Reviewer’s report

Title: Long-term exposure to air pollution and hospitalization for dementia

Version: 0 Date: 25 Apr 2019

Reviewer: Perry Hystad

Reviewer's report:

This article addresses an important question - the influence of long-term air pollution exposure and dementia. Unfortunately, the research conclusions are not clear due to the use of dementia hospitalization as the outcome ascertainment method. The authors should be commended for clearly stating the limitations of this outcome (which are substantial), but thorough analyses are also needed exploring these limitation before the article's main analysis results can be interpreted with any confidence.

* The protective effect of air pollution for Alzheimers disease and senile dementia is likely driven by confounding factors. These same factors likely influence the vascular dementia results. Sensitivity analyses are needed to examine the robustness of these results. These could include a fixed effect for neighborhoods, more urbanicity measures (e.g. density, urban core, suburban place of residence), map of model residuals and Moran's I, etc. If the authors can show what is driving these disparate results the main conclusions of the paper could be interpreted with confidence.

* Unadjusted models should be shown in the supplement to inform residual confounding concerns.

* A much more nuanced conclusion is needed given the major uncertainties with the outcome assessment. The use of hospitalizations to identify dementia cases (and all limitations) should be introduced in the methods section and analyses conducted to explore the impact of these limitations on results.

Level of interest
Please indicate how interesting you found the manuscript:

An article of importance in its field

Quality of written English
Please indicate the quality of language in the manuscript:

Acceptable
Declaration of competing interests
Please complete a declaration of competing interests, considering the following questions:

1. Have you in the past five years received reimbursements, fees, funding, or salary from an organisation that may in any way gain or lose financially from the publication of this manuscript, either now or in the future?

2. Do you hold any stocks or shares in an organisation that may in any way gain or lose financially from the publication of this manuscript, either now or in the future?

3. Do you hold or are you currently applying for any patents relating to the content of the manuscript?

4. Have you received reimbursements, fees, funding, or salary from an organization that holds or has applied for patents relating to the content of the manuscript?

5. Do you have any other financial competing interests?

6. Do you have any non-financial competing interests in relation to this paper?

If you can answer no to all of the above, write 'I declare that I have no competing interests' below. If your reply is yes to any, please give details below.

I declare that I have no competing interests

I agree to the open peer review policy of the journal. I understand that my name will be included on my report to the authors and, if the manuscript is accepted for publication, my named report including any attachments I upload will be posted on the website along with the authors' responses. I agree for my report to be made available under an Open Access Creative Commons CC-BY license (http://creativecommons.org/licenses/by/4.0/). I understand that any comments which I do not wish to be included in my named report can be included as confidential comments to the editors, which will not be published.

I agree to the open peer review policy of the journal