Author's response to reviews

Title: Socioeconomic position and allostatic load: Evidence from the West of Scotland Twenty-07 cohort study

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Author's response to reviews: see over
Dear Dr Bosma,

We would like to thank you again for your time, consideration and constructive comments on our paper submitted for publication in BMC Public Health. Please find below responses to your comments. All references to pages/paragraphs relate to the ‘tracked changes’ version of the manuscript.

We thank you for your time and look forward to hearing from you.

Yours sincerely,

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1. Supplementary Table 3: should there not be more constraints in the Constraints column. Should there not be all interactions fixed at zero (for accumulation) and all interactions fixed at zero + two other SEP measures fixed at zero too (for critical period) and all other interactions fixed at zero (for social mobility) and all effects fixed at zero (for no effect model)? The current constraints (for social mobility) might need a footnote for a brief explanation. Change $\beta_1$ to $\beta_1 (subscript)$ etc. etc and why use the somewhat uncommon theta12 for the coefficient for the interaction and why not $\beta_4 (subscript)$ etc. etc.? Holds for whole table.

We have edited Supplementary Table 3 to reflect the constraints for each model and edited the notations to reflect a simpler and clearer format. Please find this updated table at the end of the manuscript (p.23) and below:

**Supplementary Table 3**  Model specifications (Adapted from Mishra et al., 2009 and Murray et al., 2011)

<table>
<thead>
<tr>
<th>Model</th>
<th>Lifecourse model specification</th>
<th>Constraints</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saturated</td>
<td>$\alpha + \beta_1 + \beta_2 + \beta_3 + \beta_{12} + \beta_{23} + \beta_{13}$</td>
<td>$\beta_{12} = \beta_{23} = \beta_{13} = \beta_{123} = 0$</td>
</tr>
</tbody>
</table>

1a) Accumulation
- Strict $\alpha + \beta_1 + \beta_2 + \beta_3$
- Relaxed $\alpha + \beta_1 + \beta_2 + \beta_3$

1b) Critical Period
- Childhood $\alpha + \beta_1$
- Transition to Adulthood $\alpha + \beta_2$
- Adulthood $\alpha + \beta_3$

1c) Social Mobility
- Early $\alpha + \beta_1 + \beta_2 + \beta_{12}$
- Adult $\alpha + \beta_2 + \beta_3 + \beta_{23}$

No Effect $\alpha$

Where $\alpha$ = constant/intercept; $\beta$ = regression coefficient / slope; 1 = SEP_1; 2 = SEP_2; 3 = SEP_3

* Early mobility = $\alpha + \text{upward mobility} + \text{downward mobility}$
  = $\alpha + \beta_1(1-\beta_1) + \beta_2(1-\beta_2)$
  = $\alpha + \beta_1 + \beta_2 - (\beta_1 + \beta_2)$

* Adult mobility = $\alpha + \text{upward mobility} + \text{downward mobility}$
  = $\alpha + \beta_2(1-\beta_2) + \beta_3(1-\beta_3)$
  = $\alpha + \beta_2 + \beta_3 - (\beta_2 + \beta_3)$

2. In Text on page 8, last lines of first paragraph: for social mobility, the comparison apparently is with "those showing stable SEP" (high and low combined). Is that so? Normal product-terms for interaction terms would allow allostatic load scores for all four cells of the combination of the two SEP measures (so also differentiating between stable high and stable low SEP) (and making stable high SEP the reference group). This should be clarified.
This sentence should read:

“Only upward and downward mobility are considered, with the assumption that upward mobility will be associated with lower allostatic load and downward mobility with higher allostatic load compared to those showing stable SEP, such that those who remain in a manual social class at both life-stages have equal expected means to those who remain in a non-manual social class at both time points (equal to the constant in the regression model).”

3. In Text on page 7, last line: "each SEP life-stage is considered to have an independent relationship with allostatic load, irrespective of SEP at other life-stages." It is not clear how this then differs from the accumulation model (if "each SEP-stage" is "independently" related to the outcome). The next sentence "This is estimated by constraining two of the three SEP measures to equal zero" is clear though, but the authors should think about reformulating the previous sentence and adding the constraints in Supplementary Table 3 (see also previous comment). Check rest of paper for similarly confusing formulation when reporting on critical period model, for example Table 1 too. Fixing the other SEP measures at zero is the issue (at least if I understand correctly now), not independence of the other SEP measures.

We have edited this description of the critical periods model on page 7 to now read:

“For the critical period model, each SEP life-stage is considered separately for its relationship with allostatic load. This is estimated in the models by constraining the other two of the three SEP measures to equal zero. This is repeated for each of the three life-stages in turn.”

We have also edited Table 1 to also reflect this and improve clarity:

Critical Period Model: “Assumes that SEP at specific life-stages will be associated with allostatic load, irrespective of SEP at other life-stages. These effects can be modelled by analysing each of the SEP measures of interest (childhood, the transition to adulthood or adulthood SEP) in turn, while constraining the other two life-stages to be zero.”