**Supplemental Table 1.** Age-adjusted characteristics of the study population according to tertile of average folate intake.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Characteristics | Dietary average folate intake (μg/d) | | | | | | | | | | | | *P* difference | | | *P* trend | |
| T1 | | | | T2 | | | | T3 | | | |
| Mean or % | | SE | | Mean or % | | SE | | Mean or % | | SE | |
| **MEN (n=2,693)** |  | |  | |  | |  | |  | |  | |  | | |  | |
| N | 897 | | | | 898 | | | | 898 | | | |  | | |  | |
| Median intake (min, max) | 277.0 (82.3, 328.8) | | | | 370.4 (328.8, 414.5) | | | | 478.9 (414.6, 898.0) | | | |  | | |  | |
| Age (years) | 61.8 | | 0.3 | | 62.3 | | 0.3 | | 61.8 | | 0.3 | | 0.4261 | | | 0.9754 | |
| Higher education\* (%) | 26.6a | | | | 30.3 a | | | | 31.9 b | | | | 0.0249 | | | 0.0089 | |
| Smoking Status |  | |  | |  | |  | |  | |  | |  | | |  | |
| Former smoker (%) | 35.4 a | | | | 40.3 a | | | | 41.4 b | | | | 0.0185 | | | 0.0089 | |
| Current smoker (%) | 40.6 a | | | | 33.9 b | | | | 32.8 b | | | | 0.0009 | | | 0.0007 | |
| Drinking Status |  | |  | |  | |  | |  | |  | |  | | |  | |
| Former drinker (%) | 11.9 | | | | 10.8 | | | | 9.7 | | | | 0.3380 | | | 0.1415 | |
| Current drinker (%) | 65.3 | | | | 67.2 | | | | 67.5 | | | | 0.5672 | | | 0.3316 | |
| Alcohol consumption (ml/d) | 32.8 | | 1.9 | | 29.4 | | 1.9 | | 29.1 | | 1.9 | | 0.2866 | | | 0.1644 | |
| Regular exercise† (%) | 15.5 a | | | | 22.1 b | | | | 23.6 b | | | | <.0001 | | | <.0001 | |
| Body Mass Index (kg/m2) | 23.7 | | 0.1 | | 23.9 | | 0.1 | | 23.9 | | 0.1 | | 0.1426 | | | 0.1248 | |
| Body Mass Index ≥ 25 kg/m2 (%) | 34.2 | | | | 35.1 | | | | 35.1 | | | | 0.8982 | | | 0.6910 | |
| Waist circumference (cm) | 84.6 | | 0.3 | | 85 | | 0.3 | | 85.4 | | 0.3 | | 0.0771 | | | 0.0236 | |
| Fasting blood glucose (mg/dL) | 96.4 | | 0.3 | | 97.1 | | 0.3 | | 97.4 | | 0.3 | | 0.0917 | | | 0.0343 | |
| Impaired Fasting Glucose (%) | 34.0 | | | | 37.3 | | | | 39.4 | | | | 0.0552 | | | 0.0177 | |
| **Dietary intake** |  | |  | |  | |  | |  | |  | |  | | |  | |
| Energy (kJ/d) | 6854.5 | | 57.5 | | 6934.7 | | 57.5 | | 6766.1 | | 57.5 | | 0.1163 | | | 0.2449 | |
| Carbohydrate (g/d) | 322.5 | | 0.9 | | 324.3 | | 0.9 | | 322.2 | | 0.9 | | 0.2013 | | | 0.7497 | |
| Protein (g/d) | 48.8 | | 0.3 a | | 52 | | 0.3 b | | 56.3 | | 0.3 c | | <.0001 | | | <.0001 | |
| Fat (g/d) | 21.1 | | 0.3 | | 21.2 | | 0.3 | | 21.6 | | 0.3 | | 0.5209 | | | 0.0300 | |
| Iron from animal food (mg/d) | 1.4 | | 0.03 a | | 1.5 | | 0.03 b | | 1.9 | | 0.03 c | | <.0001 | | | <.0001 | |
| GI (Glycaemic index) | 58.7 | | 0.1 a | | 57.8 | | 0.1 a | | 56.1 | | 0.1 b | | <.0001 | | | <.0001 | |
| GL (Glycaemic load) | 188.4 | | 0.7 a | | 186.7 | | 0.7 a | | 180.0 | | 0.7 b | | <.0001 | | | <.0001 | |
| Magnesium (mg/d) | 90.0 | | 0.5 a | | 91.2 | | 0.5 a | | 95.0 | | 0.5 b | | <.0001 | | | <.0001 | |
| Fiber form cereals and grains (g/d) | 4.8 | | 0.04 | | 4.8 | | 0.04 | | 4.7 | | 0.04 | | 0.0837 | | | 0.0569 | |
| **Supplement users** |  | |  | |  | |  | |  | |  | |  | | |  | |
| Multinutrients (%) | 4.6 a | | | | 5.0 a | | | | 7.8 b | | | | 0.0066 | | | 0.0029 | |
| Multinutrients or vitamin supplements ‡ (%) | 6.3 a | | | | 7.7a | | | | 10.0 b | | | | 0.0151 | | | 0.0040 | |
| **Food group**§ | 46.8 | | 1.4 a | | 58.2 | | 1.4 a | | 87.2 | | 1.4 b | |  | | |  | |
| Total vegetable (g/d) | 699.5 | | 6.9 a | | 681 | | 6.9 a | | 639 | | 6.9 b | | <.0001 | | | <.0001 | |
| White rice (g/d) | 67.0 | | 3.0 a | | 75.2 | | 3.0 a | | 85.7 | | 3.0 b | | <.0001 | | | <.0001 | |
| Dairy product (g/d) | 34.1 | | 1.1 a | | 30.7 | | 1.1 a | | 27.1 | | 1.1 b | | <.0001 | | | <.0001 | |
| Red meat (g/d) | 0.3 | | 0.1 a | | 0.4 | | 0.1 a | | 0.3 | | 0.1 b | | <.0001 | | | <.0001 | |
| Processed meat (g/d) | 22.2 | | 1.9 | | 14.1 | | 1.9 | | 13.6 | | 1.9 | | 0.0818 | | | 0.9386 | |
| Sweetened beverages (g/d) | 4.8 | | 0.1 a | | 4.2 | | 0.1 b | | 3.9 | | 0.1 b | | 0.0013 | | | 0.0015 | |
| Coffee (g/d) | 46.8 | | 1.4 a | | 58.2 | | 1.4 b | | 87.2 | | 1.4 b | | 0.0024 | | | <.0001 | |
| **Dietary quality score** |  | |  | |  | |  | |  | |  | |  | | |  | |
| Korean Alternative Healthy Eating Index (KAHEI) || | 31.7 | | 0.2 a | | 33.9 | | 0.2 b | | 36.0 | | 0.2 c | | <.0001 | | | <.0001 | |
|  |  | |  | |  | |  | |  | |  | |  | | |  | |
| **WOMEN (n=4,640)** |  | |  | |  | |  | |  | |  | |  | | |  | |
| N | 1,546 | | | | 1,547 | | | | 1,547 | | | |  | | |  | |
| Median intake (min, max) | | 246.7 (105.9, 292.5) | | | | 333.2 (292.5, 376.4) | | | | 440.8 (376.5, 903.3) | | | |  |  | |
| Age (years) | | 63.1 | | 0.2 a | | 60.5 | | 0.2 b | | 58.6 | | 0.2 c | | <.0001 | <.0001 | |
| Higher education\* (%) | | 12.2 a | | | | 12.8 a | | | | 17.8 b | | | | <.0001 | <.0001 | |
| Smoking Status | |  | |  | |  | |  | |  | |  | |  |  | |
| Former smoker (%) | | 2.2 | | | | 1.7 | | | | 1.5 | | | | 0.3230 | 0.1441 | |
| Current smoker (%) | | 4.9 a | | | | 2.8 b | | | | 3.0 b | | | | 0.0027 | 0.0074 | |
| Drinking Status | |  | |  | |  | |  | |  | |  | |  |  | |
| Former drinker (%) | | 2.3 | | | | 3.5 | | | | 3.1 | | | | 0.1416 | 0.2336 | |
| Current drinker (%) | | 29.3 | | | | 30.7 | | | | 30.6 | | | | 0.6344 | 0.4484 | |
| Alcohol consumption (ml/d) | | 1.97 | | 0.32 a | | 2.38 | | 0.31 a | | 3.05 | | 0.32 b | | 0.0565 | 0.0168 | |
| Regular exercise† (%) | | 17.7 a | | | | 20.2 a | | | | 25.8 b | | | | <.0001 | <.0001 | |
| Body Mass Index (kg/m2) | | 24.2 | | 0.1 a | | 24.5 | | 0.1 b | | 24.5 | | 0.1 b | | 0.0120 | 0.0073 | |
| Body Mass Index ≥ 25 kg/m2 (%) | | 37.2 a | | | | 41.5 b | | | | 42.2 b | | | | 0.0097 | 0.0067 | |
| Waist circumference (cm) | | 82.3 | | 0.2 a | | 83.5 | | 0.2 b | | 83.4 | | 0.2 b | | 0.0001 | 0.0007 | |
| Fasting blood glucose (mg/dL) | | 93.6 | | 0.2 a | | 94.2 | | 0.2 a | | 94.8 | | 0.2 b | | 0.0039 | 0.0009 | |
| Impaired Fasting Glucose (%) | | 24.0 | | | | 26.6 | | | | 27.9 | | | | 0.0511 | 0.0187 | |
| Menopause, among women (%) | | 82.5 | | | | 84.3 | | | | 83.0 | | | | 0.2132 | 0.6903 | |
| **Dietary intake** | |  | |  | |  | |  | |  | |  | |  |  | |
| Energy (kJ/d) | | 6044.8 | | 38.3 a | | 6082.1 | | 37.9 a | | 5792.5 | | 38.2 b | | <.0001 | <.0001 | |
| Carbohydrate (g/d) | | 296.7 | | 0.6 a | | 294 | | 0.6 b | | 289 | | 0.6 c | | <.0001 | <.0001 | |
| Protein (g/d) | | 39.5 | | 0.1 a | | 42.9 | | 0.1 b | | 47.3 | | 0.1 c | | <.0001 | <.0001 | |
| Fat (g/d) | | 13.3 | | 0.1 a | | 14.4 | | 0.1 b | | 15.9 | | 0.1 c | | <.0001 | <.0001 | |
| Iron from animal food (mg/d) | | 0.98 | | 0.02 a | | 1.23 | | 0.02 b | | 1.59 | | 0.02 c | | <.0001 | <.0001 | |
| GI (Glycaemic index) | | 59.4 | | 0.1 a | | 58.2 | | 0.1 b | | 56.1 | | 0.1 c | | <.0001 | <.0001 | |
| GL (Glycaemic load) | | 175.2 | | 0.5 a | | 170.3 | | 0.5 b | | 161.5 | | 0.5 c | | <.0001 | <.0001 | |
| Magnesium (mg/d) | | 77.2 | | 0.4 a | | 79.3 | | 0.4 b | | 84.2 | | 0.4 c | | <.0001 | <.0001 | |
| Fiber form cereals and grains (g/d) | | 4.19 | | 0.03 a | | 4.2 | | 0.03 a | | 4.05 | | 0.03 b | | <.0001 | 0.0001 | |
| **Supplement users** | |  | |  | |  | |  | |  | |  | |  |  | |
| Multinutrients (%) | | 6.0 a | | | | 7.5 a | | | | 8.6 b | | | | 0.0261 | 0.0075 | |
| Multinutrients or vitamin supplements ‡ (%) | | 8.2 a | | | | 11.0 b | | | | 12.6 b | | | | 0.0004 | 0.0001 | |
| **Food group** § | |  | |  | |  | |  | |  | |  | |  |  | |
| Total vegetable (g/d) | | 45.1 | | 1.2 a | | 61.2 | | 1.1 b | | 95.2 | | 1.2 c | | <.0001 | <.0001 | |
| White rice (g/d) | | 649.2 | | 5.1 a | | 617.9 | | 5.1 b | | 563.6 | | 5.1 c | | <.0001 | <.0001 | |
| Dairy product (g/d) | | 75.5 | | 2.4 a | | 87.3 | | 2.4 b | | 100 | | 2.4 c | | <.0001 | <.0001 | |
| Red meat (g/d) | | 14.1 | | 0.5 | | 12.6 | | 0.5 | | 13.6 | | 0.5 | | 0.1091 | 0.5339 | |
| Processed meat (g/d) | | 0.23 | | 0.03 | | 0.17 | | 0.03 | | 0.16 | | 0.03 | | 0.1087 | 0.0561 | |
| Sweetened beverages (g/d) | | 10.8 | | 0.9 a | | 8.3 | | 0.9 a | | 6.3 | | 0.9 b | | 0.0013 | 0.0003 | |
| Coffee (g/d) | | 3.3 | | 0.1 a | | 3.0 | | 0.1 b | | 2.7 | | 0.1 c | | <.0001 | <.0001 | |
| **Dietary quality score** | |  | |  | |  | |  | |  | |  | |  |  | |
| Korean Alternative Healthy Eating Index (KAHEI) || | | 31.7 | | 0.2 a | | 33.8 | | 0.2 b | | 36.2 | | 0.2 c | | <.0001 | <.0001 | |

Mean values and SD for continuous variables; Percentages in parentheses for categorical variables.

All nutrients were total energy-adjusted values.

\* High school graduation or longer (≥ 12 years of education).

† ≥ 3 times/week and 30 min/session.

‡ Vitamin supplements included supplements of vitamin A, vitamin C, beta-carotene, vitamin B complexes, and vitamin E.

§ Age- and total energy-adjusted means for food groups using GLM.

||KAHEI was the modified alternative healthy eating index based on Korean Dietary Reference Intakes.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Supplemental Table 2**. The contribution of food to total dietary folate intake. | | | | | | | |
| Food items in FFQ | Contribution to total dietary folate from food\* | | | | | |
| Men | | | Women | | |
| Percentage of  contribution to variation (%)† | Percentage of folate  from each food (%) | Percentage of  contribution to variation (%)† | | Percentage of folate  from each food (%) |
| Cabbage *kimchi* | 35.6 | 31.0 | 37.2 | | 28.6 |
| Laver | 13.5 | - | 11.5 | | - |
| Strawberry | 9.5 | - | 8.2 | | - |
| *Kimchi* except cabbage and radish | 8.0 | - | 7.2 | | - |
| Drinks (from aloe, jujube, ginseng etc.) except coffee, tea, fruits juice, milk, and carbonated drinks | - | - | 5.5 | | - |
| Lettuce | 5.3 | - | 4.3 | | - |
| White rice | - | 7.5 | - | | 5.6 |
| Mixed rice | - | 6.2 | - | | 8.5 |

Only showing food that contributed more than 5.0 %.

\* Total energy unadjusted folate intake.

† R2, by regression analysis with folate from each food as the independent variable and total folate intake as the dependent variable.

**Supplemental Table 3. Multivariable adjusted IRRs and 95% CIs of T2D according to two follow-up assignment methods.**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Variable | Dietary folate intake (μg/d) | | | | | | | | | | | |
| Men *(n=2,693)* | | | | | *P* trend\* | Women *(n=4,640)* | | | | | *P* trend\* |
| T1  Reference | T2  IRR (95% CI) | | T3  IRR (95% CI) | | T1  Reference | T2  IRR (95% CI) | | T3  IRR (95% CI) | |
| **Baseline consumption**† |  |  |  |  |  |  |  |  |  |  |  |  |
| Assignment method 1 |  |  | |  | |  |  |  | |  | |  |
| Cases /person years | *36 / 2,786* | *45 / 2,999* | | *47 / 3,047* | |  | *74 / 4,910* | *64 / 5,069* | | *53 / 5,302* | |  |
| IRR | 1.00 | 1.27 | 0.82, 1.96 | 1.13 | 0.67, 1.91 | 0.7029 | 1.00 | 0.70 | 0.49, 0.98 | 0.53 | 0.35, 0.80 | 0.0029 |
| Assignment method 2 |  |  | |  | |  |  |  | |  | |  |
| Cases /person years | *36 / 4,273* | *45 / 4,331* | | *47 / 4,343* | |  | *74 / 7,444* | *64 / 7,407* | | *53 / 7,581* | |  |
| IRR | 1.00 | 1.28 | 0.82, 2.01 | 1.22 | 0.71, 2.08 | 0.5079 | 1.00 | 0.74 | 0.53, 1.05 | 0.60 | 0.39, 0.92 | 0.0174 |
| **Average consumption**‡ |  |  |  |  |  |  |  |  |  |  |  |  |
| Assignment method 1 |  |  | |  | |  |  |  | |  | |  |
| Cases /person years | *39 / 2,700* | *45 / 3,790* | | *44 / 2,941* | |  | *82 / 4,852* | *53 / 5,389* | | *56 / 5,120* | |  |
| IRR | 1.00 | 1.06 | 0.69, 1.64 | 1.01 | 0.60, 1.70 | 0.9859 | 1.00 | 0.55 | 0.39, 0.76 | 0.62 | 0.41, 0.93 | 0.0193 |
| Assignment method 2 |  |  | |  | |  |  |  | |  | |  |
| Cases /person years | *39 / 4,148* | *45 / 4,505* | | *44 / 4,294* | |  | *82 /7,201* | *53 / 7,696* | | *56 / 7,534* | |  |
| IRR | 1.00 | 1.10 | 0.70, 1.71 | 1.06 | 0.62, 1.81 | 0.8317 | 1.00 | 0.56 | 0.39, 0.80 | 0.65 | 0.43, 0.97 | 0.0300 |

All nutrients were total energy-adjusted values.

Assignment method 1 was based on the assumption that loss to follow-up participants were lost immediately after the last date they were known to be present.

Assignment method 2 was based on the assumption that loss to follow-up participants were lost immediately prior to the first date on which they were known to be absent.

\* *P* values for linear trend were obtained by imputing the median value of each tertile and treating it as a continuous variable using a modified Poisson regression with a robust error estimator.

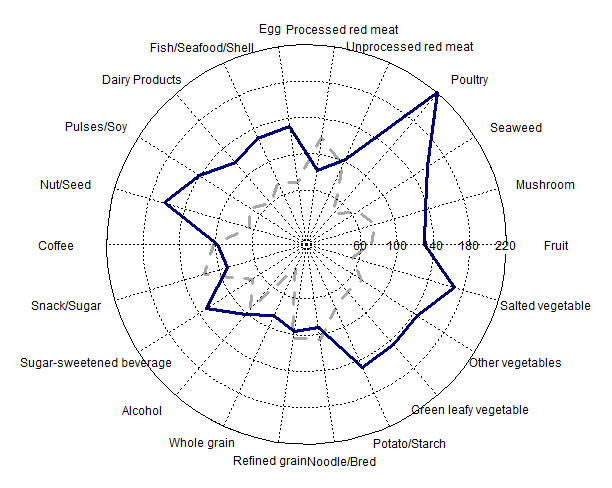
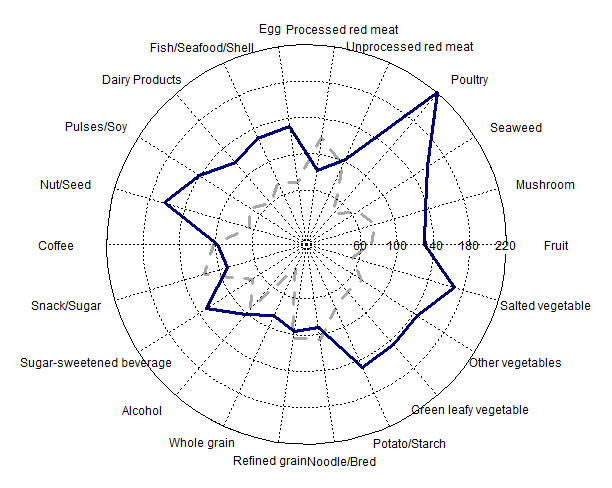
† IRR for baseline dietary folate consumption was obtained by the multivariable model including age (years), higher education level (yes/no), smoking status (never/former/current), regular exercise (yes/no), waist circumference (cm), total energy intake (kJ/d), baseline fasting blood glucose (mg/dL), iron form animal food (mg/d), glycemic load, magnesium intake (mg/d), total vegetables (g/d), dairy products (g/d), red meat (g/d), sweetened beverages (g/d), coffee consumption (g/d), and KAHEI in men and including age (years), higher education level (yes/no), current smoking (yes/no), alcohol consumption (ml/d), regular exercise (yes/no), waist circumference (cm), total energy intake (kJ/d), baseline fasting blood glucose (mg/dL), iron form animal food (mg/d), glycemic load, magnesium intake (mg/d), fiber from cereals and grains (g/d), total vegetables (g/d), dairy products (g/d), sweetened beverages (g/d), coffee consumption (g/d), and KAHEI in women

‡ IRR for average dietary folate consumption was obtained by the multivariable model including age (years), higher education level (yes/no), smoking status (never/former/current), regular exercise (yes/no), waist circumference (cm), baseline fasting blood glucose (mg/dL), iron form animal food (mg/d), glycemic load, magnesium intake (mg/d), total vegetables (g/d), dairy products (g/d), red meat (g/d), sweetened beverages (g/d), coffee consumption (g/d), and KAHEI in men and including age (years), higher education level (yes/no), current smoking (yes/no), alcohol consumption (ml/d), regular exercise (yes/no), waist circumference (cm), total energy intake (kJ/d), baseline fasting blood glucose (mg/dL), iron form animal food (mg/d), glycemic load, magnesium intake (mg/d), fiber from cereals and grains (g/d), total vegetables (g/d), dairy products (g/d), sweetened beverages (g/d), coffee consumption (g/d), and KAHEI in women.

**Supplemental Figure 1. Radar charts illustrating the percentage-wise differences in 22 food groups among men and 21 food groups among women with the lowest (T1) and highest (T3) of baseline and average folate intake; (A), The baseline folate among men; (B), The baseline folate among women; (C), The average folate among women; (D), The average folate among women; solid line, The relative percentage of the median of the highest tertile of folate intake (T3) to the median folate intake of the entire participants; dashed line, The relative percentage of the median of the lowest tertile of folate intake (T1) to the median folate intake of the entire participants.**

\* The panel indicated that men in the highest tertile in baseline folate (T3) consumed more poultry, green leafy vegetable, whole grain, dairy products, and etc. and less processed red meat, snack/sugar, refined grain, and noodle/bred than men in the lowest tertile in baseline folate (T1). For women, in the highest tertile in baseline folate (T3) consumed more mushroom, green leafy vegetable, whole grain, and dairy products, and etc. and less processed red meat, snack/sugar, refined grain, and noodle/bred than women in the lowest tertile in baseline folate (T1). A similar pattern was found in average consumption.

**(A) The baseline folate among men (B) The baseline folate among women**



**(C) The average folate among men (D) The average folate among women**

