



REPORT

EXPERT REVIEW PM2.5 PROTOCOL FOR MORWELL FIRES

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1 INTRODUCTION

The Department of Health (Victoria) has engaged Toxikos to provide an independent expert review of the PM_{2.5} response protocol for the management of impacts of the fire in the Hazelwood mine at Morwell in the Latrobe Valley. The protocol has been developed to guide the assessment and decision making for resulting actions in the event of prolonged elevated PM_{2.5} levels in the environment arising from the ongoing fires at the coal mine in Morwell. The protocol is specific to the Latrobe Valley Coal Fires incident.

2 RESULTS

2.1.1 Health Effects of PM_{2.5}

Exposure to fine particles, PM_{2.5}, has been associated with a range of adverse health effects including increases in mortality and morbidity including hospital admissions, emergency department attendances, reductions in lung function, exacerbation of existing cardiovascular and respiratory disease (including asthma and COPD). These associations have been found with both long-term (years) and short-term (daily) PM_{2.5} levels. The most recent reviews of the health effects of PM_{2.5} have been conducted by WHO (2013; 2005), USEPA (2012; 2009) and NEPC (2010). Long-term exposure to PM_{2.5} has been associated with increases in cancer (IARC, 2013) and decreases in lung function growth in children (USEPA, 2012, 2009; WHO, 2013).

The recent WHO (2013) report notes that the people within the population that are affected by short-term exposures differ from those affected by long-term exposures. People who respond to daily changes in PM_{2.5} are people who have existing health conditions, both cardiovascular and respiratory disease, who have their condition worsened by exposure to PM_{2.5}. By comparison, long-term exposures to PM_{2.5} can affect healthy people and there is some evidence that long-term exposure to PM_{2.5} can initiate some diseases eg., cancer.

Groups within the population that are most sensitive to exposure to PM_{2.5} include:

- Elderly
- People with existing cardiovascular and respiratory disease
- Children
- People with asthma
- Unborn foetus

2.1.2 Air Quality Standards

Air quality standards are derived to provide protection for the most vulnerable group within the population. The results of epidemiological studies investigating the health effects of PM_{2.5}, both short-term and long-term, have been unable to find a concentration below which adverse health effects are not observed. It is widely accepted that PM_{2.5} is a non-threshold pollutant which means that any level of exposure will lead to an increase in health effects, especially in the exacerbation of symptoms of existing disease. The higher the exposure the greater the risk of adverse effects (WHO, 2013; USEPA, 2012, 2009, NEPC, 2010). All air quality standards are established acknowledging that they will not provide absolute protection of health and that there is some residual risk associated with those standards. The aim is to minimise the risk to the population.

In 2003 The National Environment Protection Council (NEPC) varied the Ambient Air Quality NEPM to include air quality standards for PM_{2.5}. The standards are 24-hour average of 25 µg/m³ and an annual average of 8 µg/m³. The 24-hr standard is consistent with the current WHO guideline. The annual average is more stringent than any international standards.

2.1.3 PM_{2.5} Response Protocol

The draft PM_{2.5} response protocol is consistent with international approaches to public health warnings associated with bushfire (or wildfire) smoke (Californian EPA, 2012). The graded approach to the health warnings is also consistent with the approach used for bushfire smoke warnings used in Victoria for PM₁₀ since 2008.

The response is based on air quality being acceptable if it is below the current 24-hour PM_{2.5} NEPM standard. This is appropriate. The graded health warnings are based on protection of sensitive groups which is consistent with the approach to setting air quality standards. The range of PM_{2.5} levels included in each range is consistent with international systems and provides appropriate advice to minimise the adverse effects of the smoke on these groups. The trigger for advice to healthy people is considered appropriate given that most adverse effects from short-term exposures is related to people with existing disease. Healthy people will only be affected at much higher levels of exposure.

There is evidence from epidemiological studies that prolonged exposure (over several days) to high levels of PM_{2.5} leads to higher risks than exposure over a single day (WHO, 2013). The use of 3 consecutive days of extreme levels (>250 µg/m³) before recommendation to temporarily relocate is made by the Chief Health Officer is consistent with addressing the increase in risk arising from several days of constant exposure to high levels of PM_{2.5} observed in epidemiological studies.

The use of a 24-hr standard as the basis of the health messaging and response to protect public health from the smoke is appropriate. These events are generally short-term (days to weeks) as opposed to long-term (years). The potential health effects will be acute effects and the 24-hr standards have been derived to provide protection against these effects.

2.2 Conclusion

The draft PM_{2.5} response protocol is sound and provides a practical approach to minimising the risks to public health arising from exposure to PM_{2.5} in the smoke. The use of ambient air quality standards as the basis of the graded trigger levels and health warnings and actions is consistent with international approaches to managing smoke effects from wildfires.

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