

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 (ages 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 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 datatable 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

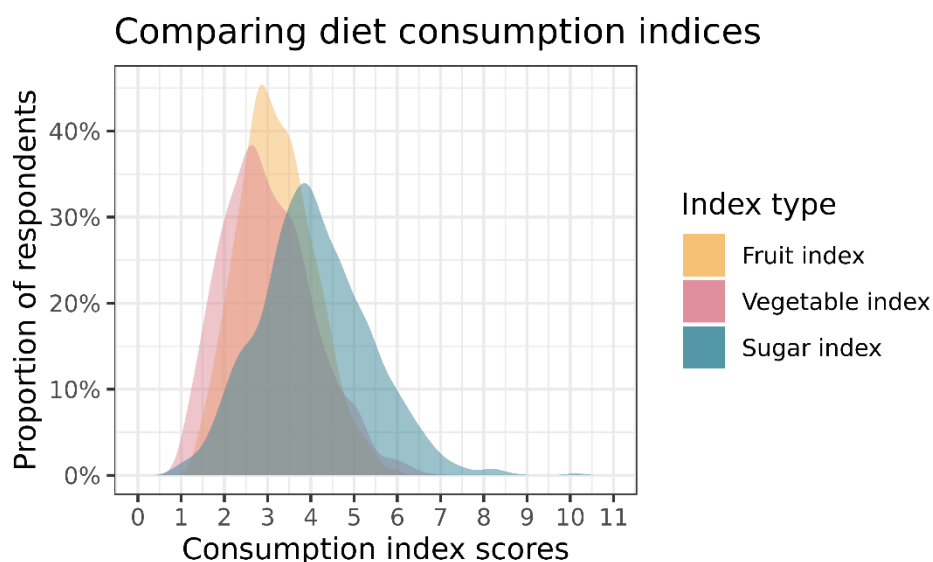


Figure 1: distribution of fruit, vegetable and sugar indices.

Fig.1 reveals fruit and vegetable consumption is most commonly reported at a low frequency (mode index scores: ~2.5 and ~3) - corresponding to an average consumption frequency of around 7-11 times annually. In contrast, sugar consumption is typically higher - around once a month (mode index score: ~4). The sugar variable also contains significantly more 'spread', suggesting a more varied consumption frequency.

Fig.2 shows reveals the prevalence of the 'extreme ends' for each food category. For example, 1.7% consume any fruit no more frequently than 1-6 times p/year, with the figure at 2.1% for vegetables.

This data reflects consumption frequency, not quantity - and so cannot directly indicate malnourishment - though it may suggest a strong deviation from US federal guidelines, which recommends 1-3.5 cups of fruit/veg *daily* for children, depending on caloric intake.⁽⁶⁾

For sugar, around 1 in 3 (33.2%) children consume any high-sugar product 3 to 4 times p/week. At the most extreme end, around 2.9% consume any high-sugar product multiple times p/day.

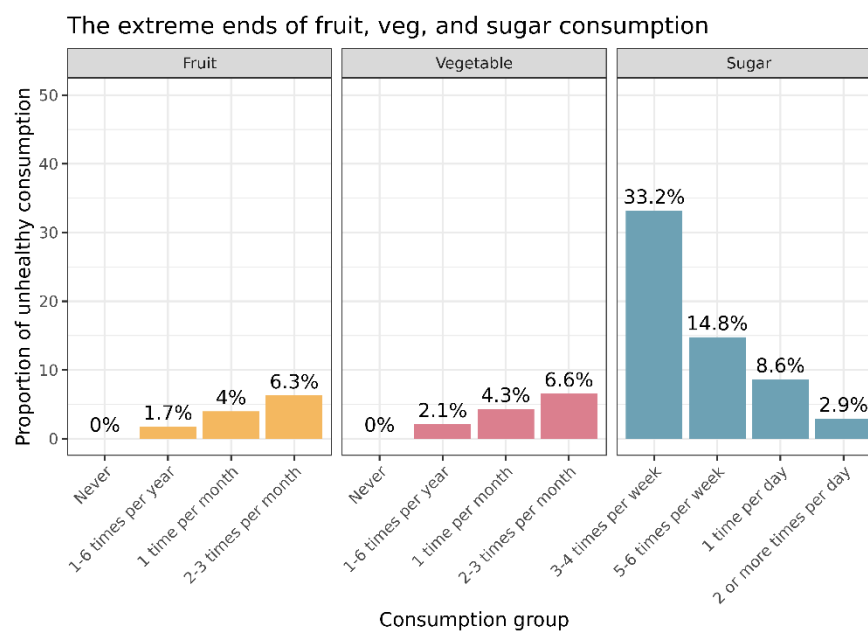


Figure 2: Proportion of respondents within different frequency levels.

Shiny app

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

The dashboard shows that low fruit/vegetable and high-sugar consumption increases with age. For instance, 18.2% of children aged 9+ exhibit high sugar consumption, compared to 10.9% and 14.6% for 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 higher income brackets tend to have lower fruit/vegetable index scores. This contrasts with population-wide studies that associate lower income with less healthy food choices,⁽⁷⁾ and underscores the need for tailored approaches in dietary studies and interventions - highlighting children as a unique demographic.

Lastly, examining age and income together uncovers greater nuance. Children aged 9+ in the \$45,000-\$64,999 income bracket show low fruit and vegetable index scores, with 13.8% engaging in low fruit and vegetable consumption. This pinpoints a specific risk group where targeted nutritional interventions could be greatly beneficial.

References

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