Young Bites, Big Questions: Unpacking Diet and Disparity among US Children

Introduction and Research Questions

Child dietary habits are emerging as a critical aspect of public health discourse. This project examines dietary consumption frequency in early and middle childhood (ages 2-12), where nutrition may play a pivotal role in shaping health outcomes later in life.[1, 2] It asks:

1. How common is unhealthy consumption among US children?
2. How are socio-economic factors associated with unhealthy consumption patterns?

Data Management

This project analysed the National Health and Nutrition Examination Survey (NHANES),[3] featuring dietary and socio-economic measures. Data management included:

Bash:

- Joining raw datasets
- Age-filtering data
- Recoding missing values

R:

- Data integrity checks
- Derived variable creation*
- Removing extraneous columns for efficiency
- Creating visualisations and `shiny` dashboard

*Dietary questions (e.g. "In the last year, how often have you eaten _apples_?") contained responses from 1 ("never") to 11 ("2+ times p/day"). These were grouped into fruit, vegetable or sugar-related and averaged to form *consumption indices* for each respondent. Meanwhile, binary variables indicate whether no fruit/vegetable was consumed more than each frequency (e.g. `fruit_1` signifies *never* consuming fruit) – or, for sugar, *at least one* item at that frequency.

Visualisation Approach

First visualisation (research question one)

- Density plots: captures index distributions, using colour and shape for pattern perception.
- Overlapping plots: utilises 'boundary perception' principles for comparative analysis, highlighting differences in shapes/areas.[4]
- Transparency effect: prevents information loss by occlusion.

Second visualisation (research question one)

- Bar chart: shows prevalence of 'extreme' consumption.
- Faceting by food: shifts comparative focus from *cross-* to *within*-food groups.
- Data literacy considerations:

Shiny dashboard (research question two)

Available at: https://sammakesapps.shinyapps.io/YoungBites/

Designed for policymakers, this dashboard allows users to undertake variable comparison of the data to identify vulnerable groups. Additional features focussed on ease-of-use for non-technical audiences, and include:

- Use of 'natural language' for selection options.
- A data table to offer a more precise quantitative assessment.
- A 'variable guide' to assist interpretability.
- A colour-blindness-friendly mode to enhance accessibility, aligning with principles for inclusive visual design.[5]
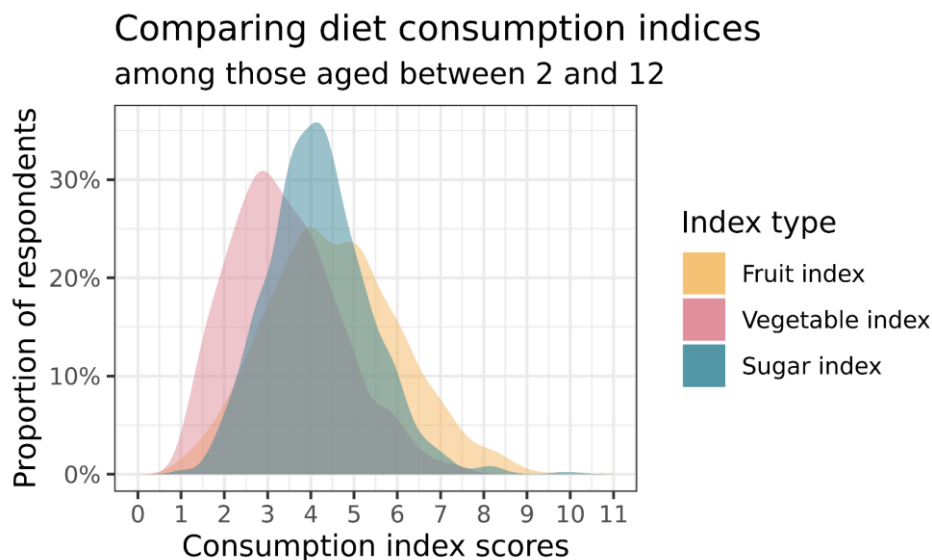
Results

Fig.1: distribution of fruit, vegetable and sugar indices.

For sugar consumption, *Fig.1* reveals a mode (i.e. the most commonly occurring index score) of ~4, corresponding to a frequency of "once per month". Notably, the distribution's right tail indicates a small segment consuming sugar far more frequently.

The vegetable index sits most commonly at ~3, corresponding to just 7-11 servings yearly. The fruit index, however, shows much greater spread, suggesting a greater mix of high and low consumption.

Fig.2 outlines the 'extremes' of dietary consumption frequency. Remarkably, around 1 in 50 (1.9%) children consumed no fruit more than 1-6 times p/year – while a concerning 1 in 200 (0.5%) abstained from fruits and/or vegetables entirely. While this data reflects consumption *frequency*, not *quantity* – and so cannot directly indicate malnourishment – it does imply significant deviations from official guidelines, recommending 1-3.5 cups of fruit/vegetables *daily* for children.[6]

Meanwhile, a quarter (25%) consumed *any* high-sugar item 5-6 times weekly, with 1 in 20 (5.1%) consuming any item multiple times daily – a concerningly high figure.
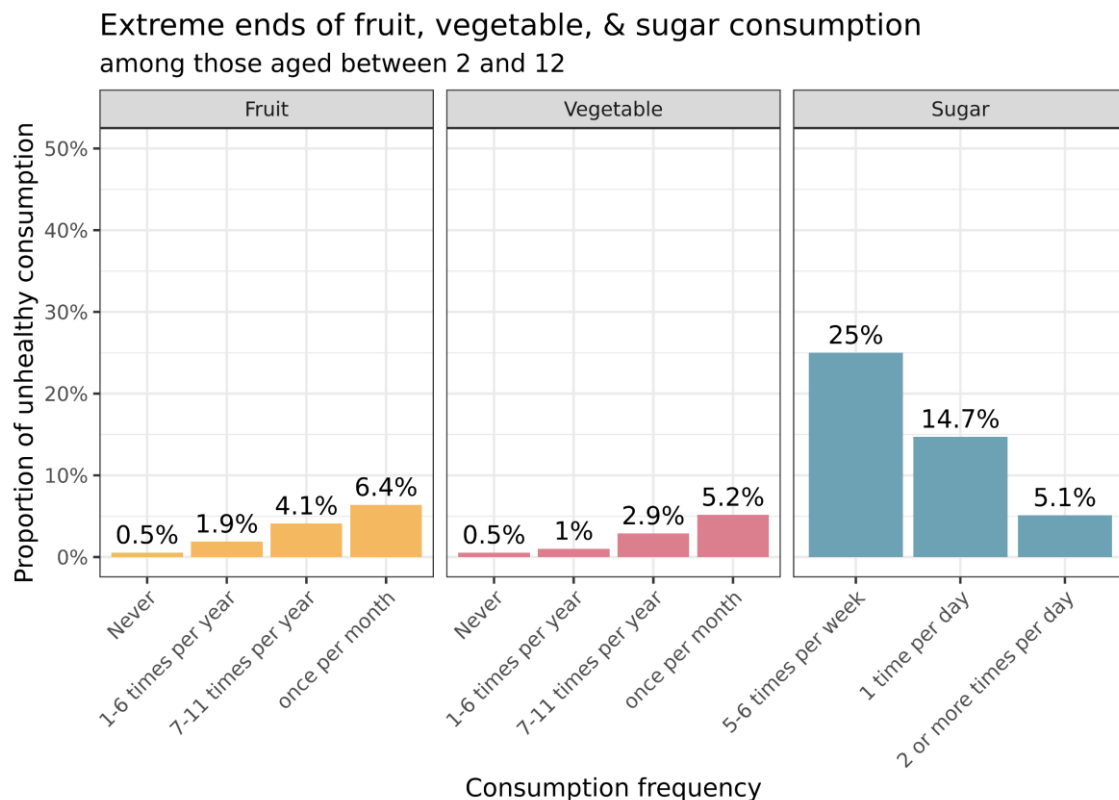

Fig.2: Proportion of respondents within 'extreme' frequency levels.

Shiny dashboard

For brevity, this section discusses 'age' and 'household income'.

Dashboard data reveals an evolving dietary pattern across age groups. 9% of children aged 9+ exhibit low fruit consumption (consuming no fruit more than 'once per month'), compared to 4% and 5.8% in the 0-4 and 5-8 groups, respectively. This suggests a correlation between age and unbalanced dietary choices, possibly associated with increased dietary autonomy.

Interestingly, when considering economic factors, the data presents an unexpected deviation from previous literature: children in the top two income brackets exhibit lower median fruit/vegetable index scores – contrasting with cross-age studies associating lower income with less healthy food choices.[7] This underscores the importance of recognising children as a unique demographic within nutritional epidemiology, understanding that nutritional challenges can transcend traditional economic boundaries.

Analysis of both age and income reveals children aged 9+ in the $45,000-$64,999 bracket have notably lower fruit/vegetable index scores – with 14.6% and 12.5% showing low fruit/vegetable consumption, respectively. This pinpoints a specific demographic where targeted nutritional interventions could be particularly impactful.

References

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