Author's response to reviews

Title: Swimming pool attendance is related to asthma among atopic school children: A population-based study

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Author's response to reviews: see over
To the Editorial Team  
Re: MS: 2010762526151967
Swimming pool attendance is related to asthma among atopic school children: A population-based study
Martin Andersson, Linnea Hedman, Gunnar Nordberg, Bertil Forsberg, Kåre Eriksson and Eva Rönmark

Dear Editorial Team,

We like to thank the referees for encouraging comments, remarks and suggestions. We have re-written the manuscript following the given advice. We have answered the questions and comments given by the referees point by point and marked the corresponding changes in the manuscript.

The revised manuscript with marked changes is hereby submitted. We believe the paper has improved considerably, and we now hope that it can be published in Environmental Health.

Answers to questions, comments and suggestions made by the referees

Referee 1 (Per Nafstad):
We thank the referee very much for the constructive criticism, questions and suggestions.

- The overlap between current and physician-diagnosed asthma (comment 1 and 2)

The overlap between physician-diagnosed asthma and current asthma was 82%. We very much agree with the referee that presenting estimates for both add little information and have changed the presentation accordingly in the figures. The results for physician-diagnosed asthma has not been removed from the text because we think that although it in some circumstance may be less specific than current asthma, it is often used in studies on asthma and could therefore be of interest for comparison with such studies. We thank the referee for helping us present the results more clearly.

- The number of figures (comment 3)

We agree and have reduced the number of figures from three to one, and do not present the outcome of physician-diagnosed asthma in the figures.
- **Statistical interaction (comment 4)**

We thank the referee(s) for this remark. We have now tested for statistical interaction. The result was borderline significant for interaction (p 0.056). We have added this information in results, page 9, line 7, and commented on it in the discussion section, page 11, line 12. We agree that caution is warranted when interpreting our results.

- **Adjusting for damp housing (comment 5)**

In this paper, we used damp housing as a possible marker of socioeconomic status and it has also been a risk factor for childhood asthma in several studies. We thank for the comment and have added information on this in the discussion, page 13, line 6.

- **"mean level of 21 mg/m3" (comment 6)**

We thank the referee for the remark and have added the word ”trichloramine”

- **Swimming pool attendance and unmeasured life style factors (comment 7)**

We thank the referee for this important comment. Unmeasured confounding is indeed possible. However, such factors still seem to mainly affect atopic children according to our results. One possible factor could be an association between living in a city with much vehicle traffic and having a swimming pool establishment within close distance. In this study, we don’t have the data to adjust for this. A previous study in the same area however found no association between traffic and asthma among atopic children. We have clarified the risk of unmeasured confounding in the discussion, page 13, line 6.

- **Population awareness (comment 8)**

We agree. This is however the first study on swimming pool exposures and children in northern Sweden, and information on swimming pool environments and health has not to our knowledge been given before, but we cannot exclude this possibility. We have clarified the discussion section on this topic, page 14, line 2.
Referee 2 (Laia Font)

We appreciate the overall judgment of the paper. We thank the referee very much for the constructive criticism, requests of clarifications, questions and suggestions.

Major Compulsory Revisions


We thank the referee for this remark and has added the reference as suggested.

- What measure of socioeconomic status was used as potential confounder (maternal education, social class...)? (comment 2)

We thank for the very relevant comment. The present study is cross-sectional but within a longitudinal study. The overall study design does not include specific questions on socioeconomic status (e.g. income) because such questions were considered to might be seen as too intrusive by the responders and therefore risk a lower participation rate. Also, Northern Sweden has relatively small socioeconomic differences. In order to address these in our study, at least to some extent, we have included damp housing as a marker of lower socioeconomic status. We have clarified this in the discussion section, page 13, line 6.

- Table 1. Why is the descriptive stratified by sex? It would be more useful to show results stratified by atopy and, if any, report relevant differences by sex in the text. (comment 3)

We fully agree and have changed table 1 according to the referee’s suggestion.

- The prevalence for the original 4 category question on pool attendance? (comment 4)

The prevalences were: never/some time every year 32.0%; some time every month 54.0%; some time every week 12.4%; three times a week or more 1.5%. We thank the reviewer for this important comment. There was a dose-response trend in the three categories in both the whole study population and among sensitized children for current asthma. Among sensitized children the dose-response trend was significant (p=0.013). However, the largest difference was seen between those exposed according to our
classification and the other two groups. Among non-sensitized children the number of exposed children with current asthma were too few for statistical analyses.

- Was there a statistical interaction between swimming and sensitization on asthma? (comment 5)

We thank for this important comment. We have performed tests for statistical interaction (p 0.056) as suggested also by referee 1, and have added this information to the manuscript, page 9, line 7 and page 11, line 12.

- Was there an association between swimming and sensitization? (comment 6)

There was no association between swimming and sensitization, this information is now included in the manuscript, page 8, line 8.

- I understand that the OR reported in paragraph 2 and 3 are unadjusted, while the adjusted models are only shown in the figures. It would be more informative if a table showing the adjusted OR for the different outcomes and for the overall population and stratifying for sensitization status was added. (comment 7)

We thank the referee for this suggestion to increase the clarity of the manuscript. We have added a table according to the referee’s advice (table 2).

- Second paragraph. The reference “Jacobs 2012” is missing at the end of the second sentence as well. The study in reference 13 (Font-Ribera 2009) did have measurements on trichloramine in air. (comment 8)

We have added the paper by Jacobs 2012 in this paragraph. We thank the referee for pointing out that there were indeed measurements in reference 13 and have added this information (page 10, line 15).

- The no association detected between swimming and asthma in the overall population is also of relevance and should be mentioned in the conclusion.

We thank the referee for the comment. There was however an association between asthma and swimming also in the whole population. This association was significant or very close to significant depending on outcome, although the effect was only seen among sensitized when stratified for sensitization.
Minor Essential Revisions

Abstract.

- **Specify “current” swimming in the methods and results (comment 10).**

  We have changed to ”current” swimming according to the referee’s advice and agree that this is important information for the reader.

Methods.

- **Specify that the question is on “current” swimming (comment 11)**

  The question has been changed as in point 10.

- **Second sentence page 6: a parenthesis “)” is missing at the end of the sentence. (comment 12)**

  We thank the referee for pointing out that the ”)” was missing and have now corrected the manuscript.

Discretionary Revisions

Results.

**What are the covariables associated with swimming pool attendance? A sentence with this information could be added. (comment 13)**

Neither parental smoking, sensitization, heredity nor damp housing was associated with swimming pool attendance. We thank for the suggestion and have added this information (page 9, line 7).

**Was socioeconomic status a confounder? (comment 14)**

Please see the answer to comment 2. Damp housing was not a confounder. We thank the referee for the possibility to provide a more clear discussion on socioeconomic status.
As this is the second follow-up of the study, could it be possible to stratify the results according to previous respiratory health such as ever asthma or ever wheezed in the first follow-up? (comment 15)

We thank for the relevant comment. Since we do not have data on the historical exposure to swimming pools among the children, we chose not to explore the asthma history further in this study. We believe that without longitudinal data on exposure, it would be hard to use the results from such an analysis to add further information on the relation between swimming and asthma.

Discussion.


We thank for this important addition to the paper and has included a comment and the relevant reference in the manuscript (page 11, line 12)

Not only the association between swimming and asthma, but also the effect modification of atopy, is inconsistent among epidemiological studies. Larger and population-based studies have not found this interaction (Font-Ribera 2009, Font-Ribera 2011, Jacobs 2012). A further discussion on this would be helpful. (Comment 17)

We very much agree and have clarified and extended the discussion section on this matter (page 11, line 12 and page 10, line 15).

On behalf of the authors,
Yours sincerely

Martin Andersson