Reviewer's report

Title: Meal analysis for understanding eating behavior: Meal- and participant-specific predictors for the variance in energy and macronutrient intake

Version: 1 Date: 19 Sep 2018

Reviewer: Darren Greenwood

Reviewer's report:

General comments:

I found this a fascinating piece of work, looking at an aspect of variation in diet that I had previously not paid much attention to. As a statistician who uses structural equation models from time-to-time, I found this an interesting application, with the methods well-applied. The extent to which the overall findings that breakfast, lunch and evening meals contain different nutrient profiles is not surprising, but this study shows more than this - it's not about the *average* intake for each meal being different, it's about the within-person *variation* in intake, for which multilevel or structural equation models are well suited to explore, and which do potentially bring new insights to inform dietary interventions.

Major points:

1. My main concern is lack of confidence intervals around any of the estimates. These are important to include to provide a sense of uncertainty around what you are claiming. It would make some of the tables even more busy, so you may have to restrict the tables to total energy intake in the main text, and move the macronutrients to supplementary material.

2. It is difficult at times to categorize a meal event. Where did any morning snacks go? What did you do if the evening meal was split into an early evening meal and later "supper"? There is some information in the supplementary material, but I think more detail on this in the methods is necessary. Your conclusions depend on these initial groupings, so this detail is important.

Minor points:

3. Some of the methodology is quite technical in nature. This interests me, and I agree that it is important, but it may be of less immediate interest to a nutritionist reader. I would support some of the more technical aspects of this material moving to supplemental material, provided it was well flagged in the text and easily accessible to the reader.
4. The phrase in the introduction "The inclusion of the meal type as another level of variation increases total intake variation" is liable to misinterpretation. How you look at the diet does not change how varied an individual's diet is. I think what is meant is that if we do not take the hierarchical nature of the data into account, i.e. meals within days within people, then we *under-estimate* that variation. So "ignoring meal type as another level of variation in the model underestimates the total variation in dietary intake" might be a better way to say this.

5. N=814 is quite a small sample in nutrition epidemiology, but with 3 recalls per person, this would appear to be a good resource on which to base this work. Presumably confidence intervals are narrow enough to draw conclusions, but we have not been shown the confidence intervals.

6. Please check journal guidelines about whether to present total energy intake as kcal or kJ or both.

7. I'm not sold on using the Pratt Index to indicate the relative importance of variables, in the same way as the R-squared explained does not encapsulate everything about what makes an important covariate. However, I see no better approach here. Maybe the authors could include a brief discussion of the strengths and weaknesses of this measure?

Future research suggestions:

8. There is much current concern about measurement error in nutrition epidemiology. You take into account random error through the model, but could the measurement model be extended to include participant characteristics such as gender or BMI?

9. I was interested by the exploration of estimated total energy expenditure to explore misreporting by meal type. It might be possible to explore this further using some of the recovery biomarkers available to EPIC Potsdam. This would require some thought, as many of the biomarkers reflect a longer time period than covered by a single meal.
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