DH feedback to Louisa Flanders, University of Melbourne

Review of : 'Analysis of death data during the Morwell mine fire', Barnett 2014a, and 'An updated analysis of death data during the Morwell mine fire' Barnett 2015

(Feedback based on review order)

1. It may be useful to clearly indicate which paper is which, in the introductory paragraph in order to facilitate cross referencing throughout the document (for instance, could be referred to as Barnett, 2014 and Barnett, 2015 rather than the first and second paper).

2. With reference to the statement: "Although the fire's effect on mortality is a plausible hypothesis, the data presented do not suggest strong evidence for this hypothesis."

   Barnett's analysis explores more generally a hypothesis of an association between the fire and deaths, and doesn't consider possible exposure pathways and mechanisms of action.

   It is suggested that references be included to explain why this hypothesis would be plausible. This may be because prolonged smoke exposure has been linked to increased mortality and "plausible hypothesis" really means "supposition worthy of investigation". It's just that it hasn't been verified by data in this instance. We note that independent health risk assessment advice sought by the Department at the time of the fire indicated that there would be no additional deaths if exposure (to smoke from the Hazelwood open cut coal mine fire) continued for 6 weeks but additional deaths would be expected after 3 months.

   Alternatively, is it possible that the conclusion could be drawn instead that the data presented do not suggest strong evidence for the author's hypothesis that the fire had an effect on mortality.

   Furthermore, could the absence of cause of death information also be considered a limitation of the current analysis and the ability to draw these conclusions? (See point below re other limitations).

3. It is noted in the "Strengths of the analysis" that it includes a consideration of regional population movements.

   Does this relate to the use of population data for Latrobe City Council and assumptions about the influx and outgoings of people in the four postcodes analysed in Barnett 2014 or does this relate to Point 2 on Page 2 of Barnett 2015 which states that "qualitative evidence about some differences between postcodes in exposures and evacuations"?

   Are there limitations in this type of analysis through the use of assumptions such as this?

4. It is noted that Barnett has fitted temperature variation in his models (with the most methodological information included in Barnett (2014), and is included if your report as a strength of the analysis. In our experience, temperature effects on mortality are not necessarily impacted by higher or lower than average temperatures, instead mortality rates are influenced by extreme (and often prolonged) fluctuations. Is the inclusion of gross temperature term in a

model appropriate in this instance? It is also not clear whether temperature data for each year of data was included in the model.

5. Information in strength of the analysis relates to the inclusion of a useful graphic comparison (specifically Figure 3 in Barnett 2015 should be referenced) of mean relative risk of death by postcode. In this 95% credible intervals overlap each other and also contain RR=1 (no significant increase or decrease).

6. Your report does highlight the ambiguity in results, the reporting of probabilities of deaths in certain postcodes, and the uncertainty in the estimated likelihood that the dates of the fire are associated with excess mortality. It is agreed that the inclusion of an estimate of probability of mortality is problematic for the general reader.

   Further to this, and with reference to point 5 above, it is noted that page 4 of Barnett 2015 states "The probability that the death rate was higher than the average during the fire is 0.82. The mean increase in deaths is [sic] as a relative risk is 1.1, or 10 as a percentage. The absolute number of deaths per postcode per month is 0.8, which over 6 postcodes and 2 months is 9.6." Our interpretation is that there was no mean increase in deaths, especially as the was a Relative Risk range (0.815-1.337) which obviously includes 1. It therefore includes the outcome that there were no additional deaths. This statement has been used by media and has been the de facto conclusion - akin to "10% more deaths due to fire" and "9.6 deaths caused by fire" so needs to be challenged more directly.

7. In your report "Review of Births Deaths and Marriages Victoria (BDMV) mortality data for the Latrobe Valley and the time of the Hazelwood coal mine fire in Morwell" in 2014 you conclude that "Analysis of the cause of deaths for this period would be required to explore common risk factors. We have no information on the underlying age/sex distribution of these localities, or of the recent demographic changes in these communities, both trends that could underlie the mortality observed in 2014."

   Likewise, the concluding page of Barnett 2015 also acknowledges that more accurate analysis could be provided by using more accurate data (using daily rather than monthly numbers, and knowing cause and age of death).

   Perhaps the above information could be also indicated in the first paragraph of the limitations of the analysis. This may serve to emphasise no matter how appropriate the choice of an analytic tactic is, it is limited by the size of and information in the data set being analysed.

8. Would it be possible please to include some information about:
   a. deviance information criteria (Barnett 2015) and the appropriateness (or not) of use for this in choosing the best model in an analysis such as this, and its use in drawing conclusions.
   b. the use and limitations of using residual plots in identifying and drawing conclusions about "spikes" in deaths.