

# Prenatal exposure to emissions from a coalmine fire and childhood lung function.

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## Background:

Studies linking early life exposure to air pollution and impaired lung health have focused on chronic, low-level exposures in urban settings. The Hazelwood coal mine, located in South-eastern Australia, burned continuously for 6-weeks in February of 2014. This fire episode produced huge amounts of smoke that blanketed local communities, however the health consequences of this exposure event are relatively unknown. We have previously assessed the relationship between lung function and exposure to this episode in infancy. We found mild impairments in peripheral lung function were associated with exposure to the mine fire, 4-years later. However, we weren't able to assess the impacts of prenatal exposure to the mine fire on lung function as the children were too young to undergo lung function tests at the 4-year follow-up.



**Aim:** We aimed to determine whether *in utero* exposure to acute, high-intensity air pollution resulted in impaired post-natal lung function, 7-years after the exposure event.

## Methods:

Mean and maximum daily average particulate matter <2.5 (PM<sub>2.5</sub>) calculated using:

➤ Chemical transport modelling and child's location every 12-hours during the fire period

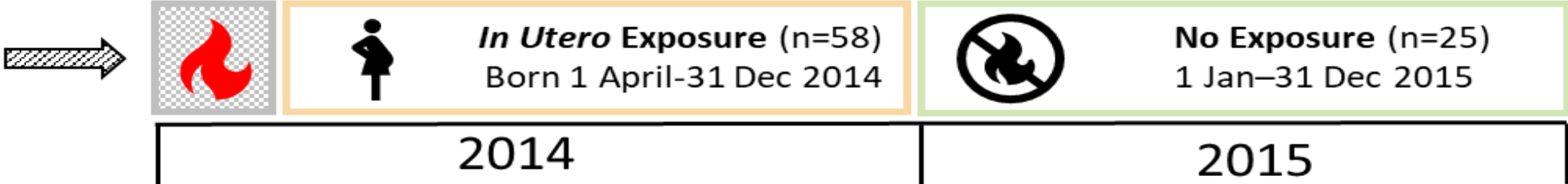
Forced oscillation technique used to measure lung function and Z-scores were calculated:

➤ Resistance at 5 Hz (R<sub>5</sub>), reactance at 5 Hz (X<sub>5</sub>) and area of reactance (AX)

## Statistical analysis:

Covariates were identified a priori and selected using stepwise regression with multiple imputation to generate unbiased replacement values for missing data. Regression models were fitted to compare Z-scores of unexposed and *in utero* exposed children (covariate: maternal education attainment). Subsequently, regression models were fitted to examine the relationship between *in utero* PM<sub>2.5</sub> exposure as a continuous variable and lung function within the *in utero* exposed children (covariate: medication usage in the last 24 hours).

Hazelwood coal mine fire  
February 9<sup>th</sup> – March 31<sup>st</sup> 2014



## Results:

1. No difference in the respiratory Z-scores of unexposed compared to *in utero* exposed children.
2. No association between respiratory Z-scores and *in utero* PM<sub>2.5</sub> exposure. Relationship not altered by the inclusion of covariates.

Photo courtesy of Hazelwood Health Study

## Discussion:

There was no detectable effect of *in utero* exposure to PM<sub>2.5</sub> from a local coalmine fire on post-natal lung function 7 years after exposure, but statistical power was limited. Further work is needed to evaluate lung function at various time points in this cohort.

Strengths: Z-scores, individual exposure estimates, clear exposure classification

Weakness: Modest attendance and low power, most severely exposed attended testing, differences in the cohort that attended compared to entire cohort