**SUPPLEMENTARY MATERIAL**

Supplemental Table 1: Biserial coefficient, IRT parameters estimates and the standard errors of all items from Nutritional Knowledge Test (N = 3,215).

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| --- | --- | --- | --- | --- | --- |
| Items | Correct answer | Biserial | aia  (SE) | bib  (SE) | cic  (SE) |
| Marcel has been playing with a ball all afternoon. During this time Kevin has been sitting at home watching television. Which of the following statements is most applicable? | Marcel burns more energy than Kevin | 0•44 | 1•16  (0•08) | -2•21  (0•13) | 0•02  (0•03) |
| Which row lists three dishes that have all been prepared using very little fat? | Boiled egg, boiled potatoes, steamed fish | 0•40 | 0•94  (0•06) | -1•11  (0•09) | 0•01  (0•02) |
| Which substance is good for your teeth? | Fluoride | 0•39 | 0•90  (0•06) | -0•68  (0•11) | 0•02  (0•02) |
| Which row lists three types of edible fish? | Codfish, turbot, carp | 0•31 | 0•69  (0•05) | -0•34  (0•14) | 0•02  (0•03) |
| Which of the following fast-food menus contains the most nutrients? | Hamburger with salad and orange juice | 0•33 | 0•70  (0•05) | -0•28  (0•12) | 0•01  (0•02) |
| Dieticians use the American term ‘junk food’ to describe certain foods. What do they mean by this? | Foods that contain a lot of energy but are of very little nutritional value | 0•39 | 0•92  (0•06) | -0•19  (0•08) | 0•01  (0•02) |
| What is another name for the coating that develops on teeth when one eats a lot of sweets? | Plaque | 0•32 | 0•67  (0•05) | -0•17  (0•12) | 0•01  (0•02) |
| Bread, cake, pasta, potatoes, and rice contain mainly… | Carbohydrates | 0•40 | 1•13  (0•13) | -0•14  (0•23) | 0•11  (0•06) |
| What effect does the fibre contained in our food have on the human body? | It stimulates the process of digestion | 0•47 | 1•20  (0•08) | 0•02  (0•07) | 0•01  (0•02) |
| What can consuming large amounts of salt result in or aggravate? | High blood pressure | 0•29 | 0•58  (0•05) | 0•13  (0•13) | 0•01  (0•02) |
| The ingredients list found items may contain a number of different terms for sugar. Which row list three terms for special types of sugar? | Dextrose, fructose, maltose | 0•54 | 1•55  (0•09) | 0•20  (0•05) | 0•01  (0•01) |
| A breakfast merely consisting of bread, jam, and butter does not contain enough… | Protein | 0•41 | 0•91  (0•07) | 0•30  (0•12) | 0•02  (0•03) |
| Which row lists three foods that contain a lot of vitamin C? | Peppers, cabbage, citrus fruit | 0•41 | 1•00  (0•10) | 0•45  (0•15) | 0•03  (0•04) |
| Which of the following statements about sugar is correct? | Sugar only provides energy | 0•29 | 0•55  (0•05) | 0•55  (0•18) | 0•02  (0•02) |
| What is the other commonly used term for energy? | Joule | 0•36 | 1•00  (0•11) | 1•03  (0•13) | 0•03  (0•03) |

Supplemental Table 1: Biserial coefficient, IRT parameters estimates and the standard errors of all items from Nutritional Knowledge Test (N = 3,215) (continuation).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Items | Correct answer | Biserial | aia  (SE) | bib  (SE) | cic  (SE) |
| Which one of the following types of mineral water would be the healthiest? | Mineral water with a high Mg content | 0•32 | 0•62  (0•06) | 1•23  (0•15) | 0•01  (0•02) |
| Which row lists three terms for energy-free sweeteners? | Aspartame, saccharin, cyclamate | 0•46 | 1•29  (0•10) | 1•46  (0•08) | 0•01  (0•01) |
| How much salt should one consume per day in addition to that contained in the foods eaten? | None at all | 0•30 | 0•62  (0•06) | 1•68  (0•17) | 0•01  (0•02) |
| How many cubes (teaspoons) of sugar are there in a can (0-33l) of coke or lemonade? | Approximately twelve cubes (seven teaspoons) | 0•27 | 0•51  (0•07) | 2•04  (0•28) | 0•02  (0•03) |
| How long must one swim in order to burn the amount of energy contained in a single chocolate? | Approximately 10 min | 0•23 | 0•40  (0•06) | 2•13  (0•42) | 0•03  (0•04) |
| A small bag of roasted peanuts (125g) contains as much energy… | As a whole lunch meal | 0•25 | 0•45  (0•06) | 2•40  (0•32) | 0•02  (0•02) |
| Raw minced meat should be stored in the refrigerator for a maximum of…? | Half a day | 0•20 | 0•73  (0•23) | 3•78  (0•51) | 0•08  (0•02) |
| How many cubes (teaspoons) of sugar are there in a bottle of ketchup (250ml)? | Approximately twenty-three cubes (fourteen teaspoons) | 0•25 | 0•54  (0•12) | 4•15  (0•53) | 0•02  (0•02) |

SE, Standard Error. a Discrimination parameter. b Difficulty parameter. c Guessing parameter.

Supplemental Table 2: Mixed model analyses between food groups intake (g/d) and IRT scores of all items from the Nutritional Knowledge Test among European adolescents adjusted by age, gender, maternal education, FAS index, and energy intake (n = 1,654).

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| --- | --- | --- | --- |
| Food groups | βa | 95% CIb | *P* value |
| Vegetables | -36•98 | -82•48, 8•52 | 0•11 |
| Fruits | 101•62 | 23•09, 180•16 | 0•01\* |
| Fruits and vegetables | 71•05 | -21•40, 163•50 | 0•13 |
| Sweets | -75•58 | -313•36, 162•20 | 0•53 |
| Cereals | 109•10 | 47•00, 171•19 | 0•001\* |
| Nuts and seeds | -4•52 | -11•60, 2•57 | 0•22 |
| Olives and avocado | -6•11 | -11•44, -0•78 | 0•02\* |
| Vegetable oils | -2•75 | -9•56, 4•06 | 0•43 |
| Alcohol | -158•34 | -234•17, -82•51 | <0•001\* |
| Dairy products | 389•46 | 222•73, 556•19 | <0•001\* |
| Pulses | 28•42 | 6•25, 50•58 | 0•01\* |
| Water | 217•50 | -196•81, 631•81 | 0•30 |
| Fish | 37•83 | 19•48, 56•19 | <0•001\* |
| Meats and eggs | 150•26 | 96•55, 203•97 | <0•001\* |
| Savoury snacks | -14•54 | -27•02, -2•05 | 0•02\* |

a Fixed effects estimates. b 95% confidence interval. \* Significant *P* values.

Centre was used as the random intercept.

Supplemental Table 3: Mixed model analyses between concentration of biomarkers and IRT scores of all items from the Nutritional Knowledge Test among European adolescents adjusted by age, gender, maternal education, FAS index, BMI, and energy intake (n = 570).

|  |  |  |  |
| --- | --- | --- | --- |
| Concentration biomarkers | βa | 95% CIb | *P* value |
| Vitamin C (mg/L) | 10•77 | 5•58, 15•96 | <0•001\* |
| Beta carotene (ng/mL) | 455•34 | 161•16, 749•51 | <0•01\* |
| EPA + DHA (%) | 5•09 | 2•90, 7•29 | <0•001\* |
| EPA + DHA (µmol/L) | 156•53 | 72•58, 240•48 | <0•001\* |
| Holo-transcobalamine (pmol/L) | 63•52 | 9•16, 117•88 | 0•02\* |
| Cobalamin (pmol/L) | 556•42 | 354•62, 758•22 | <0•001\* |
| Plasmafolate (nmol/L) | 41•91 | 25•19, 58•63 | <0•001\* |
| Erythrocyte folate (nmol/L) | 1219•25 | 618•96, 1819•54 | <0•001\* |
| *Trans* fatty acids (µmol/L) | 1•22 | 0•02, 2•42 | 0•05 |

a Fixed effects estimates. b 95% confidence interval. \* Significant *P* values.

Centre was used as the random intercept.

Supplemental Fig. 1: Scree plot of the Nutritional Knowledge Test from the factor analysis with estimation of the principal component analysis.

