Author’s response to reviews

Title: Risk Assessment of PM2.5 to Child Residents in Brazilian Amazon Region with Biofuel Production

Authors:

Beatriz FA Oliveira (beatrizenf@gmail.com)
Eliane Ignotti (eignotti@uol.com.br)
Paulo Artaxo (artaxo@if.usp.br)
Paulo HN Saldiva (pepino@usp.br)
Washington L Junger (wjunger@ims.uerj.br)
Sandra Hacon (sandrahacon@gmail.com)

Version: 2 Date: 28 July 2012

Author’s response to reviews: see over

Dear Philippe Grandjean,

We have read and considered the suggestions of the reviewers and have made the appropriate adjustments and explanations. We appreciate the comments from the three peer reviewers and found that their suggestions were able to strengthen our manuscript. Concerns of the reviewers were addressed below (in red).

Thank you again for your time and consideration,

In case of any questions please do not hesitate to contact us anytime.

The corresponding author is:
Beatriz Fátima Alves de Oliveira
Public Health and Environment Post-graduation, National School of Public Health at Oswaldo Cruz Foundation
Sampaio Ferraz, 08, Estácio, Rio de Janeiro, Brazil
Phone: (21) 2137-9668
E-mail: beatrizenf@gmail.com

Best wishes,

Beatriz Fátima Alves de Oliveira
Reviewer's report

Title: Risk Assessment of PM2.5 to Children residents in Brazilian Amazon Region with Biofuel Production

Version: 1 Date: 1 May 2012

Reviewer: Jonathan Samet

Reviewer's report:

Major comments:
1) This is an assessment of largely local interest and of value for risk management in Brazil. What are the more general "lessons learned"?

   Although our study describes local health effects, we feel it is important to know the adverse consequences at the site of production of biofuels, one of the global alternatives of mitigation of GHG. (Similar to the local importance of oil spills at the Gulf of Mexico for globally employed petroleum-derived fuels). While these studies have a local interest including the neighboring countries that are affected, as well, these emissions in the Amazon contribute to the global climate, including GHG.

2) The diesel RfC comes from animal inhalation research and is based on the outcome of pulmonary inflammation and histopathology. What is the relevance to asthma?

   The diesel RfC is a variable in factoring risk for exposed populations. The diesel RfC remains a constant value for all those exposed, while asthmatics were one of the groups that we stratified in the analysis. Asthmatics were looked at more closely as they are commonly considered a more vulnerable subgroup in exposure to air pollution.

3) Paper not clearly written.

   A native English-speaking consultant who works specifically with revision of manuscripts reviewed the paper.
Specific comments:

1) Page 3, "In this study, we apply the Risk Assessment Methodology to evaluate the intake and toxicological risk of PM2.5 in children and adolescents..."
   -- Need a reference for the risk assessment approach here.
   
   According to recommendations of reviewer 1, the reference was inserted.

2) Page 4, paragraph 1 under Study Design, "...adapting to measure the local exposure to PM2.5 in regions of elevated biomass burning."
   -- This is not clear.
   
   We added two lines to further clarify this point:
   
   “We utilized the ratio of PM2.5/PM10 to calculate the PM2.5 values from the real time PM10 values. The questionnaires were utilized to factor in the local characteristics of the population to have a more accurate assessment.”

3) Page 4, paragraph 2 under Area and population of study
   -- More information is needed. What was the response rate? Provide a table describing the characteristics of the sample.
   
   The study population consisted of a random sample of 221 children aged 6 to 14, who were participants in a pulmonary function study. The initial study sample of pulmonary function was 234 children. We included only those that responded to the semi-structured questionnaire. However, the response rate of the study was 95%. (This was included in text along with a table with the sample characteristics.)

4) Page 5, paragraph 2, "For both exposure scenarios, the probabilistic model was used to assess *exposure*..."
   -- No. *dose*.
   
   The correction was made.

5) Page 5, description under "CA=concentration of PM2.5"
   -- How measured? Proximity to residences/schools of the sample?
The following text was inserted into the manuscript:

“The average daily concentrations of $PM_{2.5}$ were measured at the air quality monitoring station of the University of Mato Grosso (UNEMAT/Tangara da Serra). This monitoring station is located in a radius of 5 km of the selected neighborhoods. Previous studies demonstrate that there is no significant difference in pollution levels within a 5-kilometer radius due to hotspots and dispersion (Freitas et al., 2005). The PM$_{10}$ measurements were measured from the Tapered Element Oscillating Monitor (TEOM). The sampling device consisted of a stacked filter unit (SFU), which separates the aerosol into coarse and fine size fraction. The filter materials used were 8-$\mu$m pore size and 0.4 $\mu$m pore size polycarbonate filters for the coarse and fine size fractions, respectively. In this study, the daily concentrations of PM were equivalent to the daily ratio of $PM_{2.5}/PM_{10}$, which was applied, in the real-time measurements of $PM_{10}$ (TEOM).”

6) Page 6, description under “RfD=Reference dose"

-- This is very problematic.

We see this as a limitation of the study but also currently in the area of study of PM$_{2.5}$ air pollution research. Thus all research in this area evaluating risk is limited in the same fashion; however we find that it is well within reason to utilize the diesel reference dose for PM$_{2.5}$. I have included an expert of reference of Integrated Risk Information System (IRIS/USEPA) to include the dose reference dose for PM$_{2.5}$:

"It also should be noted that diesel particles make up a portion of ambient particulate matter (PM). U.S. EPA has established an annual National Ambient Air Quality Standard (NAAQS) for fine particulate matter (PM$_{2.5}$), to provide protection against adverse health effects associated with both long- and short-term exposures to ambient fine PM. DPM is a typical constituent of ambient fine PM, generally about 6-10% of PM$_{2.5}$ with some examples up to 36% (U.S. EPA, 1996a, 1996b). Given the similarity of health concerns for respiratory inflammation and pulmonary health effects from both DPM and fine particles, it is reasonable to expect that DPM contributes to some of the health effects associated with PM$_{2.5}$. Current knowledge is insufficient, however, to describe
the relative potencies of DPM and the other components of PM$_{2.5}$. As long as the percentage of DPM to total ambient PM$_{2.5}$ remains in similar proportion, protective levels for PM$_{2.5}$ would be expected to offer a measure of protection from effects associated with DPM."

**Level of interest:** An article of limited interest

**Quality of written English:** Needs some language corrections before being published

**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.

---

**Reviewer's report**

**Title:** Risk Assessment of PM2.5 to Children residents in Brazilian Amazon Region with Biofuel Production

**Version:** 1  **Date:** 17 May 2012

**Reviewer:** Raúl Venancio RVD Díaz Godoy

**Reviewer's report:**
These are recommendations for improvement which the author can choose to ignore. For example clarifications, data that would be useful but not essential.

This is a carefully written paper on an important topic of world interest, of principal importance for Brazil, since this one was ranked having the most negative impact in natural forest loss on the planet, third in habitat conversion
and fertilizer use, fourth in threatened species and carbon emissions and eighth in water pollution. In this study, the authors apply the Risk Assessment methodology to evaluate the intake and toxicological risk of PM2.5 in children and adolescents in areas of high biomass burning of the Subequatorial Brazilian Amazon.

The authors solve the problem of the variables used for the calculation of the potential dose, across statistical models.

With a lack of consensus regarding the Reference Concentration (RfC) of PM2.5, the authors used the 5μg/m³ RfC of diesel particles (DPM) to calculate the reference dose to PM2.5 (RfD).

Other comments:

CI: Confidence Interval should be defined
   We inserted the abbreviations list. The correction was made.
SD: Standard Deviation should be defined
   We inserted the abbreviations list. The correction was made.

The year of study it is not mentioned in the text, only in the figures.
   Thank you for the correction. The study year was inserted in the "Study Design" section.

Level of interest: An exceptional article

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'
Reviewer's report

**Title:** Risk Assessment of PM2.5 to Children residents in Brazilian Amazon Region with Biofuel Production

**Version:** 1  **Date:** 5 May 2012

**Reviewer:** Fernando Diaz-Barriga

**Reviewer's report:**
The paper is a very interesting one, as the area of it remains as an important public health issue in many countries.

1. Is the question posed by the authors new and well defined?
   YES.

2. Are the methods appropriate and well described, and are sufficient details provided to replicate the work?
   YES.

3. Are the data sound and well controlled?
   My main concern is that the studied children were selected from a school that serves four district areas, whereas the air pollution levels were from a monitoring station located in the university. How far is the university from the school?

   The following text was inserted into the manuscript:
   “This monitoring station is located in a radius of 5 km of the selected neighborhoods. Previous studies demonstrate that there is no significant difference in pollution levels within a 5-kilometer radius due to hotspots and dispersion factors (Freitas et al., 2005).”

   The exposure time (4-8 hrs) is taking into account recreation outdoors after school time?
The exposure time represents the amount of time in which the children were at the school – 4 to 8 hours/day. They had at least 4 hours/day in the school to watch class (*the school conditions were without ventilation*). Moreover, we used the records of the panel study about the time spent of each child with outdoor physical activity. These values were in accordance with the EPA standards (US EPA, 2008). We tried to clarify this point throughout the text.

4. Does the manuscript adhere to the relevant standards for reporting and data deposition?
YES.

5. Are the discussion and conclusions well balanced and adequately supported by the data?

More discussion is needed to clarify why asthmatic children had a higher dose? (table 2).

In this study, the dose to the PM for asthmatics was influenced by individual characteristics as the inhalation rate, body weight and biological vulnerability. For instance, approximately 30% of children under 8 were asthmatic and showed a higher dose to the PM$_{2.5}$. We tried to clarify this point better throughout the text.

Also, more is needed around the issue of indoor air pollution related to indoor biomass combustion and how this issue was taken into account by the authors.

Thanks for mentioning this issue. We had information about the indoor air pollution in the questionnaires, but this variable was not statistically significant. The sources of indoor air pollution such as use of burning stove were reported by only 7% of children.

I do not agree that diesel particles are more toxic than those originated by biomass combustion, as these also have PAHs and other organics.

There is no consensus about this issue. Indeed, the particles originated by biomass burning have PAHs and other organics, but the concentrations are
lower when compared to particles emitted by diesel particles. In Brazil, a systematic review about the characteristics of air pollutants suggests that the exposure-response relationship between daily changes in PM aerosol and daily outcomes differ between Brazilian biomass burning areas and metropolitan areas in terms of time, duration and toxicity of particles (Oliveira et al., 2011). Higher concentrations of metals and HPAs were detected in metropolitan areas in comparison to the biomass burning regions.

6. Do the title and abstract accurately convey what has been found?
YES.

7. Is the writing acceptable?
YES.

**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.

**Declaration of competing interests:**
'I declare that I have no competing interests'.