

Hazelinks Mortality Report: Time series analyses of anonymous mortality data for the period July 2009 to June 2015

For a glossary of important terms used in the report, click [here](#).

Your questions and answers

What is Hazelinks?

Hazelinks is a research stream of the Hazelwood Health Study that uses population health datasets to investigate changes in the health of the community during and after the Hazelwood mine fire.

What is the Hazelinks Mortality Report?

The Hazelinks Mortality Report describes analysis of data obtained from the National Mortality Database (NMD) which is a register of every death in Australia. Using NMD data from 1 July 2009 (approximately 4 ½ years before the mine fire) to 30 June 2015 (almost 1 ½ years after the mine fire), the analysis aimed to answer three research questions:

1. In mine-fire affected communities, did death rates increase during the mine fire compared to similar time periods before and after the fire?
2. In mine-fire affected communities, did death rates increase after the mine fire compared to before the fire?
3. In mine-fire affected communities, were changes in the daily levels of mine fire smoke associated with changes in death rates?

What are the main findings in the Hazelinks Mortality Report?

The patterns of deaths observed in the Latrobe Valley over the period 1 July 2009 to 8 February 2014 were used to estimate what the *expected* risk of death was for the 30-day [mine fire period](#) when smoke levels were most intense and for the [six months after the mine fire](#).

[During the 30 day mine fire period](#)

When [all deaths](#) were considered (irrespective of the cause of death), the overall risks of death in Morwell and in other [fire impacted areas](#) during the 30 day *mine fire period*, were similar to expected.

However, when cause of death categories were looked at separately, it was observed that there was a three-fold increase in risk of [injury-related deaths](#) in Morwell during the 30 day *mine fire period*. There was also a small increase in injury-related deaths in the rest of the Latrobe Valley and surrounding smoke-impacted areas during the 30 day *mine fire period*.

It was estimated that there was a total of 11 injury-related deaths during the 30 day *mine fire period* across all of the smoke impacted areas (including three in Morwell) that were “attributable to the mine fire event”; meaning that they were additional deaths to those expected.

The excess injury-related deaths were predominantly categorised as unintentional, as opposed to cases of intentional self-harm. In the Latrobe Valley, men and residents aged 80 years or older were at greatest increased risk of death from injury during the mine fire period.

Increases in daily mine fire-related PM_{2.5} pollution levels were found to be associated with increases in risk of injury-related death, suggesting a [dose-response relationship](#).

Key findings

During the 30 day period 9 February to 10 March 2014, when smoke levels were the most intense:

- there was an increased risk of injury-related deaths in the smoke impacted areas, particularly in Morwell;
- there were 11 more injury-related deaths in the smoke impacted areas during this period than would have been expected;
- these injury-related deaths were predominantly unintentional;
- men and residents aged 80 years or older were at greatest increased risk of injury-related death.

During the six months after the mine fire

When [all deaths](#) were considered (irrespective of the cause of death), the overall risk of death in Morwell during the *six months after the mine fire* was 29% higher than expected. In smoke impacted areas outside of Morwell, the overall risk of death during the *six months after the mine fire* was similar to expected

When cause of death categories were looked at separately, it was observed that there was a 27% increase in risk of death from [cardiovascular \(heart and circulation\) conditions](#) in the Latrobe Valley as a whole and, more specifically, a 62% increase in Morwell during the *six months after the mine fire*. In particular, risk of death from Ischaemic Heart Disease (IHD, also known as coronary artery disease) was increased. In total there were an extra 26 cardiovascular deaths in Morwell attributed to this six-month period, including 17 with IHD. Those 26 cardiovascular deaths represented 38% of all cardiovascular deaths in Morwell during this six-month period. Men and residents aged 80 and above in the Latrobe Valley were at an increased risk of death from IHD in the six months after the fire.

Key findings

During the 6 months after the mine fire period, from 11 March to 11 September 2014:

- there was an increased risk of death from cardiovascular diseases in the Latrobe Valley, particularly in Morwell;
- there were 26 cardiovascular-related deaths in Morwell, including 17 with Ischaemic Heart Disease, that were additional deaths to those expected;
- men and residents aged 80 years or older were at greatest increased risk of death from cardiovascular diseases.

Was there an increase in deaths from respiratory conditions related to the mine fire during the mine fire period and in the following six months?

There were no associations observed between the mine fire and respiratory-related deaths. This is unlikely to mean that the smoke posed no threat to people with respiratory illnesses. Instead it is likely that vulnerable people with chronic respiratory illnesses took preventive action including leaving the smoke impacted areas, wearing protective masks and/or increasing their use of preventive medications or oxygen therapy. Other Hazelwood Health Study research streams have shown an association between the mine fire smoke and respiratory symptoms in smoke affected communities.

Why did injury-related deaths increase during the 30-day mine fire period?

The numbers of excess [injury-related deaths](#) (11 during the mine fire period) were too small to subcategorise into more detailed injury-types. Also, the National Mortality Database data did not allow us to infer what activities or behaviours led to the injury-related deaths. Therefore, we don't know exactly what people were doing, or what types of injuries they sustained. However, there are studies showing that exposure to environmental pollutants can have adverse neurological and behavioural effects, such as reducing cognitive judgment and increasing anxiety, depression and self-harm behaviours. Anecdotal evidence suggests that some people in smoke affected areas may have undertaken risky activities, such as climbing ladders to remove ash or flammable debris from roofing, however the National Mortality Database did not contain this information.

Who were the 11 people with injury-related deaths, and 26 people with cardiovascular-related deaths attributed to the mine fire?

The National Mortality Database data were anonymous and only allowed the researchers to look at changes in the patterns of deaths across the population as a whole. The data did not allow the researchers to identify which 11 from all injury-related deaths, or which 26 from all cardiovascular-related deaths, were additional to those expected. The researchers also couldn't answer questions about whether any individual person's death was caused by the mine fire.

GLOSSARY OF IMPORTANT TERMS USED IN THE HAZELINKS MORTALITY REPORT

PM_{2.5}: Very small particles usually found in smoke that have a diameter of 2.5 thousandths of a millimetre or less. When breathed in, PM_{2.5} particles are small enough to travel deeply into the lungs and some can even enter the bloodstream. The Hazelwood Health Study uses PM_{2.5} levels as the main measure of smoke pollution during the mine fire.

Fire impacted areas: These are the towns/localities where the ground level PM_{2.5} concentrations were higher than usual for at least one day during the *mine fire period*. See Figure 1.

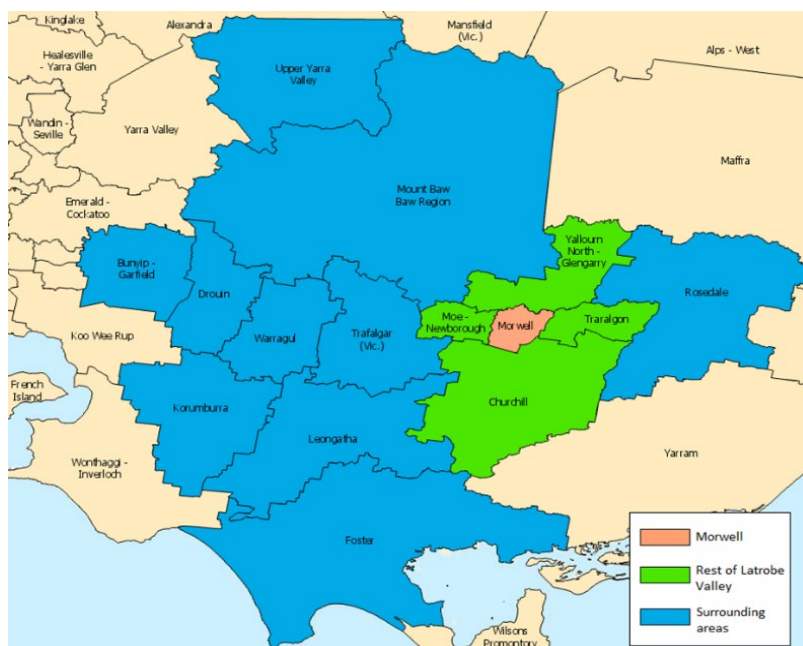


Figure 1. Geographical location of the fire impacted areas

Mine fire period: The Hazelwood mine fire burned for approximately six weeks from 9 February 2014. However, in the Hazelinks Mortality Report, the term *mine fire period* is defined as the 30-day period from 9 February to 10 March 2014. That was the period of the most intense smoke exposure. Figure 2 shows the estimated smoke PM_{2.5} concentrations from 1 February to 31 March 2014 in the southern part of Morwell. The shaded section of Figure 2 shows the first 30-day period of the mine fire, when ground level PM_{2.5} concentrations were markedly higher than usual. From 11 March 2014 onwards, PM_{2.5} concentrations returned to very close to usual levels.

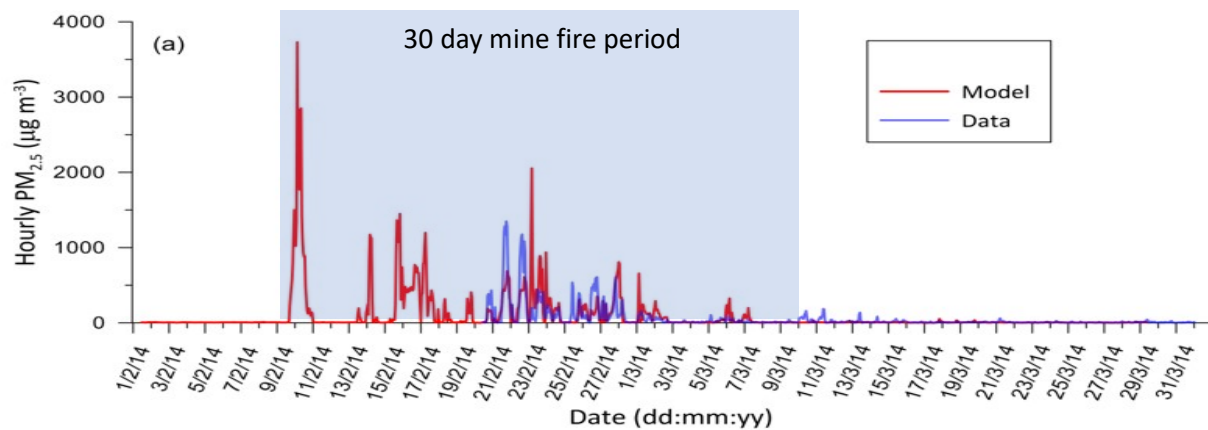


Figure 2. Hourly-averaged observed and modelled concentrations of PM_{2.5} at southern Morwell.

Source: Emmerson K, Reisen F, Luhar A, Williamson G, Cope M. Air quality modelling of smoke exposure from the Hazelwood mine fire Australia: CSIRO; 2016. Available from: <https://hazelwoodhealthstudy.org.au/study-findings/study-reports>.

Six months after the mine fire period: The period from 11 March to 11 September 2014.

Entire analysis period: The period from 1 July 2009 to 30 June 2015 for which we had death data.

All deaths or all-cause mortality: These are counts of all deaths no matter what was the cause of death.

Cardiovascular-related death: These deaths were the result of diseases of the heart and circulatory system. Examples include hypertensive diseases, pulmonary heart disease, ischemic heart disease and diseases of the arteries.

Injury-related death: These deaths were the result of an injury. Examples include injuries due to accidents (such as transport accidents, falls, accidental contact with force, heat or poison), intentional self-harm, assault and medication or drug overdoses.

Dose-response relationship: A dose-response relationship occurs when changes to the level/dose of something (like a medication or exposure to pollution) are associated with changes to a health outcome. In this report we investigated whether there was a dose-response relationship between changes in daily levels of mine fire smoke PM_{2.5} exposure and risk of death.