Reviewer's report

Title: Impact of ambient air pollution on gestational age is modified by season in Sydney, Australia

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Reviewer: Craig Hansen

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General
This article investigates the link between ambient air pollution and preterm delivery (PTD) in Sydney, Australia and adds information to this relatively new and developing area of research. Therefore this research manuscript is certainly warranted. The research question is well defined and the methods are appropriate.

A strength of this research is that the analyses control for many maternal and seasonal factors, including meteorological factors such as temperature and humidity. Very few previous studies have simultaneously controlled for both seasonal and meteorological factors, which I feel is important. Although the results are well presented, the many inconsistent results (e.g. adverse and protective effects) with the different exposure assessment methods and stratification by season need further discussion.

Major Compulsory Revisions (that the author must respond to before a decision on publication can be reached)

1. It is stated that there was a significant reduction in the risk of PTD if conception occurred in spring compared to summer. Due to the different lengths of gestation it would be beneficial to report if there was a significant association between PTD and season of birth. Season of conception assumes something occurred early in pregnancy to induce PTD at a later time, whereas season of birth assumes something closer to the time of delivery induced PTD.

2. As this is one of the few studies that have controlled for temperature and humidity, it would be interesting to know if these variables were significant in the models as the effect of temperature on PTD is worthy of brief discussion.

3. In the main analyses PM10, O3 and SO2 showed an adverse association with PTD, however, this was only for the 5km exposures with most of these effects being protective for the Sydney exposures – there is no major discussion as to why this may have occurred, especially for O3 and SO2 because the effects are so high.

4. For the 5km exposures O3 during month one of gestation showed a 60% increase in the risk of PTD (for a one unit increase in O3) – this is extremely high compared to all other studies and it needs some discussion. Furthermore, it is interesting to note that when averaged over trimester one the effect becomes protective. With such a large effect for O3 during month one you would expect the effect to persist when averaged over trimester one (therefore I assume there must have been very strong protective effects specifically for months 2 and 3 for the result to go towards the null when averaged over trimester one). Given the result presented, you would therefore assume that the timing of the effect associated with O3 exposure is very specific to month one of gestation, this should be discussed. Is there a biological mechanism that could be related to this outcome?

5. SO2 levels are low for Sydney when compared to more industrialized cities, so it would be interesting to note why the 5km effects for SO2 in Sydney are so large compared to previous studies. The effect for SO2 among those conceived during autumn is extremely high and there is no discussion as to why. Furthermore, SO2 during trimester one is a protective factor for all of Sydney in Table 4, however, in Table 5 it becomes a strong adverse effect across almost all seasons (except summer). Is this really SO2 or some other associated factor? More discussion on this is warranted.

Minor Essential Revisions (such as missing labels on figures, or the wrong use of a term, which the author can be trusted to correct)
1. Metropolitan Sydney needs to be defined. For example, did the sample include births to women who resided within a particular geographical distance from the centre of Sydney, or within particular government areas within Sydney? What defines ‘metropolitan’?

2. The exposure assessment was also based on data from a monitoring site within 5km of the mothers’ residential postcode. For the postcode to be included, was the centroid of the postcode 5km from the monitoring site, or was the postcode included if the boundary of the postcode was within 5km of a monitoring site. I ask this because there could be large postal areas in the outer regions of a city – which also relates to comment number 1.

3. The third trimester is sometimes referred to as ‘third trimester’ and sometimes referred to as ‘3 months preceding birth’ - use one or the other to make it consistent.

4. Add ‘meteorological variables’ as one of the factors adjusted for in the footnote of Table 4.

5. Table 5. – There is a significant protective effect for SO2 in summer that is not highlighted (e.g. **). Were meteorological variables included in the analyses when stratified by season of conception?

6. When presenting odds ratios from other studies (p12) for comparison purposes I feel it is important to state the unit increase in the pollutant that the authors have used in the model, otherwise the size of the effect estimates being discussed can be slightly deceiving.

What next?: Accept after discretionary revisions

Level of interest: An article of importance in its field

Quality of written English: Acceptable

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