## Supplementary material

Supplemental Table 1. Macronutrient intakes by tertiles of eating frequency and breakfast skipping

|  |
| --- |
| **Adolescents** |
|  | **Meal frequency** | **Breakfast skipping** |
|  | **3 or fewer** | **4 to 5** | **6 or more** | **Breakfast eaters** | **Breakfast skippers** |
| Energy% Carbohydrates | 45 | 46 | 48 | 46 | 46 |
| Energy% Fat | 35 | 35 | 38 | 35 | 36 |
| Energy% Protein | 18 | 16 | 16 | 17 | 16 |
| Energy% Saturated fat | 14 | 15 | 14 | 14 | 14 |
| Energy% monounsaturated fat  | 14 | 14 | 13 | 13 | 14 |
| Energy% polyunsaturated fat  | 5 | 5 | 5 | 5 | 5 |
| **Adults** |
|  | **3 or fewer** | **4 to 5** | **6 or more** | **Breakfast eaters** | **Breakfast skippers** |
| Energy% Carbohydrates | 41 | 43 | 45 | 43 | 43 |
| Energy% Fat | 34 | 35 | 34 | 35 | 35 |
| Energy% Protein | 19 | 17 | 16 | 17 | 17 |
| Energy% Saturated fat | 13 | 13 | 13 | 13 | 14 |
| Energy% monounsaturated fat  | 13 | 13 | 13 | 13 | 14 |
| Energy% polyunsaturated fat  | 6 | 6 | 6 | 6 | 6 |
|  |  |  |  |  |  |

|  |  |  |
| --- | --- | --- |
|  |  |  |

Supplemental Table 2. Energy intake and absolute- and energy adjusted intakes (per 10MJ) of micronutrients by tertiles of Eating frequency

|  |
| --- |
| Adolescents |
|  | **3 or fewer** | **4 to 5** | **6 or more** |
| mean EO per 24h | 3.2 | 4.5 | 6.1 |
| n | 725 | 2067 | 175 |
|  | ***mean*** | ***SD*** | ***mean*** | ***SD*** | ***mean*** | ***SD*** |
| kJ | 7312 | 2844 | 9044 |  2884 | 11496 |  3730 |
| Fiber gg/10MJ | 13.919.9 | 5.8 6.8 | 19.3 21.9 | 7.47.0 | 26.8 24.0 | 9.77.4 |
| Whole grains gg/10MJ | 20.930.8 | 25.136.2 | 33.838.9 | 30.335.4 | 47.443.0 | 33.129.7 |
| Vitamin D µgµg/10MJ | 4.8 6.7 | 3.33.9 | 6.2 6.9  | 3.73.4 | 7.4 6.4 | 4.53.1 |
| Folate µgµg/10MJ | 213.9 301.8 | 93.797.3 | 277.9 314.6  | 106.4102.4 | 374.4 329.5 | 154.396.2 |
| Iron mgmg/10MJ | 6.9 9.6 | 3.53.3 | 8.79.7  | 3.62.6 | 11.510.1 | 4.62.2 |
| Selenium µgµg/10MJ | 37.1 51.6 | 20.923.2 | 43.648.5  | 24.421.8 | 61.5 49.3 | 98.937.7 |
| Saturated fat gg/10MJ | 26.936.2 | 13.08.2 | 33.636.7 | 13.87.3 | 41.735.9 | 17.27.2 |
| Free sugar gg/10MJ | 47.464.1 | 38.440.7 | 61.066.2 | 42.133.7 | 80.170.2 | 49.233.8 |
| Adults |
|  | **3 or fewer** | **4 to 5** | **6 or more** |
| mean EO per 24h | 2.9 | 4.5 | 6.1 |
| n | 237 | 1226 | 333 |
|  | ***mean*** | ***SD*** | ***mean*** | ***SD*** | ***mean*** | ***SD*** |
| kJ | 6393 | 2251 | 8323 | 2408 | 9404 | 2678 |
| Fiber gg/10MJ | 13.622.1 | 5.67.8 | 19.924.6 | 6.87.2 | 24.526.8 | 8.28.2 |
| Whole grains gg/10MJ | 25.140.6 | 25.739.0 | 42.452.5 | 29.935.8 | 54.459.5 | 33.635.2 |
| Vitamin D µgµg/10MJ | 5.48.6 | 4.06.3 | 7.08.5 | 4.85.5 | 8.08.6 | 5.04.8 |
| Folate µgµg/10MJ | 189.7309.8 | 98.9139.9 | 261.1324.8 | 101.7127.8 | 298.7327.4 | 90.396.2 |
| Iron mgmg/10MJ | 8.313.6 | 3.16.6 | 10.412.7 | 3.73.5 | 11.912.9 | 4.23.6 |
| Selenium µgµg/10MJ | 38.863.3 | 17.928.3 | 45.856.6 | 19.223.1 | 49.353.3 | 19.717.7 |
| Saturated fat gg/10MJ | 22.334.3 | 10.78.9 | 30.035.6 | 12.48.6 | 33.334.9 | 15.19.3 |
| Free sugars gg/10MJ | 30.547.3 | 23.432.4 | 47.155.1 | 30.028.6 | 55.057.9 | 31.026.7 |

Supplemental table 3. Energy and nutrient intakes by levels of breakfast skipping.

|  |
| --- |
| Adolescents |
|  | **Breakfast eaters** | **Breakfast skippers** | P-value |
| Eating frequency | 4.4 EO | 3.7 EO | **<0.001** |
| n | 2376 | 591 |  |
|  | *Mean* | *SD* | *Mean* | SD |  |
| kJ | 8900 | 3046 | *8223* | *3242* | **<0.001** |
| Fiber g *g/10MJ* | 19 *22* | 8 7 | 16 *20* | 7 8 | **<0.001** |
| Whole grains g *g/10MJ* | 34 39 | 31 *35* | 23 30 | 25 38 | **<0.001** |
| Vitamin D µg *µg/10MJ* | 6.3 *7.1* | 3.8 *3.5* | 4.5 *5.7* | 3.1 *3.4* | **<0.001** |
| Folat µg *µg/10MJ* | 278 *319* | 112 *100* | 227 *286* | 107 102 | **<0.001** |
| Iron mg *mg/10MJ* | 8.6 *9.8* | 3.9 *2.8* | 7.5 *9.3* | 3.2 2.5 | **<0.001** |
| Selenium µg *µg/10MJ* | 44 *50* | 36 *24* | 38 *47* | 21 *23* | **<0.001** |
| Saturated fat g *g/10MJ* | 33 37 | 14 7 | 31 37 | 15 8 | **0.66** |
| Free sugars *g/10MJ* | 58 64 | 40 34 | 63 74 | 50 41 | **<0.001** |
| Adults |
|  | **Breakfast eaters** | **Breakfast skippers** | P-value |
| Eating frequency | 4.7 EO | 3.7 EO | **<0.001** |
| n | 1617 | 179 |  |
|  | *Mean* | *SD* | *Mean* | SD |  |
| kJ | *8356* | *2551* | *7480* | 2709 | **<0.001** |
| Fiber g *g/10MJ* | 20 *25* | 7 8 | 15 *21* | 7 7 | **<0.001** |
| Whole grains g *g/10MJ* | 44 54 | 31 *37* | 26 34 | 27 31 | **<0.001** |
| Vitamin D µg *µg/10MJ* | 7.1 *8.8* | 4.9 *5.6* | 5.2 *6.9* | 3.9 4.3 | **<0.001** |
| Folat µg *µg/10MJ* | 265 *328* | 103 *126* | 205 *281* | 91 95 | **<0.001** |
| Iron mg *mg/10MJ* | 10.6 *12.9* | 3.8 *4.1* | 8.8 *12.0* | 3.4 3.3 | **<0.001** |
| Selenium µg *µg/10MJ* | 46 *57* | 19 *24* | 39 *54* | 17 18 | **0.19** |
| Saturated fat g *g/10MJ* | 30 35 | 13 9 | 27 36 | 13 9 | **0.24** |
| Free sugars *g/10MJ* | 46 54 | 30 28 | 47 60 | 34 36 | **0.013** |

Supplemental Table 4. Average requirements (AR) or recommended intakes (Rec.) for nutrients based on Nordic nutrition recommendation 2023.

|  |  |
| --- | --- |
| **Nutrient** | **Average requirement (AR) or recommended intake (Rec.)** |
| **Fiber Rec.** | Women: 25 grams per day Men: 35 grams per day |
| **Whole grains Rec.** | 90 grams per day |
| **Vitamin D AR** | 7.5 µg per day |
| **Folate AR** | 7-10 years: 160 µg per dayGirls 11-14 years: 220 µg per dayGirls 15-17 years: 240 µg per dayGirls/Women >18 years: 250 µg per dayBoys 11-14 years: 200 µg per dayBoys/Men >15 years: 250 µg per day |
| **Iron AR** | 7-10 years: 7 mg per dayGirls 11-14 years: 10 mg per dayGirls/women 15-50 years: 9 mg per dayWomen >51 years: 6 mg per dayBoys 11-17 years: 9 mg per dayMen >18 years: 7 mg per day |
| **Selenium AR** | 7-10 years: 35 µg per dayGirls 11-14 years: 50 µg per dayGirls 15-17 years: 55 µg per dayGirls/Women >18 years: 60 µg per dayBoys 11-14 years: 50 µg per dayBoys/Men >15 years: 70 µg per day |
| **Saturated fat Rec.** | Max 10E% |
| **Free sugars Rec.** | Max 10E% |