

## Research Summary

### The impact of coal mine fire smoke on lung function in adults 9 years later

September 2024



## 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 quality 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 was established to examine the impacts of the mine fire. The Hazelwood Health Study involves multiple research streams targeting different health outcomes and different vulnerable groups.

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

### Analysis aims

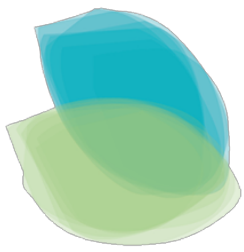
Nine years after the mine fire, this research aimed to discover whether adults who were more highly exposed to the mine fire smoke had poorer lung function than adults who were less exposed.



## What we did

We worked with CSIRO to estimate the levels of fine particles in the smoke smaller than 2.5 thousandths of a millimetre in diameter (PM<sub>2.5</sub>). Particles this fine can travel deep into the lungs. During Round 1 of the Respiratory Stream in 2017-2018, 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 micrograms per cubic metre of air ( $\mu\text{g}/\text{m}^3$ ); medium: 12  $\mu\text{g}/\text{m}^3$ ; and high: 28  $\mu\text{g}/\text{m}^3$ ), and 173 from Sale who had little to no exposure. In Round 2 (2021) we retested 217 adults from Morwell and 112 from Sale, and in Round 3 (2023) we retested 164 adults from Morwell and 80 from Sale.

In all 3 Rounds, participants underwent respiratory function testing including spirometry and the forced oscillation technique (FOT). Spirometry measured how much air they inhaled and exhaled, and how fast they exhaled, in order to detect any evidence of Chronic Obstructive Pulmonary Disease (COPD), a condition characterised by persistent obstruction of lung airflow. FOT measured how easily air moved through the lungs and how stretchy the lungs were. 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 dusts or fumes.



## What we found

In Round 1 we found that, as the level of mine fire PM<sub>2.5</sub> exposure increased, lung stretchiness decreased and evidence of COPD in non-smokers increased. That is, 3.5 years after the mine fire, higher levels of smoke exposure were associated with poorer lung function in adults. It is normal for the lungs to become less stretchy as people age. However, our findings indicated that each 10 µg/m<sup>3</sup> increment in smoke exposure was associated with a decrease in stretchiness that you would normally observe after approximately four years of aging. This finding was independent of participants' actual age.

In Round 2, the previously observed increase in airflow obstruction and decrease in lung stretchiness showed signs of recovery. In Round 3, we found the recovery to be sustained. There were also other signs of lung recovery, such as an improvement in small airways function between Rounds 1 and 3. Our findings were consistent with a slow recovery of lung function after exposure to coal mine fire smoke. That is, 9 years after the mine fire, higher levels of smoke exposure were no longer associated with poorer lung function in adults.

A more detailed paper describing these findings can be found at [www.hazelwoodhealthstudy.org.au/study-findings/publications](http://www.hazelwoodhealthstudy.org.au/study-findings/publications), or requested from the study team by emailing [contact@hazelwoodhealthstudy.org.au](mailto:contact@hazelwoodhealthstudy.org.au)



## Considerations

We could not be absolutely certain that the mine fire smoke caused the features of COPD or decrease in lung stretchiness observed at Round 1. Other factors could have affected lung health, such as genes, previous exposure to other sources of smoke, respiratory infections or access to health services.

The improvement that we observed at Round 3 may have reflected a true recovery in lung health after 9 years. However, 275 participants from Round 1 did not take part at Round 3, which meant that we couldn't know whether their lung health also improved or not. Anybody with symptoms like shortness of breath, wheezing, or frequent coughing should always have these checked by a doctor.



## Where to from here?

Our findings will be shared with local, state and international audiences to ensure that the Study leads to meaningful change in health service provision and how future environmental disasters are responded to.

### Meet the team

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

The research was funded by the Department of Health.

