# Online Supplementary Material

**Seasonal variation of diet quality in a large middle-aged and elderly Dutch population-based cohort**
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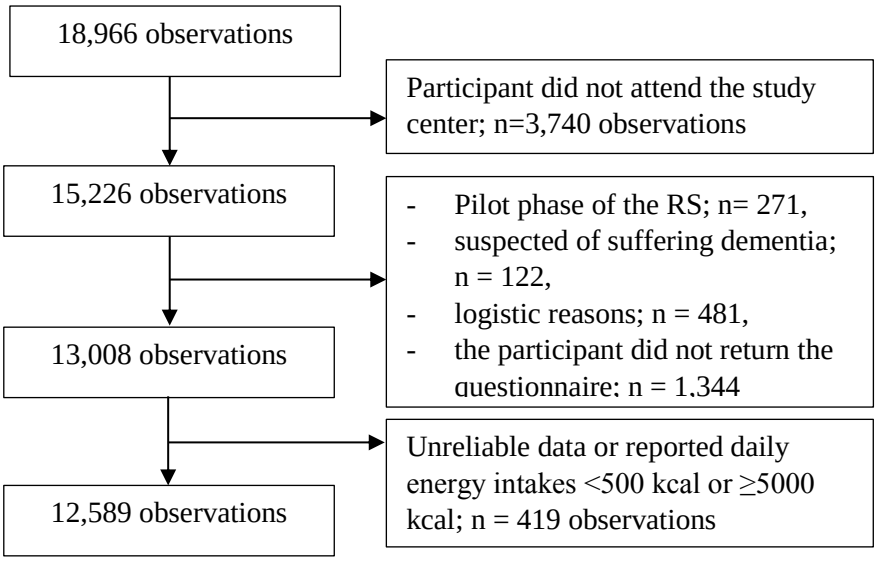
### Supplemental Figure 1. Appendix Flowchart of sample size selection




**Imputation procedures:** Sequential multiple imputation using chained equations was performed to impute missing values only of covariates. The predictors used to impute the covariates were age, sex, cohort, standardized MET hours/week, smoking behavior, BMI, education, diet quality score. We performed the imputation stratified per number of visits, in order to use the data from other visits for those participants with more than one visit. For ordered categorical variables (education) we used an ordered logit function. For categorical non-ordered variables (smoking behavior) we used multinomial logit function. For BMI and physical activity, we used linear functions. To ensure reproducibility, we used a random seed (2005). We created five imputed datasets. Covariates with missing values were: education: 111missing, smoking behavior: 53missing, BMI: 192missing, physical activity: 2177missing. Imputations were performed using the *mi impute* command of Stata software.

# Online Supplementary Material

**Supplemental Table 1. STROBE Statement—Checklist of items that should be included in reports of cross-sectional studies**

| | Item No | Recommendation | Page |
|---|---|---|---|
| **Title and abstract** | 1 | (*a*) Indicate the study's design with a commonly used term in the title or the abstract | 1 |
| | | (*b*) Provide in the abstract an informative and balanced summary of what was done and what was found | 1 |
| **Introduction** | | | |
| Background/rationale | 2 | Explain the scientific background and rationale for the investigation being reported | 3 |
| Objectives | 3 | State specific objectives, including any prespecified hypotheses | 3 |
| **Methods** | | | |
| Study design | 4 | Present key elements of study design early in the paper | 4 |
| Setting | 5 | Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection | 4 |
| Participants | 6 | (*a*) Give the eligibility criteria, and the sources and methods of selection of participants | 4 |
| Variables | 7 | Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable | 4-6 |
| Data sources/ measurement | 8* | For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group | 4-6 |
| Bias | 9 | Describe any efforts to address potential sources of bias | 6-7 |
| Study size | 10 | Explain how the study size was arrived at | 4 |
| Quantitative variables | 11 | Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why | 4-5 |
| Statistical methods | 12 | (*a*) Describe all statistical methods, including those used to control for confounding | 5-7 |
| | | (*b*) Describe any methods used to examine subgroups and interactions | 5-7 |
| | | (*c*) Explain how missing data were addressed | 6 |
| | | (*d*) If applicable, describe analytical methods taking account of sampling strategy | NA |
| | | (*e*) Describe any sensitivity analyses | 6 |
| **Results** | | | |
| Participants | 13* | (a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed | 4, Supplemental Figure 1 |
| | | (b) Give reasons for non-participation at each stage | Supplemental Figure 1 |
| | | (c) Consider use of a flow diagram | Supplemental Figure 1 |
| Descriptive data | 14* | (a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders | 8, Table 2 |
| | | (b) Indicate number of participants with missing data for each variable of interest | Supplemental Figure 1 |
| Outcome data | 15* | Report numbers of outcome events or summary measures | Table 2 |
| Main results | 16 | (*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included | Table 3 |
| | | (*b*) Report category boundaries when continuous variables were categorized | NA |
| | | (*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period | NA |
| Other analyses | 17 | Report other analyses done—eg analyses of subgroups and interactions, and | Table 4, Supplemental |

| | | | |
|---|---|---|---|
| | | sensitivity analyses | Table 3a-e, 4 and 5 |
| **Discussion** | | | |
| Key results | 18 | Summarise key results with reference to study objectives | 9 |
| Limitations | 19 | Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias | 11 |
| Interpretation | 20 | Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence | 9-11 |
| Generalisability | 21 | Discuss the generalisability (external validity) of the study results | 11 |
| **Other information** | | | |
| Funding | 22 | Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based | 13 |

*Give information separately for exposed and unexposed groups.

**Note:** An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

## Online Supplementary Material

**Supplemental Table 2. Seasonal variation of diet quality score and of contributing food group, based on non-imputed dataset.**

| Outcome | Model | Seasonal variation *** | 95%-confidence interval | Peak | Nadir | Observations |
|---|---|---|---|---|---|---|
| Diet quality score (0-14) | Model 1 | 0.12 | **0.03 – 0.21*** | 14-Dec | 14-Jun | 12,589 |
| | Model 2 | 0.15 | **0.06 – 0.25*** | 14-Dec | 14-Jun | 10,173 |
| Kilocalories/day | Model 1 | 45.93 | **17.92 – 73.95*** | 20-Nov | 22-May | 12,589 |
| | Model 2 | 43.58 | **13.08 – 74.07*** | 12-Dec | 12-Jun | 10,173 |
| *Food groups* | | | | | | |
| Vegetables (g/d) | Model 1 | 4.67 | -2.19 – 11.54 | 13-Sep | 14-Mar | 12,589 |
| | Model 2 | 6.46 | -1.23 – 14.15 | 30-Sep | 31-Mar | 10,173 |
| Fruits (g/d) | Model 1 | 6.57 | -5.36 – 18.50 | 2-Dec | 3-Jun | 12,589 |
| | Model 2 | 1.54 | -12.08 – 15.16 | 27-Nov | 28-May | 10,173 |
| Wholegrain (g/d) | Model 1 | 2.95 | -0.37 – 6.27 | 7-Feb | 8-Aug | 12,589 |
| | Model 2 | 3.51 | -0.17 – 7.19 | 2-Mar | 31-Aug | 10,173 |
| Legumes (g/d) | Model 1 | 3.52 | **2.62 – 4.42*** | 29-Dec | 29-Jun | 12,589 |
| | Model 2 | 4.01 | **2.95 – 5.07*** | 26-Dec | 26-Jun | 10,173 |
| Nuts (g/d) | Model 1 | 0.82 | **0.20 – 1.45*** | 25-Jan | 25-Jul | 12,589 |
| | Model 2 | 1.11 | **0.40 – 1.81*** | 11-Jan | 12-Jul | 10,173 |
| Dairy (g/d) | Model 1 | 16.95 | **5.03 – 28.87*** | 15-Jun | 15-Dec | 12,589 |
| | Model 2 | 16.67 | **3.58 – 29.75*** | 12-Jun | 11-Dec | 10,173 |
| Fish (g/d) | Model 1 | 1.45 | **0.57 – 2.33*** | 2-Jun | 2-Dec | 12,589 |
| | Model 2 | 1.23 | **0.25 – 2.22*** | 10-Jun | 9-Dec | 10,173 |
| Tea (mL/d) | Model 1 | 21.48 | **9.21 – 33.76*** | 6-Feb | 6-Aug | 12,589 |
| | Model 2 | 19.65 | **6.05 – 33.25*** | 7-Feb | 7-Aug | 10,173 |
| Whole grains ratio | Model 1 | 0.59 | -0.66 – 1.83 | 13-Oct | 13-Apr | 12,589 |
| | Model 2 | 0.40 | -0.90 – 1.69 | 25-Jan | 25-Jul | 10,173 |
| Unsaturated fats and oils ratio | Model 1 | 0.45 | -1.00 – 1.91 | 19-Jan | 20-Jul | 12,589 |
| | Model 2 | 0.81 | -0.82 – 2.45 | 28-Nov | 29-May | 10,173 |
| Red and processed meat (g/d) | Model 1 | 2.11 | -0.26 – 4.47 | 31-Oct | 1-May | 12,589 |
| | Model 2 | 1.93 | -0.65 – 4.50 | 28-Oct | 29-Apr | 10,173 |
| Sugar-containing beverages (mL/d) | Model 1 | 13.01 | **7.22 – 18.80** | 2-Jun | 2-Dec | 12,589 |
| | Model 2 | 12.14 | **5.56 – 18.73** | 1-Jun | 1-Dec | 10,173 |
| Alcohol (g/d) | Model 1 | 0.41 | -0.25 – 1.07 | 4-Jun | 4-Dec | 12,589 |
| | Model 2 | 0.71 | -0.02 – 1.44 | 1-Jun | 1-Dec | 10,173 |
| Salt (mg/d) | Model 1 | 84.87 | **18.37 – 151.28*** | 4-Feb | 5-Aug | 12,589 |
| | Model 2 | 93.17 | **19.20 – 167.15*** | 15-Jan | 15-Jul | 10,173 |

Model1 includes cosinor terms, sex, age, cohort and energy intake

Model 2 additionally adjusted for physical activity, smoking behaviour, body mass index, prevalent diseases (stroke, myocardial infarction, diabetes mellitus type 2, and cancer), and education.

** Seasonal variation = maximum difference between the highest annual average (peak) and lowest annual average (nadir)

* Statistically significant

## Online Supplementary Material

**Supplemental Table 3a. Stratified analyses: Seasonal variation of diet quality score and of each contributing food group according to sex**

| | Men n=5,306 observations | | | | | Women n=7,283 observations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Outcome** | **Seasonal variation**** | **%[1]** | **95%-confidence interval** | **Peak** | **Nadir** | **Seasonal variation**** | **%[1]** | **95%-confidence interval** | **Peak** | **Nadir** |
| **Diet quality score (0-14)** | 0.11 | 1.73 | -0.02 – 0.24 | 6-Jan | 6-Jul | 0.09 | 1.29 | -0.02 – 0.21 | 4-Dec | 4-Jun |
| **Kilocalories/day** | 53.84 | 2.34 | **7.34 – 100.33*** | 13-Nov | 15-May | 41.82 | 2.20 | **8.17 – 75.47*** | 14-Dec | 14-Jun |
| ***Food groups*** | | | | | | | | | | |
| **Vegetables (g/d)** | 11.39 | 5.55 | **1.68 – 21.09*** | 17-Sep | 18-Mar | 2.33 | 1.09 | -6.90 – 11.57 | 16-Jun | 16-Dec |
| **Fruit (g/d)** | 6.95 | 2.76 | -11.30 – 25.21 | 1-May | 31-Oct | 10.49 | 3.40 | -5.46 – 26.45 | 11-Nov | 12-May |
| **Whole grain products (g/d)** | 4.54 | 3.22 | -1.25 – 10.32 | 27-Dec | 27-Jun | 3.73 | 3.28 | -0.23 – 7.68 | 24-Mar | 23-Sep |
| **Legumes (g/d)** | 4.12 | 39.47 | **2.59 – 5.65*** | 23-Dec | 24-Jun | 3.13 | 38.60 | **2.05 – 4.22*** | 4-Jan | 5-Jul |
| **Nuts (g/d)** | 0.62 | 6.11 | -0.44 – 1.68 | 29-Jan | 30-Jul | 0.96 | 13.99 | **0.21 – 1.72*** | 27-Jan | 28-Jul |
| **Dairy (g/d)** | 28.96 | 8.00 | **9.72 – 48.20*** | 11-Jun | 11-Dec | 10.46 | 2.84 | -4.59 – 25.50 | 27-Jun | 27-Dec |
| **Fish (g/d)** | 2.47 | 15.50 | **1.02 – 3.92*** | 22-May | 20-Nov | 0.90 | 6.43 | -0.18 – 1.98 | 22-Jun | 22-Dec |
| **Tea (mL/d)** | 26.54 | 10.70 | **8.99 – 44.09*** | 18-Feb | 19-Aug | 15.98 | 5.03 | -0.64 – 32.61 | 28-Jan | 28-Jul |
| **Unsaturated fats and oils ratio** | 0.18 | 0.26 | -1.76 – 2.13 | 5-May | 4-Nov | 1.01 | 1.47 | -0.59 – 2.61 | 6-Oct | 6-Apr |
| **Whole grains ratio** | 0.47 | 0.89 | -1.73 – 2.67 | 17-Feb | 17-Aug | 0.25 | 0.48 | -1.74 – 2.24 | 26-Feb | 27-Aug |
| **Red and processed meat (g/d)** | 0.82 | 0.80 | -3.05 – 4.69 | 21-Nov | 22-May | 3.55 | 4.43 | **0.73 – 6.38*** | 28-Oct | 28-Apr |
| **Sugar-containing beverages (mL/d)** | 17.66 | 20.31 | **7.91 – 27.41*** | 14-Jun | 14-Dec | 9.97 | 14.84 | **2.89 – 17.06*** | 16-May | 15-Nov |
| **Alcohol (g/d)** | 0.59 | 3.51 | -0.69 – 1.87 | 28-May | 27-Nov | 0.30 | 3.96 | -0.34 – 0.94 | 28-Jul | 27-Jan |
| **Salt (mg/d)** | 112.21 | 1.79 | -0.78 – 225.19 | 19-Jan | 20-Jul | 68.83 | 1.32 | -11.25 – 148.92 | 28-Feb | 29-Aug |

Seasonal variation adjusted for cosinor terms, age, sex, cohort, physical activity, smoking behaviour, body mass index, comorbidities, education, and kilocalories/day (except when used as outcome).

** Seasonal variation expresses the maximum difference between the average highest intake/score (peak) and average lowest intake/score (nadir)

* Seasonal variation is statistically significant

[1] (Seasonal variation/average intake or score)*100%

## Online Supplementary Material

**Supplemental Table 3b. Stratified analyses: Seasonal variation of diet quality score and of each contributing food group according to age group**

| | <65 years old n=5,544 observations | | | | | ≥65 years old n=7,045 observations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Outcome** | **Seasonal variation**** | **%[1]** | **95%-confidence interval** | **Peak** | **Nadir** | **Seasonal variation**** | **%[1]** | **95%-confidence interval** | **Peak** | **Nadir** |
| Diet quality score (0-14) | 0.13 | 1.94 | -0.01 – 0.26 | 9-Dec | 10-Jun | 0.10 | 1.48 | -0.01 – 0.22 | 2-Feb | 3-Aug |
| Kilocalories/day | 76.06 | 3.49 | **31.70 – 120.43*** | 18-Nov | 19-May | 33.01 | 1.67 | -3.54 – 69.57 | 6-Dec | 7-Jun |
| *Food groups* | | | | | | | | | | |
| Vegetables (g/d) | 7.93 | 3.42 | -3.10 – 18.96 | 12-Sep | 13-Mar | 2.38 | 1.23 | -6.47 – 11.23 | 7-Jun | 6-Dec |
| Fruit (g/d) | 8.57 | 3.18 | -7.70 – 24.84 | 21-Jan | 22-Jul | 5.24 | 1.76 | -11.09 – 21.56 | 5-Mar | 4-Sep |
| Whole grain products (g/d) | 5.19 | 3.80 | -0.16 – 10.54 | 9-Dec | 9-Jun | 3.88 | 3.33 | -0.50 – 8.26 | 18-Mar | 17-Sep |
| Legumes (g/d) | 3.63 | 35.62 | **2.24 – 5.02*** | 26-Nov | 27-May | 4.15 | 50.46 | **2.94 – 5.36*** | 23-Jan | 23-Jul |
| Nuts (g/d) | 0.65 | 6.59 | -0.38 – 1.67 | 1-Feb | 2-Aug | 0.94 | 13.48 | **0.14 – 1.75*** | 10-Feb | 10-Aug |
| Dairy (g/d) | 28.26 | 7.59 | **8.74 – 47.79*** | 10-Jun | 10-Dec | 13.70 | 3.80 | -1.66 – 29.06 | 31-Jul | 30-Jan |
| Fish (g/d) | 0.96 | 6.27 | -0.37 – 2.28 | 25-May | 24-Nov | 1.94 | 13.45 | **0.70 – 3.18*** | 31-May | 30-Nov |
| Tea (mL/d) | 22.07 | 8.48 | **2.66 – 41.47*** | 9-Feb | 10-Aug | 12.78 | 4.12 | -3.74 – 29.31 | 3-Jan | 4-Jul |
| Unsaturated fats and oils ratio | 1.65 | 2.41 | -0.16 – 3.45 | 2-Dec | 2-Jun | 0.60 | 0.87 | -1.08 – 2.27 | 31-Jul | 31-Jan |
| Whole grains ratio | 1.12 | 2.06 | -0.97 – 3.21 | 21-Jan | 22-Jul | 2.05 | 4.04 | 0.00 – 4.10 | 31-Mar | 30-Sep |
| Red and processed meat (g/d) | 3.74 | 3.94 | **0.10 – 7.38*** | 21-Sep | 23-Mar | 3.52 | 4.11 | **0.44 – 6.60*** | 17-Nov | 18-May |
| Sugar-containing beverages (mL/d) | 13.39 | 15.23 | **4.16 – 22.63*** | 1-Jul | 0-Jan | 12.27 | 18.66 | **4.99 – 19.56*** | 24-May | 23-Nov |
| Alcohol (g/d) | 0.40 | 3.01 | -0.84 – 1.65 | 17-Apr | 17-Oct | 0.40 | 3.99 | -0.44 – 1.24 | 6-Jul | 5-Jan |
| Salt (mg/d) | 104.50 | 1.72 | -1.72 – 210.73 | 24-Nov | 26-May | 99.97 | 1.88 | **12.87 – 187.06*** | 7-Mar | 6-Sep |

Seasonal variation adjusted for cosinor terms, age, sex, cohort, physical activity, smoking behaviour, body mass index, comorbidities, education, and kilocalories/day (except when used as outcome).

** Seasonal variation expresses the maximum difference between the average highest intake/score (peak) and average lowest intake/score (nadir)

* Seasonal variation is statistically significant

[1] (Seasonal variation/average intake or score)*100%

## Online Supplementary Material

**Supplemental Table 3c. Stratified analyses: Seasonal variation of diet quality score and of each contributing food group according to age group**

| | BMI 18.5 – 25 kg/m$^2$ n=2,714 observations | | | | | BMI >25 kg/m$^2$ n=9,799 observations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Outcome** | **Seasonal variation**** | **%$_1$** | **95%-confidence interval** | **Peak** | **Nadir** | **Seasonal variation**** | **%$^1$** | **95%-confidence interval** | **Peak** | **Nadir** |
| Diet quality score (0-14) | 0.02 | 0.29 | -0.17 – 0.21 | 4-Jun | 3-Dec | 0.13 | 1.95 | **0.04 – 0.23*** | 22-Dec | 22-Jun |
| Kilocalories/day | 72.57 | 3.45 | **15.67 – 129.46*** | 7-Jan | 7-Jul | 44.87 | 2.18 | **12.76 – 76.98*** | 15-Nov | 16-May |
| *Food groups* | | | | | | | | | | |
| Vegetables (g/d) | 10.17 | 4.90 | -3.41 – 23.76 | 19-Jul | 19-Jan | 5.19 | 2.46 | -2.71 – 13.09 | 27-Sep | 28-Mar |
| Fruit (g/d) | 3.05 | 1.09 | -20.92 – 27.02 | 0-Jan | 1-Jul | 3.05 | 1.06 | -10.41 – 16.51 | 10-Dec | 10-Jun |
| Whole grain products (g/d) | 1.45 | 1.06 | -6.85 – 9.74 | 21-Apr | 20-Oct | 3.77 | 3.09 | **0.14 – 7.39*** | 10-Feb | 10-Aug |
| Legumes (g/d) | 2.76 | 32.66 | **0.75 – 4.77*** | 7-Jan | 7-Jul | 3.79 | 40.80 | **2.78 – 4.80*** | 29-Dec | 29-Jun |
| Nuts (g/d) | 0.95 | 10.90 | -0.47 – 2.37 | 14-Apr | 14-Oct | 1.01 | 12.43 | **0.30 – 1.71*** | 7-Jan | 8-Jul |
| Dairy (g/d) | 21.79 | 5.84 | -5.04 – 48.63 | 16-Jul | 16-Jan | 17.99 | 4.95 | **4.63 – 31.35*** | 10-Jun | 10-Dec |
| Fish (g/d) | 0.24 | 1.82 | -1.34 – 1.83 | 1-Dec | 1-Jun | 2.04 | 13.35 | **1.00 – 3.07*** | 30-May | 29-Nov |
| Tea (mL/d) | 17.03 | 5.30 | -11.59 – 45.64 | 1-Apr | 30-Sep | 25.02 | 8.97 | **11.45 – 38.59*** | 2-Feb | 3-Aug |
| Unsaturated fats and oils ratio | 1.07 | 1.54 | -1.63 – 3.76 | 4-Nov | 5-May | 0.30 | 0.45 | -1.11 – 1.71 | 20-Sep | 21-Mar |
| Whole grains ratio | 2.20 | 4.21 | -1.08 – 5.48 | 25-May | 23-Nov | 0.77 | 1.47 | -0.87 – 2.41 | 4-Jan | 4-Jul |
| Red and processed meat (g/d) | 2.93 | 3.58 | -1.64 – 7.51 | 29-Sep | 31-Mar | 2.45 | 2.66 | -0.23 – 5.12 | 10-Nov | 11-May |
| Sugar-containing beverages (mL/d) | 11.80 | 16.19 | -1.15 – 24.74 | 1-Jun | 1-Dec | 13.29 | 17.44 | **6.79 – 19.80*** | 31-May | 30-Nov |
| Alcohol (g/d) | 0.45 | 4.33 | -0.82 – 1.72 | 8-Jan | 9-Jul | 0.69 | 5.85 | -0.07 – 1.45 | 23-Jun | 22-Dec |
| Salt (mg/d) | 53.71 | 0.96 | -79.75 – 187.18 | 21-Jan | 21-Jul | 88.51 | 1.56 | **11.80 – 165.22*** | 11-Feb | 11-Aug |

Seasonal variation adjusted for cosinor terms, age, sex, cohort, physical activity, smoking behaviour, body mass index, comorbidities, education, and kilocalories/day (except when used as outcome).

** Seasonal variation expresses the maximum difference between the average highest intake/score (peak) and average lowest intake/score (nadir)

* Seasonal variation is statistically significant

$_1$ (Seasonal variation/average intake or score)*100%

## Online Supplementary Material

**Supplemental Table 3d. Stratified analyses: Seasonal variation of diet quality score and of each contributing food group according to socioeconomic status**

| | Lower SES n=8,937 observations | | | | | Higher SES n=3,652 observations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Outcome** | **Seasonal variation**** | **%[1]** | **95%-confidence interval** | **Peak** | **Nadir** | **Seasonal variation**** | **%[1]** | **95%-confidence interval** | **Peak** | **Nadir** |
| Diet quality score (0-14) | 0.09 | 1.34 | -0.01 – 0.20 | 3-Jan | 4-Jul | 0.13 | 1.94 | -0.03 – 0.29 | 5-Dec | 5-Jun |
| Kilocalories/day | 42.62 | 2.12 | **10.51 – 74.73*** | 4-Dec | 5-Jun | 57.81 | 2.62 | **3.31 – 112.30*** | 20-Nov | 22-May |
| *Food groups* | | | | | | | | | | |
| Vegetables (g/d) | 2.26 | 1.11 | -5.29 – 9.81 | 13-Jul | 12-Jan | 12.69 | 5.62 | -1.08 – 26.46 | 24-Sep | 26-Mar |
| Fruit (g/d) | 10.85 | 3.91 | -2.24 – 23.95 | 16-Dec | 16-Jun | 15.47 | 5.11 | -8.60 – 39.55 | 26-Jun | 25-Dec |
| Whole grain products (g/d) | 3.10 | 2.54 | -0.89 – 7.09 | 5-Mar | 4-Sep | 3.90 | 2.92 | -2.19 – 9.98 | 29-Dec | 30-Jun |
| Legumes (g/d) | 2.66 | 33.09 | **1.64 – 3.69*** | 5-Jan | 6-Jul | 5.77 | 49.46 | **3.95 – 7.59*** | 24-Dec | 24-Jun |
| Nuts (g/d) | 0.66 | 9.15 | -0.05 – 1.37 | 21-Jan | 22-Jul | 1.05 | 9.74 | -0.21 – 2.31 | 2-Feb | 2-Aug |
| Dairy (g/d) | 13.70 | 3.73 | -0.81 – 28.21 | 2-Jun | 2-Dec | 30.23 | 8.36 | **9.05 – 51.41*** | 29-Jun | 29-Dec |
| Fish (g/d) | 1.17 | 8.65 | **0.17 – 2.17*** | 9-May | 8-Nov | 2.79 | 15.52 | **1.00 – 4.57*** | 26-Jun | 26-Dec |
| Tea (mL/d) | 20.15 | 6.66 | **5.31 – 34.98*** | 7-Mar | 5-Sep | 32.68 | 12.89 | **10.91 – 54.45*** | 1-Jan | 2-Jul |
| Unsaturated fats and oils ratio | 0.63 | 0.92 | -0.84 – 2.10 | 28-Aug | 27-Feb | 1.13 | 1.63 | -1.00 – 3.26 | 2-Dec | 2-Jun |
| Whole grains ratio | 0.76 | 1.47 | -1.02 – 2.53 | 6-Jan | 7-Jul | 1.14 | 2.10 | -1.45 – 3.73 | 23-May | 22-Nov |
| Red and processed meat (g/d) | 2.48 | 2.77 | -0.26 – 5.22 | 25-Oct | 26-Apr | 2.21 | 2.46 | -2.14 – 6.56 | 17-Nov | 19-May |
| Sugar-containing beverages (mL/d) | 12.69 | 18.24 | **5.82 – 19.56*** | 16-May | 14-Nov | 18.73 | 20.80 | **7.81 – 29.66*** | 7-Jul | 7-Jan |
| Alcohol (g/d) | 0.46 | 4.64 | -0.27 – 1.20 | 18-Jun | 17-Dec | 0.24 | 1.57 | -1.09 – 1.57 | 15-Jul | 15-Jan |
| Salt (mg/d) | 78.70 | 1.43 | **1.74 – 155.66*** | 13-Mar | 12-Sep | 171.33 | 2.86 | **36.45 – 306.20*** | 27-Dec | 28-Jun |

SES = Socioeconomic status

Seasonal variation adjusted for cosinor terms, age, sex, cohort, physical activity, smoking behaviour, body mass index, comorbidities, education, and kilocalories/day (except when used as outcome).

** Seasonal variation expresses the maximum difference between the average highest intake/score (peak) and average lowest intake/score (nadir)

* Seasonal variation is statistically significant

[1] (Seasonal variation/average intake or score)*100%

## Online Supplementary Material

**Supplemental Table 3e. Stratified analyses: Seasonal variation of diet quality score and of each contributing food group according to living status**

| | Living alone n=3,361 observations | | | | | Living with partner/relatives/others n=9,228 observations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Outcome** | **Seasonal variation**** | **%[1]** | **95%-confidence interval** | **Peak** | **Nadir** | **Seasonal variation**** | **%[1]** | **95%-confidence interval** | **Peak** | **Nadir** |
| Diet quality score (0-14) | 0.06 | 0.88 | -0.11 – 0.23 | 27-Mar | 26-Sep | 0.16 | 2.40 | **0.06 – 0.26*** | 13-Dec | 14-Jun |
| Kilocalories/day | 15.54 | 0.80 | -39.92 – 71.00 | 2-Apr | 2-Oct | 64.42 | 3.05 | **32.01 – 96.83*** | 24-Nov | 26-May |
| *Food groups* | | | | | | | | | | |
| Vegetables (g/d) | 4.59 | 3.33 | -9.49 – 18.68 | 15-Feb | 16-Aug | 8.15 | 3.79 | **0.51 – 15.80*** | 1-Sep | 3-Mar |
| Fruit (g/d) | 21.31 | 7.18 | -2.54 – 45.16 | 8-Dec | 8-Jun | 3.35 | 1.19 | -10.04 – 16.75 | 16-Jun | 16-Dec |
| Whole grain products (g/d) | 3.94 | 3.31 | -2.88 – 10.76 | 3-May | 2-Nov | 4.26 | 3.34 | **0.45 – 8.06*** | 19-Jan | 20-Jul |
| Legumes (g/d) | 2.47 | 25.94 | **0.49 – 4.46*** | 27-Dec | 27-Jun | 4.04 | 45.22 | **3.06 – 5.02*** | 28-Dec | 29-Jun |
| Nuts (g/d) | 0.84 | 11.81 | -0.42 – 2.11 | 1-Mar | 31-Aug | 0.88 | 10.16 | **0.16 – 1.61*** | 16-Jan | 17-Jul |
| Dairy (g/d) | 21.43 | 5.49 | -4.51 – 47.37 | 10-Jul | 9-Jan | 14.47 | 4.06 | **1.17 – 27.77*** | 12-Jun | 12-Dec |
| Fish (g/d) | 0.47 | 3.08 | -1.50 – 2.44 | 2-May | 1-Nov | 1.79 | 12.22 | **0.81 – 2.76*** | 1-Jun | 1-Dec |
| Tea (mL/d) | 3.03 | 1.02 | -22.84 – 28.89 | 20-Sep | 22-Mar | 27.47 | 6.63 | **13.56 – 41.38*** | 10-Feb | 10-Aug |
| Unsaturated fats and oils ratio | 0.26 | 0.38 | -2.23 – 2.75 | 17-Dec | 18-Jun | 0.62 | 0.91 | -0.81 – 2.05 | 20-Oct | 20-Apr |
| Whole grains ratio | 3.08 | 6.31 | -0.04 – 6.19 | 1-May | 31-Oct | 1.10 | 2.05 | -0.60 – 2.79 | 3-Dec | 3-Jun |
| Red and processed meat (g/d) | 4.04 | 5.03 | -0.24 – 8.31 | 30-Nov | 31-May | 1.98 | 2.13 | -0.78 – 4.74 | 7-Oct | 7-Apr |
| Sugar-containing beverages (mL/d) | 12.63 | 17.93 | **1.43 – 23.83*** | 20-Apr | 20-Oct | 14.80 | 19.13 | **8.04 – 21.57*** | 12-Jun | 11-Dec |
| Alcohol (g/d) | 0.68 | 7.77 | -0.45 – 1.82 | 14-Sep | 15-Mar | 0.54 | 4.33 | -0.27 – 1.35 | 2-Jun | 2-Dec |
| Salt (mg/d) | 120.89 | 2.26 | -8.21 – 249.99 | 24-Apr | 23-Oct | 111.36 | 1.93 | **33.74 – 188.97*** | 9-Jan | 10-Jul |

Seasonal variation adjusted for cosinor terms, age, sex, cohort, physical activity, smoking behaviour, body mass index, comorbidities, education, and kilocalories/day (except when used as outcome).

** Seasonal variation expresses the maximum difference between the average highest intake/score (peak) and average lowest intake/score (nadir)

* Seasonal variation is statistically significant

[1] (Seasonal variation/average intake or score)*100%

## Online Supplementary Material

**Supplemental Table 4. Stratified analyses: Seasonal variation of diet quality according to FFQ**

| Outcome | Seasonal variation* | 95%-confidence interval | Peak | Nadir |
|---|---|---|---|---|
| **FFQ 170 items, n= 8,572.observations** | | | | |
| Diet quality score (0-14) | 0.10 | -0.01 - 0.20 | 2-Jan | 3-Jul |
| **FFQ 389 items, n= 4,017 observations** | | | | |
| Diet quality score (0-14) | 0.13 | -0.02 - 0.29 | 17-Dec | 18-Jun |

FFQ = Food Frequency Questionnaire.

Seasonal variation adjusted for cosinor terms, age, sex, cohort, physical activity, smoking behaviour, body mass index, comorbidities, education, and kilocalories/day.

** Seasonal variation expresses the maximum difference between the average highest intake/score (peak) and average lowest intake/score (nadir)

## Online Supplementary Material

**Supplemental Table 5. Characteristics of the study population stratified by participants with a lower, intermediate, and higher diet quality score**

| | Diet score below 1SD of average* (<6.145) n=2,071 | | Diet score between -1 SD and + 1 SD of average* n=8,549 | | Diet score above 1SD of average* (>7.302) n=1,969 | |
|---|---|---|---|---|---|---|
| **Covariate** | **Median (IQR)** | | **Median (IQR)** | | **Median (IQR)** | |
| Age (years) | 65.9 (59.7 - 71.9) | | 66.8 (59.8 - 73.9) | | 63.4 (57.3 - 75.12) | |
| Physical activity (MET-hours per week) | 43.0 (21 - 70.5) | | 62.4 (30.3 - 95.1) | | 85.3 (47.4 – 128.0) | |
| BMI, kg/m$^2$ | 27.0 (24.7 - 29.6) | | 26.6 (24.4 - 29.3) | | 25.2 (23.2 - 27.6) | |
| Kilocalories/day | 1942 (1589 – 2312) | | 1946 (1612 – 2336) | | 2264 (1934 – 2721) | |
| | **N** | **%** | **N** | **%** | **N** | **%** |
| Sex | | | | | | |
| men | 1,767 | 85.3 | 3,414 | 39.9 | 125 | 6.4 |
| women | 304 | 14.7 | 5,135 | 60.1 | 1,844 | 93.6 |
| Education | | | | | | |
| primary | 276 | 13.4 | 1,227 | 14.5 | 192 | 9.8 |
| lower | 854 | 41.5 | 3,640 | 43.0 | 695 | 35.5 |
| intermediate | 748 | 36.4 | 2,363 | 27.9 | 515 | 26.4 |
| higher | 178 | 8.7 | 1,236 | 14.6 | 554 | 28.3 |
| Smoking status | | | | | | |
| never | 84 | 4.0 | 2,671 | 31.4 | 1,276 | 65.2 |
| ever | 626 | 30.3 | 4,594 | 54.0 | 659 | 98.7 |
| current | 1,359 | 65.7 | 1,246 | 14.6 | 21 | 1.1 |
| Comorbidities | | | | | | |
| no | 1,566 | 75.6 | 7,089 | 82.9 | 1,779 | 90.4 |
| yes | 505 | 24.4 | 1,460 | 17.1 | 190 | 9.6 |
| Socioeconomic status | | | | | | |
| lower | 1,438 | 69.4 | 6,213 | 72.7 | 1,286 | 65.3 |
| higher | 633 | 30.6 | 2,336 | 27.3 | 683 | 34.7 |
| Living status | | | | | | |
| alone | 389 | 18.8 | 2,285 | 26.7 | 687 | 34.9 |
| with others | 1,682 | 81.2 | 6,264 | 73.3 | 1,282 | 65.1 |

BMI = Body mass index. IQR = Interquartile range. MET = Metabolic Equivalent of Task. SD = Standard deviation.

*Predicted average of diet score after adjusted for covariates of Model 2.