Reviewer’s report

Title: A big temperature decrease between two neighbouring days may increase the risk of childhood pneumonia

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Reviewer: Wan Yang

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The impact of climate change on human health is an interesting and important topic. Particularly, extreme weather may facilitate the transmission of certain infectious diseases and lead to increased cases of infection. In this study, Xu et al. tested the potential effect of dramatic temperature variation in childhood pneumonia outbreaks. Two types of temperature variation were tested. Authors found that a >2 °C drop in temperature between two neighbouring days seemed to be associated with increased pneumonia cases in children <14 yr of age. The effect was particularly significant among female and indigenous Australia children. This is an interesting study.

Major Compulsory Revisions:

(1) A lot of confounding factors, e.g. temperature, RH, PM10, etc., were considered in the DLNM. This is a nice feature of the study. However, the equation is quite confusing to this reader. What does the term ‘DTRt,l/TCNt,l’ mean? Is it a division operation between the two matrices? If so, could authors explain the rationale behind this operation? It doesn’t make sense. From what I read though, it seems the slash between the two matrices ('/') was used as a notation for ‘or’. If this is the case, authors should rewrite the equation to make it clearer. Also, the term ‘ns(Tt,l, 3)ns(RHt, 3)’ doesn’t make sense. Should there be a plus sign in between? And should the term ‘ns(Timet, 7)’ be ‘ns(Timet, 8) as stated in the text following the equation?

Another perhaps not so relevant question on the model, the lag effect was considered for the variable of interest (in this case, temperature variability), but not for the ‘confounding’ factors. I wonder if the lag effect is considered for all factors—be it ‘confounding’ or not—would the same association be found for the variable being tested?

(2) There is no reference to Table 3 in the text. It seems authors accidentally left the results on the lag. Besides 1, 7, and 10 days lags, did authors perform a sensitivity analysis on the lag, i.e., the lag-sensitive effect?

(3) Authors found a more substantial adverse effect of TCN for 2006-2010 than 2001-2005. Looking at Figure 1a, the pneumonia incidence records were not very different across years expect for mid-2009. Given the 2009 peak coinciding the 2009 pandemic and the similar symptoms of influenza and viral pneumonia, it is likely that the 2009 peak was actually due to the 2009 pandemic (e.g.,
misclassification of ICD 9 code, increased pneumonia complication cases following pandemic influenza infection, or increased consultation due to fears of the pandemic, etc.). Have authors checked on these possible factors? If the 2009 episode is left out of the analysis, what would the impact of TCN look like for 2006-2010, compared to that for 2001-2005?

(4) Pneumonia has a profound seasonality, with a peak in winter. Have authors considered comparing the TCN impact in different seasons? Would the TCN effect be more significant in winter vs. summer, or the other way around? Could authors plot the distribution of days with a temperature drop >2 °C in each season/month, maybe in lieu of Figure 3, and comment on this?

(5) In the discussion, authors mentioned that previous studies reached different conclusions on the impact of TCN. Could authors comment on what lead to such a disparity? What are the differences between this study and prior works that would make the conclusions of this work stronger?

Minor Essential Revisions:
(1) Page 2, second sentence in the first paragraph of Background, 120 million episodes of pneumonia in 2010 leading to 1.3 million deaths in 2011. I guess these two figures are two separate estimates; but putting them together sounds confusing in terms of timeline.

(2) Page 3, ‘10µm’, should put a space between number and unit.

(3) Page 5, last sentence in paragraph 3, should it be the other way, i.e., effect of TCN during period two greater than period one?

(4) Page 6, top paragraph, “Respiratory diseases are mainly caused by immune system’s resistance to respiratory infection …”: This statement is incorrect. Immunity plays an important role in respiratory infection; however, infectious respiratory diseases are caused by infections of pathogens. Climate factors, such as temperature and humidity, could affect the transmissibility of infectious diseases and the human immunity may fluctuate over seasons, e.g., due to change in vitamin D level or melatonin level.

(5) Page 7, last sentence in paragraph 2: what do the authors mean by ‘ecological design’?

(6) Table 1 is not very informative. Perhaps it would be better to show the values for each month instead, or just leave the table out.

(7) Figure 1: can authors compress all sub-plots into one panel, perhaps only plot out the original time series and leave out the seasonality/trend/residual?

Discretionary Revisions
(1) Could authors explain briefly the mechanism underlying the DLNM? It would put readers without prior knowledge on the model into context better.
(2) Some tables (e.g. Table 1) and figures (e.g., Figure 3) are not necessary.

**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.