

The Role of Nutrition in Public Health

Report on a Working Group

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This report is also issued in French and Russian.

CONTENTS

	Page
1. Introduction	5
2. General situation in the European Region	6
3. Prevention of protein-energy malnutrition and mineral and vitamin deficiencies	7
3.1 Effects of nutritional status on maternal and child mortality	7
3.2 Effects of subclinical deficiencies on the health status of different populations	9
3.3 Specific problems of the elderly	11
4. Prevention of conditions associated with overnutrition	12
4.1 Adult obesity and its links with excessive weight in childhood	12
4.2 Hypertension and cardiovascular diseases	14
4.3 The tracing of high-risk groups	15
4.4 Efforts at prevention	17
5. Collective feeding and industrially-produced food	17
5.1 Statistics on collective feeding and the consumption of industrially-produced foods	18
5.2 Nutritional aspects of collective feeding	18
6. Quality control	20
7. General problems of education	21
8. Advertising for baby foods	23
9. Conclusions and recommendations	23
References	26
Annex I Medical standards for marketing of infant foods in Sweden	28
Annex II List of participants	30

1. INTRODUCTION

A Working Group on the Role of Nutrition in Public Health was held in Algiers from 26 to 30 October 1976 by the Regional Office for Europe of the World Health Organization in collaboration with the Algerian Government. The Working Group brought together 10 temporary advisers from Algeria, Czechoslovakia, Federal Republic of Germany, France, German Democratic Republic, Portugal, Turkey, Union of Soviet Socialist Republics, and Yugoslavia, four observers from Algeria, and staff members from the Food and Agriculture Organization of the United Nations, and the World Health Organization headquarters and the Regional Office for Europe (for list of participants, see Annex II).

The purpose of the meeting was to examine the present situation with regard to nutrition in the European Region, giving special attention to the different situations encountered in both industrialized and developing areas, leading to correlations between the nutritional status of different populations and the prevalence of diseases linked to undernutrition or overnutrition, and to the preparation of health, economic, educational and social measures to improve the situation. Particular attention was placed on problems raised by the growth of collective feeding and the use of ready-made foodstuffs and thereby on the role of industry in human nutrition.

Participants were welcomed, on behalf of the government of the host country, by Dr O. Boudjellab (Minister of Health, Republic of Algeria) and on behalf of WHO, by Dr D.K. Sokolov (Chief, Strengthening of Health Services, Regional Office for Europe). Professor B. Lindquist was elected Chairman and Dr B. Hadj Lakehal, Vice-Chairman; Professor J. Rey acted as Rapporteur.

Opening the meeting on behalf of the Regional Director, Dr Sokolov pointed out the basic importance of family health in general and nutrition in particular. Referring to the WHO Sixth General Programme of Work, he demonstrated by quoting related activities of the European Regional Office, that nutrition had always been a focal point in international cooperation.

Nevertheless, in Europe there was still a gap between needs and demands and the services available for the people concerned. Rapid changes in society, urbanization, migration, all had an impact on nutrition, producing both a physical and mental impact on the whole population. Stressing the health hazards of malnutrition he named ischaemic and hypertensive heart diseases, obesity, diabetes and gall-stones as results of overnutrition, while undernutrition led to disturbances in physical and mental development. Both phenomena existed in the European Region, and both should be analysed by the Working Group. He announced that the meeting's results would be submitted to the technical discussions of the World Health Assembly in 1977.

Dr P.S. Rönisch, Regional Officer for Maternal and Child Health, also addressing the opening session, pointed out that, to attain the goals set forth in the WHO Constitution the Organization should, *inter alia*:

- (a) promote, in cooperation with other specialized agencies where necessary, the improvement of nutrition;
- (b) develop, establish and promote international standards with respect to food.

On the basis of the WHO Sixth General Programme of Work, the Regional Office for Europe had set itself the following objectives:

- (a) to reduce the prevalence of malnutrition (both undernutrition and overnutrition) in different communities;
- (b) to improve the nutritional status of populations, and of vulnerable groups in particular.

To achieve these objectives, the programme of the Regional Office was maintaining the following lines of approach:

- to educate the public on the importance of nutrition and good dietetics;
- to collaborate with other international, governmental, and nongovernmental organizations in implementing the recommendations of the World Food Conference of 1975, particularly in the field of manpower development and research;
- to continue to study the nutritional problems of vulnerable groups: pregnant women and young mothers, newborn infants, children between the ages of two and five years, shift workers, and the elderly; and
- to examine the use of collective feeding and ready-made foods, and the advantages and disadvantages of such use.

2. GENERAL SITUATION IN THE EUROPEAN REGION

Protein-energy malnutrition is no longer a major problem in most countries of the WHO European Region. To all intents and purposes it no longer exists in the highly-industrialized countries, apart from among certain groups, particularly some ethnic minorities escaping from under the umbrella of the surveillance agencies, including maternal and child health protection departments.

Nevertheless, it persists in the developing countries of the Region and in some geographical zones (the Mediterranean basin, and mountainous areas in particular) of more developed parts of the Region. In these countries, the chief factors to be considered here in the persistence of malnutrition situations are the population explosion, the uneven distribution of populations in areas where over-populated zones can be found side by side with zones of low population and which are often difficult of access and the uneven distribution of knowledge of wealth among the different social classes leading to a situation where a small minority possesses large incomes and cultural resources while the vast majority is poorly educated and has extremely low incomes. To this should be added the exodus from the countryside and the shift in populations towards the fringes of cities, still further exacerbating socioeconomic and cultural imbalance and leading swiftly to an abandonment of breast-feeding and thereby to an increase in marasmic forms of malnutrition among the very young.

However, although there is no doubt that malnutrition is largely reduced through improvements to economic and social conditions, some facts show that an increase in the amount of food available does not necessarily resolve all nutrition problems. In some economically advanced countries, for example, regions and population groups still exist where rising purchasing power and improving living conditions are not accompanied by a complete improvement in the nutritional situation, even though there may be an increase in the overall consumption of food. The result of this is that in industrialized countries, clinical or subclinical symptoms of mineral and vitamin deficiencies may still be encountered while at the same time increases in energy consumption and a reduction in the rate at which it is expended in activity play a significant role in increasing the prevalence of obesity and conditions generally associated with overnutrition.

3. PREVENTION OF PROTEIN-ENERGY MALNUTRITION AND MINERAL AND VITAMIN DEFICIENCIES

The prevention of malnutrition and specific deficiencies is the main priority not only in developing countries but also among high-risk groups (pregnant women, unweaned infants, children of pre-school age, the elderly, etc.), irrespective of the level of development of the countries they inhabit.

3.1 Effects of nutritional status on maternal and child mortality

The existence of a link between nutritional status and maternal and child mortality rates has been shown by numerous authors (1). For example,

child mortality rates are higher in countries where the nutritional status of children is unsatisfactory than in those where health conditions and socio-economic circumstances are at their best. Thus, in Turkey mortality is nearly 10 times higher between birth and 1 year and almost 20 times higher between the ages of 1 and 4 years than in Sweden or the Netherlands, where the lowest figures are recorded (Table 1). A close link can also be seen between maternal mortality rates and the nutritional status of the mother before or during pregnancy (obesity, nutritional anaemia). Conditions influencing the latter rates include pelvic malformations resulting from rickets in childhood, malformations which are responsible for the extremely high percentage of surgical interventions during childbirth in certain areas. The nutritional status of the mother also clearly affects the development of the foetus and this is responsible to some degree for the large number of premature births and hypotrophy among newborns reported from countries with widespread malnutrition. Nevertheless, very few statistics lend themselves to precise interpretation because in such countries infants and children are hospitalized only when malnutrition is compounded by severe respiratory or gastrointestinal conditions. In most cases the cause of death is then attributed to complications resulting from malnutrition (gastroenteric diseases, bronchial conditions, pneumonia, etc.), rather than to malnutrition itself (2).

Table 1. Mortality rates among infants, young children (1-4 years) and mothers in selected developed and developing countries (1968)

Countries	Mortality rates per 1000 live births		
	Infants	Young children	Mothers
Netherlands	12.6	3.51	0.26
Sweden	13.0	2.29	0.09
United Kingdom	18.3	3.27	0.24
France	20.4	3.46	0.32
Bulgaria	28.3	4.38	0.23
Spain	32.0	3.74	0.44
Italy	32.7	4.59	0.70
Greece	34.4	4.16	0.5
Yugoslavia	58.6	10.14	1.0
Turkey	153.0	44.5	1.3

3.2 Effects of subclinical deficiencies on the health status of different populations

Until recently the importance of moderate or subclinical states of malnutrition has not been properly appreciated in the countries of the European Region. It was thought sufficient merely to compare nutritional intake with recommended daily quantities in different population groups, thereby yielding data difficult to interpret in the absence of definite clinical symptoms of deficiency. Nevertheless, more precise anthropometric data and biological methods available for the last few years have enabled the incidence of subclinical malnutrition states to begin to be better evaluated. Thus it has been shown that despite the absence of clear malnutrition, a substantial proportion of rural populations of economically still poorly developed regions suffer from riboflavin, thiamine, pyridoxine, vitamin A, vitamin C and iron deficiencies (Table 2). In this, it is interesting to note that the haemoglobin rate is not the right parameter for noting the incidence of iron deficiency; even in groups where only 1.5% of the population shows a low haemoglobin level, more sensitive tests such as the percentage transferin saturation method prove that as many as 40% of those examined suffer from iron deficiency (Table 3). It has also been noted that some deficiencies are basically seasonal, particularly vitamin C deficiency in rural populations (3).

The incidence of subclinical deficiency is not insignificant in certain industrialized countries of the European Region either, since insufficient intakes of vitamin A, vitamin C, vitamins B₁, B₂, B₆, calcium and iron have been reported, especially from among the elderly where insufficient intake of vitamin A, vitamin C, and pyridoxine has been found among 45–86% of individuals examined (Table 4). However, all these problems are clearly more acute in developing countries, where nutritional anaemia of different types, rickets, goitres, and even pellagra and beri-beri are still to be seen in large numbers. The effects on health of such subclinical symptoms of malnutrition is also coming to be better appreciated. Many studies appear to show that a poor nutritional status can actually affect the working capacity of young adults and industrial workers and that it is related to a greater or lesser degree with increases in absenteeism (4). The idea has also been put forward that there is a link between the portion of family income earmarked for food and the prevalence of certain chronic conditions. Thus, in families whose health status seems good or satisfactory, it has been reported that nutrition status is good in some 50% of cases and poor in only 2%, while among families whose health is considered unsatisfactory, only 20% have a proper diet and more than 6% have an inadequate diet. This imbalance also appears to be clearly associated in addition to the economic standard of living, with a whole range of socio-health factors, including living and working conditions, and that an effort should be made to arrive at a clear determination of its effects. It is

also important to obtain more information on the effects of such subclinical malnutrition conditions on prospects for occupational training and on the human system's immunological defences, problems which have been the subject of much controversy.

Table 2. Biochemical evaluation of nutritional status in a part of rural Yugoslavia

Age (years)	Vitamin A µg/100 ml plasma	Vitamin C mg/100 ml plasma	Riboflavin EGR reaction	Pyridoxine EGOT reaction
	<30	<0.20	>1.20	>2.0
3-6	28.4%	26.2%	25.7%	11.8%
7-14	16.2%	30.2%	27.7%	7.3%
16-40	1.4%	16.3%	29.3%	7.1%
60-80	-	19.0%	20.2%	26.6%

EGR = erythrocyte glutathion reductase

EGOT = erythrocyte glutamic oxalacetic transaminase

Table 3. Biochemical evaluation of nutritional status in a part of rural Yugoslavia

Age (years)	Haemoglobin g/100 ml		Fe µg/100 ml	Percentage transferin saturation		Zinc (hair) ppm
	<11	<12	<50	<20	<15	<70
3-6	1.0%	11.1%	21.1%	44.1%		22.4%
7-14	0.3%	1.5%	14.3%	41.0%		28.5%
16-40	0.8%	3.5%	9.3%		14.4%	
60-80	2.0%	2.0%	5.4%		5.3%	

Table 4. Percentage of persons examined with low or insufficient intake of vitamins and minerals in the Netherlands and Switzerland

Nutrients	Children and adolescents 3-21 years		Adults 28-54 years		Elderly 57-89 years	
	Low	Insufficient	Low	Insufficient	Low	Insufficient
Calories	41	1	10	2	4	0
Protein	0	0	3	0	39	0
Vitamin C	14	3	18	18	29	64
Vitamin A	26	0	3	0	32	45
Vitamin B ₁	38	0	40	3	79	14
Vitamin B ₂	6	0	23	3	64	0
Vitamin B ₆	—	—	—	—	14	86
Calcium	31	6	29	2	7	0
Iron	40	12	40	6	57	0

Source: **Dalderup et al.** Intake of vitamins and some other nutrients in aged people, adults and children. *Int. J. Vit. Nut. Res.*, 40: 553 (1970)

3.3 Specific problems of the elderly

The increase in life expectancy that has resulted from progress in the control of communicable diseases and malnutrition has been followed by a major rise in the proportion of the elderly, particularly in more developed areas. Attention has thus come to be drawn to functional and structural changes associated with aging. This is a complex process involving a large number of factors, for example, genetic factors, about which relatively little can be done but of which certain, such as the nutritional factors, can be influenced by public health measures.

Available data can lead to the conclusion that nutritional needs among the elderly are not significantly different from those among younger adults, except for energy needs which are considerably lower because of the fall-off in the basic metabolism and the reduction in physical activity occurring in old age. At least in theory, this conclusion could help produce action designed to meet such needs.

Nevertheless, the main things affecting the nutritional status of the elderly (Table 4), by reducing their overall consumption and producing an imbalance in their intake, are certain socioeconomic factors, and physical

and mental handicaps. Among the former, the decline in income and resources following retirement and social isolation must be considered the most important, in particular among widowers who are frequently incompetent when it comes to cooking. Among the second, the difficulties resulting from the loss of teeth must be mentioned together with the gradual loss of the senses of taste and smell, and problems in swallowing. The part played by eating habits should not be underestimated either, since they are generally fixed by the time old age is reached, and constitute one of the prime obstacles to recovering good nutritional status. The result of all this is that meals tend to become very irregular, often being replaced by snacks, and that diets become increasingly monotonous, most often leading to excessive consumption of carbohydrates, at the expense of protein, and to inadequate vitamin and mineral intake, particularly of iron and calcium. At least in part, this accounts for the particularly high incidence of iron deficiency, anaemia and osteoporosis among these age groups, even where the latter is primarily caused by dystrophy in the protein matrix of the bone and responds only poorly to calcium therapy. The possibility of a negative nitrogen balance and a swift progression of osteoporosis must moreover be taken into consideration in cases of prolonged immobilization.

4. PREVENTION OF CONDITIONS ASSOCIATED WITH OVERNUTRITION

The prevalence of obesity, a high-risk factor for hypertension, hyperlipoproteinaemia, and diabetes, has risen considerably over the past few years and to an increasing degree has come to affect young age groups. While we know that mortality associated with hypertension, cardiovascular diseases and, in particular, ischaemic heart disease is also steadily rising in all countries having dietary habits of the Western type, there is no doubt that overnutrition is one of the major problems of the present time, in the European Region.

4.1 Adult obesity and its links with excessive weight in childhood

It is an undoubted fact that heredity plays a decisive part in the development of obesity in general terms and in particular in childhood obesity. However, this fact cannot explain the recent increase in the incidence of obesity which affects more than 10% of the population in industrialized nations, with some 20–30% at least of all children and adults being obviously overweight in relation to their height. Surroundings, therefore, also play a considerable part, whether in the shape of psychological factors, the effect of diminished physical activity as a result of mechanization and automation, or of purely nutritional factors. The common denominator of all of them is, however, incorrect energy intake

in relation to physiological needs and to the amount of energy burned up in activity, even though the mean energy consumption of urban populations is declining. Since the result of treating obesity after it has developed is often disappointing, every effort should be made to try to prevent its appearance, particularly in early childhood. This is all the more important in that certain experimental results and observations made in studies on human beings suggest a relationship between adult obesity and overweight in childhood.

4.1.1 *The adipose-cell hypothesis*

Overnutrition or its converse, undernutrition, can cause permanent alterations in the adipose fat of rats during the first three weeks of life, with overfed animals having more adipose tissue with cells which are larger and, more importantly, more numerous than controls or underfed animals. Moreover, in the rat, the precursors to adipose cells form during the first few weeks and once they have formed do not disappear. On the other hand, in rats displaying a predisposition to the condition (the Zucker strain, for example), obesity can be avoided in a half of all cases by early undernutrition. In man, a very positive link has also been found between the incidence of excess weight at the age of six months and that of obesity in adulthood, irrespective of the weight of the parents, social class or level of education, which likewise show a correlation with obesity. For example, it has been reported that 36% of nursing infants whose weight is over the 90th centile have a higher than average weight by the time they reach the age of 20, as against only 14% of those whose weight lies between the 25th and 75th centile. Conversely, a lower incidence of obesity was observed at the time of call-up into the Dutch Army among young men who had been born in the Netherlands following the 1944-45 famine and had been seriously undernourished during the first three months after conception and in the first months of life. A recent study has shown, moreover, that severe obesity at an early age is generally of the hypercellular type while moderate or low obesity beginning in adulthood is more often of the hypertrophic type, indicative of the fact that the first few months of life constitute, in man as well as in the rat, one of the critical periods in so far as the production of adipose tissue is concerned. In spite of the difficulty of making accurate adipose-cell counts and of measuring their size, it therefore seems likely that what has come to be known as the adipose-cell hypothesis can be applied to human obesity (5).

4.1.2 *Nutritional factors in childhood excess weight*

Numerous factors play a part in excessive energy intake during the first few months of life. Chief among them is undoubtedly the decline in breast-feeding. Some arguments suggest that right from birth the nursing infant is capable of recognizing variations in the composition of breast milk at the time of feeding and that bottle-feeding using a regular composition formula prevents this appetite-regulatory mechanism from operating. Moreover, it is well known that energy

requirements vary widely from one infant to another, and for one and the same child from one feed to another and from one day to the next, and that to plan intakes on the basis of mean recommended quantities leads inevitably to a situation where some children receive intakes higher than their proper needs. The use of improperly reconstituted dried cow's milk feeds and too high a renal solute load in some infant formulae can cause thirst and crying, which lead the mother as a rule to supplement the milk ration, and thereby contribute directly or indirectly to overfeeding. In fact, fewer chubby infants can be noted among those who are breast-fed than among those who are bottle-fed. It is also well known that obesity is a rarity among wild species. Attention should also be paid to the untimely introduction of cereals and "Deikost". There is nothing really to show that this practice produces any benefit before the age of three or four months; the excess of calories that it can result in and the often high renal osmotic load in certain preparations (in particular in small jars of vegetable formula) seem to indicate that it can have damaging effects.

4.2 Hypertension and cardiovascular diseases

Prospective epidemiological studies have shown that certain factors in isolation or together can increase the risk of coronary heart disease, stroke and arterial hypertension. Hypertension itself constitutes one of the principal risk factors for atherosclerosis, along with high plasma lipid levels in particular, cholesterol, obesity, diabetes, heavy smoking and different types of stress in general.

4.2.1 *Lipid intake and coronary heart disease*

Some data indicate a direct link, at the population or community level, between the incidence of ischaemic heart disease and cholesterolaemia and eating habits. A reduction in the incidence of atherosclerosis could therefore be generally expected from a reduction of animal fat and cholesterol intakes to the same extent as cholesterol plasma ratios may be significantly reduced by such diets. Nevertheless, no relationship has been demonstrated in individuals between the consumption of fats or cholesterol levels and the incidence of coronary heart disease. Moreover, recent increases in the frequency of coronary heart disease in Japan may clearly be only partly explained by increased consumption of fats; in the United Kingdom the increased incidence of coronary heart disease came before changes in eating habits, and in the United States the rise continues although diets have varied very little for a number of years. Finally it should be pointed out that striking differences exist between the degree of atherosclerosis and the incidence of coronary heart disease, which lends support to the idea that atherosclerosis is merely one of the factors involved in this disease and that thrombosis may be the pathological process triggering off clinical symptoms (6).

4.2.2 *Other nutritional factors associated with coronary heart disease*

Numerous other shifts in dietary habits have accompanied the increase in saturated fats and cholesterol consumption in westernized countries. The intake of refined sugar, particularly saccharose, has increased considerably and, on the other hand, the consumption of dietary fibre complexes has progressively declined, all of this having a more or less demonstrable relationship to the rise in coronary heart disease. Coffee and dietary imbalance, including a possible copper deficiency, have also been incriminated, but their effects may be considered to be either negligible or merely hypothetical (7).

4.2.3 *Intake of salt and arterial hypertension*

The contribution made by nutritional factors to the etiology of hypertension is open to question. Certain facts, however, suggest that excessive salt consumption, particularly its sodium ion, the most important from this standpoint, could itself induce hypertension. In the rat, intakes of 2.5 – 7.5 mEq/100 kJ (3–8 mEq/kg/day) are liable to result in death from hypertension among nonselected animals; among most survivors, hypertension becomes irreversible within one year, even after the excess sodium has been eliminated. However, considerable individual variations exist, some animals being insensitive to excess sodium and others being extremely sensitive to it. Much shorter periods of exposure or much lower quantities of sodium (1–2 mEq/kg/day) are sufficient in predisposed rats (genetically selected) while no blood-pressure reaction is observed with resistant strains. The duration of exposure and the age at which animals are subjected to increased sodium intake also affect their subsequent blood-pressure trends. In man, a relationship has been shown to exist between the mean consumption of salt and the incidence of hypertension among population groups belonging to different cultures. Nevertheless, as with atherosclerosis and perhaps for the same reasons, i.e., the importance of genetic factors, no link has been found at the individual level; no significant difference in the salt intakes by subjects having different blood pressures has been observed and similar blood-pressure figures have been found in isolates having different salt intakes. Available epidemiological data do not permit any conclusion to be drawn (8).

4.3 *The tracing of high-risk groups*

This creates a number of problems whose complexity has scarcely begun to be perceived and which have been treated in in-depth studies only for lipid metabolism disturbances, and to a lesser extent for hypertension.

4.3.1 *Screening for hyperlipoproteinaemia*

There is a simple method of identifying some children particularly liable later in life to coronary heart disease, since some 30% of children whose parents, particularly the fathers, have had an infarct at an early age, suffer from hyperlipoproteinaemia. The likelihood of recognizing such conditions in childhood nevertheless differs widely according to type, for among the types of hyperlipoproteinaemia with a high atherogenic potential, only type II hypercholesterolaemia is congenital and can be identified in cord blood. Nevertheless, newborns suffering from type II hypercholesterolaemia cannot be identified with certainty except if they are born to families where one of the parents has previously suffered from hypercholesterolaemia of the same type.

The risk of error is considerably increased if a nonselected population of newborns is used, since distribution is not bimodal as in families affected by type II hypercholesterolaemia and since the division between "normals" and "hypercholesterolaemics" is arbitrary as with any other continuous variable. It is moreover clear that cholesterol is a nonspecific marker and that only a portion of the population thus isolated suffers from type II hypercholesterolaemia. The vast majority of coronary heart disease cases are in any case not the result of an "innate error of metabolism" but occur among individuals having only a moderately high cholesterol level (2.5 - 3.5 g/l in the adult age), the triglyceride level creating a heightened risk of atherosclerosis only if associated with increased cholesterol levels. The problem is not really to obtain the incidence of type II hypercholesterolaemia, or other types of hyperlipoproteinaemia, but to know which children must be treated from the start of mass screening in a population or selected group, and what results might be expected from it (9).

4.3.2 *Screening for hypertension*

Among children, hypertension is nearly always secondary to a renal cause, coarctation, a suprarenal tumour or some other specific cause. However, increased blood pressure in the adolescent is perhaps more frequently the first symptom of essential hypertension. Given the possible impact of early treatment on its development, the tracing of hypertension is of incontestable importance. Nevertheless, the only reference values that can be used are the same limits as in the adult (165/95 mmHg, for example) as both systolic and diastolic pressure levels are significantly lower in the adolescent than in the adult; at the same time, the particular instability of pressure levels at this age must also be taken into account. Limits should therefore be set for each age group; beyond these, pressure levels should be retested or careful investigations should even be set in motion. In addition, during the adolescent phase of blood pressure adjustment, periodic overshoots should never be considered as a sign of labile hypertension, except when repeated measurements show an increasing frequency of recorded blood pressure elevations (10).

4.4 Efforts at prevention

There is no great certainty as to the outcome that can be expected from efforts to prevent the above conditions. Some treatment programmes have been undertaken in Finland, Norway and the United States among survivors of myocardial infarct (primary prevention). A fall-off in the recidivity incidence as against control groups left on normal diets has been reported and has been attributed to the effects of cholesterol-poor regimes that are rich in polyunsaturated fatty acids (PUFA). Favourable results have also been reported from the United Kingdom in patients treated by clofibrate but were not found in the United States by the Coronary Drug Project Research Group. Moreover, an increased incidence of gallstones and greater mortality from cancer has been noted in adults from groups on PUFA-rich regimes. It has been suggested that a cholesterol-poor diet could affect the process of myelin development in childhood, but a number of studies have shown that newborns can provide for their own needs without an exogenous cholesterol intake. Above all, the possibility that a low cholesterol level during the neonate phase can lead subsequently to the establishment of a higher degree of cholesterolaemia has been put forward on the basis of experimental results obtained from rats. Studies carried out on nursing infants have not, however, so far produced any argument to support this (11). Finally, attention has recently been drawn to the significant increase in plasma levels of phytosterols resulting from increased PUFA consumption, but its long-term effects are not known.

A return of arterial tension to normal has also been observed after treatment has been stopped in a significant percentage of severe adult hypertension cases where blood pressure has been closely monitored over a period of years. Comparable results have also been obtained in rats spontaneously developing hypertension, where the haemodynamic sequence is remarkably similar to that of the first stages in the human disease. The reports suggest that the development of hypertension can be altered at least in some cases by treatment before peripheral resistance begins rising. However, this has not been conclusively proved (10).

5. COLLECTIVE FEEDING AND INDUSTRIALLY-PRODUCED FOOD

The food industry's role is growing in importance as collective feeding develops and the use of preserved foods and ready-to-serve dishes becomes customary. This rise affects not only adult foods but also all industrially-produced children's food which, apart from infant formulas, was still very rare in the nineteen-fifties.

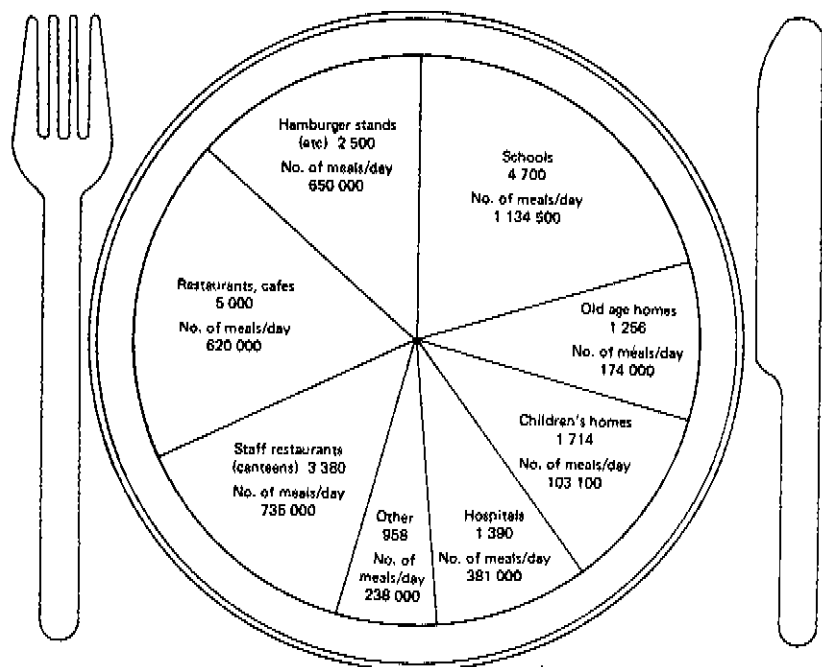
5.1 Statistics on collective feeding and the consumption of industrially-produced foods

Available statistics on collective feeding are unfortunately completely inadequate for any attempt to understand the situation in the European Region as a whole. However, the most developed country in this respect is unquestionably Sweden, where for a population of scarcely more than 8 million inhabitants, some 4 million meals per day were served in 1974 and where all children received a free school meal designed to cover 30% of their recommended daily intake of energy protein, and other essential nutrients. Around half of these collective meals as a whole are served by public institutions (schools, children's homes, hospitals, centres for the elderly, etc.) and approximately 20% were served in canteens and other staff restaurants (Fig. 1). Collective feeding is a rapidly growing sector in France too; between 9 and 10 million of the French population of 50 million eat at least 5 meals per week in communal catering establishments (at schools, universities, commercial undertakings, civil service, army, hospitals or restaurants) and it has been calculated that the number of meals served per annum was some 1700 million in 1965 and more than 5000 million in 1975, i.e., the number has trebled in 10 years (12). In developing countries, collective feeding is beginning to make up an important part of the diet of schoolchildren and workers since, for example, 2.5 million meals are served each day in canteens in Algeria (for a population of 18 million). The growth of this type of feeding is obviously possible only if there has been a parallel development of the food industry and if half-cooked or ready-to-serve dishes are available. At the moment only inadequate statistics are available on the subject, but it should be possible to compile them without too much difficulty in the different countries, both as regards adult foods and as regards children's food.

5.2 Nutritional aspects of collective feeding

Collective feeding, whether or not industrially produced food is used, theoretically provides an opportunity to control the nutritional quality of the diet, and allows it to be better adapted to working needs in schools and commercial undertakings. In addition to its lower costs, it also ensures better hygiene standards and, through the planning of menus it should permit needs to be better covered and, when necessary, should help rectify inadequate family diets. In many countries, programmes to this end have been drawn up and systematic vitamin supplement campaigns have succeeded in some areas where dietary insufficiency was particularly strongly evident. Unfortunately, the opportunities presented by collective feeding are obviously not always fully utilized, the quality of foods and their methods of preparation often leaves much to be desired, and the amounts served do not necessarily correspond to the desired standards. However, the use of industrially prepared

Fig. 1. Collective feeding in Sweden
 Number of meals, 4 035 600/day



foods offers an opportunity to exercise stricter quality controls and perhaps to alter the composition of food products itself. This is particularly clear as regards foods designed for children and infants which have been progressively changed to keep pace with improvements in knowledge and technological progress. Formulas for nursing infants, the composition of which is close to that of breast milk and which are enriched with vitamins and minerals have been developed, and the incidence of rickets and iron-deficiency anaemia has been more or less reduced to zero in countries where they are widely used. Very strict rules have also been developed by the Codex Alimentarius Commission as regards cereals and canned baby foods for infants and young children. As a whole, the advantages therefore appear greater than their disadvantages (excessively fine texture and higher costs, for example), at least in the

developed countries where abandonment of breast feeding, to which they have contributed, does not create a serious malnutrition and super-infection hazard.

6. QUALITY CONTROL

The development of world food output to combat the population explosion and increased demand caused by it, is constantly creating new problems at the production level in relation to manufacturing processes, distribution networks, and also to marketing and the accompanying publicity. The evidence goes to show that the risks of adulteration and contamination of food (by pesticide residues, heavy metals, mycotoxins and artificial additives) are steadily increasing and, if control measures are not reinforced, the state of health of populations cannot be effectively protected, not only from mass infections and cases of poisoning, but also from a gradual decline in the nutritional quality of foodstuffs.

Quality control forms one of the main goals of joint FAO/WHO committees, but though rules have been drawn up to ensure perfect chemical and bacteriological safety of products, and to lay down conditions for their packaging and labelling, some questions remain unsolved, particularly those related to food for infants and young children. To take one example, no legislation yet exists requiring a declaration as to the technical procedures used which would make it possible to arrive at some estimate of the degree of protein adulteration by heat. In practice, the long-term toxicity of products resulting from Maillard reaction has been neither confirmed nor ruled out, and lysine blockage can result in a reduction in the nutritional value of protein. The consequences of this latter phenomenon are particularly important as regards both baby foods, whose protein content is limited, and products for the inhabitants of countries where protein malnutrition is already critical.

Furthermore, the regulations of the Codex Alimentarius Commission lay down that infant foods must contain no trace of pesticides. Pesticide content is also strictly regulated for numerous products for adults, particularly milk. However, recent studies have drawn attention to contamination of breast milk (13). For the time being, these results are in no way alarming and should not be used as an argument against breast feeding. At the same time, if studies in progress did not, as is happening in some countries, show a reduction in the level of such substances in breast milk, the contamination they cause should lead governments and international agencies to greater efforts in combating the excessive use of DDT and other pesticides in agriculture and day-to-day practice.

The use of thickening agents is also limited by law as regards baby food formulas. These agents are nevertheless widely used in the manufacture of other foodstuffs for small children, though the risk that they might be absorbed

by the intestine has not been completely ruled out and though studies of their possible toxicity have so far not been sufficiently developed. At all events, no agreement has yet been made to establish short- and long-term control programmes for the mandatory testing of additives produced to improve the technological processes involved, which probably explains the extreme inadequacy of trials carried out on most thickening agents, particularly the carragenates.

Finally, the widespread use of plastic packaging gives rise to certain problems. For example, although such packaging permits ultra-high temperature sterilization, it does not allow certain vitamins, particularly vitamin C, to be preserved, and can in the long term release constituents in the plastic whose toxicity has still to be clearly proven.

An active policy should therefore be implemented to ensure the general quality of food and protect consumers against potential hazards to their health. This policy should take due note of the need to educate the consumer and, in addition to mandatory measures, should lead industrialists to the voluntary adoption of a code of practice preventing malpractice and the misuse of publicity. At the same time it should not be limited to this aspect of the problem. Quality control should actually be integrated with every stage in agricultural and industrial production, whether the product is designed for the home or export market. In this, governments should take all necessary measures to guarantee that products manufactured for the export market, in particular for Third World countries not always possessing all the necessary quality control procedures, should be in line with Codex Alimentarius specifications or at least possess the minimum characteristics laid down in their specifications and certify that they contain no substance which could make them unfit for human consumption.

7. GENERAL PROBLEMS OF EDUCATION

The teaching of nutrition has been neglected for far too long in medical schools and, despite the efforts of international organizations, particularly WHO and the International Children's Centre, there are clear gaps in the education of health personnel in this sphere as a whole. However, governments are becoming steadily more aware of the fact and in the near future UNESCO is due to hold a conference to assess the situation.

For example, the whole world recognizes that priority must be given to campaigns to encourage breast-feeding, but the particular lines of approach are not being made clearly explicit. The superiority of breast-feeding to bottle-feeding is not always really appreciated by pregnant women and young mothers in economically very highly developed countries, where food conditions

are excellent and infant mortality related to infection or malnutrition is extremely low, to the same extent as it is in developing countries, where early weaning generally has catastrophic effects. Experience shows that in most European countries, the vast majority of infants have been fed on cow-milk for decades and that there have been no major disturbances as a result. On the other hand, in all countries of the Third World undergoing industrialization where there is a noticeable shift in population from agricultural areas towards urban districts, infant mortality and the incidence of marasmic forms of malnutrition rise in parallel with abandonment of breast-feeding. Potentially worthwhile lines of approach must therefore vary according to the general economic situation pertaining in the countries or regions where the publicity is being conducted.

In industrialized countries where formulas "designed" for infants are easily available and do not take up more than a low percentage of the family budget, the accent should be primarily placed on the immunological advantages of breast milk and on the importance of breast-feeding infants for at least six weeks wherever a longer period is not possible. Stress should also be placed on the high content in breast milk, and still more in colostrum, of IgA, which the newborn is not capable of synthesizing and which does not exist in any other milk; importance should also be attached to the content in breast milk of lysozyme, lactoferrine and lactose, which all help protect the newborn against infections, particularly against gastroenteritis and respiratory infections. The absence of antigens in breast milk, its low salt content, its high cholesterol and essential fatty acid levels, are also of extreme importance in preventing allergies and, as has been suggested by other work cited above, obesity, hypertension and ischemic heart disease (14). In other countries, in particular developing countries, prime importance should be attached to the role of breast-feeding in preventing infections and malnutrition should be given greatest stress. If necessary, bottle-feeding may be viewed only as a supplement to breast-feeding when there is insufficient secretion of milk, but it must never become identified with the woman's independence. In this, the policy of birth-spacing obviously assumes crucial importance, because early motherhood and multiple pregnancies are undoubtedly one of the chief factors in maternal malnutrition and foetal hypotrophy. At the same time it can succeed only if it is integrated in a general educational programme, which together with improvements to health conditions and better realization of the need of prolonged breast-feeding is essential if infant mortality is to be reduced.

In any case every opportunity should be taken to improve the public's general level of nutritional knowledge. As schools are the most desirable place to do this, school curricula should be rearranged and nutrition introduced as an obligatory subject. Canteens and all collective feeding places likewise form an ideal place for providing improved nutritional education, in particular by involving consumers and particularly children in the preparation

of weekly menus under the guidance of nutritional advisers. In addition to their surveillance and treatment role, maternal and child health centres, and prenatal courses and consultations are generally well-suited to educating pregnant women and young mothers. Finally, the role of information brochures and the media, in particular television, should be stressed, provided that official efforts are not at the same time torpedoed by unnecessary advertising of such things as toothpaste or soda-pop.

8. ADVERTISING FOR BABY FOODS

The advertising of food for nursing infants or older babies and young children is of particular importance and should be prohibited on radio and television. Advertising for mother's milk substitutes should never be aimed directly at the public or families, and advertising for ready-made infant food preparations should show clearly that they are not meant for less than three-month old infants. Publicity for public consumption, which should in any case never be distributed without previous recommendation by the competent medical authority, should indicate that breast milk should always constitute the sole or chief constituent of food for those under three months. Finally, the distribution of free samples and other sales promotion practices for baby foods should be generally prohibited (see Annex I).

9. CONCLUSIONS AND RECOMMENDATIONS

9.1 The problems raised vary widely from country to country in the European Region, the consequences of undernutrition being dominant in the developing countries of the Region, while the prevention of conditions associated with overnutrition remain the chief goal in the industrialized countries.

9.2 Protein-energy malnutrition is not a major problem in the industrialized countries. It nevertheless exists in certain groups, especially among ethnic minorities who escape the net of the different surveillance agencies. Moreover, the incidence of subclinical manifestations of mineral and vitamin deficiencies, particularly among high-risk groups (pregnant women, young mothers, nursing infants, children of pre-school age, the elderly, etc.) remains a cause for concern. The need for general measures (vitamin and iron additives to milk, fluoridation of water, for example) should be considered for areas where such deficiencies still constitute a public health problem. However,

given the opportunities for screening, the prevention of mineral and vitamin deficiencies should nevertheless wherever possible be adapted to the particular situation of each individual. Moreover, these measures should never take the place of others essential for improving nutritional status such as increases in production, improvement in distribution and intensification of nutrition education.

9.3 In the developing countries, priority should be given to the prevention of malnutrition during pregnancy and in infancy. This type of preventive activity should not, in the present state of affairs, be based on individual diagnosis but should be undertaken in respect of the whole population. Facilities should therefore be established to provide pregnant women with systematic dietary supplements in the form of minerals and vitamins (in particular, iron and folic acid) during the second half of pregnancy. Production of weaning foods should also be encouraged on a local level; wherever possible it should be based on local resources.

9.4 The specific problems of old age are also primarily a socioeconomic problem. A system comparable to the networks of maternal and child health centres should be set up in all countries of the European Region. This system should include physicians, dieticians, home visitors and all other individuals likely to be of any assistance to the elderly, and to respect their own wishes. There should be an increase in the number of canteen and meeting places for all those who are able to get about, and cheap "ready to eat" meals should be made available to all. Encouragement should also be given to the development of bodies whose terms of reference are primarily cultural. Finally, it would also be desirable for research to be conducted into the development of special diets for the elderly.

9.5 Overnutrition constitutes a major problem in industrialized countries. In practice, some 10% of all children and adults are obviously obese and at least 20–30% are clearly overweight. The fact that a significant percentage of obese persons in adulthood were already overweight at the age of six months, and that excessive weight is more infrequent among breast-fed infants, seemed to the Group to make for an additional argument in favour of breast-feeding and against the introduction of milk "supplements" (flour, vegetables, etc.) too early in life. Generally speaking, more systematic consumer information on the energy levels of foods should be undertaken; emphasis should be placed on the harmful role of sugary drinks and overindulgence in confectionery or eating between meals. The Group also considered it desirable that the attention of governments should be drawn to the importance of encouraging physical education, sport and games for the whole population. A Working Group should be convened by WHO to define parameters indicating excess fat in an individual, to evaluate more precisely the risks run by being overweight in this way, and to consider how obesity in childhood could be best identified and prevented.

9.6 The rising incidence of cardiovascular diseases, and in particular of ischaemic heart disease, was also discussed by the Group. It considered that there was at present not enough proof that the incidence of hypertension and cardiovascular diseases could be beneficially affected by radical changes in diet for it to make recommendations on eating habits for the population as a whole. Nevertheless, some reduction in the amount of saturated fats and salt consumed in foods, particularly in children's food, would seem to be desirable. The Group was not in favour of launching mass screening of the hyperlipoproteinaemias, one of the main risk factors in this domain, since there was as yet insufficient data on the long-term effects of treatment of these conditions in relation to a subsequent risk of atherosclerosis. On the other hand, encouragement should be given to pilot surveys and tracing of hypertension and lipid metabolism disturbances in families where similar cases were already known.

9.7 The various problems raised by collective feeding were analysed. However, in view of the clear lack of statistics on the subject, the Group considered that a preliminary international study should be undertaken on different types of collective feeding to establish which experience in this area has been positive and to identify shortcomings. It nevertheless recommended that such feeding should be placed under effective control of the health services which should supervise the quality of meals distributed, and to organize, wherever feasible, supplementary feeding programmes for high-risk groups under the control of national bodies and using produce of local origin as far as possible.

9.8 The Group was also of the opinion that a policy should be actively developed to ensure the general quality of produce, to protect consumers. A description of the manufacturing procedures used and the shelf life of protein contained in the product should appear on the packaging. Additives introduced as part of technological processes should only be authorized after sufficient studies of their short- and long-term toxicity have been made and the complete programme of evaluation trials should always be followed through for all children's foods. The Group also considered it desirable for the FAO/WHO studies on contaminants and pesticides to be continued and for the pesticide content of mothers' milk to be the subject of in-depth international studies. Recommendations on the use of certain types of plastic packaging should also be considered. Finally, the Group recommended that governments should guarantee that products intended for export contained no substance which could render them unfit for human consumption and that assistance should be provided for the establishment of control laboratories in developing countries.

9.9 The Group stressed the inadequacy of dietary education among the public and health personnel. It considered that efforts undertaken in this area

should be intensified, in particular at schools, canteens, prenatal courses and maternal and child protection centres. Priority should be given to information campaigns on breast-feeding, but the subjects to be developed should vary in accordance with the general economic situation of the country where the information has to be disseminated. In return, supervisory systems should be set up in all such cases to ensure the impact of programmes developed for different vulnerable groups on the subsequent health status of such groups.

9.10 Finally, the Group hoped that all countries would adopt very strict rules for the advertising of children's foods. Such publicity should never be permitted on radio and television, and the distribution of free samples and other sales promotion techniques to families should be prohibited for everything relating to food for the young child.

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Annex I

MEDICAL STANDARDS FOR MARKETING OF INFANT FOODS IN SWEDEN^a

(The standards given below, issued on 24 October 1975, correspond essentially to the code of ethics in this field originally laid down by a group of Swedish paediatricians in 1964. It should be noted that in Sweden no advertising takes place on television or radio.)

1. Advertisements for and information concerning infant foods should always be in a form which is concordant with the views on infant feeding held by the medical consultants of the firms in question.
2. Advertisements for breast milk substitutes (starting infant formulas) should in no form be aimed directly at the public or individual families. Special discount offers to the consumer should not be made for products of this type.
3. Advertisements sent directly to the individual family for other infant foods such as fruit juices, "baby drinks", strained and junior foods, follow-up formulas and similar foods should not be distributed so that they reach the consumer before the child is about three months old.
4. Printed matter with qualified contents, such as *Mitt barn* [My child] and *Babys egen bok* [Baby's own book] should be distributed only through doctors and nurses. It should be permissible, however, for the firms concerned to send printed matter of this kind to individuals at the latter's special request. Simple printed matter such as lists of infant food ranges should, however, be allowed to be distributed directly to the consumer, but never so that they reach the consumer before the child is about three months old.
5. In printed baby menus intended for the public, for infants under four months of age only breast milk should be given as the main component of the meals. A comment may indicate, however, that the child health centres will give information on appropriate substitutes in cases where there is insufficient breast milk or where it is lacking.
6. Demonstrations of infant food products or instructions on infant feeding, for example in association with "Mothers' evenings", may be arranged by the infant food industry provided that they take place in collaboration with a doctor or registered nurse.

^a Translated from the Swedish original.

7. All new booklets or other printed matter directed at the public should be scrutinized by the proper medical consultants before publication. The same should apply to advertisements in the daily and weekly press, in medical journals and journals for nurses, and to all informational material that is to be distributed to doctors, nurses, hospitals, children's homes and child health centres, etc.

8. Free distribution of infant food and similar promotion measures for purposes of advertisement should not take place.

9. By "advertisement" in the foregoing is meant all forms of advertising in professional journals, daily newspapers, weekly magazines, books such as *Vi Föräldrars Babybok* [The parents' baby book] etc., posters in stores, booklets, lists of food ranges, books on infant foods, and the like.

Gothenburg, 24 October 1975.

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Annex II

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