

## Original Article

### Section 4: Emerging trends of nutrition: Transition and trade-offs

# Nutrition trends in Japan

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The National Nutrition Survey (NNS) in Japan has been undertaken annually since 1946. It was originally intended to provide information on the food and nutrient intake of the Japanese people, with a view to acquiring emergency food supplies from other countries when food shortages caused malnutrition in many Japanese. The food balance sheet (FBS) has been drawn up since 1949 to show the food supply available to the Japanese people. The trends and figures shown by both approaches were similar until the mid-1970s. Since then, however, the disparity between the food supply and the intake of foods and nutrients has been getting larger. National food security means that a country has enough food for everyone. This does not mean, however, that every family has enough food, because the food may not be evenly distributed. In fact, marginal deficiencies in iron and calcium are thought to still exist and there is considerable variation among households in energy intake. In Japan, nutrition and diet are now considered to play important roles in the emerging problems of obesity, diabetes mellitus, hypertension etc., because of excessive energy intake and deficiency or excessive intake of certain nutrients.

**Key words:** food balance sheet, food security, life-style related diseases, National Nutrition Survey, nutrition policy.

## Introduction

Japan has experienced drastic changes in its socioeconomic conditions during the last half century. The dietary habits of the Japanese have shifted from 'traditional' to 'modernized'. Steamed rice is still the staple food, but a large proportion of the Japanese population has turned to a Westernized diet that involves an excessive amount of energy and animal fat. The dangers of this dietary shift include the emerging problems of obesity, hyperlipidemia, diabetes mellitus and some types of cancers. The present paper examines key areas of the dietary transition in Japan, from the perspective of food security and health promotion.

## Trends in food and nutrient intake

The National Nutrition Survey (NNS) in Japan has been undertaken annually since 1946, when food shortages were causing malnutrition in many Japanese. It is intended to provide information on the food and nutrient intake of the Japanese people, with a view to acquiring necessary food supplies from other countries. The survey was originally undertaken under the guidance of the General Headquarters of the US. At first, the survey only covered the Tokyo area, but the survey area was gradually expanded, becoming nationwide in 1948 (excluding Okinawa until 1972).<sup>1–3</sup> The 1952 Nutrition Improvement Law states the aim and specifies the implementation of the National Nutrition Survey. In the survey, sample households are selected from 300 regional health centres, in turn selected from approximately 850 health centres under the supervision of the Health Promotion and Nutrition Division and the municipal authorities. Previously, 20 households were selected from each regional health

centre area, making a total of 6000 households. However, recently the actual sample size has been kept at approximately 5000 households nationwide. Since 1972, the food intake survey in households has been performed on 3 consecutive days (excluding Saturday, Sunday and national holidays) in mid-November.

The trends in nutrient and food intake, from 1946 to 1996, are shown in Tables 1 and 2.

From a socioeconomic standpoint, conditions in Japan during the 20th century can be divided into four periods: (i) the privation period (up to 1950); (ii) the reconstruction period (1950–1960); (iii) the high economic growth period (1960–1975); and (iv) the low economic growth period (after 1975).<sup>4</sup> During the privation period, particularly before 1935, the Japanese relied too much on their staple food, steamed rice. Steamed rice contributed to more than 80% of their energy intake, which was estimated to be between 7531 and 11 715 kJ/day, although steamed rice also supplied much vegetable protein (35–40 g/day) as well as carbohydrates.<sup>5</sup> After the privation period, energy intake continued to increase until 1971; since then, it has been decreasing year by year. The average energy intake is generally satisfactory. However, there is considerable variation among households in energy intake; 23.6% of households have an average energy intake at least 20% higher than the required level and 10.9% have

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**Table 1.** Annual change in intake of nutrients per capita per day in Japan from 1946 to 1996

Year	Energy (kcal)	Protein (g)	Animal protein (g)	Fat (g)	Animal fat (g)	Carbohydrate (g)	Calcium (mg)	Iron (g)	Vitamin A (IU)	Vitamin B <sub>1</sub> (mg)	Vitamin B <sub>2</sub> (mg)	Vitamin C (mg)	Salt (g)
1946	1903	59.2	11.0	14.7	–	–	253	47.5	4641	1.81	0.67	187	–
1947	2000	60.7	11.0	13.4	–	–	251	46.5	2969	1.82	0.62	153	–
1948	2014	63.0	13.0	13.9	–	–	261	44.0	3074	1.53	0.72	138	–
1949	2097	65.0	14.0	16.0	–	423	200	47.0	2416	1.60	0.70	115	–
1950	2098	68.0	17.0	18.0	–	418	270	46.0	2459	1.52	0.72	107	–
1951	2125	68.0	19.0	18.0	–	424	270	49.0	2262	1.58	0.76	99	–
1952	2109	70.0	23.0	20.0	–	412	373	65.0	2700	1.14	0.67	77	–
1953	2068	69.0	22.0	20.0	–	403	370	61.0	2721	1.07	0.65	72	–
1954	2074	68.9	22.1	20.9	–	403	362	60.0	2814	1.12	0.66	75	–
1955	2104	69.7	22.3	20.3	–	411	338	14.0	1084	1.16	0.67	76	–
1956	2092	69.1	22.6	21.8	–	405	379	16.0	1190	1.13	0.70	77	–
1957	2089	69.6	23.2	21.9	–	404	384	14.0	1253	1.09	0.71	77	–
1958	2118	70.1	23.8	23.7	–	406	388	15.0	1240	1.07	0.73	77	–
1959	2117	69.3	23.5	23.8	–	406	385	14.0	1225	1.05	0.74	78	–
1960	2096	69.7	24.7	24.7	–	399	389	13.0	1180	1.05	0.72	75	–
1961	2106	69.7	25.2	26.1	–	399	393	13.0	1228	1.04	0.73	76	–
1962	2080	70.4	27.3	28.3	–	386	402	13.0	1327	1.10	0.77	75	–
1963	2083	70.6	27.7	29.2	–	382	409	13.0	1452	1.03	0.79	79	–
1964	2223	74.4	28.7	34.3	–	398	476	–	1496	1.05	0.82	114	–
1965	2184	71.3	28.5	36.0	14.3	384	465	–	1324	0.97	0.83	78	–
1966	2193	74.8	29.3	39.7	17.8	380	499	–	1600	1.03	0.90	118	–
1967	2228	76.6	31.7	42.4	18.9	382	529	–	1407	1.08	0.92	96	–
1968	2224	76.9	32.4	44.6	19.9	375	529	–	1421	1.10	0.96	96	–
1969	2242	77.8	33.7	45.8	20.6	377	537	–	1490	1.17	0.99	104	–
1970	2210	77.6	34.2	46.5	20.9	368	536	–	1536	1.13	1.00	96	–
1971	2287	78.1	34.8	48.7	22.5	379	524	13.5	1457	1.12	0.92	108	–
1972	2279	82.9	40.4	50.1	27.0	359	549	13.9	2067	1.19	0.98	115	–
1973	2273	84.1	41.9	52.2	29.0	351	551	14.1	2043	1.22	0.98	117	14.5
1974	2187	78.7	37.9	51.6	26.9	339	540	13.3	1673	1.08	0.94	120	14.4
1975	2188	80.0	38.9	52.0	27.4	337	550	13.4	1899	1.39	1.23	138	13.5
1976	2194	79.6	38.0	55.2	26.2	329	547	10.9	2060	1.40	1.21	135	13.7
1977	2185	79.7	38.6	56.5	27.2	323	550	10.9	2095	1.40	1.24	142	13.4
1978	2204	81.0	39.8	57.9	27.7	324	562	11.0	2128	1.39	1.26	144	13.4
1979	2148	79.6	39.4	57.7	27.9	312	551	10.7	2045	1.38	1.23	132	13.0
1980	2119	78.7	39.2	55.6	26.9	309	539	10.4	1986	1.37	1.21	123	12.9
1981	2137	79.7	40.2	57.7	28.0	307	552	10.7	2113	1.37	1.24	132	12.5
1982	2136	79.6	40.0	58.0	28.2	306	559	10.8	2120	1.38	1.26	132	12.3
1983	2147	80.9	40.9	58.6	28.3	307	580	10.9	2190	1.37	1.29	134	12.4
1984	2107	79.3	40.4	58.0	28.1	299	562	10.7	2177	1.34	1.26	130	12.2
1985	2088	79.0	40.1	56.9	27.6	298	553	10.8	2188	1.34	1.25	128	12.1
1986	2075	78.9	40.1	56.6	27.9	295	551	10.7	2169	1.35	1.26	124	12.1
1987	2053	78.5	40.1	56.6	27.6	291	551	10.5	2119	1.34	1.25	122	11.7
1988	2057	79.2	41.7	58.3	28.0	289	524	11.1	2596	1.29	1.32	115	12.2
1989	2061	80.2	42.4	58.9	28.3	290	540	11.4	2687	1.26	1.36	123	12.2
1990	2026	78.7	41.4	56.9	27.5	287	531	11.1	2567	1.23	1.33	120	12.5
1991	2053	80.2	42.7	58.0	28.4	288	541	11.2	2685	1.26	1.35	113	12.9
1992	2058	80.1	42.5	58.4	28.5	289	539	11.3	2649	1.25	1.36	122	12.9
1993	2034	79.5	42.2	58.1	28.3	285	537	11.2	2603	1.22	1.34	117	12.8
1994	2023	79.7	42.5	58.0	28.5	282	545	11.3	2602	1.21	1.35	117	12.8
1995	2042	81.5	44.4	59.9	29.8	280	585	11.8	2840	1.22	1.47	135	13.2
1996	2002	80.1	43.1	58.9	29.3	274	573	11.7	2836	1.21	1.43	131	13.0

For fiscal years 1946–1963, data represent arithmetic averages of the results of surveys conducted four times a year. Because the method for the calculation of energy was revised in 1964, simple comparison with figures in previous years is not possible.

The survey was conducted in May in 1965 and 1967–1971.

From 1964 to 1971, the survey period was 5 days.

For the intake of nutrients, losses in cooking were disregarded from fiscal year 1953.

For fiscal years 1946–1971, Okinawa Prefecture is excluded from the results.

From 1969 to 1971, 'beverages' excluded intake from sake (alcoholic beverage).

The food composition table used to estimate nutrient intake was revised in 1949, 1955, 1971, 1982 and 1990. The big change in iron and vitamin A intake in 1955 may be due to the revision of the food composition table.

From fiscal year 1955, figures for vitamin A (IU) were lower because only one-third of carotene (IU) was added to the vitamin A count.

Salt = Sodium  $\times$  2.54/100

–, not available.

Table 2. Annual changes in the intake of food group per capita per day in Japan from 1946 to 1996

Year	Rice	Wheat	Total grains	Nuts	Potatoes	Sugars	Confectionary	Fats and oils	Beans	Fruit	Green and yellow vegetables	Other vegetables	Seaweeds	Condiments and beverages	Fish and shellfish	Meats	Eggs	Milk and dairy products
	(g)	(g)	(g)	(g)	(g)	(g)	(g)	(g)	(g)	(g)	(g)	(g)	(g)	(g)	(g)	(g)	(g)	(g)
1946	-	-	398.4	-	277.9	0.5	-	1.7	30.9	16.9	153.8	152.8	-	-	55.0	-	-	3.1
1947	-	-	410.7	-	268.6	0.8	-	1.2	33.2	22.7	96.0	144.1	-	-	51.7	-	-	2.2
1948	-	-	435.8	-	210.2	6.0	-	1.2	37.5	31.7	98.2	124.3	-	-	60.7	-	-	3.0
1949	333.1	65.8	473.1	0.8	169.9	5.2	-	1.8	49.8	27.5	76.0	168.9	3.4	28.1	55.8	5.4	3.2	4.1
1950	338.7	68.7	476.8	0.9	127.2	7.2	-	2.6	53.7	41.5	75.6	166.4	3.0	32.0	61.0	8.4	5.6	6.8
1951	354.7	76.3	496.3	0.7	113.6	11.3	-	3.2	63.0	47.1	66.4	154.3	3.8	39.7	72.5	7.2	7.4	8.3
1952	352.5	68.0	481.2	0.6	84.2	14.5	-	3.9	68.4	48.9	63.8	158.2	4.1	42.9	82.3	10.6	10.0	10.6
1953	349.8	72.4	478.3	0.5	74.2	14.8	-	4.2	69.6	37.8	61.0	152.5	4.4	42.2	80.3	10.3	10.3	10.3
1954	342.1	73.2	474.6	0.5	77.0	15.6	-	4.6	68.2	37.4	59.6	156.3	4.8	40.5	77.7	10.8	11.3	13.1
1955	346.6	68.3	479.6	0.4	80.8	15.8	-	4.4	67.3	44.3	61.3	184.9	4.3	42.4	77.2	12.0	11.5	14.2
1956	362.7	65.9	474.3	0.5	68.0	15.6	-	5.1	72.7	65.6	49.6	180.4	5.0	44.5	72.7	15.8	12.9	21.4
1957	351.2	59.7	458.2	0.6	78.0	10.3	17.3	4.8	69.9	64.0	49.7	170.5	5.1	47.6	75.9	15.0	12.8	18.4
1958	354.7	65.5	461.2	0.5	73.0	12.3	18.0	5.7	71.0	77.2	45.8	171.6	5.0	47.9	74.9	17.6	14.8	24.6
1959	364.4	63.7	462.4	0.4	66.7	12.5	18.6	5.8	69.9	67.3	43.1	186.9	4.7	51.8	72.6	18.5	16.5	28.5
1960	358.4	65.1	452.6	0.5	64.4	12.3	20.4	6.1	71.2	68.7	39.0	186.0	4.7	55.2	76.9	18.7	18.9	32.9
1961	363.6	63.4	450.0	0.4	64.4	12.9	21.0	6.6	69.4	75.2	40.0	179.2	4.5	57.1	73.8	21.0	22.6	35.2
1962	352.0	68.4	436.2	0.5	53.8	13.4	23.0	7.6	70.8	67.1	38.6	183.7	4.6	64.0	74.5	27.8	27.3	41.7
1963	350.7	64.6	428.2	0.4	52.8	14.0	23.4	8.1	69.4	82.3	40.7	190.2	4.6	66.1	77.5	28.2	27.6	44.7
1964	354.3	62.9	425.2	0.6	74.0	14.8	30.6	7.9	74.4	127.7	50.7	176.7	4.7	61.4	83.6	30.6	30.2	46.2
1965	349.8	60.4	418.5	0.5	41.9	17.9	31.6	10.2	69.6	58.8	49.0	170.4	6.1	87.8	76.3	29.5	35.2	57.4
1966	334.7	69.4	411.9	1.5	69.1	14.9	24.0	10.8	75.6	120.2	45.7	193.1	3.9	64.2	84.4	34.7	34.0	54.4
1967	318.7	68.0	393.7	1.9	41.1	19.2	32.4	12.9	74.0	82.3	44.0	194.4	6.9	107.7	84.0	34.8	38.9	75.4
1968	308.3	67.0	381.0	1.9	44.9	20.1	36.6	14.0	73.9	79.9	47.7	199.2	6.2	112.4	86.3	37.9	37.9	74.1
1969	305.9	66.5	377.2	1.8	44.1	20.7	36.9	15.2	72.2	99.8	46.2	197.7	6.8	125.0	86.8	40.1	41.3	78.0
1970	306.1	64.8	374.1	1.9	37.8	19.7	36.7	15.6	71.2	81.0	50.2	199.1	6.9	126.7	87.4	42.5	41.2	78.8
1971	308.4	63.3	374.7	1.7	38.8	19.9	37.1	17.3	71.2	110.5	48.8	217.0	6.8	140.2	84.2	47.0	43.0	86.2
1972	274.7	88.6	365.1	1.5	51.2	13.0	35.9	13.3	64.1	169.2	83.3	193.1	4.4	116.4	92.7	70.8	38.7	95.2
1973	269.5	90.0	361.3	1.5	50.7	12.4	31.1	14.0	63.6	184.0	81.3	202.5	4.5	115.7	96.0	73.9	41.3	94.3
1974	252.3	89.8	343.7	1.6	61.7	15.1	28.0	16.2	67.0	183.6	52.3	196.9	4.7	114.2	91.0	62.8	41.1	96.5
1975	248.3	90.2	340.0	1.5	60.9	14.6	29.0	15.8	70.0	193.5	48.2	189.9	4.9	119.7	94.0	64.2	41.5	103.6
1976	243.0	91.6	336.3	1.5	63.3	14.8	27.9	17.0	68.5	170.5	56.3	196.5	5.5	113.4	90.1	64.4	40.3	100.6
1977	234.5	92.4	328.5	1.4	61.9	14.0	27.1	17.7	67.7	180.9	59.3	203.0	5.0	116.4	88.5	68.4	40.8	106.8
1978	233.7	93.3	328.7	1.6	60.8	14.3	26.4	18.3	67.6	181.3	59.5	198.2	5.6	122.4	92.8	69.2	41.6	109.9
1979	222.9	96.3	320.7	1.3	63.9	13.6	25.0	18.0	69.4	166.5	51.0	194.7	5.3	115.6	88.8	71.7	41.1	112.9
1980	225.8	91.8	319.1	1.3	63.4	12.0	25.0	16.9	65.4	155.2	51.0	192.3	5.1	109.7	92.5	67.9	37.7	115.2
1981	221.8	96.5	319.9	1.5	61.1	12.6	24.7	18.1	66.2	154.6	58.3	195.2	4.7	108.7	92.0	72.4	39.5	116.4
1982	218.2	95.9	315.8	1.4	61.0	12.2	25.1	18.3	67.2	159.7	58.7	192.2	5.0	114.6	90.2	70.8	40.0	124.2
1983	217.9	95.3	314.9	1.6	63.1	12.4	25.2	18.0	69.9	166.4	61.1	189.0	5.7	113.3	93.4	70.7	40.4	129.4
1984	214.3	93.8	309.8	1.6	60.6	11.6	23.4	18.4	66.2	145.0	73.1	181.7	5.3	117.4	91.5	71.3	40.3	124.0

Table 2. Continued

Year	Rice	Wheat	Total grains	Nuts	Potatoes	Sugars	Confectionary	Fats and oils	Beans	Fruit	Green and yellow vegetables	Other vegetables	Seaweeds	Condiments and beverages	Fish and shellfish	Meats	Eggs	Milk and dairy products
	(g)	(g)	(g)	(g)	(g)	(g)	(g)	(g)	(g)	(g)	(g)	(g)	(g)	(g)	(g)	(g)	(g)	(g)
1985	216.1	91.3	308.9	1.4	63.2	11.2	22.8	17.7	66.6	140.6	73.9	178.1	5.6	113.4	90.0	71.7	40.3	116.7
1986	212.1	93.7	307.3	1.7	62.5	11.2	22.9	16.8	65.3	137.0	70.9	189.2	5.5	113.3	90.5	70.8	41.2	117.9
1987	208.8	91.9	302.1	1.5	61.3	10.7	20.7	17.4	64.4	137.9	71.1	174.0	5.5	121.2	92.7	69.1	40.1	121.5
1988	200.9	86.1	289.2	1.5	66.6	11.2	20.8	18.1	70.7	124.9	72.8	166.9	5.9	117.9	96.1	74.1	43.1	122.2
1989	198.0	88.3	288.5	1.6	65.3	10.9	22.0	18.7	68.1	127.9	81.1	172.4	5.8	120.6	96.2	75.2	43.6	128.4
1990	197.9	84.8	285.2	1.4	65.3	10.6	20.3	17.6	68.5	124.8	77.2	162.8	6.1	137.4	95.3	71.2	42.3	130.1
1991	198.9	87.2	288.2	1.4	68.8	10.3	21.5	17.4	68.6	112.4	73.2	165.8	6.1	144.1	96.8	76.4	42.7	128.7
1992	197.3	85.3	284.9	1.5	65.0	11.7	20.9	18.0	67.5	126.1	80.9	177.0	5.6	146.8	96.8	75.1	43.3	129.0
1993	195.4	86.9	284.4	1.4	62.5	10.2	20.3	17.9	65.9	114.9	81.6	170.2	5.5	143.3	96.2	73.7	42.7	130.8
1994	192.4	86.4	280.9	1.7	62.2	10.0	19.6	17.6	66.8	117.2	81.8	161.1	5.8	147.7	97.0	74.5	43.0	132.5
1995	167.9	93.7	264.0	2.1	68.9	9.9	26.8	17.3	70.0	133.0	94.0	184.4	5.3	190.2	96.9	82.3	42.1	144.5
1996	166.5	93.9	262.9	2.1	67.8	9.7	24.5	16.9	72.3	118.6	98.9	186.8	5.5	182.4	97.0	77.8	42.1	133.9

For fiscal years 1946–1963, data represent the arithmetic average of the results of surveys conducted four times a year.

The survey was conducted in May in 1965 and 1967–1971.

From 1964 to 1971, the survey period was 5 days.

For fiscal years 1946–1971, Okinawa Prefecture is excluded from the results.

From 1969 to 1971, 'beverages' exclude intake from sake (alcoholic beverage).

From 1958 to 1970, 'other vegetables' include mushrooms.

Tomatoes were classified as 'fruit' from 1957 to 1962, as 'other vegetables' from 1963 to 1983 and as 'green and yellow vegetables' from 1984.

–, not available.

average energy intakes at least 20% lower. The breakdown or composition of energy intake is also important. The percentage of energy obtained from fats is rising and reached 26.5% in 1996. In contrast, the percentage of energy obtained from carbohydrates has been decreasing, sinking to 57.5% in 1996 (Fig. 1).

Protein and fat intake have been increasing. In particular, the consumption of animal fat and animal protein has increased rapidly in the 1960s and 1970s, corresponding to the high economic growth period in Japan. With the oil crisis in 1973 marking the turning point to a low economic growth period, the intake of fat and protein stopped increasing and became almost stable. The percentage of fat from animal sources was 23.5% in 1996; 64.8% of fat comes from fats and oils, meat, fish and shellfish, and eggs. The percentage of protein of animal origin increased from 48.0% in 1975 to 53.8% in 1996. The percentage of protein from cereals, especially rice, decreased from 20.6% in 1975 to 13.9% in 1996. In 1996, the NNS indicated that the average Japanese intake of nutrients is generally satisfactory compared with the required level, with the exception of calcium (Fig. 2).

Sodium intake has been a major concern with regard to the prevention of hypertension, stroke and gastric cancer in Japan. Due to nationwide health campaigns and health edu-

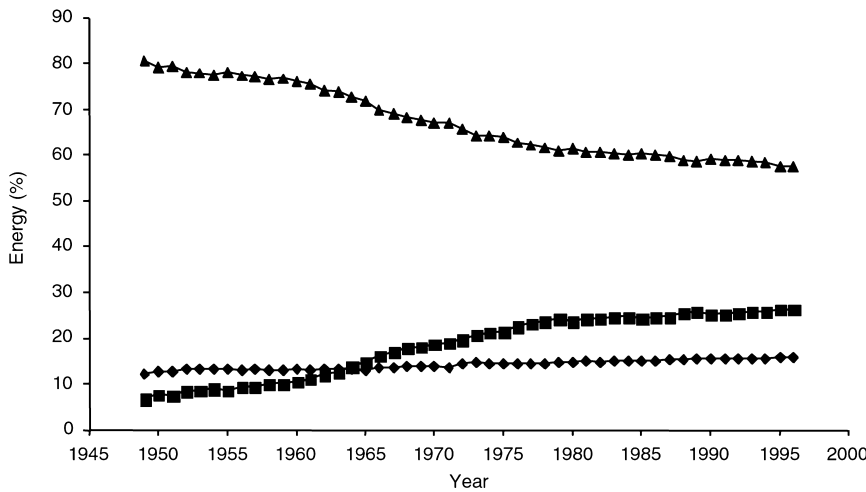
cation, as well as the spread of refrigerators, sodium intake has decreased remarkably. Data on sodium intake (based on the amount of salt intake) are available from the NNS from 1975. They were calculated from the survey of food intake, not from urine samples. Salt intake has gradually decreased, reaching its lowest level of less than 12 g per capita per day in 1987. After that, the level slowly increased and then became stable (Fig. 3).

Geographically, the Tohoku and Hokuriku areas (in the northern part of Japan) are well known for their high incidence of stroke and high salt intake. Regional differences in salt intake have become less marked, but are still present.

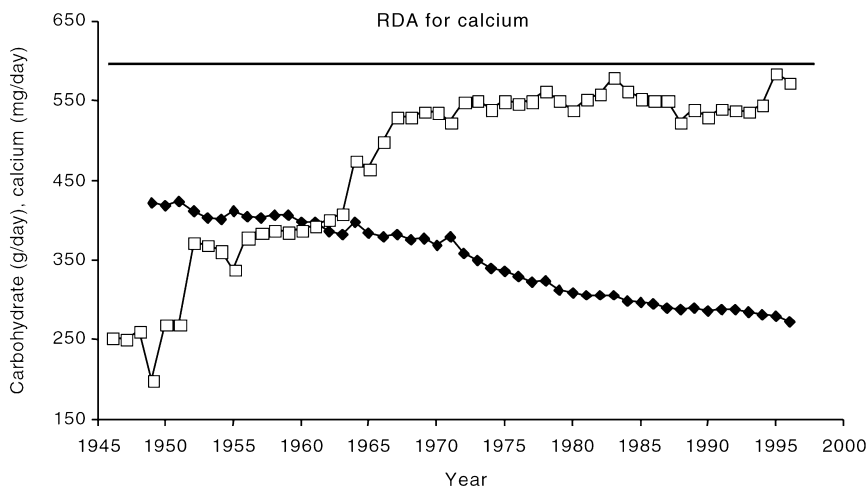
**Discrepancies between the supply and intake of food and nutrients**

The Food Balance Sheet (FBS) has been drawn up since 1949 to show the food supply available to the Japanese people. In many countries, where there is no national dietary survey system, the FBS is often used to estimate food intake. The following analysis is drawn from data for food and nutrient supply for the period from 1960 to 1996.<sup>6,7</sup>

Energy supply increased from 9581 kJ/day in 1960 to 11 088 kJ/day in 1996. The trends in both supply and intake of energy were similar until the mid-1970s, but the disparity



**Figure 1.** Percentage of energy obtained from major nutrients in Japan from 1949 to 1996. (▲), carbohydrates; (■), fat; (◆), protein.



**Figure 2.** Intake of carbohydrate (◆) and calcium (□) in Japan from 1946 to 1996.

has been getting larger since then, reaching 2720 kJ/day in 1996 (Fig. 4).

The discrepancies between supply and intake in protein, fat and carbohydrates have also been getting larger, reaching 10, 28 and 100 g, respectively, in 1996 (Figs 5–7).

Methodological issues arise in comparing data from the two approaches. The NNS was conducted four times a year from 1946 to 1963 to take into consideration the seasonal

variation of food intake. The seasonal variation of food intake has become smaller, but still exists. These discrepancies may reflect the characteristics of the season when the NNS was conducted, but the magnitude of the discrepancy is such that it is thought to be more than just the effect of seasonal variation.

The supply of energy and macronutrients as observed from the FBS has been greater than their intakes as obtained from the NNS. This means that national food security appears to be satisfactory in Japan. Under any circumstances, securing a stable food supply in terms of quantity and quality is vital to maintaining peace and stability in society and in people's lives. Today, Japanese people enjoy a widely varied diet, combining domestically produced and imported food. However, as the gap between the supply and intake of food widens, Japan's food self-sufficiency ratio is on a continual decline (Fig. 8).

In 1996, Japan's food self-sufficiency ratio was 42% in terms of energy. Figure 9 shows the self-sufficiency ratios for several food groups. The self-sufficiency ratio of Japan for grain was 29% in 1996, the lowest among the major industrialized countries. The grain self-sufficiency ratio is ranked 135 among the world's 178 economies. In other words, Japan depends on farm imports for much of its food supply.

In order to maintain its current diet, Japan depends on overseas farmland that is 2.4-fold as large as domestic farmland.<sup>8</sup>

The volume of food products imported into Japan has increased rapidly in line with the progress in globalization. As a result, Japan's food industry is faced with fierce competition from foreign products. This is prompting Japanese food companies to locate food production plants in foreign countries. If the current trend continues, this will lead to the relocation of Japan's food manufacturing industry overseas, reducing the demand for agricultural raw materials produced in Japan and further lowering the nation's food self-sufficiency ratio.

#### Problems concerning the individual intake of nutrition

The NNS in Japan has been performed on a household basis. In 1995, the Nutrition and Diet Administration started making efforts to investigate individual intake of food and nutrients in order to obtain food and nutrient intake data by sex and age

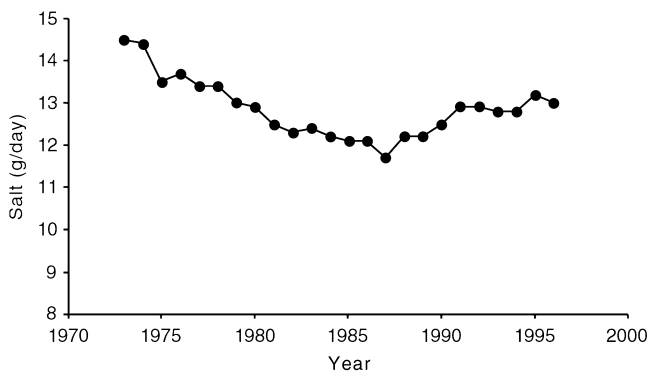


Figure 3. Salt intake in Japan from 1973 to 1996.

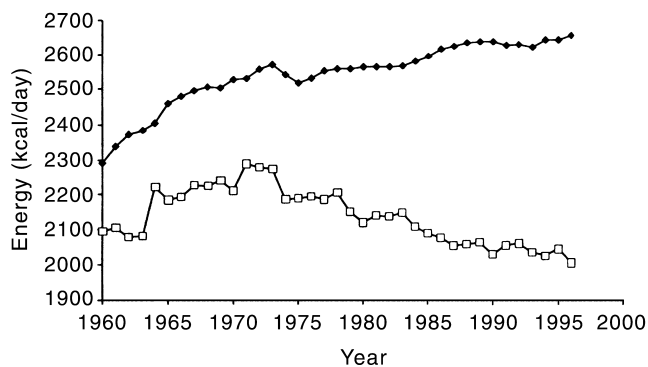


Figure 4. Energy supply (◆; data from the Food Balance Sheet)<sup>10</sup> and intake (□; data from the National Nutrition Survey)<sup>11</sup> in Japan from 1960 to 1996.

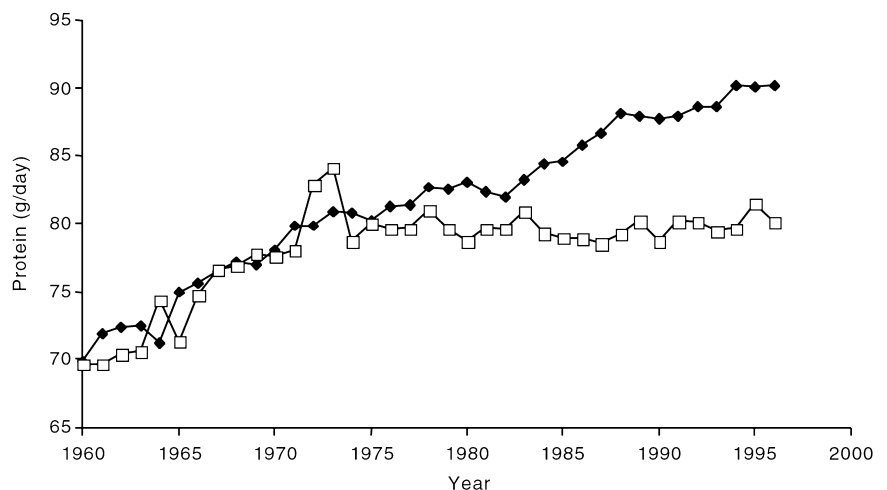
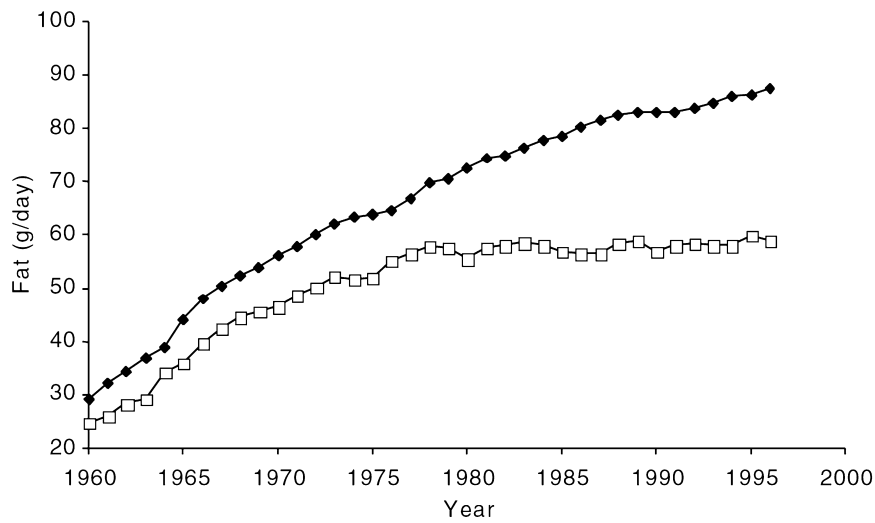
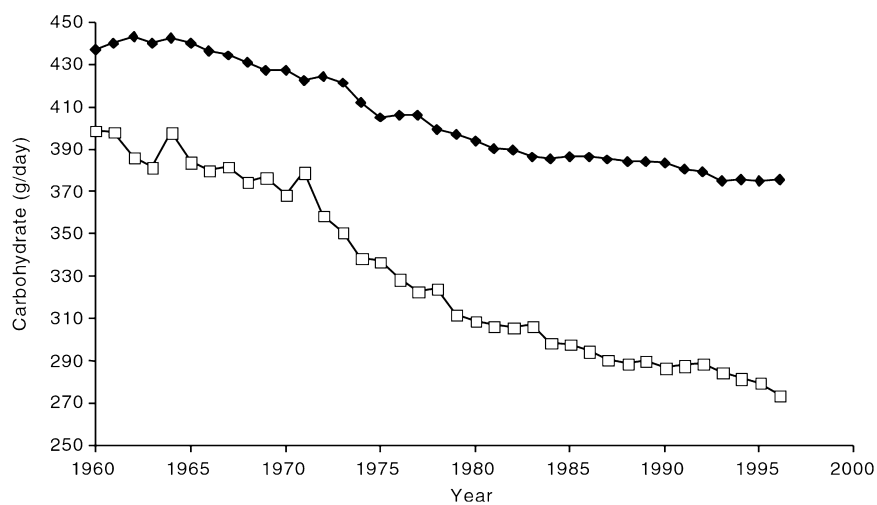


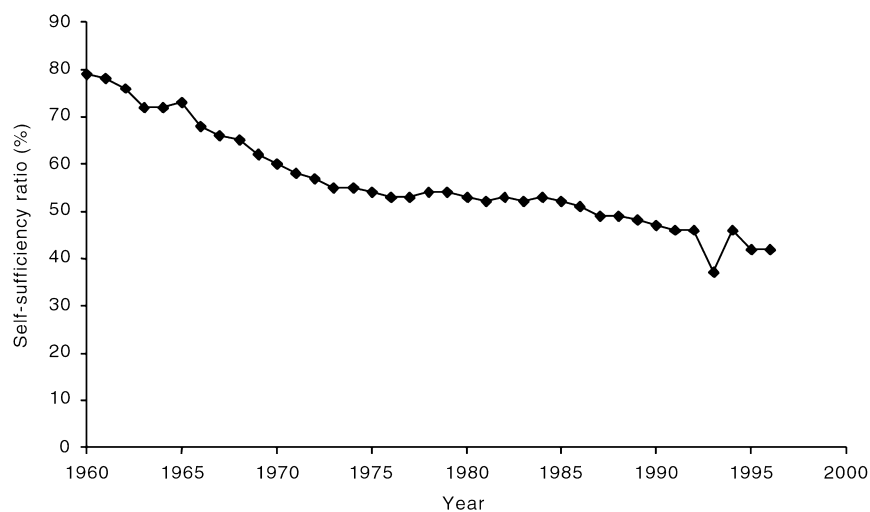
Figure 5. Protein supply (◆; data from the Food Balance Sheet)<sup>10</sup> and intake (□; data from the National Nutrition Survey)<sup>11</sup> in Japan from 1960 to 1996.



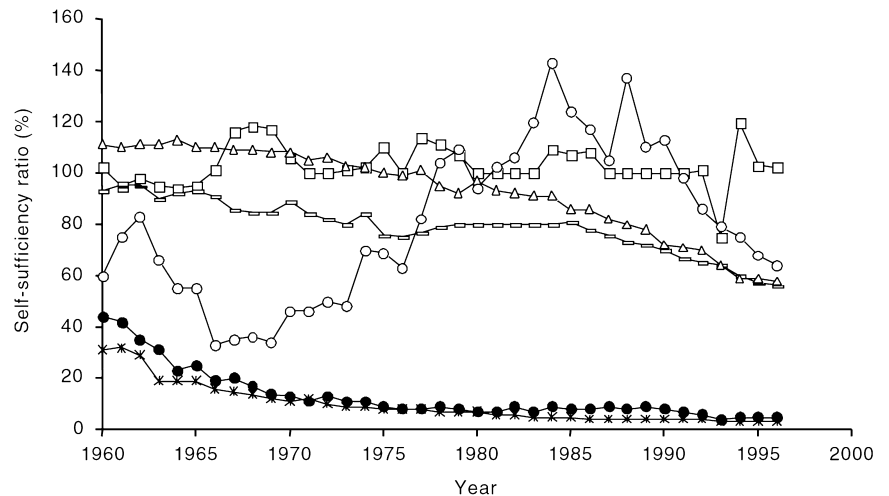
**Figure 6.** Fat supply (◆; data from the Food Balance Sheet)<sup>10</sup> and intake (□ data from the National Nutrition Survey)<sup>11</sup> in Japan from 1960 to 1996.



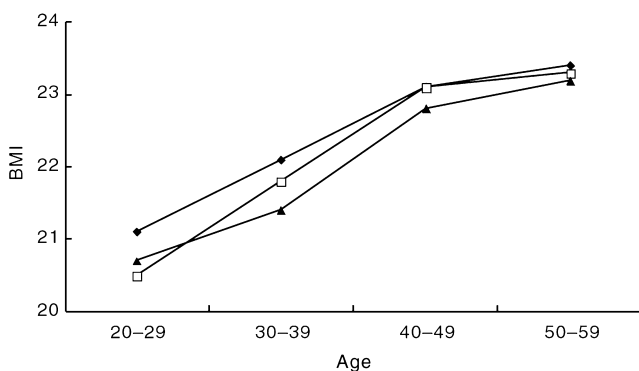
**Figure 7.** Carbohydrate supply (◆; data from the Food Balance Sheet)<sup>10</sup> and intake (□; data from the National Nutrition Survey)<sup>11</sup> in Japan from 1960 to 1996.



**Figure 8.** Food self-sufficiency ratio in Japan from 1960 to 1996.



**Figure 9.** Self-sufficiency ratio for various foods in Japan from 1960 to 1996. (□), rice; (◻), meat; (●), pulses; (×), vegetable oil; (△), fish and shellfish; (○) animal fat.<sup>10</sup>



**Figure 10.** Trends in body mass index (BMI) for females in Japan from 1976 to 1996. (◆), 1976; (□), 1987; (▲), 1996.

group. As mentioned earlier, at present the Japanese people have access to an adequate supply of food and have many food choices. However, some people have a nutrient intake that does not meet the required level (recommended dietary allowance; RDA). For example, almost 30% of young girls in their teens and 20s have an intake less than 80% of the required level of energy. Furthermore, for females in their 20s, the average body mass index level is lower now than it was 20 years ago, as shown in Fig. 10.

It is thought that young women want to be extremely slim and 10% are on a diet. However, their nutrient intake balance is not desirable, with 31.2% of energy coming from fat. In 1990, dietary guidelines for women were issued to promote better health through good eating habits. These dietary guidelines have now been modified to make them more effective.

### Conclusions

In answer to the growing concern over health and to secure a stable food supply, it is imperative that new policies are developed to enhance the quality of life of the people and to

improve their health. The necessity for improvements in nutrition policy was highlighted in a report presented by the study committee on nutrition and diet in the 21st century.<sup>9</sup> At present, the ministries involved in the field of nutrition and diet (Health and Welfare, Education, Agriculture, Forestry and Fisheries, and Labor) carry out their policies separately, under separate jurisdictions. For this reason, it is necessary to encourage cooperation and coordination among these ministries and to strengthen the functions of national policy as a whole. It is also important for ministries to work together to provide more coherent health and nutrition education.

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