



MONASH University

School of Public Health and Preventive Medicine
Faculty of Medicine, Nursing and Health Sciences

28th August 2015

Mr Robert Perry
Perry Maddocks Trollope Lawyers
Level 8/9 Yarra Street
South Yarra
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RE: Hazelwood Mine Fire Enquiry

Dear Robert,

Please find attached my requested report for the Hazelwood Mine Fire Enquiry. I hope these comments cover the matters required.

Yours sincerely

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Background

The reports touch on the questions of whether there was a discernible increase in deaths in populations exposed to the Hazelwood mine fire.

During extreme smog events in London in 1952 and 1960, a marked increase in deaths was documented, and these findings have made acute mortality monitoring relevant in setting such as the Hazelwood fire. In London, cold weather coupled with high levels of sulphur dioxide adsorbed onto smoke particle to produce a highly toxic mix of pollutants—unlike the situation at Hazelwood (where the exposure was largely confined to smoke particles alone).

Delays in notifications and processing of death certificates mean that this information is rarely available until weeks or months after the exposure, and are of little relevance to the accurate management of a public health crisis.

Scientific aspects

Most deaths occurring in an Australian community occur amongst those with a pre-existing terminal illness, such as cancer or heart failure. With an environmental event such as the Hazelwood fire, the principal concern relates to unexpected deaths from conditions such as asthma, myocardial infarction, or chronic lung disease (typically a small percent of total deaths).

Typically, public health researchers are interested in death or illness rates amongst exposed groups of individuals. If it is not feasible to identify such individuals, then a study uses a surrogate measure, such as a postcode, a worksite, or some other convenient area. Surrogate measures may not correlate well with actual exposures. If the broader area contains a mix of those heavily exposed, and those with nil or minimal exposure, then an effect on the few with high exposure may not be identified (i.e. it might be diluted out).

Barnett paper 1

Dr Barnett looked at monthly totals of deaths reported in four postcode areas in the Latrobe Valley from 2009 to 2104. He was looking to see whether the number of deaths recorded during the two months of the fire in 2014 were greater than expected on the basis of recent mortality trends and seasonal differences. Using statistical modelling he found a small (15%) increase during the months of the fire.

Various limitations are acknowledged, including the fact that the population changes in the specific postcodes were not known, and it was not possible to allow for daily temperatures (since very high temperatures are associated with increased mortality). There appeared to be little difference in the patterns observed in postcode 3840 (where most exposure occurred), compared with other postcodes further from the site of the fire.

Barnett paper 2

Dr Barnett subsequently amended his report to include additional data from two more postcodes. He used the number of deaths from every month of the years in question, and adjusted for the maximum temperature recorded in each month. Based on this modified analysis, he concluded that across the six postcodes there was a 10% increase in deaths observed during the month of the fire, after making a crude adjustment for an effect of temperature on mortality. Three of the six postcodes had a lower number of deaths than expected, including 3840 (based on Morwell) where exposure would be expected to have been highest.

Flanders et al June 2015

This analysis, undertaken by the University of Melbourne, points to a number of shortcomings in Barnett's paper and concludes that the finding of excess mortality in the months corresponding to the Hazelwood fire are, "not supported by the results reported in the paper". While it is noted that the fire's effect on mortality may be a supposition worthy of investigation, the authors point to a series of limitations that affect Barnett's analysis:

- a) Lack of information about causes of death
- b) Lack of a coherent pattern amongst results for various postcodes
- c) Conclusions based on relatively small numbers
- d) Inadequate recognition paid to the likelihood of random fluctuation

Flanders & English: Review of mortality data

This analysis attempted to replicate Barnett's findings using, "Births, Deaths and Marriages" data from Victoria. They confirmed that slightly more deaths had been reported during the months of the fire, compared with earlier years.

The authors emphasised the many limitations of their analysis and indicated that the increase might well have been due to random fluctuation (i.e. chance). They conclude, "We cannot conclude that the 2014 mortality observed is due to any single cause, or whether it has occurred by chance alone". They also pointed out that, "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."

Flanders et al Age standardised mortality and cause of death in the La Trobe Valley

This is a more detailed analysis of the mortality data looking at specific causes of death and accounting for population changes, daily temperatures, and levels of air pollution (as estimated from PM10 levels).

The authors concluded that, "this data shows no evidence that the 2014 mortality rates differ from comparable rates for the same month in 2009 (a season similar to 2014 with respect to high temperatures and high levels of particulate matter from bushfire smoke). Broad confidence intervals for each of the rate ratios for the years 2009-13 which approach or overlap the confidence intervals of the 2014 rates express the lack of statistical evidence for an overall higher rate of mortality in 2014".

There insufficient numbers of deaths from cardiovascular disease or respiratory disease to draw firm conclusions.

OPINION

1. The analysis provided by Dr Barnett was based on crude numbers of deaths occurring within postcodes located around the epicentre of the Hazelwood fire
2. Review of his papers, and subsequent further analyses undertaken by a research team at the University of Melbourne raises two questions:
 - a) Is it likely that the numbers of deaths within postcodes surrounding the Hazelwood fire were increased during February-March of 2014 compared with previous years?
 - b) If the death rate was increased, is it plausible that this was a result of the exposures from the fire?
3. In response to question 2a, Dr Barnett's analysis does not provide a convincing indication that mortality during the months of the fire was either higher or lower than would be expected in comparison to previous years. The basis of this opinion is:
 - a) The analysis involved the use of very crude information that may have created spurious findings. These include the use of the number of deaths (rather than age-specific death rates) and a lack of knowledge of changing population numbers or changing age structures within each of the postcodes over the study years examined
 - b) The observed mortality during the months of the fire was within the range of variation seen in these postcodes during previous years (i.e. the differences were not statistically significant at conventional levels of significance)
 - c) There was no coherent pattern of deaths within the postcodes studied. i.e. numbers of deaths were slightly greater than expected in postcodes remote from the fire and lower close by
 - d) A more complete analysis by University of Melbourne researchers failed to identify an increase in deaths
4. In the absence of evidence of an increased mortality during the months of the fire, question 2b becomes superfluous
5. As well as looking at total mortality, the University of Melbourne team also looked at trends in the causes of deaths likely to be increased by smoke exposure. The numbers were very low and no relevant trends were observed. It was noted that both ambient temperatures and other bushfire activity affected the La Trobe Valley at a similar time, and any increase in death rates (if it had been present) could be influenced by these events as well as the Hazelwood fire
6. It should be noted that the data provided in these reports does not exclude an excess of deaths amongst those most exposed to the products of the fire. Any increase in a smaller number exposed may have been concealed within the much larger group with little exposure. This emphasises the need to plan future analyses with care and avoid crude inaccurate approximations that might portray an inaccurate picture