**UPF CONSUMPTION AND HEALTH – MULTIVERSE TIME-SERIES-CROSS-SECTIONAL ANALYSIS - METHODS SUMMARY**

1. **SAMPLE, VARIABLES, AND DATA SOURCES**

**Sample:**

* Country-level data was collected for 78 countries from all continents
* The critical point in data collection was the exposure UPF; all countries for which comprehensive data on UPF was available were selected
* Sample covers countries with a combined 6 Billion inhabitants and also the countries with the highest GDP – focus on high to low-to-middle income countries (HIC / LMIC)

**Variable definition and data sources:**

* Differences in BMI levels and trends in relation to sex; and between adults and children and adolescents (CA)1; outcome variables therefore differentiate by sex if possible, and BMI additionally by adults / CA

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| --- | --- | --- |
| *Variables* | *Definition* | *Data Source* |
| *Outcomes* | | |
| Mean body-mass-index of CA & Adults | Age-standardized mean BMI, by sex | NCD-RisC1 |
| Prevalence of overweight in CA, Adults | Age-standardized population prevalence of overweight (more than 1 SD to  2 SD above the median BMI), by sex | NCD-RisC1 |
| Prevalence of obesity in CA, Adults | Age-standardized population prevalence of overweight (more than 2 SD above the median BMI), by sex | NCD-RisC1 |
|  | | |
| *Dietary exposures (all 100g/capita/day)* | | |
| Unprocessed or minimally processed foods (NOVA 1) | Combined sales of the following foods: Fruits, vegetables, starchy roots, pulses, nuts, rice, pasta, and noodles, fish and seafood, eggs | Euromonitor Global Passport3 |
| Processed culinary ingredients (NOVA 2) | Combined sales of the following foods: Oils and fats, butter and margarine, sugars and sweeteners. | Euromonitor Global Passport3 |
| Processed foods (NOVA 3) | Combined sales of the following foods: Frozen yoghurt, processed meat and seafood, yoghurt products, sour milk products, processed / canned fruits and vegetables, cheese, other diary. | Euromonitor Global Passport3 |
| Ultra-processed foods (NOVA 4) | Combined sales of the following foods: Breakfast cereals, sweet and savoury snacks (Chips/crisps, corn chips, pretzels, sweet snacks, salted nuts), confectionery (chocolates, sweets, pastilles, jellies), sugar confectionary, ice creams, frozen desserts, biscuit and snack bars, baked goods (packaged), frozen products (pizza, ready meals, others), soups, ready meals, sauces, dressings and condiments, spreads, carbonates (carbonates drinks), sweetened juices, sports and energy drinks | Euromonitor Global Passport3 |
| Ultra-processed foods (w/o SSB’s) | Combined sales of the following foods: Breakfast cereals, sweet and savoury snacks (Chips/crisps, corn chips, pretzels, sweet snacks, salted nuts), confectionery (chocolates, sweets, pastilles, jellies), sugar confectionary, ice creams, frozen desserts, biscuit and snack bars, baked goods (packaged), frozen products (pizza, ready meals, others), soups, ready meals, sauces, dressings and condiments, spreads | Euromonitor Global Passport3 |
| Sugar-sweetened beverages | Combined sales of the following foods: Carbonates (carbonates drinks), sweetened juices, sports and energy drinks (excludes artificially sweetened drinks) | Euromonitor Global Passport3 |
| *Covariates* | | |
| Urban population (% of total) | Urban population refers to people living in urban areas as defined by national statistical offices. It is expressed as the % of the total population.4 | World Bank4 |
| Dietary energy consumption (kcal per person) | Dietary energy consumption per person refers to the amount of food, expressed in kilocalories (kcal) per day, available for each individual in the total population during the reference period. | FAO Statistical Division5 |
| Alcohol consumption (litres per capita) | Per capita amount of alcohol consumed | Global Burden of Disease Study / IHME6 |
| Cigarette consumption (litres per capita) | Per capita amount cigarettes consumed | Global Burden of Disease Study / IHME6 |
| Income classification | High-income countries with GNI per capita of >= $12,476, Low-to middle income with GNI per capita > $1025 and < $12,476 | World Bank4 |
|  |  |  |

1. **DATA PROCESSING**

**Outcome Lags:**

* Mean BMI, overweight, and obesity in the form of four different year lags – 0, 1, 2, and 3 year-lags
* Diabetes prevalence in the form four different year lags – 1, 2, 4, 6 year lags

**Dietary exposure:**

* Original NOVA-classification includes SSB’s in UPF group; differential effects plausible
* 2nd NOVA UPF group that excludes SSB’s, SSB’s extra category

**Transformation of outcomes:**

* Comparison of data transformation Stata’s *gladder* does not yield clearly superior transformations except for obesity prevalence
* Application of two transformations for mean BMI (cubic and identity), overweight (1/sqrt and log), diabetes prevalence (sqrt and log)

1. **ANALYTICAL METHODS**

**Model specifications:**

* M1: Fixed-effects regression with panel-corrected standard errors (Ludwig / Bruederle)7
* M2: Within-between regression with autocorrelation specification (Bell and Jones)8
* M3: Generalised Estimating Equation (GEE) regression as a form of GLM (Hardin)9

**Multiverse analysis:**

* For each sex, the following combinations will then be performed:
  + 7 outcomes
  + 4 lags x 2 NOVA x 2 transformations x 3 model specifications = 48 combinations
  + = 336 combinations in total for each male and female, potentially both sexes combined?

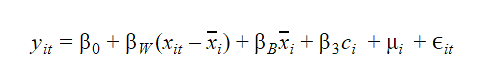
MODEL SPACE DIMENSIONS

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Model Space Dimensions** | | | | | | | |  |
| **1** | # of outcomes | BMI | | | OW | | | OB | **3** |
| **2** | outcome transform. | 1 | | | | | 2 | | **2** |
| **3** | # of lags | 1 | | 2 | | | 3 | | **3** |
| **4** | UPF / SSB DEF | Combined | | | | | Separate | | **2** |
| **5** | # Models | 1 | | 2 | | | 3 | | **3** |
| **6** | # Stat. Models | FE | BE | | | RE | | CRE | **4** |
| **∑** | **Total number of Estimates** | | | | | | | | **432** |

Number of models to be estimated for each main or interaction effect of interest.

I – By sex 🡪 UNPF / PF /

By sex, Income



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