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Vitamin and mineral nutrition for the health and development of the children of Europe

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Abstract

Most European countries are now affected by demographic transition and changing epidemiology of disease; the nutrition of children is increasingly recognised as crucial for present and future health. Adequate dietary intake and nutritional status among children are important for their own growth, development and function but there is now increasing evidence that childhood nutrition also influences adult health. Intrauterine nutrition influences adult morbidity and mortality, but the childhood diet and nutritional status modify the increased risk of being born small. Thus, childhood diet needs to be taken more seriously in order to improve a nation's health as well as producing bright, active children. A key factor is the recognition that nutritional interventions at different stages of the life cycle are necessary if childhood nutrition is to improve. The mosaic pattern of the geography and social structure of communities in Europe produces 'poverty' and 'consumer' related nutrition patterns - often side by side. At one extreme, there is an urgent need to prevent obesity; while at the other extreme serious attention is required towards the prevention of deficiency disorders, mostly related to poverty and social exclusion. Few European governments take childhood nutrition at all seriously. This paper reviews a number of micronutrient issues and makes the case for the development of evidence-based policies and programmes for improving the nutrition of children in Europe.

Keywords
Nutrition
Micronutrients
Child
Birth Weight
Diet
Anthropometry
Behaviour
Obesity
Eating Disorders
Morbidity
Mortality
Child Development

The children of Europe

The 4th Report on the World Nutrition Situation[1] presents data from many countries; both industrialised and less developed. It divides Europe into four regions on the basis of geographical, political and social clustering. While this serves as a useful starting point it is necessary to consider the range of cultures, economic groups, social groups and excluded populations within each country. In addition, with the move towards more united, European-wide policies on many aspects of life, it will be necessary to develop strategies which take account of the diversity of diet and nutrition between countries. At the very least this will affect issues of standards regarding food fortification and labelling. There is a tacit acceptance among politicians that diet and nutritional status are important in their own right, in order to produce bright healthy children, and a belief that nutrition is a key factor affecting diseases which cause an increasing financial burden on national health budgets. However there is little evidence, at a national or an international level, that European governments have policies or strategies to bring about much change. Indeed in a recent UK government proposal for action, the need to improve the health and nutrition of children is hardly even mentioned[2].

Within Europe there are various political consortia based on historical and geographical considerations, one of the largest being the EU. While there are likely to be tensions between state and EU policies for many aspects of life - legislation for nutrition and diet will require more harmonisation if the present move towards 'free trade' continues. There are challenges that face the food industry because of the different regulations around food fortification between different Member States of the EU. This would hardly be tolerated if it was a core commodity such as petrol, but because there are strengths of argument by different states, and diet is so closely linked with a nation's culture, it is not going to be easy to achieve universal agreement on such issues. If a 'European' view of the nutritional needs of children is to be developed it surely needs a clear appraisal of what the present situation is. With few exceptions there is little collection of data at the national level by any of the European governments. National nutrition surveys are expensive undertakings, requiring complex planning of statistical sampling, interviews, dietary records, blood

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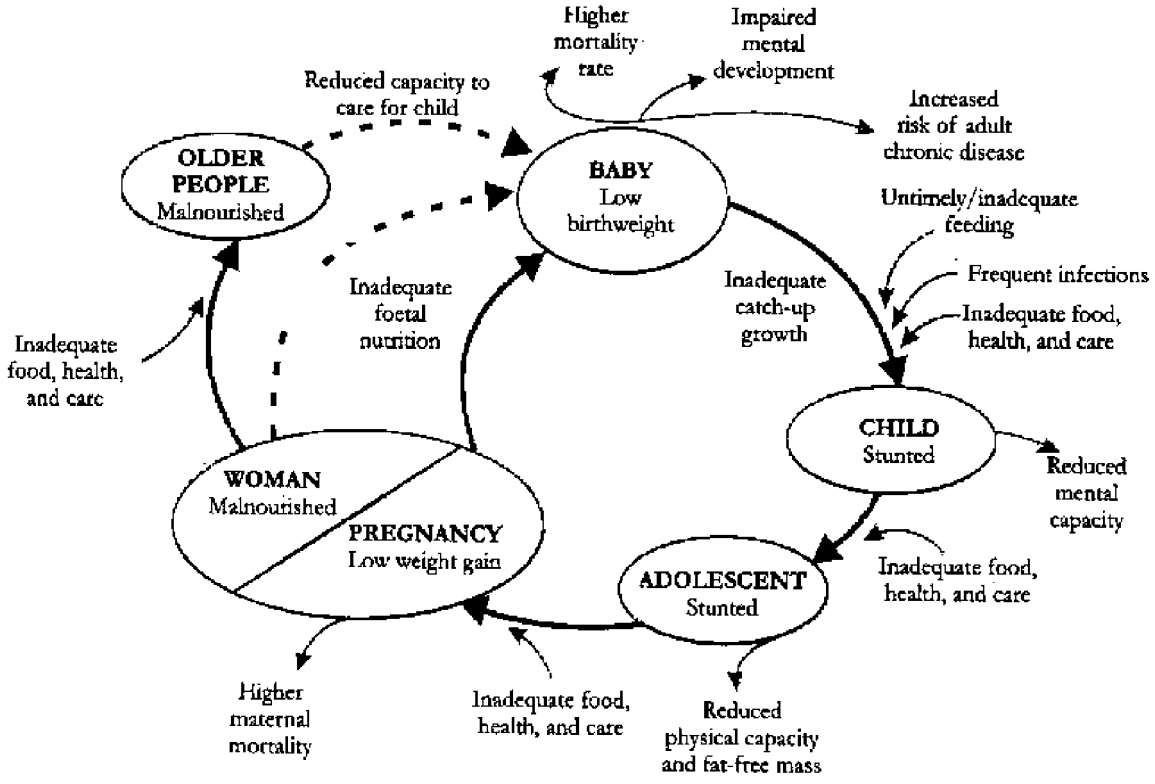

Fig. 1 Nutrition through the lifecycle

sampling and all the intricacies of obtaining local ethical committee approval and agreement by both the family and the individual child to take part. The regular surveys performed in the UK[3] have been invaluable in providing data, but they are major undertakings involving intense collaboration. It may not be necessary for each country in Europe, particularly those who are smaller or have fewer resources, to establish their own surveys of childhood nutrition. However, selecting a number of 'indicator' countries representing a typical scenario may be more beneficial. If that route is chosen then it will be helpful to identify groups with core characteristics. The classification produced by the 4th World Nutrition Report needs modification but can serve as a starting point.

Eastern Europe contains Belarus, Bulgaria, Czech Republic, Hungary, Poland, Republic of Moldova, Romania, Russian Federation, Slovakia and the Ukraine. Most of these countries have been involved in intense political, social and economic change in recent decades. There are varying patterns of industrial and agricultural development and quite marked differences within and between countries in this group. Several countries were originally subject to centrally controlled regulations concerning food production and food fortification. As a result of the development of individual, autonomous states many of these regulations have been ignored as new national legislative bodies have been created which have been busy with other 'more urgent' matters than food or nutrition.

Northern Europe contains Denmark, Estonia, Finland, Iceland, Ireland, Latvia, Lithuania, Norway, Sweden and the United Kingdom. This rather heterogeneous collection of countries has a wide range of economies and legislative procedures in relation to food production, fortification and food labelling. While most of these countries are major food producers and individual food companies are well aware of the trade in certain food items between these countries, there is little published research on how legislation, culture and commercial considerations affect dietary intake and the nutritional status in this group of countries as a whole. At present there are several strong national policies on food fortification making it impossible to market a food which is acceptable in one country to another within the same or another region in Europe.

Southern Europe contains Albania, Andorra, Bosnia and Herzegovina, Croatia, Greece, Italy, Malta, Portugal, San Marino, Slovenia, Spain, the former Yugoslav Republic of Macedonia and Yugoslavia. Several of these countries have experienced severe political disturbances and/or wars in which population mobility has put great stress on dietary provision. Other countries have been more stable with strong agricultural economies and widespread availability of the variety of foods making up to the traditional 'Mediterranean diet'. Changes in legislation on imported foods in some of these countries have affected the consumption of iodised

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salt; non-iodised salt is now being used in certain areas with recent increases in the prevalence of goitre.

Western Europe contains Austria, Belgium, France, Germany, Liechtenstein, Luxembourg, Monaco, Netherlands and Switzerland. Most of these countries have strong industrial and agricultural economies with widespread availability of meat, fish, dairy products and vegetables.

Within the geographical categories there are important social clusterings which influence nutrition. Children may be from families with social cohesion, respect and support; others may be from very 'busy' families where the microwave is the only means by which hot food is available; poor families may know what they should be eating but are unable to provide; disintegrated families may find it difficult to communicate and care about anything, least of all about food; children who are institutionalised due to the need to be 'looked after' may be at nutritional risk; immigrants often have cultural, financial and security problems; refugees are often extremely mobile and vulnerable and despite much education at schools there are still many who remain confused about what children need to eat.

Recent nutritional history

During the last few decades, most European countries have received immigrant families who have settled in differing circumstances. Some have found employment and their quality of life is reasonably high, enabling them to purchase adequate food supplies and prepare traditional diets that they were familiar with in their countries of origin or adapt to the dietary patterns of their new country. For many however, the experience is less satisfactory[4]. Whether the immigrants have legal citizen status or whether they remain as asylum seekers, the children of immigrant families frequently live in poor housing, are unemployed and are unable to purchase or prepare a satisfactory diet for their children.

The last few decades have also seen considerable increase in the levels of inequity in many European countries with an increasing proportion of the population being defined as 'poor' with difficulty in purchasing adequate food supplies. Such differences are often not detected in the national nutrition surveys, which select subjects randomly using a special sampling process. Thus, national assessment of food production, dietary intake and nutritional status may hide quite marked differentials between areas of high and low socio-economic status.

There are many surveys of selected groups of children in European countries, examining their dietary intake and food preferences. There is rather less information on the prevalence of obesity or fitness, anaemia or micronutrient deficiencies in community based studies. Whereas there is some community-based information on weight and height of children in many European countries, there is virtually no data on the prevalence of such a basic nutritional deficiency as anaemia. This makes it almost impossible to compare nutritional status between European countries. From a nutritional perspective it is also extremely difficult to know how vulnerable groups within societies are within a particular country. There is little information on the nutritional status of cohorts of children studied over the years though some studies have examined the predictive power, or rather the lack of it, in determining rates of obesity in adulthood[5,6]. However, as such research is established it is becoming increasingly clear that nutrition needs to be seen at many stages of human development and many analyses examine the differential impact of nutrition at different stages of the Life Cycle.

Nutrition throughout the life cycle

The nutritional status of children has important immediate effects on growth, intellectual capacity, school achievement and immunity[7]. Quite rapid changes in function can be achieved in children by modifying diet and nutritional status[8]. However nutrition has fundamental effects on function and capacity at nearly all stages of life. It is therefore no longer appropriate to consider a single time point in the life of an individual child and estimate the relative importance of recent dietary intake or nutritional status in determining the causes of malfunction of individual tissues, organs or the whole body. Nutrition has important effects from conception to old age. Poor nutrition often starts *in utero* and its impact continues throughout childhood, adolescence and adulthood. Infants who are born with a low birthweight (<2.5 kg) due to intrauterine growth retardation or prematurity have been recognised as being at increased risk of infectious disease because of decreased immunity[9]. There is considerable interest in the impact of dietary factors during pregnancy on the development of the infant *in utero*[10]. The recent findings of genetic susceptibility to the development of spina bifida/neural tube defect among women who have marginal folate intakes[11] and the demonstration of the teratogenicity of vitamin A when given in the large quantities in pregnancy have emphasised the potential importance of gene and nutrient interaction. It seems likely that the pathology of other functional disorders such as cleft palate and other nasopharyngeal disorders will turn out to be due to the interaction of genetic predisposition and dietary factors.

The importance of intra uterine nutrition and subsequent development, disease and longevity has been recognised for many decades, particularly in the animal literature. In recent years, epidemiological analyses have been used to support the hypothesis that intra uterine programming, as a result of nutritional exposure, may be important in determining the epidemiology of degenerative disease in adult life, e.g. hypertension, coronary

thrombosis, stroke and diabetes[12,13]. Many of the analyses have examined the relationship between anthropometric indices at birth in relation to risk of premature morbidity or mortality in middle age. Rather fewer have examined the potential effect of postnatal dietary change or growth patterns and how these might modify the level of risk attributable to a particular birth weight or length. An interesting study reviewed by Yajnik[14] refers to the analysis of a cohort of children whose birth weight, obesity patterns and early childhood growth were known and related to risk of diabetes in adulthood. Evidently all three risk factors are individually associated with risk of diabetes in a multiple regression model. Thus, the hypotheses which were developed originally to explain association between intrauterine growth and adult disease may now need to be modified to examine postnatal influences more carefully. This line of investigation is discussed in much greater detail elsewhere and provides a base on which it is possible, from carefully recorded longitudinal data sets, to estimate the relative importance of intra uterine compared with postnatal nutritional experience[12,15]. In addition to the impact of birthweight on the different components of the immune system, feeding patterns are also crucial. Thus, the protective effect of breastfeeding is of considerable significance during the first six months of life[16,17].

Anthropometric indices

The 4th World Nutrition report[1] describes community based studies which have been developed for around 160 countries globally; this data is expressed in terms of rates of stunting, under weight and wasting (in comparison with the median values from the National Centre for Health Statistics/WHO international growth reference). A recent study of British schoolchildren[3] showed that children are now on average above the existing published 50th centile of standards for growth, height and weight. They also have an average body mass index well above those calculated from the 50th centiles which were published a few decades ago. This marked secular change has been responded to by analysing more modern sets of data as reference points which show that children in many communities have higher BMIs than previously[18]. Interestingly, among the younger children, those from families where the fathers were unemployed were significantly shorter than those from families in better social circumstances[3]. Similarly, younger children from families receiving supplementary welfare benefit were significantly shorter than those from families not receiving benefits. Five European countries were included in an international comparison of the national rates of stunting and under weight in pre-school children[1]. By comparison with the results from less developed countries, where rates of stunting were between 20 and 40%, the figures for the five countries quoted seem rather small. However, they do identify that, even in Europe, stunting is quite widely prevalent (Czech Republic - 1.9%, Hungary - 2.9%, Romania - 7.8%, Russian Federation - 12.7%, Yugoslavia - 6.8%). Recent studies in the UK demonstrated a secular trend in weight and height showing that children were taller and heavier in 1990 than when a similar age group of children were measured in 1980[19]. Interestingly this increase in size has occurred despite an overall reduction in total energy intake, strongly suggesting a decrease in the general physical activity in this population. There are widespread reports of lowering exercise levels in children in many European communities. There are many apparent possible reasons. In the UK for instance, physical education and sports are often excluded from the curriculum and school sports facilities are much less adequate than they were as a result of schools selling off their land. Open-air activities including cycling, walking and running are frequently perceived as dangerous by parents. With increasing use of family car transport and much longer hours of watching TV, children of nearly all ages spend less time doing any form of exercise[20].

Assessment of dietary intake adequacy

While parents and children would like to know if an individual child is receiving enough to keep him/herself "healthy", it is not so easy to provide an answer for several reasons.

Firstly, "health" can be assessed in several ways. Is the immune system functioning well? Is the child especially susceptible to infections? Most studies which examine the risk of being at a certain level of nutritional status have been performed in communities where longitudinal records of immune function or disease prevalence can be measured[21]. The association between being shorter or having a low serum retinol or plasma zinc and the increased risk of illness or death have been measured in poor countries where infection and micronutrient malnutrition are rife[22,23]. Such studies are not available from European communities, though there is important evidence of the role of malnutrition in the outcome of serious childhood illness[24].

Secondly, it is very difficult to measure dietary intake, especially over a long enough period to be reasonably certain that what the respondent says approximates to the actual dietary intake. There are sometimes quite radical difference between energy intake when assessed using dietary recall as compared to an assessment of intake using stable isotope methods.

Thirdly, there are considerable interactions within and between foods. While dietary tables take some account of the differing degrees of bioavailability of micronutrients, there are considerable variations in the amount of phytate in food according to plant specie and subtype and these may have profound affects on bioavailability[25]. Such effects are modified considerably by dietary promoters

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and inhibitors. In addition, when certain dietary factors such as tannins in tea are given with iron containing foods they may have striking reduction in the absorption of iron

Fourthly, there is considerable biological variation in the metabolism of nutrients between individuals. Individuals of differing ages tend to have different requirements, children having a high requirement in relation to body size because of their growth and physical activity. Some of this variation may eventually be ascribed to genetic tendencies, but at present, with the exception of the recent descriptions of the work on spina bifida there is little evidence for this.

For many of the above reasons the term Dietary Reference Values (DRVs) is increasingly used to identify dietary adequacy. These values were originally set up by a panel of experts – the Committee on Medical Aspects of Food Policy (COMA) – in the UK. The COMA panel produced Reference Nutrient Intakes (RNIs) which are estimated to be sufficient to meet the needs of most people. Thus, as long as a person is eating 100% of the RNI they are unlikely to become deficient. While the person who is eating below that figure may develop deficiency it is just not possible to ascribe a relative risk with each percentile below the RNI that they eat at. These values are used extensively in comparing dietary intakes between populations but cannot be used to identify differences in nutritional risk.

Micronutrient intakes and status among children

In previous decades there was great interest in the energy and protein intakes of children and much of the differences in body composition and physical function were attributable to intake of macronutrients. In recent times there has been much greater appreciation of the contribution of micronutrients. Zinc deficiency is associated with short stature and may, through its metabolic effect on changing the energy cost of weight gain, be responsible for the short fat children that are now being seen in many middle income countries[26,27]. A range of micronutrients are now thought to play a key role as anti-oxidants, controlling the host response to infection and degenerative disease[28]. Individual deficiencies may occur with specific clinical syndromes such as iodine deficiency and goitre[29], but in many cases combined deficiencies occur. The following sections address individual micronutrient status, focusing on particular studies in European children. While there are several studies on dietary intake there are few on biochemical status.

Iron status

A study of anaemia among adolescent girls in the UK showed that 11% of white girls compared with 22% of Asian girls were anaemic[30]. Dietary records showed that a vegetarian diet and anaemia was much more common among the Asian girls, but among the entire study group, lower haemoglobin levels were also noted to be common in girls who had tried to lose weight, in those with an early onset of menarche and those from lower socio-economic families. In a review of the prevalence of anaemia among children, prepared from 118 countries, a small group of European countries were included; 12% of pre-school children and 8% of school age children were classified as anaemic in the European countries selected. Iron deficiency may occur without anaemia. This is usually measured by serum ferritin levels and 28% of girls and 8% of boys living in a poor socio-economic area of London, UK, had iron deficiency as measured by ferritin levels of less than 10 ug/l[31]. It is hoped that the WHO Micronutrient Deficiency Information System (MDIS) will provide a database for ongoing monitoring and comparison of anaemia rates in different communities. It is often claimed that marginal iron deficiency will cause impaired intellectual function. A rigorous review of the studies however by McGregor[32] concludes that it is still difficult to know at what level of iron deficiency intellect becomes affected. The relationship is complicated by the fact that early iron deficiency, in pre-school children for example, may cause prolonged neurological effects which may confound the interpretation of controlled clinical trials of iron supplementation in later childhood.

Vitamin A

Whereas there is now widespread recognition of the importance of vitamin A in relation to immunity, morbidity and mortality, most of the research has been performed in poor countries where vitamin A deficiency is a major public health problem[33]. The regular supplementation of children using 3 large doses of vitamin A (e.g. 200,000 iu) per year has resulted in a reduction in mortality by around 20% among children in many countries in Africa[22]. Such levels of deficiency do not occur in Europe, but vitamin A deficiency may be important in particular crisis situations, such as children receiving donated foods during political disturbances and in those with severe illness, such as cystic fibrosis or measles[24].

Carotenoids, the dietary precursors of vitamin A, are now recognised to be important as part of the strengthening of the anti-oxidant protective system[34]. Several studies have shown an association between the lower levels of plasma carotenoids and increased susceptibility or severity of several disease processes. A dietary survey of British children noted that Scottish children had a lower average intake of beta carotene than children from elsewhere in the UK. In the light of increasing evidence of free radical trapping as a protective response against cardiovascular and malignant disease, it is of interest that rates of these diseases are particularly high in Scotland. There are obvious co-existing factors contributing such as exercise patterns, cigarette smoking, obesity, stresses

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and overweight, but these results suggest the importance of achieving a much more satisfactory diet and nutritional status among schoolchildren in the UK. Several studies of lipid levels in children indicate that a sufficient number have levels associated with atherogenesis that much greater attention needs to be paid to dietary cardioprotection starting in childhood[35].

Vitamin E

Vitamin E levels are often low in disease processes where there is oxidative damage. Certain clinical conditions are associated with severe vitamin E deficiency and these can be detected by plasma and electrophysiological disturbance[36]. While there seems little evidence of a functional deficiency in apparently healthy European children, it is proposed that individuals at risk of developing a disease may increase their risk of developing the disease or getting it more seriously if they are vitamin E deficient. One of the difficulties in assessing the significance of apparently low values of vitamin E is the need to compare vitamin E levels to cholesterol, and there is no data on the risk of degenerative disease at different levels of vitamin E.

Zinc

The effects of zinc deficiency are well-known in relation to immunity, growth, morbidity and survival of children with severe protein energy malnutrition[27]. The importance of zinc deficiency in relation to growth of apparently healthy children is much less easy to define[37]. Early studies have shown clear evidence that zinc can be a limiting nutrient in relation to stunting of apparently healthy children. Deficiency may also contribute to impaired immunological responses and neurological dysfunction. Whereas zinc deficiency is well described in specific clinical syndromes in childhood including persistent diarrhoea[38], gluten enteropathy, anorexia nervosa and certain malignancies, there is little conclusive evidence that zinc is sufficiently deficient to affect growth or function in European children[24]. However there are certain groups that are certainly at risk. For example, those who rely on a vegetarian diet may become deficient as a result of the high phytate content which decreases the bioavailability of zinc[25].

Water soluble vitamins

Most studies show that thiamin intakes are well above requirements. Children obtain most of their supply from breakfast cereals, bread, milk, chips and potatoes. Similarly, riboflavine intake is usually above requirements with children obtaining most of their supplies from breakfast cereals and milk. If riboflavine deficiency occurs it could contribute to childhood anaemia. Vitamin C is now regarded as an important contributor to anti-oxidant defence. It is noticeable that dietary intake varies considerably between population groups in Europe. Even within the UK there are regional differences, largely due to lower consumption of fruit and vegetables by certain cultural groups[39].

Vitamin D

While the good dietary sources are well known – foods of animal origin, especially liver, fatty fish, eggs and margarine – an important proportion of vitamin D is made in the skin as a result of UV light. It is clear that certain ethnic groups, especially Asians, are vulnerable because many do not expose their skin to the sun as much as other ethnic groups[40,41]. It will be interesting to note whether the current conservative approach to solar exposure, in order to reduce the chance of developing skin cancers, will have on vitamin D status in a wider range of European subjects. With the rather poor diet, cold weather and increasingly conservative approach to solar exposure in many European countries it is likely that vitamin D deficiency is much more prevalent in the continent than is currently recognised. Nowadays, paediatricians in UK hospitals serving certain immigrant communities report regular diagnosis of clinical rickets in small children. It is not known how prevalent vitamin D deficiency is among older siblings. The recent demonstration of the interaction between genetics, vitamin deficiency and risk of developing tuberculosis in the UK highlights a possible mechanism for an association which has been noted for years[42].

Iodine

Iodine deficient disorders (IDD) are responsible for impaired production of the thyroid hormone[29]. In children or adult life this may be sufficient to increase the size of the thyroid gland and lead to biochemical hypothyroidism. IDD occurring in pregnancy is especially dangerous, as the failure to produce thyroid hormone will lead to impaired development of the brain with accompanying neurological syndromes. Much of Europe is topographically at risk from IDD; typically most mountainous areas are deficient in iodine. The relative ease of introduction of public health measures such as universal iodisation of salt makes it easy to eliminate this deficiency but several European countries do not have the necessary legislation or commitment to the implementation of the legislation to prevent brain damage in children. As an emergency measure, mothers may be given a single dose of iodised poppy seed oil but the best response is to ensure that all salt is iodised. Unfortunately it seems as though treatment with iodine among children with IDD has an effect on the biochemical status but has little or no effect on the intellectual retardation that occurs *in utero*.

Selenium

Considerable interest in selenium deficiency has developed since the demonstration of its role as an anti-oxidant[43]. The association between selenium deficiency and coronary heart disease has resulted in greater

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attention to the inclusion of selenium into fertiliser in certain European countries. In recent years there have been remarkable results from experimental studies of selenium deficiency and its effect on the structure of Coxsackie virus[44]. The demonstration of viral mutation as a result of passage of the virus in selenium deficient animals opens up major possible levels of enquiry for the interaction between nutrition and infection. The importance of selenium deficiency among European children is not understood at present.

Multiple micronutrients

There are few instances in human nutrition where dietary deficiency of a single micronutrient occurs; most dietary deficiencies involve several micronutrients. This has resulted in a flooding of the "high street" shops and pharmacies with a variety of formulations of multiple micronutrients. Many manufacturers claim that their product has a profound benefit for the nutritional status and health of children, but few are rigorously evaluated by double blind clinically controlled trials. An earlier study of a micronutrient mixture was reported as improving tests of non-verbal intelligence at school but there was considerable correspondence and controversy over experimental design[45]. Overall there seems little evidence for the rational use of a multiple micronutrient formulation for children in Europe on a routine basis. However parents and children themselves are becoming much more aware of the potential health benefits of micronutrient supplementation.

Vulnerable groups

Poor people have had worse diets than richer people since the beginning of time. It is somewhat strange therefore to find that with all the experience of social welfare policies and all the major developments in food technology in Europe that the health of poor people is still compromised by an inadequate diet. A study of nutrition and diet in lone parent families in London by Dowler and Calvert found important nutritional problems faced by the 200 lone-parent households that were investigated[46]. Using the national government assessment scheme of the Department of Social Security the study identified families who were "poor" as defined by eligibility for financial support. They noted considerable dietary deficiencies among parents but the latter were successful in obtaining food for their children which satisfied their RNIs though these were borderline for folate, calcium, iron and zinc among the older children. In a review of diets among schoolchildren in the UK Nelson noted several studies in which the poorer families faced particular difficulties. He quotes work showing higher rates of anaemia and higher serum transferrin receptor levels (indicating iron deficiency) among adolescent girls from unemployed families[31,47]. Policy options are reviewed and include: increasing the size of the financial supplement, food vouchers for subsidised food and increased entitlement to free food at school for vulnerable families with a special emphasis on increasing the intake of fruit and vegetables. He makes a strong case for radical review of supplement policies for poor families. At present the UK government aims to reduce the high rate of premature deaths from coronary thrombosis by employing more coronary by-pass teams. Nutritional interventions earlier in life might be very beneficial in reducing the need for the by-pass teams but the focus on adult rather than child health in UK government policy makes it more difficult to promote promotive and preventive nutrition within the present policy framework[2].

Refugees and immigrant communities

There is currently a massive increase in global violence and civil unrest both within and outside Europe. The obscenities of 'ethnic cleansing' within Europe have caused many thousands of people to migrate with detriment to achieving an adequate dietary intake[48]. Violence outside Europe has also caused people to move to what was hoped to be a 'safe haven' of a new adopted country, however in practice people are often housed in socially deprived areas with a limited range of foods. In addition cooking facilities may be very limited. Even if refugees become 'settled', employment prospects are bleak, and refugees are just as likely to be affected by poverty as people who were born in that country. Many studies show a higher prevalence of anaemia among non-Caucasian than Caucasian children such as the children studied in Glasgow in 1978[49].

Snack eaters

There are major social changes in many European families such that, nowadays, there are few occasions when an entire family sits down to eat together. Some children eat meals on their own, choosing those items that are attractive rather than nutritionally beneficial. Others "snack-eat" from whatever is currently available in the food store cupboard. Others may be given money to go and buy food from whichever "fast food" outlet is nearest. With the increasing use of standardised meals and portion sizes, using a range of fortified foods, there are likely to be considerable differences in the diets between children who eat traditionally (parent cooked food) and those who eat "on the run". There is remarkably little information on the nutritional impact of modern styles of childhood feeding.

Eating disorders

There is evidently a major increase in the number of children who rigorously control their appetite. They eat less in order to achieve a lean body figure to achieve cultural norms that are set by a variety of media and peer

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pressures. An original UK government survey showed that around 16% of 14–16 year old girls claimed that they were currently on a diet to lose weight[3]. It seems likely that even more children are controlling their appetite nowadays. There is little information on how much exercise children take nowadays but there is a widespread impression that children in the UK take much less than they used to in previous decades[20].

Possible future trends

Trying to plan for the future of childhood nutrition in Europe is difficult when the basic knowledge base is so weak. There is an urgent need to achieve and disseminate better information on the nutritional status of children in Europe. Among the key gaps in national nutritional data is information on food choice and its determinants. There is evidently considerable peer pressure but who or what influences food choice among children is less easily defined. It is, however, possible to be reasonably certain of a few things.

Firstly, whatever the availability of traditional staple and meat/fish diets it seems likely that children will eat a greater proportion of their nutrient intake as prepared food.

Secondly, that choice of food intake by children will be influenced more by culture, peer pressure and commercial pressure than by parental pressure. There is currently a major trend towards the globalisation of youth where preferences in dress, music and values are becoming normalised. There is overall a losing of affinity with the values and culture of one's country and a greater affinity with people of one's own age. This is likely to lead to a greater conformity in eating patterns.

Thirdly, there are likely to be particular pockets of vulnerable children and families whose diet will be compromised by their social exclusion and poverty.

Fourthly, in many European countries there is a trend towards decentralisation with resources being allocated at regional or district level. Local authorities have discretion to spend money on staff salaries, training and supplies within the health, education and social welfare sector. In a recent review of Health Improvement Programmes in 88 Health Authorities in the UK, only three included specific nutrition activities[50]. The rest focused their activities on prevention of accidents, substance abuse, teenage pregnancy, mental health services, looked after children, child protection and disability. While these are all obviously important issues for the wellbeing of children and have important impact on adult health, the almost total failure to address nutritional issues is striking. It means that nutrition professionals have not made a sufficiently convincing case for investment in nutrition; local authorities have neglected the possibility of nutrition interventions. It seems likely that pressures to focus on apparently more 'urgent' societal issues will lead to the nutritional neglect of children.

Is there hope for improving the nutrition of Europe's children? Definitely. Nutritional scientists have produced an enormous body of evidence relating diet to disease and quality of life in childhood, but they have not been so good at ensuring that this knowledge is used in the development of policies affecting the health and development of children. The challenge for the future will be for nutrition professionals to inform public policy and personal choice by providing individuals and authorities with information that enables them to make informed decisions with reasonable confidence of how a dietary decision will affect health. Individual families, schools, healthcare organisations and national government all have a role in influencing child diets and nutritional status. If they are to produce change they need considerable imagination and determination.

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