Analysis combining the multiple FAO Food Balance Sheet datasets may produce incorrect results

Analysis combining the multiple FAO food balance sheet datasets needs careful treatment

Recent methodological changes to the food balance sheets published by the Food and Agriculture Organization of the UN (FAO)[1] are leading to potential incorrect research findings and conclusions. The FAO offers open access to a large-scale, standardised food and agriculture dataset for more than 245 countries and territories, with annual panel data from 1961.[1] The data, known as food balance sheets (FBS), are crucial to monitoring long-term trends in national food supply and tracking hundreds of edible commodities—termed items—which include, for example, meats, cereals, fruits, vegetables, legumes, vegetable oils, and butter. A 2020 review found more than 1300 publications that had used FBS data,[2] for example, to predict micronutrient security,[3] quantify food waste,[4] and identify associations between diet, trade, and environmental factors.[5]

In 2020, the FBS methodology was updated,[1] causing a fracture in the dataset, with one methodology used for the years 1961–2013 (henceforth referred to as old) and a second one used for the years 2010–20 (henceforth referred to as new), without clear guidance on how to conduct trend analyses across the two.[6] In the old FBS methodology, imbalances were offset by adjusting a single component, such as stocks, industrial use, or feed. By contrast, the new methodology proportionally distributes these imbalances across multiple component modules.[6] Updates were also made to the calculation of population data, with the new methodology now using 2019 UN Development Programme (UNDP) data instead of the 2015 UNDP data, leading to changes in dietary energy supply per person.[6] Several published studies have aggregated the two datasets without adjustment.[7-9]

Comparing values for the overlapping 4 years (2010–13) shows that substantial differences exist between equivalent values from the two methodologies. The magnitude of the discrepancy across the two datasets is illustrated by plotting the differences between the

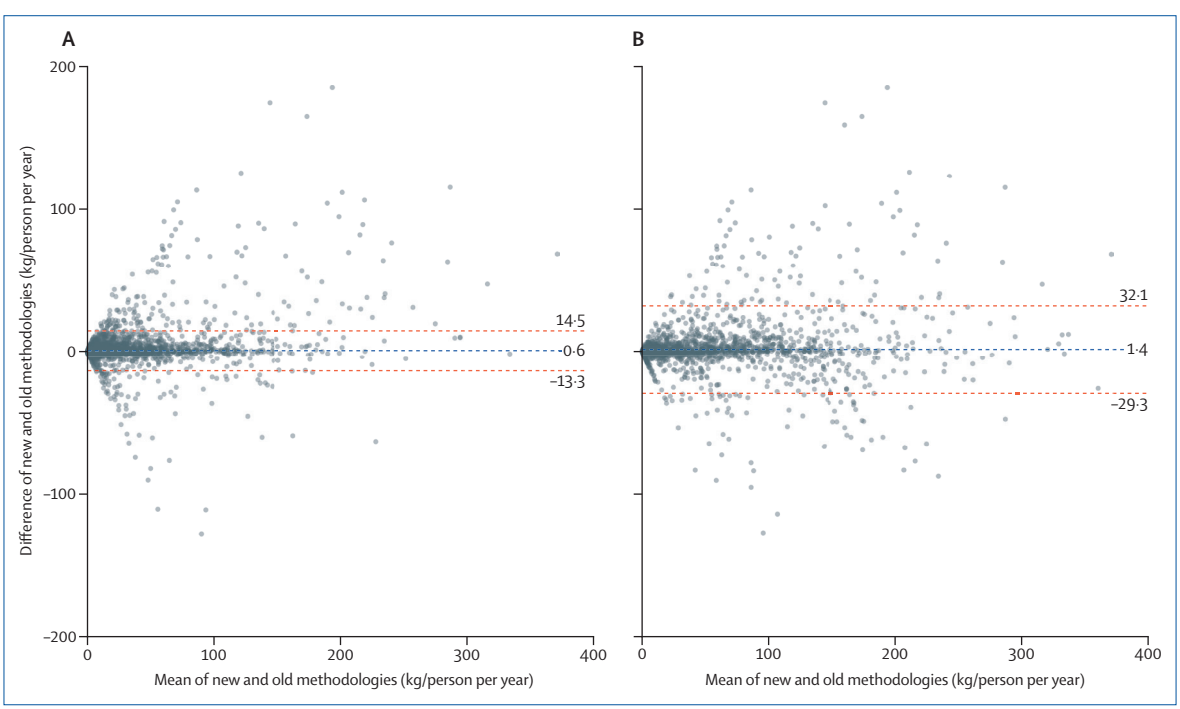

Figure 1: **Comparison of food supply in the old versus new FAO FBS data for individual items and aggregated item categories**
(A) Individual items. (B) Aggregated item categories. The blue lines indicate the bias, which represents the mean difference between the old and new method values across all items. The red lines indicate a CI containing 95% of the calculated difference values (a wider CI would indicate worse agreement between methods with more variation in the difference between values). FAO=Food and Agriculture Organization of the UN. FBS=food balance sheets.

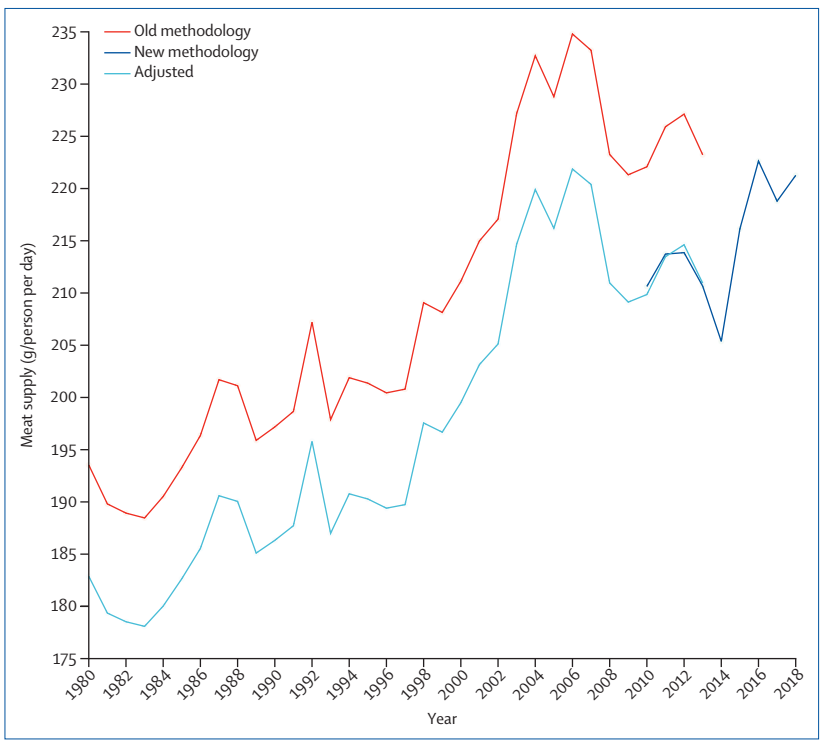

Figure 2: **UK meat supply in the old versus new FAO FBS data, with and without adjustment for overlapping year discrepancies**
The values for the old and new trend lines are taken directly from the old and new FAO FBS methodologies, respectively, for UK meat supply. FAO=Food and Agriculture Organization of the UN. FBS=food balance sheets.

new versus old methodology values for each item against their average (figure 1). Focusing solely on food supply (kg/person per year), the FBS closest proxy for consumption,[1] overall, across all individual items, all countries, and all years, the bias is small at 0·6 kg/person per year. However, there is a wide range of variation in the differences between the two methods, with some items having especially large discrepancies in values (eg, the item milk—excluding butter in 2010 for Belgium is recorded as 232 kg/person per year in the old dataset, whereas in the new dataset the same item is recorded as 59 kg/person per year). The average bias for aggregated item categories (eg, vegetables or sugars and sweeteners) is greater than the average bias for individual items (eg, onions or honey), at 1·4 kg/person per year (figure 1; appendix p 1).

See Online for appendix

The methodological changes are influencing FBS trend analyses in published research. A 2022 analysis aggregated the FBS dataset and found that UK meat supply had declined by 11·7 g/person per day (–5·2%) between 2008 and 2018.[7] When the differences in FBS values between the methodologies were raised with the authors, they then undertook a revision of their methods.[10] In this instance, a difference between datasets is apparent in the timeseries, with the old values consistently about 6% larger than the new values (figure 2). Accounting for this difference reversed the direction in meat supply to an increase of 10·3 g/person per day (4·9%) during the same period (figure 2). In this case, the ratio between old and new methodologies is mostly constant during the overlapping period (2010–13), suggesting that the application of an adjustment factor might be appropriate. However, with between-dataset item differences varying by country, it cannot be assumed to be appropriate for all countries and items (appendix pp 2–9).

Values of calorie intake per person are much more consistent across the methodologies than food supply. For example, UK meat supply calorie values are identical between the datasets in the overlapping years. Consequently, the implied calorific content of food items varies in response to the changes in consumption, which seem doubtful to have been the intended outcome. Without further information on the exact methodological changes made, this calorie versus supply discrepancy cannot be explained.

Overall, the FBS is a crucial dataset that has been used internationally to inform research and policy. In some cases, these data are the only dietary information available for countries and are often used as a proxy for consumption.[11] For researchers using the FBS to investigate dietary trends or for modelling purposes, transparency of the methods used to calculate FBS indicators is essential. Users of the FBS need to be aware of the potential inconsistencies created by the change in methodology. Unadjusted aggregation of data from before and after 2014 can and has skewed food supply trends, for example inverting the trends.[10] We argue that these issues should be more widely reported and understood to avoid inaccurate conclusions being drawn from research using these data, with the potential to lead to incorrect policy advice and decisions.

AV, BA, and PA did the analyses. AV wrote the manuscript with support from BA, LMJ, ALB, and PA. We declare no competing interests. All FAO FBS data are open access and available at https://www.fao.org/faostat/en/#data/FBSH (1961–2013) and at https://www.fao.org/faostat/en/#data/FBS (2010–20). The code to produce these analyses is open access and available on GitHub at https://github.com/axvonder/FAOComment.git.

*Alexander Vonderschmidt, Bartlomiej Arendarczyk, Lindsay M Jaacks, Alexandra L Bellows, Peter Alexander
a.vonderschmidt@sms.ed.ac.uk

Global Academy of Agriculture and Food Systems (AV, LMJ, ALB, PA) and School of Geosciences (AV, BA, PA), The University of Edinburgh, Midlothian EH25 9RG, UK

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