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Carbon footprint of food and beverage purchases: a preliminary analysis using loyaltycard transaction data from a UK supermarket

M. Dineva^{1,2}, M.A. Green³, M.S. Gilthorpe⁴, M. Thomas⁵, N. Sritharan⁵, A.M. Johnstone⁶ and M.A. Morris^{1,2}

¹*School of Food Science and Nutrition, Faculty of Environment, University of Leeds, Leeds, UK*

²*Leeds Institute for Data Analytics, University of Leeds, Leeds, UK*

³*Department of Geography and Planning, University of Liverpool, Liverpool, UK*

⁴*Obesity Institute, Leeds Beckett University, Leeds, UK*

⁵*Sainsbury's PLC, London, UK*

⁶*The Rowett Institute, University of Aberdeen, Aberdeen, UK*

Globally, a third of total anthropogenic greenhouse gas emissions (GHGE) are produced by the food system⁽¹⁾. Estimating the carbon footprint of current diets is therefore important to consumers, businesses, and policymakers. With most home-consumed food in the United Kingdom (UK) purchased from supermarkets⁽²⁾, supermarket purchasing records represent a novel data source that can provide insights into dietary patterns⁽³⁾. These data are particularly useful in an environmental sustainability context as they provide information on the amounts of foods and beverages purchased, not just the amounts consumed (as in traditional dietary assessments). We estimated GHGE of foods and beverages purchased in Yorkshire and the Humber region of the UK using supermarket transaction data from primary-shopper loyalty cards over 12 months in 2022.

We mapped a UK retailer's food and beverage products to GHGE (kg CO₂-eq/kg) using data on the environmental footprint of food commodities⁽⁴⁾, and grouped the products according to the Living Costs and Food Survey (LCFS) categories. The sustainability mapping process was guided by product sales (i.e., prioritising the most sold products and categories) and involved three stages utilising mapping approaches with different complexity, resulting in 98.6% of >28,000 store products being mapped. We estimated total GHGE of each product by multiplying the final mapped GHGE by the product weight (as sold). We then used these product-level GHGE estimations (kg CO₂-eq/item) in conjunction with the sales data (number of items sold) to estimate the contribution of each product, and subsequently each LCFS category, to total GHGE from all purchases.

When incorporating sales, the LCFS categories with the highest contributions to total GHGE included 'beef' (19.6%), 'milk' (9.8%), 'cheese and curd' (8.6%), 'ready meals' (6.9%), and 'poultry' (5.5%). The LCFS categories among the lowest contributors to total GHGE included 'confectionery products' (0.2%), 'pasta products' (0.4%) and 'soft drinks' (0.5%). Although some LCFS categories had higher GHGE per kg for their products, they were sold in smaller quantities, and therefore, their contributions to total GHGE were lower in total. For example, 'lamb' was in the top five LCFS categories with the highest GHGE per kg (39.7 kg CO₂-eq/kg) but contributed to 1.4% of total estimated GHGE when incorporating sales information, which was less than 'bread' (2.2%) and 'yoghurt' (1.7%).

Our results highlight that although some foods might be very GHGE-intensive on a per weight basis, they have a lower overall GHGE impact if they are not frequently purchased in the population. These supermarket sales data are an important resource to understanding and subsequently tackling the environmental impact of the food system. Further research, including other environmental sustainability metrics (e.g., water and land use), is needed to provide a more comprehensive picture of the environmental footprint of foods and beverages purchased by UK consumers.

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References

1. Crippa M, Solazzo E, Guizzardi D *et al.* (2021) *Nat Food* **2**, 198–209.
2. Access to Nutrition Foundation (2020) *UK Supermarket Spotlight* [Available at: <https://accesstonutrition.org/app/uploads/2020/03/ATNI-UK-Supermarket-Spotlight-report-FINAL.pdf>].
3. Jenneson VL, Pontin F, Greenwood DC *et al.* (2022) *Nutr Rev* **80**, 1711–1722.
4. Poore J & Nemecek T (2018) *Science* **360**, 987–992.