



Research Summary

The impact of coal mine fire smoke on lung function in adults 7.5 years later

February 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 HHS that examines whether exposure to smoke from the mine fire is associated with respiratory symptoms, asthma control or decline in lung function.

Analysis aims

Seven 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 function than adults who had less exposure.



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_{2.5}). Particles this fine can travel deep into people's lungs. In 2017-2018, Round 1 of the Respiratory Stream testing, we tested 346 adults from Morwell who were grouped into three levels of mine fire PM_{2.5} exposure (low: daily average of 6 micrograms per cubic metre of air (µg/m³); medium: average of 12 µg/m³; and high: average of 28 µg/m³) and 173 adults from Sale who had little or no exposure.

In 2021, Round 2, we retested 217 adults from Morwell and 112 from Sale. In both rounds, participants underwent spirometry which 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). COPD is characterised by persistent obstruction of lung airflow. Participants also underwent a test of lung health using the forced oscillation technique (FOT) which measured how easily air moved through the lungs and the stretchiness of the lungs. In round 2, all participants also underwent a breath test of airway inflammation called fractional exhaled nitric oxide (FeNO). 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_{2.5} 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/m³ increment in smoke exposure was associated with reduced 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 airflow obstruction and reduced stretchiness in the lungs showed signs of recovery. Also, there was no evidence of airway inflammation. That is, 7.5 years after the mine fire, higher levels of smoke exposure were not associated with poorer lung function in adults.

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

Meet the team

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Considerations

We could not be absolutely certain that the mine fire smoke caused the features of COPD or reduction 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 2 may have reflected a true recovery in lung health after 7.5 years. However, 190 participants from Round 1 did not take part at Round 2, 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?

All Respiratory Stream participants from Rounds 1 and 2 were invited to participate in Round 3. These assessments were completed last year and we are now analysing the data.

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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