**Supplemental Table S1.** The frequency and proportion of frequent supplement users\* in the validity study (N = 124）

|  |  |  |
| --- | --- | --- |
| **Supplement** | **N** | **%** |
| Vitamin A | 1 | 0.8 |
| Vitamin B | 6 | 4.8 |
| Vitamin C | 4 | 3.2 |
| Vitamin D | 1 | 0.8 |
| Vitamin E | 1 | 0.8 |
| Multi-vitamin | 6 | 4.8 |
| Calcium  | 6 | 4.8 |
| Iron | 1 | 0.8 |
| Zinc  | 2 | 1.6 |
| DHA  | 1 | 0.8 |

\* The frequent supplement users were defined that they consumed the dietary supplement at least three times a week for more than two months.

**Supplemental Table S2.** Agreement of cross-classification quartiles for crude and energy-adjusted nutrients intake assessed by FFQ1 and FFQ2

|  |  |  |  |
| --- | --- | --- | --- |
| Nutrients | Crude  | 　 | Energy-adjusted† |
| Quartile (%) | κw | 　 | Quartile (%) | κw |
| Exact | Exact or adjacent | Extreme |  | Exact | Exact or adjacent | Extreme |
| Energy | 44.27 | 83.97 | 0 | 0.43 | 　 |  |  |  |  |
| Protein  | 41.09 | 83.72 | 0.78 | 0.27 |  | 42.64 | 73.64 | 7.75 | 0.40 |
| Fat  | 44.96 | 81.4 | 0.78 | 0.35 |  | 44.19 | 76.74 | 3.10 | 0.41 |
| Carbohydrate  | 46.51 | 83.72 | 1.55 | 0.36 |  | 43.41 | 80.62 | 4.65 | 0.43 |
| Fiber | 48.86 | 87.79 | 0.76 | 0.49 |  | 49.62 | 89.31 | 3.05 | 0.49 |
| Soluble fiber | 41.98 | 85.5 | 0.76 | 0.33 |  | 41.22 | 77.86 | 3.05 | 0.42 |
| Insoluble fiber | 45.04 | 87.79 | 0 | 0.48 |  | 46.56 | 90.84 | 2.29 | 0.46 |
| Cholesterol  | 44.96 | 83.72 | 1.55 | 0.37 |  | 41.86 | 84.50 | 5.43 | 0.42 |
| SFA | 42.64 | 82.95 | 0 | 0.40 |  | 48.06 | 82.17 | 6.20 | 0.41 |
| MUFA | 42.31 | 76.15 | 3.08 | 0.31 |  | 38.46 | 79.23 | 3.85 | 0.33 |
| PUFA | 39.23 | 80.00 | 3.85 | 0.28 |  | 36.15 | 76.92 | 3.85 | 0.33 |
| ALA | 42.75 | 80.92 | 1.53 | 0.38 |  | 43.51 | 80.92 | 2.29 | 0.38 |
| EPA | 46.56 | 80.92 | 2.29 | 0.37 |  | 45.80 | 79.39 | 4.58 | 0.41 |
| DHA | 52.67 | 86.26 | 0 | 0.49 |  | 52.67 | 85.50 | 2.29 | 0.52 |
| DPA | 51.15 | 88.55 | 0 | 0.49 |  | 48.86 | 88.55 | 1.53 | 0.52 |
| Vitamin A  | 51.16 | 91.47 | 0 | 0.31 |  | 40.31 | 77.52 | 4.65 | 0.55 |
| Carotene  | 52.71 | 83.72 | 1.55 | 0.37 |  | 41.86 | 82.17 | 3.10 | 0.48 |
| α-Carotene | 48.09 | 91.60 | 0 | 0.44 |  | 45.80 | 86.26 | 2.29 | 0.52 |
| β-Carotene | 49.62 | 80.92 | 2.29 | 0.32 |  | 40.46 | 76.34 | 2.29 | 0.43 |
| Retinol  | 55.04 | 87.60 | 0 | 0.36 |  | 47.29 | 75.97 | 3.88 | 0.55 |
| Thiamine  | 44.96 | 84.50 | 0.78 | 0.29 |  | 41.09 | 75.19 | 6.20 | 0.43 |
| Riboflavin  | 44.96 | 90.70 | 0.78 | 0.36 |  | 44.19 | 82.95 | 7.75 | 0.48 |
| Niacin  | 45.74 | 86.82 | 0.78 | 0.53 |  | 52.71 | 89.15 | 0.78 | 0.46 |
| Vitamin C  | 49.23 | 88.46 | 2.31 | 0.36 |  | 41.54 | 83.85 | 5.38 | 0.49 |
| Vitamin E  | 43.41 | 82.17 | 0 | 0.31 |  | 38.76 | 79.07 | 4.65 | 0.41 |
| Calcium  | 37.21 | 87.60 | 0.78 | 0.26 |  | 37.21 | 75.97 | 6.20 | 0.40 |
| Phosphorus  | 35.66 | 86.05 | 0.78 | 0.42 |  | 44.19 | 85.27 | 2.33 | 0.37 |
| Potassium  | 44.96 | 87.60 | 2.33 | 0.41 |  | 48.06 | 82.17 | 4.65 | 0.45 |
| Sodium  | 39.53 | 83.72 | 0.78 | 0.35 |  | 40.31 | 80.62 | 3.10 | 0.39 |
| Magnesium  | 48.84 | 88.37 | 0.78 | 0.48 |  | 47.29 | 89.15 | 1.55 | 0.50 |
| Iron  | 46.51 | 80.62 | 0 | 0.42 |  | 49.61 | 82.95 | 5.43 | 0.42 |
| Zinc  | 41.09 | 82.17 | 0.78 | 0.42 |  | 46.51 | 83.72 | 3.10 | 0.39 |
| Selenium  | 46.51 | 85.27 | 0 | 0.41 |  | 44.96 | 85.27 | 4.65 | 0.46 |
| Copper  | 48.84 | 86.05 | 1.55 | 0.43 |  | 44.96 | 83.72 | 0 | 0.47 |
| Manganese  | 48.84 | 82.95 | 0 | 0.40 | 　 | 42.64 | 83.72 | 2.33 | 0.46 |

FFQ1, first FFQ administration; FFQ2, second FFQ administration; κw, weighted kappa;

SFA, saturated fatty acids; PUFA, polyunsaturated fatty acids; MUFA, monounsaturated fatty acids; ALA, a-linolenic acid; EPA, eicosapentaenoic acid; DHA, docosahexaenoic acid; DPA, eicosapentaenoic acid

† Energy-adjusted intakes by the residual method;

\* *P* < 0.05

**Supplemental Table S3**. Spearman correlation coefficients (SCC) between FFQ1 and FFQ2 for nutrients according to gender, age and education level

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Nutrients | Gender |  | Age |  | Education level |
| Male |  | Female |  | < 50 years |  | ≥ 50 years |  | Middle school or below |  | College or higher |
| Crude | Energy-adjusted† |  | Crude | Energy-adjusted† |  | Crude | Energy-adjusted† |  | Crude | Energy-adjusted† |  | Crude | Energy-adjusted† |  | Crude | Energy-adjusted† |
| Energy | 0.62\* |  |  | 0.53\* |  |  | 0.49\* |  |  | 0.63\* |  |  | 0.52\* |  |  | 0.63\* |  |
| Protein | 0.60\* | 0.32\* |  | 0.48\* | 0.44\* |  | 0.65\* | 0.31 |  | 0.56\* | 0.34\* |  | 0.64\* | 0.52\* |  | 0.58\* | 0.30\* |
| Fat | 0.57\* | 0.41\* |  | 0.67\* | 0.50\* |  | 0.55\* | 0.41\* |  | 0.59\* | 0.49\* |  | 0.72\* | 0.39 |  | 0.57\* | 0.43\* |
| Carbohydrate | 0.66\* | 0.46\* |  | 0.58\* | 0.43\* |  | 0.57\* | 0.37\* |  | 0.65\* | 0.50\* |  | 0.44\* | 0.38 |  | 0.68\* | 0.48\* |
| Fiber | 0.69\* | 0.70\* |  | 0.71\* | 0.61\* |  | 0.74\* | 0.60\* |  | 0.52\* | 0.47\* |  | 0.71\* | 0.69\* |  | 0.72\* | 0.59\* |
| Soluble fiber | 0.63\* | 0.54\* |  | 0.61\* | 0.47\* |  | 0.67\* | 0.49\* |  | 0.47\* | 0.48\* |  | 0.55\* | 0.69\* |  | 0.65\* | 0.43\* |
| Insoluble fiber | 0.75\* | 0.70\* |  | 0.74\* | 0.68\* |  | 0.76\* | 0.68\* |  | 0.61\* | 0.60\* |  | 0.67\* | 0.73\* |  | 0.75\* | 0.70\* |
| SFA | 0.57\* | 0.44\* |  | 0.69\* | 0.34 |  | 0.57\* | 0.50\* |  | 0.60\* | 0.50\* |  | 0.77\* | 0.30 |  | 0.59\* | 0.47\* |
| MUFA | 0.55\* | 0.44\* |  | 0.53\* | 0.41\* |  | 0.54\* | 0.29 |  | 0.52\* | 0.52\* |  | 0.65\* | 0.36 |  | 0.56\* | 0.46\* |
| PUFA | 0.48\* | 0.44\* |  | 0.48\* | 0.42\* |  | 0.49\* | 0.47\* |  | 0.50\* | 0.47\* |  | 0.64\* | 0.48\* |  | 0.47\* | 0.46\* |
| ALA | 0.6\* | 0.47\* |  | 0.55\* | 0.59\* |  | 0.49\* | 0.50\* |  | 0.53\* | 0.37 |  | 0.72\* | 0.43\* |  | 0.49\* | 0.54\* |
| EPA | 0.83\* | 0.75\* |  | 0.66\* | 0.54\* |  | 0.71\* | 0.59\* |  | 0.55\* | 0.46\* |  | 0.71\* | 0.64\* |  | 0.7\* | 0.61\* |
| DHA | 0.58\* | 0.51\* |  | 0.56\* | 0.48\* |  | 0.54\* | 0.44\* |  | 0.58\* | 0.47\* |  | 0.63\* | 0.53\* |  | 0.54\* | 0.47\* |
| DPA | 0.84\* | 0.74\* |  | 0.65\* | 0.59\* |  | 0.69\* | 0.63\* |  | 0.53\* | 0.50\* |  | 0.66\* | 0.65\* |  | 0.69\* | 0.65\* |
| Cholesterol | 0.62\* | 0.51\* |  | 0.55\* | 0.50\* |  | 0.39\* | 0.40 |  | 0.64\* | 0.70\* |  | 0.53\* | 0.60\* |  | 0.64\* | 0.52\* |
| Vitamin A | 0.73\* | 0.45\* |  | 0.72\* | 0.46\* |  | 0.65\* | 0.40\* |  | 0.73\* | 0.49\* |  | 0.78\* | 0.38 |  | 0.70\* | 0.46\* |
| Carotene | 0.62\* | 0.49\* |  | 0.67\* | 0.34 |  | 0.54\* | 0.56\* |  | 0.63\* | 0.48\* |  | 0.72\* | 0.53\* |  | 0.62\* | 0.48\* |
| α-Carotene | 0.71\* | 0.55\* |  | 0.71\* | 0.6\* |  | 0.74\* | 0.63\* |  | 0.63\* | 0.27 |  | 0.7\* | 0.44\* |  | 0.72\* | 0.62\* |
| β-Carotene | 0.47\* | 0.51\* |  | 0.57\* | 0.48\* |  | 0.57\* | 0.49\* |  | 0.64\* | 0.42\* |  | 0.61\* | 0.38\* |  | 0.58\* | 0.52\* |
| Retinol | 0.70\* | 0.44\* |  | 0.68\* | 0.42\* |  | 0.70\* | 0.35\* |  | 0.66\* | 0.49\* |  | 0.70\* | 0.33 |  | 0.69\* | 0.46\* |
| Thiamine | 0.62\* | 0.43\* |  | 0.58\* | 0.25 |  | 0.49\* | 0.22 |  | 0.60\* | 0.51\* |  | 0.73\* | 0.34 |  | 0.60\* | 0.39\* |
| Riboflavin | 0.68\* | 0.47\* |  | 0.71\* | 0.45\* |  | 0.75\* | 0.50\* |  | 0.65\* | 0.45\* |  | 0.74\* | 0.37 |  | 0.67\* | 0.47\* |
| Niacin | 0.64\* | 0.65\* |  | 0.66\* | 0.69\* |  | 0.64\* | 0.45\* |  | 0.64\* | 0.73\* |  | 0.57\* | 0.73\* |  | 0.65\* | 0.67\* |
| Folate | 0.54\* | 0.51\* |  | 0.63\* | 0.64\* |  | 0.63\* | 0.52\* |  | 0.68\* | 0.16 |  | 0.79\* | 0.6\* |  | 0.58\* | 0.6\* |
| Vitamin C | 0.65\* | 0.52\* |  | 0.73\* | 0.52\* |  | 0.53\* | 0.26 |  | 0.72\* | 0.56\* |  | 0.69\* | 0.41\* |  | 0.66\* | 0.56\* |
| Vitamin E | 0.60\* | 0.56\* |  | 0.52\* | 0.18 |  | 0.59\* | 0.48\* |  | 0.62\* | 0.53\* |  | 0.73\* | 0.37 |  | 0.57\* | 0.53\* |
| Calcium | 0.62\* | 0.48\* |  | 0.66\* | 0.27 |  | 0.68\* | 0.46\* |  | 0.59\* | 0.40\* |  | 0.76\* | 0.15 |  | 0.60\* | 0.50\* |
| Phosphorus | 0.65\* | 0.63\* |  | 0.57\* | 0.54\* |  | 0.68\* | 0.73\* |  | 0.61\* | 0.57\* |  | 0.60\* | 0.63\* |  | 0.64\* | 0.61\* |
| Potassium | 0.68\* | 0.59\* |  | 0.60\* | 0.13 |  | 0.68\* | 0.41\* |  | 0.65\* | 0.52\* |  | 0.78\* | 0.30 |  | 0.65\* | 0.55\* |
| Magnesium | 0.70\* | 0.62\* |  | 0.47\* | 0.38 |  | 0.73\* | 0.64\* |  | 0.66\* | 0.63\* |  | 0.64\* | 0.77\* |  | 0.69\* | 0.60\* |
| Iron | 0.65\* | 0.63\* |  | 0.58\* | 0.17 |  | 0.57\* | 0.45\* |  | 0.63\* | 0.59\* |  | 0.70\* | 0.41\* |  | 0.63\* | 0.59\* |
| Zinc | 0.60\* | 0.60\* |  | 0.53\* | 0.58\* |  | 0.58\* | 0.27 |  | 0.54\* | 0.69\* |  | 0.58\* | 0.75\* |  | 0.60\* | 0.59\* |
| Selenium | 0.71\* | 0.53\* |  | 0.51\* | 0.49\* |  | 0.61\* | 0.55\* |  | 0.69\* | 0.55\* |  | 0.58\* | 0.56\* |  | 0.71\* | 0.56\* |
| Copper | 0.62\* | 0.65\* |  | 0.72\* | 0.33 |  | 0.42\* | 0.45\* |  | 0.70\* | 0.69\* |  | 0.74\* | 0.54\* |  | 0.60\* | 0.63\* |
| Manganese | 0.67\* | 0.57\* |  | 0.59\* | 0.62\* |  | 0.55\* | 0.58\* |  | 0.66\* | 0.64\* |  | 0.56\* | 0.59\* |  | 0.68\* | 0.60\* |

FFQ, food-frequency questionnaire; κw, weighted kappa; SFA, saturated fatty acids; PUFA, polyunsaturated fatty acids; MUFA, monounsaturated fatty acids; ALA, a-linolenic acid; EPA, eicosapentaenoic acid; DHA, docosahexaenoic acid; DPA, eicosapentaenoic acid

† Energy-adjusted intakes by the residual method; \* *P* < 0.05

**Supplemental Table S4**. The influence of seasons on FFQ reproducibility for nutrient

|  |  |  |  |
| --- | --- | --- | --- |
| Nutrients | Subgroup analysis by season | 　 | Sensitivity analysis § |
| Spring (N = 32) | 　 | Summer (N = 32) | 　 | Autumn (N = 28) | 　 | Winter (N = 39) |  | SCC | 　 | ICC |
| Crude | Adjusted‡ | 　 | Crude | Adjusted‡ | 　 | Crude | Adjusted‡ | 　 | Crude | Adjusted‡ | 　 | Crude | Adjusted‡ | 　 | Crude | Adjusted‡ |
| Energy | 0.47\* |  |  | 0.84\* |  |  | 0.55\* |  |  | 0.68\* |  |  | 0.75\* |  |  | 0.75 |  |
| Protein | 0.48\* | 0.68\* |  | 0.78\* | 0.59\* |  | 0.44\* | 0.68\* |  | 0.66\* | 0.49\* |  | 0.59\* | 0.48\* |  | 0.52 | 0.25 |
| Fat | 0.45\* | 0.20  |  | 0.81\* | 0.42\*  |  | 0.48\* | 0.20\* |  | 0.75\* | 0.42\* |  | 0.68\* | 0.46\* |  | 0.68 | 0.38 |
| Carbohydrate | 0.59\* | 0.58\* |  | 0.81\* | 0.45\* |  | 0.42\* | 0.58\* |  | 0.76\* | 0.45\* |  | 0.79\* | 0.58\* |  | 0.76 | 0.37 |
| Fiber | 0.60\* | 0.70\* |  | 0.81\* | 0.78\* |  | 0.63\* | 0.70\* |  | 0.67\* | 0.78\* |  | 0.64\* | 0.56\* |  | 0.38 | 0.26 |
| Soluble fiber | 0.65\* | 0.75\* |  | 0.55\* | 0.43\*  |  | 0.86\* | 0.75\* |  | 0.73\* | 0.43\* |  | 0.53\* | 0.40\* |  | 0.19 | 0.15 |
| Insoluble fiber | 0.61\* | 0.64\* |  | 0.78\* | 0.60\* |  | 0.76\* | 0.64\* |  | 0.87\* | 0.60\* |  | 0.70\* | 0.58\* |  | 0.59 | 0.37 |
| Cholesterol | 0.54\* | 0.64\* |  | 0.79\* | 0.48\* |  | 0.46\* | 0.64\* |  | 0.80\* | 0.48\* |  | 0.69\* | 0.69\* |  | 0.64 | 0.64 |
| SFA | 0.52\* | 0.47\* |  | 0.84\* | 0.34\*  |  | 0.43\* | 0.47\* |  | 0.75\* | 0.34\* |  | 0.66\* | 0.51\* |  | 0.68 | 0.47 |
| MUFA | 0.62\* | 0.49\* |  | 0.57\* | 0.33\*  |  | 0.44\* | 0.49\* |  | 0.54\* | 0.33\* |  | 0.52\* | 0.40\* |  | 0.49 | 0.40 |
| PUFA | 0.44\* | 0.64\* |  | 0.65\* | 0.47\*  |  | 0.54\* | 0.64\* |  | 0.72\* | 0.47\* |  | 0.65\* | 0.57\* |  | 0.44 | 0.30 |
| ALA | 0.61\* | 0.5\* |  | 0.59\* | 0.45\* |  | 0.6\* | 0.72\* |  | 0.55\* | 0.56\* |  | 0.56\* | 0.54\* |  | 0.54\* | 0.54\* |
| EPA | 0.81\* | 0.73\* |  | 0.67\* | 0.66\* |  | 0.66\* | 0.41\* |  | 0.77\* | 0.74\* |  | 0.57\* | 0.50\* |  | 0.46\* | 0.42\* |
| DHA | 0.57\* | 0.5\* |  | 0.45\* | 0.39 |  | 0.59\* | 0.34 |  | 0.69\* | 0.65\* |  | 0.72\* | 0.67\* |  | 0.50\* | 0.47\* |
| DPA | 0.79\* | 0.8\* |  | 0.65\* | 0.57\* |  | 0.65\* | 0.47\* |  | 0.75\* | 0.75\* |  | 0.70\* | 0.68\* |  | 0.54\* | 0.50\* |
| Vitamin A | 0.71\* | 0.40\* |  | 0.79\* | 0.54\* |  | 0.60\* | 0.40\* |  | 0.74\* | 0.54\* |  | 0.69\* | 0.45\* |  | 0.52 | 0.17 |
| Carotene | 0.75\* | 0.60\* |  | 0.54\* | 0.39\*  |  | 0.57\* | 0.60\* |  | 0.70\* | 0.39\* |  | 0.59\* | 0.48\* |  | 0.42 | 0.32 |
| α-Carotene | 0.66\* | 0.58\* |  | 0.65\* | 0.71\* |  | 0.49\* | 0.37 |  | 0.78\* | 0.64\* |  | 0.73\* | 0.62\* |  | 0.59\* | 0.52\* |
| β-Carotene | 0.74\* | 0.65\* |  | 0.42 | 0.49\* |  | 0.6\* | 0.51\* |  | 0.51\* | 0.45\* |  | 0.58\* | 0.52\* |  | 0.47\* | 0.45\* |
| Retinol | 0.71\* | 0.25  |  | 0.73\* | 0.46\* |  | 0.65\* | 0.25\* |  | 0.67\* | 0.46\* |  | 0.62\* | 0.47\* |  | 0.33 | 0.25 |
| Thiamine | 0.51\* | 0.49\* |  | 0.74\* | 0.62\*  |  | 0.41\* | 0.49\* |  | 0.66\* | 0.52\* |  | 0.67\* | 0.54\* |  | 0.69 | 0.55 |
| Riboflavin | 0.64\* | 0.43\* |  | 0.78\* | 0.68\*  |  | 0.59\* | 0.43\* |  | 0.77\* | 0.38\* |  | 0.74\* | 0.60\* |  | 0.69 | 0.51 |
| Niacin | 0.44\* | 0.69\* |  | 0.80\* | 0.50\* |  | 0.57\* | 0.69\* |  | 0.71\* | 0.50\* |  | 0.68\* | 0.54\* |  | 0.66 | 0.38 |
| Folate | 0.70\* | 0.71\* |  | 0.49\* | 0.38 |  | 0.34 | 0.32 |  | 0.67\* | 0.79\* |  | 0.61\* | 0.6\* |  | 0.57\* | 0.60\* |
| Vitamin C | 0.63\* | 0.68\* |  | 0.72\* | 0.56\*  |  | 0.59\* | 0.68\* |  | 0.72\* | 0.46\* |  | 0.61\* | 0.43\* |  | 0.44 | 0.38 |
| Vitamin E | 0.73\* | 0.67\* |  | 0.49\* | 0.46\*  |  | 0.39\* | 0.67\* |  | 0.65\* | 0.36\* |  | 0.54\* | 0.61\* |  | 0.49 | 0.56 |
| Calcium | 0.63\* | 0.43\* |  | 0.63\* | 0.50\* |  | 0.45\* | 0.43\* |  | 0.71\* | 0.50\* |  | 0.70\* | 0.49\* |  | 0.58 | 0.39 |
| Phosphorus | 0.50\* | 0.67\* |  | 0.83\* | 0.72\* |  | 0.51\* | 0.67\* |  | 0.67\* | 0.72\* |  | 0.77\* | 0.71\* |  | 0.74 | 0.62 |
| Potassium | 0.57\* | 0.73\* |  | 0.63\* | 0.47\*  |  | 0.48\* | 0.73\* |  | 0.73\* | 0.37 |  | 0.69\* | 0.38\* |  | 0.63 | 0.55 |
| Magnesium | 0.65\* | 0.71\* |  | 0.75\* | 0.52\* |  | 0.59\* | 0.71\* |  | 0.73\* | 0.52\* |  | 0.72\* | 0.57\* |  | 0.68 | 0.50 |
| Iron | 0.70\* | 0.76\* |  | 0.68\* | 0.58\* |  | 0.57\* | 0.76\* |  | 0.62\* | 0.58\* |  | 0.73\* | 0.64\* |  | 0.70 | 0.66 |
| Zinc | 0.42\* | 0.58\* |  | 0.81\* | 0.42\* |  | 0.45\* | 0.58\* |  | 0.62\* | 0.42\* |  | 0.72\* | 0.57\* |  | 0.68 | 0.51 |
| Selenium | 0.63\* | 0.56\* |  | 0.78\* | 0.66\*  |  | 0.55\* | 0.56\* |  | 0.76\* | 0.46\* |  | 0.62\* | 0.42\* |  | 0.69 | 0.45 |
| Copper | 0.68\* | 0.77\* |  | 0.57\* | 0.53\* |  | 0.58\* | 0.77\* |  | 0.70\* | 0.53\* |  | 0.64\* | 0.60\* |  | 0.49 | 0.45 |
| Manganese | 0.72\* | 0.68\* | 　 | 0.63\* | 0.56\* | 　 | 0.51\* | 0.68\* | 　 | 0.63\* | 0.56\* | 　 | 0.71\* | 0.61\* | 　 | 0.67 | 0.63 |

FFQ, food frequency questionnaire; SFA, saturated fatty acids; PUFA, polyunsaturated fatty acids; MUFA, monounsaturated fatty acids; ALA, a-linolenic acid; EPA, eicosapentaenoic acid; DHA, docosahexaenoic acid; DPA, eicosapentaenoic acid; SCC, Spearman correlation coefficients; ICC, intraclass correlation coefficient;

† Energy-adjusted intakes by the residual method

§ The Sensitivity analysis was conducted to assess the reproducibility of FFQ with 12-month interval \* *P* < 0.05

**Supplemental Table S5**. Main food items and food groups used in the reproducibility and validation study

|  |  |  |
| --- | --- | --- |
| Main food items and food groups | Number of food items | Food items |
| Cereals | 11 | Rice; Steamed bread/flower rolls/pancakes, etc; Chinese-style noodles; instant noodles; wonton; steamed buns/dumplings; bread; twisted cruller; porridge; Grains (including corn, etc.); Sheet Jelly |
| Milks and Dairy products | 4 | Whole milk; low-fat milk; cheese; yogurt |
| Poultry | 1 | Poultry (chicken, duck, goose, etc) |
| Red meat | 1 | Red meat (pork, beef, mutton, etc) |
| Offal | 4 | Animal liver; pigskin; other offal; animal blood |
| Processed meat | 2 | Sausages/meatballs/fish ball; salted meat/bacon |
| Eggs | 3 | Boiled egg; fried egg; Preserved egg |
| Fish and shellfish | 4 | Seafood, such as shrimp, crab or conch; sea-fish; fresh-water fish; dried small shrimps |
| Fresh vegetables | 27 | Chinese cabbage; rape; spinach; tomatoes; pumpkin; cucumber; white gourd; celery; eggplant; broccoli (green); broccoli (white); radishes; sweet peppers; Green and red pepper (hot); agaric; mushroom; Chinese chives; Onions; garlic moss; Seaweed (kelp, etc.); lotus root; leak; Garlic; ginger |
| Tubers | 3 | Sweet potato/purple potato; Yam/Taro; potatoes and products |
| Legumes and soy products | 7 | Soybean; Mung bean; kidney beans; bean-sprout; other beans; soybean milk/uncongealed tofu; tofu/dried tofu/dried beancurd sticks |
| Pickle food | 8 | Pickle; other pickled vegetables; salted eggs; dried vegetables (dried beans/radishes, etc.); fermented bean curd; Chinese sauerkraut; soybean paste; sesame butter |
| Fresh fruit | 12 | Apple; pear; orange; banana; watermelon; peach; pineapple; Kiwi fruit; grapes; strawberry; other kinds of fruit; dates (fresh and dry) |
| Snacks/desserts | 7 | Pastry/cake; Chinese dim sum; cookies; candies/preserves/candies/preserves/jams; chocolate; ice cream; honey |
| Nuts | 3 | Melon seeds; peanut; other nuts (chestnuts/pistachios/pine nuts/hazelnuts, etc.) |
| Tea | 5 | Green tea; Black tea; Oolong tea; Pu 'er Tea; Scented tea |
| Coffee | 1 | Coffee |
| Sugar drink | 2 | Fruit juice, carbonated drink |
| Alcohol | 5 | High white wine; low white wine; rice wine; red wine; beer |
| Total | 110 |  |

**Supplemental Table S6.** Agreement of cross-classification quartiles for crude and energy-adjusted main food items and food groups intake assessed by FFQ1 and FFQ2

|  |  |  |  |
| --- | --- | --- | --- |
| Main food items and food groups | Crude  |  | Energy-adjusted† |
| Quartile (%) | κw |  | Quartile (%) | κw |
| Exact | Exact or adjacent | Extreme |  | Exact | Exact or adjacent | Extreme |
| Cereals | 48.06 | 86.05 | 0.78 | 0.43 |  | 48.06 | 84.5 | 3.88 | 0.47 |
| Milks and Dairy products | 51.94 | 86.82 | 0 | 0.40 |  | 40.31 | 85.27 | 1.55 | 0.52 |
| Poultry  | 57.36 | 84.50 | 0.78 | 0.56 |  | 50.39 | 93.8 | 0 | 0.40 |
| Red meat | 40.31 | 79.85 | 7.75 | 0.27 |  | 36.43 | 79.07 | 6.98 | 0.32 |
| Offal | 71.32 | 82.17 | 10.08 | 0.43 |  | 47.29 | 84.5 | 3.10 | 0.27 |
| Processed meat | 54.26 | 80.62 | 2.33 | 0.43 |  | 43.41 | 87.6 | 2.33 | 0.50 |
| Eggs | 45.74 | 85.27 | 1.55 | 0.36 |  | 41.09 | 81.4 | 3.10 | 0.46 |
| Fish and shellfish | 48.84 | 86.82 | 1.55 | 0.45 |  | 44.96 | 85.27 | 0 | 0.49 |
| fresh vegetables | 50.39 | 89.92 | 0.78 | 0.48 |  | 51.94 | 86.05 | 3.10 | 0.52 |
| Tubers | 41.86 | 81.40 | 1.55 | 0.34 |  | 40.31 | 79.07 | 3.10 | 0.39 |
| Legumes and soy products | 39.53 | 81.40 | 0 | 0.43 |  | 45.74 | 85.27 | 2.33 | 0.37 |
| Pickle food | 50.39 | 92.25 | 0 | 0.52 |  | 51.16 | 89.15 | 0.78 | 0.55 |
| Fresh fruit | 40.00 | 82.31 | 2.31 | 0.25 |  | 35.39 | 76.92 | 6.15 | 0.36 |
| Snacks/desserts | 53.08 | 90.00 | 0 | 0.43 |  | 46.15 | 83.85 | 2.31 | 0.55 |
| Nuts | 42.64 | 86.82 | 1.55 | 0.24 |  | 36.43 | 75.97 | 8.53 | 0.45 |
| Tea | 78.46 | 85.38 | 5.38 | 0.51 |  | 51.54 | 89.23 | 2.31 | 0.70 |
| Coffee | 88.37 | 88.37 | 11.63 | 0.50 |  | 49.61 | 87.60 | 0.78 | 0.50 |
| Sugar drink | 66.92 | 90.77 | 0.77 | 0.49 |  | 48.46 | 90.00 | 3.08 | 0.50 |
| Alcohol | 44.11 | 82.15 | 5.06 | 0.42 | 　 | 49.61 | 82.17 | 4.65 | 0.49 |

FFQ1, first FFQ administration; FFQ2, second FFQ administration; κw, weighted kappa;

\* *P* < 0.05

**Supplemental Table S7**. Spearman correlation coefficients (SCC) between FFQ1 and FFQ2 for main food items and food groups according to gender, age and education level

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Main food items and food groups  | Gender |  | Age |  | Education level |
| Male |  | Female |  | < 50 years |  | ≥ 50 years |  | Middle school or below |  | College or higher |
| Crude | Energy-adjusted† |  | Crude | Energy-adjusted† |  | Crude | Energy-adjusted† |  | Crude | Energy-adjusted† |  | Crude | Energy-adjusted† |  | Crude | Energy-adjusted† |
| Cereals | 0.67\* | 0.55\* |  | 0.45\* | 0.48\* |  | 0.63\* | 0.54\* |  | 0.62\* | 0.56\* |  | 0.23 | 0.46\* |  | 0.71\* | 0.58\* |
| Milks and Dairy products | 0.67\* | 0.55\* |  | 0.68\* | 0.63\* |  | 0.68\* | 0.45\* |  | 0.70\* | 0.63\* |  | 0.72\* | 0.73\* |  | 0.70\* | 0.55\* |
| Poultry | 0.68\* | 0.66\* |  | 0.64\* | 0.18 |  | 0.70\* | 0.66\* |  | 0.78\* | 0.73\* |  | 0.79\* | 0.49\* |  | 0.70\* | 0.67\* |
| Red meat | 0.41\* | 0.41\* |  | 0.46\* | 0.53\* |  | 0.25 | 0.11 |  | 0.42\* | 0.50\* |  | 0.46\* | 0.46\* |  | 0.43\* | 0.44\* |
| Offal | 0.70\* | 0.55\* |  | 0.65\* | 0.48\* |  | 0.68\* | 0.52\* |  | 0.70\* | 0.58\* |  | 0.59\* | 0.31 |  | 0.71\* | 0.58\* |
| Processed meat | 0.65\* | 0.65\* |  | 0.68\* | 0.59\* |  | 0.70\* | 0.72\* |  | 0.66\* | 0.62\* |  | 0.79\* | 0.64\* |  | 0.64\* | 0.64\* |
| Eggs | 0.69\* | 0.54\* |  | 0.59\* | 0.49\* |  | 0.62\* | 0.46\* |  | 0.68\* | 0.57\* |  | 0.73\* | 0.62\* |  | 0.66\* | 0.52\* |
| Fish and shellfish | 0.71\* | 0.63\* |  | 0.53\* | 0.36 |  | 0.69\* | 0.72\* |  | 0.67\* | 0.58\* |  | 0.68\* | 0.55\* |  | 0.68\* | 0.63\* |
| Fresh vegetables | 0.69\* | 0.64\* |  | 0.49\* | 0.34 |  | 0.63\* | 0.51\* |  | 0.67\* | 0.65\* |  | 0.50\* | 0.25 |  | 0.70\* | 0.66\* |
| Tubers | 0.54\* | 0.46\* |  | 0.67\* | 0.52\* |  | 0.56\* | 0.31 |  | 0.54\* | 0.48\* |  | 0.74\* | 0.63\* |  | 0.53\* | 0.44\* |
| Legumes and soy products | 0.57\* | 0.59\* |  | 0.59\* | 0.45\* |  | 0.52\* | 0.47\* |  | 0.64\* | 0.64\* |  | 0.70\* | 0.50\* |  | 0.56\* | 0.57\* |
| Pickle food | 0.76\* | 0.63\* |  | 0.62\* | 0.72\* |  | 0.78\* | 0.71\* |  | 0.71\* | 0.61\* |  | 0.62\* | 0.74\* |  | 0.76\* | 0.63\* |
| Fresh fruit | 0.53\* | 0.46\* |  | 0.51\* | 0.23 |  | 0.54\* | 0.25 |  | 0.50\* | 0.39\* |  | 0.49\* | 0.27 |  | 0.52\* | 0.45\* |
| Snacks/desserts | 0.70\* | 0.62\* |  | 0.55\* | 0.42\* |  | 0.76\* | 0.52\* |  | 0.65\* | 0.61\* |  | 0.41\* | 0.43\* |  | 0.72\* | 0.63\* |
| Nuts | 0.59\* | 0.33\* |  | 0.79\* | 0.53\* |  | 0.57\* | 0.48\* |  | 0.64\* | 0.34\* |  | 0.66\* | 0.55\* |  | 0.62\* | 0.34\* |
| Tea | 0.74\* | 0.59\* |  | 0.94\* | 0.79\* |  | 0.80\* | 0.58\* |  | 0.77\* | 0.66\* |  | 0.94\* | 0.76\* |  | 0.75\* | 0.60\* |
| Coffee | 0.84\* | 0.70\* |  | 0.90\* | 0.66\* |  | 0.80\* | 0.73\* |  | 0.86\* | 0.67\* |  | 0.99\* | 0.56\* |  | 0.83\* | 0.71\* |
| Sugar drink | 0.81\* | 0.62\* |  | 0.31 | 0.29 |  | 0.88\* | 0.75\* |  | 0.75\* | 0.51\* |  | 0.42\* | 0.22 |  | 0.81\* | 0.62\* |
| Alcohol | 0.59\* | 0.48\* |  | 0.75\* | 0.54\* |  | 0.68\* | 0.58\* |  | 0.55\* | 0.42\* |  | 0.67\* | 0.49\* |  | 0.61\* | 0.48\* |

FFQ, food frequency questionnaire; κw, weighted kappa;

† Energy-adjusted intakes by the residual method

\* *P* < 0.05

**Supplemental Table S8**. The influence of seasons on FFQ reproducibility for main food items and food groups

|  |  |  |  |
| --- | --- | --- | --- |
| Main food items and food groups | Subgroup analysis by season | 　 | Sensitivity analysis§ |
| Spring (N = 32) | 　 | Summer (N = 32) | 　 | Autumn (N = 28) | 　 | Winter (N = 39) |  | SCC | 　 | ICC |
| Crude | Adjusted‡ |  | Crude | Adjusted‡ |  | Crude | Adjusted‡ |  | Crude | Adjusted‡ |  | Crude | Adjusted‡ |  | Crude | Adjusted‡ |
| Cereals | 0.44\* | 0.45\* |  | 0.56\* | 0.43\* |  | 0.44\* | 0.25 |  | 0.49\* | 0.43\* |  | 0.71\* | 0.58\* |  | 0.66 | 0.57 |
| Milks and Dairy products | 0.64\* | 0.44\* |  | 0.81\* | 0.53\* |  | 0.70\* | 0.34 |  | 0.71\* | 0.53\* |  | 0.65\* | 0.51\* |  | 0.56 | 0.52 |
| Poultry | 0.41\* | 0.49\* |  | 0.66\* | 0.54\* |  | 0.68\* | 0.49\* |  | 0.78\* | 0.54\* |  | 0.76\* | 0.67\* |  | 0.72 | 0.64 |
| Red meat | 0.74\* | 0.63\* |  | 0.44\* | 0.26\* |  | 0.63\* | 0.63\* |  | 0.77\* | 0.46\* |  | 0.59\* | 0.53\* |  | 0.42 | 0.40 |
| Offal | 0.69\* | 0.61\* |  | 0.53\* | 0.54\* |  | 0.60\* | 0.61\* |  | 0.79\* | 0.54\* |  | 0.34\* | 0.17 |  | 0.23 | 0.18 |
| Processed meat | 0.78\* | 0.72\* |  | 0.61\* | 0.50\* |  | 0.42\* | 0.72\* |  | 0.73\* | 0.50\* |  | 0.75\* | 0.40\* |  | 0.56 | 0.36 |
| Eggs | 0.67\* | 0.54\* |  | 0.37\* | 0.52\* |  | 0.46\* | 0.54\* |  | 0.63\* | 0.52\* |  | 0.67\* | 0.69\* |  | 0.67 | 0.68 |
| Fish and shellfish | 0.67\* | 0.76\* |  | 0.48\* | 0.53\* |  | 0.68\* | 0.76\* |  | 0.61\* | 0.53\* |  | 0.58\* | 0.56\* |  | 0.57 | 0.56 |
| Fresh vegetables | 0.71\* | 0.73\* |  | 0.44\* | 0.40\* |  | 0.39\* | 0.73\* |  | 0.73\* | 0.40\* |  | 0.65\* | 0.46\* |  | 0.63 | 0.54 |
| Tubers | 0.71\* | 0.67\* |  | 0.87\* | 0.81\* |  | 0.82\* | 0.67\* |  | 0.65\* | 0.81\* |  | 0.68\* | 0.56\* |  | 0.60 | 0.65 |
| Legumes and soy products | 0.43\* | 0.32\* |  | 0.66\* | 0.57\* |  | 0.75\* | 0.42\* |  | 0.55\* | 0.57\* |  | 0.48\* | 0.60\* |  | 0.53 | 0.59 |
| Pickle food | 0.53\* | 0.46\* |  | 0.62\* | 0.63\* |  | 0.57\* | 0.46\* |  | 0.85\* | 0.63\* |  | 0.64\* | 0.66\* |  | 0.26 | 0.20 |
| Fresh fruit | 0.59\* | 0.49\* |  | 0.74\* | 0.47\* |  | 0.49\* | 0.49\* |  | 0.69\* | 0.57\* |  | 0.44\* | 0.40\* |  | 0.45 | 0.40 |
| Snacks/desserts | 0.87\* | 0.71\* |  | 0.85\* | 0.73\* |  | 0.86\* | 0.71\* |  | 0.85\* | 0.73\* |  | 0.66\* | 0.39\* |  | 0.60 | 0.48 |
| Nuts | 0.75\* | 0.54\* |  | 0.86\* | 0.73\* |  | 0.65\* | 0.54\* |  | 0.83\* | 0.73\* |  | 0.61\* | 0.38\* |  | 0.48 | 0.35 |
| Tea | 0.51\* | 0.67\* |  | 0.74\* | 0.52\* |  | 0.59\* | 0.67\* |  | 0.66\* | 0.52\* |  | 0.76\* | 0.31\* |  | 0.80 | 0.81 |
| Coffee | 0.69\* | 0.71\* |  | 0.57\* | 0.47\* |  | 0.56\* | 0.71\* |  | 0.78\* | 0.47\* |  | 0.69\* | 0.63\* |  | 0.68 | 0.68 |
| Sugar drink | 0.55\* | 0.58\* |  | 0.56\* | 0.45\* |  | 0.58\* | 0.58\* |  | 0.61\* | 0.55\* |  | 0.76\* | 0.53\* |  | 0.50 | 0.43 |
| Alcohol | 0.73\* | 0.80\* |  | 0.78\* | 0.75\* |  | 0.56\* | 0.80\* |  | 0.83\* | 0.75\* |  | 0.76\* | 0.47\* |  | 0.52 | 0.47 |

FFQ, food frequency questionnaire; SCC, Spearman correlation coefficients; ICC, intraclass correlation coefficient;

† Energy-adjusted intakes by the residual method

§ The Sensitivity analysis was conducted to assess the reproducibility of FFQ with 12-month interval

\* *P* < 0.05

**Supplemental Table S9**. Agreement of cross-classification quartiles for crude and energy-adjusted nutrients intake assessed by WDRs and FFQ

|  |  |  |  |
| --- | --- | --- | --- |
| Nutrients | Crude  | 　 | Energy-adjusted† |
| Quartile (%) | κw | Quartile (%) | κw |
| Exact | Exact or adjacent | Extreme | Exact | Exact or adjacent | Extreme |
| Energy | 37.6 | 80.8 | 1.6 | 0.34 | 　 |  | 　 |  | 0.34 |
| Protein  | 35.48 | 77.42 | 3.23 | 0.28 |  | 35.48 | 73.39 | 5.65 | 0.23 |
| Fat  | 39.52 | 81.45 | 3.23 | 0.34 |  | 37.9 | 73.39 | 8.06 | 0.23 |
| Carbohydrate  | 32.26 | 79.03 | 1.61 | 0.28 |  | 35.48 | 76.61 | 5.65 | 0.25 |
| Fiber | 30.08 | 69.92 | 8.27 | 0.15 |  | 32.33 | 79.70 | 6.77 | 0.26 |
| Soluble fiber | 36.84 | 72.18 | 5.26 | 0.25 |  | 33.83 | 71.43 | 6.02 | 0.21 |
| Insoluble fiber | 30.83 | 68.42 | 9.77 | 0.14 |  | 36.84 | 78.20 | 6.77 | 0.28 |
| Cholesterol  | 29.84 | 73.39 | 6.45 | 0.17 |  | 31.45 | 66.13 | 5.65 | 0.14 |
| SFA | 29.03 | 73.39 | 2.42 | 0.20 |  | 35.48 | 75.00 | 2.42 | 0.26 |
| MUFA | 33.60 | 80.00 | 4.80 | 0.28 |  | 32.8 | 66.4 | 4.8 | 0.16 |
| PUFA | 37.90 | 81.45 | 3.23 | 0.33 |  | 31.45 | 79.03 | 8.87 | 0.21 |
| ALA | 39.10 | 76.69 | 4.51 | 0.30 |  | 38.35 | 74.44 | 6.77 | 0.25 |
| EPA | 36.09 | 71.43 | 5.26 | 0.23 |  | 35.34 | 75.94 | 9.77 | 0.22 |
| DHA | 38.35 | 78.95 | 5.26 | 0.30 |  | 42.86 | 74.44 | 5.26 | 0.3 |
| DPA | 36.84 | 75.19 | 5.26 | 0.27 |  | 39.1 | 75.19 | 8.27 | 0.25 |
| Vitamin A  | 33.60 | 74.40 | 5.6 | 0.23 |  | 33.6 | 70.4 | 11.2 | 0.15 |
| Carotene  | 30.65 | 79.03 | 4.84 | 0.24 |  | 33.87 | 74.19 | 6.45 | 0.21 |
| α-Carotene | 34.59 | 75.19 | 6.02 | 0.24 |  | 29.32 | 71.43 | 11.28 | 0.12 |
| β-Carotene | 36.84 | 71.43 | 7.52 | 0.21 |  | 33.83 | 69.17 | 9.02 | 0.16 |
| Retinol  | 33.07 | 74.19 | 2.42 | 0.24 |  | 37.90 | 73.39 | 8.06 | 0.23 |
| Thiamine  | 38.71 | 77.42 | 1.61 | 0.32 |  | 39.52 | 70.16 | 6.45 | 0.23 |
| Riboflavin  | 38.40 | 79.20 | 2.40 | 0.33 |  | 40.00 | 72.00 | 2.40 | 0.29 |
| Niacin  | 36.29 | 79.03 | 0.81 | 0.32 |  | 45.16 | 82.26 | 3.23 | 0.39 |
| Vitamin C  | 37.10 | 74.19 | 3.23 | 0.26 |  | 43.55 | 78.23 | 4.03 | 0.34 |
| Vitamin E  | 38.71 | 83.06 | 4.03 | 0.34 |  | 37.1 | 79.03 | 4.84 | 0.29 |
| Calcium  | 37.10 | 72.58 | 6.45 | 0.23 |  | 29.03 | 71.77 | 5.65 | 0.16 |
| Phosphorus  | 40.32 | 75.81 | 0 | 0.33 |  | 37.1 | 81.45 | 2.42 | 0.33 |
| Potassium  | 41.94 | 79.84 | 5.65 | 0.33 |  | 38.71 | 73.39 | 5.65 | 0.25 |
| Sodium  | 27.42 | 66.13 | 8.06 | 0.08 |  | 28.23 | 70.16 | 8.06 | 0.12 |
| Magnesium  | 36.80 | 80.00 | 3.20 | 0.32 |  | 34.4 | 76.00 | 4.80 | 0.25 |
| Iron  | 36.29 | 78.23 | 4.84 | 0.28 |  | 34.68 | 79.03 | 5.65 | 0.26 |
| Zinc  | 42.74 | 80.65 | 2.42 | 0.37 |  | 36.29 | 79.03 | 4.03 | 0.29 |
| Selenium  | 32.54 | 72.22 | 7.94 | 0.18 |  | 41.27 | 76.19 | 7.94 | 0.28 |
| Copper  | 38.71 | 83.06 | 4.03 | 0.34 |  | 37.9 | 83.06 | 4.84 | 0.33 |
| Manganese  | 35.48 | 79.03 | 1.61 | 0.30 | 　 | 39.52 | 73.39 | 3.23 | 0.28 |

FFQ, mean of FFQ1 and FFQ2; WDRs, 8-day weighed diet records; κw, weighted kappa; SFA, saturated fatty acids; PUFA, polyunsaturated fatty acids; MUFA, monounsaturated fatty acids; ALA, a-linolenic acid; EPA, eicosapentaenoic acid; DHA, docosahexaenoic acid; DPA, eicosapentaenoic acid;

† Energy-adjusted intakes by the residual method

\* *P* < 0.05

**Supplemental Table S10.** The agreement between the FFQ and WDRs by Bland–Altman analysis

|  |  |  |  |
| --- | --- | --- | --- |
| Nutrients | Crude |  | Energy-adjusted₺ |
|  |
| Mean | 95% LOA† | Rate (%)‡ |  | Mean | 95% LOA† | Rate (%)‡ |
| Energy (kcal) | -18.02 | -925.21, 889.18 | 4.80 |  |  |  |  |
| Protein (g) | -8.89 | -77.16, 59.39 | 3.23 |  | -10.18 | -52.47, 32.11 | 2.42 |
| Fat (g) | -5.53 | -43.34, 32.28 | 4.84 |  | -6.05 | -27.30, 15.20 | 4.84 |
| Carbohydrate (g) | 17.83 | -107.33, 143 | 3.23 |  | 13.96 | -48.34, 76.26 | 4.03 |
| Fiber (g) | 1.99 | -19.60, 23.58 | 5.60 |  | 1.99 | -14.34, 18.32 | 6.45 |
| Soluble fiber (g) | 1.68 | -9.84, 13.21 | 5.60 |  | 1.68 | -7.39, 10.76 | 5.60 |
| Insoluble fiber (g) | 0.28 | -11.42, 11.97 | 5.60 |  | 0.28 | -8.98, 9.53 | 4.80 |
| Cholesterol (mg) | -112.52 | -451.01, 225.97 | 1.61 |  | -112.45 | -415.27, 190.37 | 5.60 |
| SFA (g) | -0.31 | -12.50, 11.88 | 6.45 |  | -0.27 | -7.79, 7.25 | 6.45 |
| MUFA (g) | -1.43 | -14.53, 11.67 | 4.00 |  | -1.34 | -10.26, 7.57 | 4.80 |
| PUFA (g) | -0.40 | -7.26, 6.46 | 2.42 |  | -0.56 | -5.40, 4.27 | 3.23 |
| ALA (g) | -0.06 | -0.71, 0.59 | 4.03 |  | -0.53 | -0.53, 0.41 | 4.84 |
| EPA (mg) | 10.71 | -49.39, 70.80 | 6.45 |  | -48.19 | -48.19, 69.40 | 6.45 |
| DHA (mg) | 4.26 | -55.26, 63.77 | 6.45 |  | -52.45 | -52.45, 60.80 | 6.45 |
| DPA (mg) | 0.66 | -8.6, 9.91 | 9.68 |  | -8.41 | -8.41, 9.68 | 9.68 |
| Vitamin A (μg) | 3.15 | -696.35, 702.66 | 6.40 |  | 5.07 | -612.26, 622.41 | 7.20 |
| Carotene (μg) | 170.12 | -2157.98, 2498.21 | 4.84 |  | 136.95 | -1889.47, 2163.37 | 4.84 |
| α-Carotene (μg) | -3.43 | -386.62, 379.75 | 5.65 |  | 385.71 | -395.12, 385.71 | 5.65 |
| β-Carotene (μg) | 63.97 | -1821.7, 1949.64 | 4.84 |  | 1874.86 | -1749.61, 1874.86 | 3.23 |
| Retinol (μg) | 104.6 | -754.30, 963.51 | 3.23 |  | 104.85 | -722.17, 931.87 | 3.23 |
| Thiamine (mg) | -0.04 | -0.47, 0.39 | 4.03 |  | -0.05 | -0.27, 0.18 | 6.45 |
| Riboflavin (mg) | -0.08 | -0.74, 0.59 | 6.40 |  | -0.08 | -0.50, 0.34 | 4.80 |
| Niacin (mg) | -1.14 | -11.03, 8.75 | 4.03 |  | -1.28 | -7.86, 5.31 | 5.65 |
| Folate (μg) | 6.86 | -182.16, 195.87 | 6.45 |  | 152.85 | -139.36, 152.85 | 5.65 |
| Vitamin C (mg) | 17.52 | -76.16, 111.21 | 2.42 |  | 16.95 | -59.32, 93.22 | 5.65 |
| Vitamin E (mg) | 0.68 | -14.53, 15.90 | 5.65 |  | 0.38 | -10.22, 10.98 | 7.26 |
| Calcium (mg) | -11.29 | -431.61, 409.04 | 5.65 |  | -1.12 | -285.08, 282.85 | 4.84 |
| Phosphorus (mg) | -52.96 | -670.67, 564.75 | 4.03 |  | -63.2 | -298.29, 171.89 | 4.84 |
| Potassium (mg) | -43.64 | -1444.13, 1356.86 | 5.65 |  | -56.33 | -882.12, 769.47 | 4.03 |
| Magnesium (mg) | 7.05 | -192.15, 206.25 | 6.40 |  | 2.44 | -106.92, 111.79 | 7.20 |
| Iron (mg) | -0.46 | -16.10, 15.18 | 7.26 |  | -0.59 | -11.33, 10.15 | 4.84 |
| Zinc (mg) | -0.93 | -7.23, 5.38 | 5.65 |  | -1.06 | -4.96, 2.85 | 5.65 |
| Selenium (mg) | -9.99 | -47.96, 27.98 | 5.56 |  | -10.23 | -39.63, 19.17 | 8.73 |
| Copper (mg) | -0.10 | -2.67, 2.46 | 7.26 |  | -0.11 | -2.41, 2.18 | 4.84 |
| Manganese (mg) | 0.63 | -2.30, 3.56 | 5.65 |  | 0.61 | -1.25, 2.47 | 4.84 |

FFQ, mean of FFQ1 and FFQ2; WDRs, 8-day weighed diet records; SFA, saturated fatty acids; PUFA, polyunsaturated fatty acids; MUFA, monounsaturated fatty acids; ALA, a-linolenic acid; EPA, eicosapentaenoic acid; DHA, docosahexaenoic acid; DPA, eicosapentaenoic acid;

† 95% Limits of agreement (95% LOA), Mean difference ± 1.96×SD of the differences;

‡Percentage of subjects with values out of limits of agreement

₺ Energy-adjusted intakes by the residual method

\* *P* < 0.05

**Supplemental Table S11**. Spearman correlation coefficients (SCC) between FFQ and WDRs for nutrients according to gender, age and education level

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Nutrients | Gender |  | Age |  | Education level |
| Male |  | Female |  | < 50 years |  | ≥ 50 years |  | Middle school or below |  | College or higher |
| Crude | Energy-adjusted† |  | Crude | Energy-adjusted† | Crude | Energy-adjusted† |  | Crude | Energy-adjusted† | Crude | Energy-adjusted† |  | Crude | Energy-adjusted† |
| Energy | 0.57\* |  |  | 0.29 |  |  | 0.32 |  |  | 0.48\* |  |  | 0.36 |  |  | 0.55\* |  |
| Protein | 0.39\* | 0.34\* |  | 0.34 | 0.50\* |  | 0.43\* | 0.39\* |  | 0.28\* | 0.38\* |  | 0.42\* | 0.48\* |  | 0.38\* | 0.34\* |
| Fat | 0.46\* | 0.27\* |  | 0.51\* | 0.45\* |  | 0.33\* | 0.44\* |  | 0.41\* | 0.27\* |  | 0.63\* | 0.22 |  | 0.43\* | 0.30\* |
| Carbohydrate | 0.49\* | 0.36\* |  | 0.27 | 0.49\* |  | 0.32 | 0.47\* |  | 0.45\* | 0.30\* |  | 0.26 | 0.26 |  | 0.51\* | 0.36\* |
| Fiber | 0.27\* | 0.35\* |  | 0.33 | 0.40 |  | 0.34\* | 0.44 |  | 0.06 | 0.09 |  | 0.04 | 0.05 |  | 0.36\* | 0.49\* |
| Soluble fiber | 0.19 | 0.37\* |  | 0.32\* | 0.33\* |  | 0.33\* | 0.38\* |  | 0.04 | 0.11 |  | 0.10 | 0.28 |  | 0.35\* | 0.38\* |
| Insoluble fiber | 0.27 | 0.29 |  | 0.30 | 0.41\* |  | 0.27\* | 0.42\* |  | 0.05 | 0.08 |  | 0.11 | 0.08 |  | 0.30\* | 0.48\* |
| Cholesterol | 0.25\* | 0.22\* |  | 0.38 | 0.33 |  | 0.35\* | 0.49\* |  | 0.19 | 0.28\* |  | 0.46\* | 0.24 |  | 0.22\* | 0.19\* |
| SFA | 0.36\* | 0.31\* |  | 0.36 | 0.35 |  | 0.35\* | 0.42\* |  | 0.35\* | 0.37\* |  | 0.62\* | 0.48\* |  | 0.37\* | 0.32\* |
| MUFA | 0.43\* | 0.24\* |  | 0.46\* | 0.36 |  | 0.26 | 0.34\* |  | 0.35\* | 0.27\* |  | 0.70\* | 0.25 |  | 0.38\* | 0.22\* |
| PUFA | 0.51\* | 0.33\* |  | 0.35 | 0.43\* |  | 0.25 | 0.40\* |  | 0.51\* | 0.31\* |  | 0.53\* | 0.35 |  | 0.45\* | 0.28\* |
| ALA | 0.53\* | 0.49\* |  | 0.53\* | 0.41\* |  | 0.55\* | 0.43\* |  | 0.37\* | 0.22 |  | 0.54\* | 0.21\* |  | 0.55\* | 0.41\* |
| EPA | 0.55\* | 0.43\* |  | 0.43\* | 0.37\* |  | 0.43\* | 0.36\* |  | 0.29\* | 0.31\* |  | 0.53\* | 0.55\* |  | 0.44\* | 0.32\* |
| DHA | 0.49\* | 0.46\* |  | 0.48\* | 0.45\* |  | 0.49\* | 0.46\* |  | 0.46\* | 0.34\* |  | 0.48\* | 0.44\* |  | 0.51\* | 0.44\* |
| DPA | 0.58\* | 0.53\* |  | 0.51\* | 0.46\* |  | 0.47\* | 0.45\* |  | 0.46\* | 0.43\* |  | 0.6\* | 0.56\* |  | 0.5\* | 0.44\* |
| Vitamin A | 0.33\* | 0.22\* |  | 0.71\* | 0.26 |  | 0.31 | 0.19 |  | 0.32\* | 0.23\* |  | 0.55\* | 0.26 |  | 0.32\* | 0.21\* |
| Carotene | 0.34\* | 0.3\* |  | 0.49\* | 0.54\* |  | 0.52\* | 0.43\* |  | 0.31\* | 0.32\* |  | 0.30 | 0.52\* |  | 0.37\* | 0.33\* |
| α-Carotene | 0.30\* | 0.26\* |  | 0.45\* | 0.32\* |  | 0.11\* | 0.15\* |  | 0.59\* | 0.82\* |  | 0.37\* | 0.48\* |  | 0.44\* | 0.22\* |
| β-Carotene | 0.39\* | 0.41\* |  | 0.39\* | 0.37\* |  | 0.55\* | 0.26\* |  | 0.44\* | 0.6\* |  | 0.37\* | 0.57\* |  | 0.36\* | 0.31\* |
| Retinol | 0.38\* | 0.3\* |  | 0.69\* | 0.20 |  | 0.38\* | 0.29 |  | 0.44\* | 0.35\* |  | 0.71\* | 0.47\* |  | 0.36\* | 0.22\* |
| Thiamine | 0.48\* | 0.34\* |  | 0.50\* | 0.30 |  | 0.26 | 0.45\* |  | 0.41\* | 0.32\* |  | 0.49\* | 0.20 |  | 0.47\* | 0.30\* |
| Riboflavin | 0.49\* | 0.4\* |  | 0.61\* | 0.50\* |  | 0.55\* | 0.66\* |  | 0.41\* | 0.28\* |  | 0.59\* | 0.55\* |  | 0.47\* | 0.38\* |
| Niacin | 0.56\* | 0.45\* |  | 0.41 | 0.75\* |  | 0.61\* | 0.67\* |  | 0.38\* | 0.46\* |  | 0.50\* | 0.40 |  | 0.54\* | 0.49\* |
| Folate | 0.19\* | 0.53\* |  | 0.45\* | 0.31\* |  | 0.41\* | 0.44\* |  | 0.38\* | 0.11 |  | 0.34\* | 0.17\* |  | 0.42\* | 0.43\* |
| Vitamin C | 0.38\* | 0.48\* |  | 0.25 | 0.24 |  | 0.47\* | 0.49\* |  | 0.29\* | 0.37\* |  | 0.28 | 0.35 |  | 0.37\* | 0.45\* |
| Vitamin E | 0.51\* | 0.52\* |  | 0.62\* | 0.32 |  | 0.53\* | 0.64\* |  | 0.47\* | 0.32\* |  | 0.64\* | 0.59\* |  | 0.48\* | 0.44\* |
| Calcium | 0.35\* | 0.22\* |  | 0.34 | 0.59\* |  | 0.30 | 0.21 |  | 0.29\* | 0.34\* |  | 0.40\* | 0.64\* |  | 0.32\* | 0.20\* |
| Phosphorus | 0.53\* | 0.50\* |  | 0.40 | 0.74\* |  | 0.40\* | 0.60\* |  | 0.41\* | 0.50\* |  | 0.43\* | 0.72\* |  | 0.52\* | 0.51\* |
| Potassium | 0.44\* | 0.39\* |  | 0.25 | 0.13 |  | 0.38\* | 0.37\* |  | 0.34\* | 0.40\* |  | 0.36 | 0.04 |  | 0.43\* | 0.43\* |
| Magnesium | 0.47\* | 0.33\* |  | 0.22 | 0.18 |  | 0.26 | 0.31 |  | 0.42\* | 0.44\* |  | 0.38 | 0.42\* |  | 0.46\* | 0.35\* |
| Iron | 0.52\* | 0.41\* |  | 0.21 | 0.02 |  | 0.42\* | 0.45\* |  | 0.41\* | 0.37\* |  | 0.39 | 0.23 |  | 0.48\* | 0.39\* |
| Zinc | 0.54\* | 0.43\* |  | 0.27 | 0.72\* |  | 0.51\* | 0.58\* |  | 0.37\* | 0.44\* |  | 0.23 | 0.56\* |  | 0.55\* | 0.43\* |
| Selenium | 0.32\* | 0.34\* |  | 0.33 | 0.33 |  | 0.30 | 0.48\* |  | 0.25\* | 0.30\* |  | 0.40\* | 0.58\* |  | 0.29\* | 0.32\* |
| Copper | 0.54\* | 0.57\* |  | 0.43\* | 0.28 |  | 0.17 | 0.42\* |  | 0.60\* | 0.60\* |  | 0.53\* | 0.49\* |  | 0.52\* | 0.54\* |
| Manganese | 0.45\* | 0.36\* |  | 0.56\* | 0.42 |  | 0.48\* | 0.64\* |  | 0.31\* | 0.34\* |  | 0.53\* | 0.63\* |  | 0.47\* | 0.33\* |

FFQ, mean of FFQ1 and FFQ2; WDRs, 8-day weighed diet records; SFA, saturated fatty acids; PUFA, polyunsaturated fatty acids; MUFA, monounsaturated fatty acids; ALA, a-linolenic acid; EPA, eicosapentaenoic acid; DHA, docosahexaenoic acid; DPA, eicosapentaenoic acid;

† Energy-adjusted intakes by the residual method

\* *P* < 0.05

**Supplemental Table S12**. The influence of seasons on FFQ validity for nutrient

|  |  |  |  |
| --- | --- | --- | --- |
| Nutrients | Subgroup analysis by season | 　 | Sensitivity analysis § |
| Spring (N = 29) |  | Summer (N = 31) |  | Autumn (N = 26) |  | Winter (N = 39) |  | SCC |
| Crude | Adjusted‡ | 　 | Crude | Adjusted‡ | 　 | Crude | Adjusted‡ | 　 | Crude | Adjusted‡ | 　 | Crude | Adjusted‡ |
| Energy | 0.68\* |  |  | 0.41  |  |  | 0.50 |  |  | 0.55\* |  |  | 0.43\* |  |
| Protein  | 0.31 | 0.20 |  | 0.24 | 0.45\* |  | 0.34 | 0.71\* |  | 0.43\* | 0.38\* |  | 0.35\* | 0.32\* |
| Fat  | 0.57\* | 0.20 |  | 0.52\* | 0.28 |  | 0.57\* | 0.33 |  | 0.59\* | 0.35\* |  | 0.45\* | 0.29\* |
| Carbohydrate  | 0.54\* | 0.37\* |  | 0.48\* | 0.31 |  | 0.23 | 0.31 |  | 0.41\* | 0.34\* |  | 0.33\* | 0.40\* |
| Fiber | 0.44\* | 0.36 |  | 0.20 | 0.36 |  | 0.31 | 0.32 |  | 0.17 | 0.52\* |  | 0.31\* | 0.31\* |
| Soluble fiber | 0.47\* | 0.38\* |  | 0.30 | 0.36 |  | 0.16 | 0.56\* |  | 0.17 | 0.29\* |  | 0.33\* | 0.33\* |
| Insoluble fiber | 0.40\* | 0.36 |  | 0.24 | 0.52\* |  | 0.32 | 0.09 |  | 0.18 | 0.55\* |  | 0.40\* | 0.43\* |
| SFA | 0.33 | 0.24 |  | 0.39 | 0.49\* |  | 0.23 | 0.32 |  | 0.59\* | 0.36\* |  | 0.33\* | 0.41\* |
| MUFA | 0.39\* | 0.30 |  | 0.59\* | 0.37 |  | 0.36 | 0.13 |  | 0.42\* | 0.31\* |  | 0.35\* | 0.26\*  |
| PUFA | 0.42\* | 0.15 |  | 0.42 | 0.44\* |  | 0.37 | 0.36 |  | 0.55\* | 0.29\* |  | 0.15\*  | 0.18\* |
| ALA | 0.54\* | 0.28\* |  | 0.55\* | 0.32\* |  | 0.37\* | 0.43\* |  | 0.64\* | 0.59\* |  | 0.54\* | 0.45\* |
| EPA | 0.48\* | 0.6\* |  | 0.41\* | 0.4\* |  | 0.47\* | 0.22\* |  | 0.6\* | 0.51\* |  | 0.5\* | 0.48\* |
| DHA | 0.35\* | 0.51\* |  | 0.25\* | 0.25\* |  | 0.43\* | 0.22\* |  | 0.58\* | 0.48\* |  | 0.44\* | 0.45\* |
| DPA | 0.47\* | 0.58\* |  | 0.34\* | 0.4\* |  | 0.58\* | 0.37\* |  | 0.56\* | 0.47\* |  | 0.49\* | 0.48\* |
| Cholesterol  | 0.25 | 0.19 |  | 0.34 | 0.28 |  | 0.49\* | 0.15 |  | 0.35\* | 0.20 |  | 0.62\* | 0.29\* |
| Vitamin A  | 0.37\* | 0.13 |  | 0.30 | 0.21 |  | 0.47\* | 0.10 |  | 0.41\* | 0.28 |  | 0.34\* | 0.23\* |
| Carotene  | 0.46\* | 0.21 |  | 0.33 | 0.38 |  | 0.26 | 0.26 |  | 0.45\* | 0.30\* |  | 0.14\* | 0.19\* |
| 0.35\*α-Carotene | 0.33\* | 0.29\* |  | 0.54\* | 0.12\* |  | 0.55\* | 0.5\* |  | 0.45\* | 0.29\* |  | 0.42\* | 0.31\* |
| β-Carotene | 0.47\* | 0.53\* |  | 0.21\* | 0.21\* |  | 0.54\* | 0.53\* |  | 0.24\* | 0.3\* |  | 0.37\* | 0.39\* |
| Retinol  | 0.72\* | 0.34 |  | 0.26 | 0.19 |  | 0.68\* | 0.44\* |  | 0.31\* | 0.14 |  | 0.51\* | 0.19\*  |
| Thiamine  | 0.65\* | 0.38 |  | 0.38 | 0.36 |  | 0.33 | 0.23 |  | 0.47\* | 0.34\* |  | 0.47\* | 0.19\*  |
| Riboflavin  | 0.66\* | 0.37\* |  | 0.48\* | 0.36 |  | 0.47\* | 0.48\* |  | 0.5\* | 0.46\* |  | 0.51\* | 0.35\* |
| Niacin  | 0.48\* | 0.43\* |  | 0.58\* | 0.39 |  | 0.56\* | 0.35 |  | 0.48\* | 0.58\* |  | 0.55\* | 0.35\* |
| Folate | 0.54\* | 0.15\* |  | 0.42\* | 0.6\* |  | 0.23\* | 0.19\* |  | 0.37\* | 0.42\* |  | 0.35\* | 0.37\* |
| Vitamin C  | 0.49\* | 0.30 |  | 0.42 | 0.69\* |  | 0.26 | 0.41\* |  | 0.36\* | 0.34\* |  | 0.13\*  | 0.28\* |
| Vitamin E  | 0.63\* | 0.46\* |  | 0.40 | 0.62\* |  | 0.36 | 0.09 |  | 0.50\* | 0.48\* |  | 0.19\*  | 0.28\* |
| Calcium  | 0.53\* | 0.35 |  | 0.19 | 0.15 |  | 0.20 | 0.36 |  | 0.54\* | 0.38\* |  | 0.19\*  | 0.13\*  |
| Phosphorus  | 0.62\* | 0.54\* |  | 0.29 | 0.37 |  | 0.39\* | 0.56\* |  | 0.54\* | 0.62\* |  | 0.48\* | 0.41\* |
| Potassium  | 0.56\* | 0.22 |  | 0.27 | 0.43\* |  | 0.22 | 0.32 |  | 0.51\* | 0.51\* |  | 0.24\*  | 0.18\* |
| Magnesium  | 0.50\* | 0.24 |  | 0.16 | 0.32 |  | 0.23 | 0.21 |  | 0.54\* | 0.49\* |  | 0.26\*  | 0.38\* |
| Iron  | 0.51\* | 0.25 |  | 0.19 | 0.25 |  | 0.33 | 0.37 |  | 0.39\* | 0.40\* |  | 0.23\*  | 0.14\*  |
| Zinc  | 0.41\* | 0.28 |  | 0.33 | 0.39 |  | 0.60\* | 0.60\* |  | 0.55\* | 0.50\* |  | 0.52\* | 0.38\* |
| Selenium  | 0.22 | 0.39\* |  | 0.24 | 0.31 |  | 0.24 | 0.34 |  | 0.54\* | 0.37\* |  | 0.53\* | 0.28\* |
| Copper  | 0.54\* | 0.40\* |  | 0.29 | 0.45\* |  | 0.59\* | 0.45\* |  | 0.57\* | 0.47\* |  | 0.55\* | 0.51\* |
| Manganese  | 0.46\* | 0.23 | 　 | 0.24 | 0.61\* | 　 | 0.36 | 0.32 | 　 | 0.39\* | 0.46\* | 　 | 0.28\* | 0.34\* |

FFQ, mean of FFQ1 and FFQ2; WDRs, 8-day weighed diet records; SFA, saturated fatty acids; PUFA, polyunsaturated fatty acids; MUFA, monounsaturated fatty acids; ALA, a-linolenic acid; EPA, eicosapentaenoic acid; DHA, docosahexaenoic acid; DPA, eicosapentaenoic acid;

§ The sensitivity analysis restricted to participants collected 16-day WDRs to assess the validity of the FFQ using Spearman correlation coefficients.

† Energy-adjusted intakes by the residual method

\* *P* < 0.05

**Supplemental Table S13.** Agreement of cross-classification quartiles for crude and energy-adjusted food groups intake assessed by WDRs and FFQ

|  |  |  |  |
| --- | --- | --- | --- |
| Main food items and food groups | Crude  | 　 | Energy-adjusted† |
| Quartile (%) | κw | Quartile (%) | κw |
| Exact | Exact or adjacent | Extreme | Exact | Exact or adjacent | Extreme |
| Cereals | 39.52 | 78.23 | 1.61 | 0.33 | 　 | 45.16 | 81.45 | 4.03 | 0.38 |
| Milks and Dairy products | 40.32 | 81.45 | 0.81 | 0.37 |  | 46.77 | 82.26 | 1.61 | 0.42 |
| Poultry  | 44.36 | 79.03 | 3.23 | 0.39 |  | 31.45 | 79.03 | 4.03 | 0.25 |
| Red meat | 35.48 | 70.16 | 2.42 | 0.23 |  | 31.45 | 75.00 | 8.06 | 0.19 |
| Offal | 25.00 | 64.35 | 13.55 | 0.19 |  | 29.84 | 65.32 | 12.90 | 0.06 |
| Processed meat | 40.00 | 83.20 | 3.20 | 0.39 |  | 48 | 83.20 | 1.60 | 0.44 |
| Eggs | 41.60 | 81.60 | 0 | 0.39 |  | 36.8 | 74.40 | 4.00 | 0.26 |
| Fish and shellfish | 45.16 | 79.03 | 0.81 | 0.39 |  | 33.87 | 78.23 | 2.42 | 0.28 |
| Fresh vegetables | 37.90 | 79.03 | 2.42 | 0.32 |  | 36.29 | 76.61 | 6.45 | 0.25 |
| Tubers | 33.60 | 69.60 | 7.20 | 0.18 |  | 33.6 | 68.00 | 8.80 | 0.15 |
| Legumes and soy products | 41.13 | 84.68 | 0 | 0.41 |  | 37.9 | 86.29 | 0 | 0.39 |
| Pickle food | 30.65 | 62.90 | 12.10 | 0.39 |  | 33.87 | 75.00 | 5.65 | 0.23 |
| Fresh fruit | 29.03 | 70.16 | 5.65 | 0.15 |  | 45.97 | 78.23 | 3.23 | 0.37 |
| Snacks/desserts | 30.65 | 76.61 | 1.61 | 0.26 |  | 37.1 | 79.03 | 0 | 0.33 |
| Nuts | 37.90 | 76.61 | 5.65 | 0.31 |  | 36.29 | 72.58 | 8.87 | 0.20 |
| Tea | 67.74 | 79.03 | 6.45 | 0.20 |  | 33.87 | 79.03 | 0 | 0.30 |
| Coffee | 25.81 | 65.97 | 4.03 | 0.30 |  | 41.94 | 77.42 | 6.45 | 0.30 |
| Sugar drink | 54.84 | 82.26 | 2.42 | 0.30 |  | 46.77 | 84.68 | 2.42 | 0.43 |
| Alcohol | 30.65 | 67.90 | 6.10 | 0.43 | 　 | 44.36 | 75.00 | 4.84 | 0.32 |

FFQ, mean of FFQ1 and FFQ2; WDRs, 8-day weighed diet records; κw, weighted kappa;

† Energy-adjusted intakes by the residual method

\* *P* < 0.05

**Supplemental Table S14.** Agreement between the FFQ and WDRs by Bland–Altman analysis

|  |  |  |  |
| --- | --- | --- | --- |
| Main food items and food groups (g) | Crude | 　 | Energy-adjusted₺ |
|  |
| Mean | 95% LOA | Rate (%) | 　 | Mean | 95% LOA | Rate (%) |
| Cereals | 27.35 | -315.73, 370.42 | 4.03 | 　 | 17.99 | -262.08, 298.06 | 4.84 |
| Milks and Dairy products | 23.64 | -134, 181.29 | 4.84 |  | 26.19 | -122.21, 174.59 | 4.03 |
| Poultry  | -10.16 | -92.76, 72.43 | 6.45 |  | -10.16 | -88.22, 67.9 | 4.84 |
| Red meat | -29.96 | -129.86, 69.95 | 4.84 |  | -29.89 | -119.04, 59.26 | 7.26 |
| Offal | 0.25 | -19.16, 19.66 | 3.23 |  | 0.19 | -19.37, 19.75 | 3.23 |
| Processed meat | -6.24 | -34.29, 21.82 | 4.00 |  | -6.27 | -32.71, 20.17 | 4.00 |
| Eggs | -11.14 | -84.31, 62.02 | 3.20 |  | -10.99 | -81.1, 59.12 | 2.40 |
| Fish and shellfish | -5.27 | -59.08, 48.53 | 4.03 |  | -5.47 | -57.65, 46.7 | 4.03 |
| Fresh vegetables | -7.18 | -235.86, 221.51 | 3.23 |  | -5.15 | -210.85, 200.56 | 4.84 |
| Tubers | 2.66 | -73.58, 78.9 | 5.60 |  | 2.66 | -69.1, 74.42 | 4.80 |
| Legumes and soy products | -1.43 | -111.16, 108.3 | 4.84 |  | -1.08 | -101.5, 99.35 | 4.03 |
| Pickle food | 6.37 | -18.31, 31.04 | 4.03 |  | 6.3 | -17.61, 30.21 | 4.84 |
| Fresh fruit | 70.23 | -166.3, 306.76 | 3.23 |  | 70.25 | -134, 274.5 | 3.23 |
| Snacks/desserts | 13.65 | -49.73, 77.03 | 6.45 |  | 13.96 | -41.8, 69.71 | 4.84 |
| Nuts | -1.56 | -27.93, 24.81 | 5.65 |  | -1.76 | -26.8, 23.27 | 7.26 |
| Tea | 19.33 | -430.82, 469.48 | 4.84 |  | 19.18 | -429.16, 467.52 | 4.84 |
| Coffee | 22.2 | -70.28, 114.69 | 4.03 |  | 22.07 | -69.86, 114 | 4.03 |
| Sugar drink | -10.27 | -148.81, 128.27 | 8.87 |  | -10.47 | -142, 121.06 | 8.06 |
| Alcohol | 16.22 | -70.61, 103.05 | 4.03 | 　 | 16.18 | -66.59, 98.95 | 4.84 |

FFQ, mean of FFQ1 and FFQ2; WDRs, 8-day weighed diet records;

† 95% Limits of agreement (95% LOA), Mean difference ± 1.96×SD of the differences;

‡ Percentage of subjects with values out of limits of agreement

₺ Energy-adjusted intakes by the residual method

\* *P* < 0.05

**Supplemental Table S15**. Spearman correlation coefficients (SCC) between FFQ and WDRs for main food items and groups according to gender, age and education level

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Main food items and food groups | Gender |  | Age |  | Education level |
| Male |  | Female | < 50 years |  | ≥ 50 years | Middle school or below |  | College or higher |
| Crude | Energy-adjusted† |  | Crude | Energy-adjusted† | Crude | Energy-adjusted† |  | Crude | Energy-adjusted† | Crude | Energy-adjusted† |  | Crude | Energy-adjusted† |
| Cereals | 0.57\* | 0.45\* |  | 0.21 | 0.56\* |  | 0.59\* | 0.46\* |  | 0.45\* | 0.49\* |  | 0.24 | 0.53\* |  | 0.57\* | 0.45\* |
| Milks and Dairy products | 0.58\* | 0.55\* |  | 0.77\* | 0.77\* |  | 0.63\* | 0.60\* |  | 0.58\* | 0.56\* |  | 0.71\* | 0.62\* |  | 0.59\* | 0.57\* |
| Poultry | 0.33\* | 0.31\* |  | 0.54\* | 0.14 |  | 0.41\* | 0.41\* |  | 0.49\* | 0.48\* |  | 0.63\* | 0.25 |  | 0.39\* | 0.37\* |
| Red meat | 0.42\* | 0.29\* |  | 0.45\* | 0.44\* |  | 0.34\* | 0.11 |  | 0.33\* | 0.43\* |  | 0.46\* | 0.27 |  | 0.41\* | 0.31\* |
| Offal | 0.34\* | 0.16 |  | 0.15 | 0.31 |  | 0.39\* | 0.24 |  | 0.33\* | 0.12 |  | 0.16 | -0.2 |  | 0.32\* | 0.12 |
| Processed meat | 0.51\* | 0.58\* |  | 0.29 | 0.47\* |  | 0.59\* | 0.69\* |  | 0.52\* | 0.54\* |  | 0.44\* | 0.42\* |  | 0.50\* | 0.58\* |
| Eggs | 0.49\* | 0.37\* |  | 0.73\* | 0.52\* |  | 0.46\* | 0.16 |  | 0.57\* | 0.50\* |  | 0.70\* | 0.62\* |  | 0.47\* | 0.32\* |
| Fish and shellfish | 0.51\* | 0.47\* |  | 0.64\* | 0.51\* |  | 0.58\* | 0.42\* |  | 0.51\* | 0.47\* |  | 0.38 | 0.31 |  | 0.57\* | 0.51\* |
| Fresh vegetables | 0.44\* | 0.3\* |  | 0.29 | 0.5\* |  | 0.50\* | 0.48\* |  | 0.40\* | 0.33\* |  | 0.35 | 0.53\* |  | 0.44\* | 0.33\* |
| Tubers | 0.13 | 0.08 |  | 0.43 | 0.57\* |  | 0.38\* | 0.39\* |  | 0.24\* | 0.21\* |  | 0.52\* | 0.53\* |  | 0.15 | 0.14 |
| Legumes and soy products | 0.63\* | 0.67\* |  | 0.58\* | 0.5\* |  | 0.57\* | 0.65\* |  | 0.65\* | 0.66\* |  | 0.58\* | 0.43\* |  | 0.63\* | 0.67\* |
| Pickle food | 0.25\* | 0.3\* |  | 0.20 | 0.35 |  | 0.39\* | 0.54\* |  | 0.28\* | 0.28\* |  | 0.20 | 0.30 |  | 0.29\* | 0.36\* |
| Fresh fruit | 0.32\* | 0.49\* |  | 0.51\* | 0.55\* |  | 0.29 | 0.37\* |  | 0.38\* | 0.43\* |  | 0.66\* | 0.56\* |  | 0.29\* | 0.46\* |
| Snacks/desserts | 0.45\* | 0.50\* |  | 0.41 | 0.55\* |  | 0.30 | 0.54\* |  | 0.51\* | 0.51\* |  | 0.51\* | 0.47\* |  | 0.45\* | 0.52\* |
| Nuts | 0.39\* | 0.20\* |  | 0.53\* | 0.6\* |  | 0.41\* | 0.38\* |  | 0.48\* | 0.28\* |  | 0.54\* | 0.40 |  | 0.39\* | 0.28\* |
| Tea | 0.66\* | 0.39\* |  | 0.85\* | 0.68\* |  | 0.72\* | 0.50\* |  | 0.72\* | 0.48\* |  | 0.90\* | 0.61\* |  | 0.64\* | 0.45\* |
| Coffee | 0.62\* | 0.46\* |  | 0.81\* | 0.36 |  | 0.47\* | 0.26 |  | 0.69\* | 0.45\* |  | 0.80\* | 0.42\* |  | 0.62\* | 0.42\* |
| Sugar drink | 0.65\* | 0.63\* |  | 0.40\* | 0.19 |  | 0.78\* | 0.75\* |  | 0.59\* | 0.43\* |  | 0.53\* | 0.35 |  | 0.65\* | 0.60\* |
| Alcohol | 0.50\* | 0.53\* |  | 0.39 | -0.15 |  | 0.44\* | 0.55\* |  | 0.52\* | 0.37\* |  | 0.52\* | 0.28 |  | 0.46\* | 0.44\* |

FFQ, mean of FFQ1 and FFQ2; WDRs, 8-day weighed diet records;

† Energy-adjusted intakes by the residual method

\* *P* < 0.05

**Supplemental Table S16**. The influence of seasons on FFQ validity for main food items and food groups

|  |  |  |  |
| --- | --- | --- | --- |
| Main food items and food groups | Subgroup analysis by season | 　 | Sensitivity analysis § |
| Spring (N = 32) |  | Summer (N = 22) |  | Autumn (N = 28) |  | Winter (N = 49) |  | SCC |
| Crude | Adjusted‡ | 　 | Crude | Adjusted‡ | 　 | Crude | Adjusted‡ | 　 | Crude | Adjusted‡ | 　 | Crude | Adjusted‡ |
| Cereals | 0.61\* | 0.74\* |  | 0.52\* | 0.49\* |  | 0.36 | 0.45\* |  | 0.35\* | 0.29\* |  | 0.59\* | 0.55\* |
| Milks and Dairy products | 0.52\* | 0.29 |  | 0.64\* | 0.52\* |  | 0.66\* | 0.46\* |  | 0.64\* | 0.57\* |  | 0.63\* | 0.66\* |
| Poultry  | 0.37 | 0.37\* |  | 0.45\* | 0.25 |  | 0.67\* | 0.22 |  | 0.50\* | 0.44\* |  | 0.53\* | 0.41\* |
| Red meat | 0.35 | 0.25 |  | 0.28 | 0.24 |  | 0.39 | 0.21 |  | 0.50\* | 0.36\* |  | 0.43\* | 0.33\* |
| Offal | 0.49\* | 0.35 |  | 0.40 | 0.10 |  | 0.59\* | 0.35 |  | 0.28 | 0.23 |  | 0.29\* | 0.12\*  |
| Processed meat | 0.64\* | 0.54\* |  | 0.66\* | 0.56\* |  | 0.45\* | 0.33 |  | 0.62\* | 0.69\* |  | 0.47\* | 0.26\*  |
| Eggs | 0.67\* | 0.35 |  | 0.33 | 0.06 |  | 0.71\* | 0.48\* |  | 0.37\* | 0.35\* |  | 0.72\* | 0.57\* |
| Fish and shellfish | 0.45\* | 0.52\* |  | 0.42 | 0.44\* |  | 0.37 | 0.24 |  | 0.64\* | 0.36\* |  | 0.36\* | 0.25\*  |
| fresh vegetables | 0.58\* | 0.44\* |  | 0.58\* | 0.43\* |  | 0.43\* | 0.31 |  | 0.28 | 0.21 |  | 0.30\* | 0.41\* |
| Tubers | 0.48\* | 0.18 |  | 0.52\* | 0.38 |  | 0.25 | 0.28 |  | 0.22 | 0.15 |  | 0.18\*  | 0.29\* |
| Legumes and soy products | 0.57\* | 0.39\* |  | 0.65\* | 0.74\* |  | 0.46\* | 0.53\* |  | 0.71\* | 0.63\* |  | 0.56\* | 0.55\* |
| Pickle food | 0.18 | 0.03 |  | 0.40 | 0.40 |  | 0.12 | 0.17 |  | 0.33\* | 0.28\* |  | 0.27\*  | 0.27\*  |
| Fresh fruit | 0.53\* | 0.42\* |  | 0.16 | 0.40 |  | 0.36 | 0.18 |  | 0.43\* | 0.56\* |  | 0.39\* | 0.27\* |
| Snacks/desserts | 0.27 | 0.22 |  | 0.43\* | 0.53\* |  | 0.44\* | 0.39\* |  | 0.55\* | 0.58\* |  | 0.47\* | 0.62\* |
| Nuts | 0.46\* | 0.36\* |  | 0.63\* | 0.25 |  | 0.40\* | 0.19 |  | 0.31\* | 0.24 |  | 0.32\* | 0.44\* |
| Tea | 0.64\* | 0.34 |  | 0.61\* | 0.41 |  | 0.83\* | 0.53\* |  | 0.71\* | 0.40\* |  | 0.74\* | 0.39\* |
| Coffee | 0.72\* | 0.63\* |  | 0.32 | 0.30 |  | 0.54\* | 0.23 |  | 0.71\* | 0.57\* |  | 0.77\* | 0.47\* |
| Soft drink | 0.69\* | 0.66\* |  | 0.75\* | 0.61\* |  | 0.57\* | 0.49\* |  | 0.67\* | 0.44\* |  | 0.66\* | 0.51\* |
| Alcohol | 0.49\* | 0.47\* | 　 | 0.44\* | 0.35 | 　 | 0.47\* | 0.14 | 　 | 0.53\* | 0.31\* | 　 | 0.47\* | 0.39\* |

FFQ, mean of FFQ1 and FFQ2; WDRs, 8-day weighed diet records;

§ The sensitivity analysis restricted to participants collected 16-day WDRs to assess the validity of the FFQ using Spearman correlation coefficients.

† Energy-adjusted intakes by the residual method

\* *P* < 0.05

**Supplemental Table S17.** Spearman correlation coefficients between each pair of the three measurements

|  |  |
| --- | --- |
| Nutrients | SCC |
| FFQ1 vs. WDRs | WDR vs. Biomarker | FFQ1 vs. Biomarker |
| Thiamine | 0.25\* | 0.20\* | 0.02 |
| Riboflavin | 0.33\* | 0.15 | -0.02 |
| Vitamin C | 0.19\* | 0.24\* | -0.01 |
| Vitamin E | 0.30\* | 0.13 | -0.10 |
| Magnesium | 0.31\* | 0.17 | 0.20\* |
| Iron | 0.28\* | 0.05 | -0.04 |
| SFA | 0.21\* | 0.06 | 0.14\* |
| MUFA | 0.19\* | 0.17 | 0.13\* |
| PUFA | 0.18 | 0.08 | 0.11\* |

FFQ1, first FFQ administration; SCC, Spearman correlation coefficient;

SFA, saturated fatty acids; PUFA, polyunsaturated fatty acids; MUFA, monounsaturated fatty acids;

\* *P* < 0.05