Usefulness of a Short Dietary Propensity Questionnaire in Japan

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**Aim:** There is a growing need for nutritional education for prevention and non-pharmacological treatment of risk factors for cardiovascular diseases (CVD). We compared the results of a short dietary propensity questionnaire (SDPQ) with those from the food frequency and quantity survey (FF Quantity), which had been previously quantitatively assessed by comparison with the 24-hr dietary recall (24hr-DR), to examine the usefulness of the SDPQ. The SDPQ was designed to assess dietary propensities of 12 food/nutrients relevant to CVD risk factors.

**Methods:** We conducted a dietary survey using the SDPQ on Japanese men and women. After 2–3 weeks, we conducted the FF Quantity survey with the same participants. For each of the 12 food/nutrient categories, the relationships between quintiles of results from the SDPQ and FF Quantity were examined. Results from 79 participants who completed both surveys were used.

**Results:** Spearman’s correlation coefficients (r) were significant for all food/nutrient categories. Good correlations were found with alcohol (r=0.792), starchy foods (r=0.566), and milk and dairy products (r=0.687), for which good correlations between the FF Quantity and 24hr-DR had been observed previously. Moderate correlations were found for vegetables (r=0.386) and high-salt foods (r=0.505), although the FF Quantity survey poorly correlated with the 24hr-DR.

**Conclusion:** The SDPQ may be useful for assessment of dietary propensities for alcohol, starchy foods, and milk and dairy products in Japan.

**Key words:** Cardiovascular disease risk factors, Dietary survey, Nutritional education, Japan
A dietary survey using the SDPQ was first performed for each participant. Participants filled in the questionnaire by themselves, and interviewers further checked the answers with the participant. The FF Quantity survey was scheduled 2-3 weeks after the SDPQ survey. Participants were given the FF Quantity questionnaire at the end of the SDPQ survey. Trained interviewers confirmed the frequencies written for the FF Quantity and asked usual portion sizes. Answers to the two surveys were processed using the methods described in the method section.

The interviewers were registered dietitians, public health nurses, or nurses, and all received training for the two methods before the survey.

**Table 1. Cardiovascular disease risk factors and nutritional advice to improve each risk factor**

| Risk factor                | Nutritional advice                                         |
|----------------------------|------------------------------------------------------------|
| Hypertension               | Excess intake should be avoided.                           |
|                            | High-sodium foods 9-13                                    |
|                            | Alcohol 10, 13-15                                          |
|                            | Inadequate intake should be avoided.                       |
|                            | Vegetables (potassium) 9, 10, 13, 16-18                   |
|                            | Fruits (potassium) 9, 10, 13, 16, 17                      |
| Lipid disorders            |                                                            |
| Hyper LDL cholesterolemia  | Excess intake should be avoided.                           |
|                            | Meat and eggs (SFA, cholesterol) 19-23                    |
|                            | Milk and dairy (SFA) 19, 21, 22, 23                       |
|                            | High fat sweets/snacks (SFA) 21, 23                       |
| Low HDL cholesterolemia    | Inadequate intake should be avoided.                       |
|                            | Fish and soy products (PUFA) 21-23                        |
|                            | Vegetables (dietary fiber) 19, 21, 22, 23                 |
| Hypertriglyceridemia       | Excess intake should be avoided.                           |
|                            | Alcohol 21, 23                                            |
|                            | Inadequate intake should be avoided.                       |
|                            | Fish and soy products (PUFA) 21, 23-25                    |
| Impaired glucose tolerance | Excess intake should be avoided.                           |
|                            | High-calorie foods 28-30                                   |
|                            | Inadequate intake should be avoided.                       |
|                            | Vegetables (dietary fiber) 26, 30                          |
| Obesity                   | Excess intake should be avoided.                           |
|                            | High-calorie foods 28, 29                                  |
|                            | Inadequate intake should be avoided.                       |
|                            | Vegetables (dietary fiber) 26                             |

LDL, low density lipoprotein; HDL, high density lipoprotein; SFA, saturated fatty acids; PUFA, polyunsaturated fatty acids

**Methods**

**Study Procedure**

A dietary survey using the SDPQ was first performed for each participant. Participants filled in the questionnaire by themselves, and interviewers further checked the answers with the participant. The FF Quantity survey was scheduled 2-3 weeks after the SDPQ survey. Participants were given the FF Quantity questionnaire at the end of the SDPQ survey. Trained interviewers confirmed the frequencies written for the FF Quantity and asked usual portion sizes. Answers to the two surveys were processed using the methods described in the method section.

The interviewers were registered dietitians, public health nurses, or nurses, and all received training for the two methods before the survey.
We invited men and women aged 40–74 years to participate in the survey in 2013 at two locations: Iwate prefecture and Tokyo. In Iwate prefecture, a local area in northeastern Japan, residents who attended a community health class were invited. In Tokyo, recipients of complete medical checkups at a medical institution located in a business district and employees of the institution were invited. We selected two areas with different characteristics; a local area where relatively older and retired persons could be recruited, and a business district where working persons could be recruited, assuming that the questionnaire would be used at different settings for nutritional education.

Written informed consent was obtained from all the participants. The ethical committee of the First

### Table 2. Foods listed in the SDPQ

| Foods                                      | Number of questions | Example of portion size                  | High-calorie foods | High-sodium foods |
|--------------------------------------------|---------------------|------------------------------------------|--------------------|-------------------|
| Starchy foods                              |                     |                                         |                    |                   |
| Rice (breakfast, lunch, dinner)            | 3                   | A small bowl, a medium bowl, or a large bowl | x                  |                   |
| Bread                                      | 1                   | A slice (60 g)                           |                    | x                 |
| Noodles (Japanese/Chinese served with soup)| 1                   | One serving                              |                    | x                 |
| Noodles (fried noodle, pasta)              | 2                   | One serving                              |                    | x                 |
| Potatoes and pumpkin                       | 1                   | A small potato (100 g)                   |                    | x                 |
| Fish and soy products                      |                     |                                         |                    |                   |
| Fish without added salt                    | 1                   | A piece (80 g)                           |                    |                   |
| Salted fish                                | 1                   | A piece (80 g)                           |                    | x                 |
| Fish cake                                  | 1                   | Four slices                              |                    | x                 |
| Soy products (tofu, fried tofu, boiled soy bean, etc.) | 1 | One-quarter loaf of tofu (100 g) |                    |                   |
| Meat and eggs                              |                     |                                         |                    |                   |
| Meat (boiled, broiled)                     | 2                   | One serving (80 g)                      |                    |                   |
| Meat (stir-fried, deep-fried)              | 2                   | One serving (80 g)                      |                    | x                 |
| Ham, sausages                              | 1                   | Two slices of ham (30 g)                | x                  | x                 |
| Hen eggs                                   | 1                   | One egg                                  |                    |                   |
| Milk and dairy products                    |                     |                                         |                    |                   |
| Milk and yogurt                            | 1                   | One cup                                  |                    |                   |
| Cheese, ice cream                          | 1                   | A slice of cheese/half cup of ice cream  | x                  |                   |
| Vegetables (excluding pickles)             |                     |                                         |                    |                   |
| Vegetable dish (small sized)               | 1                   | Served in a small dish                   |                    |                   |
| Vegetable dish (medium sized)              | 1                   | Served in a medium/large dish           |                    |                   |
| Between-meal eating                        |                     |                                         |                    |                   |
| Fruits                                     | 1                   | One banana, half an apple               |                    |                   |
| High fat sweets/snacks                     | 1                   | One-quarter bag of chips, one piece of cake | x       |                   |
| Low fat sweets/snacks                      | 1                   | Three rice crackers                     | x                  |                   |
| Sugary beverages                           | 1                   | A can                                    |                    | x                 |
| Fats and oils                              |                     |                                         |                    |                   |
| Dishes with cooking fats/oils (deep-fried/pan-fried) | 4 | Single serving                           | x                  |                   |
| Mayonnaise/dressing                        | 1                   | One tablespoon                           |                    | x                 |
| High-sodium condiments and dishes          |                     |                                         |                    |                   |
| Soups (miso soup and other soup)           | 1                   | A bowl                                  |                    |                   |
| Soup for noodles (Japanese/Chinese)        | 1                   | One serving                             |                    | x                 |
| Flavored rice (sushi, rice bowl dish)      | 1                   | One serving                             |                    | x                 |
| Japanese pickles                           | 1                   | One small plate                         |                    | x                 |
| Discretionary soy sauce                    | 1                   | One tea spoon                            |                    | x                 |

**Total 40**

SDPQ, brief dietary propensity questionnaire

The “x” in columns for “high-calorie foods” and “high-sodium foods” was added to note consumption points for high-calorie foods and high-sodium foods, respectively.
Table 3. Median (IQR) for intakes of the 12 foods/nutrient categories obtained from the SDPQ and FF Quantity method (n=79)

| Food/nutrient category | SDPQ (unit) | Median (IQR) | Food/nutrient category | FF Quantity method (unit) | Median (IQR) |
|------------------------|------------|-------------|------------------------|---------------------------|-------------|
| Starchy foods          | (Pts/wk)   | 46 (38–53)  | Starchy foods          | (g/day)                   | 412 (327–524) |
| Fish and soy products  | (Pts/wk)   | 13 (9–20)   | Fish and soy products  | (g/day)                   | 170 (137–254) |
| Meat and eggs          | (Pts/wk)   | 18 (13–23)  | Meat and eggs          | (g/day)                   | 92 (68–133)  |
| Milk and dairy products| (Pts/wk)   | 6 (3–10)    | Milk and dairy products| (g/day)                   | 196 (87–258) |
| Vegetables             | (Pts/wk)   | 10 (6–16)   | Vegetables             | (g/day)                   | 309 (186–398) |
| Fruit                  | (Pts/wk)   | 4 (2–6)     | Fruit                  | (g/day)                   | 127 (69–221) |
| Fatty sweets and snacks| (Pts/wk)   | 1 (1–2)     | Fatty sweets and snacks| (g/day)                   | 8 (5–19)     |
| Low fat sweets and snacks| (Pts/wk) | 1 (1–2)     | Low fat sweets and snacks| (g/day)                   | 49 (18–128)  |
| Sugary beverages       | (Drinks/wk)| 0 (0–2)     | Sugary beverages       | (g/day)                   | 12 (7–21)    |
| High-calorie foods     | (Pts/wk)   | 31 (21–39)  | Total energy           | (kcal/day)                | 1972 (1677–2353) |
| High salt foods        | (Pts/wk)   | 19 (14–25)  | Salt                   | (g/day)                   | 10.8 (8.7–13.1) |
| Alcohol                | (go/wk)    | 0 (0–3)     | Alcohol                | (go/day)                  | 0.0 (0.0–1.0) |

IQR, interquartile range; SDPQ, brief dietary propensity questionnaire; FF Quantity, food frequency and quantity

Institute for Health Promotion and Health Care, Japan Anti-Tuberculosis Association approved the study protocol.

SDPQ

For the SDPQ, we defined five CVD risk factors that should be improved by nutritional education using this method: hypertension, lipid disorders, IGT, and obesity. The five risk factors with their corresponding dietary advice are listed in Table 1. We included dietary advice stating that increasing/decreasing food/nutrient intake would improve the risk factor level, for which evidence was provided in both cross-sectional and intervention studies, and included in guidelines. We categorized foods that were to be enquired about in the SDPQ, such that healthcare providers may provide dietary advice using the results of the SDPQ. The basic structure of food categorization used in the FF Quantity was used for the SDPQ, but some of the food categories in the FF Quantity were consolidated in the SDPQ.

Food items to assess food/nutrients in Table 1 are listed in Table 2. Some foods were included to assess the consumption of high-calorie foods and high-sodium foods. For high-calorie foods, we included foods associated with a higher proportion of fat intake (%kcal) and elevated body mass index in epidemiological studies. For high-sodium foods, we included foods with a higher contribution to sodium intake in the Japanese diet. Examples of portion sizes shown in the SDPQ were determined by referring to the common portion sizes from our previous study using the FF Quantity method.

In the survey, participants were asked to answer their usual frequencies of consuming specific foods over the past month by selecting one of the options provided. The options were “do not eat,” “less than once a week,” “two to three times a week,” “four to five times a week,” “six or more times a week,” and “two or more times a day.” Foods were presented in general portion sizes (i.e., “one bowl” for rice, “one cup” for beverages, “a piece” for fish, “one tablespoon” for mayonnaise and dressings, etc.). Several utensils (rice bowls, bento boxes, plates and cups of different sizes) were used to recall their usual portion size with interviewers. If the general portion size posed in the questionnaire was larger or smaller than the usual portion size for the participant, the interviewer reselected the frequency accordingly, i.e., lower frequency was reselected if the participant’s portion size was smaller, and higher frequency was reselected if the portion size was larger.

A calculation table was prepared for interviewers to organize the answers to the SDPQ. Using the table, frequencies per week were assigned to the chosen frequency options; i.e., 0 for “do not eat,” 1 for “less than once a week,” 2 for “two to three times a week,” 4 for “four to five times a week,” 6 for “six or more times a week,” and 14 for “two or more times a day.” Decimals for the frequency were avoided to avoid complex calculations that would require a calculator. Then, the frequencies were multiplied by coefficients prepared for each food question in the calculation table; i.e., 1 for vegetable dish (small size), and 2 for vegetable dish (medium size), and for other foods 1 corresponded to approximately 160 kcal, and for high salt foods 1 corresponded to approximately 1 gram to calculate consumption points per week (pts/wk). For alcoholic beverages, alcohol intake per day was estimated with the

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into quintiles according to the 12 SDPQ consumption points and 12 food/nutrient intakes obtained using the FF Quantity survey. For each food/nutrient category, the relationship between quintiles of SDPQ consumption points and food/nutrient intake by FF Quantity was examined using Spearman’s correlation coefficients. Percentages of agreement within the same or adjacent quintile from the two surveys were also examined.

Statistical testing was two-tailed, with 0.05 indicating significance. SPSS v.21.0 for Windows (IBM Corporation, Chicago, IL, USA) was used throughout the analyses.

### Results

Ninety-four persons; 69 persons in Iwate prefecture (28 men and 41 women, average age was 64.0 years for men and 64.6 years for women) and 25 persons in Tokyo (22 men and 3 women, average age was 56.0 years for men and 52.7 years for women) agreed to participate in the survey. Results from 79 participants; 57 participants in Iwate prefecture (21 men and 36 women, average age was 62.0 years for men and 64.8 years for women) and 22 participants in Tokyo (20 men and 2 women, average age was 50.7 years for men and 45.5 years for women) who completed the two surveys were included in the analysis. It took approximately 10 min to confirm the SDPQ for the participant and the interviewer.

Table 2 shows the median and interquartile range (IQR) for the 12 food/nutrient categories in the two methods. For starchy foods, the median (IQR) was 412 g/day (327–524) by the FF Quantity survey, and 46 pts/wk (38–53) by the SDPQ; for meat and eggs, it was 92 g/day.
(68–133) by the FF Quantity method, and 18 pts/wk (13–23) by the SDPQ survey.

Spearman’s correlation coefficients between quintiles obtained by the two methods are shown in Table 4. Correlation coefficients were significant for all the food/nutrient categories. The correlation coefficients (r) were high for starchy foods (r = 0.566), milk and dairy products (r = 0.687), and alcohol (r = 0.792).

Table 5 shows percentage agreement in the same quintile, same or adjacent quintile, and opposite quintile (Q1 from the SDPQ and Q5 from FF Quantity, and vice versa) of the 12 food/nutrient categories obtained with the two methods. For all the categories, more than half of the participants were classified in the same or adjacent quintiles. Few participants were grouped into the opposite quintile.

**Discussion**

The consumption points obtained from the SDPQ correlated with the food/nutrient intakes obtained using the semi-quantitative dietary questionnaire, the FF Quantity method.

In this study, we compared the results of the SDPQ survey with those from the FF Quantity survey but did not compare with those from detailed dietary surveys. Table 6 shows the degree of correlation between results from 24-hr dietary records and the FF Quantity survey that we previously reported and the results of the present study on the FF Quantity and SDPQ (Table 4). The correlation was considered good if the correlation coefficient (r) was ≥ 0.6, moderate if r was ≥ 0.3 but < 0.6, and poor if r was < 0.3. Differences in the degree of correlation among foods have also been reported in other previous studies in Japan, comparing the results of food frequency questionnaires (FFQs) and detailed dietary surveys. In the current analysis, we found significant correlations between the results from the SDPQ and FF Quantity surveys for all foods/nutrients (Table 4), and few participants were categorized into the opposite quintile (Table 5). Most participants were categorized into a similar consumption rank for all foods/nutrients by both the SDPQ and FF Quantity surveys. However, this did not apply to all food/nutrients in the comparison of FF Quantity and 24-hr dietary recalls (Table 6). We found good/moderate correlations between the FF Quantity and 24-hr dietary recalls and between the FF Quantity and SDPQ for some foods such as starchy foods, milk and dairy products, and alcohol. For these foods, results from the SDPQ may be useful as a quantitative assessment. For foods with a poor correlation between 24-hr recalls and the FF Quantity, such as vegetables and salt, results from the SDPQ should be used only as a reference. Detailed questions on consumption of these foods must be asked to provide advice on nutritional education.

For use in nutritional education, we prepared a table indicating ranges of consumption points from the SDPQ corresponding to “excessive,” “ordinary,” “lower,” and “insufficient” intake levels by each food/nutrient category for adult/elderly men and women. In making the table, we referenced the median and IQR values of food intakes reported in the National Health and Nutrition Survey in Japan 2012 and nutritional guidelines. By applying the ranges to the results of the SDPQ for a patient, healthcare providers may view the propensity of his/her dietary habits (eg. higher meat and egg consumption, but lower fish and soy product consumption), and provide dietary guidance.
advice to improve risk factor levels. Detailed questions are necessary and helpful in the educational interview for effective behavior modification, especially for foods with limited correlations on survey comparison, such as vegetables and salt.

When developing a FFQ, the foods that are frequently consumed by the general population are listed. In Japan, the most existing FFQs were developed to assess baseline dietary characteristics of participants in cohort studies, and some were developed to assess certain nutrient/food intakes relevant to certain diseases, i.e., habitual calcium intake in a study on osteoporosis, for patients with diabetes mellitus, but few were developed for use in the education of CVD risk factors. According to the review of 21 FFQs in Japan, the number of food items questioned in the FFQs ranged from 9 to 169, and six of them included more than one hundred questions. Many food items have to be assessed for cohort studies because beneficial or harmful foods may be discovered during follow-up. For nutritional education on CVD, assessment of food/nutrients with sufficient evidence for risk factors is adequate. Large numbers of questions may require more time to answer and confirm the answers, which may be significantly difficult for busy healthcare departments and elderly participants.

In 2008, Specific Health Checkups and Specific Health Guidance were enacted in Japan as stipulated by the Act on Elderly Health Care. Under this system, health insurance providers across the country, municipal governments, and corporate health insurance societies are required to hold six month long health education programs to improve metabolic syndrome of the insured person based on the results of health checkups. In 2013, 759,982 untreated insured persons finished the Specific Health Guidance program provided by their municipal government or health-care provider. Hospitals and clinics also provide health education for their outpatients. Knowledge, techniques, and tools for effective health education among healthcare providers are needed.

Participants in the current analysis were elderly local residents in Iwate prefecture and middle-aged persons in Tokyo. Both participants and interviewers did not encounter any major difficulties in using the SDPQ, and comparisons of the SDPQ and FF Quantity surveys in the two settings yielded similar results (data not shown). The SDPQ has utility in both healthcare centers of municipal governments and internal medicine outpatient departments.

There are several limitations to this study. Although Japanese people consume a wide variety of foods, we consolidated the questions. This may have caused misclassification of foods, as well as underestimation of food/nutrient intakes. Participants were asked to answer their frequencies from a limited number of options, which may have caused misclassification during assessment. The SDPQ was not compared with

| Four 24-hr dietary recalls and FF Quantity | FF Quantity and SDPQ |
|------------------------------------------|----------------------|
| Cereals | Good | Starchy foods | Moderate |
| Fish and shellfish | Moderate | Fish and soy products | Moderate |
| Soy bean and soybean products | Poor | Meat and eggs | Moderate |
| Eggs | Moderate | Milk and dairy products | Good |
| Meat | Poor | Milk and soybean products | Moderate |
| Milk and yogurt | Good | Vegetables | Moderate (Results should be used only as a reference) |
| Other dairy products | Moderate | Vegetables | Moderate |
| Vegetables | Poor | Fruits | Moderate |
| Fruit | Moderate | Fatty sweets and snacks | Moderate |
| Sweets and snacks | Moderate | Low fat sweets and snacks | Poor |
| Total energy | Moderate | Sugary beverages | Moderate |
| Salt | Poor | Total energy vs. high-calorie foods | Moderate |
| Alcohol | Good | Salt vs. high salt foods | Moderate (Results should be used only as a reference) |
| Alcohol | Good | Alcohol | Good |

FF Quantity, food frequency and quantity
Poor, Spearman’s correlation coefficient (r) < 0.3; moderate 0.3 ≤ r < 0.6; good, r ≥ 0.6
detailed dietary surveys, and the dietary propensities obtained using the questionnaire should be used as a guide for dietary modification for people who need improvement in CVD risk factors. The possibility of selection bias cannot be excluded because the participants were either at a community health class or a medical facility providing complete medical checkups. They may have been interested in diet, and the present findings may not fit with the general population in Japan.

Conclusion

The SDPQ may be useful for assessment of dietary propensities for alcohol, starchy foods, and milk and dairy products in Japan. Healthcare providers should make additional detailed questions to give advice regarding vegetables and salt to people who need improvement in CVD risk factors.

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Conflicts of Interest

None.

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