Author’s response to reviews

Title: Effect of ambient temperature on emergency department visits in Shanghai, China: a time series study

Authors:

Yue Zhang (12211020011@fudan.edu.cn)
Haidong Kan (Kanh@fudan.edu.cn)
Junshan Cao (caojunshan@hotmail.com)
Li Peng (Phyllis_pl@163.com)
Jianming Xu (xjmdt@sina.com)
Weibing Wang (wwb@fudan.edu.cn)

Version: 2
Date: 26 July 2014

Author’s response to reviews: see over
July 25, 2014

Dear Editors,

We thank the *Environmental Health* for considering another review of our paper entitled “Effect of ambient temperature on emergency department visits in Shanghai, China: a time series study.” We have done our best to revise the manuscript based on reviewers’ suggestions. Below is a point-by-point explanation of our revisions with respect to each comment.

Editorial’s comment:

Format modification:
1. As for the formatting, on the title page remove the running title and the degrees after the authors' names. The authors' email addresses should be placed below the phrase *Corresponding author under the heading Email addresses. The names should be changed to initials e.g. YZ. Remove the correspondence information placing the * after his/her superscript number(s). In the Abstract, remove the colons and place the text below the headings. Italicized text should be changed to normal except where noted in the References. Please insert a space between the text and the citations. In the References, list up to 30 authors before inserting et al. For the tables, insert all horizontal lines. Please also ensure that your revised manuscript conforms to the journal style (http://www.ehjournal.net/info/instructions/ ). It is important that your files are correctly formatted.

Response: Thanks. We have modified the format accordingly.

Reviewer Zhiwei Xu’s comments:

Major Compulsory Revisions:

**Background**

1. Reference 3 does not add too much to the Introduction. Suggest you to remove it.

Response: Thank you. This reference has been removed as suggested.

2. Paragraph 2- “Thus non-fatal...... high temperatures.” It needs to be referenced (Ye et al., Ambient temperature and morbidity: a review of epidemiological evidence, 2012 EHP).

Response: Thanks. As suggested, we have revised the reference accordingly in Paragraph 2.

3. Paragraph 3- You should highlight the uniqueness of Shanghai between “Few Chinese cities ....morbidity outcomes” and “We therefore performed.....in Shanghai, the largest city in China.”
Response: Thanks for this good suggestion. The sentences have been revised accordingly.

Methods
1. **The length of the lag period you chose should be better clarified. Have you tested “how long the lagged effect of temperature on EDVs was” before choosing the lag period?**

Response: We used the moving average lag model to examine the lagged effect of temperature on EDVs with a lag from day 0 (same day) to day k, where k was determined from the results of the model. We did test the range of lag periods with effects of temperature on ED visits. The models show that the lagged effect appears significant up to three days, after that the effect is not significant. Thus, we considered the average of the ambient temperature for the same day and up to three days previous as the lag period.

2. What is the reason behind you controlling for wind speed in the model? Why PM_{2.5-10} rather than PM_{2.5} was chosen in this study?

Response: Thanks. Shanghai is located on the eastern tip of the Yangtze River Delta and along China’s eastern coastline, at latitude 31°14’N and longitude 121°29’E. The city features a moderate subtropical climate, with four distinct seasons. The city is affected by marine and terrestrial winds of average 2.97 m/s. Thus, wind speed is also the dominant meteorological condition and may potentially affect the EDVs. Many studies have shown that air pollutants such as PM_{10} and PM_{2.5} are important factors for mortality or morbidity and hospital admissions. We only collected coarse particulate matter PM_{10-2.5} (the fraction of particulates in air of very small size (2.5µm<PM_{10-2.5}<10µm)) from the Shanghai Center for Urban Environmental Meteorology. If the data including thoracic particulate matter (PM_{10}) and fine (PM_{2.5}) can be obtained, we will analysis further and compare the results.

Results
1. **Age stratified analysis of the effects of ambient temperature—“the effects of heat were greater for persons aged <45 years than those aged 45-64 years.”**: This result worth a thorough discussion.

Response: Thanks. We have extended the discussion according to the results (see page 13, paragraph 2).

Minor Essential Revisions:
Methods
1. **Data analysis paragraph 2—“First, we utilized......and other confounders”**: Please clarify what are “other confounders”.

Response: Thanks for mentioning this. In this study, we controlled the relative
humidity, rainfall and wind speed using a natural cubic spline. The clarification has been now added into paragraph 2.

2. The full name of DMT should be mentioned when it appears for the first time and $SO_2$ and $NO_2$ were not well-spelled in this section.

Response: Thank you. As suggested, the statement has been revised accordingly.

Discussion
1. Paragraph 1- “Although the relationship between ambient temperature and ED visits had not previously been evaluated”: Please be more judicious when using this kind of statement. Xu et al. have published a paper looking at temperature and EDVs in Brisbane (Xu et al., 2014, Environmental Research).

Response: We thank the reviewer to bring this point to our attention. As suggested, we have referred this reference and changed the statement accordingly.

Reviewer Jeremy Hess’s comments:

Major Compulsory Revisions:
1. One major strength of this study is its sample size. However, the reader needs more information about sample demographics. They state that the sample is drawn from the 5.92 million Shanghai residents who participate in basic social medical insurance, also referred to as pension insurance elsewhere in the paper. Readers unfamiliar with the Chinese health care system will wonder about the general demographic profile of this sample. Moreover, more information regarding sample demographics will help readers determine how generalizable the findings may be. The reader is left with many questions about the constitution of the sample, i.e., does it include children? Are all individuals in the sample pensioners, i.e. retired? This has implications for generalizability to a working-age population and possible occupational exposures. The authors should present basic sample demographics in Table 1 and characterize the sample in relation to the rest of the Chinese population in the text.

Response: Thanks. As suggested, we have inserted specific description about the collection of sample demographics. The study population consisted of the 5.92 million residents of Shanghai who participated in urban workers’ basic medical insurance, including employees, retirees and other insured participants. Table 1 summarizes the basic statistics for $EDVs$ (please see page 5, paragraph 3).

2. More information is also needed about the exposure data. The authors note that weather data are from a single station but do not provide information about where that station is located, whether there are any missing data, and how representative weather data from this station are for the geographic area from which their population sample was drawn.
Response: Thank you. The weather data were measured at a fix-site station located in Xuhui District of Shanghai and there were not missing data in our study. It can represent the meteorological condition in Shanghai approximately. The study population is the registered residents who participated in urban workers’ basic medical insurance in Shanghai. Therefore, we can examine the relationship between ambient temperature and EDVs. We have inserted related information into the Methods Section.

3. Another exposure concern relates to the issue of ozone. Importantly, the study controls for other criterion air pollutants but not ozone. It would be helpful for the authors to comment on this choice and the possible implications for their analysis.

Response: We thank the reviewer for bringing this point to our attention. In this study, we controlled the air pollutants such as PM$_{2.5-10}$, SO$_2$ and NO$_2$. We agree to this argument put forward by the reviewer. Previous researches did show daily mean concentrations of ozone affect emergency department visits. Due to the limitation of the availability of ozone data, however, we didn’t include the ozone as a control factor in the final model. Instead, the potential impacts from ozone were extended in the Discussion Section (please see page 14, paragraph 1).

4. The authors should also provide an explanation of why they chose mean temperature as the exposure rather than maximum or minimum temperature, and why they controlled for humidity instead of evaluating a synthetic measure such as humidex or apparent temperature. These are important analytic choices that may be entirely justified but the reasoning needs to be explained.

Response: Thanks. In some studies, daily maximum or minimum temperature, synthetic measure such as humidex or apparent temperature were used to examined the effects on EDVs. Daily measurements may have different impacts with average ambient temperature on EDVs. Sensitivity analyses from previous studies using multiple temperature metrics have found that the effect estimates of all temperature metrics were similar (references: 1. Son et al. The impact of heat waves on mortality in seven major cities in Korea. Environ Health Perspect120:566–571. 2. Anderson BG et al. Weather-related mortality: how heat, cold, and heat waves affect mortality in the United States. Epidemiology 20:205–213). Moreover, considering daily mean temperature may be able to provide more easily interpreted results in a policy context and more familiar to the public, we use it for subsequent analyses.

5. The primary outcome in this study is an emergency department (ED) visit for any cause. It would be helpful if the authors could provide a definition of an ED visit and the associated day. Does it start at midnight and go for 24 hours? This will be helpful in understanding the analysis of lag structures.
Response: Thanks. We collected those hospitalizations occurred on the same day as an ED visit. It started at midnight and go for 24 hours. We defined each ER visit as a record; thus, a patient could be in the dataset more than once if the person experienced multiple visits.

6. **Also, it would be helpful to know why the authors chose all-cause ED visits as their primary outcome. Many of the cases seen in EDs are not temperature-sensitive. It is reasonable to choose all-cause visits as the initial outcome and then explore more temperature-sensitive outcomes, but the authors might want to comment on this choice. If the authors have access to chief complaints or discharge diagnoses, however, they may also want to analyze major subsets of outcomes, e.g. cardiac or respiratory complaints, to give a sense of how the exposure-outcome association may change based on the outcome being considered.**

Response: We agree to this argument put forward by the reviewer. Indeed, many of the cases seen in EDVs are not temperature-sensitive. In the current study, due to unavailability of cause-specific EDVs data in the Health Insurance System, we were not able to explore the exposure-outcome association based on major subsets of outcomes, such as cardiovascular or respiratory diseases. However, we would argue that the all-cause ED visits could lead to an estimation of direct emergent health impacts and be subject to even higher significance in policy-making to reduce the impacts from temperature changes. We have extended the limitations in the discussion section (please see page 14, paragraph 1).

7. **On page 4 the authors state that “Other studies have focused specifically on ED data.” They should start a new paragraph at this point and elaborate further on the findings reported in the studies cited in order to orient the reader more fully. They should, for instance, list the outcomes for which there were same-day effects found in the (Basu et al. 2012) reference. The authors should also include a review by Ye et al. published in 2011 in Environmental Health Perspectives (http://ehp.niehs.nih.gov/1003198/). It would also be helpful if the authors would report on the magnitude of the effects reported in other studies and then compare these effects with their results in the Discussion section.**

Response: Thank you. As suggested, we have inserted several references to elaborate further findings. We also included the review by Ye et al published in 2011 in Environmental Health Perspectives. The added discussion and comparison with previous studies was organized in a new paragraph.

**Minor Essential Revisions:**
1. **It would be helpful to the reader if the authors would provide more information on ED use in Shanghai, as ED utilization patterns and the populations that tend to**
use the ED differ widely around the world.

Response: Thanks. As mentioned above, we now have inserted the specific description about the collection of sample demographics (see page 6, paragraph 1). Daily hospital admissions for ED visits were collected from the Health Insurance System of Shanghai. The Health Insurance System of Shanghai covers most of the residents in Shanghai (the coverage rate was 95% in 2008). All hospitals are under contract with this System and computerized records of hospital admissions are maintained at each contracted hospital and sent to the Health Insurance System through an internal computer network (please see page 6, paragraph 2).

2. The authors do not say anything about institutional ethics board review of their study. Can the authors comment on whether the study was reviewed?

Response: Thank you. In this study, patient records/information was de-identified prior to analysis; then daily aggregated counts for ED visits were calculated and used to conduct the final analysis. We did not access to patient individual information prior to anonymization and data aggregation, and there was no any interaction with the patients for this study. Therefore, it conformed to the institutional ethics and exempt from informed consents.

3. In the Conclusion the authors state that “…these findings suggest that preventive programs targeting high risk subgroups may reduce the impact of ambient temperature on population health.” They make a similar statement in the Abstract. While these statements may be true, the analysis does not specifically support them, as the analysis did not identify high-risk subgroups, nor did it identify outcomes wherein preventive programs have any proven efficacy. The authors should rephrase this statement and consider what the true implications of their findings may be for public health and what the findings add to our knowledge base regarding ambient temperature and ED visits.

Response: Thanks. In this study, we assess the effects of ambient temperature on ED visits for the entire population and stratified groups by gender and age (<45, 45-65, 65-75 and ≥75 years). The results implied that some sub-populations (for instance, women and old people were susceptible to cold temperature) may be subject to a higher risk of ED visits. But we agree that the evidence needs to be explored in further studies. In addition, we were not able to analyze the associations between ED visits and other demographic factors.

Discretionary Revisions:
1. It would be helpful, but not compulsory, to know if there have been any assessments of Shanghai’s urban heat island to help the reader get a sense of the magnitude of any exposure misclassification.
Response: Thank you. In this study, we focus on the effects of ambient temperature on emergency department visits. We agree with the reviewer on this point. As one of the most significant human-induced changes to Earth's surface climate, the urban heat island, could exacerbate heat wave stress on human health in wet climates where high temperature effects are already compounded by high air humidity and in drier years. It is our plan to explore the effects of urban heat island in future.

On behalf of my co-authors, I thank the reviewers and editors for their insightful comments and suggestions. We feel the incorporation of this feedback has greatly improved this revised manuscript.

Sincerely,
Weibing Wang