

## **Author's response to reviews**

**Title:** Health impact assessment of particulate pollution in Tallinn using fine spatial resolution and modelling techniques

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**Author's response to reviews:** see over

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Journal Editorial

Dear Editorial Board of Environmental Health and reviewers,

We are re-submitting our paper “Health impact assessment of particulate pollution in Tallinn using fine spatial resolution and modelling techniques”.

We are really grateful to the reviewers for very helpful comments regarding the improvements in the paper. We believe it is now easier to understand, more clear and better quality.

Sincerely,

Hans Orru

## **The remarks and corrections are following:**

### **Reviewer's report (Michal Krzyzanowski):**

1) The estimation of the PM2.5 is not clear. How the authors included the background (regional) levels?

There was no reliable data about background levels of PM2.5. Some of the expert assumptions were as high as monitoring data (what is in reality impossible). PM2.5 is measured only in 1 place (Õismäe station) in Estonia.

The modeling was based only on emissions in Tallinn. This is also the reason, why modeling results are underestimated. We can presume that the remaining part is background.

2) The description of differences between the model and monitoring results should be better illustrated (with a figure?) then it is done on page 5/6 now.

The illustration is added as figure 2.

3) The selection of PM reference level (i.e. the level above which the impacts were calculated) is not clearly stated. There was data about reference levels on PM2.5.

We assume that part of the reference level is background. Other part is the minimal modelled value for areas outside the borders of Tallinn (0.42  $\mu\text{g}/\text{m}^3$ ), what was subtracted. However, as concentrations itself are quite low in Estonia, we cannot take as high reference level as in other studies.

4) The authors calculate the impacts of long term exposure for small administrative areas but use the RR from the ACS study (Pope et al 2002) which were based on mean pollution levels for large agglomerations. The authors should discuss in more detail the possible impact of this different approach. For example, they could calculate the impacts based on the (pop. weighted PM2.5 mean for the entire city).

More discussion regarding the possible impact of basing estimations on small administrative areas while using RR is added to the paper.

5) N.B. I have an impression that the number of premature deaths in the row "total" is just a sum of the numbers estimated for individual districts.

As:

- the data on baseline mortality was available only on city level, and it was divided by districts based on number of inhabitants

- and the exposure is calculated as population average;

the number is the same.

In the whole report of Tallinn HIA we calculated YLL in all 72 neighbourhoods separately. The sum of these YLL is 3860. The total number was calculated based on population-weighted exposure and total number of inhabitants – the YLL came 3859. It means that there was not a big difference.

Minor essential revisions:

The Background section contains a number of sentences which should be corrected:

- page 2, para. 5: References 11 and 12 quote the same analysis performed for CAFE. Also references 13 and 14 are referring to the same WHO analysis, but the estimate of 800,000 deaths refers to impacts of outdoor air pollution, and 3 million - to the sum of indoor and outdoor air pollution.

Reference [11] was deleted.

Reference [13] is still 800 000.

<http://ehs.sph.berkeley.edu/krsmith/publications/2005%20pubs/Cohen%20et%20al%20JTEH%20GBD-OAP.pdf>

The 3 million – as it is not absolutely clear, it will be deleted.

- Page 2, para 6: The reduction of life expectancy loss will result from
- implementation of the currently agreed policies related to the emission reductions - NOT from compliance with the air quality directive quoted.

Replaced

- Page 2, para 7, last sentence - the HIA does NOT confirm that air pollution has an important role in causing premature mortality; in fact it is teh ASSUMPTION of HIA.

Corrected

- Page 11, top paragraph - it should be made clear that the authors refer to a reference level used for HIA and not the "threshold" for effects of the pollution (which is not established - see WHO Air Quality Guidelines, WHO 2006, conclusions). The reference value is a matter of choice of the HIA authors, should be well justified and be in agreement with the HIA purpose.

Deleted

- Page 14, last para, sentence "The existence of a threshold value is still unclear..." should be deleted or the formulation from AQG should be used.

Deleted and replaced

- Discretionary revisions. Table 1 - should include the number of premature deaths /1000 and the loss of life expectancy in each district.

Added

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

Re-checked

Version: 1 Date: 6 June 2008

Reviewer: Ferran Ballester

Reviewer's report:

- The introduction is too long. In some bibliographical reference quoted, such as the one for Kunzli et al, almost the whole abstract of the article is transcribed.
- This introduction should be revised and reduced where possible.

The introduction was revised and reduced.

- In the introduction, at the end of page 2, authors state that “a number of HIA findings confirm that air pollution has an important ‘role’ in causing premature mortality”. By nature (they are not etiologic studies) HIA do not confirm causality, but they are more oriented to evaluate or estimate potential effects, applying the evidence from epidemiology and other areas of research.

The sentence was reformulated.

- Authors use standard methods from Apehis project and from WHO-Europe to perform HIA calculations. However, the threshold value for calculating excesses is not clear. Authors should clarify that. Also, when presenting health indicators at study, authors should present the indicators depending on short and long term exposure in a clearer way.

In regard of other reviewers comments, part of the threshold is background (which was indirectly taken into account) and other part is minimal modelled value for areas outside the borders of Tallinn (0.42 µg/m<sup>3</sup>) what was subtracted. However, as concentrations itself are quite low in Estonia, we cannot take as high reference level as in other studies.

- Exposure assessment data and methods are not well presented. First of all, authors should show the descriptives of the particulate air pollution levels from the 3 monitoring stations. Secondly, the

authors should indicate which is the temporal resolution of the sources of information used (traffic, heating data, etc).

- a) figure 2 was added
- b) temporal resolution was added

Thirdly, authors should show which indicator of error or difference they are using to validate the results of the PM modelled. How has the percentual difference of the measured and modelled PM 2.5 been calculated? Part of the collected information in this section should be included in results: levels of pollution in the three monitoring stations, validation of the PM modelled estimations,...

- a) Sentence improved, figure added
- b) Paragraph moved to results

On the other hand, the explanation of the calculus of the economic impact needs further clarification. Terms such as 'statistical value of life' and 'value of statistical life', are sometimes confused and therefore may lead to error.

According to the reviewer suggestion, the term 'statistical value of life' was substituted with more formal 'value of statistical life' throughout the paper.

I was surprised by the amount that the authors use to assess the cost of a day of work lost (10 €). I have looked for information and I have found that the average monthly net salary in Estonia is about 456 euro, which is undoubtedly very little compared to the developed countries, but is more than the authors established.

As the reviewer correctly stated in the comment, the average monthly net salary in Estonia in 2005 was over 400€ (412€ according The Statistical Service of Estonia) which gives us an average of 19€ per working day. However, the compensations of a workday in Estonia are calculated based on the salaries of the previous calendar year and can be up to 80% that salary. In addition to that the first day of a sick

leave is not compensated which all in all leads to an average 10€ compensation per lost workday in 2005.

In addition to previous - as stated in the methodology section of the paper the compensation of workdays was included in the calculation of the direct costs generated by the air pollution and not the indirect economic effect of workdays lost. The latter is already included in the estimations based on the years of life lost (YLL).

Regarding HIA results, Provided the difference in data for size and structure of the population of the different sections, the authors should present the results in the form of adjusted rates, and not as absolute numbers as in figure 2. This figure adds little since the highest number of YLL will be a function of the number of inhabitants of each section. On the contrary of what authors say in page 13, critical issues, end of the first paragraph, age structure plays an important role in mortality rates.

The figure 2 (now figure 3, as one extra figure was added) shows the absolute values and figure 3 (now figure 4) shows relative values. Age-structure was taken into account in calculations.

In the Conclusions section, at the end of the first paragraph, authors assign a different role in long and short term effects to the different PM, PM<sub>2,5</sub> and PM<sub>10</sub>, respectively. In my opinion, results from this study do not support this statement, which is here derived from the available relative risks, more than from tested epidemiological evidence.

Sentence improved

In the same section, second paragraph, authors propose informing people suffering from chronic diseases about the air quality in different regions. Are the authors proposing for a change in the address of these people? This could be little affordable from an individual point of view, and efforts should be directed to improve the situations in the more polluted sections.

Sentence specified

The authors should include a list of acronyms at the beginning of the manuscript to help in the understanding of some parts of the text (for instance: EHIF)

Comment to the editor – where the list of acronyms could fit?

AirQ – Air Quality Health Impact Assessment Tool

COMEAP – Committee on the Medical Effects of Air Pollutants

EC – European Commission

EHIF – Estonian Health Insurance Fund

EU – European Union

EU-25 – European Union with 10 new member states that joined it 2004.

GDP – Gross Domestic Product

GIS – Geographic Information Systems

HIA – Health impact assessment (

PM<sub>2.5</sub> – fine particles (particles with diameter less than 2.5 µm)

PM<sub>10</sub> – particulate matter (particles with diameter less than 2.5 µm)

VOLY – Value of Life Year

WHO – World Health Organisation

YLL – Years of Life Lost

SVL – Statistical Value of Life