12 ENERGY AND NUTRIENT INTAKE

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12.1 INTRODUCTION

Many population studies from different parts of the world have shown that free-living elderly people have relatively good food habits and nutrient intakes [1-6,14] and that the ageing process per se is not a cause of malnutrition in the healthy [7-9]. These studies have found a low to moderate prevalence of frank nutrient deficiencies, but a marked increase in risk of malnutrition and evidence of subclinical nutrient deficiencies. The significance of these observations becomes clear with the recognition that nutritional status influences the age-related rate of functional decline in many organ systems. Reduced energy needs, chronic disease, socio-psychological factors (such as loneliness), and socio-economic factors (such as income and education) are all important risk indicators. Information on how these factors are associated with dietary intake of elderly individuals is fragmentary and inconsistent [10-12], and little knowledge is available regarding the relationship between such factors and longevity and health in different cultures.

The IUNS study was designed to describe food habits in relation to health in population groups with different dietary patterns in different geographical and cultural settings in both developed and developing countries. Focus is not only on nutrient content, but also on data concerning food items. Past and present food intakes, cooking methods, meal patterns and food beliefs are taken into consideration within the framework of cultural and psychosocial characteristics. The purpose of this chapter is to describe and discuss nutrient intake in the IUNS centres and compare the intakes with results from the EURONUT-SENECA study [13], and the New Zealand & Adelaide studies [5,6]. Detailed comparisons between the studies are difficult because of possible differences in dietary assessment methods, different age and sex compositions of samples, and use of different nutrient databases. Also, within the IUNS-centres there may be methodological differences.

12.2 METHODS

12.2.1 Populations

Nutrient intake data was available from eight study communities (See Table 12.1).

Table 12.1. Populations by sex and age.

Population Centres		Males 70-79 n	*	Males 80+ n	*	Females 70-79 n	*	Females 80+ n	*
Swedes	Gothenburg	47	(1)	19	(2)	70	(1)	50	(2)
Anglo-Celtics	Melbourne	43	(3)	7	(4)	41	(3)	6	(4)
Greeks	Melbourne	66	(5)	28	(6)	59	(5)	36	(6)
Greeks	Spata	32	(7)	19	(8)	31	(7)	22	(8)
Chinese	Rural Tianjin	47	(9)	3	(10)	40	(9)	10	(10)
Chinese	Urban Tianjin	43	(11)	7	(12)	41	(11)	9	(12)
Chinese	Beijing	79	(13)	45	(11)	124	(13)	56	(11)
Japanese	Okazaki	28	(15)	15	(16)	331	(15)	3	(16)
Adelaide & New Zealand									
New Zealanders	Mosgiel	202		75		322		152	
Australians	Adelaide	471		84		562		135	
EURONUT-SENECA Total			1217				1241		

* The brackets denominate the populations in the figures.

12.2.2 Data collection

A food frequency questionnaire (FFQ) was used in the Caucasian study samples for estimation of usual food intake over the past year. Trained interviewers visited the probands in their own homes. Serving sizes were checked by a booklet with photographs. Each centre had their own photos of one small and one large portion. Food items were coded and analysed for nutrient content in each participating country using local food tables. Due to inconsistencies in analysis of different types of carbohydrates and dietary fibre between food composition tables, such data should be treated with caution. Furthermore, in Sweden, average cooking losses of thiamine (30%), riboflavin (25%), niacin (15%), vitamin B (20%) and vitamin C (50%), [16] were incorporated into the data analysis.

Not all centres used the food frequency questionnaire. In Tianjin, nutrient intake was collected by 24-hour recall for three consecutive days. Photographs were not used, but food intake was described in household measures. In Beijing, the FFQ was adapted for use. In Okazaki, nutrient data were collected for three consecutive days by a combination of the 24-hour recall and food record methods. The subjects were interviewed and servings were weighed for verification of portions sizes at the study site.

12.2.3 Energy and nutrient intake

In this chapter, results from the centres are reported as intake of energy and some selected nutrients, namely macronutrients, dietary fibre, vitamin C, riboflavin, iron, calcium and zinc. For details on all nutrients studied, see the appendices. Conclusions will be drawn from selected nutrients, but a complete interpretation must also take food intake and anthropometry into consideration. Nutrient intake tends to increase with a higher energy intake [15]. Therefore, significant differences in nutrient intakes may exist when comparing study subjects simply due to differences in energy intake. By expressing nutrients per unit energy (i.e. nutrient density) this effectively controls for energy intake. The absolute intakes are compared and presented as mean values without any statistical tests for differences because of the uncertainty to what extent observed differences depend on methodological errors or the inter-country differences.

The nutrient densities are discussed in the text (See appendices for tables). Further, a systematic validation has not been made for the IUNS food frequency questionnaire, except for the Swedish and Greek samples (See Chapter 5). Assessment of the adequacy of nutrient intake for all study samples was made by comparison of individual intake results with the American Recommended Dietary Allowances (RDA). American allowances were used in order to standardise comparisons [17]. Many different standards have been used to assess dietary adequacy using RDAs. Most researchers use the accepted cut-off limits of two thirds of the RDA [4,14,18-21], for the basis of prevalence of 'low intakes'. Recommended nutrient density (RND) is the recommended nutrient intake divided by the recommended energy intake. Nutrient density is another way of comparing and evaluating nutrient intake and gives an indication of the quality and adequacy of the diet. Where appropriate, nutrient densities for study communities will be compared with RNDs [24,25].

12.3 RESULTS

12.3.1 Energy and macronutrient intake

See Figures 12.1-12.4 for energy intake and distribution of energy from macro-nutrients. Within the IUNS centres, energy intakes were lower in the 80+ age group, except Chinese women from urban Tianjin, Japanese males and Anglo-Celtics. Differences between age groups were, however, small and no trend could be seen of lower nutrient density in the highest age group. The highest and lowest energy intakes were shown in the Swedish and urban Tianjin population, respectively. Compared to estimates from the other study centres these energy estimates were extreme in each direction.

Figure 12.1. Energy intake (KJ/day) in males in the different countries, see Table I

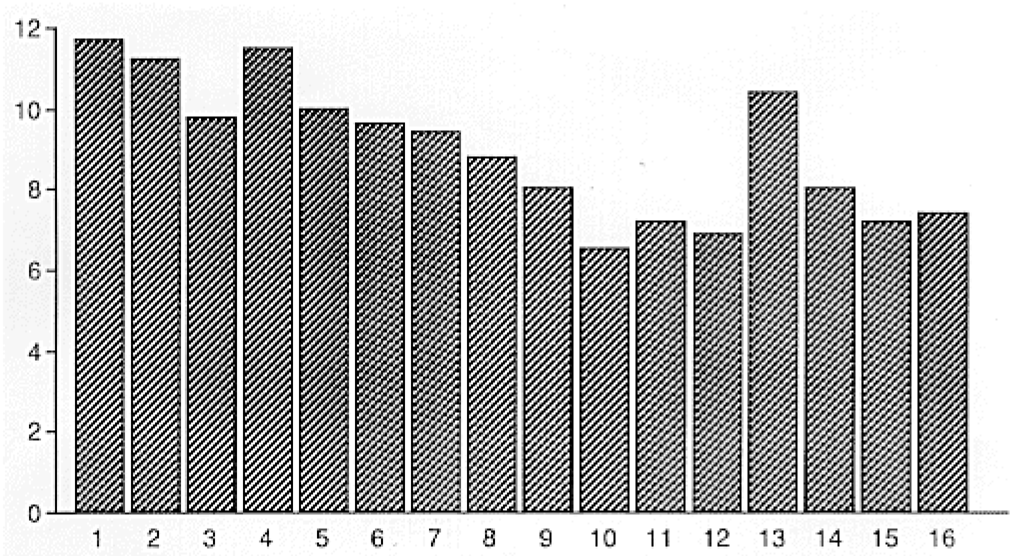


Figure 12.2. Energy intake (KJ/day) in females in the different countries, see Table I

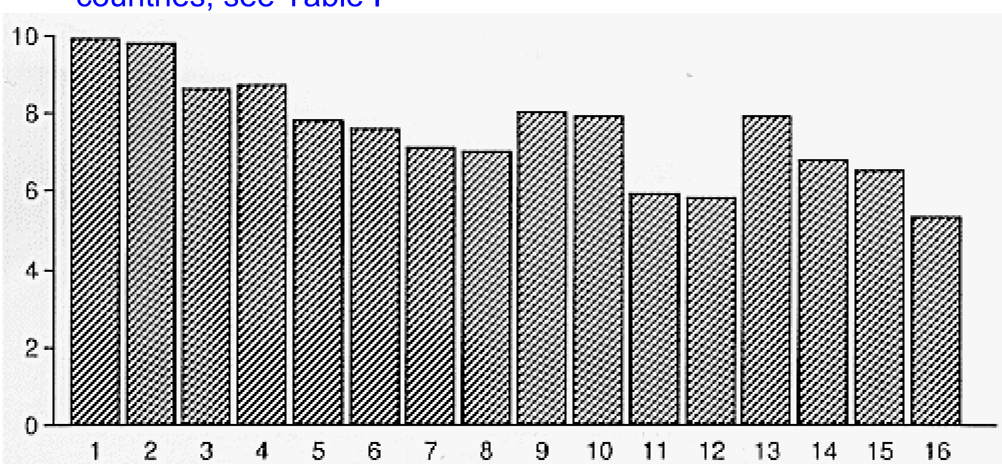


Figure 12.3. Distribution (per cent of energy intake) of macronutrients in males in the different countries, see Table I

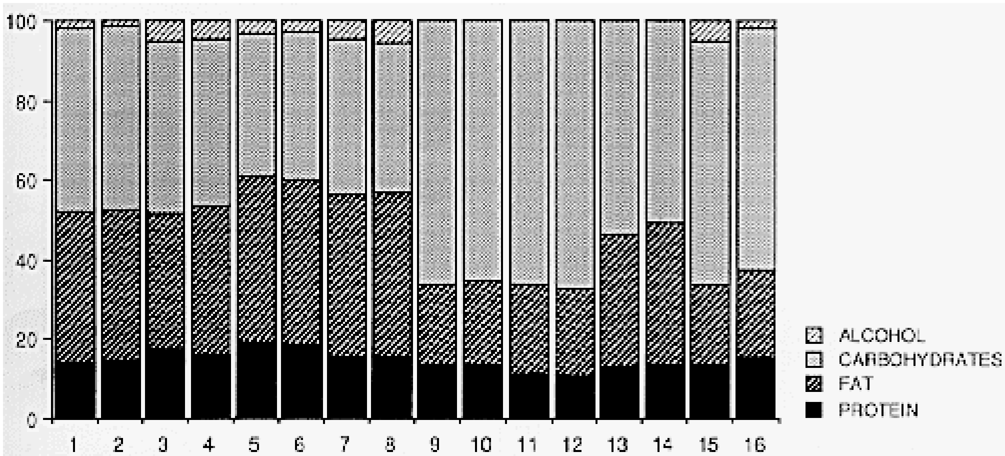
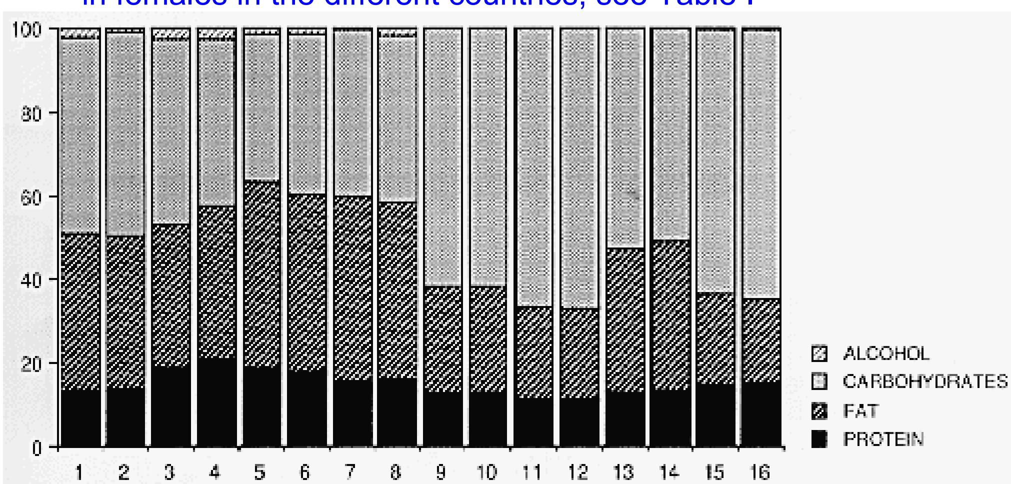


Figure 12.4. Distribution (per cent of energy intake) of macronutrients in females in the different countries, see Table I



Protein intake varied markedly within the IUNS centres (Figures 12.5 and 12.6) with the highest values in both absolute amounts, for nutrient density, and in proportion of total energy intake in the Greek Melbourne male population. Among females the Anglo-Celtic Australian population had the highest intake. The lowest values were seen in the urban Tianjin population. Compared to other IUNS centres this population had the lowest protein density; about 25 and 50%, of males and females, respectively, were below two thirds of the RDA. This population also had low energy intakes in contrast to the populations within the EURONUT-SENECA study where a trend was seen with higher energy proportions from protein in the populations with lower energy intake estimates. An important difference regarding protein intake was noticed between the two Chinese populations, with higher intake in the Beijing population than in the Tianjin populations. In Beijing, animal protein intake comprised 35% and 40% of total protein intake in the young and old age groups, respectively. Information was not available regarding this proportion in the

Tianjin population. However, when nutrient density for protein, fat, iron, and calcium intake were compared, it seemed possible that these Chinese centres differed in food habits regarding food items rich in protein. From the literature it can be concluded that elderly subjects may need more dietary protein per kilogram body weight to maintain their nitrogen balance than younger people [22,23]. The protein proportion of total energy should not be less than 12-14%, and a daily protein intake of 1 g/kg body weight should be regarded as sufficient to cover needs in both health and disease [22].

Figure 12.5. Protein intake (g/day) in males in the different countries, and two thirds of the RDA, see Table I

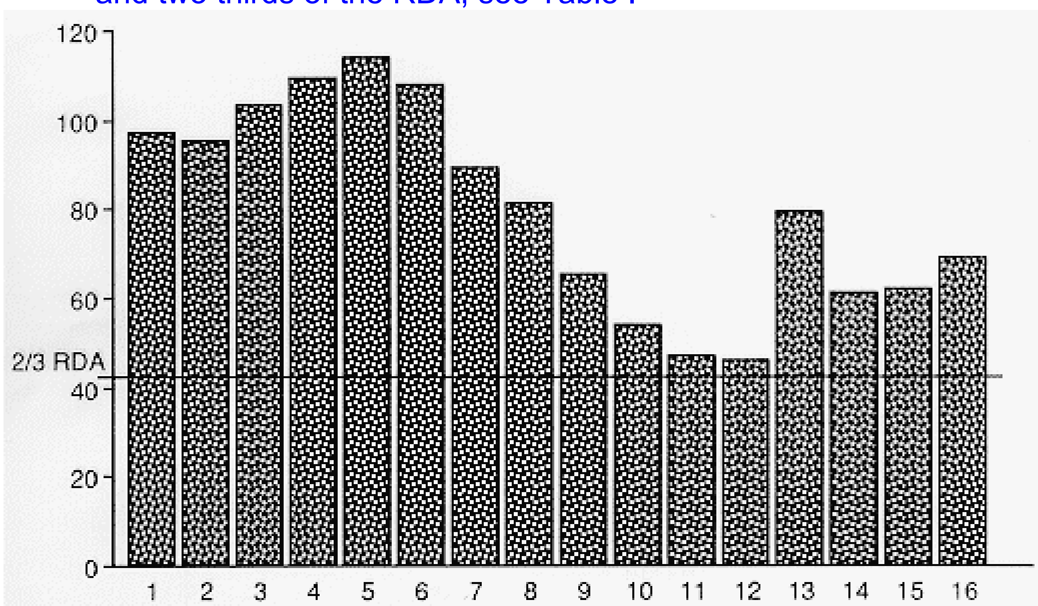
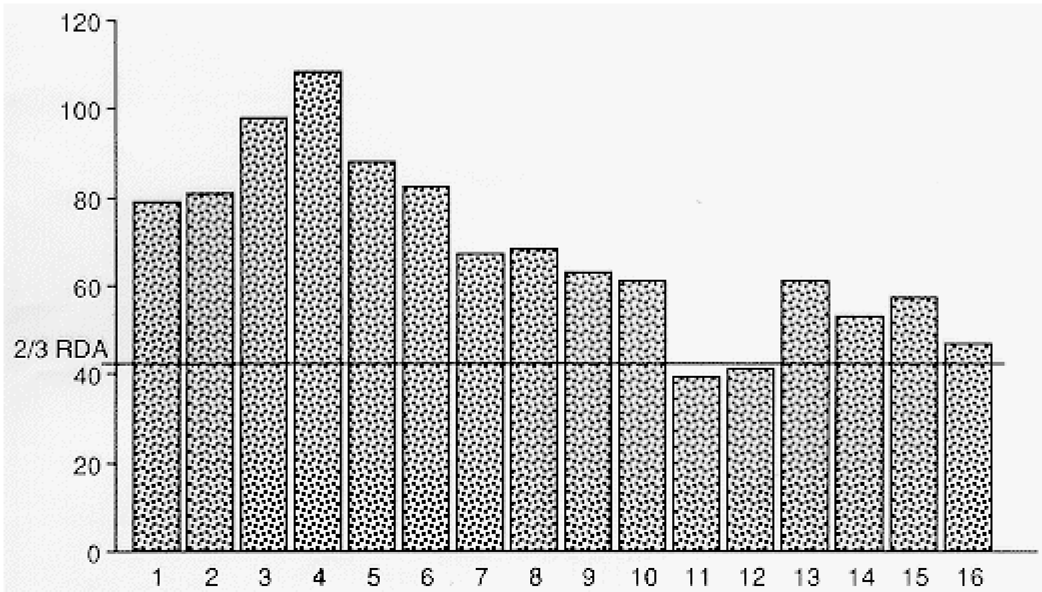


Figure 12.6. Protein intake (g/day) in females in the different countries, and two thirds of the RDA, see Table I



Fat intake and fat quality varied between the IUNS centres. The Japanese and Tianjin Chinese populations had the lowest, and the Greek populations the highest proportion of energy from fat. The Greeks in Melbourne were similar to the Greeks in Spata regarding fat quality. Both populations had a high proportion of monounsaturated fatty acids of total fat intake. In the EURONUT-SENECA study it was the Greek and Spanish populations who showed the highest intake of monounsaturated fatty acids. The Adelaide and New Zealand populations showed low intakes of both mono- and polyunsaturated fats and were, thereby, different than the Greeks in Melbourne. It is obvious that the Greeks in Australia have different food habits than the Anglo-Celtic population in this area. For Japan, estimates on monounsaturated and polyunsaturated fat intakes were not available. However, the ratio between saturated and polyunsaturated fatty acids (which was about 1.0) indicates a low intake of saturated fatty acids and a high intake of polyunsaturated fatty acids. The low intake of total fat, high P/S-ratio and relatively high proportion of total energy from protein indicates that fish is an important food and contributor to the nutrient intake in Japan.

Alcohol intake was highest in the Spata Greek population compared to Greeks in Melbourne, the Anglo-Celtics, Swedes, Japanese, and the Adelaide and New Zealand populations. In the EURONUT-SENECA study, however, these values were exceeded by the Italian, Hungarian, Spanish and Swiss males. Information on alcohol intake was not available from the Chinese centres. The percentage energy intake from total carbohydrate was highest in the Chinese Tianjin and Japanese populations. Despite that, these populations showed low estimates of dietary fibre intake compared to other study centres, which in turn could be partly explained by different ways of analysing fibre and partly by food choice.

Rice, which is an important contributor to carbohydrate intake in these regions, has a proportionally low content of dietary fibre compared to other cereals. The rural Chinese tend to eat more fibre compared to the urban population which can be explained by a higher intake of total cereals, rather than fruit and vegetables. Greeks in Melbourne showed a higher intake of fibre than Greeks in Spata, and almost twice the intake of vitamin C. Obviously, food patterns in these Greek populations differed regarding cereals, fruit and vegetables. Anglo-Celtic females showed the highest intake of both fibre and vitamin C of all populations, indicating a high intake of fruit and vegetables.

12.3.2 Micronutrient intake

As mentioned before the Swedish database takes cooking losses of vitamin C (50%) into consideration. Mean vitamin C values for all IUNS populations exceeded two thirds of RDA (See Figures 12.7 and 12.8). However, a great proportion of individuals from rural Tianjin were below this cut-off limit. Anglo-Celtic females showed high intake values for this vitamin. There were considerable differences regarding riboflavin intake between the centres. The highest absolute intakes and densities were seen in the Anglo-Celtic and Swedish populations and the lowest in the Tianjin populations. For the urban Tianjin population 100% of the population were below 2/3 of the RDA. For the rural Tianjin sample 70-100% of the population were below this cut-off limit. The Tianjin populations reached only half of the recommended level of 0.17 mg/MJ for this nutrient density [24,25]. Spata-Greeks were just below this value. The nutrient density recommendation is not meant for energy intakes below 7.0 MJ. However, all except the younger men from urban Tianjin were below this level for energy intake. Riboflavin is abundant in animal food items and the present Tianjin populations show the lowest protein intakes compared to other study centres.

Figure 12.7. Vitamin C intake (mg/day) in males in the different countries, and two thirds of RDA, see Table I

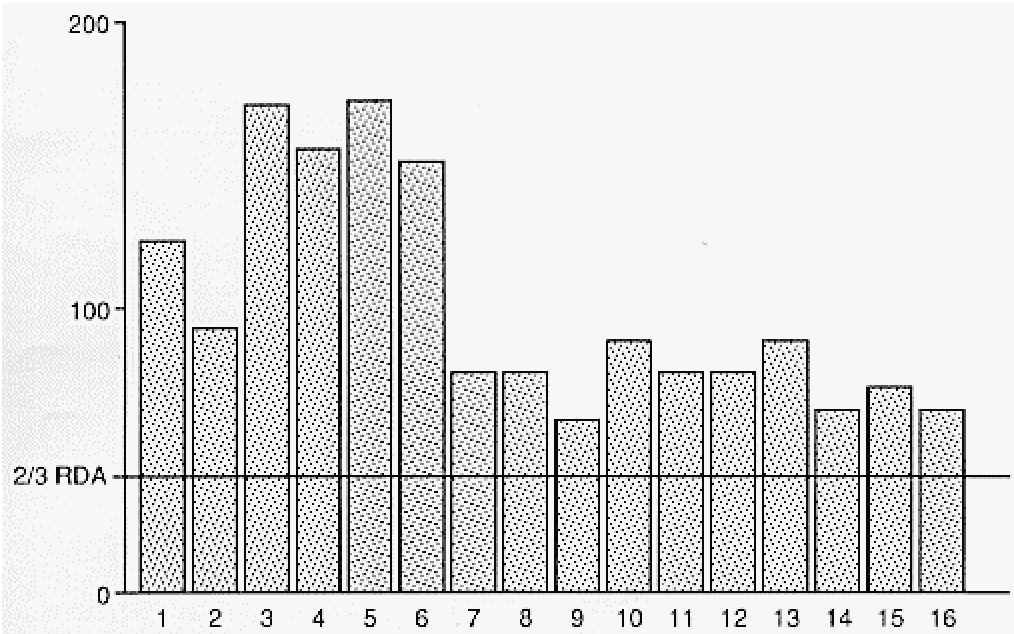
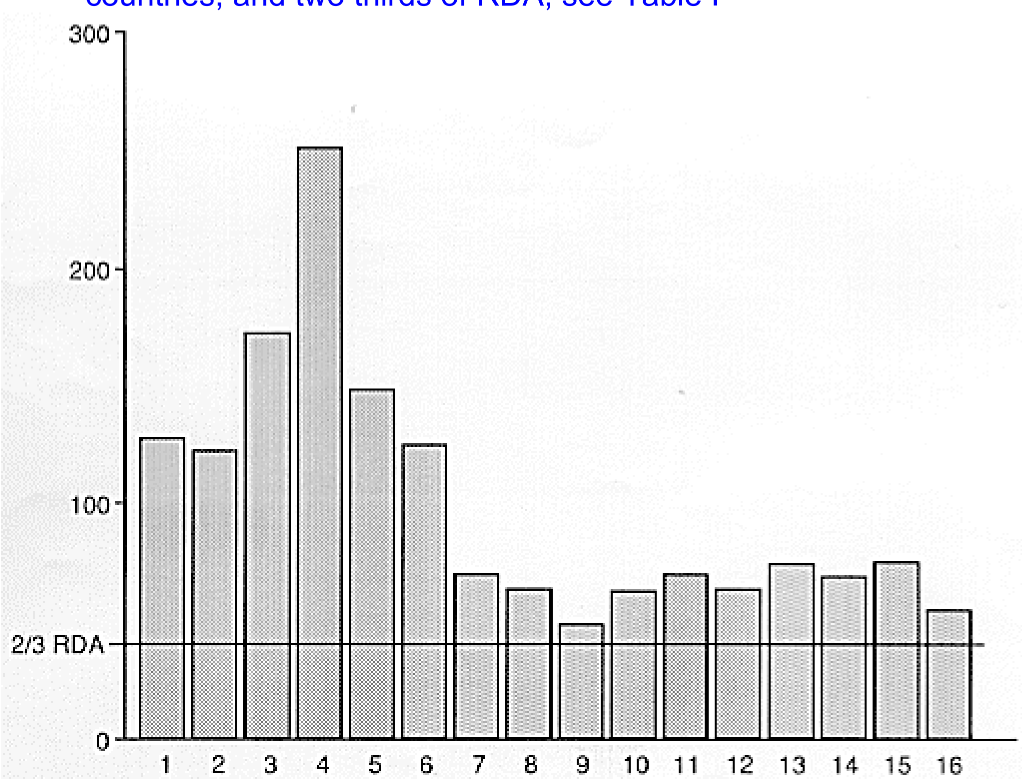


Figure 12.8. Vitamin C intake (mg/day) in females in the different countries, and two thirds of RDA, see Table I



Calcium intake varied markedly between the IUNS centres (Figures 12.9 and 12.10). The Swedes had the highest and the Chinese populations the lowest intakes. In Sweden just a few per cent of younger subjects fell below the cut-off limit. However, 10% of both 80+ males and females were below two thirds of the RDA for calcium. In the Anglo-Celtic sample, despite a high mean intake and nutrient density, as much as 20% and 33% respectively, of younger and older females were below 2/3 of RDA for calcium. All urban Tianjin probands fell below 2/3 of the RDA, and about 95% and 90%, respectively, of males and females from rural Tianjin were below this cut-off limit. Also in Okazaki about 50% of males and 75% of females, respectively, were below this cut-off limit.

Figure 12.9. Calcium intake (mg/day) in males in the different countries, and two thirds of RDA, see Table I. Calcium values are missing from Beijing (13,14)

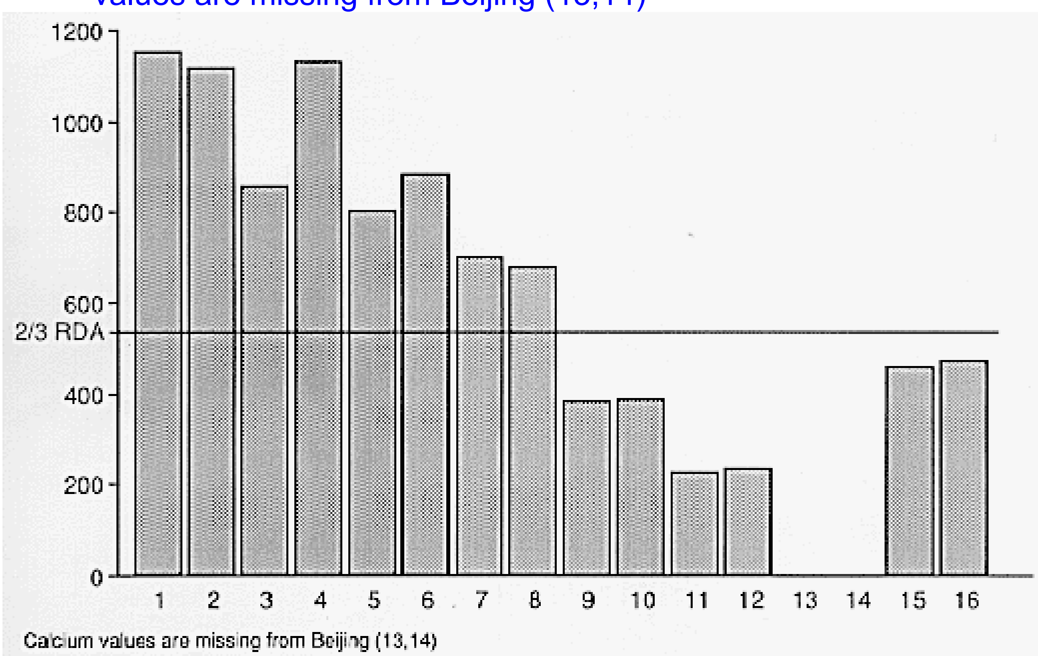
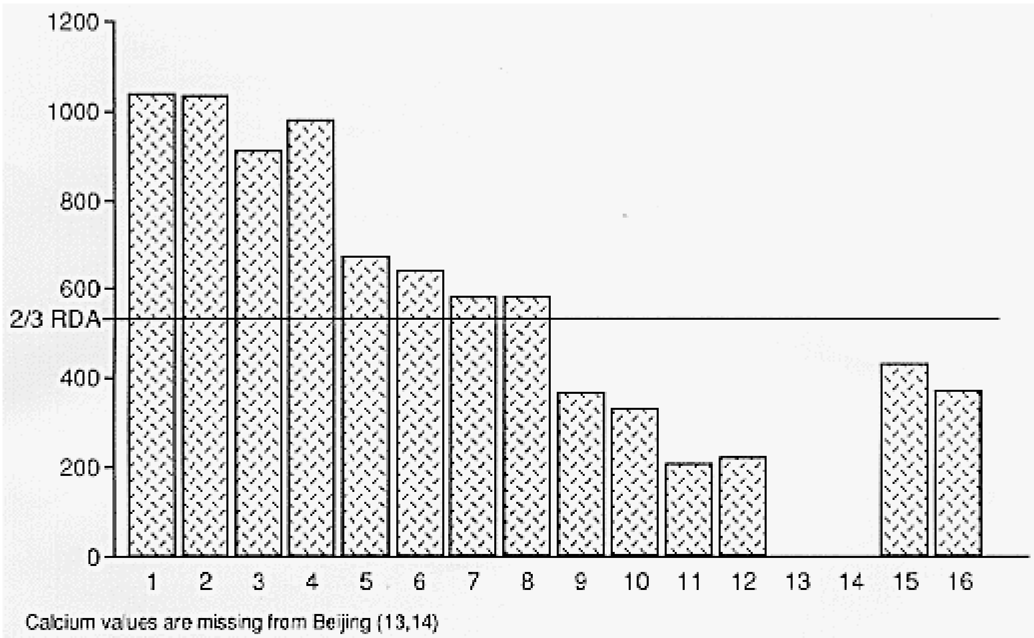


Figure 12.10. Calcium intake (mg/day) in females in the different countries, and two thirds of RDA, see Table I. Calcium values are missing from Beijing (13,14)



The Greeks in Melbourne tended to have about 100-200 mg higher intake of calcium than the Greeks in Spata. In the Melbourne Greek sample, 25% and 21% younger and older males and 39% and 50% of younger and older females, respectively, were below the cut-off limit for calcium. One of the Greek populations (Greeks in Markopoulo - a rural area, sample of 60 individuals) within the EURONUT-SENECA study showed mean values for calcium intake at 1412 and 1231 mg for males and females, respectively. Compared to Greeks in both Spata and Melbourne these values were high and indicate different food habits. The lowest nutrient density values within the EURONUT-SENECA study were 71 (Hamme/ Belgium) and 72 mg/MJ (Marki/ Poland) for males and 76 mg/MJ (Marki/ Poland) for females, respectively.

Compared to other IUNS centres, Japan had the lowest iron density and absolute intake; a large proportion of the sample, especially women, were below 2/3 of RDA. The second and third lowest of the study groups in iron density were the Anglo-Celtic and Swedish elderly. However, very few subjects were below the RDA cut-off limit in these populations. In urban Tianjin a significant proportion of women were below 2/3 of the RDA for iron.

Zinc intake was not available from the Japanese and Chinese (Tianjin) populations. However, among available intakes, Swedish subjects had the highest intakes, which were almost twice as high as intakes of Greek subjects. This difference was also seen with respect to zinc density. Compared to the recommendation for zinc density [24,25] all available intakes from the IUNS centres except for young men from Spata and the Anglo-Celtic Australians, exceeded this value (1.7 mg/MJ). The Adelaide and New Zealand populations showed zinc density values below this cut-off value. The high intake of zinc in the Swedish subjects is probably related to their high intake of organ meats and rye bread.

12.4 DISCUSSION

In the past, researchers have been interested mainly in nutrients and their relationship to nutritional status and health. More and more studies are emerging showing relationships between specific foods and health, which are not necessarily explained by their nutrient content. It appears that food intake may not be adequately described by nutrient intake alone, since there are many biologically active non-nutrient components of food [27,28]. For this reason, the IUNS study focused on describing food intake and habits and thus, the nutrient intake and health profiles of study subjects should be interpreted in conjunction with the food intake data described in Chapter 11. In this chapter, apparent differences in aspect of selected nutrients have been identified 1) between the Caucasian and the Asian study communities 2) within the Caucasian and the Asian communities and 3) between rural and urban communities. The ultimate interpretation of the results and their generalisability may be limited and should be recognised.

12.4.1 Methodological Considerations

The use of the food frequency questionnaire (FFQ) in the Caucasian communities and 3-day 24-hour recall method in the Asian communities implies that nutrient intake will be inherently lower in the Asian communities. The FFQ assessed usual food intake over the past year whereas the 24-hour recall provided current dietary intake on a particular day. Therefore, attempts to illustrate differences in average daily intake amongst study communities must take this into account (See Chapter 11). In this chapter, nutrient intake adequacy is assessed by comparing with the American RDAs [17]. The RDAs for the elderly are bared on extrapolations from more well known data on younger individuals [26]. To determine the requirements for adequate needs of nearly all healthy elderly people is complicated on several fronts [32], like the effect on nutrient requirements of age related diseases and the obvious heterogeneity among elderly regarding biological, social and functional age and possibly even racial differences. Despite the complications, several countries have made recommendations of nutrient intake for elderly people [17,32-34]. However, these recommendations vary extensively regarding age span and completeness regarding nutrients. None of these recommendations means there is better evidence available in one country than in another. To make proper guidelines for nutrient intake among elderly people, good population based studies are needed in several countries with varied ethnic groups. It is only during the last two decades that such studies have started to become available. This is one important reason for conducting cross-cultural population studies, like the IUNS study, which focus on describing current food and nutrient intakes with respect to health and functional performances.

Another limitation of using RDAs to assess nutrient intake adequacy, is that standards usually incorporate a wide safety margin to cover individual variability (± 2 standard deviations). Therefore, it cannot be concluded that the nutrient intake of an individual is deficient if (s)he does not obtain the RDA. In addition, as the distribution of requirements for nutrients is usually unknown, it is impossible to estimate the probability than an individual is undernourished.

Nevertheless, the greater the proportion of people with intakes below the RDA, the greater the possibility that some individuals may be undernourished for the nutrient in question. Thus assessment of the adequacy of dietary intake by comparison of individual intake results with RDAs provides only a guide to areas of risk, and not proof of absolute deficiency [14]. Furthermore, the cut-off limit of two thirds of the RDA, should be regarded with caution because it does not separate between deficient and adequately nourished without error [30]. Such cut-offs give an estimate of the proportion of people within a population with an intake below a certain value sufficient for most healthy people [17].

12.4.2 Differences in nutrient intake

Considerable variation exists between centres regarding energy and nutrient intake. In a transcultural study like this with study centres in different cultures in different parts of the world, a variety of uncertainties makes it difficult to establish what are real differences and what could be deduced from divergences in methodology. Despite these reservations some trends could be discerned, regarding mean intake level when comparing the centres.

The Swedish, Anglo-Celtic and the Greek populations seemed to have a satisfactory energy and nutrient intake related to standards. The Tianjin and Japanese populations - especially the urban Tianjin population - seemed, however, to be low in energy as well as nutrient intakes. Further, the Greek populations differed from other centres - even compared to the New Zealand and Adelaide studies - regarding fat quality. In this study, two clearly different nutrient intake patterns could be distinguished, one western with high intake of fat and low intake of carbohydrates and one eastern with the opposite relation regarding contribution to total energy intake. Between these food patterns is Beijing. Finally, to get a better understanding of the differences and to make a judgement of the probability in these nutrient data, they must be seen in the context of food intake and anthropometry.

12.5 ADDITIONAL INFORMATION

12.5.1 Aboriginal Australians (Antigone Kouris-Blazos)

Nutritionist 3 nutrient analysis computer programme was used to analyse the nutrient content of a 'typical' elderly Aboriginal diet at Junjuwa. The average quantities of food consumed by the elderly community on feast days and famine days over a 2 week period in the wet season are approximations based upon observation, weighing of food and information from key informants [35]. Therefore these quantities were derived by 'consensus' and 'triangulation' to represent the whole community rather than from each and every elderly Aborigine in the community involved in the study for reasons outlined in Section 5.1.

These average quantities were used (for quantities see Section 9.7.1) to calculate nutrient intake for both men and women combined, incorporating foods eaten on a weekly basis. A slight overestimation of nutrient intake is expected using this method of collecting and analysing food intake data (not unlike 24 hour recalls incorporating the check-list of foods eaten on a weekly basis). Bush food consumption was not included in the analysis as it was consumed irregularly. The difference in nutrient content of the elderly diet with and without meals-on-wheels is also presented.

Average nutrient intakes are reported for the purpose of illustrating the general quality of the diets consumed by the elderly as well as to highlight the marked changes in food and nutrient intake occurring from day to day. While such qualitative nutrient intake data may appear crude at first glance, it still provides an invaluable insight into the diet of elderly Aboriginal Australians. Therefore, given the qualitative nature of the way in which the food intake data was collected and analysed, the percentage contribution of macronutrients to total energy intake and the percentage RDA presented should be treated as 'ball park' figures only. Additionally, gender differences in nutrient intake could not be calculated, therefore this should be borne in mind when interpreting the data. The RDIs used were for Australian Caucasians over the age of fifty-five (NH & MRC, 1986) [34].

Lee [36] used extended collection and analysis of store turnover data over 6 weeks in 6 remote Aboriginal communities to determine per capita food and nutrient intakes. Indigenous Australian bush foods were not included since more than 80% of foods are usually purchased from the local store. Alcohol consumption was not recorded and neither was there an attempt to apply a correction factor for food wastage in this study. Nevertheless, it still provides an important insight into the diets of Australian Aborigines, as well as remarkably comparable data to the qualitative findings in this study. Apparent total energy intake was about 4000 kcal/day. However, on a feast day it was as much as 6000 kcal and on a famine day as little as 1000 kcal. Of these, sugar, beef and white flour together provided more than 50% of total energy intake. In the wider Australian community a much larger number of foods significantly contribute to the total energy, especially fruit, vegetables, dairy products and wholegrain cereals (see Table 12.2).

Table 12.2. Macronutrient intakes (% of total energy intake on feast and famine days and with or without meals on wheels).

Nutrient	Feast day -MOW	Feast day +MOW	Famine day -MOW	Famine day +MOW	Average daily Intake
Energy (Kcal)	6000	1000	2000	4000	4000
Protein %	16	8	10	10	10
Carbohydrate %	36	50	52	45	45
Fat %	48	37	34	45	45
Fibre (g)	42	21	21	21	24

Cholesterol (mg)	900	75	120	390	390

+MOW = diets with meals on wheels; -MOW= diets without meals on wheels

Most of the energy available in Aboriginal communities is derived from fat, where it contributes about 45% of total energy intake. This is 30% more energy from fat than the wider Australian population 30% and 50% more energy from fat than recommended (22.5%). Fatty meat products from beef, lamb and manufactured foods provide about 60% of the total fat intake. Beef is the most popular meat providing about 40% of total fat intake alone. Cuts of meat available in Aboriginal communities are notoriously low in quality, with an average of 40% fat by weight in samples of beef, which provides in the order of 80% of all calories available from consumption of the meat (see Table 12.3).

Table 12.3. Comparison of apparent intake of nutrients in aboriginal and wider Australian communities.

	*Wider Australian Community (store turnover)	**6 Remote Aboriginal communities (RAP)	Junjuwa Aboriginal elderly
Protein (g)	100	76.5	100
(% energy)	(12%)	(8%)	(10%)
Fat (g)	133	184	200
(% energy)	(37%)	(45%)	(45%)
Total Carbohydrate (g)	398	453	450
(% energy)	(49%)	(50%)	(45%)
Refined Carbohydrate (g)	124	250	200
(% energy)	(15%)	(27%)	(20%)
Energy (kJ)	13670	15385	16800
(kcal)	3255	3663	4000

*Australian Bureau of Statistics 1985 **Lee A, 1987 [37]

The current contribution of meat (60%) to total fat intake in Aboriginal communities is similar to the profile in the wider Australian population over 50 years ago. Currently less than 36% of the total fat intake in the wider Australian community is derived from meat. Dairy products contribute less than 5% of the total fat intake compared to 14% in the wider community. Less than 2% of total fat intake is contributed by margarine/ oils. Most fat consumed is saturated and the ratio of polyunsaturated to saturated fatty acids is only half that for the wider community. The large quantities of white flour eaten daily, mainly in the form of damper (500g/day provides 1000 kcal, +17 g fibre), contributed 25% of the total energy intake, 55% of total carbohydrate and sodium intake and most of the total daily fibre (mainly insoluble) and unrefined carbohydrate intake, since fruit, vegetables, legumes, nuts and wholegrain cereals were not eaten daily and only in small quantities, if at all. The proportion of energy derived from refined carbohydrate is twice that of the wider Australian community with white sugar per se contributing about 70% of all refined sugars consumed, mainly in the form of table sugar. Soft drinks, juices, ice-cream and biscuits are more commonly eaten by Caucasian Australians. Average sodium intake was about three times the RDA; major sources being damper (500 g provides 3300 mg sodium), tinned meat (30 g contains 300 mg sodium), added salt (2 g contains 800 mg sodium), milk powder (4 tablespoons contains 200 mg sodium) and take away food. Magnesium intake was low (50% RDA) due to inadequate consumption of fruit, vegetables and wholemeal cereals. Calcium intake was also low (60% RDA) due to low consumption of calcium rich foods such as dairy products. Most of the calcium was obtained from 4 tablespoons of milk powder (600 mg calcium) added to tea (see Table 12.4).

Very little vitamin D is obtained from the diet but given the high degree of sun exposure, vitamin D deficiency is not a problem. Folate intake was also low due to poor intake of green leafy vegetables, fruit and wholemeal bread. In general, elderly who also eat meals-on-wheels (MOW) obtain a higher intake of nutrients on 'famine days' especially vitamin E and B vitamins.

However, receiving MOW does not appear to greatly improve nutrient intake. In the study by Lee [36] using store turnover data, K and Ca reached 100% RDI, whereas riboflavin and niacin did not, and sodium intake appeared lower (150% RDI). When the pension came fortnightly, the number of 'famine' days was considerably higher - only recently was payment changed to weekly. Some elderly would have survived mainly on damper for more than a week. The average daily percentage nutrient intake would therefore have been much lower. Over the past 10 years, more than half of the elderly have lost weight with the average loss being 6 kg. It is suspected that with weekly payments, some elderly will gain weight.

In summary, intakes of energy, sugar, sodium and fat appear grossly excessive, while intakes of dietary fibre, unrefined carbohydrate, some minerals (Mg, Zn, K, Ca, Se) and some vitamins (folic acid) are inadequate compared with average recommended dietary intakes for the community as a whole. Only three elderly Aborigines at Junjuwa were observed to be consuming alcohol, whereas their younger counterparts were observed to be heavy consumers. Australian indigenous bush foods comprise less than 20% of their total food intake and even though the Fitzroy River is near by, fresh fish (or even tinned/ frozen) was not regularly eaten by the elderly Aborigines. A significant reduction in consumption of total fat could be achieved by the choice of leaner cuts of meat and removal of visible fat as well as increased fish consumption. A dramatic reduction in refined carbohydrate could be achieved by a reduction in sugar consumption per se and increased consumption of unrefined carbohydrate and fibre as fruit, vegetables, wholegrain cereals, nuts and pulses. Aborigines should be encouraged to continue eating bush foods and more research is required on the impact of 'feast' and 'famine' eating to the health of Australians Aborigines.

Table 12.4. Average nutrient intakes (% RDA on 'binge' and 'lean' days and with or without meals on wheels).

Nutrient	Feast Day -MOW %RDA	Famine day +MOW %RDA	Average daily -MOW %RDA	+MOW %RDA	Intake %RDA
Nutrients exceeding RDA					
Sodium	600	300	200	300	300
Iron	240	60	110	140	160
Phosphorus	160	45	65	95	100
Vitamin E	180	10	25	100	100
Vitamin C	250	35	180	100	180
Vitamin A	160	40	250	87	200
Thiamin	100	40	100	70	100
Riboflavin	170	70	85	100	120
Niacin	280	40	75	150	150
Vitamin B6	180	10	100	80	130
Vitamin B12	550	100	160	260	300
Nutrients below RDA					
Potassium	90	30	50	50	60
Magnesium	70	25	45	30	50
Zinc	130	15	80	60	90
Calcium	70	45	60	60	60
Selenium	100	10	65	40	60
Vitamin D	35	0	0	10	10
Folate	65	10	40	30	50

+MOW = diets with meals on wheels (about 50% of elderly received MOW daily). See also section Meal pattern for description of foods eaten.

-MOW= diets without meals on wheels.

12.6 SUMMARY

- The highest energy intake was found in SWE elderly, followed by ACA, GRK-M and GRK-S; the Chinese elderly had the lowest energy intakes.
- The highest intake of protein was found amongst GRK-M, followed by ACA, GRK-S, JPN, SWE, CBJ and CTJ-R - the lowest values were seen in CTJ-U.
- The highest intake of fat was found amongst GRK-M and GRK-S, followed by SWE, ACA and CBJ - JPN and CTJ elderly had the lowest intakes.
- Mean percentage energy intake from carbohydrates was highest amongst Japanese and Chinese elderly and lowest amongst Greek elderly.
- The highest intake of alcohol was found amongst GRK-S and ACA, followed by GRK-M, SWE and JPN; information on alcohol intake was not available from the Chinese centres.
- SWE elderly had the highest intake of calcium, followed by ACA and GRK; the majority of Chinese elderly had inadequate calcium intakes.
- Iron intake was high (especially GRK-M) in most study communities, except amongst JPN and CTJ-U elderly.
- Zinc intake was not available for the Japanese and Chinese populations. SWE elderly had the highest intakes, followed by GRK-M. A large proportion of ACA and GRK-S had inadequate intakes.
- Riboflavin intake was highest amongst ACA and SWE, followed by GRK-M. A large proportion of GRK-S and CTJ elderly had low intakes.
- The highest intakes of vitamin C were found amongst ACA, followed by GRK-M and SWE. GRK-S, JPN and a large proportion of CTJ elderly had inadequate intakes.

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12.7 LEGEND OF FIGURES

Figure 12.1 Energy intake (KJ/day) in males in the different countries, see Table I.

Figure 12.2 Energy intake(KJ/day) in females in the different countries, see TableI.

Figure 12.3 Distribution (per cent of energy intake) of macronutrients in males in the different countries, see Table 1

Figure 12.4 Distribution (per cent of energy intake) of macronutrients in females in the different countries, see Table 1

Figure 12.5 Protein intake (g/day) in males in the different countries, and two thirds of the RDA, see Table 1

Figure 12.6 Protein intake (g/day) in females in the different countries, and two thirds of the RDA, see Table 1

Figure 12.7 Vitamin C intake (mg/day) in males in the different countries, and two thirds of RDA, see Table 1.

Figure 12.8 Vitamin C intake (mg/day) in females in the different countries, and two thirds of RDA, see Table 1.

Figure 12. 9 Calcium intake (mg/day) in males in the different countries, and two thirds of RDA, see Table 1. Calcium values are missing from Beijing (13,14).

Figure 12. 10 Calcium intake (mg/day) in females in the different countries, and two thirds of RDA, see Table 1. Calcium values are missing from Beijing (13,14).

Figure12.11 Iron intake (mg/day) in males in the different countries, and two thirds of RDA, see Table 1.

Figure12.12 Iron intake (mg/day) in females in the different countries, and two thirds of RDA, see Table 1.

CHAPTER 12

ENERGY & NUTRIENT INTAKE

12.1 INTRODUCTION