Reviewer's report

Title: Age-Period-Cohort Analysis for Trends in Body Mass Index in Ireland

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Reviewer: Brad Metcalf

Reviewer's report:

This is a well written manuscript that uses partial least squares (PLS) to estimate the separate effects of age, period and cohort on the BMI of subjects measured in the ‘Surveys of Lifestyle, Attitudes and Nutrition’ - Republic of Ireland. The PLS approach, unlike standard regression techniques, overcomes the issue of collinearity between age, period and cohort (ie. period = age + cohort). I have no major comments relating to this manuscript but I do have several suggestions which I believe will improve the paper and which may help the reader understand the results.

Major Compulsory Revisions:
None

Minor Essential Revisions:
None

Discretionary Revisions:

Comments relating to the analysis and results:

1 - The paragraph that describes the data analysis needs further explanation to help the reader understand what is done and why. Two of the authors were involved in a similar paper published in PLoS-One (Tu 2011) and I think that some of the explanation regarding PLS in that paper could be added to the main text of the current manuscript rather than the supplemental file. For example, the following lines and formulas lifted from the supplemental file explain very clearly how the PLS coefficients are calculated for each of the three variables from a 2-component model:

“Having obtained the coefficients for the PLS components, it is necessary to recover the coefficients for the original predictor variables. For example, suppose we take the full 2-component model in our analysis of BMI, we would obtain the following:

BMI = B1t1 + B2t2
= B1(w11Age + w12Period + w13Cohort) + B2(w21Age = w22Period + w23Cohort)
= (B1w11 + B2w21)Age + (B1w12 + B2w22) Period + (B1w13 + B2w23)Cohort

with B1 and B2 being the estimated coefficients for the 1st and 2nd PLS components respectively. We can therefore, extract the separate regression coefficients for Age, for instance, to be B1w11 + B2w21 via simple algebraic manipulation” ---- (Please note that formatting failed to copy across - B should be the beta character, numbers should be subscript)

2 - It may actually be useful to report the weightings within each component too, this may help the reader understand why the coefficients for ‘Period’ almost doubles in the model that contains two components compared to the one-component model (males: 0.039 to 0.079, females: 0.055 to 0.1023)

3 - The authors fitted loess curves to the data to identify curvilinear effects, perhaps it would help the reader to explain what loess (local regression) does and why it was used in preference to the alternatives. The curvilinear associations in Figure 1 appear to be relatively simple curves which could be described by quadratic terms (perhaps a 3rd order polynomial for ‘Cohort–Women’). Could the authors please explain, though not necessarily in the manuscript, why they did not fit a quadratic term or attempt to fit cubic splines as in the ‘Tu 2011’ paper. While these alternative approaches may not be as easy to interpret as the loess curve, they may have explained a greater proportion of the variation.

4 - It is not clear what proportion of the subjects were born in what decade or were of a particular age. Perhaps a table could be inserted early on in the results to indicate the n(%) of subjects born between 1930-40, 1940-50 … 1980-90 and n(%) who were aged 18-30y, 30-40y …. 70-75y.

Other comment:

4 - The authors speculate that the age-related decline in BMI after the age of 60y was a due to the fact that many people with very high levels of BMI may die prematurely. While this may explain some of the decline there may also be a real age-related fall in BMI due to a fall in muscle mass. Is there longitudinal data on elderly people that can be referenced to support an age–related loss of bodyfat or muscle.

Level of interest: An article of importance in its field

Quality of written English: Acceptable

Statistical review: Yes, and I have assessed the statistics in my report.