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## **Coal Mine Fire at Morwell, Victoria, Australia. PEER REVIEWS**

### **Review of the EPA Victoria response to the Morwell Coal Fire: Process for Public Health Protection.**

#### **Review scope:**

1. Does the draft Carbon Monoxide Response Protocol adequately address protection of public health?
2. Are there any other procedures or techniques that might be used in addition to this, or as alternatives?
3. Is the EPA monitoring the right parameters to adequately inform public health assessments?
4. Any other relevant comments?

#### **Reviewer details:**

Dr Fay Johnstone. Senior Research Fellow, Environmental Epidemiology, Menzies Research Institute Tasmania at University of Tasmania.

(Dr Johnstone authored her review with collaboration from Dr Guy Marks, Director of the Centre for Air Quality and Health Research and Evaluation, Sydney)

#### **Brief Bio:**

Dr Fay Johnston is a Public Health Physician, GP and Senior Research Fellow at the Menzies Research Institute Tasmania where she is supported by an ARC DECRA Fellowship. Her research focus on the public health impacts of bushfires, heat events and outdoor air pollution from biomass combustion.

#### **Your understanding of the topic and scope:**

Very familiar with bushfires and their health effects

#### **Material supplied by EPA:**

1. More detailed maps of Morwell town (with monitoring sites)
2. An example of the daily AIR DATA QUALITY report
3. The 21/2/2014 Draft of the LVCF Carbon Monoxide Response Protocol

#### **Additional material requested:**

Nil

#### **Any other relevant comments:**

Further communications were directly with the Department of Health.



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Issues for consideration in the public health responses to the Latrobe Valley Coal Fires: A discussion document produced at the request of the Environment Protection Authority Victoria.

Fay Johnston<sup>1,2</sup> and Guy Marks<sup>1,3</sup>

1. NHMRC Centre for Air Quality and Health Research and Evaluation
2. Menzies Research Institute Tasmania
3. Woolcock Institute of Medical Research

## Background

The Centre for Air quality and health Research and evaluation (CAR) is a Centre of Research Excellence funded by the National Health and Medical Research Council ([www.car-cre.org.au](http://www.car-cre.org.au)). CAR's role is to enable research on the impact of air pollution on human health and to translate that research into contributions to policy and practice that mitigates the impact. CAR is a collaboration among senior researchers in the fields of epidemiology, toxicology, air physics and chemistry, biostatistics and clinical respiratory medicine based at universities in NSW, Tasmania, Queensland, and Victoria.

This document was prepared as a rapid response to a request from the Environment Protection Authority Victoria to provide to expert review on the response framework for Carbon Monoxide (CO) from the Latrobe Valley coal fires and discuss issues and challenges relevant to the public health response. In reviewing the document, we consulted relevant guidelines, evidence reviews and some individual studies, particularly concerning coal fires and their possible duration. We also sought informal advice from international experts in the field. Below is a summary of this rapid review of the current state of the evidence concerning public health interventions and CO thresholds for health protection. We drew on the specific expertise and experience of our team in quantifying public health impacts from severe episodic smoke events, largely from forest and peat fires, and the relevance of these to public health responses.

This commentary relates only to the document entitled "Latrobe Valley Coal Fires, Carbon Monoxide Response Protocol, Department of Health, Draft 21/02/2014", which we were asked to review. We are aware that many other public health responses are in place other than those which are discussed in this document.

We note the enormous challenges presented by the current coal fires in the La Trobe Valley and the considered and systematic public health responses implemented to date. There is considerable uncertainty about the likely duration and severity of the ongoing pollution episode. There are few studies that directly address the health effects of outdoor CO exposures impacting on entire communities, but there is now a reasonable evidence-base concerning severe episodic particulate exposures.

We understand that many complex clinical and public health judgements are required in applying the available evidence and resources to manage this event, which is unprecedented in Australia. This



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document is intended to provide a timely support to those with responsibility for decision making. We recognise that there is no clear correct course of action and that all approaches taken to mitigate the public health impacts will have associated benefits and risks.

#### Public health risks and responses

In refining the evolving public health responses we identified several issues worthy of on-going review and consideration. These were:

- (1) The CO thresholds selected for public health action;
- (2) The specific public health responses associated with these thresholds;
- (3) The effect of the expected prolonged hazard and associated episodes of extremely elevated particle concentrations.

These are discussed in turn below.

#### Selection of CO thresholds for public health action

The current draft of the response protocol is based on the US National Academy of Sciences (NAS) Technical Support Document for CO Volume 8, last updated in 2010. The NAS produces Acute Exposure Guideline Levels (AEGs) for Selected Airborne Chemicals (National Research Council Committee on Toxicology 2010). The document defines an AEGL-2 level as 'the airborne concentration (expressed as ppm or mg/m<sup>3</sup>) of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.' The AEGL-2 is the basis of the response framework in this document.

While these guidelines are current and authoritative we recommend caution in stating that *These are the most protective public health values available*. We note that there are several other guidelines that are more conservative. (see the Hazardous Substance Databank of the National Library of Medicine Toxicology Network, for a full list <http://toxnet.nlm.nih.gov/>).

Specifically, the AEGL-2 for CO is designed to protect against CO exposures of a concentration and duration that would be expected to produce a carboxyhaemoglobin (COHb) of 4%. This could be reasonable for the purposes of the guideline but we recommend against stating that this is the *'no observed effect level'*.

Reviews and guidelines based on more recent evidence have identified a wider range of adverse health impacts at lower COHb concentrations. For example it there is now evidence that many vulnerable people will experience adverse impacts at, or even below, a COHb of 2% (WHO 2010). WHO guidelines (along with several other guidelines) calculate acute exposure thresholds based on the duration and exposure concentration combinations that would generally produce a COHb of 2% (WHO 2010).



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### Suggestions and possible considerations for refining the on-going public health response

*Note – these are provided in the context of incomplete information about the details of the response to date other than what is contained in the document provided. Many of these suggestions are likely to have already been considered. Others, although worthy of consideration, might not be the most appropriate in the circumstances.*

1. Consider using WHO 2010 as the primary guideline document when considering public health impacts of CO exposure.
2. Consider the likely effectiveness or otherwise of advice to 'shelter in place' in the light of
  - a. The unpredictable timing, severity and duration of CO emissions. For an exposure of less than an hour it could be reasonable – for exposures of several hours the benefit would be questionable.
  - b. The difficulties of communicating effectively to people of all ages and circumstances at all hours of the day and night. Effective protection assumes a rapid receipt of advice and appropriate action by community members at whatever hour of the day the problem is recognised.
  - c. The extent of community concern and confusion potentially generated by repeated advice to commence and terminate of 'shelter in place' advice.
  - d. The age of the housing stock in Morwell. If most houses are pre-1990 the assumed 6 hours likely a major over-estimate of possible duration of protection, even if promptly and technically well executed.
3. If not already addressed, clarify the detailed procedures for community relocation in an emergency.
4. In the light of the unknown duration and extreme particulate exposures associated with the coal fires, consider elective evacuation of all people or of people at higher risk from the areas of Morwell that are experiencing repeated and severe particulate and occasional CO exposures. Higher risk groups include pregnant women, children, older age groups, people with anaemia, diabetes, heart or lung disease or any other chronic medical condition.
5. In the light of the unknown duration and extreme particle exposures, consider offering in-house protection such as HEPA filters to higher risk individuals. This is the only intervention with clear evidence for effectiveness (other than evacuation) for severe particle exposures (Health Canada in preparation). However, this will NOT provide protection against elevated CO concentrations.
6. Given the extent of community concern and the unprecedented nature of the incident, consider establishing a rapid study of the cardiorespiratory health impacts and how these are modified by the interventions that are used in the response.



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