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ABSTRACT

The impact of ultra-processed food on carbon, water and ecological footprints of foods in Brazil

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Background: Ultra-processed foods (UPF) have been associated with major diet-related public health issues that share underlying drivers with climate change. Both challenges require major changes to the food system and so the potential benefits to health and the environment present a double motivation for transformation. Our aim is to assess the impacts of UPF on total greenhouse gas emissions (GHGE), water and ecological footprints in Brazil food purchases. **Methods**: We have used data from 4 Brazilian Household Budget Surveys (1987, 1996, 2003, 2009). Each food item was classified into NOVA food groups (unprocessed/minimally processed, culinary ingredients, processed and ultra-processed). The

information was linked to nutrition and footprint data. Purchases were converted into grams per capita per day to estimate total energy (kcal), percentage of energy from UPF, as well as total GHGE, water and ecological footprints. We performed linear regression to calculate year-adjusted means of footprints per 1000 Kcal by year-specific quintiles of UPF participation in the total energy. The data were analysed in R v.3.6.1 and STATA SE 14.1. **Results**: The mean UPF participation in total energy varied from 13% (SD 2.4) in the 1st UPF quintile to 29% (SD 5.1) in the 5th quintile. The footprints increased linearly across quintiles: the mean g CO2eq varied from 1312 in the 1st to 1721 in the 5th UPF quintile (p-trend<0.001); the mean litres of water varied from 1420 in the 1st to 1830 in the 5th quintile (p-trend<0.001); the mean m^2 varied from 9.4 in the 1st to 12.3 in the 5th quintile (p<0.001). **Conclusion**: The environmental impacts were higher for Brazilian diets with a larger fraction of energy from UPF. Specifically, low UPF diets seem to have lower GHGE, water and ecological footprints. Our findings offer new motivators for dietary change to simultaneously healthier and more sustainable eating patterns and will be of relevance to consumers and policymakers.

Message 1: Diets high in UPF cause more climate impact than diets with lower levels of UPF.

Message 2: Healthy and sustainable dietary patterns should be low in ultra-processed foods.

Keywords: nutrition, health, environment

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