

## Research Summary

### The impact of coal mine fire smoke on lung ventilation in adults.

May 2023



## Background

The fire in the Morwell open cut brown coal mine adjacent to the Hazelwood Power Station blanketed the town of Morwell and the surrounding area in smoke and ash for six weeks in February and March 2014. The smoke event was recognised as one of the most significant air pollution incidents in Victoria's history. It caused considerable concern within Morwell and the broader community. In response to these concerns, and following extensive community consultation, the Hazelwood Health Study (HHS) was established to examine the impacts of the mine fire. The HHS involves multiple research streams targeting different health outcomes and different vulnerable groups.

The Respiratory Stream is the part of the HHS that examines whether exposure to smoke from the mine fire is associated with respiratory symptoms, asthma control or decline in lung health.

### Analysis aims

Three and a half years after the mine fire, this research aimed to discover whether adults who were more highly exposed to the mine fire smoke had poorer lung health than adults who were less exposed.



## What we did

We worked with CSIRO to estimate the levels of fine particles in the smoke smaller than 2.5 thousandths of a mm in diameter (PM<sub>2.5</sub>). Particles this fine can travel deep into people's lungs and some may even enter the bloodstream. We tested 346 adults from Morwell who were grouped into three levels of mine fire PM<sub>2.5</sub> exposure (low: daily average of 6 millionths of a gram per cubic metre of air (µg/m<sup>3</sup>); medium: average of 12 µg/m<sup>3</sup>; and high: average of 28 µg/m<sup>3</sup>) and 173 adults from Sale who had little or no exposure.

Participants underwent a test of lung health called Multiple Breath Washout (MBW) which measures how evenly and efficiently gases we breathe, such as oxygen and nitrogen, are mixed and distributed throughout different parts of the lungs as people breathe in and out. Uneven mixing of gases in the lung (termed ventilation heterogeneity) occurs in people with asthma, chronic obstructive pulmonary disease or other small airway diseases, and is an indication of impaired lung function. We took into consideration other factors that could influence lung health, such as age, height, weight, cigarette smoking and participant's jobs that may have involved exposure to dust or fumes.



## What we found

We found that as the level of mine fire PM<sub>2.5</sub> exposure increased, ventilation heterogeneity also increased, indicating uneven (poorer) mixing of gases in the part of the lung termed the conductive region. That is, three and a half years after the mine fire, higher levels of smoke exposure were associated with poorer lung function in adults. It is normal for lung ventilation to become more uneven as we age. However, our findings indicated that each 10 µg/m<sup>3</sup> increase in smoke exposure was associated with a change in ventilation that you would normally observe after approximately 7.6 years of aging. This finding was independent of participants' actual age.

A detailed paper describing the findings from this analysis can be requested from the Hazelwood Health Study researchers by email [contact@hazelwoodhealthstudy.org.au](mailto:contact@hazelwoodhealthstudy.org.au) or phone 1800 985 899

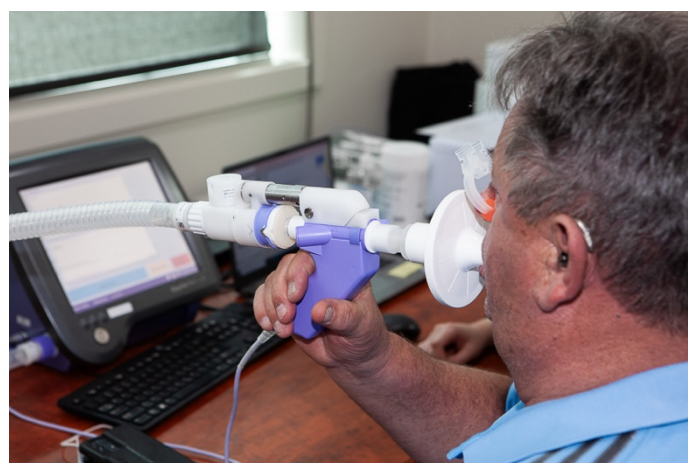


## Where to from here?

Follow up testing of the Respiratory Stream participants is taking place so that longer term health effects of the mine fire smoke can be investigated and we can see if the changes in lung health resolve, persist or worsen.

### Meet the team

Tom McCrabb  
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## Considerations

We cannot be absolutely certain that the mine fire smoke caused the change in lung ventilation because additional factors can affect lung health, such as genes, previous exposure to other sources of smoke, infections or access to health services. The small decreases in gas mixing that we measured may not mean that the affected adults will experience any noticeable lung problems now or in the future. However, people with symptoms like shortness of breath, wheezing, or frequent coughing should always have these checked by a doctor. Further, because a majority of adults from Morwell and Sale did not participate in the baseline Adult Survey from which the Respiratory Stream participants were drawn, it is possible that the findings do not truly represent lung health in the two communities.

The HHS is led by Monash University with collaborators from Menzies Institute for Medical Research, Federation University, The University of Adelaide, and CSIRO.

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