NUTRIENT SUPPLY

Nutrient accounting in global food systems

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Standfirst: Working across agriculture-nutrition domains, Nutrition Balance Sheets provide “farm-to-fork” estimates of the availability of dietary nutrients for human consumption

The COVID-19 pandemic, political instability and the climate crisis have renewed focus on the capacity and resilience of global food systems to deliver adequate food and nutrients to the growing global population. With 702 – 828 million people affected by hunger in 2021 [1], and >2 billion people suffering one or more micronutrient deficiencies, commentators have called for rigorous monitoring and evaluation of food system performance to guide policies and promote accountability[2].

In Nature Food, Lividini and Masters present Nutrient Balance Sheets (NBS) that account for the production and dietary supply of 36 nutrients “from farm-to-fork”. Estimates reported globally for the years 1961 – 2018 draw on food balance sheet (FBS) data from the Food and Agriculture Organization Corporate Statistical Database (FAOSTAT). The NBS provide a unifying framework to assess and characterise food system dietary nutrient supplies, and to explore future scenarios and intervention options where deficiencies in dietary nutrient supplies are apparent. The framework enables various components of the food system – food production, trade, processing, cooking, loss and wastage, consumption – to be explored in terms of dietary nutrient supplies and deficiency risks to populations.

The approach works across agriculture-nutrition domains, integrating food systems perspectives. . For example, the authors show how combinations of staple crop biofortification, food fortification and micronutrient supplementation interventions can fill shortfalls in dietary nutrient supplies from the prevailing food system in various countries. The NBS of Lividini and Masters is the latest in a growing body of studies that report frameworks for estimating the availability of dietary nutrients for human consumption. The advance comes in the reporting of a wider range of nutrients over the full timescale of available FBS data for most countries globally, and the use of the Supply and Utilization Account data which sit behind the FBS data, giving greater granularity and allowing users to trace back to production stage.

The FBS data which underpin this study are, due in-part to their consistent structure, suited to comparisons cross-country and over time. FBS data are integral to various nutrition and food system models and tools, such as the HarvestPlus Biofortification Priority Index tool which considers the potential of biofortified crops in different countries, the International Food Policy Research Institute IMPACT model[3] which provides estimates of future nutrient supplies under different future scenarios of food system change, and dietary risk factors in the Global Burden of Disease[4]. In addition, FAOSTAT's "Food and Diet Domain" will report the supply of dietary nutrients available for human consumption, based on FBS, household survey and individual-level food consumption data.

While FBS data are powerful, they are geographically coarse – providing estimates of food available for consumption at national-level, for up to 96 distinct food items. FBS data do not capture subnational variation in diets including between regions, by socioeconomic or sociocultural group, or by gender/demographic group. As such, the framework is only suitable for certain applications, and there may be instances where integration or triangulation with other data sources may be useful. Indeed, the authors suggest the NBS could be strengthened through integration with household consumption and expenditure survey (HCES) data, including from the family of Living Standards Measurement Study (LSMS) surveys[5]. Alternatively, where individual-level dietary data are available, these could be used to inform sub-national distributions of intake and variation between socioeconomic and demographic groups.

There is growing use of HCES data in widescale assessments of dietary nutrient supplies and in nutrition modelling tools[6], and while they are not available in all countries, the socioeconomic and spatial resolution they provide is undoubtedly valuable. However, relatively little attention has been paid to increasing the quality and spatial resolution of food composition data. There is substantial variation in staple crop nutrient composition due to soil, climate, agronomic and other factors, and the spatial scales at which this variability occurs is likely to drive important variation in nutrient intakes, particularly in contexts where food systems are predominantly localised[7,8]. There is a need to establish routine surveillance of crop nutrient composition, particularly staple crops due their dominance in the diets of low-income populations, as well as the development of nutrient accounting frameworks that can incorporate these data at subnational scales. This should be a priority area of work to support the rigorous monitoring and evaluation of food system performance to inform policies in support of resilient and sustainable global food systems.

References

1. *The State of Food Security and Nutrition in the World 2022*. (FAO, 2022). doi:10.4060/cc0639en.

2. Fanzo, J. *et al.* Viewpoint: Rigorous monitoring is necessary to guide food system transformation in the countdown to the 2030 global goals. *Food Policy* **104**, 102163 (2021).

3. Wiebe, K. *et al.* 10 - Modeling biophysical and socioeconomic interactions in food systems with the International Model for Policy Analysis of Agricultural Commodities and Trade (IMPACT). in *Food Systems Modelling* (eds. Peters, C. & Thilmany, D.) 213–230 (Academic Press, 2022). doi:10.1016/B978-0-12-822112-9.00008-4.

4. Afshin, A. *et al.* Health effects of dietary risks in 195 countries, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017. *The Lancet* **393**, 1958–1972 (2019).
5. Zezza, A., Carletto, C., Fiedler, J. L., Gennari, P. & Jolliffe, D. Food counts. Measuring food consumption and expenditures in household consumption and expenditure surveys (HCES). Introduction to the special issue. *Food Policy* **72**, 1–6 (2017).
6. Tang, K. *et al.* Systematic review of metrics used to characterise dietary nutrient supply from household consumption and expenditure surveys. *Public Health Nutrition* **25**, 1153–1165 (2022).
7. Gashu, D. *et al.* The nutritional quality of cereals varies geospatially in Ethiopia and Malawi. *Nature* **594**, 71–76 (2021).
8. Diriba B Kumssa *et al.* Cereal grain mineral micronutrient and soil chemistry data from GeoNutrition surveys in Ethiopia and Malawi. *Sci Data* (in press) doi:https://doi.org/10.1038/s41597-022-01500-5.