Reviewer's report

Title: Hourly Differences in Air Pollution and Risk of Respiratory Disease: a time-stratified case-crossover study

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Reviewer: David Stieb

Reviewer's report:

This is a well written paper describing a case-crossover study of air pollution and ambulance calls for respiratory conditions among the elderly. The methodology appears to be sound and the paper adds to the literature by considering associations on an hourly rather than daily time scale which has been employed in most other studies.

Major compulsory revisions:

1. Most of the reported associations are not statistically significant. The authors should acknowledge that because of the large number of hypothesis tests, the small number of significant associations could be due to chance alone, or provide a rationale for why they believe this is not the case. Their hypothesis might also be more efficiently addressed employing a distributed lag model.

2. The weekly number of influenza cases is included as a covariate, while it is also an outcome variable in the pneumonia and influenza models. Consensus is lacking on whether it is necessary to control for influenza epidemics in studies of short term associations with air pollution. In this case, it would be reasonable at least to conduct a sensitivity analysis without weekly influenza cases as a covariate.

Minor essential revisions:

3. Although a previous paper is cited regarding the basis for number of df in natural splines for temperature and humidity, the authors should still provide a brief explanation.

4. In table 1, influenza and pneumonia together account for just over 50% of visits. It would be helpful to include percentage figures other specific conditions accounting for the remaining 40+ percent of visits.

Discretionary revisions:

5. Consider moving the description of city (population etc.) to the beginning of the data section.

6. There is considerable experimental evidence that high levels of SO2 cause adverse respiratory effects with a very short time lag (see WHO 2005 Air Quality Guidelines:
http://www.euro.who.int/__data/assets/pdf_file/0005/78638/E90038.pdf?ua=1), which could be considered consistent with their observation that SO2 exhibited associations on a shorter time-scale. The authors should consider citing this.

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

**Quality of written English:** Acceptable

**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.