Validity of a Self-Administered Food Frequency Questionnaire against 7-day Dietary Records in Four Seasons

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(Received March 16, 2002)

Summary The validity of a food frequency questionnaire (FFQ) was evaluated against four 7-d diet records among 23 men aged 27–70 y. Volunteer women recorded the amounts of all foods and beverages consumed by their husbands or fathers over a period of 7 d in four consecutive seasons in 1997 and 1998, and a self-administered FFQ was answered by each man after completion of the fourth diet record. The diet record was kept in accordance with the method used for Japan's National Nutrition Survey. The FFQ ascertained frequencies and amounts of consumption of rice, bread, noodles, green tea, and coffee; consumption frequency of 35 food items; and consumption frequency and amount of five alcoholic beverages. As for most nutrients and foods, mean intakes estimated by the FFQ were lower than those estimated from the diet record. Crude intake of nutrients showed fairly good agreement between the two methods in terms of Pearson's correlation coefficient ($r > 0.5$), except for total energy ($r = 0.23$), fat ($r = 0.36$), and vitamin A ($r = 0.29$). The adjustment for energy intake generally reduced the correlation; the reduction being fairly large for fat intake and vitamin A ($r = 0.19$ for both). There was generally good agreement for the intake of foods and beverages with exceptions for fats/oils (Spearman correlation coefficient, $r_s = 0.30$) and other vegetables ($r_s = 0.35$). The highest correlation was observed for alcoholic beverages ($r_s = 0.91$), bread ($r_s = 0.80$), and fruits ($r_s = 0.77$). An FFQ covering a limited number of common foods may be useful in assessing the relative position of an individual's habitual consumption of foods and nutrients; however, the instrument generally underestimates absolute intake.

Key Words validity, food frequency questionnaire, diet record, Japanese men

Much attention has been drawn to the role of diet in the prevention of cancer and cardiovascular diseases over the past decades (1–3). It is important to measure the habitual, long-term intake of foods and nutrients in order to study the relationship between diet and chronic diseases (3, 4). Of the several methods for measuring an individual's intake of foods and nutrients, the food frequency questionnaire (FFQ), with and without partial quantitation, has been used most frequently in epidemiologic studies mainly because of easy administration in a large population (3, 4). While a quantitative estimation of food and nutrient intake by FFQ has been done successfully for epidemiologic studies of chronic diseases such as cancer and cardiovascular diseases in Europe and North America (5–14), most epidemiologic studies on diet and disease in Japan have been based on only the frequency of consuming a limited number of food items and groups (15–21). Simple or semiquantitative FFQs have been developed very recently to estimate the habitual intake of foods and nutrients quantitatively in Japan (22–26). We developed a self-adminis-

tered FFQ for use in the Self Defense Forces Health Study (27–29), in which our aim was to examine the relationship of dietary factors to colorectal adenomas. This paper describes the validity of our FFQ as compared to the diet record method.

MATERIALS AND METHODS

Subjects. A total of 24 volunteer women were recruited to participate in the study. They were asked to record the amounts of foods and beverages consumed by their husbands or fathers for a 7-d period four times in 1 y. The first record was done in July to August 1997; the second in October to November 1997; the third in January to February 1998; and the fourth in April to May 1998. A gratuity of 5,000 Japanese yen was awarded after the completion of each 7-d record. One woman withdrew before the third record, and the remaining 23 completed four records for their husbands ($n = 18$) or fathers ($n = 5$). The participating women were research nurses ($n = 10$) and clerical workers ($n = 2$) at the Department of Preventive Medicine, Kyushu University and their acquaintances ($n = 11$), who were housewives.

Dietary records. Detailed instruction was given per-

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sonally as to how to record the foods and beverages before implementing the first record; the instruction was in accordance with the method used for Japan's National Nutrition Survey (30). In brief, amounts of foods used for each dish and of beverages consumed for breakfast, lunch, supper, and between-meal snacks and drinks were weighed or alternatively estimated. As for foods consumed outside of the home, in the absence of the woman in charge of recording, the amounts of such foods and beverages were elicited by inquiring to the husband or father. Dietetic scale apparatus were provided when needed. A set of forms for recording the diet for 7 d was given with an example of a recording. As for the second to fourth records, the instructions and record forms were mailed or handed to each participating woman. The participating women were requested not to inform their husbands or fathers of the future administration of the FFQ. For each 7-d record, the record forms were inspected for completeness by an expert dietitian, and ambiguous records were solved by asking questions to participating women via telephone or in person.

Diet records were analyzed to calculate the intake of 12 nutrients and 23 food groups on the basis of the Food Composition Table, Version 4 (31) using software developed by one of the authors (T. Shirota). For reported foods that were not in the Food Composition Table, an expert dietitian chose the most appropriate substitute foods from the table. Version 5 of the Food Composition Table was published in 2000 (32), but the software did not incorporate the new version. Green tea and coffee consumption were enumerated manually because the amount of an individual food or beverage was not reported in the software.

FFQ. A self-administered FFQ was answered by each man in July to August 1998 after completion of the fourth diet record. The self-administered questionnaire inquired about the average consumption of 40 food items and five types of alcoholic beverage in the past year (see Appendix 1). The 40 food items were determined on the basis of previous experiences with dietary surveys done by one of the authors (33). Both consumption frequency and amount were ascertained regarding rice, noodles, bread, green tea, and coffee. Individuals answered the frequency of consuming rice, noodles, and bread by choosing one of five categories (almost null, once a week, 2–3 times a week, 4–5 times a week, and almost daily), and those that consumed a food item once or more per week reported the amount consumed per day using conventional units (e.g., number of bowls for rice and noodles, number of slices for bread). Tea and coffee consumption were ascertained by using closed-ended questions (almost null, one cup per week, 2–3 cups per week, 4–5 cups per week, and almost daily) and open-ended questions inquiring to those who answered "almost daily" the number of cups consumed per day. The frequency of consumption of the remaining 35 items was ascertained using six categories (almost null, once a week, 2–3 times a week, 4–5 times a week, almost once per day, and two times or

more per day). As for alcoholic beverages, the frequency and quantity were ascertained for *sake*, *shochu*, beer, spirits, hard liquor, and wine separately. Six response categories (no use, 1–3 times per month, 1–2 times per week, 3–4 times per week, 5–6 times per week, and almost daily) were prepared for each alcoholic beverage, and the average amount of each beverage consumed per occasion was reported.

To calculate the intake of nutrients and food groups from the FFQ, the portion size of each food item and the proportions of individual composite foods were determined (see Appendix 2). Five specific food items (onion, broiled fish, broiled meat, broiled poultry, and raw vegetables) were not used for calculating the intake of nutrients and food groups because broader food items were ascertained separately. For most of the food items, portion sizes and proportions of individual composite foods were based on data from a previous survey (33). As for several other food items, they were determined on the basis of information from various sources including recipe books (34–37).

Statistical analysis. Mean and standard deviation are shown in terms of absolute intake of nutrients and foods. Pearson correlation coefficients were used to examine the agreement between nutrient intake derived from the FFQ and that from the diet record. The distributions of most nutrients were skewed toward higher values, and thus natural-log transformation was done for all the nutrient variables. Nutrient intake adjusted for total energy intake was calculated by the Willett method using the residuals from a regression line (38). The agreement for the food groups was evaluated using Spearman's rank correlation coefficient. Further, the subjects were classified into three groups at the tertiles of the distribution in terms of FFQ-based intake and record-based intake each, and the agreement of categories was evaluated by weighted kappa statistics. All statistical computations were done using SAS Version 6.12 (SAS Institute, Inc., Cary, NC, USA).

RESULTS

The average daily intake of energy and nutrients estimated from the FFQ were generally lower than those derived from the 28-d record (Table 1). The average intakes reported for energy, protein, and fat were about 40% lower in the questionnaire-based estimates, and the intakes reported for carbohydrates and dietary fiber were approximately 30% lower. Questionnaire-based intake was also lower than that estimated from the diet records for some, but not all, food groups (Table 2). While the intakes reported for fish, meat, poultry, eggs, and vegetables were 40–60% lower in the questionnaire than in the diet record, the questionnaire-based intakes of cereals, soy products, green tea, and coffee did not differ greatly from the intakes estimated using the diet records. The average alcohol intake estimated by the two methods was almost identical.

Pearson correlation coefficients between nutrient intake estimated from the diet records and questionnaire-based nutrient intake are shown in Table 3. While the

Table 1. The average daily intake of energy and nutrients estimated from the diet record and food frequency questionnaire (FFQ).

Nutrient (unit)	Mean (SD)		Ratio of FFQ to record
	Diet record	FFQ	
Energy (kcal)	2,251 (285)	1,366 (169)	0.61
Protein (g)	89 (10)	49 (6)	0.55
Fat (g)	67 (15)	41 (10)	0.62
Carbohydrates (g)	266 (51)	181 (38)	0.68
Total fiber (g)	11.1 (2.6)	8.0 (2.0)	0.72
Soluble dietary fiber (g)	1.9 (0.6)	1.4 (0.5)	0.74
Insoluble dietary fiber (g)	9.2 (2.1)	6.5 (1.6)	0.71
Vitamin A (IU)	2,903 (1,086)	1,368 (483)	0.47
Vitamin C (mg)	104 (36)	58 (23)	0.56
Calcium (mg)	573 (150)	330 (106)	0.58
Iron (mg)	12 (2)	6 (1)	0.49
Potassium (mg)	2,905 (549)	1,742 (423)	0.60

Table 2. Absolute intake (g/d) of selected food groups estimated from the diet record and food frequency questionnaire (FFQ).

Food and beverage	Mean (SD)		Ratio of FFQ to record
	Diet record	FFQ	
Cereals	485 (100)	412 (86)	0.85
Rice	352 (119)	306 (98)	0.87
Noodles	84 (37)	64 (44)	0.77
Bread	38 (32)	42 (52)	1.11
Confectioneries	24 (21)	15 (13)	0.63
Fats and oils	20 (8)	16 (8)	0.83
Fish	77 (35)	33 (15)	0.43
Meat	112 (42)	48 (17)	0.43
Poultry	32 (20)	13 (7)	0.40
Eggs	41 (17)	27 (20)	0.66
Dairy products	90 (83)	106 (99)	1.18
Seaweed	5 (4)	1 (1)	0.13
Total vegetables	266 (61)	165 (75)	0.62
Green-yellow vegetables ¹	58 (24)	45 (21)	0.78
Other vegetables ¹	193 (36)	110 (64)	0.57
Pickled vegetables	14 (16)	10 (11)	0.73
Tofu	50 (20)	43 (23)	0.86
Fermented soybeans	12 (8)	10 (10)	0.86
Soy paste	10 (5)	8 (2)	0.82
Fruits	67 (80)	56 (70)	0.82
Green tea	150 (129)	126 (170)	0.84
Coffee	258 (179)	318 (282)	1.23
Alcoholic beverages ²	30 (30)	32 (42)	1.06

¹ Not including pickled vegetables.

² Amount in ethanol (g).

intake of total energy, fat, and vitamin A showed relatively low correlations, other macronutrients and micronutrients showed fairly high correlations. The correlation coefficients for energy-adjusted nutrient intake were generally smaller than those for crude intake. The correlation coefficients for fat and vitamin A were much attenuated when energy-adjusted intake was used.

As for most of the food groups in the study, the corre-

lation between questionnaire-based and record-based intake was fairly good (Table 4). The items “fats/oils” and “vegetables other than green-yellow vegetables” had Spearman’s correlation coefficients of less than 0.4. The correlation coefficients for four food groups were greater than 0.7: bread ($r_s=0.80$), fruits ($r_s=0.77$), coffee ($r_s=0.75$), and alcohol ($r_s=0.91$). Kappa statistics also showed a fairly good agreement between the two methods, except for cereals (0.29), confectioneries

Table 3. Pearson's correlation coefficients of energy and nutrient intake between the diet record and food frequency questionnaire.

Nutrient (unit) ¹	Crude ²	Energy-adjusted ²
Energy (kcal)	0.23	—
Protein (g)	0.58	0.44
Fat (g)	0.36	0.19
Carbohydrates (g)	0.57	0.45
Total fiber (g)	0.57	0.56
Soluble dietary fiber (g)	0.62	0.52
Insoluble dietary fiber (g)	0.55	0.56
Vitamin A (IU)	0.29	0.19
Vitamin C (mg)	0.51	0.35
Calcium (mg)	0.55	0.52
Iron (mg)	0.55	0.31
Potassium (mg)	0.72	0.63

¹ All variables were transformed to the scale of natural logarithm.

² $p < 0.05$ for correlation coefficient > 0.41 , $p < 0.01$ for correlation coefficient > 0.53 .

(0.33), fats/oils (0.14), and other vegetables (0.30).

DISCUSSION

The dietary questionnaire used in the present study underestimated the absolute intake of nutrients and foods, but fairly adequately predicted the relative position of an individual's long-term intake of most nutrients and foods. The underestimation of amounts was probably due to the limited number of food items in the questionnaire. It is also possible that the portion size assigned to some of the food items may have been lower than the average portion size consumed by the study subjects. It has been reported that nutrient and food intake measured using FFQs is generally lower than estimates made on the basis of diet records or detailed diet histories in both Western countries (5, 9, 10, 12–14) and Japan (24).

In the present study, most of the nutrients and foods showed fairly good correlation between record and questionnaire except for the items of total energy, fat intake, vitamin A, and fats/oils. The correlation coefficient of 0.23 for total energy intake was much smaller than reported in some of the previous studies using a semiquantitative FFQ (11, 13, 14), but not materially less than the values reported in other studies (5, 7, 10, 12) in Western countries. The correlation coefficients for total energy were 0.21 in one Japanese study (26) and 0.45 in another study based on a semiquantitative FFQ in Japan (23). In the present questionnaire, the quantity was elicited only regarding rice, bread, noodles, and alcoholic beverages as well as green tea and coffee. It would be necessary to ascertain the portion size of energy-dense, common foods such as meat, poultry, and confectioneries to improve the estimation of energy intake on the basis of the questionnaire. A major source of fat intake in the Japanese diet is vegetable oils used for cooking (deep-frying, and pan-frying); one

Table 4. Spearman's correlation coefficients and weighted kappa statistics of individual food intake between the diet record and food frequency questionnaire.

Food and beverage	Spearman's correlation ¹	Weighted kappa ²
Cereals	0.51	0.29
Rice	0.56	0.54
Noodles	0.47	0.46
Bread	0.80	0.72
Confectioneries	0.40	0.33
Fats and oils	0.30	0.14
Fish	0.51	0.38
Meat	0.48	0.44
Poultry	0.59	0.44
Eggs	0.69	0.55
Dairy products	0.58	0.56
Seaweed	0.56	0.47
Total vegetables	0.40	0.35
Green-yellow vegetables ³	0.40	0.37
Other vegetables ³	0.35	0.30
Pickled vegetables	0.58	0.42
Tofu	0.52	0.41
Fermented soybean	0.52	0.53
Soy paste	0.61	0.51
Fruits	0.77	0.62
Green-tea	0.64	0.58
Coffee	0.75	0.71
Alcoholic beverages ⁴	0.91	0.70

¹ $p < 0.05$ for correlation coefficient > 0.42 , $p < 0.01$ for correlation coefficient > 0.53 .

² All variables were classified into three categories.

³ Not including pickled vegetables.

⁴ Amount in ethanol (g).

study showing that approximately 15% of fat intake is derived from vegetable oils used for cooking (39). It is difficult to ascertain the exact amount of oil used for cooking. The present study ascertained the frequency of deep-fried and pan-fried foods, and 10 g and 5 g of vegetable oil were assigned to one serving of deep-fried or pan-fried foods, respectively. Admittedly, this method was crude for estimating the amount of oil consumed. The poor estimate for oil intake probably resulted in a relatively weak correlation for fat intake, and consequently total energy intake, between the dietary record and FFQ.

The use of energy-adjusted nutrient intake did not increase the correlation between the estimates from the diet record and those from the questionnaire. In general, correlation coefficients between the diet record and FFQ were slightly higher for the energy-adjusted intake of nutrients than for unadjusted (raw) nutrient intake in studies in Europe and North America (5, 7, 9–12). These results indicate that the reduction in correlated measurement error for total calories and nutrients exceeds the reduction in between-individual variations of nutrient intake resulting from adjustment for energy intake (38). In the present study, fat intake showed a much smaller correlation coefficient between the two

methods after adjustment for energy intake. The variation of fat intake was only slightly attenuated by adjustment for energy intake; the coefficient of variation of energy-adjusted fat intake in the scale of natural logarithm being 3.8%, while that of unadjusted fat intake was 4.9%. The measurement error in the FFQ and/or diet record may have been greater for total energy intake than for fat intake. Two validation studies in Japan also reported that the correlation coefficient for energy-adjusted fat intake was lower than that for crude fat intake (23, 24). The correlation coefficients for crude and energy-adjusted nutrients other than fat in the present study were almost the same in magnitude as reported in other Japanese studies (23, 24, 26).

Diet records have been regarded as the best reference method for validating an FFQ. However, we have no exact information regarding the thoroughness of diet records. There may have been some inaccuracy in estimations even based on the diet record. The period of recording is an important factor for determining the accuracy of habitual nutrient and food intake, especially when intake varies according to season. The method of taking four 7-d records over a period of 1 y was used in the validation of a semiquantitative FFQ used in the Nurses' Health Study (9). Two 7-d dietary records were employed to validate another semiquantitative FFQ given in the Health Professionals Follow-up Study (10) and a FFQ with a portion-size picture booklet in the Alpha-Tocophenol Beta Carotene Cancer Prevention Study (11). The semiquantitative FFQ used in a Dutch prospective study was validated by making a comparison with three 3-d records carried out 4–5 months apart (13). In Japan, Wakai et al. (22) validated their FFQ using four 4-d records which were obtained at intervals of 3 mo, and Tokudome et al. (23) repeated a 1-wk record four times over a 1-y period to validate a semiquantitative FFQ. While a record of 7–14 d in length has been considered adequate to measure most of the diet in Western populations (5, 7, 10, 12, 13), it is not certain how many days are needed to estimate the habitual intake of nutrients and foods in the Japanese diet. In this regard, the use of four 7-d records in the present study is noteworthy.

Another methodological advantage in the present study is that female spouses (or daughters) recorded the diet of their husbands (or fathers). In previous studies using diet records (5–7, 9–14, 22–24, 26), participants themselves recorded their diet and answered a dietary questionnaire. The correlation between the FFQ and diet record observed in these studies probably overestimated the validity because persons participating in the diet record may have been more interested in their diet; and therefore may have recorded the diet and administered the questionnaire more accurately.

The present questionnaire was developed to primarily examine the relation of food and nutrient intake to colorectal adenomas in middle-aged men of the Self Defense Forces. It may be difficult to address the role of fat intake in the occurrence of colorectal adenomas because the crude measurement necessarily attenuates

the true association.

In conclusion, the FFQ covering a limited number of common food items may be useful in assessing the relative position of an individual's habitual consumption of foods and nutrients while the instrument generally underestimates absolute intake.

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Part 1. Alcoholic beverages

飲酒（種類別の頻度と量）：この1年間を平均して、あてはまるところに（✓）をつけてください。

[illegible]

Keywords: child sexual abuse; disclosure; legal system

[illegible]

副食

[illegible]

Vegetables, fruits, etc.

野菜・果物など

Almost null ほとんど食べない	1 time/week 週に1回	2-3 times/week 週に2~3回	4-5 times/week 週に4~5回	Almost daily ほぼ毎日	2+ /day 毎日2回以上
Green-yellow vegetables ☐ 緑黄色野菜	☐	☐	☐	☐	☐
Other vegetables ☐ 淡色野菜	☐	☐	☐	☐	☐
Onions ☐ たまねぎ	☐	☐	☐	☐	☐
Garlic ☐ にんにく	☐	☐	☐	☐	☐
Pickles ☐ 漬物	☐	☐	☐	☐	☐
Seaweeds ☐ 藻類(ワカメなど)	☐	☐	☐	☐	☐
Apples ☐ りんご	☐	☐	☐	☐	☐
Oranges ☐ みかん類	☐	☐	☐	☐	☐
Other fruits ☐ 他の果物	☐	☐	☐	☐	☐
Mayonnaise ☐ マヨネーズ	☐	☐	☐	☐	☐
Dressing ☐ ドレッシング	☐	☐	☐	☐	☐
Deep-fried foods ☐ 揚げ物	☐	☐	☐	☐	☐
Pan-fried foods ☐ 炒め物	☐	☐	☐	☐	☐

Tea and coffee

お茶とコーヒー

Almost null ほとんど飲まない	1 cup/week 週に1杯	2-3 cups/week 週に2~3杯	4-5 cups/week 週に4~5杯	Almost daily ほぼ毎日	Amount 量
Green tea ☐ 緑茶	☐	☐	☐	☐	cups/d ()杯/日
Coffee ☐ コーヒー	☐	☐	☐	☐	cups/d ()杯/日

Main foods selected special foods

調理品

Almost null ほとんど食べない	1 time/week 週に1回	2-3 times/week 週に2~3回	4-5 times/week 週に4~5回	Almost daily ほぼ毎日	2+ /day 毎日2回以上
Broiled fish ☐ 焼き魚	☐	☐	☐	☐	☐
Broiled meat ☐ 焼き肉	☐	☐	☐	☐	☐
Broiled poultry ☐ 焼き鳥	☐	☐	☐	☐	☐
Raw vegetables ☐ 生野菜	☐	☐	☐	☐	☐
Chinese dumpling ☐ ぎょうざ	☐	☐	☐	☐	☐

Appendix 2: Food items in the food frequency questionnaire and corresponding foods in the Food Composition Table used for estimating nutrient intake¹

Food item	Portion (g)	Food in the Food Composition Table
Steamed rice	140	cooked paddy rice [142d]
Noodles	200	udon [121b] (0.8), Chinese noodle [128a] (0.2)
Bread	120	white bread [113a] (0.62), soft rolls [11319] (0.38)
Butter	7	butter [1128]
Margarine	7	margarine [57]
Jam/honey	7	strawberries [137] (0.24), apples [1391] (0.24), grape [1374] (0.24), honey [316] (0.28)
Confectioneries ²	50 ³	custard pudding [443] (0.3), Japanese cake [424e] (0.13), jam bun [456] (0.11), Danish pastry [458] (0.10), bean-jam bun [454] (0.12), chocolate-cornet [457] (0.16), snack cake [463] (0.08)
Sweet beverages	180 ³	carbonated beverages [1633a] (0.25), cola [1633b] (0.25), grapefruit juice [1338d] (0.25), apple juice [1389e] (0.25)
Fish	70	fish paste products [8246] (0.23), sea bream [8110a] (0.2), mackerel [884a] (0.19), sardine [826a] (0.15), tuna [8149] (0.13), fish sausage [8258] (0.1)
Poultry ⁴	50	chicken breast [947a] (0.5), chicken thigh [949a] (0.5)
Beef ⁴	70	sirloin [912a] (0.5), rump [920b] (0.5)
Pork ⁴	70	loin [968b] (0.5), belly [969b] (0.5)
Ham/sausage	20 ³	loin [986c] (0.5), mixed [987h] (0.5)
Eggs	50	chicken egg [105a]
Milk	180	ordinary milk [112]
Cheese	24	process cheese [1123]
Yogurt	100	yogurt [119a]
Miso soup	15	rice-koji miso [732a]
Tofu	100	soybean curd [721a]
Fermented soybean	50	<i>natto</i> [729]
Green-yellow vegetables	75	tomato [1285] (0.45), carrot [1294a] (0.35), green pepper [12108a] (0.15), others (0.05)
Other vegetables	150	cucumber [1225a] (0.28), cabbage [1224a] (0.22), eggplant [1287a] (0.2), Japanese radish [1256a] (0.18), onion [1270a] (0.12)
Garlic	5	garlic [1295]
Pickled vegetables	20	Chinese cabbage [12101b]
Seaweed	2	dried seaweed (<i>wakame</i>) [1535a]
Apple	180 ³	apple [1388]
Citrus fruits ²	100 ³	mandarin [1317b] (0.6), <i>natsumikan</i> [1354] (0.18), <i>iyokan</i> [1311] (0.11), <i>hassaku</i> [1362] (0.11)
Other fruits ²	100 ³	banana [1364] (0.85), watermelon [1345] (0.11), strawberry [136] (0.04)
Mayonnaise	10	mayonnaise (egg-yolk type) [1710b]
Salad dressing	10	salad dressing [179a]
Deep-fried foods ⁵	10	vegetables oils [51]
Pan-fried foods ⁵	5	vegetables oils [51]
Chinese dumpling ⁵	180	pork belly [969b] (0.19), cabbage [1224a] (0.22), garlic [1295] (0.01), welsh onion [1296] (0.08), uncounted (0.5)
Green tea	100 ³	green-tea infusion [1621b]
Coffee	150 ³	brewed coffee [1630b]

In parentheses are proportions of each food used to calculate nutrients. Codes in brackets stand for food codes in the Food Composition Table.

¹ Unless otherwise specified, portion sizes and proportions of composite foods are based on a previous survey conducted by Shirota and Yoshizumi (33).

² Proportions of composite foods are based on data compiled by the Fukuoka Prefectural Association of Dietitians (34).

³ Determined on the basis of commonly used portion or serving sizes (35). Common individual foods were assigned to items of sweet beverages and ham/sausage with equal proportions.

⁴ Portion sizes are based on a previous survey (33), and proportions of composite foods were determined on the basis of commonly used recipes (36, 37).

⁵ Both portion sizes and proportions of composite foods were determined on the basis of commonly used recipes (36, 37).