



# FOOD INTAKE

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## 11.1 INTRODUCTION

The main objective of this chapter is to report the food intake patterns of the IUNS elderly populations. Food intake data are often used to assess nutrient intake and in particular nutrient intake adequacy. Food intake, together with food beliefs, practices, preparation, appetite, eating surroundings, and nutrient intake, are key elements in the description of population food habits.

In a socio-cultural model, major determinants of food intake include the traditional food culture (food beliefs), food availability, and household economy [1-7]. Population food intake may be estimated using anthropological approaches [8,9], while intakes of an individual are estimated using a recall, diary, or food frequency method. In this chapter, food intake in grams of food consumed per day is presented. Food categories are used. Food intake diversity is also presented.

## 11.2 METHODS

Food intake data were collected in all elderly among the study communities of ACA, GRK-M, GRK-S, SWE, and CBJ, and in 100 elderly (50 men and 50 women) in each of the CTJ-R and CTJ-U study communities. For Japanese study communities, the total food consumed by major food categories is also presented.

### 11.2.1 Dietary intake methodology

A food frequency questionnaire (FFQ) was developed for use in GRK-S and adopted for use in GRK-M and SWE. It was further modified for use in ACA. CBJ adopted the FFQ method. Additionally, a 24-hour recall was used. Both of the Tianjin communities (CTJ-R and CTJ-U) and all four Japanese communities used a 3-day 24-hour recall. The frequency of food consumption was based upon the past 12-month period for ACA, GRK-M, GRK-S, SWE, and CBJ. A more detailed dietary intake assessment method is reported in Chapter 5.

### 11.2.2 Food groups

The foods reported eaten have been grouped into 13 major food groups. These are:

- 1) meat and meat products (abbreviation: MEATS),
- 2) fish, seafood and products (abbreviation: SEAFOODS),
- 3) eggs,
- 4) milk and milk products (abbreviation: MILK),
- 5) cereal and cereal products (abbreviation: CEREALS),
- 6) vegetables,
- 7) legumes,
- 8) fruits and fruit juices,
- 9) snack foods,
- 10) non-alcoholic beverages,
- 11) alcoholic beverages,
- 12) fats and oils, and
- 13) others.

Within these food groups, foods are categorised into subgroups of foods of similar types. For example, steamed rice is included within rice and rice noodles subgroup, with the major food group being CEREALS. Mixed dishes are assigned to food subgroups in accordance with major components. A commonly used recipe was obtained to determine ingredients and major components of a mixed dish. For example, meatloaf is classified as MEATS and lentil soup is included within LEGUMES. Index of major food groups and subgroups is shown in Table 11.1.

**Table 11.1. Index of major food groups and subgroups.**

<b>Food groups</b>	<b>Food items</b>
<b>Alcoholic beverages</b>	
Beer	Beer/alcoholic cider; low alcohol beer
Spirit & sherry	Port/sherry; spirit
Wine	Wine
<b>Cereal and cereal products</b>	
Bread	Brown bread; crumpets; fruit loaf; muffins; multigrain bread; oat bran bread; pikelets; pita bread; rolls - brown; rolls - white; rye bread; scones; white bread; white bread - hi fibre; wholemeal bread
Breakfast cereals	Bran cereals (All Bran); cornflakes; Just Right; muesli - natural or flakes; muesli - toasted; Oat Bran; Oat Bran cereal; Other breakfast cereals; porridge/oats; Raw Bran; rice Bubbles; Weetbix/ Vita Brits; Wheatgerm
Cakes, biscuits, buns	Choc coated biscuits; cream biscuits; donuts; dry biscuits; fruit cake; fruit pie/crumble (apple); lamington; oat/wholemeal biscuits (anzac, granita); other biscuits; other pastries (danish); pancakes; pavlova; plain sweet biscuits (marie); rich cake (cream, cheese); shortbread
Desserts	Custard; mousse; other deserts; plain cake (butter, carrot); pudding; trifle
Pasta	Macaroni cheese; pasta (spaghetti, fettuccini); pasta sauce (tomato); pasta sauce (with mince)
Rice, Rice noodles	boiled/steamed brown rice; boiled/steamed white rice; fried rice (Chinese style); noodles
<b>Eggs</b>	
Eggs	Boiled/poached/fried eggs; omelette; other eggs; scrambled eggs
<b>Fats/oils</b>	
Fat	Butter; butter blended oil; canola margarine; cooking/table margarine; low fat margarine; peanut butter; polyunsaturated margarine
Oil	Blended vegetable oil; canola oil; corn oil; oil; olive oil; other sauces or dressings; peanut oil; polyunsaturated vegetable oil; salad dressing - light, low cal; salad dressing - regular; sunflower oil
<b>Fruits &amp; juices</b>	
Fruit juices	Apple juice; fruit drink (desserts % fruit juice); orange juice; orange, mango juice; other fruit juice; ribena; tang, quench; vegetable juice
Fruits	Apples; apricots - fresh; avocados; bananas; berries; canned fruit; cantaloupe/honey dew melon; cherries; currants; dates; dried apricots/apples; dried figs; dried fruit mix; figs; fruit salad - fresh; grapefruit; grapes; kiwi fruit; mandarins; mangoes; oranges; other dried fruit; other fruit; passion fruit; peaches - fresh; pears - fresh; pineapple - fresh; plums; prunes; raisins; rhubarb - stewed; strawberries; sultanas; watermelon
<b>Legumes</b>	
Legumes	Baked beans; bean curd; bean salad; black eye bean; broad beans; green peas; kidney beans; lentil burgers
<b>Meats</b>	
Chicken, turkey	Chicken - fried/crumbed; grilled/boiled/ steamed chicken; roast - meat only , breast chicken; roast - meat only, other chicken; roast - meat, skin chicken; turkey
Chicken, turkey mixed dish	Casserole/stew chicken; stir-fried chicken
Lamb, veal, beef	Boiled beef; corned beef; lamb chops/cutlets; lean short cuts (cubes) lamb; meat loaf; other beef; other veal; rissoles; roast beef; roast lamb; roast veal; schnitzel veal; steak; stewed mince meat

Lamb, veal, beef mixed dish	Casserole/stew (Irish) lamb; casserole/stew/curried beef; hamburgers; lasagne; mousaka; souvlaki in pita; steak/kidney pie; stir-fried beef
Organ meats	Brains; liver; other organ meats; pate dips; tripe
Pork, mixed dish	Bacon; casserole/stew pork; ham; ham steak; lean fillets ( new fashioned) pork; leg/roast pork; other pork; pork chops; stir-fried pork; sweet, sour pork
Processed meat	Frankfurt; sandwich meat ( salami); sausages
Rabbit, game birds	Duck (roast); rabbit
<b>Milk &amp; dairy</b>	
Milk, dairy products	Camembert cheese; cheddar/tasty cheese; cottage cheese; cream; cream cheese; danish blue cheese; dried full cream milk; dried skim milk; edam cheese; feta cheese; flavoured milks e.g. Big M; frozen yoghurt; full cream milk; full fat yoghurt - fruit; full fat yoghurt - plain; ice-cream (in summer); ice-cream (in winter); low fat Philadelphia cheese; low fat yellow cheese e.g. cotto; low fat yoghurt - fruit; low fat yoghurt - plain; milk shake/thick shake; other cheese; other milk; other yoghurt; parmesan cheese; Philadelphia cheese; polyunsaturated cheese (minichol); processed (Kraft slices) cheese; reduced fat cheddar/tasty cheese; reduced fat processed cheese; Rev/Physical milk; ricotta cheese; Skinny milk; sour cream; soya milk ( "So Good"); Swiss cheese; white sauce (béchamel)
<b>Non-alcoholic beverages</b>	
Coffee	Coffee (instant/filter/etc); decaf coffee/coffee substitute
Soft drinks	Cola e.g. Coke, Pepsi; cordial; flavoured mineral water; lemonade, Fanta; low calorie soft drink; other soft drinks; soda water/mineral water; wine cooler
Tea	Herbal tea; tea
<b>Others</b>	
Fungi	Mushrooms
Herbs/garlic/olive	Garlic; gherkins/relish/pickles/pickled onions; olives; parsnips
Soups	Cream soup (cream of ...); French onion dips; lentil or dried bean soup; minestrone soup; other soup; packet soup (noodle); pea, ham soup; tomato soup; vegetable soup
Spreads	Mayonnaise - light, low cal; mayonnaise - regular; other spread; vegemite
Take away	Chicken rolls; chicko rolls; Chinese; Dennys/counter tea (hotel); Dim Sims; French; Greek; home made pies/pasties; hot dogs; Indian; Italian; Kentucky fried/Red Rooster; Lebanese; McDonalds/Hungry Jacks; meat pies; Mexican; other Asian; other eating out; other pasta; other sausages; Pancake Parlour; pasties; pizza (eg. Pizza Hut),takeaway; quiche; Russian; sausage rolls; spring rolls
<b>Seafood</b>	
Fish, fish dish	Dried salted fish (Cod); fish & chips - fish; fish fingers/cakes; fresh fish - fried; fresh fish - fried in batter; fresh fish - grilled/baked/boiled; tinned salmon/tuna; tinned sardines
Shellfish, crustaceans	Canned/dried shrimps; other seafood; oysters; prawn; scallops; squid (calamari)
<b>Snack foods</b>	
Nuts, dips, snacks	BBQ sauce; caviar salad dips; Cheezels/ Twisties; chickpea dips (hummus); corn chips; eggplant dips; fish paste dips; garlic dips; gravy; mixed nuts; mustard; other dips; other roasted nuts; other snacks; other unroasted nuts; potato chips/crisps; roasted - cashews; roasted - peanuts; salmon dips; soy sauce; tomato sauce; unroasted - almond; unroasted - walnuts; Worcestershire sauce
Sugar, jam, honey, sweets	chocolate bars; chocolate pieces; cocoa; health or muesli bar; honey; jam; jelly; lollies/toffees; other sweets; Ovaltine/Milo (drink, on cereal); sugars
<b>Vegetables</b>	
Flower-like vegetables	Asparagus; broccoli; Brussels sprouts; cauliflower

Green leafy vegetables	Cabbage (all types); endives/chicory; lettuce; silver beet; spinach
Marrow-like vegetables	Cucumber; egg plant; pumpkin; radishes; squash; zucchini/gourgettes
Other vegetables	Alfalfa; artichoke; bean sprouts (all kinds); beetroot; capsicum (peppers); celery; green beans; onions (fried, salad, etc); other vegetables; snow peas; sweet corn/baby corn; tomatoes
Root vegetables	Carrots; fish & chips - chips; potato salad; potatoes - chips; potatoes - microwave; potatoes - roast; potatoes - boiled; potatoes - mashed; Swede; turnips
Vegetable mixed dish	Coleslaw; mixed vegetables (frozen); ratatouille (vegetable stew); vegetable burgers

### Water

Food items included in this table are those used in the ACA food frequency questionnaire. ACA food frequency questionnaire has a comprehensive list of 350 food items.

### 11.2.3 Food intake variety

Food intake variety is the number of foods consumed over a given period [10]. A variety score, the average number of subgroups of food consumed, was given if the average daily intake was reported. The highest achievable variety score for an individual was 44. Food intake variety within major food groups was also reported. For each individual, the maximum achievable variety within each major food group equals to the number of food subgroups within each major food group. Because different dietary intake assessment methods have been used, the interpretation of intake variety must take into account the time frame, eg average variety over three days for study communities using a 3-day 24-recall method or an average over the past 12 months for study communities that used a FFQ.

### 11.2.4 Food intake

Average daily food intake is presented in grams per day for the total amount of foods consumed, and by each major food group. All food items reported for intake were converted into grams per day and then grouped (see above). The intakes of cereals, meats, and vegetables were further broken down into food subgroups. The intake of cereals and cereal products includes the intake of bread, pasta, rice and rice noodles, breakfast cereals, cakes, biscuits, buns, desserts, puddings, etc. Meat intakes include lamb, veal, beef and mixed dish, pork and mixed dish, poultry and mixed dish, rabbits and game birds, organ meats, and processed meat. Vegetable intakes include the intakes of root vegetables, leafy greens, marrow-like vegetables, flower-like vegetables, vegetable-mix-dishes, and all other vegetables. The intake of water was not recorded by all centres and is excluded from the total food intake analysis.

### 11.2.5 Contribution to total food intake

The contribution of the subgroup intakes to each of the major food groups is also reported. The contribution of major food groups to the total food intake equals the intake of the given food group divided by the total food intake. This is expressed in a percentage of the total. It allows for

comparisons in food intake patterns between study communities, taking into account the total amount of food consumed. Similarly, the contribution of food subgroups to their major food group is reported.

### 11.2.6 Statistics

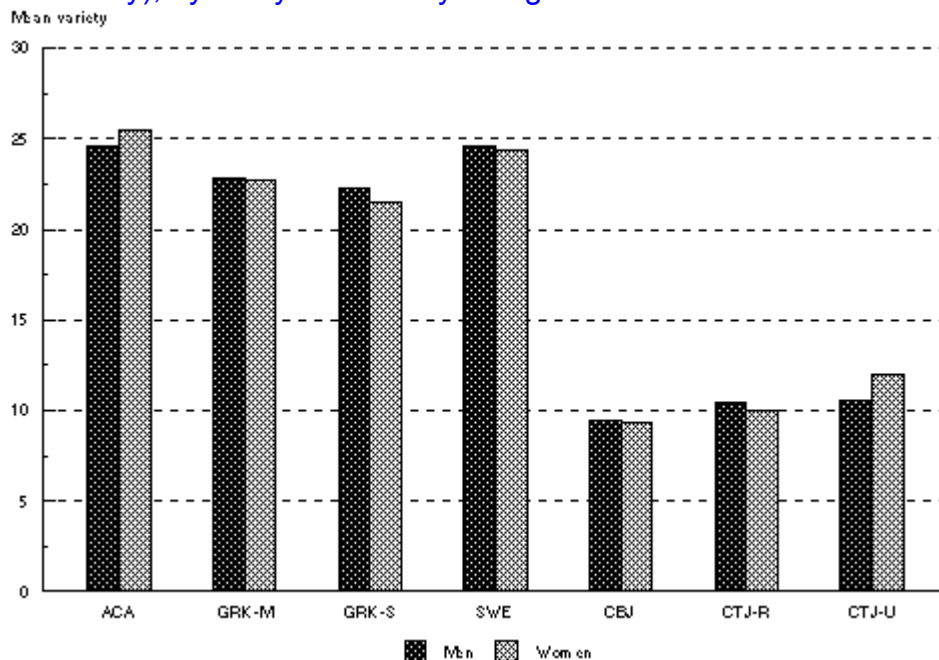
The total and major food group intakes were recalculated and the means, standard deviations, and percentiles presented. These statistics differ from the Appendices where the intake of finer food groupings are tabulated. Figures are used to illustrate dissimilarity amongst the study communities. The contribution of major food group intakes to the total (in percentage) was used to compare differences amongst the study communities. No formal tests were performed to test statistical significance between or among communities.

## 11.3 RESULTS

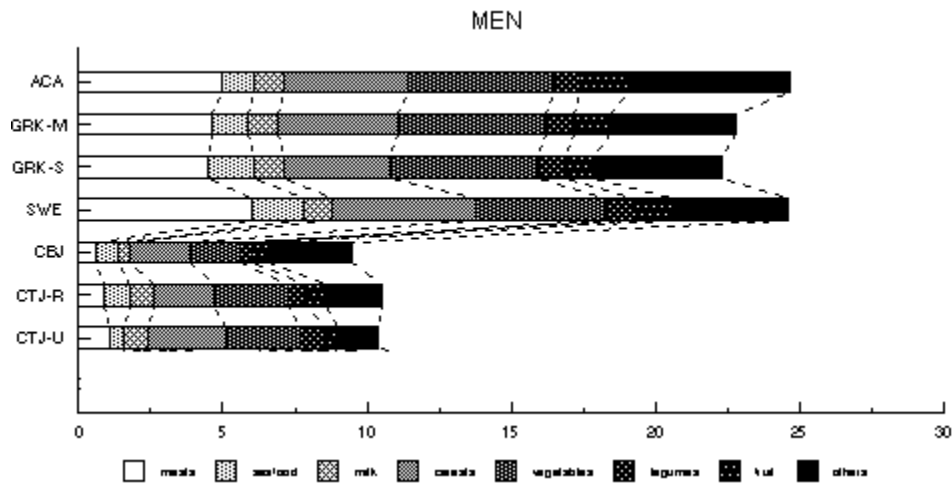
### 11.3.1 Food intake variety

The average food intake variety ranged from 21 to 26 amongst the four Caucasian populations (ACA, GRK-M, GRK-S, and SWE), and was about 10 for the three Chinese populations (Figure 11.1). For each of the food groups, a greater variety was also found in the four Caucasian populations (Figures 11.2 and 11.3).

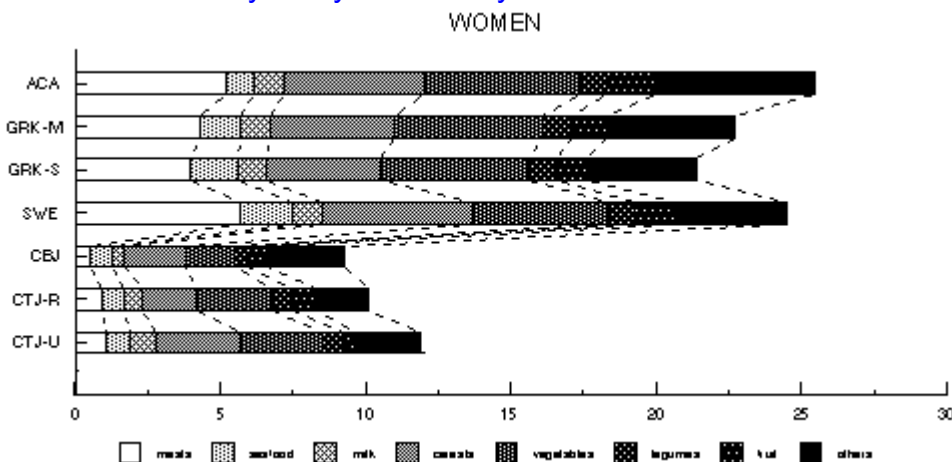
**Figure 11.1.** Average number of food items consumed (food intake variety), by study community and gender.



**Figure 11.2.** Food intake variety for each major food group, for men and by study community.



**Figure 11.3.** Food intake variety for each major food group, for women and by study community.

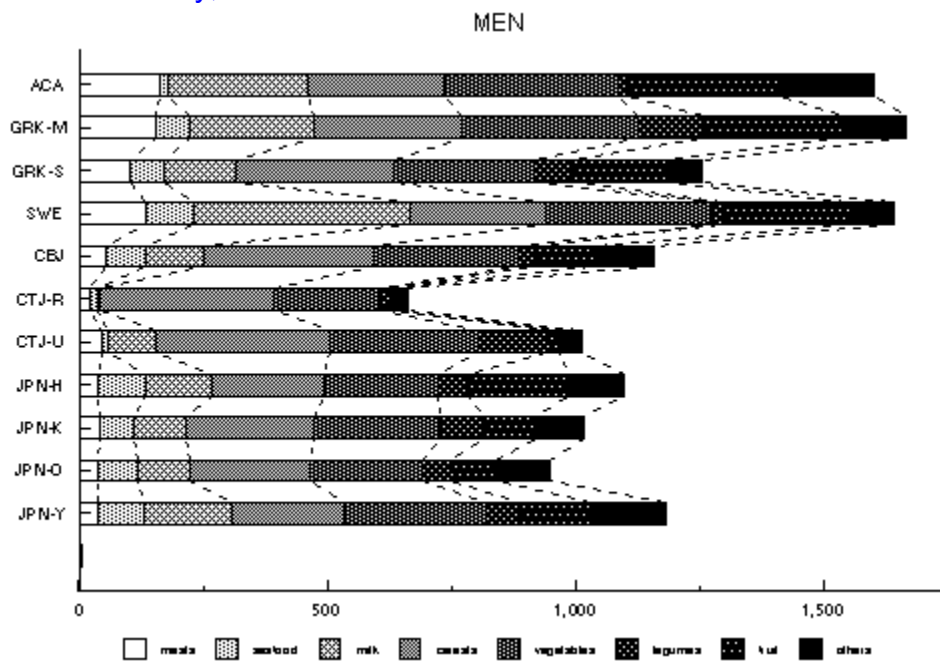


### 11.3.2 Total food consumed

The total amount of food consumed for each of the food groups is presented in Figure 11.4 for men and in Figure 11.5 for women. For men, the total food intake in ACA, GRK-M, and SWE exceeds 1500 gram per day (excluding water intake). Rural Tianjin Chinese and Okazaki Japanese men (JPN-O) reported a total food consumption of below 1000 gram per day (Figure 11.4). Women reported a lower food intake than their male counterparts. ACA and SWE women reported a total intake in excess of 1500 grams per day, while the average total food intake in

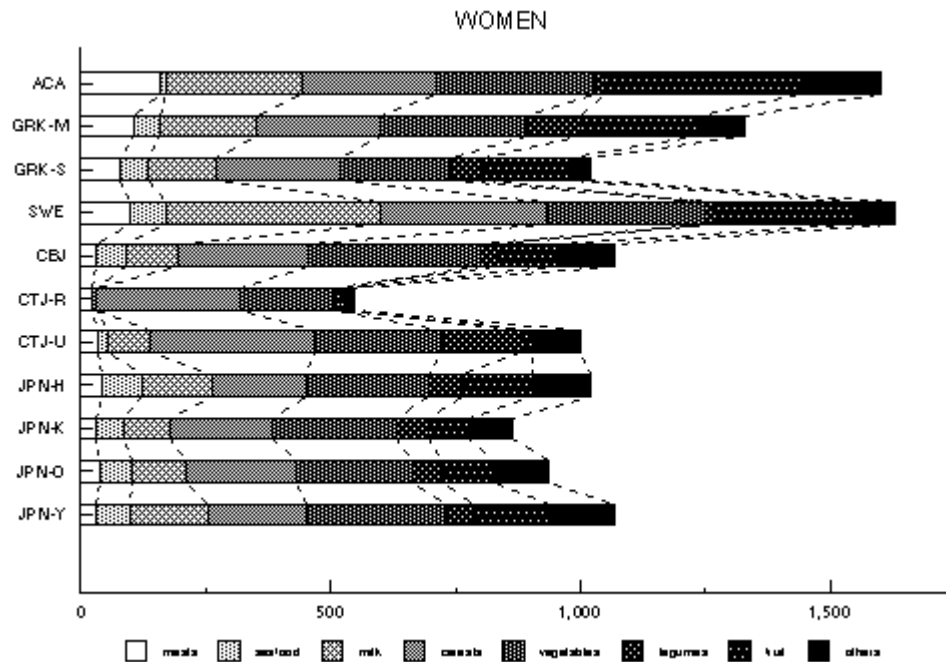
CTJ-R, JPN-K (Japanese in Kumamoto), and JPN-O (Japanese in Okazaki) women was less than 1000 grams per day (Figure 11.5). Standard deviation and percentiles for the total food intake (in grams) by study community are presented in Table 11.2.

**Figure 11.4.** Average daily intake by major food group and study community, for men.



**Figure 11.5.** Average daily intake by major food group and study community, for women.





**TABLE 11.2. All food consumed (excluding water), by gender and study communities.**

	N	Mean	SD	Percentiles				
				5th	25th	50th	75th	95th
<b>Men</b>								
ACA	50	3161	790	2042	2603	3124	3608	4262
GRK-M	94	2941	758	1976	2396	2826	3344	4078
GRK-S	51	3309	1074	1999	2680	2985	3845	5028
SWE	66	2238	744	1336	1679	2097	2580	3598
CBJ	122	1159	354	641	907	1115	1409	1784
CTJ-R	50	692	96	559	625	670	772	870
CTJ-U	50	1027	278	625	818	991	1177	1362
<b>Women</b>								
ACA	47	3040	965	1567	2407	2839	3790	4306
GRK-M	95	2266	674	1293	1796	2075	2640	3541
GRK-S	53	2128	632	1194	1699	2110	2389	3385
SWE	120	2295	766	1154	1819	2163	2718	3851
CBJ	179	970	295	534	733	941	1180	1456
CTJ-R	50	569	121	413	486	560	647	746
CTJ-U	50	1021	236	678	888	994	1162	1398

### 11.3.3 Contribution of food group intakes to the total

Figures 11.6 and 11.7 show major food groups attributable to the total food intake (in percentage). The contribution of meats and meat products to total food intake among the Chinese

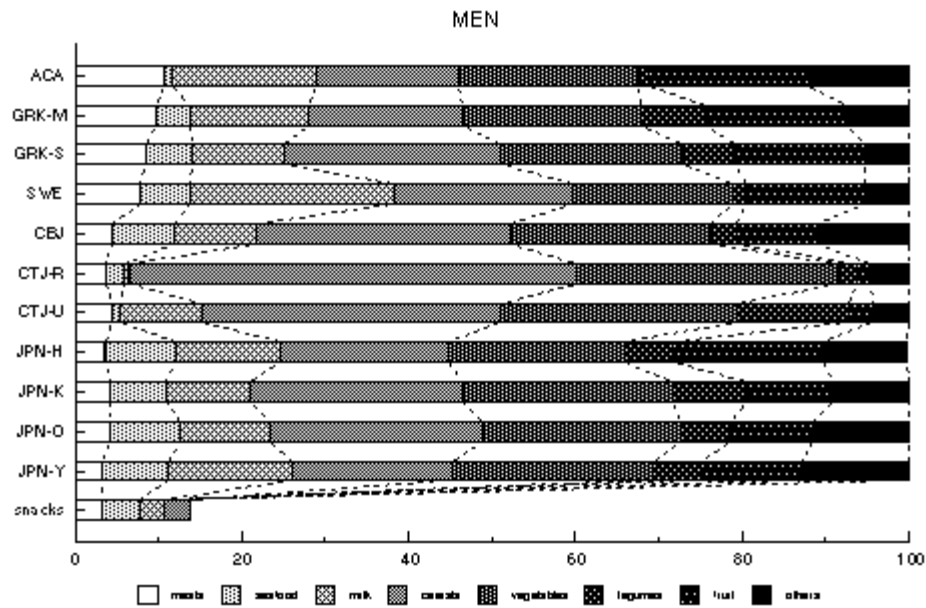
and Japanese populations was lower than that of the Caucasian populations. The contribution of fish and seafood intake was less pronounced among the ACA, CTJ-R and CTJ-U than the other study centres. A high percentage of the Swedish elderly daily food intake was derived from the intake of milk and milk products. However, the intake of milk and milk products contributed little to the total food intake of the rural Tianjin elderly community. The contribution of cereal intake to the total food intake was high among the three Chinese communities, particularly for rural Tianjin.

**Photo 11.1.** China, Tianjin 1989 (rural sample): underground cabbage store well.

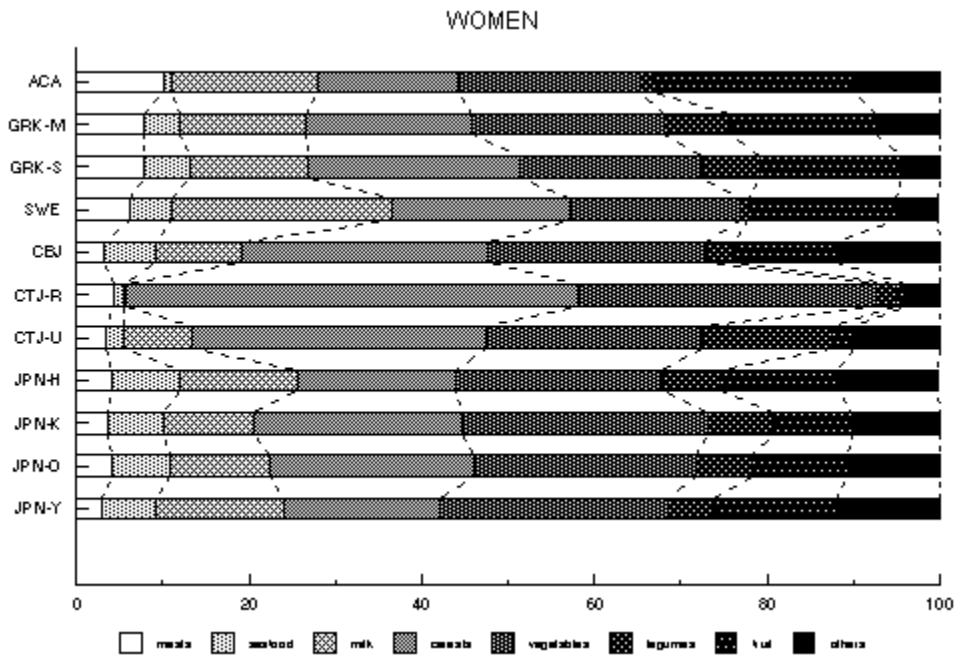


A high percentage of the total food intake of the elderly Chinese in rural Tianjin was of vegetable source. Although the intake of legumes was about the same between the GRK-M and CTJ-U (men: 132 g/d for GRK-M and 140 g/d for CTJ-U; women: 106 g/d for GRK-M and 155 g/d for CTJ-U), the contribution of legumes to the total food intake was far greater in the CTJ-U than GRK-M. The contribution of fruit intake to the total intake was less significant among the Chinese in Tianjin (CTJ-R and CTJ-U).

**Figure 11.6.** Percentage contribution of major food group to total food intake, by study community, for men.



**Figure 11.7.** Percentage contribution of major food group to total food intake, by study community, for women.

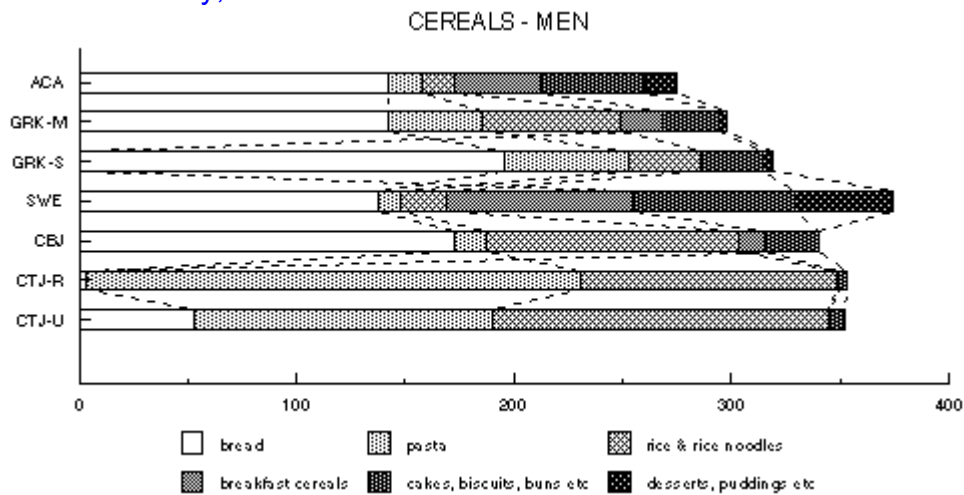


### 11.3.4 Selected subgroup intakes

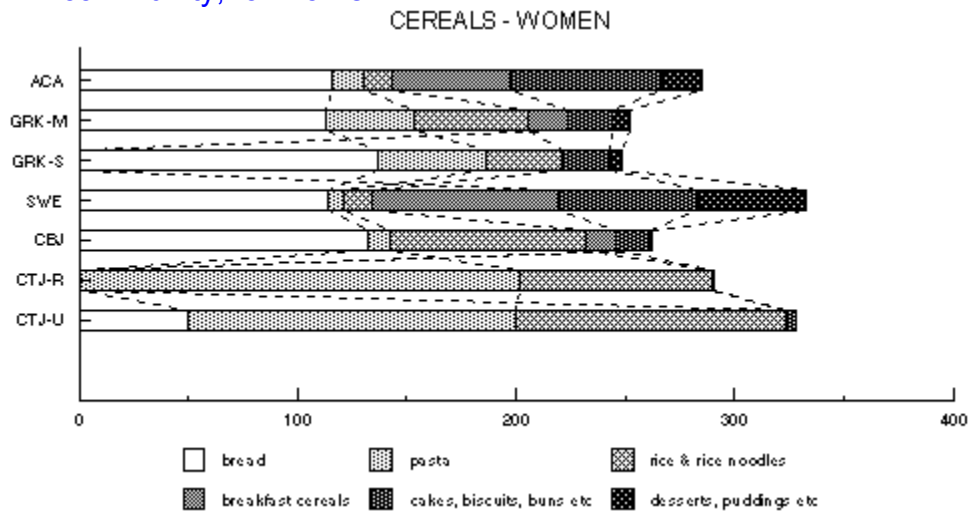
11.3.4.1 *The intakes of cereal and cereal products*

The intake of cereals was the highest among the SWE, although this was accounted for by the higher intake of cakes, biscuits, buns, desserts, puddings, etc. The three Chinese communities had a high intake of non-sweet-type cereal products. Particularly, the intakes of bread, pasta, or rice and rice noodles exceeded the four Caucasian communities and the intakes of rice in the three Chinese communities were consistently high (Figures 11.8 and 11.9).

**Figure 11.8.** Average daily cereal intake by food subgroup and study community, for men.

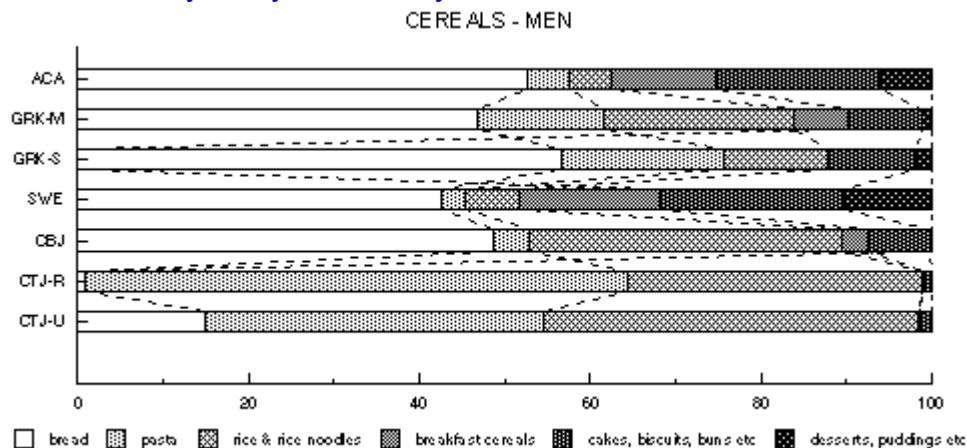


**Figure 11.9.** Average daily cereal intake by food subgroup and study community, for women.

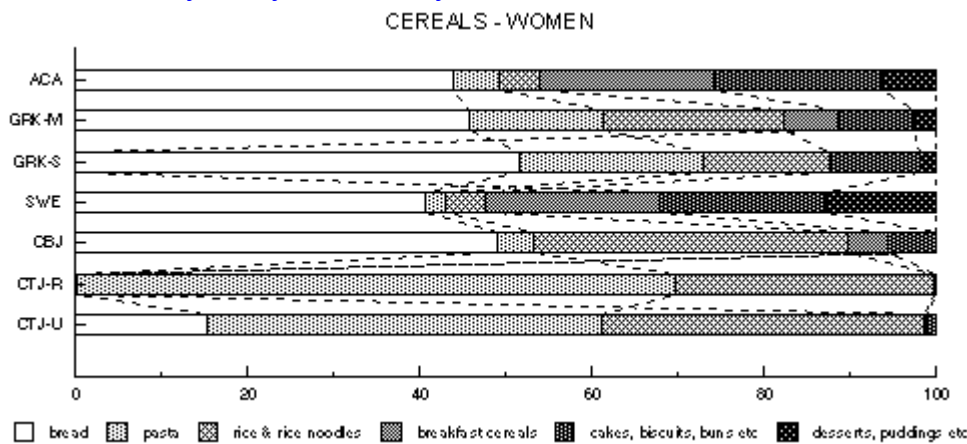


Differences in cereal intake pattern are also apparent and better appreciated in Figures 11.10 and 11.11. The intake of bread, pasta, and rice and rice noodles contributed more than 80% of the total food intake in the two Greek, and three Chinese populations. Additionally, the contribution of rice and rice noodles to the total intake was more pronounced in the Chinese than in the Greek communities.

**Figure 11.10.** Percentage contribution of food subgroup to cereal intake, by study community, for men.



**Figure 11.11.** Percentage contribution of food subgroup to cereal intake, by study community, for women.



A high percentage of the total cereal intake in Beijing Chinese was attributable to the high intake of bread, while a high percentage of the total cereal intake in the Tianjin Chinese was derived from the intake of rice and rice noodles.

#### 11.3.4.2 The intakes of meats and meat products

The intake of meats and meat products ranged from 24 (CTJ-R) to 162 (ACA) grams per day for men (Table 11.3) and from 23 (CTJ-R) to 157 (ACA) grams per day for women (Table 11.4). The Caucasian communities reported a much higher (more than two-fold) meat intake than the three Chinese communities. Although the contribution of meat intake to total food intake for the two rural communities (GRK-S and CTJ-R) was similar to their urban counterparts. Greeks in Spata had a lower total meat intake compared to their urban Caucasian counterparts and the Chinese in rural Tianjin had a lower intake compared to their urban counterparts (Figures 11.12 and 11.13).

**Table 11.3. The intake of major food groups (grams) in men, by study communities.**

	N	Mean	SD	Percentiles			
				5th	25th	50th	75th
<b>Meats</b>							
ACA	50	162	9648	98	134	200	342
GRK-M	94	155	6256	115	146	194	274
GRK-S	51	104	6642	58	90	129	238
SWE	66	134	6962	90	119	169	228
CBJ	122	55	870	0	0	100	200
CTJ-R	50	24	140	17	25	33	50
CTJ-U	50	47	655	23	40	50	83
<b>Seafoods</b>							
ACA	50	16	151.6	5.9	12	21	40
GRK-M	94	70	4312	41	62	90	162
GRK-S	51	66	3912	36	63	90	143
SWE	66	100	5921	59	89	130	212
CBJ	122	82	800	0	64	130	250
CTJ-R	50	13	7.80	5.0	15	17	25
CTJ-U	50	10	140	0	0	25	40
<b>Eggs</b>							
ACA	50	18	160	6.6	14	28	50
GRK-M	94	12	220	0.0	3.9	16	47
GRK-S	51	12	160	0.0	7.9	16	55
SWE	66	17	190	1.8	12	20	55
CBJ	122	38	400	0.0	40	55	110
CTJ-R	50	17	120	6.7	20	23	40
CTJ-U	50	21	250	0	0	40	66
<b>Milk</b>							
ACA	50	282	17941	207	243	360	558
GRK-M	94	247	22035	100	231	292	600
GRK-S	51	145	13730	59	106	175	319
SWE	66	434	25356	279	406	588	688
CBJ	122	116	1480	0	0	250	250
CTJ-R	50	4	30	2	5	7	10
CTJ-U	50	98	830	10	125	130	250
<b>Cereals</b>							
ACA	50	275	17877	168	229	336	726
GRK-M	94	299	108139	218	275	361	471

GRK-S	51	319	138136	211	306	418	567
SWE	66	374	181117	228	334	522	708
CBJ	122	340	137175	250	325	400	575
CTJ-R	50	353	56267	300	350	392	433
CTJ-U	50	352	91233	280	329	400	513
<b>Vegetables</b>							
ACA	50	351	222101	210	305	421	663
GRK-M	94	355	145140	280	336	407	642
GRK-S	51	281	14381	168	277	359	584
SWE	66	332	166111	223	319	423	659
CBJ	122	292	2120	150	260	400	675
CTJ-R	50	212	66125	167	200	263	325
CTJ-U	50	296	161113	177	263	350	650
<b>Legumes</b>							
ACA	50	19	170	4	17	29	55
GRK-M	94	132	8040	82	119	161	274
GRK-S	51	79	4420	53	71	103	164
SWE	66	27	250	10	20	38	73
CBJ	122	38	610	0	0	50	175
CTJ-R	50	14	140	0	10	25	42
CTJ-U	50	140	1070	50	131	250	300
<b>Fruits &amp; fruit juices</b>							
ACA	50	308	19136	189	298	382	677
GRK-M	94	285	18260	156	238	389	667
GRK-S	51	191	1223	91	171	251	382
SWE	66	254	17932	128	225	325	563
CBJ	122	115	1290	0	83	190	370
CTJ-R	50	11	90	0	10	20	25
CTJ-U	50	27	380	0	0	50	100
<b>Snack foods</b>							
ACA	50	96	5835	55	83	126	229
GRK-M	94	96	6518	50	79	127	238
GRK-S	51	45	2911	21	39	60	104
SWE	66	59	542.8	26	48	83	148
CBJ	122	49	3517	27	38	62	116
CTJ-R	50	1.0	3.10	0	0	0	5.0
CTJ-U	50	3.1	7.20	0	0	0	25
<b>Non-alcoholic beverages</b>							
ACA	50	1204	602457	800	1143	1400	2400
GRK-M	94	1119	562351	731	1069	1366	2153
GRK-S	51	1839	882651	1046	1844	2330	3200
SWE	66	496	3795	204	404	736	1202
CBJ	122	na	nana	na	na	na	na
CTJ-R	50	na	nana	na	na	na	na
CTJ-U	50	na	nana	na	na	na	na
<b>Alcoholic beverages</b>							
ACA	50	300	3980	29	110	480	1344
GRK-M	94	127	1620	0	50	200	490
GRK-S	51	183	1880	0	200	300	600
SWE	66	na	nana	na	na	na	na
CBJ	122	na	nana	na	na	na	na

CTJ-R	50	6.1	150	0	0	0	50
CTJ-U	50	na	nana	na	na	na	na
<b>Fats/ oils</b>							
ACA	50	30	155.0	20	30	40	51
GRK-M	94	28	1215	17	25	35	50
GRK-S	51	34	1215	25	35	50	50
SWE	66	na	nana	na	na	na	na
CBJ	122	na	nana	na	na	na	na
CTJ-R	50	25	5.617	20	25	27	35
CTJ-U	50	13	130	0	8.4	25	33
<b>Others</b>							
ACA	50	100	1360	20	58	128	302
GRK-M	94	17	260	3.7	8.7	23	46
GRK-S	51	12	170	1.6	5.0	20	41
SWE	66	12	210	2.0	5.3	16	33
CBJ	122	32	480	0	13	50	125
CTJ-R	50	12	6.57.8	8.3	10	13	25
CTJ-U	50	20	410	0	8.3	13	133

**Table 11.4. The intake of major food groups (grams) in women, by study communities.**

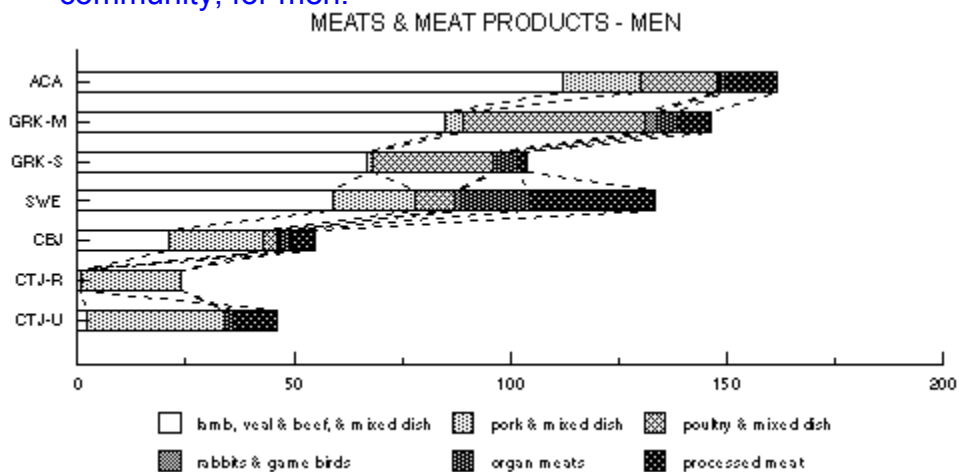
	N	Mean	SD	Percentiles			
				5th	25th	50th	75th
<b>Meats</b>							
ACA	47	157	12051	90	118	189	336
GRK-M	95	105	5326	68	97	137	181
GRK-S	53	77	3827	49	70	101	161
SWE	120	97	5119	63	89	128	184
CBJ	179	31	590	0	0	50	130
CTJ-R	50	23	160	17	20	30	50
CTJ-U	50	33	195	20	34	40	50
<b>Seafoods</b>							
ACA	47	15	110	6.4	10	21	32
GRK-M	95	55	387.0	28	52	72	134
GRK-S	53	56	448.3	22	50	69	144
SWE	120	75	5112	37	64	109	175
CBJ	179	58	730	0	40	85	200
CTJ-R	50	6.0	5.80	0	5.0	8.3	17
CTJ-U	50	20	180	0	20	33	50
<b>Eggs</b>							
ACA	47	17	180	4.9	9.8	21	57
GRK-M	95	9.9	130	2.0	7.9	16	39
GRK-S	53	7.5	130	0	2.0	7.9	31
SWE	120	15	180	3.7	7.9	16	55
CBJ	179	41	430	0	55	55	110
CTJ-R	50	9.2	6.60	6.7	8.3	13	20
CTJ-U	50	51	1826	40	47	60	80
<b>Milk</b>							
ACA	47	273	17128	113	260	403	605
GRK-M	95	190	11449	100	162	256	438



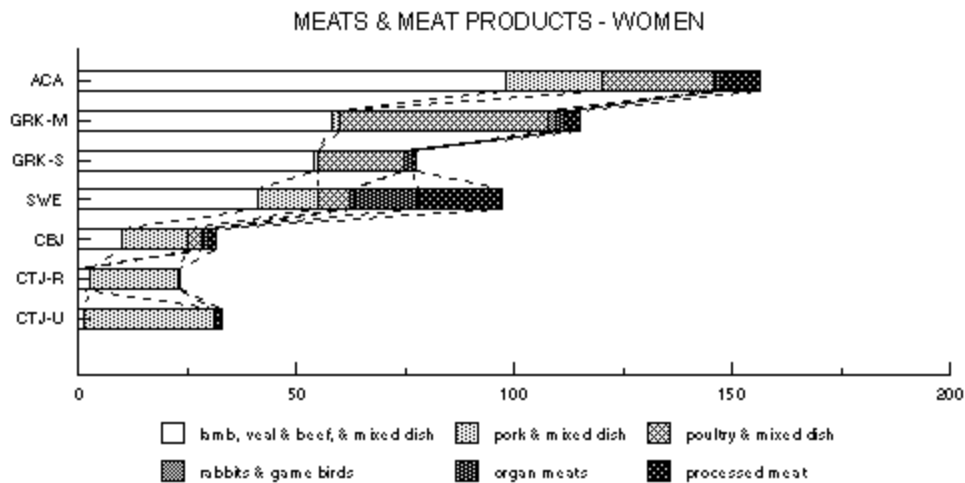
GRK-S	53	138	9424	85	108	192	322
SWE	120	429	23671	260	411	555	898
CBJ	179	105	1290	0	0	250	250
CTJ-R	50	2	20	0	3	3	5
CTJ-U	50	87	1250	7	83	125	167
<b>Cereals</b>							
ACA	47	266	13886	156	251	337	472
GRK-M	95	251	94121	176	245	295	439
GRK-S	53	247	114100	165	222	312	452
SWE	120	333	176121	198	292	428	691
CBJ	179	262	110125	200	250	300	450
CTJ-R	50	290	87142	258	284	350	450
CTJ-U	50	328	76225	275	323	375	479
<b>Vegetables</b>							
ACA	47	317	120126	237	307	418	506
GRK-M	95	293	122118	217	271	359	554
GRK-S	53	221	11768	119	219	295	407
SWE	120	316	145120	220	295	381	613
CBJ	179	244	1588	125	225	325	525
CTJ-R	50	187	65100	145	182	217	325
CTJ-U	50	257	12792	167	218	360	500
<b>Legumes</b>							
ACA	47	23	290	6	17	27	64
GRK-M	95	106	6826	60	94	137	243
GRK-S	53	67	3720	40	60	81	148
SWE	120	17	180	2	12	24	50
CBJ	179	34	710	0	0	50	170
CTJ-R	50	12	110	0	10	17	33
CTJ-U	50	155	1310	25	129	275	357
<b>Fruits &amp; fruit juices</b>							
ACA	47	391	24359	247	343	523	791
GRK-M	95	233	14059	131	211	315	506
GRK-S	53	171	11022	83	157	212	386
SWE	120	284	19938	147	219	406	679
CBJ	179	120	1210	0	100	200	350
CTJ-R	50	6	50	3	5	8	17
CTJ-U	50	23	310	0	0	50	75
<b>Snackfoods</b>							
ACA	47	67	458.5	28	67	100	131
GRK-M	95	76	539.4	38	64	97	187
GRK-S	53	31	1810	19	29	39	69
SWE	120	51	502.5	18	44	63	158
CBJ	179	50	4017	27	39	58	133
CTJ-R	50	0.48	2.50	0	0	0	3.3
CTJ-U	50	0.87	2.40	0	0	0	8.3
<b>Non-alcoholic beverages</b>							
ACA	47	1360	601200	1000	1400	1614	2343
GRK-M	95	867	514251	460	711	1202	1886
GRK-S	53	1052	541409	666	978	1322	2190
SWE	120	666	5254	401	570	918	1746
CBJ	179	na	nana	na	na	na	na

CTJ-R	50	na	nana	na	na	na	na
CTJ-U	50	na	nana	na	na	na	na
<b>Alcoholic beverages</b>							
ACA	47	41	860	0	0	34	200
GRK-M	95	42	870	0	0	50	200
GRK-S	53	28	740	0	0	0	200
SWE	120	na	nana	na	na	na	na
CBJ	179	na	nana	na	na	na	na
CTJ-R	50	0	00	0	0	0	0
CTJ-U	50	na	nana	na	na	na	na
<b>Fats/oils</b>							
ACA	47	23	135	10	20	30	50
GRK-M	95	25	9.811	15	25	30	42
GRK-S	53	28	1215	25	25	35	50
SWE	120	na	nana	na	na	na	na
CBJ	179	na	nana	na	na	na	na
CTJ-R	50	23	4.817	20	25	25	30
CTJ-U	50	22	5.510	17	20	25	35
<b>Others</b>							
ACA	47	92	911.2	15	58	152	260
GRK-M	95	12	180	3.4	5.7	12	42
GRK-S	53	5.2	7.50	0	1.4	6.5	23
SWE	120	12	180	1.1	5.6	15	43
CBJ	179	24	370	0	5.0	35	103
CTJ-R	50	10	1.68.3	8.3	10	12	13
CTJ-U	50	45	648.3	10	13	44	163

**Figure 11.12.** Average daily meat intake by food subgroup and study community, for men.

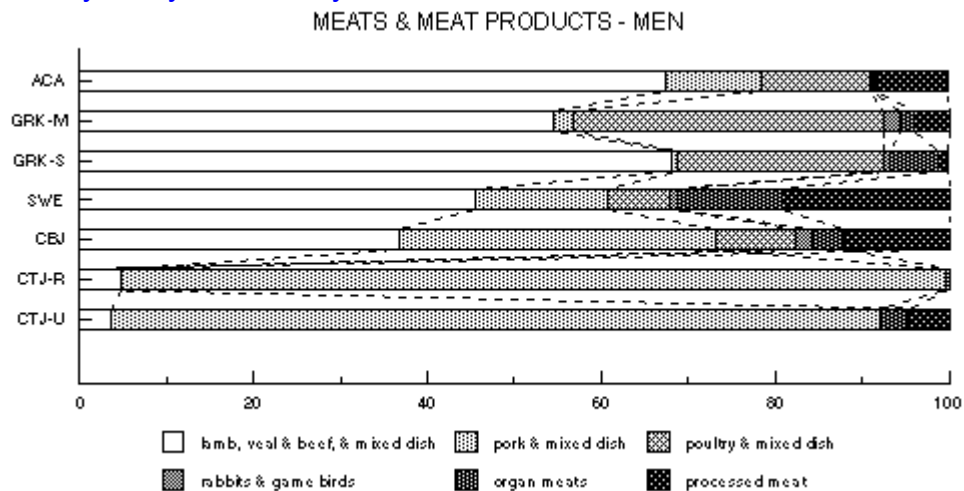


**Figure 11.13.** Average daily meat intake by food subgroup and study community, for women.

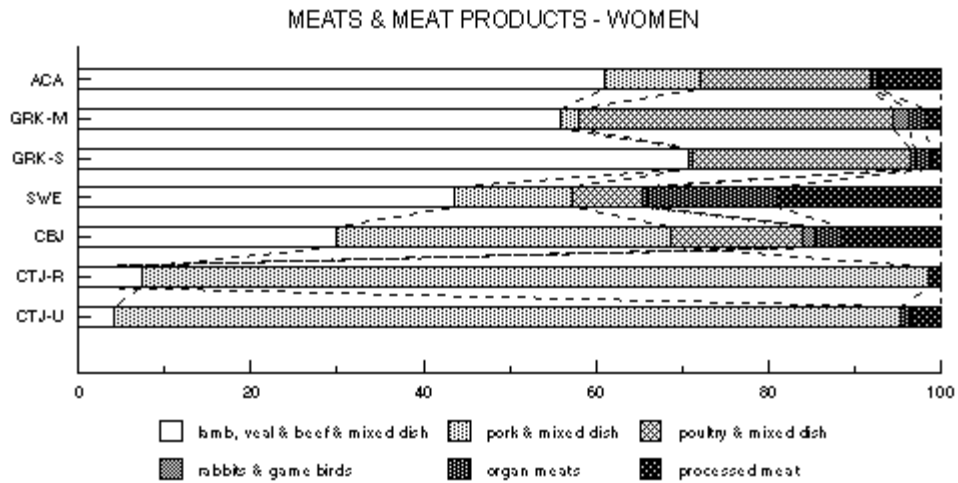


Lamb, veal, beef and mixed dish were major contributors to the total meat intake in the four Caucasian communities and Beijing Chinese (Figures 11.14 and 11.15). Pork and mixed dish were the major meats consumed by the Tianjin Chinese. On the other hand, pork and mixed dish contributed little to the total meat intake of the elderly Greeks in Melbourne and Spata. Organ meats and processed meat contributed about 30% of all meat consumed by the SWE.

**Figure 11.14.** Percentage contribution of food subgroup to meat intake, by study community, for men.



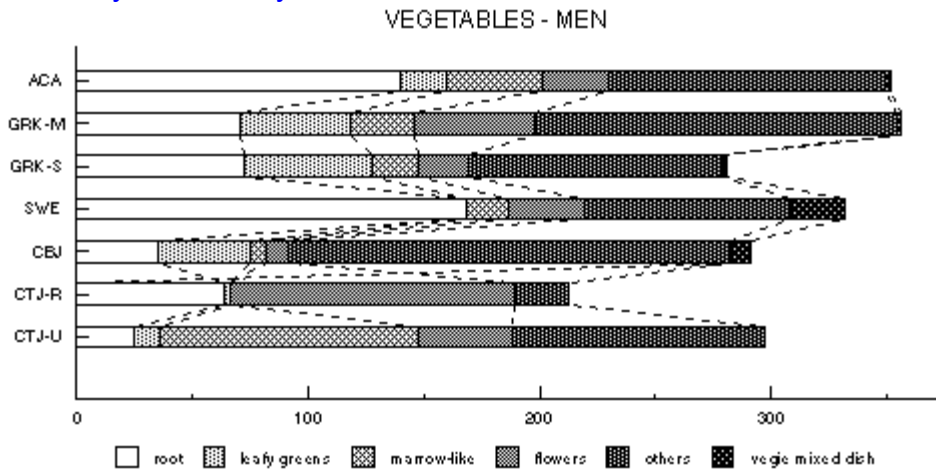
**Figure 11.15.** Percentage contribution of food subgroup to meat intake, by study community, for women.



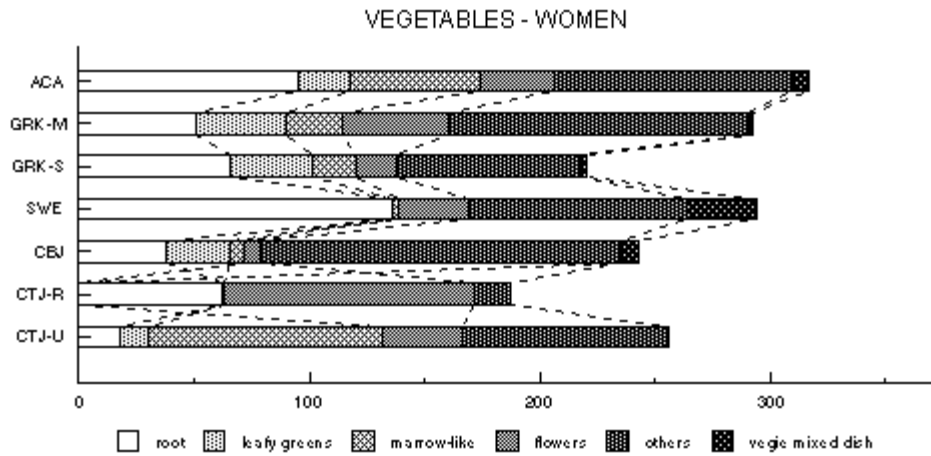
### 11.3.4.3 Vegetable intakes

The total vegetable intake among the four Caucasian communities was higher than the three Chinese communities. Among the urban communities, the intake was similarly higher than their rural counterparts (Figures 11.16 and 11.17).

**Figure 11.16.** Average daily vegetable intake by food subgroup and study community, for men.

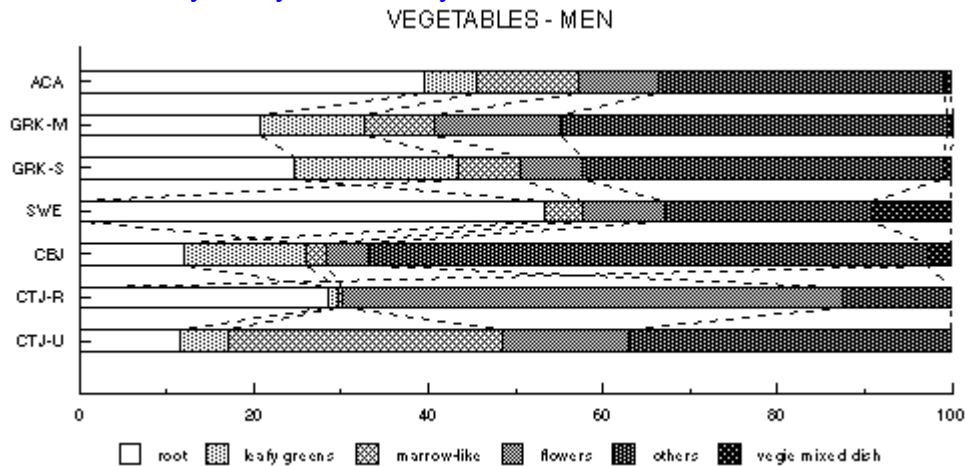


**Figure 11.17.** Average daily vegetable intake by food subgroup and study community, for women.

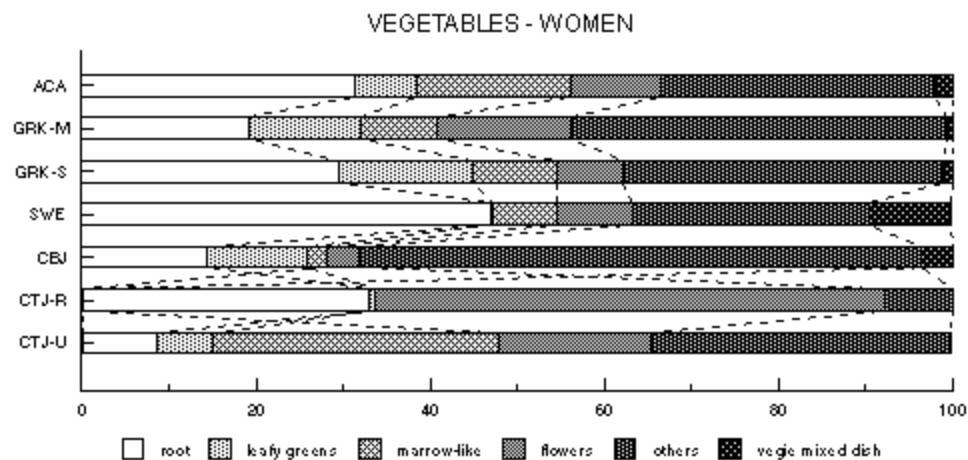


The intake of leafy greens contributed little to the total vegetable intake in the SWE and CTJ-R. ACA, SWE and CTJ-R, however, there was a high contribution of root intake to their total vegetable intake. Flower-like vegetables made up more than 50% of the total vegetable intakes in CTJ-R (Figures 11.18 and 11.19).

**Figure 11.18.** Percentage contribution of food subgroup to vegetable intake, by study community, for men.



**Figure 11.19.** Percentage contribution of food subgroup to vegetable intake, by study community, for women.



**Photo 11.2.** Melbourne, Australia (Greek) (1990-91): Traditional dishes; front left: pastrouma (salted beef); front middle: cooked green chilly peppers, oil, vinegar; front right: vegetable fritters; back left: boiled chicory/endives, oil, lemon; back right: spanakopita (spinach, feta cheese, egg, filo pastry).



**Photo 11.3.** Melbourne, Australia (Greek) (1990-91): front left: potato salad; front right: bean and rice salad; back left: bean and chickpea salad; back middle: okra and tomato casserole; back right: cabbage salad.



**Photo 11.4.** Melbourne, Australia (Greek) (1990-91): front: vine dolmas (grape vine leaves stuffed with rice); left: tzatziki dip (yoghurt, garlic, cucumber, olive oil); centre: grilled capsicum in oil and vinegar; back right: lettuce & tomato salad.



**Photo 11.5.** Melbourne, Australia (Greek) (1990-91): this vegetable garden contains butter lettuce (far left), chicory (centre) and 'sinapi' (similar to Chinese broccoli) or mustard cabbage (*Sinapis alba*).





## **11.4 DISCUSSION**

Cross-cultural studies of food intake are useful for generating hypotheses and providing a global picture of cultural diversity and its impact on food and health relationships. In this chapter we have identified apparent differences in aspects of food intake 1) between the Caucasian and the Asian study communities, 2) within the Caucasian and the Asian communities, and 3), where appropriate, between the two rural communities (GRK-S and CTJ-R). The ultimate interpretation of the results and their generalisability may be limited and should be recognised.

### **11.4.1 Differences in dietary intake methodology**

The use of FFQ in the Caucasian communities and 24-hour recall method in the Asian communities (e.g. a single 24-hour recall for the Chinese and a 3-day 24-hour recall for the Japanese) raises several issues. The two methods differ in the time frame on which the intake estimates were based. The FFQ was intended for the assessment of usual intakes over the past 12 month period and the 24-recall provided current dietary intake estimates on a particular day. There is abundant literature to support the fact that the FFQ and a single 24-hour recall do not provide inter-exchangeable intake estimates [11-16]. Intake estimates derived from a single 24-hour recall agrees with a multiple-day 24-hour recall [12]. Thus, attempts to illustrate any differences in average daily intake amongst the study communities must take this into account. It should also be said that intrinsic differences in food intake patterns may still exist amongst the study communities in spite of potential differences attributable to the intake assessment methodology. Whereas the source of differences, derived from methods and/ or variation between individuals can not be separated with available information, comparisons amongst the four Caucasian and amongst the three Chinese communities are still possible.

### **11.4.2 Serving size and weight mass of foods**

FFQ and recall methods rely on estimates of serving size to obtain intake estimates. Describing intake by grams per day is therefore subject to errors derived from serving size estimation [11,17]. For foods (like fruit) or beverages which are consumed without elaborate preparation, the errors in the estimation of grams per serve are reduced to serving size estimation per se. However, foods are generally served in dishes and prepared with more than one ingredient, especially in developed countries. Foods can be prepared in a variety of ways. Cooked foods are generally heavier than raw ingredients of the same serving size because water is added (or evaporated). In this case, the estimation of food intake in grams per day is subject to errors such as serving size estimation and added weight mass of prepared foods.

### **11.4.3 Misclassification of food groups**

The use of food groups to present food intake data was inevitable, even though individual food

items may be a better description of food culture. Due to the great diversity in food culture amongst the 12 study communities, foods needed to be classified in aggregates. Errors may occur when classifying foods into groups. We adopted the basic food groups to classify foods. In food cultures where food consumption follows basic food groups, misclassification is less likely to happen. On the other hand, where the use of mixed dishes is the prevailing food culture of the study community, then misclassification is possible.

#### **11.4.4 Missing information**

In all communities where food intake variety was high, the total amount of food reported for consumption was also high. This was further exemplified by the observation that study communities that adopted the FFQ intake methodology had both a higher food intake variety and a higher total food intake compared to communities that used a 24-hour recall. It is not clear whether the absence of information about the intake of non-alcoholic beverages in the three Chinese communities (that used a single 24-hour recall method) was due to the fact that Chinese do not consume non-alcoholic beverages excluding water or tea (a culture related food choice, see below) or that the information was not collected.

#### **11.4.5 Differences in food intake variety**

The food intake variety results suggest that the average variety achieved over any one-day period was lower than that achieved over a 12 month period. The average food intake variety within each food group was also consistently lower amongst the Chinese than the Caucasian populations. The apparent differences in mean food intake variety amongst the Caucasian and Chinese communities may be attributable to the differences in intake methodology as well as intrinsic differences between the Caucasian and Chinese communities.

#### **11.4.6 The total food intake**

In contrast to the food intake variety, where differences between the rural and urban communities were not apparent for both Caucasian and Asian communities, the total amount of food reported for consumption differed between the two community settings. The rural communities (Greeks in Spata, Greece, and Chinese in rural Tianjin, China) reported a smaller total food intake compared to their urban counterparts (Greeks in Melbourne, Australia, and Chinese in urban Tianjin, China). The Japanese communities from an urban community setting, reported a total food intake comparable to the urban Tianjin and Beijing Chinese elderly. Additionally, the total food intake was similar amongst the urban living Caucasian elderly. This suggests that the total amount of food reported for intake in these elderly communities is independent of food intake variety in the diet and that rural elderly generally consume less food than their urban counterparts independent of dietary intake methodology.

#### **11.4.7 Food choices**

Individual food choice may be based upon personal preferences, habit or tradition, social pressure, availability, convenience, economics and/ or nutritional value [18]. For example, the higher intake of milk and milk products in the Swedish elderly may be explained by traditional habit and/ or nutritional value while the much lower milk intake amongst the Chinese elderly in Tianjin may be a result of lack of supply and/ or affordability. Cross-cultural considerations need to take into account food beliefs (see Chapter 8) and traditional food culture. There may exist cross-cultural differences in food intake patterns amongst the elderly populations, as evident in this chapter. Differences in nutritional and health status in these communities is yet to be verified.

**Photo 11.6.** Sweden, Gothenburg 1991: dairy section of the Super market.



## 11.5 ADDITIONAL INFORMATION

### 11.5.1 Aboriginal Australians (A Kouris-Blazos)

Approximate serving sizes and frequency of intake were obtained for most 'Western' foods consumed by the elderly over a period of a fortnight during the wet season using Rapid Assessment Procedures [8]. A serving size range is provided - the minimum would be eaten on a 'famine' day and the maximum on a 'feast' day. Major gender differences in food intake were not observed. Average quantities 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 that occurred from day to day. Although such qualitative food intake data may appear crude at first glance, it still provides an invaluable insight into the diet of these elderly Aboriginal Australians. A typical feast day (3 days) and famine day (4 days) are described in

Tables 11.5-11.7.

**Table 11.5. Typical 'feast day' (3 days of week).**

	<b>Typical serving</b>	<b>Serving range</b>
<b>Breakfast</b>		
Damper (White flour, water, unleavened)	400 g	100-400 g
Tinned corned beef	170 g	30-200 g
Margarine	5 g	5 g
Milk powder, full cream	20g	10-20 g
Sugar	40 g	20-40 g
Tea	500ml	200-500 ml
<b>Lunch</b>		
Damper	200 g	100-400 g
5-6 lamb chop (+ fat)	300 g	100-400 g
Potato boiled	90 g	50-100 g
Onion	30 g	30 g
Mixed frozen vegetables (peas, corn, carrot)	40 g	40 g
Salt	2 g	2 g
Tomato sauce	40 g	40 g
<b>Dinner</b>		
Damper	200 g	100-400 g
Margarine	5 g	5 g
Fried chicken	200 g	200-400 g
Potato chips	50 g	50-100 ml
Milk powder, full cream	20g	20g
Sugar	40 g	20-40 g
Soft drink	300 ml	100-300 ml

**Table 11.6. Typical 'lean day' (4 days of week).**

	<b>Typical serving</b>	<b>Serving range</b>
<b>Breakfast</b>		
Damper (White flour, water)	200 g	100-200 g
Tea	500 ml	200-500 ml
Milk powder	20g	0-20 g
Margarine	5 g	5 g
<b>Lunch</b>		
Damper	200 g	100-200 g
Tinned corned beef	50 g	0-50 g
<b>Dinner</b>		
Damper	200 g	100-200 g
Tinned spaghetti in sauce	100 g	0-100 g
Tea	500 ml	200-500 ml
Milk powder	20g	0-20 g

**Table 11.7. Foods eaten on a weekly basis.**

<b>Foods</b>	<b>Quantity</b>
Sardines (once a week)	60-120 g
Tinned oysters (once a week)	10 g
Fruit (Bananas, oranges, apples, watermelon)	Twice a week
Porridge (once a week)	100 g
Weet Bix (once a week)	120g
Rice (once a week)	200 g
Eggs (once a week)	60g
Jam (once a week)	40 g

Bush foods were not eaten regularly (about twice a month). The most commonly eaten bush foods (which have little resemblance to non-native Australian foods) were found to be: gooseberry, passion fruit, cucumber, fig, conkerberry, onion, potato, tree gum, honey, fresh fish from the Fitzroy river (barramundi, black bream), cherrabun (fresh water cray fish), mussels, goanna (native lizard), and sand frogs (see Section 9.7.1.5). From 1980-84, meals on wheels (MOW) were provided for the elderly. However, the meals would be shared or taken by others, so the elderly were not benefiting from the service. Since 1985, lunch has been served at the primary school on weekdays during the school term. The community bus takes approximately half the elderly from Junjuwa to the school; the remainder stay home either because they are too frail or by choice. Plans are in progress to serve lunch on weekends and during the holidays. Most other Aboriginal communities did not provide meals. The lunch meal provided (which will be referred to as MOW) is described in Table 11.8.

**Table 11.8. Meals on wheels (lunch only, 5 days of week, 50% of elderly).**

<b>Foods</b>	<b>Quantity</b>
1 slice white bread	30 g
Boiled white rice	200 g
Beef stew	80 g
Boiled carrot	20g
Boiled pumpkin	20g
Boiled pumpkin	20g
Boiled potato	60g
Onion cooked	10 g
Zucchini boiled	20g
Salt	2 g
Orange	90 g

**Photo 11.7.** West Australia, Fitzroy Crossing, Junjuwa (1988): damper is cooked when the surface feels crispy and hard.





## 11.6 SUMMARY

- The food frequency questionnaire method (over the past year) was used on GRK-S, GRK-M, SWE, ACA, CBJ; 3 day 24 hour recall method was used in CTJ-R, CTJ-U and Japan (JPN).
- Elderly SWE and ACA reported the greatest total food intake, followed by GRK-M and GRK-S; CTJ-U, CTJ-R and JPN elderly reported the lowest total food intake. Overall, rural elderly consumed less food than urban elderly, as did women compared to men.
- In the Asian communities, a large proportion of total food intake was cereals, vegetables and legumes. In contrast, in the Caucasian communities, a greater proportion of total food intake was meat, fish, dairy products and fruit.
- Absolute intake of meat was greater in the urban elderly compared with their rural counterparts. Lamb, veal and beef were the major contributors to the total meat intake in the four Caucasian communities and CBJ. SWE had the highest intake of organ meats and CTJ the highest intake of pork.
- Absolute intake of vegetables among the four Caucasian communities was higher than the Asian communities, as was higher for the urban elderly than for the rural elderly.
- Interpretation of the food intake data across the study communities may be limited by:
  1. differences in dietary intake methodology
  2. serving size estimation and weight mass of foods
  3. misclassification of food groups
  4. missing information
  5. food choice influenced by culture/ availability.

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## 11.8 LEGEND OF THE FIGURES

- Figure 11.1 Average number of food items consumed (food intake variety), by study community and gender.
- Figure 11.2 Food intake variety for each major food group, for men and by study community.
- Figure 11.3 Food intake variety for each major food group, for women and by study community.
- Figure 11.4 Average daily intake by major food group and study community, for men.
- Figure 11.5 Average daily intake by major food group and study community, for women.
- Figure 11.6 Percentage contribution of major food group to total food intake, by study community, for men.
- Figure 11.7 Percentage contribution of major food group to total food intake, by study community, for women.
- Figure 11.8 Average daily cereal intake by food subgroup and study community, for men.
- Figure 11.9 Average daily cereal intake by food subgroup and study community, for women.

- Figure 11.10 Percentage contribution of food subgroup to cereal intake, by study community, for men.
- Figure 11.11 Percentage contribution of food subgroup to cereal intake, by study community, for women.
- Figure 11.12 Average daily meat intake by food subgroup and study community, for men.
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- Figure 11.14 Percentage contribution of food subgroup to meat intake, by study community, for men.
- Figure 11.15 Percentage contribution of food subgroup to meat intake, by study community, for women.
- Figure 11.16 Average daily vegetable intake by food subgroup and study community, for men.
- Figure 11.17 Average daily vegetable intake by food subgroup and study community, for women.
- Figure 11.18 Percentage contribution of food subgroup to vegetable intake, by study community, for men.
- Figure 11.19 Percentage contribution of food subgroup to vegetable intake, by study community, for women.

## 11.9 ILLUSTRATIONS

- Photo 11.1. China, Tianjin 1989 (rural sample): underground cabbage store well.
- Photo 11.2. Melbourne, Australia (Greek) (1990-91): Traditional dishes; front left: pastrouma (salted beef); front middle: cooked green chilly peppers, oil, vinegar; front right: vegetable fritters; back left: boiled chicory/endives, oil, lemon; back right: spanakopita (spinach, feta cheese, egg, filo pastry).
- Photo 11.3. Melbourne, Australia (Greek) (1990-91): front left: potato salad; front right: bean and rice salad; back left: bean and chickpea salad; back middle: okra and tomato casserole; back right: cabbage salad.
- Photo 11.4. Melbourne, Australia (Greek) (1990-91): front: vine dolmas (grape vine leaves stuffed with rice); left: tzatziki dip (yoghurt, garlic, cucumber, olive oil); centre: grilled capsicum in oil and vinegar; back right: lettuce & tomato salad.
- Photo 11.5. Melbourne, Australia (Greek) (1990-91): this vegetable garden contains butter lettuce (far left), chicory (centre) and 'sinapi' (similar to Chinese broccoli) or mustard cabbage (*Sinapis alba*).
- Photo 11.6. Sweden, Gothenburg 1991: dairy section of the Super market.
- Photo 11.7. West Australia, Fitzroy Crossing, Junjuwa (1988): damper is cooked when the surface feels crispy and hard.

## **CHAPTER 11**

### **FOOD INTAKE**

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#### **11.9 ILLUSTRATIONS**

