Reviewer's report

Title: Development of Health Risk-Based Metrics for Defining a Heatwave: a Time Series Study in Brisbane, Australia

Version: 1 Date: 24 March 2014

Reviewer: Graeme Tucker

Reviewer's report:

- Major Compulsory Revisions

1. I am very surprised that the data is so old. The authors have used data on deaths to November 2004, and yet the Australian Bureau of Statistics released coded cause of death information for all of Australia for 2007 in (or before) January 2010. They have since released data to “preliminary” data for 2011 in January of this year, but I accept that this data was not available for this analysis. The authors used data on Emergency Hospital Admissions up to December 2005, which indicates that their analysis was not limited by the range of data available for deaths, so I am again curious as to why their dataset for EHAs is so dated. I think the credibility of their findings would benefit from an update to the data files.

- Minor Essential Revisions

2. Typographical error on page 6. “.. different time periods even though there was no (not) any physical or climate basis for the division ..”

3. On page 6, the terms intensity and duration are introduced without definition. I assume intensity means which percentile is being assessed as a heatwave threshold. The meaning of duration is clear, but what is not clear is how this was entered into the models. Was the total duration of the heatwave entered for each day, or the day number of each day of the heatwave used as the predictor?

- Discretionary Revisions

4. On page 6, the authors state “We used a relative index (i.e., percentile of temperature) instead of an absolute measure (i.e. Celsius) for the heatwave definition, as the relation between temperature and health may change over time and space, and therefore, a relative measure may be more appropriate than an absolute one.” To me this sentence implied a flexible threshold for a heatwave from year to year. Examination of the Tables showed the definition to be based on quantiles for the whole dataset, so e.g. 95% was an average daily temperature of 28.0°C, which is of course both a percentile and an absolute temperature. I think the sentence above needs clarification.

5. On page 6, the terms intensity and duration are introduced without definition. I assume intensity means which percentile is being assessed as a heatwave
threshold. The meaning of duration is clear, but what is not clear is how this was entered into the models. Was the total duration of the heatwave entered for each day, or the day number of each day of the heatwave used as the predictor?

6. I accept that the target audience for this paper probably knows little about Generalised Additive Models, and doesn’t care a whit about the details. I am a statistician, and am therefore interested in more details about how the models were fit. What smoothing functions were used and how the spans for the smoothers were selected? The authors state that R package “mgcv” was used to analyse the data. In this software the underlying representation and estimation of the models is based on a penalized regression spline approach, with automatic smoothness selection. I think the inclusion of this information in the paper could satisfy the curiosity of readers like me, without overcomplicating the text for other readers.

7. On page 11, the authors argue that “the heat warning system should be activated well before a heatwave occurs”, and state that “it would be feasible to trigger a heat warning system a week before a heatwave event is anticipated.” I wonder whether a warning a week prior to a heat event is too soon. The public may forget or lose the sense of urgency with heat warnings that far in advance. This is only conjecture which the authors are free to ignore.

**Level of interest:** An article of importance in its field

**Quality of written English:** Acceptable

**Statistical review:** Yes, and I have assessed the statistics in my report.

**Declaration of competing interests:**

I declare that I have no competing interests