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SYMPOSIUM ON 'SOME ASPECTS OF DIET AND HEALTH'

A comparative look at recommended nutrient intakes

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Recommended nutrient intakes are difficult values to produce; good human data are scarce, and even non-existent for some age groups; requirements vary between individuals and in response to the common illnesses and demands of life. Committees that draw them up first have to balance the interpretations of their different experts and then decide whether to estimate the average physiological minimum requirements, plus a margin to allow for most of the upper range among individuals, or to aim for the more intangible ideal of optimal intakes.

When produced, recommended intakes are difficult to use in interpreting dietary data, because of the uncertainties in obtaining representative figures for true intake, because of the variability of food composition, and because some nutrients vary in quality and many interact with one another and with other environmetal conditions.

Recommended intakes are now used in six different ways. The first three are well established in practical nutrition; the remaining three uses have only appeared in the last few years.

(1) They provide a yardstick against which the diets of different sections of a community can be measured. An example is the National Food Survey in Britain which, in its annual reports, records how the diets of samples of different socio-economic classes measure up to the recommendations for the major nutrients (National Food Survey Committee, 1975).

(2) They provide a guide for dietitians prescribing diets for individuals and for caterers responsible for feeding large numbers. Caterers in hospitals and long-stay homes need to check that their menu cycles provide all the major nutrients and, even for single meals, the recommended intakes are used as the basis of the nutritional standards for school dinners (Department of Education and Science, 1975).

(3) They should be one major input in developing national agricultural policies. They are used by the international agencies in planning long-term aid for

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underdeveloped regions and even for calculating rations in famine relief (Davidson, Passmore, Brock & Truswell, 1975). Recommended intakes are thus becoming common ground between economic planners and nutritionists. This cooperation is one place where nutrition seems likely to grow. But you cannot diagnose the nutritional disorders of a country by comparing average food available per head against recommended intakes.

(4) Nutrition labelling, which is coming into use in the USA (Nutrition Reviews, 1973), depends on recommended intakes. The US Food and Drug Administration has produced a legally defined set of figures, the US Recommended Daily Allowances (RDA), which was derived from the highest values for men and non-pregnant, non-lactating women in the US Food and Nutrition Board tables ((US) National Research Council, 1968) for protein and nineteen other nutrients. Seven of these require label listing, or a disclaimer, while the rest may be used optionally. Nutrients are expressed as percentages of the RDA.

(5) In considering new types of manufactured foods and food enrichment the concept of nutrient density (Hansen, 1973) is being used. The Council on Foods and Nutrition of the American Medical Association (1973) suggests that formulated foods which cannot be easily compared with a conventional food should contain, per serving, the major nutrients in (at least) the same ratio to energy as in the RDA. Nutrient density is useful in teaching nutrition and has been used particularly by Swedish nutritionists.

(6) Any doctor setting out to maintain the nutrition of a patient, who is comatose or has severe gastrointestinal disease, with intravenous fluids over more than a few days has to see that he is giving all the essential nutrients. He should aim to give not only the usual recommended dietary intakes but several other nutrients, including trace elements, that can usually be taken for granted when people are eating food and have normal gastrointestinal function. I shall return later to an augmented list of nutrient requirements for complete parenteral nutrition.

Increasing use is thus being made of recommended dietary intakes. In the last 2 years revised sets of figures have been published by the USA (1974), Canada (1974) and West Germany (1975), FAO/WHO have produced a simplified *Handbook on Human Nutritional Requirements* (Passmore, Nicol, Rao, Beaton & DeMaeyer, 1974) and the Committee on International Dietary Allowances of the International Union of Nutritional Sciences (IUNS) (1975) have surveyed the available recommendations from eighteen different countries (plus FAO/WHO). It therefore seems an opportune time to review selected aspects of these recommendations and consider how they have changed with time and how they vary between different countries.

The first comprehensive set of recommended allowances was produced by the Technical Commission on Nutrition, League of Nations (1938); they made recommendations, often tentative, for twelve nutrients (Table 1). The same nutrients have appeared regularly in all subsequent tables except for iodine, phosphorus and (essential) fats, which have appeared inconstantly. Other nutrients have been added, starting with nicotinic acid in the 1942 US Food and Nutrition

Board recommendations ((US) National Research Council, 1942). At present this is the only nutrient in the main British table (Department of Health and Social Security, 1969) that was not given by the League of Nations in 1938. However the 1974 FAO/WHO handbook (Passmore *et al.* 1974) includes folic acid, while the 1974 USA and Canadian tables have vitamin E, vitamin B_6 (pyridoxine), vitamin B_{12}, magnesium and zinc as well, making a total of eighteen nutrients.

Table 1. *Nutrients for which intakes have been recommended*

(Nutrients otherwise mentioned in the reports are given in parentheses)

Technical Commission on Nutrition, League of Nations (1938) (twelve nutrients)
Calories, calcium, phosphorus, iron, iodine, vitamin A, vitamin B_1, riboflavin, vitamin C, vitamin D, protein (fats).

(US) National Research Council (1942) (ten nutrients+three)
Calories, protein, Ca, Fe, vitamin A, thiamin, riboflavin, niacin, ascorbic acid, vitamin D (I, copper, vitamin K).

British Medical Association (1950) (eleven nutrients)
Calories, protein, Ca, Fe, vitamin A, vitamin D, thiamin, riboflavin, niacin, ascorbic acid, I.

(US) National Research Council (1964) (ten nutrients)
Calories, protein, Ca, Fe, vitamin A, thiamin, riboflavin, niacin, ascorbic acid, vitamin D.

(US) National Research Council (1968) (seventeen nutrients)
Energy, protein, vitamin A, vitamin D, vitamin E, ascorbic acid, folacin, niacin, riboflavin, thiamin, vitamin B_6, vitamin B_{12}, Ca, P, I, Fe, magnesium.

Department of Health and Social Security (1969) (ten nutrients+sixteen)
Energy, protein, thiamin, riboflavin, nicotinic acid, ascorbic acid, vitamin A, vitamin D, Ca, Fe (vitamin B_6, folic acid, vitamin B_{12}, pantothenic acid, vitamin E, essential fatty acids (EFA), sodium, potassium, chlorine, Mg, P, fluorine, Cu, zinc, manganese, I).

FAO/WHO (Passmore, Nicol, Rao, Beaton & DeMaeyer, 1974) (twelve nutrients+nine)
Energy, protein, vitamin A, vitamin D, thiamin, riboflavin, niacin, folic acid, vitamin B_{12}, ascorbic acid, Ca, Fe (pyridoxine, I, F, Zn, Mg, Cu, chromium, selenium, molybdenum).

(US) National Research Council (1974) (eighteen nutrients+twelve)
Energy, protein, vitamin A, vitamin D, vitamin E, ascorbic acid, folacin, niacin, riboflavin, thiamin, vitamin B_6, vitamin B_{12}, Ca, P, I, Fe, Mg, Zn (EFA, vitamin K, pantothenate, biotin, Na, K, Cl, Cu, F, Cr, Mn, Mo).

Deutsche Gesellschaft für Ernährung (1975) (twenty-four nutrients+ten)
Energy, protein, EFA, water, Na, Cl, K, Ca, P, Mg, Fe, I, F, vitamin A, vitamin D, vitamin E, thiamin, riboflavin, niacin, vitamin B_6, folic acid, pantothenic acid, vitamin B_{12}, vitamin C (biotin, vitamin K, Cu, Cr, cobalt, Mn, Se, Zn, carbohydrate).

The new West German recommendations (Deutsche Gesellschaft für Ernährung, 1975) show in the main tables recommended intakes for water, essential fatty acids, sodium, chloride, potassium, pantothenic acid and even fluoride. The question which each committee has to resolve is how far to go in allowing for unusual dietary or medical conditions. The current US table states in a footnote: 'The allowances are intended to provide for individual variations among most normal persons as they live in the United States under usual environmental stresses. Diets should be based on a variety of common foods in order to provide other nutrients for which human requirements have been less well defined. See text for more detailed discussions of allowances and of nutrients not

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tabulated' ((US) National Research Council, 1974). There are twelve other nutrients discussed in the text that accompanies the 1974 USA recommendations—a text of 100 pages with some 600 references ((US) National Research Council, 1974).

Similarly it is often not realized that there is more to the British (Department of Health and Social Security, 1969) recommended intakes than the main table, which is widely reproduced and quoted. Another sixteen nutrients are considered in varying detail in the text.

I have chosen six nutrients for consideration of the amounts that have been recommended in the past and are being recommended in different countries at present. I shall not deal with allowances for energy because, unlike other nutrients, there is little if any margin between minimum requirements and the optimum allowance. The energy requirement varies so greatly with energy expenditure in individuals that comparison between the averages for different times and countries would be tedious. For the sake of comparison I shall (except for iron) consider the requirements for adult males, and where there are different figures for young and elderly men I shall compare the former.

Nicotinic acid

Nicotinic acid requirements have had a straightforward history (Table 2). The vitamin was not discovered until shortly before the Second World War and it did not appear in official recommendations until 1942. The British Medical Association (1950) recommended 4 mg nicotinic acid (as such)/4·2 MJ (1000 kcal). Conversion of tryptophan to nicotinic acid in man was demonstrated in the mid-1950s and from the 1964 US requirements ((US) National Research Council, 1964) onward, all authorities have recommended 6·6 mg nicotinic acid

Table 2. *History of published recommended nicotinic acid intakes for adult men*

Vitamin discovered 1937	
Technical Commission on Nutrition, League of Nations (1938)	No recommendation
(US) National Research Council (1942)	15–23 mg/d (with 2500–4500 kcal (10·5–18·8 MJ))
British Medical Association (1950)	9–20 mg/d (with 2250–5000 kcal (9·4–20·9 MJ))
(US) National Research Council (1964)	19 mg/d*
Joint FAO/WHO Expert Group (FAO/WHO, 1967)	21 mg/d* (with 3200 kcal (13·4 MJ))
(US) National Research Council (1968)	18 mg/d*
Department of Health and Social Security (1969)	18 mg/d*
(US) National Research Council (1974)	18 mg/d*
FAO/WHO (Passmore, Nicol, Rao, Beaton & DeMaeyer, 1974)	19·8 mg/d* (6·6 mg/1000 kcal (1·6 mg/MJ))
Deutsche Gesellschaft für Ernährung (1975)	9–15 mg/d*

*Nicotinic acid equivalents.

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equivalents/4·2 MJ (1000 kcal). The consistency between different committees may reflect a relative neglect of the vitamin by experimental workers. The recent West German recommendations (Deutsche Gesellschaft für Ernährung, 1975) serve to remind us that a variable amount of nicotinic acid in foods is in a bound form and the equivalence of 60 mg tryptophan to 1 mg nicotinic acid does not always hold good. In pregnancy the ratio could be nearer 30:1 (Brown, Thornton & Price, 1961) and the Joint FAO/WHO Expert Group (FAO/WHO, 1967) recognized that the relationship may not hold under conditions where tryptophan forms the limiting amino acid in the diet.

Thiamin

Thiamin recommendations (Table 3) have always been calculated on an energy basis on the assumption that this correlates fairly well with carbohydrate intake. Harris (1938) worked out from experimental data available to him at that time that 0·3 mg/4·2 MJ (1000 kcal) was the minimum and 0·6 mg/4·2 MJ (1000 kcal) a desirable intake (he expressed it in i.u.). The FAO/WHO (1967) and the Department of Health and Social Security (1969) recommendations are 0·4 mg/4·2 MJ (1000 kcal), the US recommendations ((US) National Research Council, 1968, 1974) are 0·5 mg/4·2 MJ (1000 kcal) and the West German (Deutsche Gesellschaft für Ernährung, 1975) are 0·6 mg/4·2 MJ (1000 kcal). This illustrates how some committees tend to be more generous and others more thrifty in their recommendations.

Table 3. *History of published recommended thiamin intakes for adult men*

Technical Commission on Nutrition, League of Nations (1938)	0·9 mg/d (with 3000 kcal (12·6 MJ))
Harris (1938)	0·9–1·8 mg/d
(US) National Research Council (1942)	1·5, 1·8 or 2·3 mg/d (with 2250, 3000 or 4500 kcal (9·4, 12·6 or 18·8 MJ))
British Medical Association (1950)	0·9–2·0 mg/d (with 2250–5000 kcal (9·4–20·9 MJ))
(US) National Research Council (1964)	1·2 mg/d (with 2900 kcal (12·1 MJ))
Joint FAO/WHO Expert Group (FAO/WHO, 1967)	1·3 mg/d (with 3200 kcal (13·4 MJ))
(US) National Research Council (1968)	1·4–1·2 mg/d (with 2800–2400 kcal (11·7–10·0 MJ))
Department of Health and Social Security (1969)	0·8–1·4 mg/d (with 2100–3600 kcal (8·8–15·1 MJ))
FAO/WHO (Passmore, Nicol, Rao, Beaton & DeMaeyer, 1974)	1·2 mg/d (with 3000 kcal (12·6 MJ))
(US) National Research Council (1974)	1·4 and 1·2 mg/d (younger men 2700 kcal (11·3 MJ), older men 2400 kcal (10·0 MJ))
Deutsche Gesellschaft für Ernährung (1975)	1·6 mg/d (with 2600 kcal (10·9 MJ))

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Table 4. *History of published recommended protein intakes for adult men*

Chittenden (1909)	40–50 g/d (mixed diet)
Sherman (1920*a*, *b*)	44 g (range 21–64)/d minimum; 70 g/d suggested standard
Technical Commission on Nutrition, League of Nations (1938)	1 g/kg body-wt (70 g/d)
(US) National Research Council (1942)	70 g/d
British Medical Association (1950)	66–146 g/d (with 2250–5000 kcal (9·4–20·9 MJ))
FAO (1957)	0·52 g/kg body-wt × 100/70 (PS) = 0·75 g/kg body-wt (53 g/d)
(US) National Research Council (1964)	70 g/d
Joint FAO/WHO Expert Group (FAO/WHO, 1965)	0·71 g/kg body-wt × 100/70 (PS) = 1·01 g/kg (65 g/d)
(US) National Research Council (1968)	65 g/d
Department of Health and Social Security (1969)	68–90 g/d (with 2700–3600 kcal (11·3–15·1 MJ)/d) recommended; 45 g/d minimum
Joint FAO/WHO *ad hoc* Expert Committee (FAO/WHO, 1973)	0·57 g/kg body-wt × 100/70 (PS) = 0·81 g/kg body-wt (53 g/d)
FAO/WHO (Passmore, Nicol, Rao, Beaton & DeMaeyer, 1974)	0·57 g/kg body-wt (37 g/d) (as egg or milk protein)
(US) National Research Council (1974)	56 g/d (NPU 0·75, body-wt 70 kg)
Deutsche Gesellschaft für Ernährung (1975)	0·9 g/kg body-wt (59 g/d) (body-wt 70 kg)

PS, protein score; NPU, net protein utilization.

Protein

Protein recommended intakes (Table 4) have been the most controversial of all. In 1920 Sherman (1920*a*) reviewed the human nitrogen balances measured with a variety of proteins up to that time. The physiological minimum appeared to average 44 g/d but the best data, with adequate adjustment periods, gave an average of about 0·5 g/kg body-weight per d. However, Sherman (1933) suggested an allowance of 1·0 g/kg body-weight per d as an optimal standard or allowance. The dualism between the physiological minimum and the optimum has exercised all committees since then, and rightly so because these figures are of great economic and political importance. In 1963 the USA was following the League of Nations in recommending 70 g/d. In 1968 the US allowance edged down to 65 g/d and in 1974 was set at 56 g/d, which is very close to the FAO/WHO (1965) safe level. The British (Department of Health and Social Security, 1969) recommendations are 68 g/d for sedentary men and proportionately more, on the basis of 10% of energy intake, for those engaged in heavy work. But the report also supplies another table of minimum requirements, which includes 45 g/d for men, regardless of energy intake. Most protein recommendations are for a mixed diet with a net protein utilization (NPU) of 0·70, and the need for adequate energy has been particularly stressed in the current report of the Joint FAO/WHO *ad hoc* Expert Committee on Energy and Protein Requirements (FAO/WHO, 1973).

In the IUNS survey of different countries (Committee on International Dietary Allowances of the IUNS, 1975) protein allowances work out (for NPU of 0·70) to range from 53 to 85 g/d (Table 5). In general the figures are rather higher for affluent countries.

Table 5. *Protein allowances for young men in different countries** 1964–73†

Country or authority	Recommended allowance (g/d)	NPU given	Allowance (g/d) adjusted to NPU 0·70
FAO/WHO (1973)	37	Egg or milk	53
Thailand	54	—	—
India	55	0·65	51
Malaysia	55	0·70	—
West Pacific	39	1·00	56
USA (1974)	56	0·70	—
Canada (1974)	56	0·70	—
Finland	60	—	—
Phillipines	63	0·63	57
Turkey	63	0·60	54
Indonesia	65	0·60	56
Netherlands	65	—	—
Colombia	68	—	—
UK	68‡	0·70	—
Australia	70	0·70	—
West Germany (1965)	70	—	—
INCAP	70	0·60	60
Japan	70	—	—
East Germany	85	—	—

NPU, net protein utilization; INCAP, Institute of Nutrition of Central America and Panama.
*Committee on International Dietary Allowances of the International Union of Nutritional Sciences (1975).
†With 1974 USA and Canadian figures.
‡More for high energy intakes.

Ascorbic acid

Ascorbic acid recommendations to prevent scurvy comfortably have been 30 mg/d from the time of the League of Nations (Technical Commission on Nutrition, League of Nations, 1938). The USA recommended 75 mg/d in 1942 ((US) National Research Council, 1942) (Table 6) to allow tissue saturation. It is interesting to see how the American recommendations have moved progressively from 70 mg/d in 1964, to 60 mg/d in 1968 and 45 mg/d in 1974. The present (1974) Canadian recommendation (Committee for Revision of the Canadian Dietary Standard, Bureau of Nutritional Sciences, 1974) is 30 mg/d, like the British (Department of Health and Social Security, 1969), which moved up from only 20 mg/d recommended by the British Medical Association (1950).

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Table 6. *History of published ascorbic acid requirements for adult men (mg/d)*

Sherman (1920*a*, *b*)	Estimate from foods; mentioned as minimum about 15
Technical Commission on Nutrition, League of Nations (1938)	30
(US) National Research Council (1942)	75
British Medical Association (1950)	20
(US) National Research Council (1964)	70
(US) National Research Council (1968)	60
Department of Health and Social Security (1969)	30
Joint FAO/WHO Expert Group (FAO/WHO, 1970)	30
(US) National Research Council (1974)	45
FAO/WHO (Passmore, Nicol, Rao, Beaton & DeMaeyer, 1974)	30
Deutsche Gesellschaft für Ernährung (1975)	75

The question of whether additional ascorbic acid over and above the amount to prevent scurvy should be recommended to prevent the common cold is well known in Dublin (Wilson & Loh, 1973), but the amounts which may prevent colds appear to be 250 mg/d or more (Anderson, Suranyi & Beaton, 1974). Table 7 shows the current recommendations in the nineteen countries' reports reviewed by IUNS. The majority are clustered in the 30–50 mg/d range. Higher recommendations are made in the USSR; Professor A. Pokrovsky has sent me tables which show 70–100 mg/d for adult men.

Table 7. *Ascorbic acid requirements (mg/d) for young men in different countries** 1964–73†

Australia, Canada, Finland, Malaysia, Thailand, UK, West Pacific, WHO	30
USA (1974)	45
Colombia, India, Netherlands, Turkey	50
INCAP	55
Indonesia, Japan	60
East Germany	70
West Germany, Phillipines	75
USSR	70–100

INCAP, Institute of Nutrition of Central America and Panama.

*Committee on International Dietary Allowances of the International Union of Nutritional Sciences (1975).

†With 1974 USA figures and USSR (A. Pokrovsky, personal communication) recommendations.

Iron

Fe is another nutrient which I have picked out as a difficult one. The historical perspective for adults, men and women, is shown in Table 8. The Technical Commission on Nutrition, League of Nations (1938) recommended 10 mg/d for men and stated that 'The requirement of women of child-bearing age is higher owing to the demands of menstruation, pregnancy and lactation'. The question is, how much higher? Dietary policy depends on the judgement of the national committee for recommended intakes. In Britain the allowance for women has

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Table 8. *History of published iron requirements (mg/d) for men and women (of reproductive age)*

	Men	Women
Sherman (1920*a*, *b*)	10 (15)	>10
Technical Commission on Nutrition, League of Nations (1938)	10	>10
(US) National Research Council (1942)	12	12
British Medical Association (1950)	12	12
(US) National Research Council (1964)	10	15
(US) National Research Council (1968)	10	18
Department of Health and Social Security (1969)	10	12
Joint FAO/WHO Expert Group (FAO/WHO, 1970)*	5, 6, 9	14, 18, 28
(US) National Research Council (1974)	10	18
WHO/FAO (Passmore, Nicol, Rao, Beaton & DeMaeyer, 1974)†	5–9	14–28
Deutsche Gesellschaft für Ernährung (1975)	12	18

*For diets with animal foods providing from 25 to 10% of the energy.
†For diets with animal foods providing >25–<10% of the energy.

remained only 12 mg/d while in the USA it moved from 12 mg/d in 1942, through 15 mg/d in 1964 to 18 mg/d in 1968 and 1974. In consequence it is now proposed to fortify bread with Fe in the USA at 55 mg/kg. Fe varies greatly in its absorption and is better absorbed from meat. This qualitative difference is incorporated in the FAO/WHO (1970) recommendations, which have to cover the whole world including many populations with only occasional access to meat. The British approach to the minority of women with menorrhagia and Fe depletion, which depends on a comprehensive health service, is that enrichment of bread with Fe is not an efficient way of reaching the target group, who should be identified and managed medically (Callender, 1973). Table 9 shows the current Fe

Table 9. *Recommendations for iron intake (mg/d) for men and women in different countries** 1964–73†

	Men	Women
Thailand	6	16
FAO/WHO	6	19
Finland	8	12
Phillipines	8	18
Australia, West Germany, Indonesia, Malaysia, Netherlands, UK	10	12
Canada (1974)	10	14
Colombia, East Germany, Japan	10	15
INCAP, USA	10	18
Turkey	12	22
West Pacific	15	15
India	20	30
Mean	9·7	15·7

INCAP, Institute of Nutrition of Central America and Panama.
*Committee on International Dietary Allowances of the International Union of Nutritional Sciences (1975).
†With 1974 Canadian figures.

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recommendations for men and women in the IUNS review. The Indian values are not a misprint; these from the 1968 report are much the same as were recommended in 1960.

Table 10. *History of published recommended calcium requirements for adult males (mg/d)*

Sherman (1920*b*, 1933)	minimum 450; standard 680
Technical Commission on Nutrition, League of Nations (1938)	750
(US) National Research Council (1942)	800
British Medical Association (1950)	800
Joint FAO/WHO Expert Group (FAO/WHO, 1962)	400–500
(US) National Research Council (1964)	800
(US) National Research Council (1968)	800
Department of Health and Social Security (1969)	500
FAO/WHO (Passmore, Nicol, Rao, Beaton & DeMaeyer, 1974)	400–500
(US) National Research Council (1974)	800
Deutsche Gesellschaft für Ernährung (1975)	800

Calcium

Ca is another difficult nutrient, not because of clinical deficiency, though the nagging suspicion persists that chronic imbalance may lead to osteoporosis in the elderly, but because the experimental and epidemiological data are confusing. The classical Ca balance experiments done by Sherman (1920*b*) showed an average minimum requirement of 450 mg/d, with a range from 270 to 820, and Sherman (1933) suggested adding for safety 50% to the average minimum to give 680 mg/d. The League of Nations and subsequent Committees in the USA (Table 10) have followed this line and recommended 750–800 mg/d. Nordin (1973) in Leeds has done many Ca balances and finds the average physiological requirement is 500 mg/d in young adults and greater in post-menopausal women. On the other hand Walker (1972) points out that communities such as the South African Bantu have Ca intakes (on high-phytate diets) well below the US RDA and yet have good bones into old age. It was for such reasons that the Joint FAO/WHO Expert Group (FAO/WHO, 1962) decided to lower the recommendation to 400–500 mg/d, and many countries including Britain (Table 11) have followed them. It has

Table 11. *Recommended calcium intakes (mg/d) for adults in different countries** 1964–73†

Colombia, INCAP, India, Indonesia, Malaysia, Phillipines, Thailand, Turkey, UK, West Pacific, FAO/WHO	400–500
Australia	400–800
Japan	600
Finland	700
East Germany, Netherlands, USA, Canada (1974)	800

INCAP, Institute of Nutrition of Central America and Panama.

*Committee on International Dietary Allowances of the International Union of Nutritional Sciences (1975).

†With 1974 figures for Canada.

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been thought that the abundant sunshine in tropical countries may increase the efficiency of Ca absorption. More recently it has been found that Ca retention in man is reduced by high protein intakes (Walker & Linkswiler, 1972). This makes the US recommendations look more appropriate for a temperate-zone population, consuming high protein intakes, than the FAO/WHO figures. The Canadian recommendations, which in 1964 were 500 mg/d, have now (1974) been brought into line with the USA.

Now here are a few thoughts about future trends. One field I mentioned in the introduction is that of clinicians and manufacturers of parenteral fluids, who need special recommended allowances for complete intravenous nutrition. Table 12 is taken from a paper by Wretlind (1975), in Stockholm, who has much experience of this speciality in nutrition. There is no question that the dietary recommendations do not include a large enough list of nutrients for long-term parenteral nutrition. K

Table 12. *Tentatively recommended daily allowances of energy and nutrients for patients on complete intravenous nutrition. The allowances will cover resting metabolism, some physical activity and specific dynamic action, but no increased need resulting from trauma, burns, or other conditions (Wretlind, 1975)*

	Allowance (/kg body-weight)	
Nutrient	Adults	Neonates and infants
Water (ml)	30	120–150
Energy (MJ (kcal))	0·13 (30)	0·38–0·50 (90–120)
Amino acid-nitrogen (mg)	90 (0·7 g amino acids)	330 (2·5 g amino acids)
Glucose or fructose (g)	2	12–18
Fat (g)	2	4
Sodium (mmol)	1–1·4	1–2·5
Potassium (mmol)	0·7–0·9	2
Calcium (mmol)	0·11	0·5–1
Phosphorus (mmol)	0·15	0·4–0·8
Magnesium (mmol)	0·04	0·15
Iron (μmol)	1	2
Manganese (μmol)	0·6	1
Zinc (μmol)	0·3	0·6
Copper (μmol)	0·07	0·3
Chlorine (mmol)	1·3–1·9	1·8–4·3
Fluorine (μmol)	0·7	3
Iodine (μmol)	0·015	0·04
Thiamin (mg)	0·02	0·05
Riboflavin (mg)	0·03	0·1
Nicotinamide (mg)	0·2	1
Pyridoxine (mg)	0·03	0·1
Folic acid (μg)	3	20
Cyanocobalamin (μg)	0·03	0·2
Pantothenic acid (mg)	0·2	1
Biotin (μg)	5	30
Ascorbic acid (mg)	0·5	3
Retinol (μg)	10	100
Ergocalciferol or chole-calciferol (μg)	0·04	2·5
Phytylmenaquinone (μg)	2	50
α-Tocopherol (mg)	1·5	3

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and Na depletion are common even with short-term intravenous feeding, and undoubted essential fatty acid deficiency has been reported in patients given fat-free fluids for a long time (Collins, Sinclair, Royle, Coats, Maynard & Leonard, 1971; Caldwell, Jousson & Otherson, 1972). Wretlind's (1975) list adds up to thirty nutrients.

Reverting to dietary recommendations, I believe that the main tables of nutrients should concentrate on nutrients whose deficiency is occurring or has occurred in the country. For this reason it seems to me unhelpful for nutrition education that riboflavin is one of the 'big seven' in the US RDA now being used as the basis for nutrient labelling. On the other hand folic acid is not included in many tables including the British (1969), yet deficiency is not uncommon. However, the four most recent reports (published in 1974 and 1975) all included folic acid (Table 13). The difficulties with this nutrient are its multiple forms in

Table 13. *Recommended intakes (μg/d) for folic acid by different authorities*

Age (years)	Passmore, Nicol, Rao, Beaton & DeMaeyer (1974)*	(US) National Research Council (1974)†	Deutsche Gesellschaft für Ernährung (1975)	Committee for Revision of the Canadian Dietary Standard, Bureau of Nutritional Sciences (1974)‡
Boys and girls				
0–1	60	50	100	50
1–2	100 (1–2 and 2–3)	100	200	100
2–3				
3–5	100 (3–5 and 5–7)	200	300	100
5–7				
7–9	100	300	300	100
Boys				
9–12	100	400 (9–12 and 12–15)	(400)	100
12–15	(167)			200
15–18	200	400	400	200
Girls				
9–12	100	400 (9–12 and 12–15)	(400)	100
12–15	(167)		400	200
15–18	200	400	400	200
Men				
18–35	200 (18–35 to 75 and over)	400	400 (18–35 to 75 and over)	200 (18–35 to 75 and over)
35–65		400		
65–75		400		
75 and over		400		
Women				
18–55	200 (18–55 to 75 and over)	400	400	200
55–75				
75 and over				
Pregnant (last 2/3)	400	800	800	250
Lactating	300	600	1000	250

*Handbook does not state in what form the requirements are given but the original report (FAO/WHO, 1970) recommends 200 μg 'free' folate/d for adults (and 400 μg/d in pregnancy, etc.).

†Recommendation is for 'total food folacin' (i.e. generally *Lactobacillus casei* assay after conjugase treatment).

‡Expressed as free folate.

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food and its heat-lability. Now that it seems to be coming into the tables of recommendations we shall need more analytical work on folates in cooked as well as raw foods.

Lastly, is it enough in 1975 that official recommendations in developed countries should confine themselves to stipulating the minima of protein and the micronutrients? Both the 1974 USA and 1975 West German reports have sections in their texts which recommend that dietary fat should not exceed 35% of the total energy intake, of which half or less should be saturated.

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