

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

Introduction and Research Questions

The dietary habits of children are emerging as a critical aspect of public health discourse. This project examines dietary consumption frequency in early and middle childhood (aged 0-12) in the United States, where nutrition plays a pivotal role in shaping health outcomes later in life.^(1, 2) It asks:

1. What is the prevalence of 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 data. Data management included:

Bash:

- Merging datasets using the “SEQN” identifier.
- Filtering observations by age.
- Removing extraneous columns.
- Recoding missing values.

R:

- Undertaking interval validation.
- Variable creation*
- Creating visualisations and a `shiny` app.

*Dietary questions (e.g. “How often do you eat *apples*?”) had ordinal responses from 1 (“never”) to 11 (“2+ times per day”). These were grouped into fruit, vegetable, or sugar groups, treated as continuous, and averaged to form *consumption indices*. Binary variables indicate whether *any* fruit/vegetable/sugar product was consumed at each instance (e.g. ``fruit_1`` signifies *no* fruit consumption).

Visualisation Approach

First visualisation (research question one)

- Density plots: captures overarching index distribution information, utilising colour and shape for pattern perception.
- Overlapping plots: utilises ‘boundary perception’ principles for comparative analysis, highlighting differences in distribution shapes/areas.⁽⁴⁾
- Transparency effect: prevents information loss by occlusion.

Second visualisation (research question one)

- Bar chart: groups data for response comparison among low-consumption groups.
- Faceting by consumption category: shifts comparative focus from *cross-* to *within-* consumption groups.

- Data literacy considerations:
 - Y-axis fixed at '50%' to avoid inadvertently overinflating prevalence by displaying 'tall' bars.
 - Direct bar labelling provides more precise quantitative insight.

Shiny dashboard (research question two)

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

Designed for policymakers, this dashboard allows users to undertake advanced filtering of the data to identify vulnerable groups, in line with the second research question. Additional features focussed on ease-of-use for non-technical audiences, including:

- Use of 'natural language' for subsetting 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

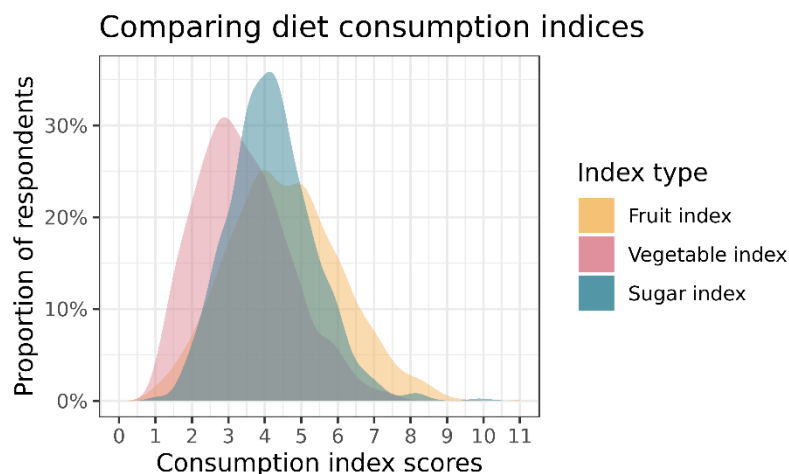


Figure 1: distribution of fruit, vegetable and sugar indices.

For sugar consumption, *Fig.1* reveals that the most commonly occurring index score is ~4, corresponding to a mode frequency of “once a month”. The distribution’s right tail indicates a segment consuming sugar far more frequently.

The vegetable index most commonly registers at ~3, corresponding to consumption at just 7-11 times *annually*. The fruit index shows greater variance, indicating a greater mix of low and high fruit consumption.

Fig.2 outlines the ‘extreme ends’ of consumption. 1.9% of children consume fruit no more than 1-6 times p/year, and 1% for vegetables. Remarkably, 0.5% abstain from fruits or vegetables entirely.

While this data reflects consumption *frequency*, not *quantity* - and so cannot directly indicate malnourishment - it does imply significant deviations from federal guidelines, recommending 1-3.5 cups of fruit/vegetables *daily* for children.⁽⁶⁾

For sugar, a quarter of the sample consume any high-sugar item 5-6 times weekly, with 5.1% consuming them multiple times daily.

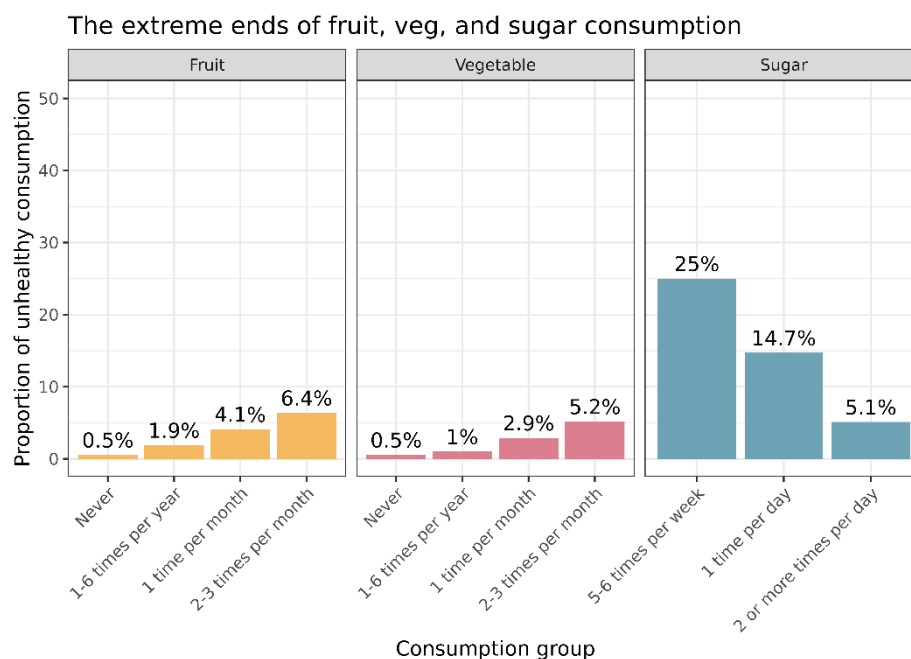


Figure 2: Proportion of respondents within different frequency levels. Frequency levels are ‘in the last year...’.

Shiny app

For brevity, this section focuses on ‘age’ and ‘household income’.

Dashboard data indicates that low fruit/vegetable and high sugar consumption increases with age. Notably, 9% of children aged 9+ exhibit low fruit consumption, compared to 4% and 5.8% in the 0-4 and 5-8 age groups, respectively. This indicates a potential correlation between age and unbalanced dietary choices, possibly linked to increased dietary autonomy.

Intriguingly, children in the top two income bracket have notably lower fruit/vegetable index scores. This contrasts with population-wide studies associating lower income with less healthy food choices,⁽⁷⁾ and underscores the need for tailored approaches in dietary studies and interventions - recognising children as a unique demographic.

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

References

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