The IUNS cross-cultural study of "Food Habits In Later Life"-- an overview of key findings

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The need to understand the nutritionally related health problems of elderly people in developing countries became more apparent following a WHO Workshop in Hyderabad, India, in 1986. On behalf of WHO, Dr Gary Andrews published a study of the social and health status of elderly people in the Western Pacific in 1986. For all of the difficulties in cross-cultural comparisons, there were enough great and important differences in social factors and self-perceived health indicators to make a case for further cross-cultural studies on a wider international scale.

The IUNS Committee on "Nutrition and Aging" began to address the way in which the cross-cultural aspects of nutritional assessment and the social and health status methods could be applied using the socio-anthropological approaches. A project to study "Food Habits In Later Life" was formulated. Communities where there was a concentration on food culture and its relationship to health were recruited into the project to be assessed non-invasively, without the limitations that collection of biological specimens might impose. Results from 13 elderly communities in Australia, China, Greece, Japan, the Philippines, and Sweden studied in 1988-1992 have now been documented in book form. This book also brings together some cross-cultural studies of the elderly which have considered food and health at the same time as the IUNS project: these studies are the EC SENECA study, a study by the National Institute of Nutrition and Food Hygiene in Beijing of six Chinese communities with distinctive food patterns, a New Zealand-Australian study of two communities and studies in Central America. The IUNS study itself has the attributes of an ecological investigation and the related limitations. The ethnological and anthropological focus, however, represents an advantage in that the range of variation of the nutritional exposure under consideration is much greater among populations than within any particular population. The IUNS study is unique in the scope of the variables studied. Some of these study communities will be followed prospectively to take advantage of what a cohort study can provide in the elderly.

Historical background

In 1988, the International Union of Nutritional Sciences (IUNS) Committee on Nutrition and Aging (II-8) undertook to coordinate cross-cultural studies of food habits and health in later life with the following objectives:

1) to describe health status, lifestyle and the range of food habits (present and past), amongst the aged in developed and developing countries, and

2) to determine to what extent food habits and lifestyle variables predict health status in the aged.

The principal hypothesis is that it is possible for comparable health status to be achieved by people in later life, having eaten, and continuing to eat in quite different ways from each other. We cannot, however, comment on the nature of survivorship from a nutritional point of view for those of whom die prematurely, before the age of 70, or before the upper age stratum in a community where life expectancy is relatively short. Nevertheless, our assumption is that achievement of optimal health status by nutritional means is worthy of consideration amongst the aged in its own right[18].

Results from 13 elderly communities, giving a total of 2013 subjects, have now been descriptively documented in book form, fulfilling the first objective of the study[16].

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Additionally, similar studies undertaken by EURONUT-SENECA group[3], Horwath and colleagues in Australia and New Zealand[8-10], and the Institute of Nutrition and Food Hygiene in Beijing, China, are also included, comprising 27 centres in all.

The value of the book is that it brought together variables from all of these centres for comparison. The variables included socio-demography, health status, food intakes, food beliefs and habits, nutrient intakes, anthropometry, social network and factors, and lifestyle. The IUNS study is unique in scope and will provide researchers with data on how elderly people are eating in various communities and factors affecting food intake and health. The book provides a reference point in approaches and methodology for the study of nutrition and aging in various communities.

The objectives of this paper are:
1) to report methodology developed for the IUNS study of "Food habits in later life: Cross-cultural approaches" with special references to health status, food intakes, social factors, and lifestyle, and
2) to present key findings related to the general investigation of food habits and health status.

Methods
Study communities and subjects
Representative samples of 13 elderly communities, aged 70 years and over (or where this has not been the upper decile of the population, a age less than 70 years) were studied, drawing from Australia (rural Aboriginal, urban

Anglo-Celtic, and urban Greek Australians), China (urban Beijing, and rural and urban Tianjin Chinese), Greece (rural Spata Greeks), Japan (semi-urban Okazaki, urban Hiroshima, semi-urban Kumamoto, and urban Yokohama Japanese), Philippines (urban Manila Filipinos), and Sweden (urban Gothenberg Swedes). Elderly participants were representative of the community being studied, but not of the entire country. Subjects were randomly selected from the telephone directory, register or electoral rolls. Psycho-geriatric patients in nursing homes and subjects unable to answer questions independently were excluded from the study. All study centres aimed for a participation rate of at least 60%. Community characteristics and sample size are shown in Table 1.

For each community, young and old elderly was defined. In communities where 70 years of age was the lowest limit for entry, the young elderly were those who aged less than 80 years, and the old elderly were those who aged 80 years and over. In communities where the upper decile of the community was aged below 70 years, the young elderly were those aged less than 70 years, and the old elderly were those aged 70 years and over. The age range for each study community is shown in Table 2.

Interviewer administered questionnaires, anthropometric measurements, blood pressure, and blood tests were employed to collect individual data. Questionnaire information was available from all study communities. In some centres, anthropometric measurements, blood pressure, and blood tests were also performed (Table 3).

Table 1. Participating Communities: community code, location, ethnicity, and sample size (men, women and total)

| Code | Location | Rural or Urban | Ethnicity | Sample Size | | | | | | |
| | | | | Men | | Women | | Combined | | |
				young	old	young	old	young	old	Total
ABOR*	Fitzroy Crossing, Australia	rural	Aboriginal	16	4	16	7	32	11	43
ACA	Melbourne, Ausrtalia	urban	Anglo-Celtic	42	7	40	6	82	13	95
GRK-M	Melbourne, Ausrtalia	urban	Greeks	66	28	59	36	125	64	189
GRK-S	Spata, Greece	rural	Greeks	32	19	31	22	63	41	104
SWE	Gothenburg,Sweden	urban	Swedes	52	21	80	64	132	85	217
FIL*	Manila,Philippines	urban	Filipinos	33	41	109	98	142	139	281
JPN-O	Okazaki, Japan	semi-urban	Japanese	28	15	33	13	61	28	89
JPN-H	Horoshima, Japan	urban	Japanese	37		53		90		
JPN-K	Kumamoto, Japan	semi-urban	Japanese	43		48		91		
JPN-Y	Yokohama, Japan	urban	Japanese	28		40		68		
CBJ*	Beijing, China	urban	Chinese	80	45	124	56	204	101	305
CTJ-R	Tianjin, China	rural	Chinese	73	10	79	19	152	29	181
CTJ-U	Tianjin, China	urban	Chinese	107	19	102	32	209	51	260
Total				846		1167		2013		

* the upper decile of the community was sampled, 50 years and over for Beijing women and Aboriginal Australians, and 55 years and over for Beijing men and filipinos.

Table 2. Age range, by study community

	ABOR	ACA	GRK-M	GRK-S	SWE	FIL	JPN-O	CBJ	CTJ-R	CTJ-U
Men:										
Young elderly	50-70	70-79	70-79	70-79	69-79	57-69	70-78	57-69	70-79	70-79
Old elderly	70-80	80-84	80-97	80-91	80-91	70-83	80-91	70-88	80-89	80-87
Total	50-80	70-84	70-97	70-91	69-91	57-83	70-91	57-88	70-89	70-87
Women:										
Young elferly	50-70	70-79	70-79	70-78	69-79	58-69	70-79	53-69	70-79	70-79
Old elderly	70-80	80-94	80-104	80-94	80-96	70-91	80-87	70-95	80-94	80-96
Total	50-80	70-94	70-104	70-94	69-96	58-91	70-87	53-95	70-94	70-96

*relative age was obtained based upon members of the community

Table 3. Information gathered, by study community

	ABOR	ACA	GRK M&S	SWE	FIL	JPN H,K,O &Y	CBJ	CTJ R&U
Questionnaires	yes*	IUNS/mod	IUNS	IUNS	IUNS	IUNS		
Food intake	yes*	FFQ	FFQ	FFQ	24-hr FFQ	3-d 24-hr	24-hr FFQ	3-d 24-hr
Anthropometry	WT,HT, BMI,WHR TSF	all	all	all	WT, HT, BMI	WT, HT, BMI, WHR	all exc WHR	all
Blood pressure	no	yes	yes	yes	yes?	no	yes	yes
Blood tests	no	yes	yes	yes	yes?	no	no	no

* RAP was used to obtain demographic and community food intake information; ? not available to the present paper

Interviewer administered questionnaires

The interviewer administered questionnaires were designed for the study on health status, food habits, social factors and lifestyle[17]. Questions were adapted from previously trialled questionnaires used in elderly studies, such as the Multi-level Assessment Instrument[12] which included validated health scores, the WHO Eleven County Study in Europe[6], the WHO Four Country Study in the Western Pacific[1], and EURONUT-SENECA study in 19 European centres[3]. Apart from the health scores, all other scores (exercise, activities of daily living,medication, well-being, memory social activity, social networks) were developed for the study. In all cases a higher score was a better score.

The questionnaires covered the following aspects:
Health status
Health status included questions or a set of questions so that the following aspects could be assessed as an aggregate:

1) self-rated health,
2) self-reported health conditions,
3) self-reported medication use,
4) well-being, and
5) memory.

Both individual questions and the aggregate were used to identify potential differences in health status between the study communities.

The health section of the Multi-level Assessment Instrument (MAI)[12] was used to obtain information in self-rated health, health behaviour and health conditions. The self-rated health section consisted of four questions, describing how one would rate their overall health at present, and the aggregate gave a score of 4 to 13. The health behaviour section consisted of three questions in relation to the use of medical services (such as frequency of physician visits). The aggregate gave a health behaviour score of 3 to 9. The self-reported health conditions section consisted of a 23 item check-list of common health conditions, including diabetes, high blood pressure, eyesight and hearing, and whether limbs were missing or handicapped. The aggregate gave a self-reported health condition score of 25 to 50. A non-index item, describing the use of a wheel chair, gave a score of 1 to 2. A total health score was then obtained by adding these scores together. They ranged from 33 to 74.

The self-reported medication use was assessed using a 21 item check-list of the Older American Research Services (OARS) questionnaire[17]; the aggregate gave a

score of 21 to 42. Questions were also asked on vitamin supplements and the use of various health aids, such as canes, hearing aids, and so on.

Well-being, describing feelings of worry, depression, tiredness, sleeplessness, and contentness with life, was assessed using a 7 item questionnaire of the WHO Western Pacific Study, by Andrews and colleagues[1]. The aggregate gave a well-being score of 0 to 7.

The memory of the elderly was tested with basic questions regarding their recall of their address, the date and whether they felt they were more forgetful now compared with the past. Also adopted from the WHO Western Pacific Study[1] was a 5 item questionnaire in relation to ability to recall correct year, month and day of the week, home address and whether or not there was a feeling of forgetfulness of people's names. The aggregate gave a memory score of 0 to 5.

Food habits
The usual food intake, distant past food intake, food and health beliefs, cooking methods, facilities, eating environment, and eating difficulties were inquired so that food habits pertaining to individual elderly could be assessed.

Anthropological methods (Rapid Assessment Procedures) were used[13] to obtain information on food and health beliefs and to examine further other factors possibly affecting food intake[11,14,15]. The food habits questionnaire development encouraged the expression of food culture of the study communities and, within the framework of food habits inquiries, allowed for modification.

The food frequency questionnaire (FFQ) was used in study communities where seasonal intake of foods was evident (Australia, Greece, and Sweden). Questionnaire food items were modified in accordance with local food supply and cultural food preferences. A three consecutive day 24-hour recall method was used in the Chinese and Japanese study communities where the use of FFQ had not been used previously and was virtually untested during the early development of this study. The FFQ methodology relies on the use of standard portion size to estimate usual intake which is possible for communities of European food culture, but not the traditional Asian food cultures where foods are placed in the centre of the meal table, principally served to and shared amongst the extended family members.

Nutrient intake data was analysed using country specific food composition tables. Micro-nutrient intakes were compared with two thirds of the US RDAs in order to

assess adequacy of intake. Due to differences in country specific food composition tables, certain nutrients were not available such as zinc and magnesium for Chinese and Japanese elderly, and folacin, vitamin B6 and vitamin B12 for most study subjects. Nevertheless, a qualitative assessment of intake was made by identifying foods consumed which are good sources of these nutrients.

Food intake data derived from the FFQ or 3 day recalls were categorised into 13 major food groups and 43 food subgroups. In this report, the usual food intakes (in grams per day) are reported for selected food groups. The food intake variety was calculated based on the 43 food subgroups[7]. Energy intake, the percentage of energy from carbohydrate and fat intakes, and the percentage below two thirds of the US RDA for retinol equivalent and thiamin intakes were reported.

Social factors
Social factors, including social activity, network and support, adopted questions from the Multi-level Assessment Instrument (MAI)[12]. The questions were available to the Greeks (GRK-M and GRK-S), the Swedes and the Japanese (JPN-O), and modified for use in the Anglo-Celtic Australians and Chinese in Beijing and Tianjin.

Social activity, aiming to assess ways of spending time on meetings, church congregation, and personal hobbies, consisted of 22 questions. The aggregate gave a social activity score of 22 to 176. Social networks consisted of 12 questions in relation to contact with friends and relatives, and feelings of loneliness or degree of support. The aggregate gave a social network score of 12 to 46.

Lifestyle
Activities of daily living, exercise, sleep, and substance abuse were inquired and aimed to explore the cross-cultural circumstance of lifestyle in the various elderly communities.

Activities of daily living (ADL) questions were adopted from the WHO Eleven Country Study[6]. The questions consisted a 14 item check-list inquiring degrees of difficulty with basic bodily functions and performing basic tasks, such as using the toilet, eating, and walking between rooms. The aggregate gave an ADL score of 15 to 62.

Questions on how often does one go out of the house or building and how many hours/ minutes spent per day or week doing various activities were asked to assess exercise pattern. The aggregate gave an exercise score of 1 to 7. Questions relating to sleep patterns, including time of waking and sleeping, number of hours sleep per night, and whether or not they nap during the day, were asked. Smoking habits and alcohol consumption were also asked.

Anthropometry
A standard protocol was developed for use in the study. Not all study centres had a complete set of anthropometric data (Table 3). Where the collection of anthropometric data was possible, the study protocol was followed. All measurements were measured twice and included:

1. Body weight: in kilograms to the nearest 0.5kg, with light clothes on;
2. Stature: in centimetres to the nearest 0.5cm, in standing position with socks and shoes removed;
3. Body mass index (BMI): calculated as weight in kilograms divided by stature in meter squared (kg/ m^2);
4. Waist circumference: at the level of umbilicus in centimetres to the nearest 0.5cm, with light clothes on, in standing position with abdomen relaxed, arms at the sides, feet together and weight equally divided over both legs;
5. Hip circumference: at the level of maximal gluteal protrusion in centimetres to the nearest 0.5cm, with light clothes on, in standing position with abdomen relaxed, arms at the sides, feet together and weight equally divided over both legs;
6. Waist-to-hip circumference ratio (WHR)[2]: calculated as waist circumference divided by hip circumference;
7. Mid arm circumference (MAC): in centimetres to the nearest 0.5cm, in standing position, with sleeves removed, arm relaxed, and legs apart;
8. Skinfold thicknesses: triceps (TSF), biceps, suprailiac and subscapular in millimetres using a Harpenden or Holtain caliper (the two agree reasonably well);
9. Mid arm muscle circumference (MAMC): calculated using the following equation:
$$MAMC = MAC - (3.14 \times TSF)$$
where MAC equals mid arm circumference and TSF equals triceps skinfold thickness
10. Mid arm muscle area (MAMA)
$$MAMA = [MAC - (3.14 \times TSF)]^2 / 12.56$$
where MAC equals mid arm circumference and TSF equals triceps skinfold thickness
11. Fat free mass (FFM) in kilograms, total body fat (TBF) in kilograms, and percentage body fat[4]: estimated using body weight, stature, age, and gender; the approach makes it possible to compare body fatness amongst the study communities because more direct measures were not available from all centres; the formula is as follows:
$$FFM = 0.395 \times WT + 0.282 \times ST + 8.4 \times gender - 0.144 \times age - 23.6;$$
where WT is body weight in kilograms, ST is stature in centimetres, gender equals 1 for men and 0 for women, and age in years.

Blood pressure
Blood pressure was measured twice from the right arm, with elderly resting in a sitting position. The Korotkoff's phase I and V were recorded for systolic and diastolic pressure, respectively. Blood pressure data were available from most study communities, except for the Aboriginal Australians and the Japanese.

Blood tests
Fasting venous blood were sampled from the Anglo-Celtic and Greek Australians, and the Swedes. Biological markers included:

1. Haematology: full blood examination, plasma folic acid in nmol/ 1 and plasma vitamin B12 in pmol/ 1
2. Lipids: Serum total cholesterol, triglycerides, HDL-cholesterol, and LDL-cholesterol[5] in mmol/ 1

3. Plasma fasting glucose in mmol/ l

4. Iron status: plasma iron in μmol/ l, plasma ferritin in μg/ l, iron saturation in percentage (%), and iron binding capacity in μmol/ l

Immune function: white blood cell (WBC) in x10⁶/ l, total lymphocyte count (TLC) in x10⁶/ l

Results

Health status

In a comparison of the Anglo-Celtic Australians, Greek Australians, Greeks in Spata and Swedes in Gothenburg, it was found that, in general, men had a higher well-being score than women, and the young elderly (age group 70 to 79 years) had a higher score than the old elderly. Melbourne Greek and Swedish men had the highest well-being score of all the communities where the score was obtained (Figure 1).

Figure 1. Mean well-being score, by study community, age group and gender.
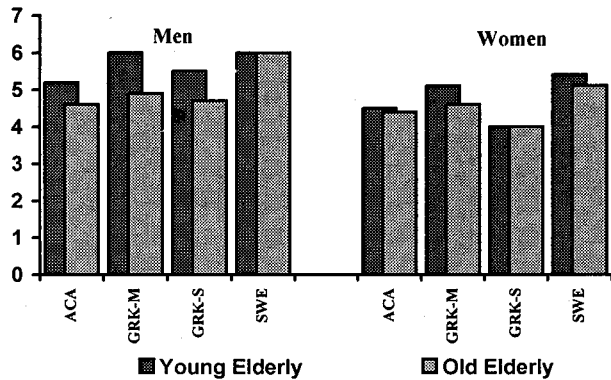
Several indices of mental status were assessed. One of the most illuminating indices was self-rated happiness. About 80% of the young and old elderly in all study communities reported being happy, the only exception being Greek elderly in Spata, where 50 to 60% reported happiness. On the other hand, 20 to 30% of the elderly reported feeling sad or depressed, except Spata and Japanese women (50%). Overall, a greater proportion of women reported feeling depressed or sad compared with men (Figure 2).

Figure 2. Percentage feeling sad or depressed, by study community, age group and gender
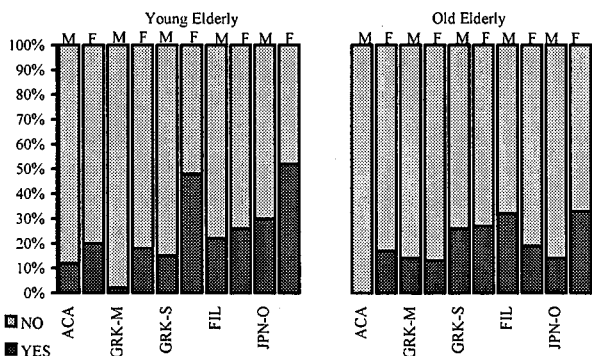
A greater proportion of Anglo-Celtic elderly (70%) reported being more forgetful, followed by Filipinos (60%), Greeks in Melbourne (50%), Greeks in Spata and

Chinese elderly (30%). Only 10% of the Japanese elderly reported being forgetful (Figure 3).

Figure 3. Percentage reported being forgetful, by study community, age group and gender
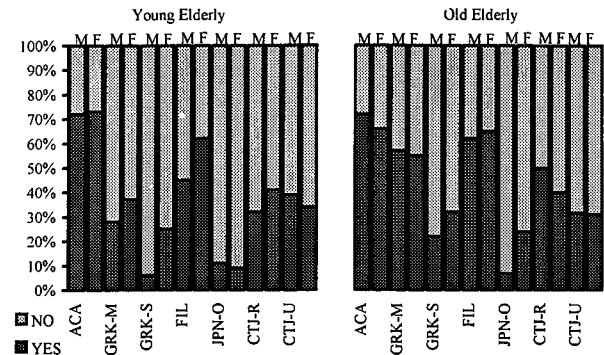

We graded self-reported health status into poor, fair, good and excellent. Combining good and excellent together, Greeks in Melbourne and Chinese in Tianjin, whether rural or urban, rated their health best. Those who rated least well were Filipinos in Manila and Japanese in Okazaki. Men also tended to rate their health better than the women especially in the older age group. This gender difference was particularly evident in the Greek and Swedish elderly (Figures 4 and 5).

Figure 4. Prevalence of self-reported health status, by study community, age group and gender, for young elderly.
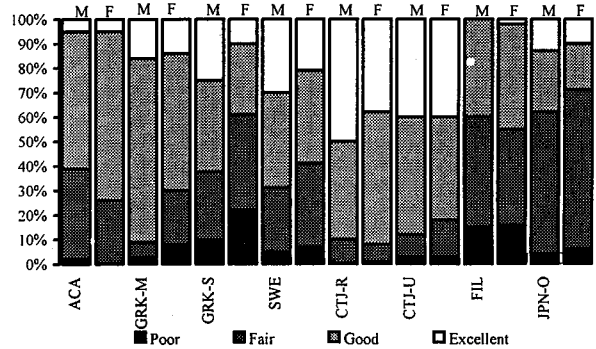

Figures 5. Prevalence of self-rated health status, by study community, age group and gender, for old elderly
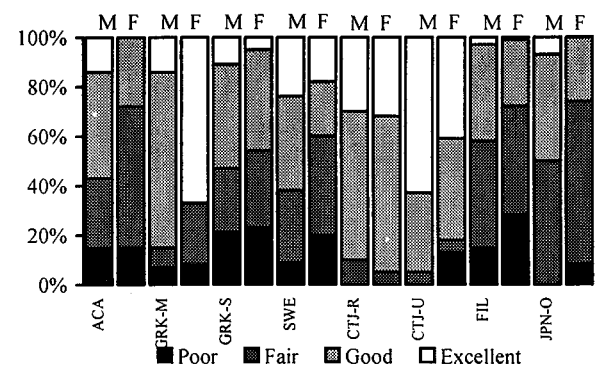
Rheumatism and/ or arthritis, hypertension, 'heart trouble', diabetes and stroke were disorders most commonly reported in the elderly communities studied.

Rheumatism was reported by about 40 to 60% of the Anglo-Celtic, Greek and Filipino elderly, compared with only 10% of the Swedes, Chinese and Japanese elderly. Rheumatism appeared to be more frequently reported by women than by men (Figure 6).

Figure 6. Prevalence of self-reported rheumatism, by study community, age group and gender
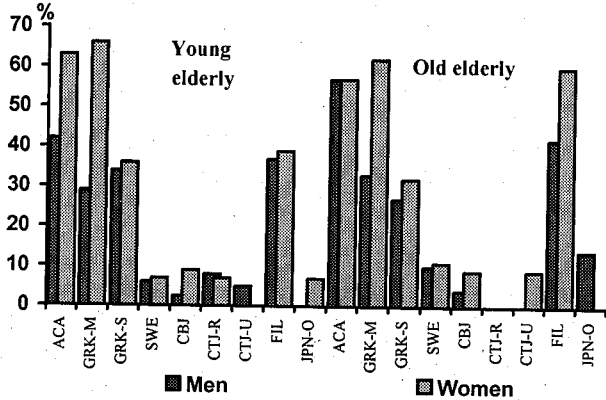
Self-reported hypertension ranged from 30 to 55%. Japanese men reported the lowest rates of hypertension (5 to 10%). Women were more likely to report hypertension compared to men, especially Anglo-Celtic, Greeks and Filipinos (Figure 7).

Figure 7. Prevalence of self-reported hypertension, by study community, age group and gender
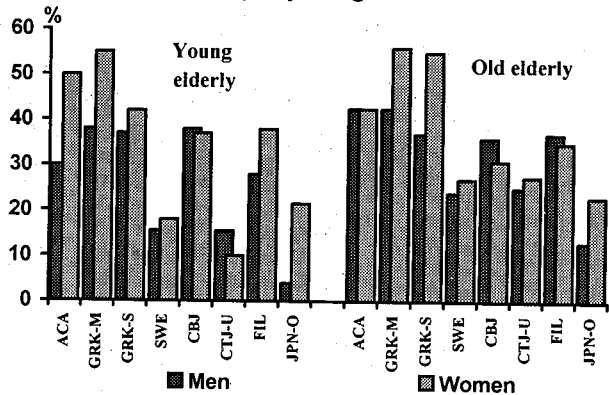
Anglo-Celtic men aged 70 to 79 years had the highest self-reported rates of heart disease (60%), followed by Greek women in Melbourne aged 80 years and over (50%) and Swedish women aged 80 years and over (45%). About 20 to 30% of the remaining subjects reported having heart problems. Rural Chinese and Japanese subjects reported the lowest rates of heart problems (less than 10%) (Figure 8).

The self-reported prevalence of diabetes was as high as 20% amongst older Anglo-Celtic and Greek women, in each case higher than for men. Of the men, Greek Australians had the highest prevalence of diabetes (17%), followed by Japanese men aged 70 to 79 years (15%). The diabetes prevalence amongst the Chinese, Filipinos and Japanese was about 5 to 10%. Amongst Caucasian, Swedish elderly had the lowest prevalence of diabetes,

comparable to Asians (Figure 9). Overall, the prevalence of diabetes appeared greater in women compared to men and in those aged 80 years and over.

Figure 8. Prevalence of self-reported heart trouble, by study community, age group and gender

Figure 9. Prevalence of self-reported diabetes, by study community, age group and gender
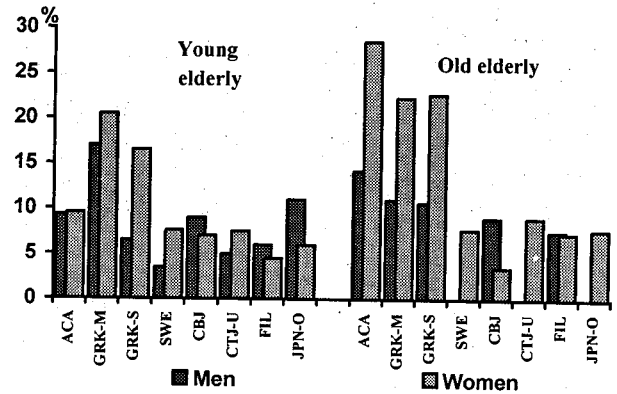
Self-reported stroke ranged between 5 and 10%. Rural Chinese in Tianjin reported the highest rates (30%), followed by Japanese men (15%) and Spata women (15%). Anglo-Celtic men had higher reported stroke rates than their female counterparts. In contrast, Greek and Filipino women reported higher stroke rates than the men. Self-reported stroke appeared to be higher in the age group of 80 years and over, especially by men.

The cancer prevalence amongst the elderly Anglo-Celtic individuals was the highest amongst all communities studied (30%). This is probably attributable to the fact that skin cancer prevalence of Anglo-Celtic Australians is high by international comparisons.

Apart from lower rates amongst the Chinese (less than 5%) and higher rates amongst Anglo-Celtic women (35%), the prevalence of self-reported cataracts was between 10 to 20% for the younger elderly. Self-reported cataracts increased significantly to about 40% in the older age group.

Food intakes

Total food intake (excluding fluid) was about 1500 grams per day for the Caucasian men and 1300 grams per day for the women (Figure 10). Asian men consumed about 1000 gram per day of solid food and women about 700 grams

per day. Rural Greeks in Spata and rural Chinese in Tianjin consumed about 300 grams less food daily than their urban counterparts.

Figure 10. Average daily total food intake, by major food group, study community and age group, for men
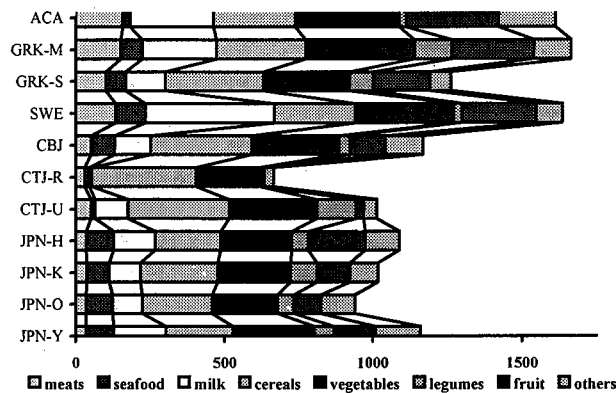
Marked differences were observed in the types and quantities of foods consumed. Mean daily intake of cereals was highest amongst Chinese elderly (350 grams per day), followed by Greeks (250 grams per day), Swedes and Anglo-Celtics (200 grams per day).

Total vegetable intake was highest amongst Greeks in Melbourne (355 grams per day for men and 300 grams per day for women), followed by Anglo-Celtic Australians (350 grams per day for men and 320 grams per day for women) and Swedes (330 grams per day for men and 320 grams per day for women). Greeks in Greece (280 grams per day for men and 220 grams per day for women), Chinese in Beijing (292 grams per day for men and 244 grams per day for women) and Chinese in urban Tianjin (296 grams per day for men and 257 grams per day for women) had similar intakes of vegetables. Chinese in rural Tianjin had the lowest intakes of vegetables (210 grams per day for men and 190 grams per day for women).

Anglo-Celtic elderly had the highest mean fresh fruit intake (200 to 300 grams per day), followed by Greeks and Swedes (200 grams per day), Japanese and Beijing Chinese (100 grams per day) and Tianjin Chinese (less than 50 grams per day).

Caucasian elderly (especially in Australia) generally consumed almost three times as much meat (100 to 150 grams per day) as Asian elderly (30 to 40 grams per day). Anglo-Celtic elderly consumed little fish or shellfish (less than 20 grams per day) compared with Greek Australians (60 grams per day) and Swedes (90 grams per day). Japanese and Chinese elderly in Beijing also had high fish intakes (60 to 80 grams per day) compared to Tianjin elderly (less than 20 grams per day).

Mean daily intake of milk and milk products was greatest amongst the Swedes (400 grams per day), followed by Anglo-Celtics (300 grams per day), Greeks in Melbourne (200 grams per day), Greeks in Spata, Chinese in Beijing and Japanese (150 grams per day) lastly Chinese in Tianjin (less than 100 grams per day).

Total energy intake and the contribution of macro-nutrient intake to energy

Mean energy intake for the Caucasian men ranged between 2200 kcal per day (Greek and Anglo-Celtic) and 2700 kcal per day (Swedes). Japanese and Chinese men had energy intakes between 1700 kcal per day and 2000 kcal per day. Of the Caucasian women, Swedes had the highest energy intake (2500 kcal per day), followed by Anglo-Celtic (2100 kcal per day), Greek Australians (1900 kcal) and Spata women (1700 kcal per day). The Chinese and Japanese women had average energy intakes of about 1700 kcal per day (Figure 11).

Figure 11. Mean daily energy intake, by study community, age group and gender

Mean percentage energy intake from carbohydrates was high amongst Japanese and Chinese elderly (55 to 65%) compared with Caucasian elderly (38 to 45%). Greek elderly had the lowest mean percentage from carbohydrates (38%) (Figure 12).

Figure 12. Percentage energy derived from carbohydrate intakes, by study community, age group and gender
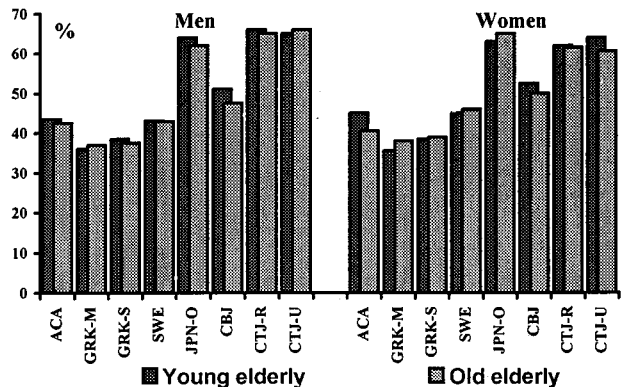
Mean percentage energy intake from fat was high amongst Caucasian elderly (35 to 43%) compared with Chinese and Japanese elderly (20 to 25%). Of the Caucasian elderly, Greek subjects had the highest mean percentage energy from fat (42%) and the Anglo-Celtics the lowest (35%). Of the Asian elderly, Beijing Chinese had the highest percentages of energy from fat (35%). Overall, women appeared to have a greater proportion of their energy intake from fat compared with men.

The Anglo-Celtic and Greeks in Melbourne had the highest percentage of energy from protein (18%), followed by Greeks in Spata (16%), Japanese (15%), Swedes (14%) and Chinese (12%).

Spata and Anglo-Celtic men had the highest percentage of energy intake from alcohol (5%), followed by Greek men in Melbourne (3%), Anglo-Celtic women (3%), Swedish men (2%), and Greek and Swedish women (1.5%).

Prevalence of nutrient intake inadequacy

Almost 100% of the Chinese elderly did not achieve two thirds of the US RDA for calcium, followed by Greek (30 to 50%) and Anglo-Celtic women (20%). Less than 5% of Swedish elderly did not achieve two thirds of the US RDA. Overall, a greater proportion of women appeared to have lower mean calcium intakes than men.

Iron intake appeared adequate in most study communities, with less than 5% of the subjects having intakes below two thirds of the US RDA. In contrast, a greater proportion of elderly (especially women) appeared to have inadequate zinc intakes. About 20 to 30% of Anglo-Celtic men and women, Spata and Swedish women had intakes below two thirds of the US RDA. Melbourne Greek women, Greek and Swedish men had higher zinc intakes (less than 15% had intakes below two thirds of the US RDA).

About 10 to 20% of the Anglo-Celtic, Greek Australians and Swedes did not achieve two thirds of the US RDA for magnesium compared with 40 to 60% of the Spata elderly.

Almost 100% the Chinese subjects did not achieve two thirds of the US RDA for vitamin A (retinol equivalent), followed by Greeks in Spata (60%), and Greeks in Melbourne (20%). Less than 10% of Swedes and Anglo-Celtic Australians did not achieve two thirds of the US RDA (Figure 13).

Figure 13. Percentage below two thirds of the US RDA for vitamin A, by study community, age group and gender.
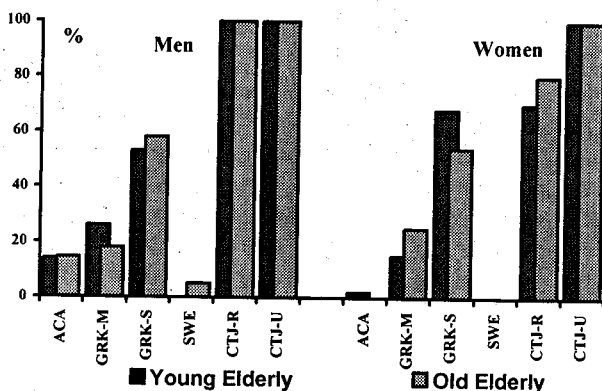
Intake of thiamin was particularly high amongst Anglo-Celtics and Swedes, with less than 5% not achieving two thirds of the US RDA. Average daily thiamin intakes were similar amongst the Greeks in Melbourne, the Chinese and the Japanese with 10 to 20% not achieving two thirds of the US RDA. The Greeks in Spata had the lowest thiamin intakes, with 30 to 50% below two thirds of the US RDA (Figure 14).

Figure 14. Percentage below two thirds of the US RDA for thiamin, by study community, age group and gender.

Anglo-Celtic Australians and Swedes had a somewhat higher riboflavin intake compared to other communities. Less than 2% of the subjects did not achieve two thirds of the US RDA. Greek Australians had higher riboflavin intakes than their counterparts in Greece; only 5% of Melbourne Greeks and 10 to 20% of Spata Greeks did not achieve two thirds of the US RDAs. More than 75% of the Chinese in Tianjin had an intake below two thirds of the US RDA. Most of the elderly achieved the US RDA for niacin.

The highest mean intakes of vitamin C were observed in the Anglo-Celtic and Greek Australians; none of the subjects had intakes below two thirds of the US RDA. About 5 to 10% of the Swedish elderly did not achieve two thirds of the US RDA. The Spata Greeks, followed by the Chinese and Japanese elderly, had the lowest mean vitamin C intakes. The Spata elderly had lower mean intakes than their counterparts in Melbourne, with 5 to 15% not achieving two thirds of the US RDA. In China, up to 40% of the elderly did not achieve two thirds of the US RDA.

Social factors

The largest proportion of elderly reporting to have someone to confide in were the Greek subjects (90%), followed by Anglo-Celtic, Swedish and Japanese elderly (80%), and lastly Filipino elderly (30%). However, when questioned about feeling lonely, the Greek elderly in Melbourne (especially women) reported the greatest frequency of loneliness (20%) whereas Anglo-Celtic and Filipino elderly were less likely to report feeling lonely very often. Similarly, less than 10% of the Swedes, Chinese and Japanese reported feeling lonely very often.

Lifestyle

Overall, sleeping disorders were reported more often by women (20 to 30%) than by men (5 to 15%). However, the duration of sleep, exceeded six hours a night for about 80% of the elderly people.

The activities of daily living (ADL) score could only be computed in the Caucasian elderly. Men generally had average scores above 55. Women tended to have lower scores, but even here, the lowest score was 49 amongst the older Greek women in Melbourne.

In support of the ADL score, enquiry about difficulty in walking between rooms revealed that it was unusual for more than 15% of the elderly to have difficulty. It was found that the proportion of Greek women had greater experiences of difficulty (20 to 30%).

The exercise score could only be computed for the Caucasian elderly and the Japanese. Overall, the least active appeared to be Melbourne and Spata Greeks, especially the women, with only 10% defined as very active; except 40% of Spata men were defined as very active due to their farming activities. Anglo-Celtic and Swedish elderly appeared to be the most active with 40% being defined as very active. The Japanese elderly appeared to be moderately active (Figure 15).

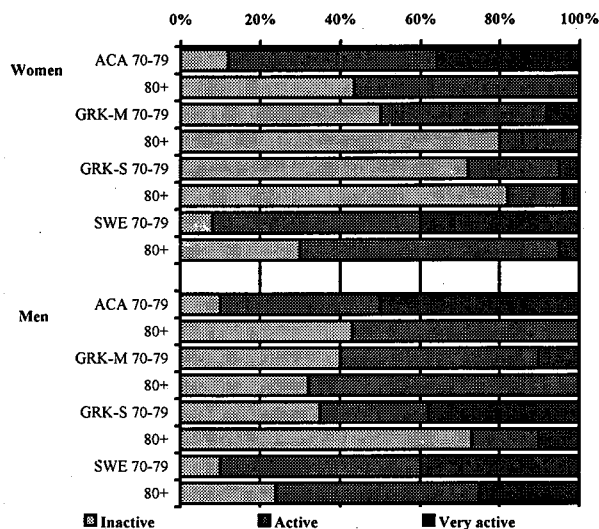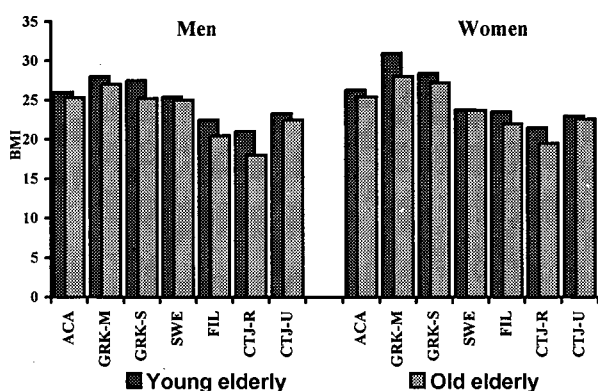**Figure 15.** Exercise score, by study community, age group, and gender

Inactive   Active   Very active

Figure 16. Average body mass index, by study community, age group and gender (measured in kg/ m²)

Young elderly   Old elderly

Body fatness

Greek women in Melbourne had the highest mean body mass index (BMI 30), followed by Greek women in Spata (BMI 29) and Anglo-Celtic women in Melbourne (BMI 27). The remaining Caucasian elderly of both genders had average BMIs of about 25. Filipino and Chinese elderly had average BMIs between 20 and 22, the rural Chinese had the lowest BMIs of all study communities (BMI 19). Overall, the women tended to have higher BMIs than men,

and the young elderly had higher BMIs than their older counterparts (Figure 16).

The Greek and Anglo-Celtic women had the highest average WHRs (about 1.1) compared with Swedish (about 0.8) and Chinese women (about 0.9) and men. The men in all study communities had average WHRs between 0.9 and 0.95 (Figure 17).

Average body fat per cent ranged from 43 to 50% in women and from 25 to 35% in men. The Greek women in Melbourne had the highest mean percentage of body fat (48%), followed by Greek women in Spata (47%) and Anglo-Celtic women (45%). The Swedish, Chinese and Filipino women had about 43% average body fat. The Caucasian men all had average body fat percentage of about 33%. The Asian men appeared to have markedly lower average percentages of body fat (23%) (Figure 18).

Figure 17. Average waist-to-hip circumference ratio, by study community, age group and gender
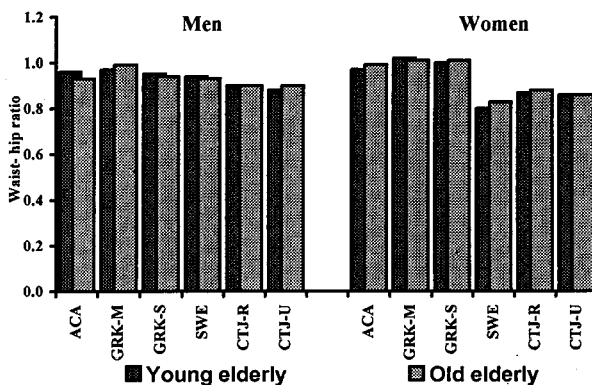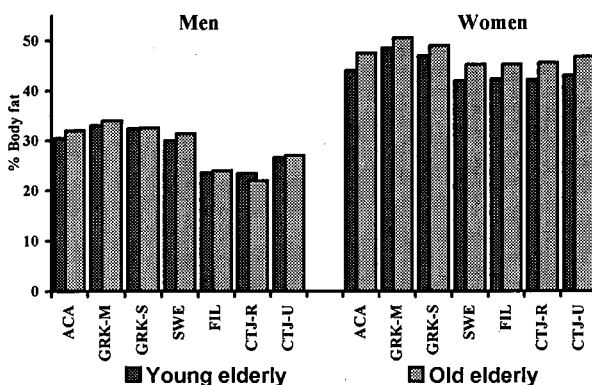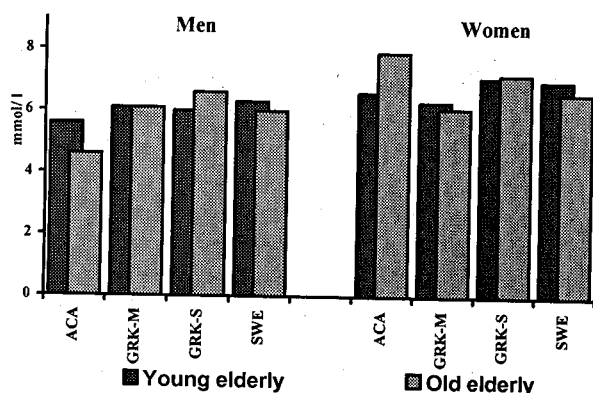

Young elderly   Old elderly

Figure 18. Average percentage body fat, by study community, age group and gender

Young elderly   Old elderly

Blood Lipids

Blood tests were only performed on Caucasian elderly. Average fasting plasma blood glucose was greatest amongst Greeks in Melbourne (6mmol/ l), followed by Greeks in Spata (5.5mmol/ l) and Anglo-Celtic and Swedish elderly (5.0mmol/ l). Women tended to have higher values than men and the old elderly tended to have higher values than their younger counterparts.

Figure 19. Average total serum cholesterol, by study community, age group and gender

■ Young elderly   □ Old elderly

The Anglo-Celtic young elderly men had the lowest average total serum cholesterol (5.8mmol/ l) compared to the other Caucasian communities (6 to 6.5mmol/ l). Cholesterol values tended to be higher amongst the old elderly (Figure 19).

Discussion

The first part of the IUNS study has provided us with a unique data set on health, dietary patterns, social activity and lifestyle in 13 disparate communities. The most striking differences in health profiles and food intake patterns are seen between Caucasian and Asian communities, rather than between individual communities.

Notwithstanding the differences in cultural or ethnic background, the well-being is comparable and high across all elderly communities. In the main, whatever their circumstances, disability or disease profile, elderly people regarded themselves as happy. Social network and activity levels appeared to account best for a sense of well-being in those communities where we were able to examine the relationships. It would seem that elderly people do not need to have a sense of good health to feel happy. The different dietary methods used on Caucasian elderly and Asian elderly should be taken into account when interpreting the food intake data (see Methods). The use of 24-hour recall in Chinese and Japanese communities may result in underestimation of food intake, when compared to data obtained with food frequency questionnaires in the Caucasian communities. The findings described so far will be used in further cross-sectional analyses on the role of differences in dietary habits and nutrition on health, taking into account living habits and lifestyle. The results allow identification of nutritional risk profiles in the elderly, of which the importance and impact on health should be confirmed in a follow-up study. Prospective studies linking dietary intake of nutrients with nutritional status, health, and especially functional capacity, will provide a better understanding of the nutritional requirements of the elderly and the establishment of RDAs and dietary guide-lines for the various subsets of older populations of different ethnicities.

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國際營養科學聯合會 (IUNS) 的晚年飲食習慣的跨文化研究

—— 主要發現的評論 ——

摘要

自 1986 年世界衛生組織 (WHO) 在印度海德拉巴 (Hyderabad) 舉行專題討論會後，人們要求了解老年人營養與健康的問題更加迫切。Gary Andrew 博士代表 WHO 在 1986 年發表了一份西太平洋老年人的社會與健康狀況的研究。盡管跨文化比較困難不少，但在社會因素和自覺健康指標方面已發現有重大差異，這些差異說明了有必要在更大的國際範圍內進行進一步的跨文化研究。IUNS 委員會在「營養與益壽」這個問題上，已開始用社會 —— 人類學的方法去研究跨文化方面的營養與健康的關係，因而誕生了一個「晚年飲食習慣」的研究項目。參加這個科研項目的團體不強調生物樣本的收集，只集中研究食物文化與健康的關係，是非侵害性的。從 1988–1992 年研究了澳大利亞、中國、希臘、日本、菲律賓和瑞典等國家的 13 個老年社會，將結果匯集成書，該書把老年人的跨文化研究收集在一起，同時作為 IUNS 研究項目，考慮食物與健康的關係。這些研究包括歐洲老年人 (EC SENECA) 的研究，一個由北京營養與衛生研究所進行的，包括 6 個華人社會的獨特食物模式的研究，一個新西蘭 —— 澳大利亞兩個社會的研究和一個中美洲的研究。IUNS 研究本身有其生態學調查及與此有關的局限性的特徵，但將研究重點集中在人種學和人類學上會體現了一種優勢，因為在幾個人種中得到的結果要比任何單一人種的結果好得多，IUNS 研究在可變因素研究的範圍內是很好的，其中一些被研究的社區將繼續追蹤並獲得利益。