Author's response to reviews

Title: Pattern and determinants of hospitalization during heat waves: an ecologic study

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Author's response to reviews: see over
Reviewer: Michael McGeehin

Comment 1
The statement “adaptations to extreme temperatures in late summer are unlikely” is much too broad for a single study.
Answer 1
In the new version of the manuscript, we acknowledged that the finding came from a single study and weakened the statement (see Abstract, Discussion-page 10, paragraph 2- and Conclusions).

Comment 2
There should be some mention of what effect these findings may have on preparedness planning for heat waves for city governments.
Answer 2
The heat-wave events of summer 2003 have shown the lack of preparedness of health care and social systems for such an event, the lack of intervention plans and the lack of effective technical solutions in Veneto as well as in other European countries. The Epidemiological Department will continue to collaborate with public health authorities of Veneto in order to communicate the risks of extreme heat and evaluate current heat emergency response plans with emphasis on their ability to predict mortality and morbidity associated with specific climatologic factors. This appears in Discussion (page 10, first paragraph) of the revised manuscript.

Comment 3
The cardiovascular disease finding should be given in the Results section and discussed more thoroughly.
Answer 3
We included the analysis of cardiovascular diseases (CD) in both tables. CD did not show any increase with duration or intensity (table 1); nor a consistent pattern of correlation with heatwaves characteristics (table 2). This is now reported in Results and Discussion of the revised paper (last paragraph).
Reviewer: Haidong Kan

Comment 1.
The authors collected a large variety of morbidity outcomes, including both cardiovascular and respiratory diseases. However, only heat diseases and respiratory diseases were presented in relation to heat wave. The readers may want to know the association of other outcomes, especially cardiovascular disease, with heat-wave.
Answer 1
We included cardiovascular diseases (CD) in the statistical analysis. CD did not show any increase with duration or intensity (table 1) nor any consistent pattern of correlation with heatwaves characteristics (table 2). This is now reported in the revised paper. Using information obtained in the graphical representations, other nosologic groups did not show any relationship with heatwave characteristics (see: Results, page 7, paragraph 2).

Comment 2
The authors seemed to use the current-day humidex to assess its relation with hospitalization. How about the results using other lag structures (e.g. current-day Humidex and next-day hospitalization, or multi-day average Humidex)?
Answer 2
The investigation of lag structures seems to be more appropriate for time series studies where the interest is to investigate the association between heat indicators and health effects over long periods of observation. Our is essentially a heat-episode analysis, where the interest is to investigate about the relative effect of heatwave intensity and duration, both related to the current day.

Comment 3
Could have more discussion on the limitation of this work and its implication.
Answer 3
In the revised manuscript we added more discussion on the limitations of our study, such as lack of air pollution data (page 8, first paragraph), or the reported absence of adaptation to extreme temperature in late summer, which was based on a single late summer heatwave (page 10, paragraph 2).

Comment 4
Humidex = 40 degrees was set as the threshold and used to define the heatwave. Ideally, a sensitivity analysis based on other definition of threshold Humidex value might be usefully.
Answer 4
According to the Weather Service of Environment Canada, an extremely high Humidex reading can be defined as one that is over 40; furthermore, this threshold was also used in a study of heat-related mortality conducted in Italy. We therefore adopted the threshold of 40 °C. A sensitivity analysis based on other definition of threshold Humidex value could be of difficult interpretation, since in our heat-episode analysis any change in the threshold of Humidex modifies the length of heatwaves. Nevertheless, a parallel analysis showed that, at 39 degrees, the effect of duration tends to decrease and the effect of Humidex tends to increase, while the contrary is true at 41 degrees.

Comment 5
The authors do not describe the completeness of their data. For how many days were all data components (Humidex, hospitalization, etc.) available? This is a major problem because the reader does not know how well the data set represents the entire time period.
Answer 5
The data set of hospital admissions was complete over the entire study period. We used the daily average of Humidex values measured at the seven city capitals (see Methods); there were 30 missing values out of 1288 measures from individual cities (2.3%).
Comment 6
Is the daily air pollution data available in the research area? If yes, air pollution can be included in the multivariate analysis as a confounder.
Answer 6
Daily data of air pollution were not available.

Comment 7
In the results section, it’s better to describe the outcome and heatwave characteristics, e.g. the mean and its standard error.
Answer 7
Mean and standard deviation have been added in the first paragraph of Results.

Comment 8
In figure 1, I suggest adding the heat-wave intensity (daily Humidex).
Answer 8
In the revised paper, in order to have a comprehensible illustration, we made two figures with daily Humidex, heatwave duration, and hospital admissions for heat related diseases (Figure 1), or respiratory diseases (Figure 2).
Reviewer: Alistair W Stewart

Comment 1
… it would be valuable to have the GEE model further detailed, especially how the autoregressive error structure was incorporated.
Answer 1
Modeling the relation of hot weather with hospital admissions was performed using the statistical package STATA 8 through the command “xtgee” with a log link and a Poisson error distribution. Daily counts of hospital admissions within each summer were assumed to be correlated; the correlation structure was modeled using a first order autoregressive error structure, which assumes that responses further apart in time will be less correlated than those closer in time. This appears in the new version of the paper (see page 5 continuing on page 6).

Comment 2
Tables 1 and 2 present only the variables that are described in detail. Are the other variables, primary variables (need to be detailed) and day of week in the multivariate model?
Answer 2
In tables 1 and 2, incidence rate ratios were adjusted for day of week. This now appears in a footnote of both tables. There were no other variables in the model.

Comment 3
At the beginning of the results there is reference to the figure which says that it can be seen that both diseases seem to be more correlated to duration than intensity. However, intensity is not presented in the figure so the statement is wrong.
Answer 3
In the current version of the manuscript we made two figures, showing heatwave duration and daily Humidex besides daily admissions for heat disease (figure 1) or respiratory disease (figure 2). We modified accordingly the text at the beginning of the results: “The daily values of heatwave duration, Humidex and admissions for respiratory disease (RD) or heat disease (HD) are shown in Figure 1 and 2, respectively. It can be seen that both diseases seem more correlated to heatwave duration than intensity …” (see page 7, paragraph 2).

Comment 4
The figure would be improved by giving the units of heat disease and respiratory disease (obvious but never-the-less should be given) and indicating that HD and RD refer to heat disease and respiratory disease.
Answer 4
We changed accordingly the new figures 1 and 2.

Comment 5
In the last sentence of the background it is stated that the objective is to ‘prove’ the relationship … An observational study of this type can never ‘prove’ a relationship; I’d suggest a word like ‘show’.
Answer 5
We changed accordingly the text.

Comment 6
The English used through-out the paper could be improved. Discomfort is spelt with an ‘m’.
Answer 6
The English spelling has been checked through-out the paper.