Reviewer's report

Title: Low birth weight and presence of fine particulate matter and carbon monoxide in the Brazilian Amazon: a population-based case-control

Version: 3
Date: 3 March 2014

Reviewer: Melanie Bannister-Tyrrell

Reviewer's report:

Major Compulsory Revisions

1. The study title describes the study design as a population-based case control study, which is inaccurate. The study is better described as a cohort study, as defined in the Methods.

2. The authors should incorporate discussion of a recent systematic review of the association between air pollution and low birth weight in nine countries into the introduction and conclusion: Dadvand et al, Maternal Exposure to Particulate Air Pollution and Term Birth Weight: A Multi-Country Evaluation of Effect and Heterogeneity. Environmental Health Perspectives 2013; 121(3): 267-373. Please also see previous publications by this consortium. This meta-analysis presents similar analyses to the current manuscript, by investigating low birth weight at term as the primary outcome and exposure to PM10 and PM2.5. throughout pregnancy and in each trimester and using maternal education as the primary measure of socioeconomic status. Discussion of how the submitted manuscript aligns with this international meta-analysis would strengthen the article.

3. The authors should provide data on the seasonality of biomass burning and seasonal variation in PM2.5 and CO, as several important confounders that have not been included in this study also vary seasonally. For example, malaria infection varies seasonally and is associated with low birth weight, similarly other infections and nutrition are also likely to vary seasonally and be associated with low birth weight. In the absence of data on these variables, at minimum the authors should include an indicator variable for season or month in the logistic regression model.

4. Air pollution due to other sources such as traffic-related emissions and domestic fuel stove use is also likely to be a confounder and may vary with temperature/season. The authors should clarify whether the modeled pollutant dispersion estimates the prevalence of all pollutants from all sources, or just the pollutants estimated to be emitted from biomass burning.

5. The authors state that the years 2004-2005 were periods of particularly intense biomass burning. Was there a large increase in biomass burning in 2004-2005 compared to 2002-2003, for example? To overcome several of the limitations in terms of seasonal confounding and air pollution due to traffic emissions, indoor fuel stoves and other sources, the authors could also
investigate the prevalence of low birth weight in the study municipalities in the years before the period of intense biomass burning, as a historical control period.

6. Categorisation of maternal education is inconsistent in the Methods and Results. In the Methods (5th paragraph), mother’s education is “categorized as up to three years of study and four years or more of study” – is this primary or secondary study? In the Results in text and in tables, mother’s education is classified as 0-7 years versus 8+ years. Is this primary or secondary study? The categorization must be consistent throughout.

7. Please provide more information on how exposure level was classified for each municipality. Does the CATT-BRAMS model output exposure levels for each town and city, or over a defined area? How were the exposure data allocated to women - based on primary residence or birth location?

8. The first paragraph of the results states that the prevalence of LBW was higher among male newborns, but the second paragraph and Table 2 shows that female newborns have higher odds of LBW. Please check.

9. Add numbers for each category in Table 2.

10. Discussion, paragraph 3: Explain why studies of the effects of air pollution on LBW are controversial in Brazil.

11. Report the stratum-specific estimates for the interaction between maternal age and pollutant exposure in a separate table, along with the overall p-values for interaction (not the stratum-specific p-values).

Minor Essential Revisions

1. Last sentence of first paragraph in Background: The second half of this sentence is misleading. “Pollutants released in the process of incomplete combustion” includes particles (PM10, PM2.5) as well as carbon monoxide (CO), not carbon dioxide (CO2). Particle pollutants (aerosols) have a cooling effect on the atmosphere, and carbon monoxide has very weak direct effects on atmospheric temperature. The products of incomplete combustion cause poor air quality but not rising temperatures – so delete the second half of the sentence after the comma.

2. Paragraph 4 of Background: The sentence “This is due mainly to the fact that there are no measurements of atmosphere pollutants”. What does this mean? Are there no stationary monitors in regions with high biomass burning? Please clarify this sentence to explain the lack of data more explicitly.

3. Second paragraph of methods: Replace the words ‘specific coefficients’ with ‘variables’.

4. Throughout methods and results: Replace ‘bivariate’ with ‘univariable’ and ‘multivariate’ with ‘multivariable’ as these are the more accurate statistical terms (occurs several times).

5. Paragraph 8 of methods: Replace ‘chi-squares’ with ‘chi squared tests’.

6. Paragraph 8 of methods: Authors state that the variable ‘type of delivery’ was not included in the adjusted model but results for ‘type of delivery’ are presented
in Table 2.

7. Paragraph 9 of method: The authors state “We were able to use this method (logistic regression) because the outcome is a rare event...”. This isn’t true – what you mean is that when the outcome is a rare event, the odds ratio approximates the risk ratio. Also delete the following sentence (“Also, there is evidence if similarity between prevalence ratios and odds ratios in bivariate analysis”).

8. Second paragraph of Results, last sentence – “In the adjusted analysis, only the number of prenatal visits was associated with LBW (NOT “with statistical significance”)

9. Identify the reference category of PM2.5 or CO exposure that was used in the model producing the adjusted results for Table 2, in text and in the Table information.

Discretionary revisions

1. Last paragraph of methods: the sentence ‘Interaction terms we used were...’ is unnecessary and may be deleted, as the interaction is sufficiently described in the previous sentence.

2. Last line of Methods - the plural for software is not softwares – perhaps say ‘software packages’ or just ‘software’.

3. First paragraph of Results – it is confusing to read the prevalence of LBW was 3.1% and then read that among pregnancies of mothers with 8-11 years of education it is 39.9%. It would be better to give absolute prevalence percentages in the different groups.

4. Second paragraph of Results – delete “we noticed that” and just state that in univariable analysis (see point 4 of minor essential revisions) LBW was associated with...

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

**Quality of written English:** Acceptable

**Statistical review:** Yes, and I have assessed the statistics in my report.

**Declaration of competing interests:**

I declare that I have no competing interests