Reviewer's report

Title: Development of a Canadian Socioeconomic Status Index for Environmental Health

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Reviewer: Anne Peasey

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This was an interesting paper, that set out to develop a more sensitive measure of SES than the indices currently used in Canada, while at the same time building of the previous work. The development of the index was thorough, however I have a number of comments, some relating to the validation of the index which I have set out below. Since there are a number of major revisions being requested, these need to be addressed before a decision on published can be reached.

- Major Compulsory Revisions. The author must respond to these before a decision on publication can be reached.

1. The word ‘health’ or the rough equivalent is used in many places throughout the manuscript but this terminology needs to be defined more succinctly. For example, in the title it is environmental health (line 1), in the abstract it is children’s health (line 23) and then later pregnancy outcomes, then line 72 refers again to child health, line 87 is more general and says health outcomes and in line 143 “birth outcomes. I would recommend changing most of these to health, and then for the validation sections of text state “birth outcomes” because at present the focus is unclear.

2. Line 72: what is the project on mapping environmental factors and child health? While I am sure the authors are familiar with the context of the paper, the read will not be familiar. The start of this paragraph should be reworded. I would suggest deleting lines 72 and 73, and beginning the paragraph with “Environmental stressors such as …”.

3. Line 87-91: reword the lines “We provide an example of how to develop an SES index …. We created a novel index …” These sentences should set out what the paper plans to do, not summarise what the paper achieves – that should be in discussion and/or conclusions e.g. line 226 onwards.

4. Line 143-150: unless I have misunderstood there is a fundamental flaw in the time line or temporality in this paper. The authors are attempting to validate the new index by examining the association between birth outcomes in the period 1999-2008 and the SES index from 2006. While some of the births will have occurred after the 2006 census, most of the births are likely to pre-date the
census data, and some by as much as 7 years. This would seem to makes it impossible to use this outcome data to validate the index by, as the authors state, examining “the well-researched concept that low SES may be related to adverse birth outcomes” (line144-145).

A correct validation would require the authors to limit the analysis to data on singletons from 2006-2008, or find a more recent set of pregnancy outcomes, or alternatively use a previous census to construct the SES index.

Or have the authors assumed that these SES measures have been fairly static over the period, and so assessment of the association is valid with the data presented? Is there evidence to support this? There is no mention in the discussion of these critical assumptions nor the evidence. This point must be appropriately addressed before the paper can be considered for publication.

5. Line 152: add detail concerning the statistical methods / tests used to assess the association between SES index and concentration of particulate matter.

6. Line 152: here, as in point 4, it is not clear what came first, the SES data or the particulate concentrations. Is it appropriate to look at the association between these two if there is up to 7 years separating the data?

7. Line 160: please modify this section so that it describes the statistical method / test used to compare the association between the new SES and the Pampalon index, and the outcomes of interest. Current it only describes the variables in the Pampalon index.

8. Line 229-231: it is stated “it is novel in that we …” but there was no mention in the results section of the contribution of “age of homes” nor the importance of “cultural identities”. The manuscript returns to same topic in lines 236-247. The authors must add results to support these statements to the results section, and then discuss in the Discussion.

9. Line 231-234: while it is adequately argued by the authors that a single scale such as the new Index proposed here could be beneficial, it is important to also present the downside i.e. the potential shortcomings of the index and also of the paper in general. This is lacking from the paper at present and should be added. For example, while for the purposes of mapping pollution, SES and health a single index could be useful, for the purposes of public health policy and intervention, the Pampalon index would enable independent consideration of social and material deprivation.

10. Line 249: “Cultural differences were strongly evident with our SES index” – please add results to support this statement to the results section.

11. Line 285 and other places in the manuscript where there is reference to comparing the association between the new Index and adverse birth outcomes, and the Pampalon index and adverse birth outcomes – as discussed above in point 4, there is potentially a major flaw in using singleton data from before the 2006 census to compare the performance of the two indexes.
12. There is no section on the limitations of the paper. This section must be added to the discussion.

- Minor Essential Revisions
1. Line 30: make it clear that time period for birth outcomes is 1999-2008 and PM2.5 exposures during pregnancy.
2. Line 34: make clear that normal at country level not DA level
3. Line 58-62: Reword slightly “….. using Census 2006 data. [7] Four deprivation criteria: residential instability, material deprivation, dependency and ethnic concentration were defined and inequalities in 18 health and behavioural problems from the Canadian Community Health Survey (CCHS) reported.[7]”
5. Line 100: replace “We investigated these data for all of Canada’s dissemination areas …” with “These data cover all of Canada’s dissemination areas …”
6. Line 105: “A set of 22 variables FROM THE 2006 CENSUS was selected …”
7. Line 271: Replace “Another consideration …” with “Another explanation…”
8. Line 283-284: correct the grammar. Change “and” for “with”
9. Line 456: Please state the data source for these variables
10. Figure 1: The provinces needs to be explained eg footnote.
11. Figure 1: The zero is missing from the y-axis label for 0.00
12. Figure 1: Change y-axis to 1 decimal place
13. Figure 2-5: maybe present on a single page these 4 figures.
14. Add descriptive table of general characteristics of singleton births and all birth outcomes in Edmonton
15. Supplement 1 to 4: add footnote for all Canadian provinces.

- Discretionary Revisions
These are recommendations for improvement which the author can choose to ignore. For example clarifications, data that would be useful but not essential.
1. Line 55: maybe you could refer to more recent deprivation indices such as IMD2010.
2. Line 64: change the word “utilization” for “value”
3. Line 67-70 : it is not clear which index is referred to when you say “This index only included …”. Please reword. “The Pampalon index only included … “
4. Lines 87-91 – some of this text is really well written, instead of being deleted this text could be moved to the conclusion (line 297)
5. Lines 300-303: this is a quite narrow conclusion. If properly validated, then this
new index has the potential to enable a better assessment of SES inequalities in a variety of health outcomes in Canada at DA level, including those in environmental health.

**Level of interest:** An article whose findings are important to those with closely related research interests

**Quality of written English:** Needs some language corrections before being published

**Statistical review:** No, the manuscript does not need to be seen by a statistician.

**Declaration of competing interests:**

I declare that I have no competing interests