

Short Communication

Reproducibility and validity of semi-quantitative food frequency questionnaire measuring dietary *trans*-fatty acids intake among Korean adults

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BACKGROUND/OBJECTIVES: Compelling evidence indicates that consumption of *trans*-fatty acids (TFA) is associated with a wide range of diseases. However, few validated tools for TFA intake assessment are available in Korea. We aimed to validate a food frequency questionnaire (FFQ) estimating usual intake of TFA in Korean adults.

MATERIALS/METHODS: Eighty-two healthy adults completed an FFQ with a 3-day diet record (3DDR), and 58 completed a second FFQ at a 1-month interval. To assess the reproducibility of the FFQ, we compared estimated TFA intakes from each FFQ. To assess the validity, we compared estimates from the FFQ with those from the 3DDR.

RESULTS: The FFQ was reproducible (Spearman $r = 0.71$) and provided modest correlations with the 3DDR (Spearman $r = 0.38$). After adjustment for total energy intake, the correlations increased ($r = 0.45$). Measurement-error correction also de-attenuated the correlations ($r = 0.57$). When quintiles of the FFQ and 3DDR were joint-classified, 9% on average were misclassified into extreme quintiles.

CONCLUSIONS: Our findings suggest that the developed FFQ is reproducible and reasonably valid in categorizing individuals according to TFA intakes among healthy young and middle aged adults in Korea.

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INTRODUCTION

Evidence from epidemiologic studies and randomized controlled trials indicates that *trans*-fatty acids (TFA) consumption is associated with a wide range of diseases, including coronary heart disease [1,2], dyslipidemia [3], obesity [4], diabetes [5], and cancer [6]. The World Health Organization recommended in 2003 that TFA intake be limited to less than 1% of total energy intake [7]. Several Western countries, including Denmark [8], Netherlands [9], US [10,11], and Canada [12], have taken action to regulate the consumption. Likewise, mandatory nutrition labeling of TFA in Korea came into effect in December 2007 [13].

Although overall intake of TFA in Korea is relatively low compared with that in Western countries [13], consumption of fast foods and confectionary, which usually contain the most TFA, is higher and has increased among children, adolescents, and young adults [14,15]. Thus, the adverse health effects of

TFA will be more prominent in near future. However, few validated tools for TFA intake assessment are available in Korea. One reason has been the lack of comprehensive TFA database. Between 2004 and 2006, the Korean Food and Drug Administration (KFDA) constructed a TFA database on more than 500 foods and products [13]. Using this database, we developed a semi-quantitative food frequency questionnaire (FFQ) estimating TFA intake.

FFQ has been widely used in epidemiologic studies because of its low cost and feasibility. Such FFQ should be reproducible and valid. Reproducibility refers to consistency of measurements on repetition; validity refers to the ability to measure what the FFQ was designed to measure. To assess validity, a superior, although always imperfect, standard is used for comparison [16]. In this study, we assessed the reproducibility and validity of an FFQ by comparing estimates of TFA intake from the FFQ and a 3-day diet record (3DDR) among healthy adults.

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SUBJECTS AND METHODS

Study population

We recruited volunteers among healthy medical students and nurses aged 20-55 years in a university hospital in Seoul, Korea. We excluded individuals who reported gaining or losing greater than 5 percent of their body weight in the previous year, those who reported major changes in their diets, and those who started to take new drugs regularly during the previous year. Participants were asked to complete an FFQ and a 3DDR, followed by a second FFQ after 1 month. Of the 100 initial participants, 18 subjects who did not complete the 3DDR or first FFQ (FFQ1) were also excluded. In current analyses, we included 82 participants (61 women, 21 men). Among them, 58 provided a second FFQ (FFQ2). The Institutional Review Board of Konkuk University approved this study (No.2008-25-52).

Development of the FFQ

In consultation with an experienced nutritionist and the Nutrition Assessment Team of the KFDA, we developed a 74-line item semi-quantitative FFQ requesting information on individuals' usual diets during the last 6 months (see Appendix). We used the format of Kim's FFQ [17], which were validated for general dietary assessment in Korea, and modified it to be most sensitive to TFA intake.

Our data source for dietary TFA was based on the KFDA report in 2006 (not open to the public) [13] which includes specific brand names for about 500 foods and products commonly consumed and considered to contain appreciable amounts of TFA. From those, we selected 118 major TFA sources (margarine, shortening, bread, cake, chocolate, confectionery, pop corn, french fries, doughnuts, dairy, and meats) that are ranked highly in TFA content and frequently consumed among Korean children and young adults. According to the similarity of TFA contents per portion size, the 118 items were grouped into 56-line items and then included in the FFQ. To estimate total calorie and other nutrient intakes, we asked additional 18-line items about commonly consumed foods in Korea. For other nutrients' compositions, we used the Korean Nutrition Society Food and Nutrition Database [18].

For each food item listed, we specified a portion size using natural units whenever possible (e.g., a slice of bread) and otherwise using typical serving sizes (e.g., 1 teaspoon of margarine). Participants were asked about their usual frequency of consumption for each food by selecting one of nine possible responses ranging from 'never or less than once per month' to 'more than 2 times per day'. To calculate a total TFA intake for each individual, we multiplied a weight assigned to the consumption frequency (e.g., once per day is equal to 1) by the TFA composition for the specified portion size of each food and then summed across all foods.

3-Day dietary record

Participants completed a 3DDR over a 1-week period. To better capture day-to-day variability, participants were asked to keep records for 2 days on weekdays and 1 day on the weekend. A dietitian provided detailed instructions to each participant

on estimating portion size and recording all foods consumed, including brands, preparation methods, and recipes whenever possible. To aid in standard portion size estimation, specifically devised food models were used. After completion of the 3DDR, the dietitian reviewed all entries, interviewed each participant to resolve any ambiguities or incompleteness, and coded the records. TFA intakes from the 3DDR were analyzed using CAN-Pro (ver 3.0, The Korean Nutrition Society) [18], a nutrient software package, by entering the KFDA database on TFA into this program.

Statistical analysis

Nutrient estimates from the FFQ and 3DDR were natural log transformed since they were skewed toward higher values. Because nutrient intakes are correlated with energy intake, we adjusted for total energy intake with regression-residual method to remove the variation due to energy intake and its correlated measurement error [19].

The reproducibility of the FFQ was assessed by comparing FFQ1 and FFQ2 using the Spearman and Pearson correlation coefficients, and its validity was evaluated by comparing the FFQ and 3DDR using those correlations. Within-person variation in daily intakes may cause measurement error in the 3DDR, which can attenuate correlations between the FFQ and 3DDR. To de-attenuate these correlations, we calculated corrected correlation coefficients using the probit transformation [20] (for the Spearman correlation) and the within- to between-person variance ratios [21,22] (for the Pearson correlation). Regression coefficients were calculated by regressing TFA intakes from the 3DDR on the estimates from the FFQ.

Since nutritional measurements are usually utilized as categorical variables in epidemiologic studies, we categorized energy-adjusted TFA intakes into quintiles for the FFQ1 and 3DDR, and examined their joint classification. Statistical tests were performed using STATA version 12.0 (Stata Corp., College Station, TX) and SAS version 9.3 (SAS Institute Inc., Cary, NC).

RESULTS

Among 82 participants who provided both 3DDR and FFQ1, 58 individuals completed the FFQ2 (Table 1). Dietary intakes estimated using the FFQ1 were higher than those using the FFQ2 ($P \leq 0.02$). Compared to the 3DDR, TFA intake from the FFQ (average between FFQ1 and FFQ2) was higher ($P = 0.04$). The FFQ underestimated total calorie intake compared with the 3DDR ($P < 0.001$), but the mean absolute total fat intake was roughly comparable between the two methods ($P = 0.40$).

Reproducibility

The Spearman and Pearson correlations between the estimates from the FFQ1 and FFQ2 were identical and reasonably high ($r = 0.71$, $P < 0.001$), indicating a high degree of reproducibility (Table 2). Adjustment for total energy intake did not appreciably alter these correlations. The within- to between-person variance ratios of TFA intakes (energy-adjusted) from the 3DDR were 0.80.

Validity

The Spearman and Pearson correlations between the FFQ and

Table 1. Characteristics of study participants and mean (standard deviation) daily *trans*-fatty acids and calorie intakes estimated by a 3-day diet record (3DDR), the first pass of the *trans*-fat food frequency questionnaire (FFQ1), and second pass of the *trans*-fat food frequency questionnaire (FFQ2)

	3DDR (n = 82)	FFQ1 (n = 82)	FFQ2 (n = 58)	$P^{1)}$	$P^{2)}$
Age (yrs)	29.9 (6.6)	29.9 (6.6)	30.1 (7.6)	-	-
Male (%)	25.6 (25.6)	25.6 (25.6)	15.5 (15.5)	-	-
Body mass index (kg/m ²)	21.9 (2.8)	21.9 (2.8)	21.9 (2.6)	-	-
Total calorie (kcal)	1709.6 (309.4)	953.2 (528.9)	773.7 (506.3)	0.01	< 0.001
Total fat (g)	49.3 (13.6)	51.7 (29.8)	42.0 (29.4)	0.02	0.40
<i>Trans</i> -fatty acids (g)	0.55 (0.87)	1.23 (1.18)	0.58 (0.57)	< 0.001	0.04
<i>Trans</i> -fatty acids (% energy)	0.29 (0.45)	1.19 (1.12)	0.82 (0.99)	< 0.001	< 0.001
<i>Trans</i> -fatty acids (% fat)	1.17 (1.85)	2.56 (2.51)	1.93 (2.96)	0.01	0.004

¹⁾ P -value from paired t-test between FFQ1 and FFQ2 among individuals who provided both FFQ1 and FFQ2.

²⁾ P -value from paired t-test between 3DDR and average of FFQ1 and FFQ2 among individuals who provided both FFQ1 and FFQ2.

Table 2. Reproducibility of semiquantitative food frequency questionnaire (FFQ) and intraclass correlation and variance components ratios (S^2_w/S^2_b) for the 3-day diet record (3DDR)¹⁾

	FFQ1 vs. FFQ2		3DDR	
	Spearman $r^{***3)}$	Pearson $r^{***3)}$	Intraclass r	S^2_w/S^2_b ²⁾
Unadjusted	0.71	0.71	0.54	0.87
Energy adjusted	0.66	0.67	0.55	0.80

¹⁾ *Trans*-fatty acids values are transformed using log_e to improve normality.

²⁾ Ratio of between- and within-person variance components calculated using ANOVA.

³⁾ *** $P < 0.001$ for all Spearman and Pearson correlation coefficients.

3DDR were similar and showed stronger correlations when adjusted for energy intake (Table 3). The FFQ1 provided reasonably moderate correlations with the 3DDR (for energy-adjusted TFA, Spearman $r = 0.45$, $P < 0.001$; Pearson $r = 0.46$, $P < 0.001$). After correcting for measurement error, the de-attenuated Spearman coefficients increased to 0.57. Similarly, the de-attenuated Pearson coefficients increased. The regression coefficients for the TFA estimates from the FFQ1 were 0.87 (for unadjusted) and 1.45 (for energy-adjusted).

Since the goal of the FFQ was to provide relative rankings of individuals by TFA intake, we evaluated the degree of misclassification regarding categorized intakes (Table 4). Ten of

16 participants (63%) in the highest 3DDR quintile were also in the highest FFQ quintile, and 88% were in the highest one or two FFQ quintiles. Likewise, 35% of participants in the lowest 3DDR quintile were in the lowest FFQ quintile, and 59% were in the lowest one or two FFQ quintiles. On average, about 9% were misclassified into extreme quintiles.

DISCUSSION

In this study, we validated a 74-line item self-administered semi-quantitative FFQ estimating usual intake of TFA in Korean young adults. The FFQ was reproducible and provided reasonably valid in categorizing individuals according to TFA intakes among healthy young and middle aged Korean adults compared with the 3DDR.

In the validation of dietary assessment methods, it is desirable to compare methods with uncorrelated errors to reduce the possibility of artificially inflated correlations [23]. In this study, we employed dietary records (DRs) as a reference because it allows direct measurement of food quantities and minimally depends on memory, whereas an FFQ relies primarily on individuals' recall of their usual food intakes over a long-term period [24].

Table 3. Correlation (r) and regression (b) coefficients between semiquantitative food frequency questionnaires (FFQs) and the average of 3-day diet record (3DDR) calculated for unadjusted and energy-adjusted *trans*-fatty acids intake¹⁾

	FFQ1			FFQ2		
	Spearman $r^{*5)}$	Pearson $r^{*5)}$	Regression $b^{*4)5)}$	Spearman $r^{*5)}$	Pearson $r^{*5)}$	Regression $b^{*4)5)}$
Unadjusted	0.38	0.34	0.87	0.32	0.31	0.55
Energy adjusted ²⁾	0.45	0.46	1.45	0.36	0.35	0.66
De-attenuated ³⁾	0.57	0.52	-	0.50	0.39	-

¹⁾ Values were transformed using log_e to improve normality.

²⁾ Using the residuals from regression models with caloric intake as the independent variable and *trans*-fatty acids intake as the dependent variable.

³⁾ Calculated using the probit transformation for the Spearman rank correlation coefficients, and using the within- to between-person variance ratios (Table 2) measured from the 3DDR for the Pearson correlation coefficients.

⁴⁾ Calculated from regressing the estimated *trans*-fatty acids intakes from the 3DDR on the intakes from the FFQ.

⁵⁾ * $P < 0.05$ for all coefficients.

Table 4. Comparison of *trans*-fatty acids intake from FFQ1 with the mean of 3-day diet record (3DDR) based on joint classification of quintiles calculated from energy-adjusted intakes¹⁾

Highest quintile on 3DDR			Lowest quintile on 3DDR		
Highest quintile on FFQ (%)	Highest 2 quintiles on FFQ (%)	Lowest quintile on FFQ (%)	Lowest quintile on FFQ (%)	Lowest 2 quintiles on FFQ (%)	Highest quintile on FFQ (%)
62.5	87.5	6.3	35.3	58.8	11.8

¹⁾ Adjusted using the residuals from regression models with caloric intake as the independent variable and *trans*-fatty acids intake as the dependent variable.

The correlation coefficients between the FFQ and 3DDR were modest. Because both the FFQ and 3DDR (the reference) are imperfect measures of long-term intake, the modest correlations might be due to errors in both methods. Hunter *et al.* [25] compared two 1-week diet records (DRs) and an FFQ with subcutaneous fat aspirates for polyunsaturated fatty acid intake measurement. Correlations comparing the two dietary assessment methods to the actual fat stores from aspirates were very similar. These results suggest that an FFQ and DRs have similar degrees of error, thus the conventional practice of using a DR as a gold standard may substantially underestimate the validity of an FFQ. To decrease this bias, we calculated measurement-error-corrected correlations, and the de-attenuated correlation coefficients were reasonably high.

In our results, TFA intake from the 3DDR correlated more strongly with the first FFQ (completed before the 3DDR collection) than the second FFQ (completed after). Plausible explanations are that the process of keeping a 3DDR may have sensitized participants to their TFA consumption, so that they may have changed their usual dietary patterns or under-reported, consciously or unconsciously, their consumption of TFA-containing foods that are socially less desirable. When a simple FFQ is compared with a more detailed assessment method in the same individual, the sequence of assessment is important because the completion of one method may affect the performance of and responses to the other method, especially in short intervals [24]. Furthermore, tendencies to under-report unhealthy foods and over-report socially desirable foods have been documented in previous studies [16].

This study has several limitations. First, a 3DDR cannot fully represent a long-term usual diet. This measurement error can decrease the correlations between the FFQ and 3DDR. To minimize this error, we provided de-attenuated correlations. Second, the FFQ and 3DDR were administered at short intervals, which might have influenced the correlations between these methods. Third, although estimation of calorie intake was not a primary objective of our FFQ, it is certainly possible to improve its ability. Lastly, our results may not be applicable to other age groups (e.g., children, adolescents). Future studies to develop an FFQ aiming at these age groups are warranted.

The strengths of this study include that, to our knowledge, this is the first validation study of an FFQ assessing TFA intake in Koreans. We used the KFDB database, which encompasses various foods and specific brands. The 3DDR was reviewed and coded by a dietitian to minimize variability in data interpretation.

In conclusion, the semi-quantitative FFQ developed in this study reasonably categorizes individuals by TFA intake. These findings suggest the potential applicability of this FFQ in a larger population to quantify relationships between TFA intake and various health outcomes. Recently, the levels of TFA in food products have been changing, thus it is warranted to update and refine the FFQ continuously.

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Appendix. *Trans*-fatty Acids Food Frequency Questionnaire (English)

► For each food listed, fill in the box indicating how often on average you have used the amount specified during the past 6 months.

RICE, BREADS, STARCHES, FAST FOODS	AVERAGE USE LAST 6 MONTHS									Average amount per one use			
	Never or < 1/month	1 per month	2-3 per month	1-2 per week	3-4 per week	5-6 per week	1 per day	2 per day	3 per day	Portion size	Less	Same	More
Rice	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	1 bowl (210 g)			
Bread, toast	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	2 slices (70 g)			
Margarine, spread	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	2 ts (8 g)			
Butter	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	1 ts (5 g)			
Instant noodle	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	1 bowl (120 g)			
Hamburger	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	1			
Pizza	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	2 slices			
Spaghetti/pasta	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	1 bowl (250 g)			
Cake, pastry, stick pie, croissant	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	Cake: 1 slice others: 1			

BAKED GOODS, CONFECTIONERY	AVERAGE USE LAST 6 MONTHS									Average amount per one use			
	Never or < 1/month	1 per month	2-3 per month	1-2 per week	3-4 per week	5-6 per week	1 per day	2 per day	3 per day	Portion size	Less	Same	More
French fries	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	1 serving			
Cruller, red bean bun	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	1 pack			
Ho-duck, Bam-man-ju	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	2			
Doughnut	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	1			
Muffin, pound cake	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	1, 1 slice			
Mini-ball (7-8), butter-roll (3), sponge cake (1)	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	7-8, 3, 1 pack			
Cream bun, pineapple bun	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	1 pack			
Popcorn (for microwave)	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	1 pack			
Popcorn (conventional)	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	1 serving			
Corn-choco, Corn-cheese, Sado-bap, Sun-chip	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	1 pack (45 g)			
Kokal-corn, Cheetoz	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	1 pack			
Chipwells (1/2), O-gamja (1/2), Guen-gamja (1)	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	1/2 pack, 1 pack (35 g)			
Pokan (1), Tinkle (1), Kameo (1/2)	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	1 pack, 1/2 pack (50 g)			
Zec (1), Butter-ring (1/2)	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	1 small pack, 1/2 pack (45 g)			
Wehas, Arte, Ace, Oh-yes, Mongshell-tongtong, Choco-pie	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	1 pack (30 g)			
Kan-cho, Dangkong-sand, Haute	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	1 pack			
Fresh-berry (1), Castard (1), Potto (1), Kukudas (4)	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	1 pack (23 g), 4 packs			
Oh-new, Na	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	1 pack (20 g)			
JuJu-dongmulwon, Ivy, Harvest, Chochochip, Its, Digechoco	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	1 pack			
Tongk, Nalssin-gamja	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	1 pack			
Cham-cracker, French-pie, San-do, Choco-heim	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	1 pack			
Bintz (1), Bebe (1), Keyran-kaja (1), Sabre (4)	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	1 pack, 4 pieces (Sabre)			
Choco-songi, Ai-songi, Margaret, Wa-ddang, Lotte-sand	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	1 pack			
Oh-chamkae, Meein-black	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	1 pack			
Paepaero, Kosomi, Yachae-cracker, Choco-frakey	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	1/2 pack			
Butter-coconut, Chick-chock, Grace	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	4 pieces			

BEEF	AVERAGE USE LAST 6 MONTHS									Average amount per one use			
	Never or < 1/month	1 per month	2-3 per month	1-2 per week	3-4 per week	5-6 per week	1 per day	2 per day	3 per day	Portion size	Less	Same	More
Bulgogi/Rhos-guee (sirloin)	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	1 serving (200 g/150 g)			
Galbi	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	1 serving (200 g)			
Liver, intestine, Soondae	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	1/2 serving (100 g)			
Sulung-tang, Gom-tang, Galbi-tang, other tang	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	1 serving			
Beef side dish (a broil, soup, stew, boiled in sauce)	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	1 serving (40 g)			

PORK	AVERAGE USE LAST 6 MONTHS									Average amount per one use			
	Never or < 1/month	1 per month	2-3 per month	1-2 per week	3-4 per week	5-6 per week	1 per day	2 per day	3 per day	Portion size	Less	Same	More
Samgyeopsal	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	1 serving (200 g)			

Yangnyum-bulgogi, a broil, Galbee	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	1 serving (200 g)			
Tangsuyook, Donkas	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	1 serving			
Sooyook (Penyook, Bossam, Jockbal)	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	1/2 serving (5 slices, 70 g)			
Ham (1), spam (1), Vienna sausage (5)	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	1 slice of ham/spam, 5 Vienna sausage			

CHICKEN/EGGS	Never or < 1/month	1 per month	2-3 per month	1-2 per week	3-4 per week	5-6 per week	1 per day	2 per day	3 per day	Portion size	Less	Same	More
Chicken fry, Yangnyum-tongdak	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	2 pieces (180 g)			
Chicken/duck side dish (a broil, hard-boiled, roasted)	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	1 piece (60 g)			
Backsuk, Samgye-tang	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	1 serving			
Egg/quail egg	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	1 egg, 5 quail eggs			

BEANS	Never or < 1/month	1 per month	2-3 per month	1-2 per week	3-4 per week	5-6 per week	1 per day	2 per day	3 per day	Portion size	Less	Same	More
Bean curd (regular, soft)	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	1/6 piece (80 g)			
Bean, hard-boiled, boiled in soy sauce	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	1 Tbs (20 g)			
Bean-paste soup, bean-paste stew, Chungkukjang	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	1 serving			
Bean-paste, Samgjang	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	1 Tbs (20 g)			

VEGETABLES	Never or < 1/month	1 per month	2-3 per month	1-2 per week	3-4 per week	5-6 per week	1 per day	2 per day	3 per day	Portion size	Less	Same	More	
Raw (wrap, salad, Muchim, etc.) Lettuce, cabbage, sesame leaf, squash leaf, cucumber, carrot, pepper, garlic	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	1 serving (40 g)				
Cooked (Na-mul, soup, etc.)	Green vegetables (Spinach, mallow, crown daisy, dropwort, etc.) squash, eggplant, Chinese cabbage, bean sprouts, green bean sprouts	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	1 serving (70 g)			
	Fern, taro stalk, sweet potato stalk, radish, balloon flower, lotus root, other roots, garlic in soy sauce, onion, mushrooms	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	1 serving (70 g)			
Napa cabbage/cubed radish/radish kimchi	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	1/3 cup (40 g)				
Watery kimchi, watery radish kimchi, etc.	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	1/2 cup (with water)				
Laver	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	1 large piece				
Brown seaweed, kelp	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	1 serving (70 g)				

MILK, DAIRY	Never or < 1/month	1 per month	2-3 per month	1-2 per week	3-4 per week	5-6 per week	1 per day	2 per day	3 per day	Portion size	Less	Same	More
Milk, soy milk	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	1 cup (200 g)			
Yakurt [®]	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	1 (65 g)			
Yogurt (Bulgari, Yoplei, etc.)	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	1 serving (150 g)			
Ice cream	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	1 serving			
Cheese	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	1 slice (20 g)			

OILS, SWEETS	Never or < 1/month	1 per month	2-3 per month	1-2 per week	3-4 per week	5-6 per week	1 per day	2 per day	3 per day	Portion size	Less	Same	More
Candy (soft sweet)	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	3			
Chocolate	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	1 serving (20 g)			
Soybean oil, corn oil for cooking (pancake, Jun, etc.)	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	1 ts (5 g)			
Olive oil for cooking (pancake, Jun, etc.)	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	1 ts (5 g)			
Shortening	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	2 ts (8 g)			

BEVERAGES	Never or < 1/month	1 per month	2-3 per month	1-2 per week	3-4 per week	5-6 per week	1 per day	2 per day	3 per day	≥ 4 per day	Portion size	Less	Same	More
Café Latte, cappuccino, coffee mix	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	<input type="checkbox"/> 9	1 cup			
Coffee	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	<input type="checkbox"/> 9	1 cup (2 g)			
Added sugar	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	<input type="checkbox"/> 9	2 ts (5 g)			
Added cream	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input type="checkbox"/> 7	<input type="checkbox"/> 8	<input type="checkbox"/> 9	2 ts (5 g)			