Reviewer's report

Title: Intelligence gain and social cost savings attributable to environmental lead exposure reduction strategies since the year 2000 in Flanders, Belgium

Version: 0 Date: 31 Aug 2019

Reviewer: Martine Bellanger

Reviewer's report:

Review the title. First, using societal costs might be misleading for the reader who would expect more than the current estimates. Only productivity loss due to IQ decrease was included in the calculation, I would rather use social costs (even only partial social costs were estimated, as the authors discussed in the manuscript). Second, why the authors did not use Flanders region in Belgium? West (or Western?) EU region, might not be precise enough.

2) Background

I find that section as a mix of background and methods, since population studied is partially included in that section. This results in very short "background" per se. It will be all the more relevant to explicitly show some lead exposure findings in other European countries, with the same strategies implemented. The authors should then explain the importance such a study on adolescent exposures and economic evaluation of prevention, when lead can be associated with other factors, such as socio-economic status, smoking and other environmental factors. Lines 38 to 57: some of the population studied should be moved within the method section, this will avoid some redundancy.
Methods

Some improvements are required. See below for more details.

3) I understand that "detailed information on the selection of the study population and recruitment (...) has been described elsewhere, lines 44-46. However, it would be much easier for the reader to have some of that information, for instance sampling weights, and adjustments made. Only couple of additional lines will be sufficient.

4) I found the text in lines 19 and 59 pretty confusing. Your choice of Lanphear et al (2005) study should be more straightforward. For instance, a loss of 1.9 IQ points was associated with an increase from 10 to 20 µg/dL, so that not all children with a blood lead level greater than 10 would be expected to incur such a loss, as you stated further based on your Figure 1.

Line 4-5, page 11 the findings from Figure 1, were based on your estimates? For the last interval, as shown in Figure 1, I would suggest to write 20 µg/dL and 30 µg/dL, instead of ≥ 20 µg/dL.

In the following paragraph lines 25 to 41, you refer to Gilbert and Weiss' argument in 2006, of using a 2 µg/dL level for action. At that level, since it is below 10µg/dL, did you use a linear relationship or a log linear relationship?

Lines 39-40, why did you estimate the IQ loss per 100,000, this is a bit confusing. Do you mean for a population of 100,000 individuals, to make uniformed your different sampled populations?

Perhaps the 5.4 paragraph could be revised to make it clearer. You'll adjust the result section accordingly (see below)

5) Page 10: lines 25-26, what do you mean by "a clear dose-response relationship has been demonstrated from 2 µg/dL onwards, we estimated IQ loss to BLL above this threshold". You did no longer differentiate based on different sub-levels, as based on Figure 1?

6) Assuming a non-economist reader, I would suggest to be more explicit in the economic estimates of IQ loss. What do you mean by a "Belgian estimate" of the lifetime value of a one IQ point"? Did you adjust for Purchaser power parity (PPP) for Belgium? It is not clear for which year your estimates were made. I would suggest to use a recent year and update for inflation the 2008 value, and state it is a present value.

Overall, I would recommend to write a specific paragraph on the economic estimates since your study wants to show the economic saving associated with the reduction of lead exposure on adolescents. Explain what costs are included, how they were estimated, and what costs were not included and the reasons of doing so. This would prevent you to refer to methods in the results or in the discussion sections (see Lines 2 to 21 page 15 in the discussion)
7) Results of great interest were found. But, again, I find the text in lines 19 to 49 not easy to read. Results should be presented as results, and not as mix of methods and results. Since Table 1 will be included in the text, the reader will have the findings, so it might not be necessary to repeat information from Table 1, extensively. Overall the result section has to be revised and summarized. For instance, there is no need to "repeat during the second sampling (line 33) and line 40, during the third sampling, just refer to the first, second and third samples.

8) Line 53, the sentence should be in the method section if not in the section yet. In the result section, the reader should have the results of the simulation that are presented in Table 2. Also check the consistency of the simulation period are 2015 to 2029 line 56-58 and 2014 - 2027 line 7 on the following page.

9) Table 2 see title of col BLL ≥2 , this should be proportion of population?

10): It would be helpful if the authors could lead the reader through the Tables 1 and 2, clarifying how the various calculations were carried out. This could be done in a footnote.

11) Discussion:

The results of the study should be summarized (lines 3 to 27)

12) The added value of the study should be introduced.

13) As above mentioned, lines 2 to 21 should be better placed in a specific paragraph in the method section. And in the discussion, it would be good to emphasize that the authors have only considered a subset of societal costs that are the most important part of costs in this type of estimates. And maybe authors could refer to studies where those other costs were estimated, to discuss their own results that are conservative. Also, using IQ value has some limitation that authors should report.

14) Line 28, page 16, I totally agree with the authors, he difference in BLL between children and adolescents have to be taken into account in the estimates. Would this be possible to show how, even no precision model between the two populations is apparently available.

Minor edits among many other typos not reported below

Some quotation marks appear in the manuscript for instance

Abstract : line 35
Background: line 8

Background: Line 18-19 to be revised

Study population: Line 41 3th year should be replaced by 3rd year.

Estimation of IQ loss, line 42, check the use of duplication, I would suggest a doubling

Page 11: For each period the IQ loss and and economic loss (...) were calculated instead of was

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