# **Supplementary Methods**

Dietary data from one or two 24-hour diet recalls may not represent a person’s usual intake due to substantial within-person variability due to day-to-day variations in food intake. To correct for measurement errors, we applied the National Cancer Institute (NCI) method to estimate usual intake of nutrients from foods (1). As documented in prior literature, the NCI method is the preferred method for estimating usual intake distribution from 24-hour diet recalls (2). It also corrects biases caused by measurement errors in evaluating associations between usual intake and health outcomes using regression calibration (3). A 2-step approach was used to estimate usual intake. The first step models both the amount and probability of consuming a given food. (2) For foods that are consumed frequently (5% or less of the individuals reporting zero intake in a given day) such as refined grains, the amount-only model was used in the first step (MIXTRAN macro). For foods that are not consumed daily by most persons (i.e., more than 5% of the individuals reporting zero intake in a given day) including all food components except for refined grains, we used a two-part model that estimates both the amount and probability of consumption. The second step involves estimating usual intake with parameters estimated from the first step using mixed-effect linear regression on a transformed scale with a person-specific effect (INDIVINT macro).(1) The NCI method requires that some of the participants have multiple days of nutrient intake to estimate and separate the within and between-person variations.(4) In our study, 68% of the participants who provided a single valid diet recall also provided a second valid recall. For each food, the following covariates were specified in estimating usual intake: age group (20-34, 35-49, 50-64, 65+ years), sex, and race/ethnicity (non-Hispanic white, non-Hispanic black, Hispanic, and other). For evaluating the association between diet quality indices and mortality, we also included education, physical activity, cigarette smoking, alcohol consumption, total energy intake, body mass index, and baseline comorbidity conditions, and accounted for the NHANES survey weights.

# **Supplementary Table 1.** Examples of Foods Included in the Food Components for the Comprehensive Diet Quality Index (*c*DQI)

|  |  |
| --- | --- |
| **Food Groups** | **Examples of Foods** |
| **Plant-based Foods** |  |
|   Whole grains | Whole grain bread, breakfast cereal, cooked oatmeal, brown rice, oats, bran, wheat germ, quinoa, dark rye  |
|   Vegetables excluding white potatoes | Broccoli, collards, kale, lettuce, mustard greens, parsley, spinach, turnip greens, carrots, red chili peppers, red or orange bell peppers, pumpkin, squash sweet potatoes, tomatoes, artichoke, asparagus, avocado, string beans, Brussels sprouts, cabbage, corn, onions, cauliflower, cucumber, eggplant, mushrooms, radish |
|   Whole fruits | Blackberries, blueberries, cranberries, kiwifruit, raspberries, strawberries, cantaloupe, watermelon, grapefruit, oranges, apples, bananas, cherries grapes, mangoes, nectarines, peaches, pears, pineapple, plums |
|    Nuts/seeds/legumes | Peanuts, tree nuts, seeds, black beans, blackeye peas, brown beans, fava beans, kidney beans, lentils, lima beans, soybeans |
|  Vegetable oils | Vegetable oils except palm oil, palm kernel oil, and coconut oil |
|  Coffee/tea | Coffee, decaffeinated coffee, tea |
|   Fruit juices | Apple juice, orange juice, berry juice, other fruit juice |
|   Refined grains | White bread, refined grain muffins, bagels, rolls, breakfast cereals or biscuits, pancakes, waffles, pasta, and crackers, white rice  |
|   White potatoes | French fries, potato chips, boiled, baked, or smashed potatoes |
|  Sugar-sweetened beverages | Any non-alcoholic, carbonated or non-carbonated, beverage with added caloric sweetener (≥ 50 kcal per 8 oz.) including sodas, energy drinks, sports drinks, fruit drinks  |
|  Sweets and desserts | Cookies, candy bars, cake, doughnuts, brownies, sweet rolls, pile, candy bars, candy without chocolate, chocolate, jams or jellies |
| **Animal-based Foods** |  |
|  Fish/seafood | Anchovy, herring, mackerel, salmon, clams, cod, crabs, flounder, mussels, octopus, oyster, scallop, shrimp, snapper, tuna  |
|  Dairy | All types of fluid milk, yogurt, all types of cheeses such as brie, cheddar, cottage cheese, feta, mozzarella, and Swiss |
|  Poultry | Chicken, duck, game birds, goose, turkey. |
|  Processed meats | Frankfurters, sausages, luncheon meats, cured meat made from beef, chicken, pork, and turkey |
|  Red meats | Beef, goat, lamb, pork (includes fresh or uncured ham), veal, game meat |
|  Egg | Chicken eggs and other birds’ eggs and their components such as egg yolk or white |

# **Supplementary Table 2.** Component Score of the Comprehensive Diet Quality Index (*c*DQI) in Association with All-Cause Mortality Among US Adults, NHANES 1999-2014

|  |  |  |
| --- | --- | --- |
|  | **Person years** | **All-Cause Mortality** |
| **N** | **HR (95% CI) 1** |
| Whole grains |  |  |  |
|  Q1 (M:<0.51; F:<0.65)  | 77652 | 448 | Ref |
|  Q2 (M:0.51-0.85; F:0.65-1.12) | 79822 | 1237 | 0.96 (0.80, 1.16) |
|  Q3 M: 0.86-1.55; F:1.13-1.89) | 72170 | 1315 | 0.91 (0.76, 1.08) |
|  Q4 M: ≥1.56; F: ≥1.90) | 64670 | 1669 | 0.99 (0.82, 1.19) |
|  |  |  | *P*-trend =0.89 |
| Vegetables excluding white potatoes |  |  |  |
|  Q1 (M<1.54; F: <1.94) | 73691 | 782 | Ref |
|  Q2 (M:1.54-1.94; F:1.94-2.47) | 74671 | 1010 | 0.88 (0.74, 1.04) |
|  Q3 (M:1.95-2.44; F:2.48-3.0) | 74956 | 1337 | 0.85 (0.73, 0.99) |
|  Q4 (M: ≥2.45; F: ≥3.1) | 70996 | 1540 | 0.75 (0.64, 0.88) |
|  |  |  | *P*-trend <0.001 |
| Whole fruits |  |  |  |
|  Q1 (M:<1.40; F: <2.25) | 74330 | 362 | Ref |
|  Q2 (M:1.40-2.70; F:2.25-4.24) | 78288 | 1188 | 0.81 (0.65, 1.02) |
|  Q3 (M:2.71-4.9; F:4.25-4.99) | 45092 | 927 | 0.79 (0.62, 1.01) |
|  Q4 (M: ≥5.000; F: ≥5.00) | 96604 | 2192 | 0.72 (0.57, 0.91) |
|  |  |  | *P*-trend=0.002 |
| Nuts/seeds/legumes |  |  |  |
|  Q1 (M: <1.90; F: <1.95)  | 70670 | 595 | Ref |
|  Q2 (M:1.9-2.64; F:1.95-2.74) | 78631 | 1402 | 0.97 (0.85, 1.09) |
|  Q3 (M:2.65-4.18; F:2.75-4.30) | 74629 | 1468 | 0.85 (0.76, 0.96) |
|  Q4 (M: ≥4.19; F: ≥4.31) | 70384 | 1204 | 0.77 (0.67, 0.89) |
|  |  |  | P-trend<0.001 |
| Vegetable Oils |  |  |  |
|  Q1 (M: <1.00; F: <2.00)  | 83301 | 1272 | Ref |
|  Q2 (M:1.00-1.99; F:2.00-3.99) | 78548 | 1226 | 0.93 (0.81, 1.06) |
|  Q3 (M:2.00-3.99; F:4.00-4.99) | 73708 | 1244 | 0.89 (0.79, 0.99) |
|  Q4 (M: ≥4.00; F: ≥5.00) | 58756 | 927 | 0.82 (0.71, 0.94) |
|  |  |  | *P*-trend=0.006 |
| Coffee/tea |  |  |  |
|  Q1 (M: <1.00; F: <2.00)  | 76338 | 593 | Ref |
|  Q2 (M:1.00-1.99; F:2.00-3.99) | 72611 | 1149 | 0.90 (0.76, 1.07) |
|  Q3 (M:2.00-3.99; F:4.00-4.99) | 74505 | 1351 | 0.75 (0.65, 0.88) |
|  Q4 (M: ≥4.00; F: ≥5.00) | 70860 | 1576 | 0.81 (0.70, 0.94) |
|  |  |  | *P*-trend=0.002 |
| Fruit juices |  |  |  |
|  Q1 (M: <2.48; F:<2.05)  | 72150 | 1408 | Ref |
|  Q2 (M:2.48-3.84; F:2.05-3.66) | 72453 | 1360 | 0.96 (0.86, 1.07) |
|  Q3 (M:3.85-4.11; F:3.67-3.96) | 73385 | 1156 | 0.90 (0.80, 1.01) |
|  Q4 (M: ≥4.12; F: ≥3.97) | 76325 | 745 | 0.90 (0.79, 1.03) |
|  |  |  | *P*-trend=0.06 |
| Refined grains |  |  |  |
|  Q1 (M:<2.33; F:<2.21) | 75590 | 1032 | Ref |
|  Q2 (M:2.33-3.03; F:2.21-2.94) | 76450 | 1273 | 1.11 (0.99, 1.26) |
|  Q3 (M:3.04-3.73; F:2.95-3.65) | 74139 | 1310 | 1.04 (0.90, 1.20) |
|  Q4 (M: ≥3.74; F: ≥3.66) | 68135 | 1054 | 1.02 (0.87, 1.19) |
|  |  |  | *P*-trend=0.72 |
| White potatoes |  |  |  |
|  Q1 (M:<2.09; F:<2.11) | 70042 | 1659 | Ref |
|  Q2 (M:2.09-2.65; F:2.11-2.67) | 74639 | 1317 | 0.98 (0.87, 1.11) |
|  Q3 (M:2.66-3.0; F:2.68-3.12) | 75659 | 1088 | 1.00 (0.89, 1.12) |
|  Q4 (M: ≥3.1; F: ≥3.13) | 73973 | 605 | 0.93 (0.78, 1.11) |
|  |  |  | *P*-trend=0.52 |
| Sugar-sweetened beverages |  |  |  |
|  Q1 (M: 0; F:0) | 67953 | 633 | Ref |
|  Q2 (M:0.01-2.00; F:0.01-2.45) | 93769 | 1070 | 0.96 (0.84, 1.09) |
|  Q3 (M:2.10-3.15; F:2.46-3.43) | 68848 | 938 | 0.96 (0.85, 1.09) |
|  Q4 (M: ≥3.16; F: ≥3.44) | 63744 | 2028 | 0.90 (0.79, 1.03) |
|  |  |  | *P*-trend=0.12 |
| Sweets and desserts |  |  |  |
|  Q1 (M:<2.00; F:<1) | 68763 | 1655 | Ref |
|  Q2 (M:2.00-2.99; F:1.00-2.99) | 78111 | 1201 | 0.96 (0.86, 1.06) |
|  Q3 (M:3.00-4.99; F:3.00-3.99) | 77797 | 1198 | 1.05 (0.95, 1.16) |
|  Q4 (M: ≥5.00; F: ≥4.00) | 69643 | 615 |  0.96 (0.84, 1.09) |
|  |  |  | *P*-trend=0.96 |
| Fish/seafood |  |  |  |
|  Q1 (M:<2.03; F:<2.26) | 78226 | 454 | Ref |
|  Q2 (M:2.03-2.63; F:2.26-2.88) | 76140 | 944 | 0.81 (0.67, 0.98) |
|  Q3 (M:2.64-3.5; F:2.89-3.91) | 72836 | 1784 | 0.89 (0.73, 1.10) |
|  Q4 (M: ≥3.6; F: ≥3.92) | 67112 | 1487 | 0.84 (0.67, 1.04) |
|  |  |  | *P*-trend=0.55 |
| Dairy |  |  |  |
|  Q1 (M:<1.84; F:<2.15) | 75300 | 1109 | Ref |
|  Q2 (M:1.84-2.44; F:2.15-2.82) | 74097 | 1080 | 1.05 (0.92, 1.18) |
|  Q3 (M:2.45-3.10; F:2.83-3.55) | 74222 | 1194 | 0.99 (0.88, 1.12) |
|  Q4 (M: ≥3.11; F: ≥3.56) | 70695 | 1286 |  1.05 (0.92, 1.18) |
|  |  |  | *P*-trend=0.69 |
| Poultry |  |  |  |
|  Q1 (M:<1.00; F:<2.00)  | 70831 | 1375 | Ref |
|  Q2 (M:1.00-2.99; F:2.00-2.99) | 78429 | 1464 | 1.12 (0.97, 1.31) |
|  Q3 (M:3.00-3.99; F:3.00-4.99) | 77475 | 1033 | 0.97 (0.83, 1.13) |
|  Q4 (M: ≥4.00; F: ≥5.00) | 67578 | 797 | 1.05 (0.88, 1.25) |
|  |  |  | *P*-trend=0.88 |
| Processed meats |  |  |  |
|  Q1 (M:<2.15; F:<2.65)  | 67306 | 1210 | Ref |
|  Q2 (M:2.15-2.83; F:2.65-3.2) | 72243 | 1171 | 1.07 (0.93, 1.23) |
|  Q3 (M:2.84-3.33; F:3.3-3.67) | 76878 | 1349 | 1.17 (1.02, 1.34) |
|  Q4 (M: ≥3.34; F: ≥3.68) | 77887 | 939 | 0.99 (0.86, 1.14) |
|  |  |  | *P*-trend=0.37 |
| Red meats |  |  |  |
|  Q1 (M:<1.7; F:<2.23) | 74759 | 1401 | Ref |
|  Q2 (M:1.7-2.21; F:2.23-2.72) | 76415 | 1247 | 0.95 (0.84, 1.09) |
|  Q3 (M:2.22-2.70; F:2.73-3.14) | 75170 | 1115 | 0.96 (0.83, 1.11) |
|  Q4 (M: ≥2.71; F: ≥3.15) | 67969 | 906 | 0.95 (0.82, 1.10) |
|  |  |  | *P*-trend=0.55 |
| Egg |  |  |  |
|  Q1 (M:<2.00; F:<1.00) | 68662 | 1663 | Ref |
|  Q2 (M:2.00-2.99; F:1.00-2.99) | 72020 | 1351 | 1.06 (0.94, 1.21) |
|  Q3 (M:3.00-4.99; F:3.00-3.99) | 75482 | 1119 | 1.08 (0.96, 1.21) |
|  Q4 (M: ≥5.00, F: ≥4.00) | 78150 | 536 | 1.01 (0.85, 1.21) |
|  |  |  | *P*-trend=0.58 |

**Abbreviations:** *c*DQI, comprehensive Diet Quality Index; US, United States; NHANES, National Health and Nutrition Examination Survey; CI, confident intervals; HR, hazard ratio.

1. Cox proportional hazard models were used to assess the associations between each component score and mortality. HRs and 95% CIs were adjusted for age, sex, race/ethnicity, education, total energy intake, physical activity, cigarette smoking, alcohol consumption, BMI, and comorbidities at baseline and accounted for NHANES survey weights.

# **Supplementary Table 3**. Plant- and Animal-Based Diet Quality and All-Cause, Heart Disease, Cancer and Other Mortality Among US Adults by cycles, NHANES 1999-2014

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Person Years** | **All-Cause Mortality** |  | **Heart Disease Mortality** | **Cancer Mortality** |
| **N** | **HR (95% CI) 1** |  | **N** | **HR (95% CI) 1** | **N** | **HR (95% CI) 1** |
| **NHANSE Cycles 1999-20062** |
| **Comprehensive Diet Quality Index (*c*DQI)3** |
|  Q1  | 54882 | 678 | Ref |  | 112 | Ref | 154 | Ref |
|  Q2 | 53242 | 913 | 0.96 (0.83, 1.10) |  | 151 | 0.97 (0.66, 1.42) | 201 | 1.06 (0.85, 1.33) |
|  Q3 | 47869 | 1008 | 0.85 (0.73, 0.98) |  | 178 | 0.95 (0.64, 1.41) | 203 | 0.90 (0.64, 1.27) |
|  Q4 | 36691 | 858 | 0.79 (0.66, 0.95) |  | 172 | 1.07 (0.70, 1.65) | 177 | 0.95 (0.67, 1.36) |
|  |  |  | *P-*trend=0.004 |  |  | *P*-trend=0.71 |  | *P*-trend=0.57 |
|  |  |  |  |  |  |  |  |  |
| **Plant-Based Diet Quality Index (*p*DQI)3** |
|  Q1 | 56998 | 525 | Ref |  | 81 | Ref | 124 | Ref |
|  Q2 | 52218 | 799 | 0.78 (0.67, 0.91) |  | 126 | 0.83 (0.57, 1.22) | 181 | 0.92 (0.64, 1.34) |
|  Q3 | 46961 | 1105 | 0.83 (0.71, 0.97) |  | 208 | 1.10 (0.75, 1.60) | 222 | 0.92 (0.64, 1.31) |
|  Q4 |  36508 | 1028 | 0.69 (0.60, 0.81) |  | 198 | 1.02 (0.71, 1.47) | 208 | 0.80 (0.54, 1.17) |
|  |  |  | *P*-trend<0.001 |  |  | *P*-trend=0.48 |  | *P*-trend=0.22 |
|  |  |  |  |  |  |  |  |  |
| **Animal-Based Diet Quality Index (*a*DQI)3** |
|  Q1 | 46182 | 1104 | Ref |  | 213 | Ref | 218 | Ref |
|  Q2 | 50228 | 1012 | 0.99 (0.89, 1.11) |  | 175 | 0.95 (0.66, 1.37) | 238 | 1.04 (0.80, 1.36) |
|  Q3 | 49990 | 800 | 1.01 (0.87, 1.19) |  | 138 | 1.00 (0.74, 1.35) | 172 | 0.99 (0.69, 1.41) |
|  Q4 | 46285 | 541 | 0.94 (0.80, 1.10) |  | 87 | 0.79 (0.51, 1.23) | 107 | 0.99 (0.71, 1.38) |
|  |  |  | *P-*trend=0.67 |  |  | *P-*trend=0.40 |  | *P-*trend=0.90 |
|  |  |  |  |  |  |  |  |  |
| **NHANSE Cycles 2007-20142** |
| **Comprehensive Diet Quality Index (*c*DQI)3** |
|  Q1 | 24076 | 228 | Ref |  | 22 | Ref | 52 | Ref |
|  Q2 | 24095 | 287 | 0.80 (0.67, 0.97) |  | 47 | 1.58 (0.56, 4.45) | 72 | 0.93 (0.66, 1.32) |
|  Q3 |  25074 | 343 | 0.83 (0.65, 1.06) |  | 59 | 1.57 (0.65, 3.75) | 86 | 1.03 (0.61, 1.72) |
|  Q4 | 28384 | 354 | 0.65 (0.52, 0.83) |  | 57 | 1.13 (0.49, 2.64) | 76 | 0.77 (0.49, 1.22) |
|  |   |  | *P-*trend=0.002 |  |  | *P-*trend=0.89 |  | *P-*trend=0.28 |
|  |  |  |  |  |  |  |  |  |
| **Plant-Based Diet Quality Index (*p*DQI)3** |
|  Q1 | 23598 | 165 | Ref |  | 13 | Ref | 31 | Ref |
|  Q2 | 24490 | 250 | 0.77 (0.60, 0.99) |  | 39 | 0.97 (0.34, 2.78) | 64 | 1.03 (0.60, 1.79) |
|  Q3 | 25254 | 397 | 0.83 (0.66, 1.05) |  | 71 | 1.47 (0.47, 4.59) | 103 | 1.21 (0.73, 2.02) |
|  Q4 | 28287 | 400 | 0.58 (0.45, 0.73) |  | 62 | 0.89 (0.32, 2.45) | 88 | 0.88 (0.53, 1.47) |
|  |   |  | *P*-trend<0.001 |  |  | *P*-trend=0.63 |  | *P*-trend=0.49 |
|  |  |  |  |  |  |  |  |  |
| **Animal-Based Diet Quality Index (*a*DQI)3** |
|  Q1 | 25887 | 409 | Ref |  | 62 | Ref | 101 | Ref |
|  Q2 | 24669 | 309 | 1.06 (0.87, 1.30) |  | 44 | 1.32 (0.61, 2.86) | 72 | 0.97 (0.67, 1.42) |
|  Q3 | 25060 | 285 | 1.18 (1.00, 1.38) |  | 44 | 1.16 (0.62, 2.20) | 62 | 1.14 (0.77, 1.69) |
|  Q4 | 26014 | 209 | 1.18 (0.94, 1.47) |  | 35 | 1.46 (0.82, 2.59) | 51 | 1.07 (0.68, 1.70) |
|  |   |  | *P*-trend=0.09 |  |  | *P*-trend=0.29 |  | *P*-trend=0.61 |

**Abbreviations:** US, United States; NHANES, National Health and Nutrition Examination Survey; HR, hazard ratio; CI, confidence interval; *c*DQI, Comprehensive Diet Quality Index**;** *p*DQI, Plant-Based Diet Quality Index.; *a*DQI, Animal-Based Diet Quality Index**.**

1. Cox proportional hazard models were used to assess the associations between diet quality indices and mortality. HRs and 95% CIs were adjusted for age, sex, race/ethnicity, education, total energy intake, physical activity, cigarette smoking, alcohol consumption, and BMI. We also accounted for NHANES survey weights. *p*DQI and *a*DQI were simultaneously adjusted in the same model.

2. There were 16487 participants in the 1999-2006 NHANES cycles and 20338 participants in the 2007-2014 NHANES cycles being included in this analysis.

3. Quartiles were defined based on sex-specific cut-offs. For *c*DQI, Q1 (male:<37.0; female:<40.8); Q2 (male: 37.0-40.7; female: 40.8-44.9); Q3 (male:40.8-45.0; female: 45.0-49.4); and Q4 (male: ≥45.1; female: ≥49.5). For *p*DQI, Q1 (male:<22.4; female:<24.3); Q2 (male: 22.4-25.7; female: 24.3-28.0); Q3 (male: 25.8-29.6; female: 28.1-32.1); and Q4 (male: ≥29.7; female: ≥32.3). For *a*DQI, Q1 (male:<13.1; female:<15.0); Q2 (male: 13.1-14.9; female: 15.0-16.9); Q3 (male: 15.0-17.0; female: 17.0-18.8); and Q4 (male: ≥17.1; female: ≥18.9).

# **Supplementary References**

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