J Nutr Sci Vitaminol, **59**, 584–595, 2013

Report

Dietary Intake of Nutrients with Adequate Intake Values in the Dietary Reference Intakes for Japanese

Nobuyo TSUBOYAMA-KASAOKA[1], Asuka TAKIZAWA[1], Megumi TSUBOTA-UTSUGI[1], Makiko NAKADE[1], Eri IMAI[1], Akiko KONDO[1], Kazue YOSHIDA[1], Nagako OKUDA[2], Nobuo NISHI[3] and HIDEMI TAKIMOTO[1,2]

[1] *Section of the Dietary Reference Intakes, Department of Nutritional Epidemiology,*
[2] *Section of the National Health and Nutrition Survey, Department of Nutritional Epidemiology, and*
[3] *Center for International Collaboration and Partnership, National Institute of Health and Nutrition, Tokyo 162–8636, Japan*

(Received July 12, 2013)

Summary The Adequate Intake (AI) values in the Dietary Reference Intakes for Japanese (DRIs-J) 2010 were mainly determined based on the median intakes from 2 y of pooled data (2005–2006) from the National Health and Nutrition Survey-Japan (NHNS-J). However, it remains unclear whether 2 y of pooled data from the NHNS-J are appropriate for evaluating the intake of the population. To clarify the differences in nutrient intakes determined from 2 and 7 y of pooled data, we analyzed selected nutrient intake levels by sex and age groups using NHNS-J data. Intake data were obtained from 64,624 individuals (age: ≥1 y; 47.4% men) who completed a semi-weighed 1-d household dietary record that was part of the NHNS-J conducted annually in Japan from 2003 to 2009. There were no large differences between the median intakes calculated from 2 or 7 y of pooled data for *n*-6 or *n*-3 polyunsaturated fatty acids (PUFAs), vitamin D, pantothenic acid, potassium, or phosphorus. When the AI values and median intakes were compared, there was no large difference in the values for *n*-6 or *n*-3 PUFAs, pantothenic acid, or phosphorus. Conversely, the AI values for vitamin D and potassium differed from the median intakes of these nutrients for specific sex and age groups, because values were not based on NHNS-J data. Our results indicate that 2 y of pooled data from the NHNS-J adequately reflect the population's intake, and that the current system for determination of AI values will be applicable for future revisions.

Key Words Adequate Intake (AI), Dietary Reference Intakes (DRIs), median intake, National Health and Nutrition Survey-Japan (NHNS-J)

In 2004, the Dietary Reference Intakes for Japanese (DRIs-J) were established to replace the Recommended Dietary Allowances (RDAs) for Japanese as the official nutritional standards in Japan (*1*). In the DRIs-J, there are three useful categories for the prevention of nutrient deficiency. The Estimated Average Requirement (EAR) is the intake that would meet the needs of 50% of a population of a specific sex and age, and was established to allow evaluation of insufficient nutrient intake. The RDA is calculated based on the EAR, and is defined as the intake that satisfies the requirements of nearly all individuals in a sex- and age-specific population. When there is insufficient evidence to establish both the EAR and the RDA, the Adequate Intake (AI) is established as a surrogate value. These DRI categories were established with reference to the concept of DRIs in the United States and Canada (*2*). AI in the United States and Canada is defined as "the recommended average daily intake level based on observed or experimentally determined approximations or estimates of nutrient intake by a group (or groups) of apparently healthy people that are assumed to be adequate; used when an RDA cannot be determined" (*2*). In the United States and Canada, the AIs for various nutrients are determined using several different methods, including experimental derivation, mean intake, and median intake (*2*). Similarly, in the DRIs-J, AI is defined as "a sufficient intake level to maintain the health of and prevent the nutrient deficiency of almost all members of a population" (*3*).

Although several methods were used to establish the AIs in the current version of the DRIs-J 2010, the majority (except those for infants) were determined based on the median intakes of healthy people (*3*). In the DRIs-J 2010, AIs were established for individuals aged ≥1 y for 10 nutrients: *n*-6 and *n*-3 polyunsaturated fatty acids (PUFAs), vitamin D, vitamin E, vitamin K, pantothenic acid, biotin, potassium, phosphorus, and manganese. The AIs for seven of these nutrients were determined based on the median intakes reported by the National Health and Nutrition Survey-Japan (NHNS-J). The AIs for biotin and manganese were determined based on the mean intakes of a small Japanese population, because intake data for these nutrients were not assessed in the NHNS-J. The AI for vitamin K was determined by an

E-mail: ntsubo@nih.go.jp

Table 1. Methods used for AI determination by age group in the DRIs-J 2010.

Nutrients with AI	Children, 1–17 y old	Adults, 18–69 y old	Elderly, 70 y old and older
n-6 PUFAs	Median intake (NHNS-J 2005–2006)	Median intake (NHNS-J 2005–2006)	Median intake (NHNS-J 2005–2006)
n-3 PUFAs	Median intake (NHNS-J 2005–2006)	N/A	N/A
Vitamin D	Mean of median intake for boys and girls	Median intake for women aged 50–69 (NHNS-J 2005–2006), which is the minimum requirement to maintain circulating 25-hydroxyvitamin D levels	Same as adult AI
Pantothenic acid	Median intake (NHNS-J 2005–2006)	Median intake (NHNS-J 2005–2006)	Median intake (NHNS-J 2005–2006)
Potassium	Extrapolation by the 0.75th power of the body weight ratio considering growth factors; based on the AI for adults aged 18 to 29 y	Men: median intake for men aged 50 y and older (NHNS-J 2005–2006) Women: Adjustment by the energy intake of AI for men	Men: median intake for men aged 50 y and older (NHNS-J 2005–2006) Women: Adjustment by the energy intake of AI for men
Phosphorus	Median intake (NHNS-J 2005–2006)	Median intake (NHNS-J 2005–2006)	Median intake (NHNS-J 2005–2006)
Vitamin K	Blood coagulation Extrapolation of 82 μg/d (72 kg BW) by the 0.75th power of the BW ratio	Extrapolated by the 0.75th power of the weight ratio considering growth factors; based on the AI of adults	Same as adult AI

DRIs-J, Dietary Reference Intakes for Japanese; AI, Adequate Intake; PUFAs, polyunsaturated fatty acids; NHNS-J, National Health and Nutrition Survey-Japan; BW, body weight.

experimental study.

The median intakes from pooled 2005–2006 data were used to establish the AIs based on the NHNS-J 2010 (*3*). Although the NHNS-J is conducted every year in Japan, single-year data have several associated problems such as sampling size and sampling bias, and thus, pooled data from 2 y were used. It has been reported that a large sample size is needed to reduce the standard deviation of nutrient intakes (*4*). However, the actual data used to determine the AIs were not published, and it therefore remains unclear whether the pooled data from 2 y of the NHNS-J had sufficient subjects to accurately determine the AIs. If the data from 7 y were pooled, the numbers of subjects in each sex and age category would be 500 or greater, and these data have recently become available. In the present study, we used 7 y of pooled median intake data from the NHNS-J (2003–2009) to reevaluate the current AI values for the purpose of improving AI determination in future revisions of the DRIs-J.

Methods

Data source. Data obtained from the NHNS-J between 2003 and 2009 were used with permission from the Ministry of Health, Labour and Welfare, Japan. The NHNS-J is conducted every November as a cross-sectional survey of a nationally representative sample of non-institutionalized Japanese people who are residents of 300 survey districts selected using a two-stage stratified random sampling design (*5–13*). The survey protocol and data collection design are completely documented in the NHNS-J annual reports (*7–13*). The quality assurance of the data processing has been described elsewhere (*14*).

Study population. The survey included 25,907 households (70,036 subjects), and involved all household members aged ≥1 y. The response rate was estimated to be 60–70% (*13*). For the purposes of our study, pregnant and lactating women were excluded from the analysis. From the remaining 69,449 subjects, 4,825 subjects were excluded because they provided incomplete answers during the dietary assessment. Finally, data from 64,624 subjects (47.4% men; mean age: 44.5 y for men, 46.9 y for women) were analyzed. The numbers of subjects in each year were as follows: 10,999 in 2003 (47.8% men); 8,695 in 2004 (47.6%); 8,825 in 2005 (47.2%); 9,340 in 2006 (47.6%); 8,789 in 2007 (47.4%); 9,061 in 2008 (47.1%); and 8,915 in 2009 (46.9%).

Data collection. A semi-weighed 1-d household dietary record, including the approximate proportions by which each dish was divided among the family members, was used to estimate the nutrient and food intakes (*15*). The nutrient intakes for each family member were

Table 2. *n*-6 polyunsaturated fatty acid intake in Japanese men and women by age group.

Age, y	Pooled data	Men							Women						
		DRIs-J AI (g/d)	*n*	Mean	Std dev	Percentile			DRIs-J AI (g/d)	*n*	Mean	Std dev	Percentile		
						25	50	75					25	50	75
1–2	2 y (2005–2006)		167	5.4	2.6	3.5	4.9	6.9		144	5.6	3.0	3.6	4.9	7.4
	2 y (2008–2009)	5	124	5.0	2.5	3.0	4.6	6.7	5	132	4.4	2.5	2.8	3.9	5.5
	5 y (2005–2009)		351	5.2	2.7	3.3	4.8	6.7		338	4.9	2.9	2.9	4.5	6.3
3–5	2 y (2005–2006)		255	7.2	3.0	5.1	6.7	9.0		277	6.8	3.0	4.9	6.3	8.4
	2 y (2008–2009)	7	234	6.7	3.1	4.6	6.2	8.2	6	225	6.3	2.8	4.5	5.9	7.6
	5 y (2005–2009)		631	7.1	3.1	5.0	6.5	8.7		640	6.6	2.9	4.6	6.2	8.0
6–7	2 y (2005–2006)		165	8.6	3.8	5.9	7.8	10.9		189	8.0	3.8	5.4	7.2	9.4
	2 y (2008–2009)	8	181	8.2	3.5	5.7	7.8	10.4	7	167	7.4	3.2	5.2	6.8	9.0
	5 y (2005–2009)		434	8.4	3.6	5.9	7.9	10.6		453	7.8	3.5	5.4	7.2	9.4
8–9	2 y (2005–2006)		202	9.4	3.8	6.7	8.6	10.8		203	9.1	4.1	6.5	8.2	10.7
	2 y (2008–2009)	9	194	9.1	3.5	6.6	8.4	11.1	8	186	8.5	4.2	5.4	7.4	10.4
	5 y (2005–2009)		506	9.3	3.7	6.8	8.5	11.1		488	8.8	4.0	5.9	8.1	10.5
10–11	2 y (2005–2006)		209	10.4	4.0	7.7	9.9	12.2		194	9.8	4.1	6.8	8.9	11.7
	2 y (2008–2009)	10	178	9.9	5.1	6.5	9.1	12.0	9	195	8.8	3.8	6.2	7.9	11.1
	5 y (2005–2009)		471	10.2	4.5	7.1	9.6	12.2		487	9.4	4.0	6.6	8.4	11.3
12–14	2 y (2005–2006)		294	12.1	4.8	8.4	11.3	14.7		279	11.1	4.5	7.8	10.6	14.0
	2 y (2008–2009)	11	275	11.5	5.1	7.8	10.6	14.4	10	260	10.2	4.1	7.3	9.8	12.4
	5 y (2005–2009)		720	11.9	5.1	8.3	11.2	14.7		693	10.6	4.3	7.5	10.0	13.1
15–17	2 y (2005–2006)		307	14.3	6.6	9.8	12.9	17.5		286	11.2	4.4	8.2	10.7	13.9
	2 y (2008–2009)	13	258	13.6	6.2	9.6	12.6	17.2	11	237	10.0	4.6	6.7	9.2	12.1
	5 y (2005–2009)		700	13.8	6.3	9.6	12.6	16.9		657	10.7	4.6	7.4	10.1	13.6
18–29	2 y (2005–2006)		916	11.6	5.7	7.8	10.8	14.5		906	9.7	4.7	6.4	9.1	12.5
	2 y (2008–2009)	11	772	11.3	5.9	7.4	10.2	14.4	9	813	9.2	4.5	6.2	8.7	11.6
	5 y (2005–2009)		2,058	11.5	5.8	7.6	10.6	14.5		2,113	9.5	4.6	6.4	8.9	11.9
30–49	2 y (2005–2006)		2,110	11.2	5.4	7.4	10.3	14.1		2,291	9.4	4.6	6.2	8.7	11.8
	2 y (2008–2009)	10	2,013	10.6	5.2	7.0	9.8	13.4	9	2,168	9.0	4.5	5.7	8.4	11.3
	5 y (2005–2009)		5,200	10.9	5.3	7.2	10.1	13.7		5,619	9.2	4.5	6.0	8.5	11.6
50–69	2 y (2005–2006)		2,591	10.4	5.1	6.9	9.6	13.0		3,005	9.0	4.6	5.8	8.2	11.4
	2 y (2008–2009)	10	2,662	10.3	4.9	6.8	9.5	12.9	8	3,080	8.8	4.4	5.8	8.1	11.1
	5 y (2005–2009)		6,504	10.3	5.1	6.8	9.6	12.9		7,528	8.9	4.5	5.8	8.1	11.2
70–	2 y (2005–2006)		1,390	8.6	4.7	5.2	7.8	10.7		1,785	7.6	4.1	4.6	6.8	9.6
	2 y (2008–2009)	8	1,558	8.1	4.3	5.0	7.4	10.4	7	2,064	7.3	3.9	4.4	6.8	9.6
	5 y (2005–2009)		3,644	8.4	4.5	5.1	7.6	10.6		4,695	7.4	4.0	4.5	6.8	9.6

DRIs-J, Dietary Reference Intakes for Japanese; AI, Adequate Intake.

estimated on the basis of the Standard Tables of Food Composition in Japan, Fifth Revised and Enlarged Edition (*16*, *17*). Further details about the methods used can be found elsewhere (*7–13*).

According to the categories in the DRIs-J 2010, participants were divided into the following age groups (in years): 1–2; 3–5; 6–7; 8–9; 10–11; 12–14; 15–17; 18–29; 30–49; 50–69; and ≥70. We reevaluated the AIs for six nutrients that had been determined from 2 y of pooled NHNS-J data (*n*-6 and *n*-3 PUFAs, vitamin D, pantothenic acid, potassium, and phosphorus). The intakes of these nutrients were calculated from ordinary foods. Dietary supplements and fortified foods were not used for the calculation of these nutrient intakes. Since the AI of vitamin K was not determined using the NHNS-J median intake, the intake of vitamin K is shown in Table appendix-1. Vitamin E was excluded from our analysis because it will be reported separately (*18*). The intake data for *n*-6 and *n*-3 PUFAs were only available for 5 y (2005 to 2009); therefore, we analyzed only 5 y of pooled data. For comparisons with AIs based on 2 y of pooled data, we used the data from 2005–2006 and 2008–2009.

Because body size (measured as height and weight) of a population is related to dietary intake, we provided the height and weight distribution according to age and sex in Table appendices 2 and 3.

Statistical analysis. All analyses were performed

Table 3. *n*-3 polyunsaturated fatty acid intake in Japanese men and women by age group.

Age, y	Pooled data	Men							Women						
		DRIs-J AI (g/d)	*n*	Mean	Std dev	Percentile			DRIs-J AI (g/d)	*n*	Mean	Std dev	Percentile		
						25	50	75					25	50	75
1–2	2 y (2005–2006)		167	1.1	0.7	0.6	0.9	1.5		144	1.1	0.8	0.6	0.9	1.6
	2 y (2008–2009)	0.9	124	1.0	0.7	0.5	0.8	1.3	0.9	132	0.9	0.6	0.4	0.7	1.2
	5 y (2005–2009)		351	1.1	0.7	0.5	0.9	1.4		338	1.0	0.7	0.5	0.9	1.4
3–5	2 y (2005–2006)		255	1.5	1.0	0.9	1.3	2.0		277	1.5	0.9	0.9	1.3	1.8
	2 y (2008–2009)	1.2	234	1.3	0.8	0.7	1.1	1.8	1.2	225	1.3	0.9	0.7	1.0	1.6
	5 y (2005–2009)		631	1.5	1.0	0.8	1.2	1.9		640	1.4	0.9	0.8	1.2	1.8
6–7	2 y (2005–2006)		165	1.9	1.2	0.9	1.6	2.3		189	1.8	1.1	1.0	1.3	2.3
	2 y (2008–2009)	1.6	181	1.7	1.0	0.9	1.4	2.2	1.3	167	1.5	0.8	0.8	1.3	2.0
	5 y (2005–2009)		434	1.8	1.1	0.9	1.5	2.3		453	1.6	1.0	0.9	1.3	2.1
8–9	2 y (2005–2006)		202	1.9	1.0	1.1	1.7	2.5		203	1.8	1.2	1.1	1.6	2.3
	2 y (2008–2009)	1.7	194	1.9	1.1	1.1	1.5	2.3	1.5	186	1.8	1.0	1.0	1.7	2.3
	5 y (2005–2009)		506	1.9	1.1	1.1	1.6	2.4		488	1.8	1.1	1.0	1.6	2.2
10–11	2 y (2005–2006)		209	2.1	1.2	1.3	1.8	2.7		194	2.0	1.1	1.1	1.7	2.7
	2 y (2008–2009)	1.8	178	1.9	1.1	1.2	1.7	2.5	1.7	195	1.7	0.9	1.0	1.5	2.2
	5 y (2005–2009)		471	2.0	1.1	1.3	1.8	2.6		487	1.9	1.1	1.1	1.6	2.5
12–14	2 y (2005–2006)		294	2.4	1.3	1.5	2.1	3.1		279	2.3	1.3	1.4	2.1	3.0
	2 y (2008–2009)	2.1	275	2.3	1.3	1.4	2.1	2.9	2.1	260	2.0	1.2	1.2	1.8	2.6
	5 y (2005–2009)		720	2.4	1.3	1.4	2.2	3.0		693	2.1	1.2	1.2	1.9	2.8
15–17	2 y (2005–2006)		307	2.9	1.6	1.7	2.6	3.8		286	2.3	1.2	1.5	2.1	2.8
	2 y (2008–2009)	2.5	258	2.7	1.5	1.6	2.4	3.5	2.1	237	2.0	1.1	1.2	1.8	2.7
	5 y (2005–2009)		700	2.8	1.5	1.7	2.5	3.5		657	2.2	1.2	1.3	2.0	2.8
18–29	2 y (2005–2006)		916	2.5	1.6	1.4	2.1	3.3		906	2.2	1.4	1.2	1.9	2.9
	2 y (2008–2009)	—	772	2.4	1.7	1.3	2.1	3.1	—	813	2.0	1.3	1.1	1.8	2.6
	5 y (2005–2009)		2,058	2.5	1.7	1.3	2.1	3.2		2,113	2.1	1.4	1.1	1.8	2.7
30–49	2 y (2005–2006)		2,110	2.6	1.7	1.5	2.3	3.4		2,291	2.2	1.4	1.2	1.9	2.9
	2 y (2008–2009)	—	2,013	2.5	1.7	1.3	2.1	3.2	—	2,168	2.0	1.3	1.0	1.7	2.6
	5 y (2005–2009)		5,200	2.5	1.7	1.4	2.2	3.2		5,619	2.1	1.4	1.1	1.8	2.7
50–69	2 y (2005–2006)		2,591	2.9	1.9	1.6	2.6	3.9		3,005	2.5	1.6	1.3	2.2	3.3
	2 y (2008–2009)	—	2,662	2.8	1.7	1.6	2.5	3.8	—	3,080	2.4	1.6	1.3	2.1	3.2
	5 y (2005–2009)		6,504	2.9	1.8	1.6	2.5	3.8		7,528	2.5	1.6	1.3	2.1	3.3
70–	2 y (2005–2006)		1,390	2.7	1.8	1.4	2.3	3.6		1,785	2.3	1.5	1.2	1.9	3.0
	2 y (2008–2009)	—	1,558	2.5	1.7	1.3	2.1	3.4	—	2,064	2.1	1.4	1.1	1.8	2.9
	5 y (2005–2009)		3,644	2.6	1.8	1.3	2.2	3.5		4,695	2.2	1.5	1.1	1.9	3.0

DRIs-J, Dietary Reference Intakes for Japanese; AI, Adequate Intake.

separately for men and women. First, the mean and percentile values for each intake level by age group, as calculated from both 2 and 7 y of pooled NHNS-J data, were noted for each nutrient. To compare the effects of sample size, we arranged the percentiles for each nutrient calculated using 2 and 7 y of pooled data in tables. In addition, the median nutrient intakes were compared with the AI values to estimate the accuracy of the values currently listed in the DRIs-J 2010.

Results

Table 1 shows the methods used to determine the AIs for each age category in the DRIs-J 2010. Tables 2–7 show the mean and percentile intake values in men and women by age group for *n*-6 and *n*-3 PUFAs, vitamin D, pantothenic acid, potassium, and phosphorus. The median intakes of the selected nutrients, energy intakes, and body weights of the subjects did not differ greatly in any survey year from 2003 to 2009 (data not shown). Furthermore, there were no large differences between the median intake values obtained using 2 y of pooled data and those obtained using 7 y of pooled data. The sample sizes for the 2 y of pooled data for the age groups of 1–11 y were around 200 or fewer. However, despite the small sample sizes, the median intakes of the 200 or fewer participants for the 2 y of pooled data did not differ greatly from the median intakes of the 500 or more participants included in the 7 y of pooled data.

Table 4. Vitamin D intake in Japanese men and women by age group.

Age, y	Pooled data	Men							Women						
		DRIs-J AI (μg/d)	*n*	Mean	Std dev	Percentile			DRIs-J AI (μg/d)	*n*	Mean	Std dev	Percentile		
						25	50	75					25	50	75
1–2	2 y (2005–2006)		167	4.1	5.1	0.8	2.3	4.8		144	3.9	5.0	0.9	2.2	4.2
	2 y (2008–2009)	2.5	124	3.9	4.6	1.2	2.1	5.0	2.5	132	3.6	4.4	0.9	1.7	5.3
	7 y (2003–2009)		554	3.8	4.4	0.9	2.4	4.8		513	3.7	4.3	0.9	2.1	4.5
3–5	2 y (2005–2006)		255	4.6	6.3	1.3	2.6	5.1		277	4.7	5.7	1.2	2.6	5.6
	2 y (2008–2009)	2.5	234	3.9	5.0	1.2	2.0	4.6	2.5	225	4.2	5.4	1.3	2.1	4.5
	7 y (2003–2009)		923	4.4	5.2	1.4	2.6	5.1		918	4.2	4.9	1.4	2.5	4.6
6–7	2 y (2005–2006)		165	5.2	6.7	1.5	2.7	6.3		189	5.7	7.2	1.6	2.7	7.2
	2 y (2008–2009)	2.5	181	5.3	5.4	1.7	3.1	7.8	2.5	167	4.7	5.4	1.6	2.6	6.3
	7 y (2003–2009)		651	4.9	5.6	1.6	2.9	6.2		655	4.6	5.5	1.5	2.6	5.8
8–9	2 y (2005–2006)		202	5.9	7.5	1.6	3.1	7.5		203	5.0	5.6	1.6	2.8	6.2
	2 y (2008–2009)	3	194	5.6	5.1	2.3	3.6	6.6	3	186	6.6	7.2	2.0	3.5	8.3
	7 y (2003–2009)		739	5.2	5.8	1.8	3.2	6.4		698	5.4	6.2	1.7	3.0	6.9
10–11	2 y (2005–2006)		209	6.1	6.8	1.9	3.4	7.7		194	5.5	6.3	1.5	3.0	7.1
	2 y (2008–2009)	3.5	178	5.8	5.3	2.4	3.5	7.3	3.5	195	5.5	5.5	2.2	3.7	6.5
	7 y (2003–2009)		715	5.7	6.4	2.0	3.2	7.0		697	5.6	6.1	1.8	3.3	6.8
12–14	2 y (2005–2006)		294	6.4	6.6	2.1	3.6	8.1		279	6.9	8.6	2.0	3.5	8.9
	2 y (2008–2009)	3.5	275	7.2	6.9	2.6	4.3	10.4	3.5	260	6.9	6.9	2.1	4.2	9.3
	7 y (2003–2009)		1,033	6.9	7.5	2.3	3.9	9.0		985	6.6	7.2	2.0	3.7	9.1
15–17	2 y (2005–2006)		307	8.1	9.6	2.2	4.5	10.8		286	6.2	6.9	1.9	3.3	7.8
	2 y (2008–2009)	4.5	258	7.2	9.7	2.3	3.7	7.6	4.5	237	6.2	7.6	1.8	3.2	7.2
	7 y (2003–2009)		1,022	7.6	8.8	2.3	4.4	9.9		958	6.7	7.9	2.0	3.6	8.5
18–29	2 y (2005–2006)		916	6.7	8.6	1.4	3.1	8.9		906	6.4	8.1	1.5	3.1	8.4
	2 y (2008–2009)	5.5	772	6.6	8.2	1.6	3.1	9.3	5.5	813	5.6	7.7	1.5	2.8	6.9
	7 y (2003–2009)		3,115	6.7	8.3	1.6	3.3	8.9		3,220	6.3	8.1	1.5	3.1	8.0
30–49	2 y (2005–2006)		2,110	7.8	9.5	1.7	3.8	11.4		2,291	6.6	8.2	1.5	3.2	9.1
	2 y (2008–2009)	5.5	2,013	7.2	8.7	1.6	3.6	10.0	5.5	2,168	5.8	7.4	1.4	2.8	7.8
	7 y (2003–2009)		7,519	7.6	9.2	1.8	3.9	10.6		8,101	6.5	7.9	1.5	3.2	8.8
50–69	2 y (2005–2006)		2,591	10.2	10.6	2.5	6.7	14.8		3,005	8.9	9.8	2.1	5.7	12.6
	2 y (2008–2009)	5.5	2,662	9.7	9.8	2.4	6.5	13.9	5.5	3,080	8.6	9.3	2.0	5.4	12.3
	7 y (2003–2009)		9,371	10.3	10.7	2.6	7.0	14.8		10,775	8.9	9.5	2.2	5.7	12.7
70–	2 y (2005–2006)		1,390	9.5	9.1	2.6	6.6	13.8		1,785	8.4	8.5	2.0	5.7	11.9
	2 y (2008–2009)	5.5	1,558	9.9	10.5	2.4	6.6	13.5	5.5	2,064	8.1	8.8	2.0	5.1	11.5
	7 y (2003–2009)		4,975	9.8	10.3	2.5	6.6	13.9		6,487	8.4	8.8	2.1	5.5	11.9

DRIs-J, Dietary Reference Intakes for Japanese; AI, Adequate Intake.

When the AI values and median intakes from 2 or 7 y of pooled data were compared, there were no large differences in the values for *n*-6 or *n*-3 PUFAs, pantothenic acid, or phosphorus. The AI of vitamin D was higher than the median intake of vitamin D for women aged 15–17 y and men and women aged 18–49 y, as shown in Table 4. Conversely, the AI of vitamin D was lower than the median intake of vitamin D for men aged 50 y and over. There was also a difference between the AI and median intake for potassium, as shown in Table 6.

Discussion

To examine the accuracy of the AI values published in the DRIs-J, we compared the values obtained using 2 y of pooled data from the NHNS-J with those obtained using 7 y of pooled data. The median intake values obtained using both sets of data were similar.

In general, sample size is a critical factor that contributes to data quality (*4*). Given that nutrient intake data are available from a large national survey, in cases where there is insufficient evidence to develop quantitative recommendations about nutrient insufficiency, effective utilization of the national survey data is desirable. Our results indicate that, unless the Japanese dietary habits change dramatically, the current system for determining AIs is appropriate. Since AIs are considered to be surrogate and tentative standard values, it has not been considered necessary to frequently update them. As we

Table 5. Pantothenic acid intake in Japanese men and women by age group.

Age, y	Pooled data	Men							Women						
		DRIs-J AI (mg/d)	*n*	Mean	Std dev	Percentile			DRIs-J AI (mg/d)	*n*	Mean	Std dev	Percentile		
						25	50	75					25	50	75
1–2	2 y (2005–2006)		167	3.7	1.4	2.6	3.4	4.4		144	3.5	1.4	2.6	3.3	4.4
	2 y (2008–2009)	3	124	3.4	1.3	2.6	3.2	4.3	3	132	3.1	1.4	2.2	3.1	3.9
	7 y (2003–2009)		554	3.5	1.4	2.6	3.3	4.3		513	3.3	1.4	2.4	3.2	4.2
3–5	2 y (2005–2006)		255	4.6	1.6	3.4	4.4	5.4		277	4.2	1.4	3.3	4.1	5.1
	2 y (2008–2009)	4	234	4.1	1.3	3.2	4.0	4.9	4	225	3.8	1.2	3.0	3.6	4.4
	7 y (2003–2009)		923	4.4	1.5	3.4	4.2	5.2		918	4.1	1.3	3.2	4.0	4.9
6–7	2 y (2005–2006)		165	5.5	1.8	4.4	5.1	6.3		189	5.0	1.4	4.0	4.9	6.0
	2 y (2008–2009)	5	181	5.2	1.5	4.3	5.2	6.1	5	167	4.7	1.4	3.7	4.7	5.5
	7 y (2003–2009)		651	5.4	1.6	4.3	5.2	6.3		655	4.8	1.4	3.9	4.8	5.6
8–9	2 y (2005–2006)		202	6.1	1.5	5.0	6.1	7.0		203	5.6	1.5	4.5	5.4	6.4
	2 y (2008–2009)	6	194	5.8	1.5	4.7	5.7	6.6	5	186	5.4	1.5	4.5	5.3	6.3
	7 y (2003–2009)		739	5.9	1.6	4.9	5.8	6.8		698	5.5	1.5	4.5	5.4	6.3
10–11	2 y (2005–2006)		209	6.6	1.8	5.4	6.5	7.5		194	6.1	1.5	5.1	5.9	7.0
	2 y (2008–2009)	7	178	6.3	1.7	5.3	6.1	7.2	6	195	5.7	1.5	4.7	5.7	6.6
	7 y (2003–2009)		715	6.5	1.7	5.4	6.4	7.5		697	6.0	1.5	5.0	5.8	6.9
12–14	2 y (2005–2006)		294	7.2	2.3	5.8	6.8	8.2		279	6.4	1.8	5.3	6.3	7.5
	2 y (2008–2009)	7	275	6.7	1.8	5.5	6.6	7.8	6	260	6.0	1.7	4.8	5.8	7.0
	7 y (2003–2009)		1,033	7.1	2.2	5.7	6.8	8.3		985	6.2	1.8	5.0	6.1	7.2
15–17	2 y (2005–2006)		307	6.9	2.4	5.2	6.6	8.3		286	5.7	1.7	4.4	5.5	6.7
	2 y (2008–2009)	7	258	6.8	2.3	5.2	6.6	8.3	5	237	5.1	1.6	4.0	5.0	5.9
	7 y (2003–2009)		1,022	7.0	2.5	5.3	6.7	8.3		958	5.5	1.8	4.2	5.3	6.6
18–29	2 y (2005–2006)		916	5.7	2.2	4.2	5.5	7.0		906	4.8	1.7	3.6	4.7	5.8
	2 y (2008–2009)	5	772	5.6	2.3	4.0	5.3	6.7	5	813	4.7	1.6	3.6	4.5	5.5
	7 y (2003–2009)		3,115	5.7	2.3	4.2	5.4	6.9		3,220	4.8	1.8	3.6	4.6	5.8
30–49	2 y (2005–2006)		2,110	5.7	2.0	4.3	5.4	6.9		2,291	5.0	1.7	3.8	4.8	5.9
	2 y (2008–2009)	5	2,013	5.5	2.0	4.2	5.3	6.6	5	2,168	4.8	1.7	3.6	4.6	5.7
	7 y (2003–2009)		7,519	5.7	2.0	4.3	5.4	6.8		8,101	4.9	1.7	3.7	4.7	5.9
50–69	2 y (2005–2006)		2,591	6.1	2.0	4.7	5.9	7.2		3,005	5.5	1.9	4.2	5.3	6.6
	2 y (2008–2009)	6	2,662	6.0	2.0	4.6	5.8	7.1	5	3,080	5.4	1.8	4.1	5.2	6.4
	7 y (2003–2009)		9,371	6.1	2.0	4.7	5.9	7.2		10,775	5.5	1.9	4.2	5.3	6.5
70–	2 y (2005–2006)		1,390	5.8	2.0	4.3	5.5	7.0		1,785	5.1	1.9	3.8	4.9	6.1
	2 y (2008–2009)	6	1,558	5.6	2.1	4.2	5.4	6.8	5	2,064	4.9	1.8	3.6	4.7	5.9
	7 y (2003–2009)		4,975	5.7	2.1	4.3	5.5	6.9		6,487	5.0	1.8	3.7	4.8	6.0

DRIs-J, Dietary Reference Intakes for Japanese; AI, Adequate Intake.

have now shown that use of 2 y of pooled data is sufficient for determining AI values, future revisions of these values will be easy.

On the other hand, this study also revealed that AI values may differ greatly from the typical nutrient intakes depending on the methods used for determination. In the case of vitamin D, the AI for adults was determined using the median intake for women aged 50–60 y from the NHNS-J, and this is a population that requires maintenance of the circulating 25-hydroxyvitamin D levels (*19*). Therefore, the AI values for the other age groups for adults differed from the median intake of vitamin D. For potassium, the AI was calculated to compensate for endogenous potassium loss and maintenance of potassium balance at the current intake level, which was based on the median intake in adults determined from 2 y of pooled data from the NHNS-J (*20*). However, the AI for children was extrapolated from the 0.75th power of the body weight ratio in consideration of growth factors, based on the AI of adults aged 18–29 y. Similar to the discrepancy between the AI and median intake for vitamin D, the AI for potassium differed for other sex and age groups, especially children. Extrapolation is a frequently used method for infants and children owing to the lack of relevant evidence available for both nutrient requirements and upper tolerance levels. However, the same extrapolation method is not necessarily applicable to all age cat-

Table 6. Potassium intake in Japanese men and women by age group.

Age, y	Pooled data	Men							Women						
		DRIs-J AI (mg/d)	*n*	Mean	Std dev	Percentile			DRIs-J AI (mg/d)	*n*	Mean	Std dev	Percentile		
						25	50	75					25	50	75
1–2	2 y (2005–2006)		167	1,379	537	1,012	1,291	1,691		144	1,372	553	990	1,333	1,649
	2 y (2008–2009)	900	124	1,275	465	953	1,235	1,630	800	132	1,217	542	842	1,209	1,535
	7 y (2003–2009)		554	1,329	568	944	1,258	1,642		513	1,283	540	916	1,261	1,583
3–5	2 y (2005–2006)		255	1,715	603	1,339	1,661	2,047		277	1,616	517	1,234	1,609	1,939
	2 y (2008–2009)	1,000	234	1,553	495	1,242	1,525	1,848	1,000	225	1,427	491	1,131	1,351	1,663
	7 y (2003–2009)		923	1,643	562	1,278	1,603	1,978		918	1,562	497	1,207	1,520	1,871
6–7	2 y (2005–2006)		165	2,006	614	1,605	1,912	2,343		189	1,899	560	1,515	1,846	2,226
	2 y (2008–2009)	1,300	181	1,923	549	1,566	1,906	2,262	1,200	167	1,782	591	1,379	1,699	2,155
	7 y (2003–2009)		651	1,991	590	1,594	1,912	2,316		655	1,828	561	1,437	1,779	2,158
8–9	2 y (2005–2006)		202	2,337	637	1,898	2,279	2,715		203	2,141	595	1,722	2,151	2,464
	2 y (2008–2009)	1,500	194	2,139	612	1,693	2,059	2,476	1,400	186	2,046	615	1,565	1,982	2,406
	7 y (2003–2009)		739	2,214	616	1,791	2,164	2,589		698	2,097	604	1,662	2,061	2,423
10–11	2 y (2005–2006)		209	2,452	733	1,928	2,341	2,876		194	2,320	603	1,869	2,299	2,679
	2 y (2008–2009)	1,900	178	2,321	609	1,962	2,221	2,673	1,700	195	2,097	648	1,684	2,033	2,436
	7 y (2003–2009)		715	2,421	674	1,952	2,330	2,819		697	2,268	650	1,837	2,205	2,623
12–14	2 y (2005–2006)		294	2,602	773	2,082	2,578	3,042		279	2,409	738	1,882	2,341	2,851
	2 y (2008–2009)	2,300	275	2,455	762	1,955	2,401	2,878	2,100	260	2,226	699	1,795	2,140	2,606
	7 y (2003–2009)		1,033	2,615	836	2,062	2,565	3,042		985	2,343	742	1,836	2,245	2,779
15–17	2 y (2005–2006)		307	2,475	944	1,809	2,355	2,984		286	2,142	788	1,577	2,050	2,591
	2 y (2008–2009)	2,700	258	2,391	895	1,740	2,224	3,015	2,000	237	1,892	687	1,354	1,860	2,288
	7 y (2003–2009)		1,022	2,477	929	1,838	2,356	3,028		958	2,070	762	1,548	1,976	2,514
18–29	2 y (2005–2006)		916	2,141	850	1,525	2,051	2,684		906	1,984	823	1,405	1,892	2,448
	2 y (2008–2009)	2,500	772	2,076	884	1,474	1,945	2,505	2,000	813	1,838	695	1,316	1,777	2,298
	7 y (2003–2009)		3,115	2,154	892	1,524	2,044	2,641		3,220	1,922	768	1,370	1,832	2,357
30–49	2 y (2005–2006)		2,110	2,290	838	1,715	2,208	2,789		2,291	2,107	793	1,564	2,015	2,533
	2 y (2008–2009)	2,500	2,013	2,195	807	1,631	2,125	2,650	2,000	2,168	1,987	747	1,473	1,916	2,411
	7 y (2003–2009)		7,519	2,251	830	1,686	2,169	2,724		8,101	2,061	773	1,519	1,979	2,495
50–69	2 y (2005–2006)		2,591	2,695	998	1,993	2,592	3,250		3,005	2,601	1,055	1,906	2,486	3,124
	2 y (2008–2009)	2,500	2,662	2,605	942	1,943	2,495	3,139	2,000	3,080	2,495	910	1,859	2,382	3,024
	7 y (2003–2009)		9,371	2,665	980	1,979	2,557	3,206		10,775	2,559	977	1,891	2,444	3,085
70–	2 y (2005–2006)		1,390	2,665	1,048	1,958	2,555	3,201		1,785	2,429	967	1,761	2,296	2,954
	2 y (2008–2009)	2,500	1,558	2,546	984	1,834	2,444	3,097	2,000	2,064	2,333	900	1,712	2,212	2,825
	7 y (2003–2009)		4,975	2,608	1,018	1,910	2,501	3,166		6,487	2,380	947	1,717	2,260	2,901

DRIs-J, Dietary Reference Intakes for Japanese; AI, Adequate Intake.

egories. For example, since energy intake declines with age, the AI for elderly people is extrapolated from that for younger adults based on the median energy intake (*21*). In the Population Reference Intake (PRI) for the European Community, if reliable data were not available, the values were extrapolated from those for young adults on the basis of energy expenditure, unless other specific methods were used (*22*). In the PRI, potassium was extrapolated using a factorial approach. It is necessary to consider both nutrient characteristics and nutrient intake when determining the extrapolation method. When data from the NHNS-J were not used for determination of the AIs, the AI values became completely different from the usual nutrient intakes. Although each AI has the same purpose of avoiding deficiency, the meanings differ. Consequently, if an AI is not based on the group mean or median intake of a healthy population, it is necessary for health professionals to recognize the methods used to determine the AI when using it for evaluation of nutrient intake (*23*).

This study had several limitations. First, the data were obtained from a detailed semi-weighed food record for 1 d in November. Thus, there corded nutrient intakes may not be representative of the habitual dietary intake, because of the lack of data regarding typical day-to-day and seasonal variations in food intake. Second, although the participants were representative of the Japanese population, the proportions of young and middle-aged subjects living alone were small (*24*). These people may have different dietary characteristics that are not adequately represented in our data.

In conclusion, our results indicate that the current

Table 7. Phosphorus intake in Japanese men and women by age group.

Age, y	Pooled data	Men							Women						
		DRIs-J AI (mg/d)	*n*	Mean	Std dev	Percentile			DRIs-J AI (mg/d)	*n*	Mean	Std dev	Percentile		
						25	50	75					25	50	75
1–2	2 y (2005–2006)		167	615	235	435	589	736		144	592	233	427	578	726
	2 y (2008–2009)	600	124	588	218	442	560	718	600	132	530	229	381	540	660
	7 y (2003–2009)		554	593	244	415	553	730		513	564	236	400	554	706
3–5	2 y (2005–2006)		255	820	278	630	790	971		277	746	231	606	733	883
	2 y (2008–2009)	800	234	720	223	575	700	834	700	225	664	216	511	651	787
	7 y (2003–2009)		923	773	250	600	749	917		918	724	222	572	720	853
6–7	2 y (2005–2006)		165	949	272	770	907	1,100		189	892	263	718	844	1,068
	2 y (2008–2009)	900	181	921	256	736	911	1,088	900	167	832	236	679	812	995
	7 y (2003–2009)		651	950	273	757	912	1,106		655	854	252	688	829	1,013
8–9	2 y (2005–2006)		202	1,112	275	923	1,082	1,277		203	991	242	837	992	1,122
	2 y (2008–2009)	1,100	194	1,037	255	850	1,000	1,194	1,000	186	969	256	796	962	1,110
	7 y (2003–2009)		739	1,060	270	872	1,041	1,214		698	983	254	816	974	1,125
10–11	2 y (2005–2006)		209	1,195	338	986	1,161	1,375		194	1,083	256	917	1,051	1,214
	2 y (2008–2009)	1,200	178	1,128	266	950	1,113	1,288	1,100	195	1,024	252	867	1,019	1,189
	7 y (2003–2009)		715	1,164	300	964	1,129	1,332		697	1,072	264	903	1,040	1,217
12–14	2 y (2005–2006)		294	1,273	362	1,060	1,220	1,465		279	1,144	306	933	1,128	1,322
	2 y (2008–2009)	1,200	275	1,201	315	995	1,167	1,431	1,100	260	1,083	297	864	1,051	1,259
	7 y (2003–2009)		1,033	1,269	367	1,033	1,227	1,474		985	1,120	309	907	1,087	1,298
15–17	2 y (2005–2006)		307	1,238	421	933	1,163	1,495		286	1,016	313	787	995	1,179
	2 y (2008–2009)	1,200	258	1,219	389	930	1,196	1,467	1,000	237	901	269	721	893	1,065
	7 y (2003–2009)		1,022	1,249	415	959	1,208	1,483		958	989	314	772	965	1,163
18–29	2 y (2005–2006)		916	1,032	386	756	997	1,260		906	888	307	668	882	1,055
	2 y (2008–2009)	1,000	772	1,015	391	750	973	1,224	900	813	837	282	643	814	1,015
	7 y (2003–2009)		3,115	1,041	392	774	1,000	1,259		3,220	870	300	662	848	1,048
30–49	2 y (2005–2006)		2,110	1,056	347	817	1,023	1,255		2,291	911	303	710	887	1,084
	2 y (2008–2009)	1,000	2,013	1,013	346	764	988	1,217	900	2,168	867	292	666	841	1,041
	7 y (2003–2009)		7,519	1,046	349	813	1,014	1,247		8,101	899	299	693	874	1,072
50–69	2 y (2005–2006)		2,591	1,148	367	898	1,113	1,351		3,005	1,008	342	771	973	1,202
	2 y (2008–2009)	1,000	2,662	1,113	348	878	1,087	1,314	900	3,080	978	320	761	950	1,159
	7 y (2003–2009)		9,371	1,142	364	894	1,107	1,344		10,775	1,003	334	773	971	1,192
70–	2 y (2005–2006)		1,390	1,061	357	810	1,017	1,267		1,785	924	319	697	889	1,095
	2 y (2008–2009)	1,000	1,558	1,030	357	781	997	1,240	900	2,064	888	307	674	857	1,065
	7 y (2003–2009)		4,975	1,053	364	803	1,012	1,256		6,487	912	323	683	877	1,093

DRIs-J, Dietary Reference Intakes for Japanese; AI, Adequate Intake.

system of determining AI values based on 2 y of pooled NHNS-J data is adequate, and that using 7 y of pooled data produces similar values. This information will be useful for subsequent revisions of the DRIs-J. Given that AIs are surrogate and tentative standard values, it is necessary to accumulate evidence before shifting to EAR and RDA values in the future.

Acknowledgments

This study was supported by a Health and Labour Sciences Research Grant (H22-Junkankitou [Seishuu]-Shitei-015, principal investigator, Shinkan Tokudome) from the Ministry of Health, Labour and Welfare, Japan. None of the authors have any personal or financial conflicts of interest to declare. We are grateful to Drs. Shinkan Tokudome and Satoshi Sasaki for their advice and to Dr. Tetsuji Yokoyama for his support regarding data analysis.

REFERENCES

1) Ministry of Health, Labour and Welfare (Scientific Committee of Dietary Reference Intakes for Japanese). 2004. Dietary Reference Intakes for Japanese (2005). Ministry of Health, Labour and Welfare, Tokyo (in Japanese).
2) Institute of Medicine. 2006. Dietary Reference Intakes: The Essential Guide to Nutrient Requirements. National Academy Press, Washington DC.
3) Ministry of Health, Labour and Welfare (Scientific Committee of Dietary Reference Intakes for Japanese). 2009. Dietary Reference Intakes for Japanese (2010 revision). Ministry of Health, Labour and Welfare, Tokyo (in Japanese).
4) Stevens J, Bryant M, Wang C-H, Cai J, Bentley ME. 2012.

Sample size and repeated measures required in studies of foods in the homes of African-American families. *J Nutr* **142**: 1123–1127.
5) Nakamura M, Tajima S, Yoshiike N. 2002. Nutrient intake in Japanese adults—from The National Nutrition Survey, 1995–99. *J Nutr Sci Vitaminol* **48**: 433–441.
6) Wakita Asano A, Miyoshi M, Arai Y, Yoshita K, Yamamoto S, Yoshiike N. 2008. Association between vegetable intake and dietary quality in Japanese adults: a secondary analysis from the National Health and Nutrition Survey, 2003. *J Nutr Sci Vitaminol* **54**: 384–391.
7) Ministry of Health, Labour and Welfare, Japan. 2005. National Health and Nutrition Survey Japan (2003). Tokyo.
8) Ministry of Health, Labour and Welfare, Japan. 2006. National Health and Nutrition Survey Japan (2004). Tokyo.
9) Ministry of Health, Labour and Welfare, Japan. 2007. National Health and Nutrition Survey Japan (2005). Tokyo.
10) Ministry of Health, Labour and Welfare, Japan. 2009. National Health and Nutrition Survey Japan (2006). Tokyo.
11) Ministry of Health, Labour and Welfare, Japan. 2010. National Health and Nutrition Survey Japan (2007). Tokyo.
12) Ministry of Health, Labour and Welfare, Japan. 2011. National Health and Nutrition Survey Japan (2008). Tokyo.
13) Ministry of Health, Labour and Welfare, Japan. 2011. National Health and Nutrition Survey Japan (2009). Tokyo.
14) Iwaoka F, Yoshiike N, Date C, Shimada T, Tanaka H. 2001. A validation study on a method to estimate nutrient intake by family members through a household-based food-weighing survey. *J Nutr Sci Vitaminol* **47**: 222–227.
15) Nishi N, Nakade M, Sarukura K, Nozue M, Tsubota M, Miyoshi M, Taku K, Yoshita K, Yoshiike N. 2012. Cooperation rate of the National Health and Nutrition Survey and its related factors. *J Health Welfare Statistics* **59**: 10–15 (in Japanese).
16) Ministry of Education, Culture, Sports, Science and Technology, the Government of Japan. 2005. Standard Tables of Food Composition in Japan, 5th revised and enlarged ed. Printing Bureau, Ministry of Finance, Tokyo (in Japanese).
17) Ministry of Education, Culture, Sports, Science and Technology, the Government of Japan. 2002. Standard Tables of Food Composition in Japan, 5th revised ed. Printing Bureau, Ministry of Finance, Tokyo (in Japanese).
18) Tsubota-Utsugi M, Nakade M, Imai E, Tsuboyama-Kasaoka N, Nozue M, Umegaki K, Yoshizawa T, Okuda N, Nishi N, Takimoto H. 2013. Distribution of vitamin E intake among Japanese dietary supplement and fortified food users: A secondary analysis from the National Health and Nutrition Survey, 2003–2009. *J Nutr Sci Vitaminol* **56**: 576–583.
19) Tanaka K, Terao J, Shidoji Y, Tamai H, Imai E, Okano T. 2013. Dietary Reference Intakes for Japanese 2010: Fat-Soluble Vitamins. *J Nutr Sci Vitaminol* **59**: S57–S66.
20) Uenishi K, Ishimi Y, Nakamura K, Kodama H, Esashi T. 2013. Dietary Reference Intakes for Japanese 2010: Macrominerals. *J Nutr Sci Vitaminol* **59**: S83–S90.
21) Atkinson SA, Koletzko B. 2007. Determining life-stage groups and extrapolating nutrient intake values (NIVs). *Food Nutr Bull* **28** (1 Suppl International): S61–76.
22) The Scientific Committee for Food. 1993. Nutrient and energy intakes for the European Community (Opinion expressed on 11 December 1992). Reports of the Scientific Committee for Food (Thirty-first series), p 1–248. Office for Official Publications of the European Communities, Luxembourg.
23) Murphy SP, Vorster HH. 2007. Methods for using nutrient intake values (NIVs) to assess or plan nutrient intakes. *Food Nutr Bull* **28** (1 Suppl International): S51–60.
24) Katanoda K, Nitta H, Hayashi K, Matsumura Y. 2005. Is the national nutrition survey in Japan representative of the entire Japanese population? *Nutrition* **21**: 964–966.

Table appendix-1. Vitamin K intake in Japanese men and women by age group.

Age, y	Pooled data	Men							Women						
		DRIs-J AI (μg/d)	*n*	Mean	Std dev	Percentile			DRIs-J AI (μg/d)	*n*	Mean	Std dev	Percentile		
						25	50	75					25	50	75
1–2	2 y (2005–2006)		167	125	122	45	85	168		144	121	119	41	78	169
	2 y (2008–2009)	25	124	112	92	40	87	152	25	132	96	87	42	74	122
	7 y (2003–2009)		554	115	111	39	82	155		513	112	113	38	74	151
3–5	2 y (2005–2006)		255	141	102	77	109	173		277	145	104	74	112	186
	2 y (2008–2009)	30	234	131	104	61	109	161	30	225	122	101	60	93	155
	7 y (2003–2009)		923	140	112	69	108	170		918	137	103	72	107	172
6–7	2 y (2005–2006)		165	156	107	87	122	196		189	152	104	83	118	185
	2 y (2008–2009)	40	181	158	110	84	126	199	40	167	132	94	74	117	164
	7 y (2003–2009)		651	166	124	89	128	200		655	142	100	80	114	170
8–9	2 y (2005–2006)		202	168	113	92	144	214		203	171	104	95	148	226
	2 y (2008–2009)	45	194	161	102	92	129	205	45	186	164	118	84	130	215
	7 y (2003–2009)		739	173	133	93	136	215		698	173	116	94	140	216
10–11	2 y (2005–2006)		209	204	151	108	167	235		194	195	120	115	169	240
	2 y (2008–2009)	55	178	189	134	94	156	243	55	195	162	105	96	135	203
	7 y (2003–2009)		715	197	142	102	157	241		697	188	127	106	155	236
12–14	2 y (2005–2006)		294	214	134	122	184	277		279	208	127	120	182	257
	2 y (2008–2009)	70	275	193	114	108	167	259	65	260	192	119	103	157	265
	7 y (2003–2009)		1,033	212	144	119	171	268		985	204	137	112	166	259
15–17	2 y (2005–2006)		307	252	190	125	212	327		286	223	150	113	184	308
	2 y (2008–2009)	80	258	217	137	115	190	289	60	237	177	110	94	152	245
	7 y (2003–2009)		1,022	235	169	118	193	304		958	208	155	102	166	270
18–29	2 y (2005–2006)		916	222	165	104	177	298		906	202	150	87	162	275
	2 y (2008–2009)	75	772	205	164	93	165	266	60	813	184	143	89	146	238
	7 y (2003–2009)		3,115	216	179	97	165	281		3,220	201	162	87	154	265
30–49	2 y (2005–2006)		2,110	235	172	108	190	320		2,291	225	171	98	176	306
	2 y (2008–2009)	75	2,013	217	163	97	172	299	65	2,168	207	158	95	165	281
	7 y (2003–2009)		7,519	232	180	102	181	314		8,101	221	175	95	171	299
50–69	2 y (2005–2006)		2,591	290	208	128	243	398		3,005	291	211	128	242	407
	2 y (2008–2009)	75	2,662	282	210	130	230	379	65	3,080	274	197	124	227	381
	7 y (2003–2009)		9,371	292	223	128	232	399		10,775	290	219	125	235	403
70–	2 y (2005–2006)		1,390	289	214	125	238	395		1,785	264	198	114	210	371
	2 y (2008–2009)	75	1,558	271	209	107	219	382	65	2,064	250	193	106	203	346
	7 y (2003–2009)		4,975	282	217	115	226	394		6,487	261	203	109	209	366

DRIs-J, Dietary Reference Intakes for Japanese; AI, Adequate Intake.

Table appendix-2. Heights of Japanese men and women by age group.

Age, y	Pooled data		Men							Women						
			DRIs-J height (cm)	*n*	Mean	Std dev	Percentile			DRIs-J height (cm)	*n*	Mean	Std dev	Percentile		
							25	50	75					25	50	75
1–2	Crude	2 y (2005–2006)	85.0	139	84.6	6.8	79.5	85.0	88.8	84.0	124	83.4	6.7	77.8	84.1	88.8
		2 y (2008–2009)		107	85.3	5.7	81.0	84.9	89.7		115	82.2	6.4	77.1	82.8	87.0
		7 y (2003–2009)		475	84.9	6.4	80.0	85.0	89.4		450	83.1	6.7	78.0	83.3	88.0
	Weighted[2]	2 y (2005–2006)		139	84.7	8.1	79.5	85.0	88.8		124	83.3	8.5	77.6	84.0	88.7
		2 y (2008–2009)		107	84.6	7.7	80.0	84.0	89.3		115	82.9	8.4	78.1	83.5	87.5
		7 y (2003–2009)		475	84.6	4.2	79.8	84.8	89.3		450	83.4	4.4	78.0	83.8	88.2
3–5	Crude	2 y (2005–2006)	103.4	223	104.1	7.0	99.0	104.6	109.0	103.2	239	103.1	7.0	97.5	103.0	108.0
		2 y (2008–2009)		217	103.5	6.8	98.2	103.6	108.5		201	102.2	7.7	97.0	102.4	107.7
		7 y (2003–2009)		829	103.7	7.2	98.5	103.6	108.6		809	102.6	7.3	97.0	102.6	108.2
	Weighted[2]	2 y (2005–2006)		223	103.5	8.2	98.0	103.4	108.4		239	103.4	7.9	97.7	103.2	108.8
		2 y (2008–2009)		217	103.5	8.0	98.2	103.6	108.5		201	101.8	9.5	96.7	102.0	107.2
		7 y (2003–2009)		829	103.5	4.4	98.2	103.2	108.4		809	102.7	4.5	97.0	102.8	108.5
6–7	Crude	2 y (2005–2006)	120.0	144	119.4	5.4	116.0	120.0	122.9	118.6	173	118.9	5.9	115.0	118.7	122.7
		2 y (2008–2009)		153	119.4	5.9	115.7	119.0	122.8		149	118.5	6.0	114.0	118.0	122.4
		7 y (2003–2009)		572	119.0	5.9	115.0	119.2	122.8		594	118.8	5.9	114.6	118.5	122.5
	Weighted[2]	2 y (2005–2006)		144	119.4	6.4	116.0	120.0	122.9		173	118.8	6.4	114.9	118.6	122.7
		2 y (2008–2009)		153	119.3	6.7	115.6	119.0	122.8		149	118.7	7.0	114.1	118.3	122.4
		7 y (2003–2009)		572	119.0	3.5	115.0	119.2	122.8		594	118.7	3.4	114.5	118.4	122.4
8–9	Crude	2 y (2005–2006)	130.0	167	130.7	6.9	126.1	130.1	135.0	130.2	173	130.1	6.2	126.0	130.0	134.5
		2 y (2008–2009)		169	129.8	6.4	126.0	130.0	133.2		169	129.1	7.0	124.8	128.5	134.2
		7 y (2003–2009)		622	130.4	6.5	126.3	130.2	134.3		609	129.8	6.7	125.0	129.4	134.3
	Weighted[2]	2 y (2005–2006)		167	130.6	7.6	126.0	130.0	135.0		173	130.4	6.7	126.1	130.2	134.6
		2 y (2008–2009)		169	129.8	7.0	126.0	130.0	133.2		169	129.4	7.7	125.0	129.0	134.3
		7 y (2003–2009)		622	130.3	3.7	126.1	130.2	134.2		609	130.0	3.8	125.2	129.7	134.5
10–11	Crude	2 y (2005–2006)	142.9	173	142.0	7.1	137.8	142.3	146.1	141.4	167	142.8	7.6	137.3	141.7	149.0
		2 y (2008–2009)		146	140.8	7.1	135.6	141.1	145.0		175	143.4	7.6	137.5	143.4	149.0
		7 y (2003–2009)		598	141.2	7.2	136.0	141.2	145.4		596	142.9	7.6	137.7	142.6	148.1
	Weighted[2]	2 y (2005–2006)		173	142.1	7.6	137.9	142.9	146.4		167	142.4	8.3	137.1	141.4	148.0
		2 y (2008–2009)		146	140.9	8.3	135.6	141.1	145.0		175	143.5	8.1	137.8	143.4	149.0
		7 y (2003–2009)		598	141.3	4.2	136.3	141.3	145.6		596	142.9	4.4	137.6	142.4	148.0
12–14	Crude	2 y (2005–2006)	159.6	234	158.7	9.0	153.0	159.8	165.0	155.0	218	154.7	5.8	151.4	155.0	159.0
		2 y (2008–2009)		225	158.2	9.1	151.7	159.7	165.0		209	154.3	5.5	150.5	154.0	158.0
		7 y (2003–2009)		838	157.9	9.3	151.4	159.4	165.0		800	154.5	5.7	151.0	155.0	158.0
	Weighted[2]	2 y (2005–2006)		234	158.6	10.2	153.0	159.6	165.0		218	154.8	6.8	151.5	155.0	159.0
		2 y (2008–2009)		225	157.8	11.0	150.0	159.0	165.0		209	154.5	6.7	150.5	154.3	158.0
		7 y (2003–2009)		838	158.0	5.6	151.4	159.5	165.0		800	154.6	3.5	151.0	155.0	158.2
15–17	Crude	2 y (2005–2006)	170.0	216	169.6	6.3	165.0	170.0	173.1	157.0	214	157.2	5.4	154.0	157.0	160.4
		2 y (2008–2009)		207	169.8	6.2	166.0	170.0	174.0		191	158.1	4.9	154.6	158.0	161.5
		7 y (2003–2009)		778	169.6	6.2	165.5	170.0	174.0		771	157.8	5.1	154.1	157.7	161.0
	Weighted[2]	2 y (2005–2006)		216	169.6	7.4	165.0	170.0	173.1		214	157.2	6.4	154.0	157.0	160.4
		2 y (2008–2009)		207	169.6	7.5	166.0	170.0	174.0		191	158.2	6.2	154.7	158.0	161.5
		7 y (2003–2009)		778	169.6	3.8	165.5	170.0	174.0		771	157.8	3.2	154.1	157.7	161.0
18–29	Crude	2 y (2005–2006)	171.4	670	171.3	5.9	167.5	171.4	175.0	158.0	718	158.4	5.6	154.8	158.0	162.0
		2 y (2008–2009)		609	171.3	6.0	167.5	171.0	175.0		681	157.9	5.3	154.3	158.0	161.2
		7 y (2003–2009)		2,408	171.4	6.0	167.6	171.2	175.0		2,676	158.2	5.4	154.7	158.0	162.0
30–49	Crude	2 y (2005–2006)	170.5	1,624	170.7	5.8	167.0	170.5	175.0	158.0	1,999	157.7	5.3	154.0	158.0	161.3
		2 y (2008–2009)		1,673	170.9	5.8	167.0	170.6	175.0		2,024	157.9	5.2	154.5	158.0	161.2
		7 y (2003–2009)		6,041	170.8	5.8	167.0	170.5	174.9		7,410	157.6	5.4	154.0	157.7	161.0
50–69	Crude	2 y (2005–2006)	165.7	2,165	165.7	6.3	161.5	165.7	170.0	153.0	2,702	152.9	5.5	149.3	153.0	156.9
		2 y (2008–2009)		2,388	166.3	6.0	162.3	166.2	170.0		2,876	153.3	5.5	149.6	153.3	157.0
		7 y (2003–2009)		8,134	165.8	6.1	161.8	165.7	170.0		9,968	152.9	5.6	149.2	153.0	156.8
70–	Crude	2 y (2005–2006)	161.0	1,225	160.8	6.5	157.0	161.0	165.0	147.5	1,561	146.9	6.3	143.1	147.5	151.0
		2 y (2008–2009)		1,389	160.6	6.6	156.5	160.9	165.0		1,869	147.2	6.3	143.1	147.8	151.7
		7 y (2003–2009)		4,424	160.6	6.5	156.5	160.6	165.0		5,776	147.0	6.3	143.0	147.4	151.0

DRIs-J, Dietary Reference Intakes for Japanese.

Data from 56,178 subjects (45.8% men) were analyzed.

[1] Excluding pregnant women.

[2] Weighted values according to the subject distribution by age and sex are shown for the age group of 1–17 y.

Table appendix-3. Weights of Japanese men and women by age group.

Age, y	Pooled data		Men							Women						
			DRIs-J weight (kg)	*n*	Mean	Std dev	Percentile			DRIs-J weight (kg)	*n*	Mean	Std dev	Percentile		
							25	50	75					25	50	75
1–2	Crude	2 y (2005–2006)	11.7	140	11.7	1.7	10.5	11.7	13.0	11.0	124	11.2	1.8	10.0	11.1	12.4
		2 y (2008–2009)		110	11.8	1.6	10.8	11.9	13.0		115	11.0	1.7	9.8	11.0	12.1
		7 y (2003–2009)		481	11.8	1.7	10.6	11.8	13.0		451	11.2	1.8	10.0	11.0	12.4
	Weighted[2]	2 y (2005–2006)		140	11.7	2.0	10.5	11.7	13.0		124	11.2	2.2	9.9	11.0	12.4
		2 y (2008–2009)		110	11.7	2.1	10.5	11.6	13.0		115	11.1	2.3	10.0	11.0	12.2
		7 y (2003–2009)		481	11.8	1.1	10.6	11.7	13.0		451	11.3	1.2	10.0	11.2	12.5
3–5	Crude	2 y (2005–2006)	16.2	223	16.8	2.5	15.1	16.5	18.0	16.2	240	16.5	2.9	14.5	16.0	18.0
		2 y (2008–2009)		217	16.6	2.8	14.8	16.4	18.0		201	16.2	2.5	14.3	16.0	18.0
		7 y (2003–2009)		830	16.8	2.9	15.0	16.3	18.2		810	16.4	2.8	14.4	16.0	18.0
	Weighted[2]	2 y (2005–2006)		223	16.6	2.9	15.0	16.2	18.0		240	16.6	3.3	14.5	16.2	18.0
		2 y (2008–2009)		217	16.7	3.3	14.8	16.4	18.0		201	16.1	3.1	14.3	16.0	17.7
		7 y (2003–2009)		830	16.7	1.7	14.9	16.2	18.1		810	16.4	1.7	14.4	16.0	18.0
6–7	Crude	2 y (2005–2006)	22.0	144	22.7	4.2	19.7	22.0	24.8	22.0	173	22.2	3.6	19.8	22.0	24.0
		2 y (2008–2009)		153	22.7	3.7	20.1	22.0	24.5		149	21.6	3.6	19.5	21.0	23.1
		7 y (2003–2009)		572	22.6	4.2	20.0	21.8	24.4		594	22.1	3.7	19.6	21.5	24.0
	Weighted[2]	2 y (2005–2006)		144	22.7	4.9	19.7	22.0	24.8		173	22.2	3.9	19.7	22.0	24.0
		2 y (2008–2009)		153	22.6	4.3	20.0	22.0	24.5		149	21.7	4.2	19.5	21.0	23.4
		7 y (2003–2009)		572	22.6	2.5	20.0	21.8	24.4		594	22.0	2.1	19.5	21.5	24.0
8–9	Crude	2 y (2005–2006)	27.5	167	28.8	5.9	24.5	27.8	32.4	27.2	173	28.0	5.8	24.1	27.0	29.5
		2 y (2008–2009)		169	28.1	5.7	24.3	27.1	30.5		169	27.7	5.9	23.6	26.2	31.0
		7 y (2003–2009)		621	28.6	6.0	24.5	27.5	31.5		609	28.0	5.9	24.0	27.0	30.5
	Weighted[2]	2 y (2005–2006)		167	28.7	6.5	24.5	27.5	32.0		173	28.3	6.3	24.2	27.2	30.0
		2 y (2008–2009)		169	28.2	6.2	24.3	27.1	30.7		169	27.9	6.4	23.7	26.4	31.6
		7 y (2003–2009)		621	28.5	3.4	24.5	27.5	31.4		609	28.1	3.4	24.0	27.0	30.7
10–11	Crude	2 y (2005–2006)	35.5	173	37.5	9.3	31.4	35.5	41.0	34.5	166	36.0	7.5	30.0	34.8	41.0
		2 y (2008–2009)		147	35.3	9.0	29.8	33.6	39.0		175	37.1	8.5	31.0	36.0	42.0
		7 y (2003–2009)		599	36.1	8.3	30.2	34.0	40.0		595	36.2	7.9	30.0	35.0	41.0
	Weighted[2]	2 y (2005–2006)		173	37.6	10.0	31.4	35.5	41.2		166	35.8	8.1	30.0	34.5	41.0
		2 y (2008–2009)		147	35.4	10.6	30.0	33.6	39.0		175	37.2	9.1	31.0	36.0	42.0
		7 y (2003–2009)		599	36.1	4.8	30.2	34.3	40.2		595	36.1	4.6	30.0	35.0	41.0
12–14	Crude	2 y (2005–2006)	48.0	234	48.3	9.4	42.0	48.0	53.5	46.0	217	46.5	7.9	41.0	45.7	50.4
		2 y (2008–2009)		225	47.4	10.0	41.2	46.0	52.9		208	46.0	7.8	41.0	45.0	50.6
		7 y (2003–2009)		836	48.0	10.3	40.9	47.0	53.9		795	46.3	7.9	41.0	45.0	50.8
	Weighted[2]	2 y (2005–2006)		234	48.3	10.6	42.0	48.0	53.3		217	46.6	9.3	41.0	46.0	51.0
		2 y (2008–2009)		225	47.1	11.5	40.8	46.0	52.4		208	46.2	9.4	41.0	45.0	51.0
		7 y (2003–2009)		836	48.1	6.2	41.0	47.2	54.0		795	46.4	4.9	41.2	45.3	51.0
15–17	Crude	2 y (2005–2006)	58.4	213	59.9	10.2	53.0	58.4	64.5	50.6	212	51.9	7.8	47.0	50.6	55.1
		2 y (2008–2009)		203	59.9	10.8	53.1	58.0	64.7		190	50.8	7.1	46.0	50.0	54.3
		7 y (2003–2009)		770	60.4	10.6	53.5	58.6	65.0		765	51.3	7.3	46.5	50.0	55.0
	Weighted[2]	2 y (2005–2006)		213	59.8	12.0	53.0	58.4	64.5		212	51.9	9.2	47.0	50.6	55.1
		2 y (2008–2009)		203	59.8	13.1	53.0	58.0	64.6		190	50.8	8.8	46.0	50.0	54.3
		7 y (2003–2009)		770	60.3	6.6	53.4	58.5	65.0		765	51.3	4.6	46.5	50.0	55.0
18–29	Crude	2 y (2005–2006)	63.0	664	65.4	11.3	58.0	63.0	70.6	50.6	713	51.6	7.4	46.6	50.6	55.4
		2 y (2008–2009)		607	64.5	11.4	56.8	62.0	70.0		678	51.3	8.3	46.0	50.0	54.5
		7 y (2003–2009)		2,393	65.1	11.1	58.0	63.0	70.0		2,663	51.5	7.8	46.3	50.0	55.0
30–49	Crude	2 y (2005–2006)	68.5	1,623	69.6	11.1	62.0	68.5	75.0	53.0	1,991	54.4	9.0	48.1	53.0	58.5
		2 y (2008–2009)		1,666	70.3	11.5	62.0	69.0	77.2		2,016	54.5	9.8	48.2	52.6	58.5
		7 y (2003–2009)		6,020	69.8	11.2	62.0	68.5	76.0		7,388	54.2	9.2	48.0	52.6	58.2
50–69	Crude	2 y (2005–2006)	65.0	2,158	65.4	9.4	59.0	65.0	71.2	53.6	2,695	54.4	8.4	48.5	53.6	59.1
		2 y (2008–2009)		2,380	65.6	9.7	59.0	65.0	71.4		2,868	53.7	8.5	48.0	52.9	58.3
		7 y (2003–2009)		8,114	65.4	9.5	59.0	64.9	71.0		9,950	54.0	8.4	48.1	53.1	59.0
70–	Crude	2 y (2005–2006)	59.7	1,222	59.8	8.8	54.0	59.7	65.0	49.0	1,558	49.8	8.4	44.0	49.0	55.1
		2 y (2008–2009)		1,386	59.9	8.9	53.5	60.0	65.8		1,870	49.8	8.7	43.8	49.0	55.0
		7 y (2003–2009)		4,419	59.5	9.4	53.2	59.5	65.0		5,780	49.7	8.6	43.9	49.0	55.0

DRIs-J, Dietary Reference Intakes for Japanese.
Data from 56,055 subjects (45.8% men) were analyzed.
[1] Excluding pregnant women.
[2] Weighted values according to the subject distribution by age and sex are shown for the age group of 1–17 y.