University of Reading

URINARY AND HAIR BIOMARKERS AS OBJECTIVE MEASURES OF DIETARY INTAKE IN DISADVANTAGED UK COMMUNITIES

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FoodSEqual-Project

UK Research and Innovation

What is FoodSEqual

The Food Systems Equality project (FoodSEqual) is part of the 'Transforming the UK Food System for Health People and a Healthy Environment SPF Programme' which aims to fundamentally transform the UK food system by placing healthy people and a healthy natural environment at its centre.

TRANSFORMING UK FOOD SYSTEMS
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Health inequalities and poor diet

Health inequalities linked to poor diet are more prevalent in disadvantaged communities.

Food insecurity and limited access to affordable, healthy foods reduce dietary quality.

This leads to a higher risk of obesity and other diet-related diseases over time.

Traditional dietary assessment methods

Tools such as: FFQs and 24-hour recalls rely on self-reporting and are prone to recall bias, portion size misestimation.

Often leads to underreporting particularly of unhealthy foods, reducing the accuracy of dietary intake data.

Biomarkers in dietary assessment

Biomarkers provide objective and quantifiable measures of nutrient intake.

They are based on measurable compounds in biological samples such as urine, blood, or hair, reducing reliance on self-reporting.

As a result, biomarkers can improve the accuracy of dietary assessment and strengthen the evidence base for addressing nutrition-related health inequalities.

Aims and objectives

The project aims to evaluate urinary and hair biomarkers as indicators of dietary intake.

It also compares biomarker data with self-reported dietary information and examines site based dietary differences across four disadvantaged communities in the UK.

Method

Design: Cross-sectional study

Participants: Adults from Reading, Plymouth, Tower Hamlets, Brighton & Hove.

Sample collection: Spot urine & hair

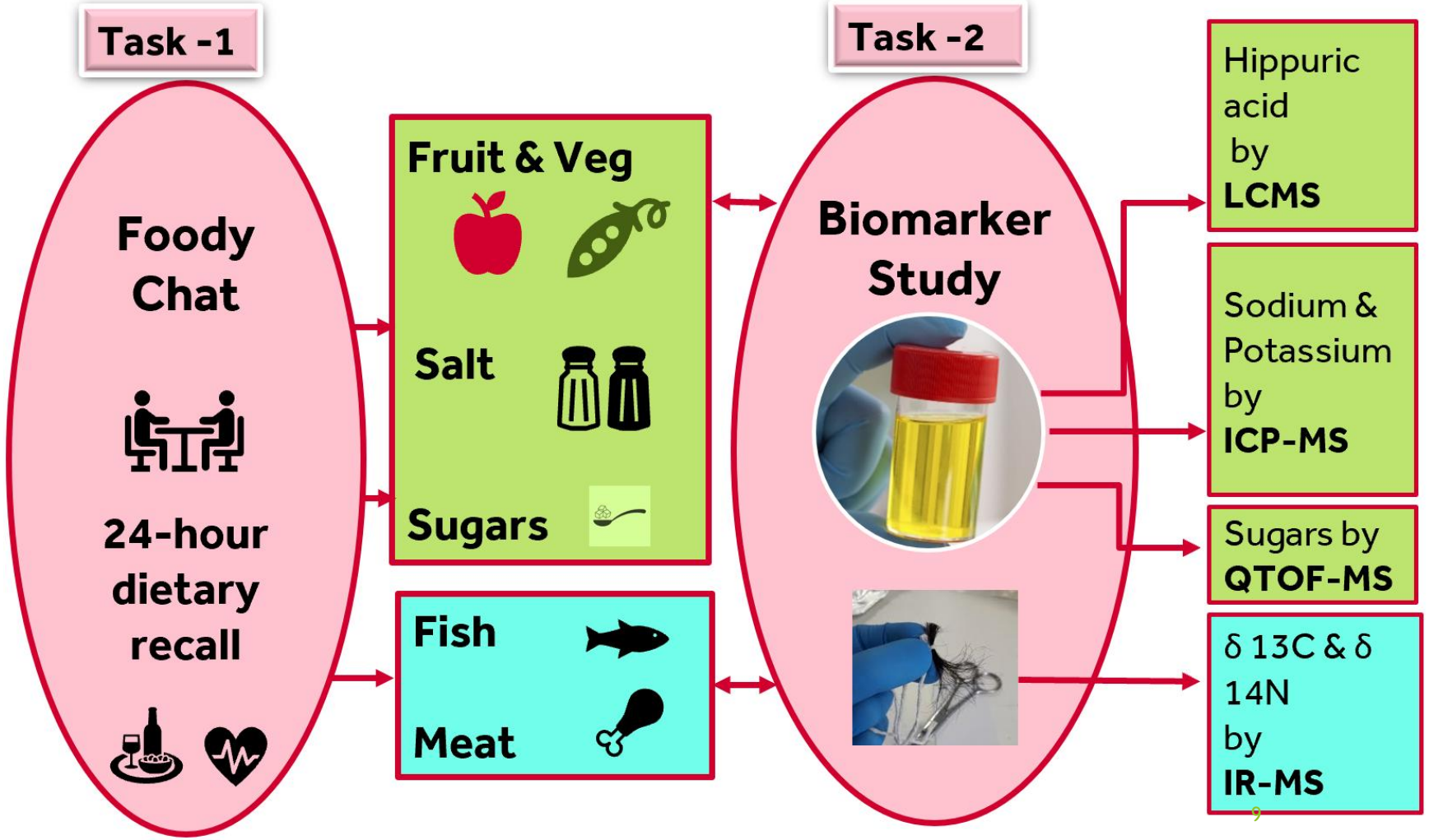
Why Urine and hair

Urine and hair samples give better information about some aspects of food we eat.

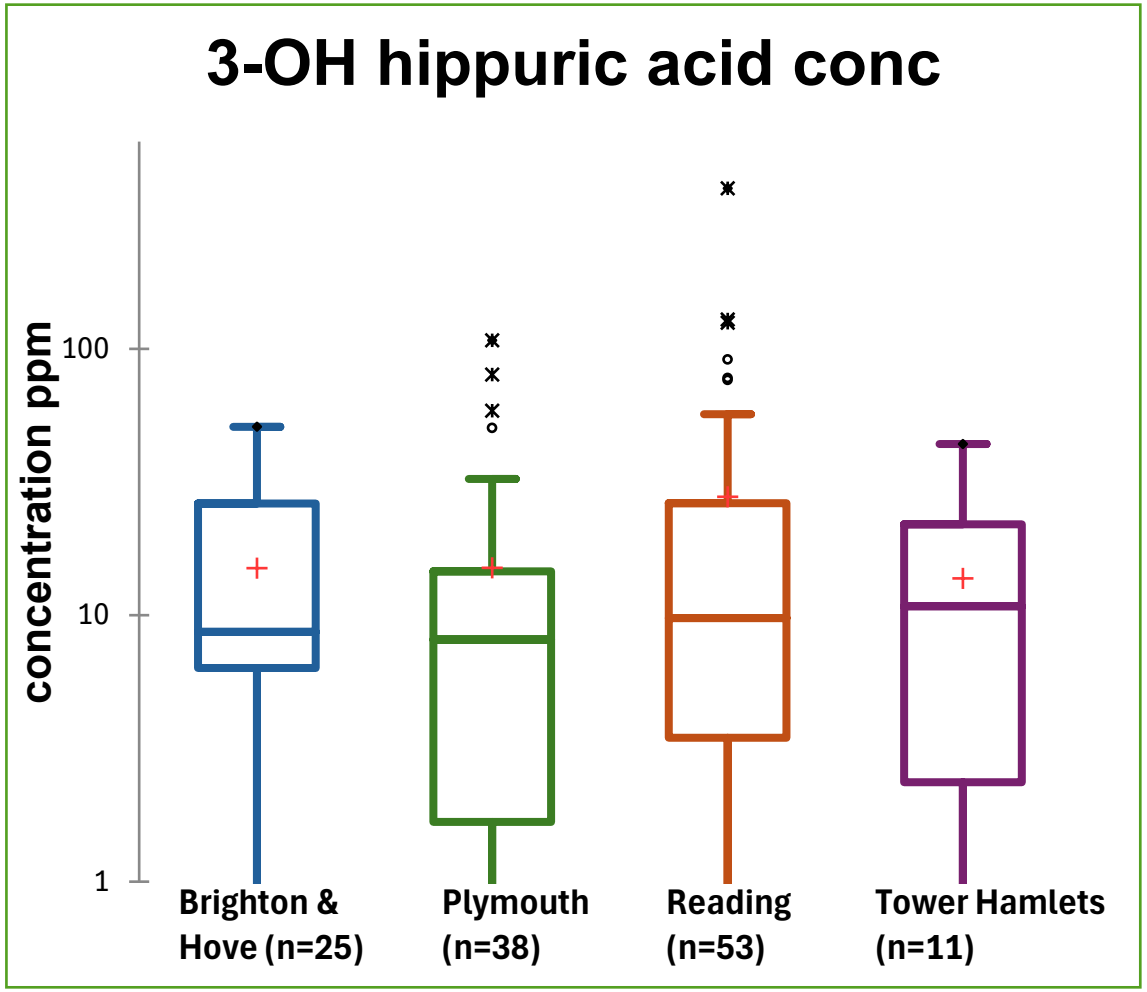
Hair samples can provide information about what you have eaten in last couple of months.

Urine samples can tell us about individual nutrient.

Biomarker and diet study



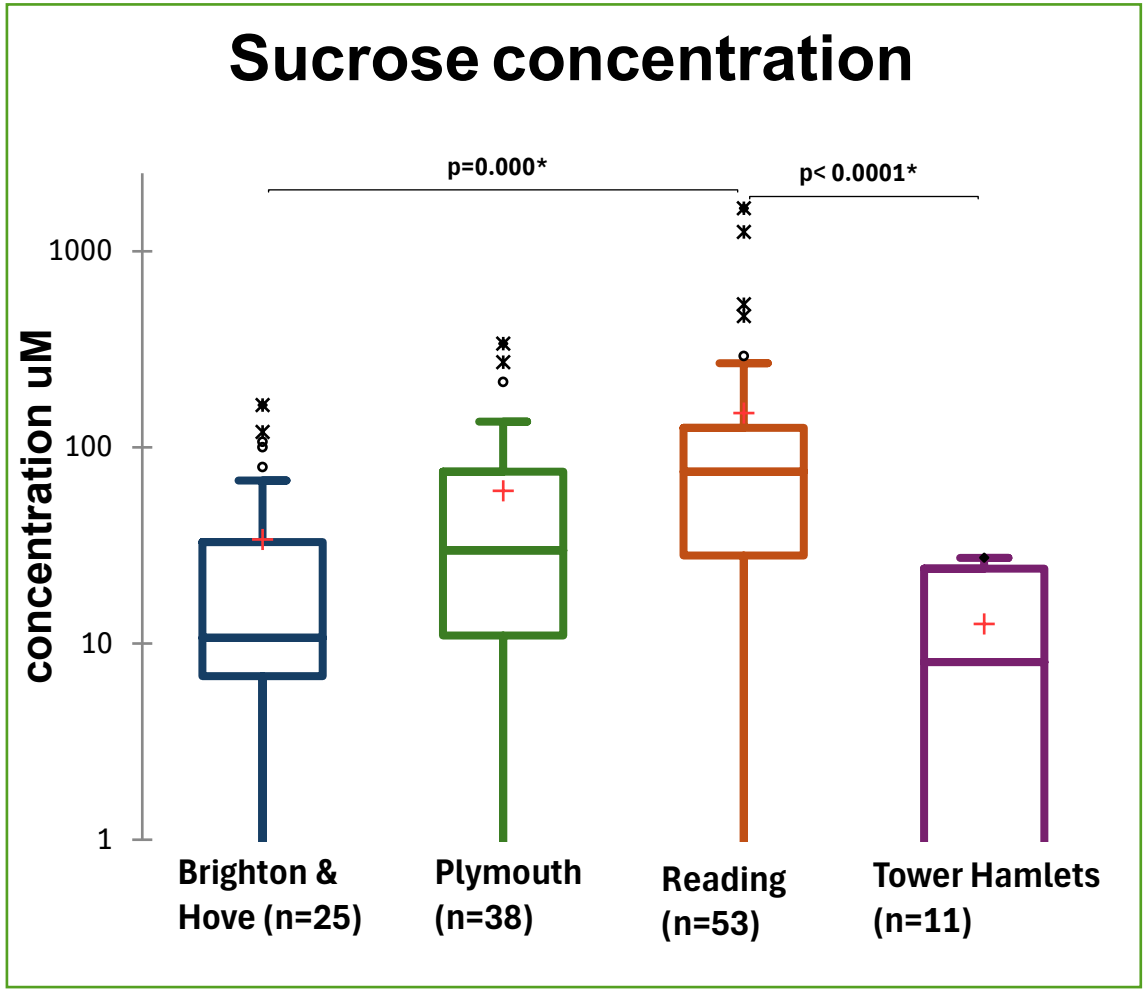
Urinary 3-hydroxy Hippuric acid



- Hippuric acid is an experimental marker.
- 3-hydroxy hippuric acid is formed by a range of phenolic compounds, including fruit & veg and tea.
- No significant difference between the four cohorts.

The average concentration of urinary 3-hydroxy hippuric acid at four sites.
* represents significant differences with p=0.05 from a Kruskal-Wallis test with a Bonferroni correction for multiple comparisons.
The line is the median, boxes are the interquartile range, and whiskers are 1.5 times the interquartile range.

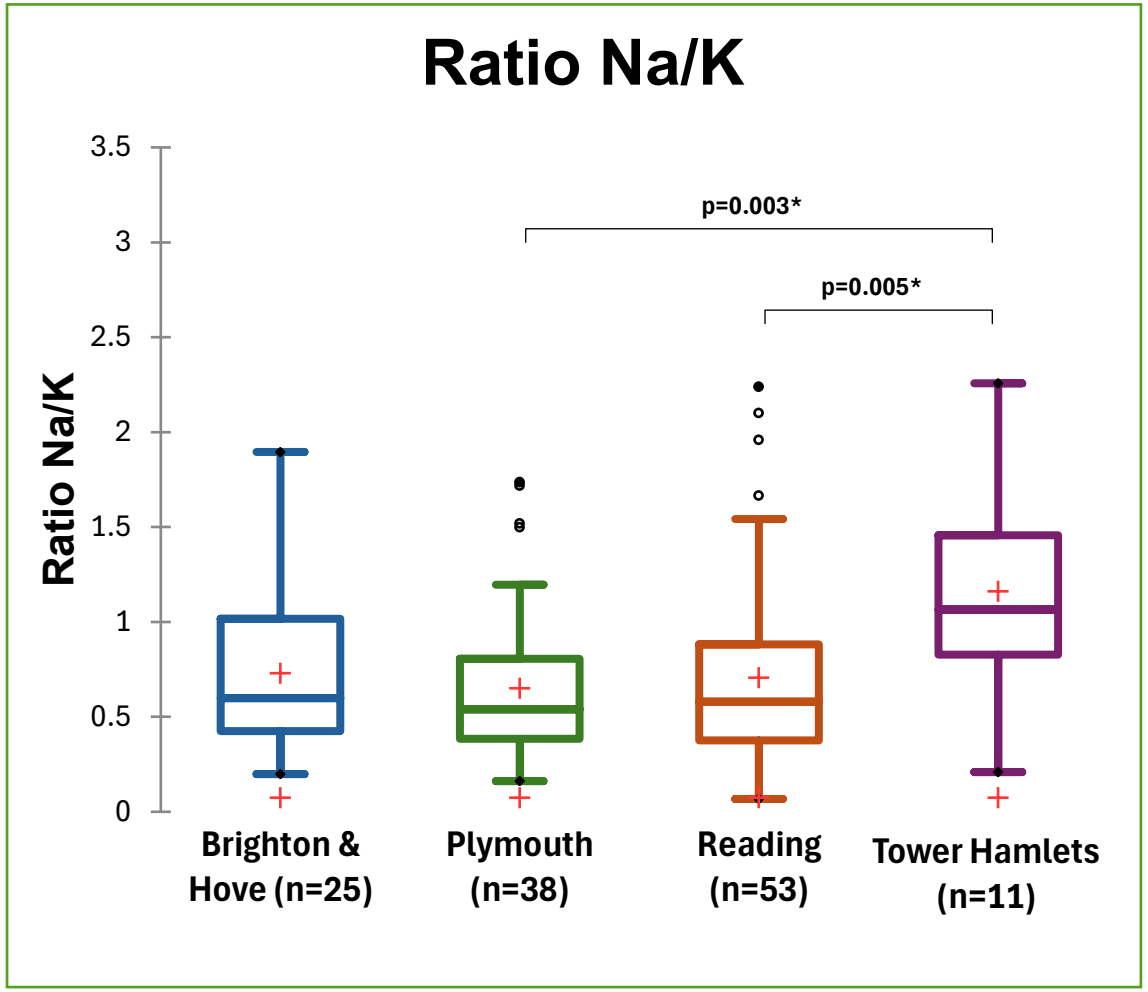
Urinary sucrose



- Urinary sucrose is a biomarker of sugar intake.
- Urinary sucrose concentration was notably higher in Reading cohorts, indicating greater exposure to sugar-rich foods and beverages.

The average concentration of urinary sucrose at four sites.
* represents significant differences with p=0.05 from a Kruskal-Wallis test with a Bonferroni correction for multiple comparisons.
The line is the median, boxes are the interquartile range, and whiskers are 1.5 times the interquartile range.

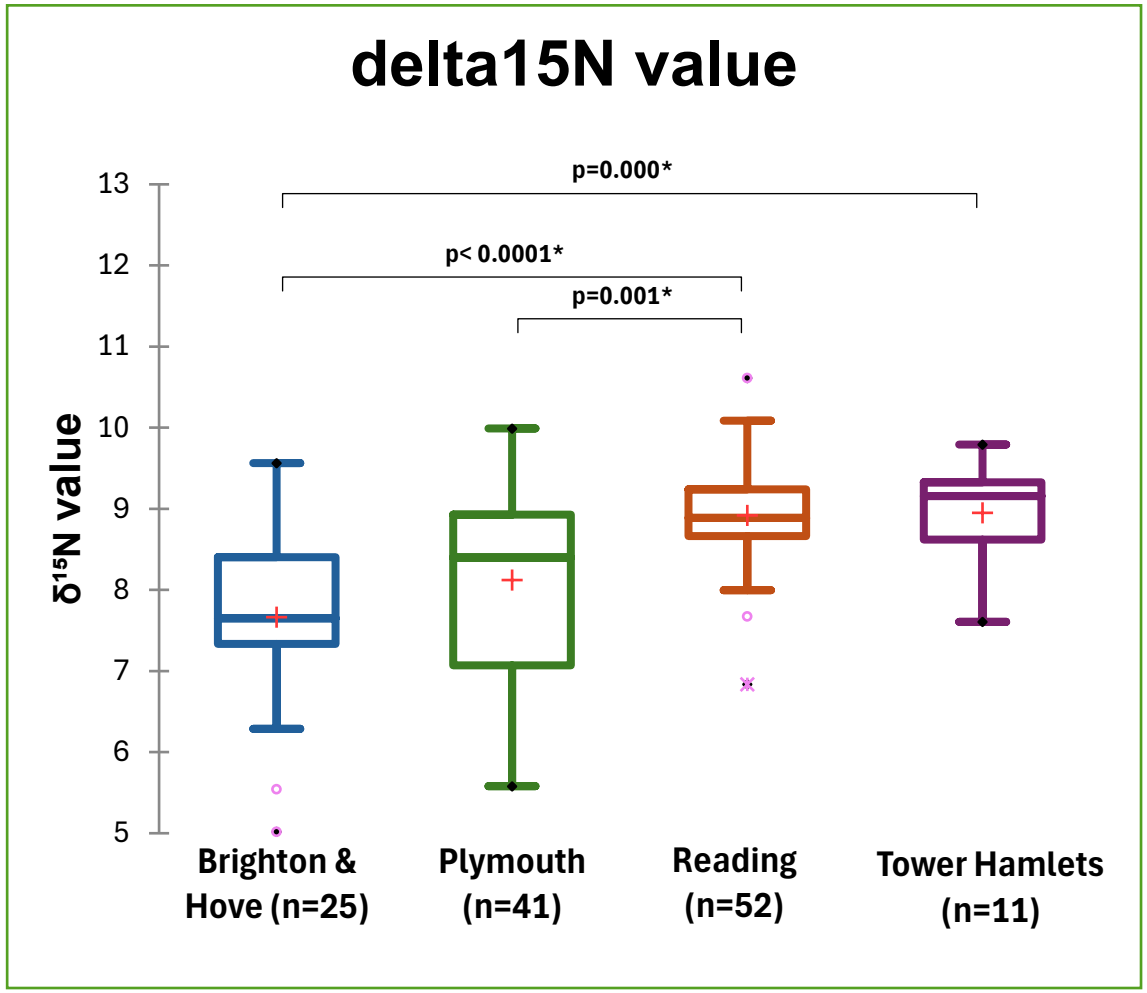
Urinary sodium/potassium



- Urinary sodium/potassium ratio is a marker of salt intake in spot urine.
- The Tower Hamlets cohorts had a higher Na/K ratio, consistent with diets containing more salted foods.

The average concentration of urinary Na/K at four sites.
* represents significant differences with p=0.05 from a Kruskal-Wallis test with a Bonferroni correction for multiple comparisons.
The line is the median, boxes are the interquartile range, and whiskers are 1.5 times the interquartile range.

Hair biomarker



- The stable isotope ratio of nitrogen is a marker of the source of protein in hair.
- The Tower Hamlets cohorts had the highest $\delta^{15}N$ values, suggesting a greater consumption of animal-derived protein.

The average concentration of $\delta^{15}N$ at four sites.
* represents significant differences with p=0.05 from a Kruskal-Wallis test with a Bonferroni correction for multiple comparisons. The line is the median, boxes are the interquartile range, and whiskers are 1.5 times the interquartile range.

Conclusion

Biomarkers provide objective and measurable information about dietary intake, revealing nutritional patterns that may not be captured by traditional methods.

Clear differences between sites highlight the influence of cultural practices and local food environments on dietary behaviour.

Although the cross-sectional design, small sample size, and spot urine and hair samples limit long-term assessment, the study still provides valuable insights.

These findings offer an important foundation for developing targeted and equitable interventions in disadvantaged communities.

Acknowledgements

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