



# CURRENT STATUS OF FOOD AND NUTRIENT INTAKES OF THE ELDERLY IN JAPAN

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## 22.1 DIFFERENCES IN NUTRIENT INTAKE BY LIVING ARRANGEMENTS IN OKAZAKI

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### 22.1.1 Descriptive demography

Okazaki-shi (Okazaki city), in the prefecture of Aichi, where the nutritional surveys on the elderly were done in 1991, is located near the middle of the long, slender main island of Honshu, which stretches from north to south and is on the Pacific Ocean coastal side of Japan. It is densely populated and has mixed urban and semi-rural areas. Its climate is considered mild throughout the year, with an average temperature of 17°C (maximum 38°C, minimum -2.9°C), an average humidity of 76% and an average precipitation of 1,320 mm. It has a population of approximately 310,000 with the numbers of men and women almost even. There are about 94,000 households. The elderly aged seventy years and over are 6.22% of the total population, being lower than the nationwide percentage of 8.19%. The population density is 1,352 persons/km<sup>2</sup>, which is higher than nationwide density (333 persons/km<sup>2</sup>). These are 1991 figures [1,2].

### 22.1.2 Subject recruitment

A total of 140 subjects (73 men, 67 women) aged seventy years and over were randomly selected from the mixed urban and semi-rural areas of Okazaki-shi using the city hall population register for residents living in Okazaki-shi. Letters were sent requesting their participation in the IUNS study. The population register includes the number of households, and the names and ages (by birthdate) of people in each household. Eighty nine, (43 men and 46 women), of these elderly

responded, making a response rate of 58.9% for men and 68.6% for women, respectively. No subjects who responded were in an institution or hospital. In Japan, 1.62% of those over 65 years old were in institutions in 1990 [3]. The living styles of the elderly subjects were classified as: living alone (10 men, 11 women), living with spouse (15 men, 12 women) and living with another family member (18 men, 23 women). Generally, the last group included their children and grandchildren, with health care and meal-supply being managed by the younger household wife. The stature, weight, body mass index and waist hip ratio are summarised in Table 22.1 according to gender and living type. Nutritional questionnaires were administered from September to October in 1991. The interviewer visited the subject's home for three consecutive days and recorded all dishes and foods eaten the day before. Most subjects had recorded the foods they had eaten using a portable scale, provided by the research team, and the interviewer completed the questionnaire details. Ordinarily it took 4 visits to collect each subject's 3-day food intake and information on food beliefs and diet history.

**Table 22.1 Descriptive statistics for number of subjects, age, stature, body weight, body mass index and waist hip ratio of the elderly aged over seventy years old living in Okazaki-shi, Aichi-ken, Japan.**

	Men		Women	
	mean	SD	mean	SD
<b>Age (year)</b>				
≥ 70	78	6	77	5
70-79	74	3	74	3
≥80	85	4	83	2
<b>Stature (cm)</b>				
Average	158.4	5.9	145.4	6.2
Living alone	159.5	4.7	144.4	6.5
Living with spouse	157.4	7.1	149.4	6.2
Living with another family member	158.7	5.1	143.9	5.0
<b>Body weight (kg)</b>				
Average	54.7	8.7	46.6	8.6
Living alone	53.4	5.8	44.8	7.8
Living with spouse	55.2	8.3	50.3	7.0
Living with another family member	55.1	10.1	45.5	9.1
<b>Body mass index (kg/m<sup>2</sup>)</b>				
Living alone	21.9	3.6	22.0	3.4
Living with spouse	21.0	2.4	21.5	3.5
Living with another family member	22.4	3.3	22.5	2.5
	21.9	4.2	21.9	3.7
<b>Waist hip ratio</b>				

Living alone	0.903	0.070	0.849	0.080
Living with spouse	0.905	0.050	0.844	0.077
Living with another family member	0.896	0.072	0.880	0.050
	0.908	0.070	0.840	0.090

≥70 years M=43, F=46; 70-79 years M=28, F=33; ≥80 years M= 15, F= 13.

**Photo 22.1.** Yokohama, Japan (1991): An 84 year old male and his 76 year old wife have been living with their first son's family and two grandchildren for 50 years.



### 22.1.3 Intakes of foods and nutrients

Food and nutrient analyses were performed using two commercially available software programs (VIAND and NUTAS 4 by Software Developing Company Co. Ltd., Tokyo and Nankodo New Media Co. Ltd, Tokyo respectively) based on the 1982 and 1989 standard tables of food composition [4,5] in Japan. Intake of 3 macro-nutrients (including saturated and polyunsaturated fatty acids), 5 minerals (Ca, P, Fe, Na and K), and 6 vitamins (A, B1, B2, niacin and C and E) were estimated \*. Dietary fibre intakes from 231 foods were estimated using the dietary fibre composition table [6], for which values were obtained by the enzymatic-gravimetric method. Therefore, apparent values estimated here for dietary fibre are considered to be less than the actual dietary fibre intakes. Foods which contribute to dietary fibre consumption in Japan, such as fungi, seaweeds and pulses, were included in the food composition table (See Table 22.2)

**Table 22.2. Descriptive statistics for average intake of dietary fibre from food groups by the elderly living in Okazaki-shi, Aichi-ken, Japan.**

Dietary fibre intake (g/day) from:	Men (n=43)		Women (n=46)	
	mean	SD	mean	SD
Cereals	2.55	1.36	1.97	0.86
Potatoes	0.72	0.81	0.79	0.67
Nuts & seeds	0.26	0.79	0.09	0.24
Pulses	1.98	1.29	1.98	1.20
Fish & shellfish	0.14	0.15	0.13	0.15
Meat & meat products	0.01	0.01	0.00	0.00
Eggs	0.03	0.02	0.03	0.02
Milk & dairy products	0.01	0.02	0.01	0.03
Vegetables	2.62	1.85	2.67	1.77
Fruit	0.90	0.78	0.98	0.91
Fungi	0.45	0.86	0.41	0.63
Algae	0.56	0.56	0.61	0.74

**Photo 22.2.** Okazaki, Japan (1991): A 79 year old(left), and a 78 year old(right) women are well and enjoying lunch at a senior citizens club.



## 22.1.4 Results

### 22.1.4.1 *Characteristics of food intake of elderly surveyed in Okazaki*

Breakfast was consumed between 6:30-9:30AM, lunch between 11:45 AM -2:30PM, and dinner between 5:30-8:00 PM. Snacks were reported to be consumed between meals; the number of snacks consumed depended on each subject. Food variety was measured according to the number

of different kinds of foods eaten each day. As shown in Tables 22.3-22.6, the number of foods consumed by both men and women in the study was about 20. This is less than the recommended number of 22 (See Table 22.7) in Japan. According to living arrangements, men and women "living alone" had the lowest dietary diversity.

**Table 22.3. Descriptive statistics for average intake of a variety of foods consumed by the elderly living in Okazaki-shi, Aichi-ken, Japan.**

Food intakes (g/day):	Men (n=43)		Women (n=46)	
	mean	SD	mean	SD
Cereals	234.6	75.9	199.6	61.0
Potatoes	44.2	47.2	39.9	32.9
Sugars and sweeteners	11.2	13.7	11.7	12.1
Confectioneries	25.3	31.5	38.2	37.3
Fats and oils	8.0	8.5	6.6	6.5
Nuts and seeds	6.3	22.5	2.3	11.2
Pulses	60.7	51.8	59.4	47.6
Fish and shellfish	85.2	55.9	59.9	37.9
Meat and meat products	33.5	33.3	29.5	24.6
Eggs	30.1	25.5	27.2	20.2
Milk and milk products	114.5	117.5	119.3	90.6
Green & yellow vegies	72.1	59.2	69.0	58.2
Vegetables (and fungi)	112.8	80.9	121.6	60.7
Fruit	86.6	69.2	104.0	81.9
Algae	3.3	3.7	3.9	4.5
Beverages	436.7	369.3	432.4	315.4
Seasonings and spices	36.0	26.7	31.5	13.6
Prepared foods	2.9	10.2	0.2	1.5
Average number of kinds of foods eaten per day	19	6	20	4

**Table 22.4. Descriptive statistics for average food intakes from food groups by the elderly aged 70+ living in Okazaki-shi in subjects living alone.**

Food intakes (g/day):	Men (n=10)		Women (n=11)	
	mean	SD	mean	SD
Cereals	233.3	86.3	240.9	70.1
Potatoes	23.6	21.4	31.7	22.2
Sugars & sweeteners	12.8	20.3	10.6	8.1
Confectioneries	21.3	27.8	38.0	40.0
Fats & oils	7.7	10.1	7.4	7.9

Nuts & seeds	0.9	1.9	0.2	0.3
Pulses	63.3	37.0	41.4	37.5
Fish & shellfish	63.5	46.4	59.6	41.9
Meat & meat products	30.9	33.3	19.8	22.2
Eggs	36.6	25.7	27.9	13.5
Milk & dairy products	114.4	116.9	91.9	107.0
Green & yellow vegies	59.1	51.2	71.3	51.8
Vegetables (and fungi)	90.6	57.1	109.1	64.0
Fruit	68.9	53.0	109.5	102.0
Algae	2.2	1.7	2.1	1.8
Beverages	386.1	425.4	553.2	501.3
Seasonings and spices	49.3	42.7	34.1	13.7
Prepared foods	0.0	0.0	0.0	0.0
Average numbers of kinds of foods eaten a day	17	8	17	5

**Table 22.5. Descriptive statistics for average food intakes from food groups by the elderly aged 70+ in Okazaki-shi, in subjects living with spouse.**

Food intakes (g/day):	Men (n=15)		Women (n=12)	
	mean	SD	mean	SD
Cereals	242.6	67.1	168.0	40.2
Potatoes	57.9	58.9	65.1	32.4
Sugars & sweeteners	12.7	13.5	16.4	14.7
Confectioneries	30.6	34.0	25.7	19.1
Fats & oils	8.8	8.7	8.3	7.7
Nuts & seeds	0.5	1.5	0.8	1.1
Pulses	40.7	32.4	45.9	25.7
Fish and shellfish	83.8	40.5	59.3	28.8
Meat & meat products	46.1	37.6	38.5	31.7
Eggs	39.7	17.6	40.0	22.0
Milk & dairy products	99.6	77.7	184.5	67.5
Green & yellow vegies	78.2	58.9	106.5	79.7
Vegetables (and fungi)	123.6	76.8	132.5	78.8
Fruit	111.5	75.5	136.4	72.1
Algae	4.2	5.3	4.8	6.1
Beverages	472.0	293.4	362.6	170.3
Seasonings & spices	35.5	16.9	31.6	7.4
Prepared foods	2.2	6.2	0.0	0.0
Average numbers of kinds				

of foods eaten a day	20	5	21	4
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**Table 22.6. Descriptive statistics for average food intakes from food groups by the elderly aged 70+ living in Okazaki-shi, in subjects living with another family member.**

Food intakes (g/day):	Men (n=18)		Women (n=23)	
	mean	SD	mean	SD
Cereals	228.6	76.0	196.3	53.8
Potatoes	44.4	42.2	30.7	30.6
Sugars and sweeteners	9.0	7.5	9.7	11.5
Confectioneries	23.1	30.7	44.9	41.3
Fats & oils	7.4	7.3	5.3	4.5
Nuts & seeds	14.1	33.1	4.1	15.5
Pulses	75.8	64.9	75.1	54.9
Fish & shellfish	98.3	66.7	60.4	40.0
Meat & meat products	24.3	25.3	29.4	19.1
Eggs	18.6	26.4	20.3	18.5
Milk & dairy products	127.0	141.5	98.5	74.5
Green & yellow vegies	74.4	62.4	48.3	31.8
Vegetables (and fungi)	116.2	92.2	121.9	45.1
Fruit	75.6	65.7	84.5	69.1
Algae	3.2	2.3	4.2	4.3
Beverages	435.4	388.7	411.0	231.7
Seasonings and spices	29.0	17.7	30.1	15.7
Prepared foods	5.1	14.5	0.4	2.0
Average numbers of kinds of foods eaten a day	20	5	21	4

**Table 22.7. Current guidelines of foods recommended for consumption to satisfy dietary allowances for the elderly aged 70+ (8).**

Recommended amount (g/day) of:	Men	Women
Cereals	250-270	200-230
Potatoes	60	60
Green & yellow vegies	50-70	50-60
Vegetables inc fungi	100-150	100
Fruit	150-200	150

Algae	5	5
Nuts & seeds	-	-
Pulses	70	60-70
Fish & shellfish	60	55
Meat & meat products	50	40
Eggs	30	25
Milk & dairy products	200	200
Beverages	-	-
Seasonings & spices	salt >10	salt >10
Prepared foods	-	-
Sugars & sweeteners	10-15	10-15
Confectioneries	-	-
Fats & oils	10-15	10
Average numbers of kinds of foods eaten a day	30	30

**Photo 22.3.** Yokohama, Japan (1991): A fit 75 year old man has been living alone for 20 years.



1. Tables 22.4 - 22.6 indicate that all the elderly subjects consumed more than half or nearly the same amounts of most foods as those recommended by Dr Hayami [8] in Japan (Table 22.7). Particularly, intakes of fish and shellfish, green and yellow vegetables and other vegetables including fungi, were much higher, except women "living with another family member", whose intake of green and yellow vegetables was considerably lower.
2. Comparisons of food intake amongst the three 'living arrangement groups' (Tables 22.4 to



22.6), indicated that the elderly group 'living with spouse' had higher intakes of most foods. The elderly group 'living with another family member' had a high intake of pulses, but the women of this group had the lowest intake of green and yellow vegetables. The 'living with spouse' group ate more animal foods such as meat and meat products, fish and eggs. In all groups, the intake of fish and shellfish was higher than that of meat and eggs. The 'living with another family member' group had the highest intake of fish, while the 'living with spouse' group had the highest intake of meat and eggs. Intake of milk, dairy products and fruit fell below the recommended amounts. In all the elderly surveyed, adequacy of milk and dairy products was low (about 60% of the recommended amount for both sexes.)

#### 22.1.4.2 *Characteristics of nutrient intakes of the elderly surveyed in Okazaki*

In the study by Yoshida et al. [7], nutrient intakes of Japanese elderly appear to have been overestimated. For example, energy intake was reported to be over 8,000 kJ per day. The present study provides further data on the nutrient intakes of Japanese elderly.

1. *Intake of macro nutrients:* Of the three major-nutrients, carbohydrates were consumed in similar amounts (about 30%) at each main meal (Table 22.25). More protein and fat were eaten at dinner (approximately 40%) than at breakfast and lunch (25-30%). The percentage of each macro-nutrient derived from extra meals (interim snacks) was less than 9% except for carbohydrate in women (14%). This eating pattern is somewhat unique to Japanese food habits and could be related to the longevity of the Japanese elderly.
2. *Comparisons of nutrient intakes with the dietary allowances (Tables 22.8-22.23, 22.27):* The average daily intakes of energy, protein and vitamins B1, B2, and C were higher than their recommended allowances for both men and women in the three living arrangement groups, whilst Ca, Fe and vitamin A were only slightly less than their recommended dietary allowances. These results suggest that the Japanese elderly, overall, have an adequate intake of nutrients every day. Tables 22.26 and 22.27 show that the energy intakes from fat are within the allowance of 20-25% in subjects of both sexes, and that the contribution of alcohol is very low, particularly for women. Animal fats were below half of the total fat intake and the S/P ratios of fatty acids were in the desirable range, presumably due to the high intakes of fish and shellfish. Salt intakes in both sexes were about 10 grams per day, which is slightly more than the recommended amount for the elderly (See Table 22.18). Some researchers in Japan have advised that the Japanese in general should consume at least 15 g of dietary fibre a day. The elderly consumed only about 10 grams (See Table 22.12). Table 22.12 shows dietary fibre intakes were derived mainly from cereals, vegetables and pulses. Dietary allowances for the other nutrients have not yet been recommended in Japan.

3. *Nutrient intakes according to the 'living arrangement' groups:* Of interest is that the average daily intakes of energy, protein, iron, vitamins A and C in the 'living with spouse' group tended to be greater in both men and women than the other 2 groups, despite similar body sizes (Table 22.1). The low intake of vitamin A in the group 'living with another family member' can be supported by the low intake of meat and eggs in this group (Tables 22.3-22.6). Other nutrient intakes such as fat, carbohydrate, dietary fibre, P, Na, K, vitamins B1 and B2 were similar in all the living arrangement groups in both men and women (Tables 22.3, 22.8-22.12, 22.14, 22.16, 22.17, 22.19, 22.20).
4. The average ratios of Ca/P (Table 22.26) appeared desirable, despite lower than recommended intakes of Ca (Table 22.13), and in some cases, a higher than recommended intake of salt (Table 22.18).

<b>Table 22.8. Descriptive statistics for energy intake by the elderly aged 70+ living in Okazaki-shi, Aichi-ken, Japan.</b>				
	<b>Men (n=43)</b>		<b>Women (n=46)</b>	
	<b>mean</b>	<b>SD</b>	<b>mean</b>	<b>SD</b>
<b>Energy (kj)</b>				
Breakfast	1920	629	1638	491
Lunch	2039	663	1697	449
Dinner	2817	965	2140	709
Extra meals	493	537	671	522
Daily total	7264	1760	6149	1494
<b>Living alone</b>	<b>n=10</b>		<b>n=11</b>	
Breakfast	1933	566	1592	567
Lunch	2059	481	1940	584
Dinner	2592	1184	2207	1029
Extra meals	478	707	571	575
Daily total	7062	2027	6309	2171
<b>Living with spouse</b>	<b>n=15</b>		<b>n=12</b>	
Breakfast	2189	527	1833	481
Lunch	1861	767	1618	307
Dinner	3038	945	2224	598
Extra meals	514	429	676	449
Daily total	7601	1578	6352	936
<b>Living with another family</b>	<b>n=18</b>		<b>n=23</b>	
Breakfast	1690	650	1557	424
Lunch	2174	621	1622	392
Dinner	2754	794	2065	549
Extra meals	484	508	716	524
Daily total	7096	1703	5967	1299

**Table 22.9. Descriptive statistics for protein intake by the elderly aged 70+ living in Okazaki-shi, Aichi-ken, Japan.**

Protein (g)	Men (n=43)		Women (n=46)	
	mean	SD	mean	SD
Breakfast	16.4	5.6	14.4	4.2
Lunch	18.5	7.4	14.9	4.8
Dinner	27.0	10.6	21.5	7.2
Extra meals	2.8	3.4	3.3	2.9
Daily total	64.7	17.2	54.1	12.4
<b>Living alone</b>	<b>n=10</b>		<b>n=11</b>	
Breakfast	16.8	6.4	12.8	4.8
Lunch	17.6	6.5	16.8	5.0
Dinner	23.0	12.1	19.6	9.5
Extra meals	2.8	4.1	2.7	3.0
Daily total	60.2	21.5	51.9	15.4
<b>Living with spouse</b>	<b>n=15</b>		<b>n=12</b>	
Breakfast	18.6	5.3	16.2	2.9
Lunch	16.8	7.2	15.7	5.5
Dinner	30.9	11.2	22.6	7.8
Extra meals	2.6	2.2	4.1	3.5
Daily total	68.9	15.7	58.6	12.4
<b>Living with another family</b>	<b>n=18</b>		<b>n=23</b>	
Breakfast	14.3	4.6	14.3	4.0
Lunch	20.3	7.6	13.6	3.8
Dinner	25.9	7.6	21.7	5.1
Extra meals	3.0	3.7	3.3	2.4
Daily total	63.5	14.8	52.9	9.9

**Table 22.10 Descriptive statistics for fat intake by the elderly aged 70+ living in Okazaki-shi, Aichi-ken, Japan.**

Fat (g)	Men (n=43)		Women (n=46)	
	mean	SD	mean	SD
Breakfast	11.6	6.7	9.2	5.3
Lunch	11.2	6.3	8.7	4.5
Dinner	17.8	10.1	15.0	8.9
Extra meals	1.9	2.7	2.3	3.0
Daily total	42.5	17.2	34.9	14.1

<b>Living alone</b>	<b>n=10</b>		<b>n=11</b>	
Breakfast	12.3	7.7	7.3	4.8
Lunch	10.8	8.3	8.3	4.8
Dinner	15.2	10.2	14.7	13.8
Extra meals	1.8	3.2	0.9	1.1
Daily total	40.0	20.4	30.3	17.3
<b>Living with spouse</b>	<b>n=15</b>		<b>n=12</b>	
Breakfast	13.3	5.2	13.9	6.2
Lunch	9.8	4.8	9.0	4.3
Dinner	19.0	11.2	15.7	7.8
Extra meals	1.6	1.8	3.8	4.3
Daily total	43.8	16.6	42.4	17.2
<b>Living with another family</b>	<b>n=18</b>		<b>n=23</b>	
Breakfast	9.7	6.7	7.5	2.9
Lunch	12.7	5.8	8.6	4.4
Dinner	18.3	8.7	14.8	6.0
Extra meals	2.1	3.1	2.2	2.5
Daily total	42.8	15.6	33.2	7.8

**Table 22.11. Descriptive statistics for carbohydrate intake by the elderly aged 70+ living in Okazaki-shi, Aichi-ken, Japan.**

<b>Carbohydrate (g)</b>	<b>Men (n=43)</b>		<b>Women (n=46)</b>	
	<b>mean</b>	<b>SD</b>	<b>mean</b>	<b>SD</b>
Breakfast	70.8	26.0	61.6	21.3
Lunch	73.7	26.5	64.9	19.2
Dinner	84.9	27.0	68.4	21.7
Extra meals	22.5	24.4	32.2	25.5
Daily total	251.6	65.5	227.5	61.1
<b>Living alone</b>	<b>n=10</b>		<b>n=11</b>	
Breakfast	68.0	25.4	65.0	23.0
Lunch	75.5	18.2	75.8	23.8
Dinner	85.3	36.9	76.6	25.0
Extra meals	21.6	32.2	29.9	29.3
Daily total	250.4	73.9	247.3	80.9
<b>Living with spouse</b>	<b>n=15</b>		<b>n=12</b>	
Breakfast	80.7	23.9	61.2	22.5
Lunch	70.1	32.2	60.2	15.0
Dinner	90.8	18.8	66.5	20.5
Extra meals	24.1	20.6	28.3	17.6
Daily total	265.0	55.3	216.2	35.6

<b>Living with another family</b>	<b>n=18</b>		<b>n=23</b>	
Breakfast	64.1	25.5	60.3	19.6
Lunch	75.7	24.9	62.1	16.5
Dinner	79.7	25.2	65.4	19.5
Extra meals	21.6	22.0	35.3	26.5
Daily total	241.1	66.4	223.8	58.3

**Table 22.12. Descriptive statistics for dietary fibre intake by the elderly aged 70+ living in Okazaki-shi, Aichi-ken, Japan.**

<b>Dietary fibre (g)</b>	<b>Men (n=43)</b>		<b>Women (n=46)</b>	
	<b>mean</b>	<b>SD</b>	<b>mean</b>	<b>SD</b>
Breakfast	3.75	2.63	3.11	1.38
Lunch	2.80	1.51	2.76	1.29
Dinner	3.78	1.72	3.48	1.62
Extra meals	0.62	1.11	0.52	0.66
Daily total	10.46	4.37	9.87	3.37
<b>Living alone</b>	<b>n=10</b>		<b>n=11</b>	
Breakfast	2.68	1.36	3.18	1.89
Lunch	2.36	1.14	2.84	1.27
Dinner	3.16	1.47	3.50	1.61
Extra meals	0.71	1.20	0.49	0.54
Daily total	8.63	3.68	10.01	4.44
<b>Living with spouse</b>	<b>n=15</b>		<b>n=12</b>	
Breakfast	5.26	3.43	3.35	1.15
Lunch	3.01	1.39	3.23	1.30
Dinner	3.93	0.98	4.16	2.16
Extra meals	0.40	1.12	0.38	0.72
Daily total	11.57	3.32	11.13	3.27
<b>Living with another family</b>	<b>n=18</b>		<b>n=23</b>	
Breakfast	3.08	1.64	2.96	1.17
Lunch	2.88	1.73	2.48	1.22
Dinner	4.00	2.18	3.12	1.10
Extra meals	0.76	1.02	0.60	0.67
Daily total	10.56	5.10	9.16	2.53

**Table 22.13. Descriptive statistics for calcium intake by the elderly aged 70+ living in Okazaki-shi, Aichi-ken, Japan.**

	<b>Men (n=43)</b>	<b>Women (n=46)</b>
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<b>Calcium (mg)</b>	<b>mean</b>	<b>SD</b>	<b>mean</b>	<b>SD</b>
Breakfast	151.3	82.2	142.7	75.2
Lunch	143.7	78.9	119.2	64.9
Dinner	125.4	114.2	101.8	78.7
Extra meals	39.7	61.6	48.4	54.3
Daily total	460.1	185.6	412.1	171.3
<b>Living alone</b>	<b>n=10</b>		<b>n=11</b>	
Breakfast	175.1	98.9	133.0	97.0
Lunch	124.6	87.8	113.4	76.4
Dinner	96.5	55.8	84.7	44.2
Extra meals	35.6	66.1	28.8	40.0
Daily total	431.8	193.6	359.9	194.3
<b>Living with spouse</b>	<b>n=15</b>		<b>n=12</b>	
Breakfast	154.8	78.1	178.3	73.2
Lunch	158.6	89.9	114.9	56.3
Dinner	97.2	58.6	147.3	128.4
Extra meals	36.3	52.0	73.7	72.4
Daily total	446.9	157.8	514.2	194.2
<b>Living with another family</b>	<b>n=18</b>		<b>n=23</b>	
Breakfast	135.1	70.9	128.8	55.8
Lunch	142.0	58.7	124.3	62.6
Dinner	164.9	154.5	86.2	37.3
Extra meals	44.9	65.9	44.6	43.2
Daily total	486.8	198.6	383.9	115.8

**Table 22.14. Descriptive statistics for phosphorus intake by the elderly aged more than 70+ living in Okazaki-shi, Aichi-ken, Japan.**

<b>Phosphorus (mg)</b>	<b>Men (n=43)</b>		<b>Women (n=46)</b>	
	<b>mean</b>	<b>SD</b>	<b>mean</b>	<b>SD</b>
Breakfast	280	110	260	78
Lunch	291	135	237	88
Dinner	393	135	317	95
Extra meals	54	71	63	60
Daily total	1019	271	874	202
<b>Living alone</b>	<b>n=10</b>		<b>n=11</b>	
Breakfast	293	117	238	96
Lunch	273	100	258	87
Dinner	339	172	301	131
Extra meals	49	76	41	48
Daily total	953	317	838	261
<b>Living with spouse</b>	<b>n=15</b>		<b>n=12</b>	

Breakfast	309	110	297	57
Lunch	260	111	269	118
Dinner	448	137	317	90
Extra meals	48	57	87	82
Daily total	1065	242	970	202
<b>Living with another family</b>	<b>n=18</b>		<b>n=23</b>	
Breakfast	249	97	251	71
Lunch	328	159	210	56
Dinner	378	86	324	74
Extra meals	62	78	60	45
Daily total	1017	257	841	146

**Table 22.15** Descriptive statistics for iron intake by the elderly aged 70+ living in Okazaki-shi, Aichi-ken, Japan.

Iron (mg)	Men (n=43)		Women (n=46)	
	mean	SD	mean	SD
Breakfast	2.68	1.57	2.44	0.90
Lunch	2.52	1.11	2.24	0.82
Dinner	3.64	1.58	3.13	1.11
Extra meals	0.44	0.50	0.59	0.55
Daily total	9.28	3.12	8.41	2.20
<b>Living alone</b>	<b>n=10</b>		<b>n=11</b>	
Breakfast	3.32	2.62	2.25	1.31
Lunch	2.24	0.71	2.26	0.69
Dinner	2.91	1.58	3.22	1.46
Extra meals	0.39	0.73	0.55	0.66
Daily total	8.85	4.07	8.28	2.96
<b>Living with spouse</b>	<b>n=15</b>		<b>n=12</b>	
Breakfast	2.92	1.11	2.62	0.73
Lunch	2.54	1.33	2.61	1.04
Dinner	4.39	1.65	3.36	1.13
Extra meals	0.53	0.43	0.59	0.40
Daily total	10.38	3.00	9.18	2.01
<b>Living with another family</b>	<b>n=18</b>		<b>n=23</b>	
Breakfast	2.11	0.68	2.44	0.71
Lunch	2.66	1.05	2.04	0.66
Dinner	3.43	1.23	2.98	0.86
Extra meals	0.39	0.37	0.61	0.56
Daily total	8.60	2.22	8.06	1.72

**Table 22.16 Descriptive statistics for potassium intake by the elderly aged 70+ living in Okazaki-shi, Aichi-ken, Japan.**

Potassium (mg)	Men (n=43)		Women (n=46)	
	mean	SD	mean	SD
Breakfast	619	292	539	212
Lunch	602	237	547	203
Dinner	907	384	779	261
Extra meals	166	223	187	151
Daily total	2303	672	2052	557
<b>Living alone</b>	<b>n=10</b>		<b>n=11</b>	
Breakfast	685	394	530	311
Lunch	535	207	580	200
Dinner	733	410	689	297
Extra meals	119	154	138	142
Daily total	2071	784	1938	710
<b>Living with spouse</b>	<b>n=15</b>		<b>n=12</b>	
Breakfast	650	232	614	157
Lunch	595	236	681	215
Dinner	1022	420	908	322
Extra meals	163	266	218	173
Daily total	2430	643	2421	487
<b>Living with another family</b>	<b>n=18</b>		<b>n=23</b>	
Breakfast	556	255	505	164
Lunch	646	245	462	149
Dinner	908	288	755	164
Extra meals	195	210	193	136
Daily total	2325	591	1915	398

**Table 22.17. Descriptive statistics for sodium intake by the elderly 70+ living in Okazaki-shi, Aichi-ken, Japan.**

Sodium (mg)	Men (n=43)		Women (n=46)	
	mean	SD	mean	SD
Breakfast	1386	707	1363	612
Lunch	1429	770	1218	556
Dinner	1678	652	1429	565
Extra meals	74	106	98	107
Daily total	4568	1419	4109	1197
<b>Living alone</b>	<b>n=10</b>		<b>n=11</b>	



Breakfast	1289	742	1260	666
Lunch	1618	944	1290	538
Dinner	1548	809	1384	415
Extra meals	38	68	82	108
Daily total	4492	2169	4016	1264
<b>Living with spouse</b>	<b>n=15</b>		<b>n=12</b>	
Breakfast	1546	888	1277	634
Lunch	1304	857	1217	565
Dinner	1723	593	1409	391
Extra meals	84	105	122	128
Daily total	4656	1205	4025	820
<b>Living with another family</b>	<b>n=18</b>		<b>n=23</b>	
Breakfast	1306	446	1457	556
Lunch	1428	525	1184	557
Dinner	1713	590	1462	688
Extra meals	85	119	94	91
Daily total	4538	988	4197	1317

**Table 22.18. Descriptive statistics for sodium chloride intake by the elderly aged 70+ living in Okazaki-shi, Aichi-ken, Japan.**

Sodium chloride (g)	Men (n=43)		Women (n=46)	
	mean	SD	mean	SD
Breakfast	3.5	1.8	3.4	1.5
Lunch	3.1	1.6	2.8	1.4
Dinner	4.1	1.6	3.4	1.1
Extra meals	0.2	0.3	0.2	0.3
Daily total	10.8	3.3	9.9	2.9
<b>Living alone</b>	<b>n=10</b>		<b>n=11</b>	
Breakfast	3.2	1.9	3.2	1.7
Lunch	2.8	1.4	2.9	1.6
Dinner	3.5	1.7	3.4	1.0
Extra meals	0.1	0.2	0.2	0.3
Daily total	9.6	3.8	9.7	3.4
<b>Living with spouse</b>	<b>n=15</b>		<b>n=12</b>	
Breakfast	3.9	2.3	3.2	1.5
Lunch	3.0	1.9	3.1	1.4
Dinner	4.2	1.6	3.5	1.1
Extra meals	0.2	0.3	0.3	0.3
Daily total	11.4	3.3	10.1	2.1
<b>Living with another family</b>	<b>n=18</b>		<b>n=23</b>	

Breakfast	3.3	1.1	3.7	1.4
Lunch	3.3	1.3	2.6	1.3
Dinner	4.3	1.5	3.3	1.2
Extra meals	0.2	0.3	0.2	0.2
Daily total	11.1	2.6	9.9	2.9

**Table 22.19. Descriptive statistics for vitamin B1 intake by the elderly aged 70+ living in Okazaki-shi, Aichi-ken, Japan.**

Vitamin B1 (mg)	Men (n=43)		Women (n=46)	
	mean	SD	mean	SD
Breakfast	0.21	0.09	0.18	0.07
Lunch	0.27	0.11	0.22	0.09
Dinner	0.38	0.17	0.30	0.10
Extra meals	0.04	0.06	0.05	0.04
Daily total	0.90	0.28	0.75	0.20
<b>Living alone</b>	<b>n=10</b>		<b>n=11</b>	
Breakfast	0.18	0.09	0.16	0.07
Lunch	0.31	0.14	0.22	0.08
Dinner	0.35	0.21	0.26	0.11
Extra meals	0.04	0.05	0.05	0.05
Daily total	0.87	0.38	0.69	0.24
<b>Living with spouse</b>	<b>n=15</b>		<b>n=12</b>	
Breakfast	0.25	0.09	0.19	0.05
Lunch	0.25	0.11	0.25	0.11
Dinner	0.44	0.16	0.30	0.07
Extra meals	0.04	0.05	0.05	0.04
Daily total	0.98	0.25	0.79	0.17
<b>Living with another family</b>	<b>n=18</b>		<b>n=23</b>	
Breakfast	0.18	0.08	0.18	0.07
Lunch	0.26	0.10	0.20	0.09
Dinner	0.34	0.13	0.32	0.10
Extra meals	0.05	0.07	0.05	0.03
Daily total	0.84	0.23	0.75	0.19

**Table 22.20. Descriptive statistics for Vitamin B2 intake by the elderly aged 70+ living in Okazaki-shi, Aichi-ken, Japan.**

	Men (n=43)	Women (n=46)
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<b>Vitamin B2 (mg)</b>	<b>mean</b>	<b>SD</b>	<b>mean</b>	<b>SD</b>
Breakfast	0.32	0.15	0.29	0.15
Lunch	0.31	0.17	0.25	0.12
Dinner	0.43	0.22	0.35	0.15
Extra meals	0.08	0.11	0.11	0.11
Daily total	1.14	0.40	1.00	0.32
<b>Living alone</b>	<b>n=10</b>		<b>n=11</b>	
Breakfast	0.33	0.17	0.27	0.15
Lunch	0.27	0.15	0.27	0.10
Dinner	0.39	0.26	0.32	0.15
Extra meals	0.07	0.11	0.08	0.11
Daily total	1.06	0.38	0.94	0.30
<b>Living with spouse</b>	<b>n=15</b>		<b>n=12</b>	
Breakfast	0.37	0.13	0.42	0.16
Lunch	0.34	0.21	0.33	0.18
Dinner	0.52	0.25	0.35	0.14
Extra meals	0.08	0.09	0.16	0.15
Daily total	1.30	0.50	1.26	0.38
<b>Living with another family</b>	<b>n=18</b>		<b>n=23</b>	
Breakfast	0.27	0.12	0.23	0.10
Lunch	0.31	0.14	0.20	0.05
Dinner	0.38	0.11	0.37	0.15
Extra meals	0.09	0.11	0.10	0.08
Daily total	1.04	0.24	0.90	0.20

**Table 22.21. Descriptive statistics for Niacin intake by the elderly aged 70+ living in Okazaki-shi, Aichi-ken, Japan.**

<b>Niacin (mg)</b>	<b>Men (n=43)</b>		<b>Women (n=46)</b>	
	<b>mean</b>	<b>SD</b>	<b>mean</b>	<b>SD</b>
Breakfast	2.6	1.3	2.3	1.3
Lunch	4.2	2.8	2.8	1.6
Dinner	7.0	3.8	5.7	2.8
Extra meals	0.5	0.9	0.5	0.4
Daily total	14.3	5.2	11.3	4.1
<b>Living alone</b>	<b>n=10</b>		<b>n=11</b>	
Breakfast	2.2	1.3	2.1	1.0
Lunch	3.6	1.5	3.3	1.5
Dinner	5.6	3.0	4.5	2.5
Extra meals	0.3	0.4	0.4	0.5
Daily total	11.7	3.6	10.3	3.6

<b>Living with spouse</b>	<b>n=15</b>		<b>n=12</b>	
Breakfast	3.0	1.5	2.1	1.1
Lunch	3.6	2.4	3.5	2.0
Dinner	8.2	4.6	6.5	2.7
Extra meals	0.5	0.8	0.5	0.4
Daily total	15.3	5.7	12.6	3.6
<b>Living with another family</b>	<b>n=18</b>		<b>n=23</b>	
Breakfast	2.4	1.1	2.6	1.5
Lunch	5.0	3.3	2.2	1.1
Dinner	6.7	3.0	5.9	2.8
Extra meals	0.7	1.2	0.5	0.4
Daily total	14.9	4.9	11.2	4.4

**Table 22.22. Descriptive statistics for Vitamin C intake by the elderly aged 70+ living in Okazaki-shi, Aichi-ken, Japan.**

<b>Vitamin C (mg)</b>	<b>Men (n=43)</b>		<b>Women (n=46)</b>	
	<b>mean</b>	<b>SD</b>	<b>mean</b>	<b>SD</b>
Breakfast	17.2	11.1	14.1	8.6
Lunch	16.8	13.5	18.4	13.1
Dinner	28.9	18.4	28.8	16.6
Extra meals	6.6	12.5	8.0	10.1
Daily total	69.5	37.2	69.2	30.9
<b>Living alone</b>	<b>n=10</b>		<b>n=11</b>	
Breakfast	17.6	10.7	16.0	10.2
Lunch	15.8	10.7	17.5	10.0
Dinner	23.8	15.9	23.7	17.3
Extra meals	5.3	12.9	10.2	10.2
Daily total	62.5	32.4	67.3	39.9
<b>Living with spouse</b>	<b>n=15</b>		<b>n=12</b>	
Breakfast	18.3	7.5	14.7	8.8
Lunch	19.4	15.6	25.6	18.1
Dinner	33.7	14.9	41.0	17.6
Extra meals	6.9	14.5	7.1	13.0
Daily total	78.4	27.9	88.4	30.2
<b>Living with another family</b>	<b>n=18</b>		<b>n=23</b>	
Breakfast	16.0	13.5	12.8	7.3
Lunch	15.1	12.5	15.0	9.2
Dinner	27.7	21.3	24.9	11.8
Extra meals	7.1	10.2	7.5	7.8

Daily total	65.9	44.3	60.2	20.0
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**Table 22.23. Descriptive statistics for Vitamin A intake by the elderly aged 70+ living in Okazaki-shi, Aichi-ken, Japan.**

Vitamin A (IU)	Men (n=43)		Women (n=46)	
	mean	SD	mean	SD
Breakfast	631	937	470	659
Lunch	495	626	387	506
Dinner	888	995	655	485
Extra meals	65	107	73	99
Daily total	2078	1689	1585	1274
<b>Living alone</b>	<b>n=10</b>		<b>n=11</b>	
Breakfast	555	546	697	1165
Lunch	610	887	563	609
Dinner	751	788	575	495
Extra meals	69	118	44	61
Daily total	1984	1278	1879	1878
<b>Living with spouse</b>	<b>n=15</b>		<b>n=12</b>	
Breakfast	1046	1391	680	416
Lunch	572	690	596	670
Dinner	1119	1088	825	572
Extra meals	53	66	130	147
Daily total	2790	2159	2231	1274
<b>Living with another family</b>	<b>n=18</b>		<b>n=23</b>	
Breakfast	328	286	251	183
Lunch	366	269	194	161
Dinner	772	983	604	403
Extra meals	72	125	58	66
Daily total	1538	1140	1107	474

**Table 22.24. Descriptive statistics for Vitamin E intake by the elderly aged 70+ living in Okazaki-shi, Aichi-ken, Japan.**

Vitamin E (mg)	Men (n=43)		Women (n=46)	
	mean	SD	mean	SD
Breakfast	1.6	0.9	1.3	0.6
Lunch	1.6	1.1	1.3	0.6
Dinner	2.7	1.5	2.3	1.2

Extra meals	0.3	0.5	0.3	0.3
Daily total	6.2	2.4	5.2	1.8
<b>Living alone</b>	<b>n=10</b>		<b>n=11</b>	
Breakfast	1.7	1.1	1.2	0.7
Lunch	1.8	1.8	1.4	0.6
Dinner	2.1	1.5	2.2	1.4
Extra meals	0.3	0.6	0.3	0.3
Daily total	5.9	3.0	5.1	2.3
<b>Living with spouse</b>	<b>n=15</b>		<b>n=12</b>	
Breakfast	1.8	0.5	1.9	0.5
Lunch	1.5	0.6	1.4	0.6
Dinner	3.0	1.6	2.9	1.2
Extra meals	0.3	0.6	0.3	0.4
Daily total	6.6	2.0	6.5	1.5
<b>Living with another family</b>	<b>n=18</b>		<b>n=23</b>	
Breakfast	1.3	0.9	1.0	0.3
Lunch	1.7	0.8	1.2	0.7
Dinner	2.7	1.2	2.0	0.9
Extra meals	0.3	0.4	0.2	0.3
Daily total	6.0	2.2	4.4	1.3

**Table 22.25. Percentage intake of three major nutrients (g/day) taken from each meal for a day.**

	<b>Men %</b>	<b>Women %</b>
<b>Carbohydrate</b>		
Breakfast	28.1	27.1
Lunch	29.3	28.5
Dinner	33.7	30.1
Extra meals	8.9	14.2
<b>Protein</b>		
Breakfast	25.4	26.6
Lunch	28.6	27.5
Dinner	41.8	39.7
Extra meals	4.3	6.1
<b>Fat</b>		
Breakfast	27.3	26.4
Lunch	26.3	24.9
Dinner	41.9	43.0
Extra meals	4.5	6.6

**Table 22.26. Descriptive statistics for percentage energy intake from macronutrients, percentages of animal proteins and fat, and ratios of P/S, P/Ca and K/Na by the elderly aged 70+ living in Okazaki-shi, Aichi-ken, Japan.**

	Men		Women	
	mean	SD	mean	SD
Carbohydrate (%E)	63.5	7.4	63.9	7.0
Fat (%E)	21.6	6.0	21.2	5.9
Protein (%E)	14.9	2.6	14.9	2.1
Alcohol (%E)	4.8	9.9	1.0	2.6
Percentage of animal protein	45.2	13.1	44.5	10.4
Percentage of animal fat	47.3	14.2	47.5	13.8
Polyunsaturated fatty acids ratio (S/P)	1.02	0.37	1.02	0.42
Calcium phosphorus ratio (P/Ca)	1.83	0.54	1.74	0.55
Potassium sodium ratio (K/Na)	0.54	0.17	0.53	0.17

Calculated using a values of 7 kcal/g for available energy of alcohol and values of alcohol concentration of alcoholic beverages, 16% for Sake and Shochu (a) or Umeshu (b), 4.5% for beer, 12% for wine. (a) produced from polished rice by fermentation, (b) distilled fluid of cereals or sweet potatoes fermented.

**Table 22.27. Daily dietary allowances (per capita per day) for the elderly aged 70+ by sex and gender which have been recommended in Japan since 1989.**

	Men	Women
Energy (kj)	6270 - 6897	5016 - 6061
Protein (g)	60 - 70	45 - 65
Energy ratio of fat (%)	20 -25	20 - 25
Calcium (mg)	550 - 650	500 - 650
Iron (mg)	10	10
Sodium chloride (g)	<10	<10
Vitamin A (IU)	2000	1800
Vitamin B1 (mg)	0.6 - 0.7	0.5 - 0.7
Vitamin B2 (mg)	0.8 - 1.0	0.6 - 0.9
Vitamin C (mg)	50	50

### 22.1.5 Conclusion

The elderly in Okazaki aged over 70 years had lower intakes for many kinds of food groups than those recommended in Japan. However, close to adequate intakes of nutrients in both quality and

quantity were still achieved in both men and women. They had macro-nutrients in nearly similar amounts from each main meal and in a small amount from extra meals, an eating pattern which presumably is somewhat unique.

The 'living with another family member' group tended to have a lower intake of foods than the 'living alone' group. This is probably due to the fact that those living with family members are less involved in food purchase and food preparation, resulting in inadequate intakes of nearly all nutrients. Those 'living with spouse' on the other hand, consumed a variety of foods and had adequate nutrient intakes. This study was presented at the annual meeting of the Japan Society of Home Economics on May in 1993.

## **22.2 DIFFERENCES IN NUTRIENT INTAKE AMONG THE JAPANESE CENTRES YOKOHAMA, OKAZAKI, HIROSHIMA, KUMAMOTO**

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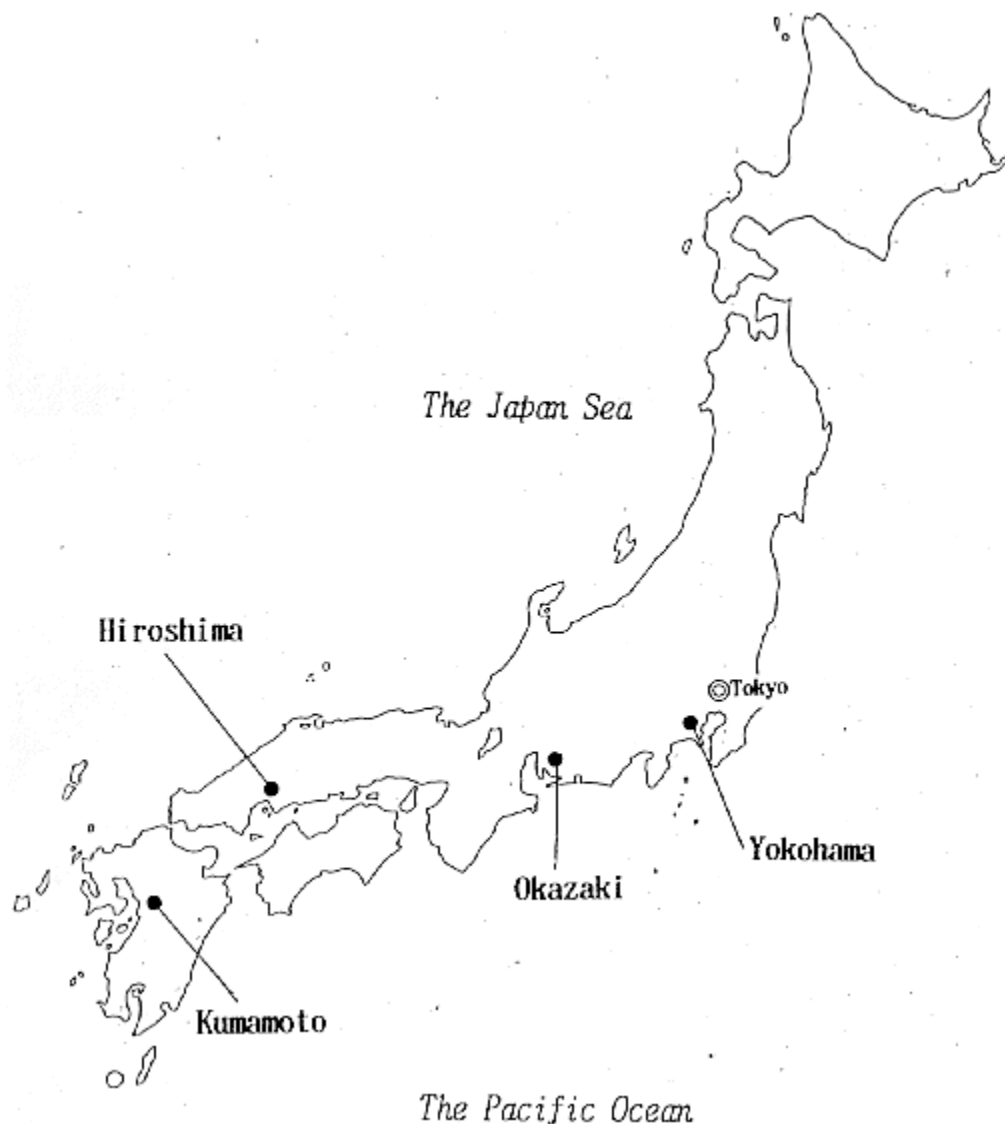
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### **22.2.1 Descriptive demography of four areas surveyed**

The nutritional surveys of the Japanese elderly were carried out from August to October in 1991 in four areas of Japan: Yokohama City, Okazaki City, Hiroshima City and Kumamoto City. The former three cities are located in the prefecture of Kanagawa, Aichi and Hiroshima, respectively. These prefectures are situated in the long and slender main island of Honshu, which stretches from north to south, on the Pacific Ocean coastal side of Japan. Kumamoto city is located in the prefecture of Kumamoto, which belongs to the western and middle region of Kyushu island of Japan.

[Map of Japanese Locations](#)





Average temperature and precipitation throughout the year is 15-17°C and 1,535-1,968 mm (including seldom snowfalls) in the four cities [9]. An approximate population is 3,210,000 in Yokohama City; 310,000 in Okazaki City; 1,060,000 in Hiroshima City and 620,000 in Kumamoto City, with the numbers of men and women almost even. The population densities in persons/km<sup>2</sup> of each city are as follows: 7,399 at Yokohama; 1,352 at Okazaki; 1,467 at Hiroshima; and 3,386 at Kumamoto [9]. The nationwide population density is 333 persons/km<sup>2</sup>. In 1991, the elderly aged 65 years and over were 9.2% of the population in Yokohama, 9.5% in Okazaki, 10.3% in Hiroshima and 12.2% in Kumamoto. There are about 10,800,000 households of elderly aged 65 years and over in Japan; single elderly households were 14.9%, elderly couple households were 21.4%, and others (generally consisting of their child and grandchildren, with

health and meal-supply for the elderly being managed by the younger household wife) were 63.7% in 1990 [2].

### **22.2.2 Subject recruitment**

Subjects aged 70 years and over were randomly selected from an urban area of Yokohama, mixed urban and semi-rural areas of Okazaki, an urban area of Hiroshima and mixed semi-urban and semi-rural areas of Kumamoto. The city hall population registers for residents living in each city were used and letters were subsequently sent requesting their co-operation in the IUNS study. The population register collects names and ages (by birth date) of people in each household. In some places, recruitment of identifying subjects was aided by a council committee of social welfare in the area. The numbers of elderly who responded were 68 (28 men, 40 women) in Yokohama, 89 (43 men, 46 women) in Okazaki, 90 (37 men, 53 women) in Hiroshima and 91 (43 men, 48 women) in Kumamoto.

The response rate to the nutritional survey was 84% in Yokohama, 87% in Okazaki, 89% in Hiroshima and 85% in Kumamoto. All subjects responding to the letter were community-based. In Japan, 1.62% of the 65 and over age group were in institutions in 1990 [3]. The nutritional surveys were carried out on three consecutive days for each subject from August to October in 1991. The interviewers, who were skilled dieticians on most occasions, visited the subject's home and recorded every food and dish eaten on the day or the day before. Most subjects had recorded the weight of foods or dishes eaten, using a scale provided prior to commencement.

### **22.2.3 Intakes of foods and nutrients**

Food and nutrient analyses were performed using the same methods used for the National Nutrition Survey conducted by the Ministry of Health and Welfare in Japan every year [10]. Foods were classified into groups and nutrient intakes estimated using the tables of 'weight average' values which are derived from the usual consumption frequency and serving size of foods. Intakes of energy, protein, calcium, iron, salt and vitamins of A, B1, B2 and C were computed. The dietary method chosen (3 consecutive day food record) is the most widely used method in large scale surveys in Japan. A study by Mori et al. [11] on female college students, showed that the range of four-seasonal foods and nutrient intakes were very small. This suggests that the one-point-survey method as used in the present study, is likely to be appropriate when investigating the nutritional status of subjects.

### **22.2.4 Results:**

#### *22.2.4.1 Characteristics of body sizes of the elderly surveyed*

The average stature and body weight of the subjects were not significantly different between men and women, respectively, resulting in almost similar body mass indices.

**Photo 22.4.** Okazaki, Japan (1991): A group of elderly people, 70, 81, 74 and 70 years old (from left) enjoy a Japanese Gate Ball game every morning.



#### 22.2.4.2 *Characteristics of food intakes of the elderly surveyed*

The intake of foods or food groups by the elderly aged 70 years and over, of Yokohama, Okazaki, Hiroshima and Kumamoto areas are shown in Tables 22.28-22.31. The traditional staple food of boiled rice and the traditional miso or miso-soups, were eaten commonly in the four areas. The intake of these foods were greater in elderly men and women of Okazaki and Kumamoto than in Yokohama and Hiroshima. The inverse was seen for the intake of bread. On the other hand, milk intake was lower in the former than in the latter areas, as was consumption of green and yellow vegetables (especially in women). These consumption patterns suggest that the elderly in Okazaki and Kumamoto still maintain a more traditional Japanese diet. In all areas, intake of alcoholic drinks for men was markedly higher than women. There were no distinguishing differences among the elderly men and women in the four areas for the intake of specific food or food groups.

**Table 22.28. Descriptive statistics for average food intakes by the elderly aged 70+ living in Yokohama.**

<b>Food intakes (g/day):</b>	<b>Men (n=28)</b>		<b>Women (n=40)</b>	
	<b>mean</b>	<b>SD</b>	<b>mean</b>	<b>SD</b>
Rice	145.57	72.30	116.89	46.77
Bread	46.40	40.42	42.72	31.36
Noodles & others	34.33	32.95	33.25	37.23
Potatoes	52.20	76.82	45.41	40.07
Sugars	9.55	8.86	9.60	8.70
Confectionaries	44.64	47.49	33.11	34.15
Fats and oils	10.52	8.55	11.00	9.43
Misos	12.71	11.51	11.17	6.64
Soybean products	52.76	47.06	41.69	34.54
Pulses	3.37	8.24	3.67	8.13
Fruit	144.17	82.22	152.27	93.20
Green & yellow vegies	99.97	82.32	96.63	64.02
Other vegetables	132.92	84.20	139.48	77.72
Seaweeds	71.51	8.84	7.30	14.23
Seasonings	23.79	14.92	20.09	13.62
Alcoholic drinks	149.31	392.32	12.80	42.83
Beverages	55.38	73.99	38.40	64.73
Fish & shellfishes	91.94	55.73	66.93	38.09
Meat & meat products	39.45	28.43	30.50	21.75
Eggs	46.36	25.14	39.38	26.31
Milks	167.39	167.68	151.55	135.24
Dairy products	10.35	24.36	7.71	14.99
Prepared food	18.46	23.69	18.59	23.60

**Table 22.29. Descriptive statistics for average food intakes by the elderly aged 70+ living in Okazaki.**

<b>Food intakes (g/day):</b>	<b>Men (n=37)</b>		<b>Women (n=53)</b>	
	<b>mean</b>	<b>SD</b>	<b>mean</b>	<b>SD</b>
Rice	167.86	70.59	152.85	58.35
Bread	38.43	47.84	28.59	36.27
Noodles and others	34.18	40.23	40.17	136.54
Potatoes	41.57	40.78	41.55	32.38
Sugars	11.90	12.25	9.73	9.79
Confectionaries	23.47	29.76	33.96	34.51
Fats and oils	13.01	10.75	10.61	7.91
Misos	17.91	10.58	16.28	8.66
Soybean products	37.37	31.32	41.96	48.57
Pulses	2.54	6.05	1.38	4.58

Fruit	93.83	68.49	105.77	87.02
Green & yellow vegies	80.38	63.51	71.07	58.46
Other vegetables	102.65	69.37	118.32	63.47
Seaweeds	3.32	3.90	2.96	3.47
Seasonings	28.58	24.64	26.01	18.35
Alcoholic drinks	179.78	350.74	23.85	49.45
Beverages	21.75	36.00	24.54	47.75
Fish & shellfishes	81.66	52.56	62.26	38.13
Meat & meat products	38.95	30.25	28.50	23.27
Eggs	31.33	24.15	28.84	20.35
Milks	89.36	89.80	100.00	87.73
Dairy Products	13.37	32.87	8.53	23.37
Prepared food	9.49	11.34	6.66	9.22

**Table 22.30. Descriptive statistics for average food intakes by the elderly aged 70+ living in Hiroshima.**

Food intakes (g/day):	Men (n=37)		Women (n=53)	
	mean	SD	mean	SD
Rice	140.86	67.64	113.35	43.00
Bread	54.26	33.98	40.69	31.25
Noodles and others	27.08	33.63	32.73	41.63
Potatoes	33.26	32.46	36.30	25.66
Sugars	9.98	8.51	10.59	10.39
Confectionaries	16.51	24.14	23.90	29.75
Fats and oils	14.91	10.82	13.92	10.19
Misos	7.91	7.06	10.83	7.82
Soybean products	50.94	51.35	53.33	33.74
Pulses	2.48	6.13	4.76	10.51
Fruit	199.72	236.45	139.73	107.07
Green & yellow vegies	95.47	90.32	103.77	68.03
Other vegetables	136.55	72.92	104.52	64.33
Seaweeds	3.27	4.38	3.48	4.10
Seasonings	25.98	12.68	26.61	14.62
Alcoholic drinks	180.88	285.70	24.44	72.24
Beverages	16.98	37.21	19.69	36.90
Fish & shellfishes	94.12	59.35	79.97	36.06
Meat & meat products	40.26	32.98	42.20	31.93
Eggs	38.78	28.61	40.43	26.87
Milks	130.85	165.69	120.35	130.12
Dairy Products	6.10	20.16	20.43	41.62

Prepared food	15.88	28.04	13.47	18.88
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**Table 22.31. Descriptive statistics for average food intakes by the elderly aged 70+ living in Kumamoto.**

Food intakes (g/day):	Men (n=43)		Women (n=46)	
	mean	SD	mean	SD
Rice	192.48	45.85	162.30	47.58
Bread	30.93	42.11	17.23	21.82
Noodles and others	34.48	39.02	28.82	28.92
Potatoes	34.89	36.04	29.15	31.15
Sugars	11.29	9.33	8.77	6.16
Confectionaries	10.70	16.85	12.68	22.69
Fats and oils	10.12	9.62	8.16	9.22
Misos	16.71	9.79	14.93	6.71
Soybean products	71.02	52.25	49.76	34.17
Pulses	1.61	5.15	1.50	3.37
Fruit	105.35	99.17	78.24	77.86
Green & yellow vegies	81.80	56.01	75.21	49.39
Other vegetables	139.48	72.59	142.93	78.36
Seaweeds	5.37	8.62	5.65	7.62
Seasonings	22.86	10.26	21.17	11.58
Alcoholic drinks	134.31	179.68	23.11	57.35
Beverages	54.64	100.46	43.28	108.19
Fish & shellfishes	67.04	36.95	56.50	31.65
Meat & meat products	44.27	36.11	30.73	26.32
Eggs	39.17	23.73	33.23	22.90
Milks	95.85	118.10	82.18	101.17
Dairy Products	8.02	20.05	7.17	2.17
Prepared food	4.11	5.01	6.05	7.25

#### 22.2.4.3 Characteristics of nutrient intakes of the elderly surveyed

Table 22.27 lists the recommended dietary allowances (RDAs) since 1989 for Japanese elderly, calculated on the basis of stature, age and gender [12]. Tables 22.32 - 22.35 show that the elderly men and women had adequate intakes of energy, protein, vitamins B1, B2 and C, compared with the RDA. The values for Yokohama's elderly were the highest among the four areas, except for vitamin B2 intake in women. On the other hand, the intake of Ca was adequate in men and women of Yokohama and in Hiroshima women, but was slightly below the RDA for Okazaki

and Kumamoto. Iron intake was adequate only in men of Yokohama and was considerably below the RDA in the women of all areas, especially in Kumamoto. The salt intakes were more than the recommended figure, except in both men and women of Kumamoto.

From the food and nutrient characteristics mentioned above, the elderly surveyed could be classified into two groups, namely, a group of Yokohama and Hiroshima and that of Okazaki and Kumamoto. The former elderly group seems likely to be related to an urban area and the latter to a mixed urban and semi-rural area. Nevertheless, the food habits in Japan tend to be homogeneous, especially in elderly people. For example, all the foods and food groups listed in Tables 22.28-22.31 were eaten commonly throughout the four areas surveyed, with only small differences in their intakes. This study, in part, has already been reported to the Ministry of Health and Welfare in Japan [12].

**Table 22.32. Descriptive statistics for average nutrient intakes by the elderly aged 70+ living in Yokohama.**

Daily nutrient intakes	Men (n=28)		Women (n=40)	
	mean	SD	mean	SD
Energy(kj)	8005	1735	6506	1652
Protein(g)	75.41	17.13	61.33	16.81
Calcium(mg)	637.83	303.59	556.51	245.33
Iron(mg)	10.03	3.08	8.70	2.64
Vitamin A(IU)	1914.23	864.93	1943.05	760.66
Vitamin B1(mg)	1.02	0.32	0.98	0.26
Vitamin B2(mg)	1.29	0.44	1.11	0.39
Vitamin C(mg)	127.80	58.90	126.90	53.90
Sodium chloride(g)	12.25	4.76	10.66	4.4

**Table 22.33. Descriptive statistics for average nutrient intakes by the elderly aged 70+ living in Okazaki.**

Daily nutrient intakes	Men (n=43)		Women (n=46)	
	mean	SD	mean	SD
Energy(kj)	7357	1831	6633	2581
Protein(g)	64.96	18.02	58.43	19.21
Calcium(mg)	480.90	179.84	472.82	160.84
Iron(mg)	8.56	2.45	8.12	2.58
Vitamin A(IU)	1799.79	1232.12	1590.05	1199.79
Vitamin B1(mg)	0.88	0.28	0.81	0.33
Vitamin B2(mg)	1.00	0.32	0.91	0.27
Vitamin C(mg)	84.40	46.49	93.83	46.63

Sodium chloride(g)	11.62	4.21	11.00	3.54
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**Table 22.34. Descriptive statistics for average nutrient intakes by the elderly aged 70+ living in Hiroshima.**

Daily nutrient intakes	Men (n=37)		Women (n=53)	
	mean	SD	mean	SD
Energy(kj)	7336	1955	6478	1477
Protein(g)	68.55	21.86	63.20	15.16
Calcium(mg)	523.08	249.68	505.62	192.29
Iron(mg)	9.01	3.07	8.69	2.35
Vitamin A(IU)	1960.54	931.08	2009.51	795.03
Vitamin B1(mg)	0.92	0.31	0.86	0.27
Vitamin B2(mg)	1.19	0.50	1.15	0.39
Vitamin C(mg)	165.26	175.87	123.54	67.64
Sodium chloride(g)	10.78	4.69	10.44	3.83

**Table 22.35. Descriptive statistics for average nutrient intakes by the elderly aged 70+ living in Kumamoto.**

Daily nutrient intakes	Men (n=43)		Women (n=48)	
	mean	SD	mean	SD
Energy(kj)	7459	1592	5893	1333
Protein(g)	66.27	16.91	54.01	14.46
Calcium(mg)	465.26	186.57	409.32	164.77
Iron(mg)	8.83	2.42	7.46	2.16
Vitamin A(IU)	1851.94	101.52	1582.59	894.04
Vitamin B1(mg)	0.92	0.27	0.76	0.21
Vitamin B2(mg)	1.07	0.33	0.88	0.31
Vitamin C(mg)	101.92	60.90	87.90	45.28
Sodium chloride(g)	9.85	2.68	9.26	3.18

### 22.3 SUMMARY

- The chapter describes differences in food and nutrient intakes according to living arrangements of Japanese elderly participating in the IUNS study.
- A total of 89 (M 43, F 46) subjects aged 70+ were studied, living in mixed urban and semi rural areas of Okazaki-shi (Okazaki city). The response rate was 58.9% for men and 68.6% for women.



- The living styles of the elderly subjects were classified as: living alone (M 10, F 11), living with spouse (M 15, F 12) and living with another family member (M 18, F 23).
- The interviewer visited the subject's home for three consecutive days and recorded all dishes and foods eaten the day before. Most subjects had recorded the foods they had eaten using a portable scale.
- Men and women living alone had the lowest dietary diversity. Women living with another family member had a significantly lower intake of green and yellow vegetables, but overall such a living arrangement was conducive to a higher intake of pulses and fish. Elderly living with a spouse had higher intakes of most foods, especially meat, fish and eggs.
- Average daily intakes of energy, protein, iron, vitamins A and C in the elderly living with a spouse was greater than in the other 2 groups. Elderly living with another family member had the lowest intake of vitamin A. Intakes of fat, carbohydrate, fibre, P, Na, K, vitamins B1 and B2 were similar in all the living arrangement groups.

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## 22.5 ILLUSTRATIONS

- Photo 22.1. Yokohama, Japan (1991): An 84 year old male and his 76 year old wife have been living with their first son's family and two grandchildren for 50 years.
- Photo 22.2. Okazaki, Japan (1991): A 79 year old(left), and a 78 year old (right) women are well and enjoying lunch at a senior citizens club.
- Photo 22.3. Yokohama, Japan (1991): A fit 75 year old man has been living alone for 20 years.
- Photo 22.4. Okazaki, Japan (1991): A group of elderly people, 70, 81, 74 and 70 years old (from left) enjoy a Japanese Gate Ball game every morning.

## CHAPTER 22

### CURRENT STATUS OF FOOD AND NUTRIENT INTAKES OF THE ELDERLY IN JAPAN

#### 22.1 DIFFERENCES IN NUTRIENT INTAKE BY LIVING ARRANGEMENTS IN OKAZAKI

22.1.1 Descriptive demography

22.1.2 Subject recruitment

22.1.3 Intakes of foods and nutrients

22.1.4 Results

22.1.4.1 *Characteristics of food intake of elderly surveyed in Okazaki*

22.1.4.2 *Characteristics of nutrient intakes of the elderly surveyed in Okazaki*

22.1.5 Conclusion

#### 22.2 DIFFERENCES IN NUTRIENT INTAKE AMONG THE JAPANESE CENTRES YOKOHAMA, OKAZAKI, HIROSHIMA, KUMAMOTO

22.2.1 Descriptive demography of four areas surveyed

22.2.2 Subject recruitment

22.2.3 Intakes of foods and nutrients

22.2.4 Results:

22.2.4.1 *Characteristics of body sizes of the elderly surveyed*

22.2.4.2 *Characteristics of food intakes of the food intakes of the elderly surveyed*

22.2.4.3 *Characteristics of nutrient intakes of the elderly surveyed*

#### 22.3 SUMMARY

#### 22.4 REFERENCES

#### 22.5 ILLUSTRATIONS

