COAL AND HEALTH IN AUSTRALIA

Associate Professor Linda Selvey
Curtin University, Perth, Western Australia

CONTEXT

It is worth remembering that perhaps the biggest health impact of mining and burning coal today is the impact on our climate due to the CO_2 that will be released from coal combustion. At Copenhagen in December 2009, world leaders agreed on a target of 2°C warming. At current global emissions we are way off that target, and are set for at least 4°C warming by 2100. If we are going to meet the 2°C degree target, then the world can only emit 1000 billion tonnes of CO_2 between 2000 and 2050. In the first 13 years of the century, we've already burned 40% of that. If we were to mine and then burn Australia's known coal reserves, on their own, would use up one-twelfth of the remaining global carbon budget. Whether we burn our coal here or sell it to China, it's all the same to the atmosphere.

DIRECT IMPACTS

There is very little information about the impact of coal mining and coal combustion on health in Australia. It is important to have Australian-specific information, as the impact of coal on health depends on a range of factors that vary between countries. These include the composition of the coal, how it is mined, the proximity of coal fired power stations to towns and cities, and the emission controls in place.

In response to community concerns, the NSW government initiated the Hunter health study. While the study was a great start, the full conclusions have not yet been published. Dr Tony Merritt from the Hunter New England Health Service gave a presentation about the outcomes of the study in 2010. He analysed hospital admissions data and found some increase in respiratory and cardiovascular admissions in some areas where coal mines and coal-fired power stations occur. There were trends that suggested that coal might be having an effect on hospital admissions, but the data were not consistent across all affected areas. The study design was unable to take into account confounders such as differences in smoking rates between areas. I look forward to further outcomes of the study with interest.

POSSIBLE IMPACTS

1. Coal mining and transport

a. Dust

Coal mining releases particulate matter. These particulates are more likely to be coarser particles (PM10) than finer particles produced through combustion (PM2.5 and lower), though these are also released during coal mining. Depending on their composition and their concentration, PM10 particles can cause respiratory problems such as asthma. The impacts of the particles produced by coal mining on the health of people in the affected areas are not well defined and will depend on what mitigation measures are in place and the extent of the mining.

In 2013, the Australian Government Senate inquiry into air quality in Australia released its report. Included in the report was some anecdotal evidence from a range of sources about the impact of coal dust on the health of the community. For example, the Asthma Foundation of New South Wales argued that proximity to coal mines has been linked to higher rates of asthma.

Evidence provided to the Senate inquiry from the NSW Environment Protection Authority (EPA) indicated the contribution of coal mining to emission levels in that state broadly, with mining for coal accounting for 27.6% of PM2.5 in the greater metropolitan region of Wollongong, Sydney and Newcastle (GMR), and 58.4% of PM10 in the GMR. In the Upper Hunter region those levels are higher, at 66% of PM2.5 and 87.6% of PM10 emissions.

Dust also has other impacts. For example, the large particles causing nuisance dust that can contaminate houses, ceilings, water (rainwater tanks etc). This is an important consideration in itself, but is often disregarded.

The transport of coal also releases coal dust, for example from uncovered coal wagons. The Queensland Resources Council did an evaluation of the cost-effectiveness of introducing wagon lids that was commissioned by Queensland Rail Limited. Queensland Rail Limited estimated that the costs to provide and operate lids on all coal wagons in Australia would be approximately $10 per wagon per day. While the evaluation concludes that it

would not be cost effective for Queensland Rail Limited to introduce lids at the current time, the analysis notes that the introduction of covers on coal wagons 'would almost eliminate coal dust emissions from the primary dust source'. Others may have a different view about the cost-effectiveness of this measure.

There is a proposed expansion of a coal terminal in Newcastle (the T4 coal port). Newcastle community members formed a group the Coal Terminal Action group. This group commissioned monitoring of PM10 particles in the vicinity of coal trains. They found increases of PM10 particles by up to 13 times after a coal train went by, which lasted for up to 4 minutes. They found that there was more particle pollution from unloaded than loaded coal trains. While there is some particulate pollution monitoring in Newcastle at present, monitoring is not performed that close to the source.

b. The impacts of diesel used in coal mining

The WHO has listed diesel emissions as a Group 1 carcinogen. This is based on extensive evidence that exposure is associated with increased risk of lung cancer. Diesel exhausts release benzene, sulphur dioxide, carbon monoxide, nitrogen dioxide, polycyclic aromatic hydrocarbons and particulate matter, all of which have known adverse health effects.

Emissions from diesel engines, particularly in mines, can contribute significantly to poor air quality with approximately one litre of diesel fuel used per tonne of coal produced. The NSW EPA reported to the Senate committee that in the Upper Hunter region non-road diesel equipment is responsible for 13.2% of PM2.5 and 3.1 per cent of PM10.

c. Traffic

There are no Australian data about the impact of increased traffic due to coal mining. However, in Kentucky, USA between 2000 and 2004, there were 53 deaths, 536 injured as a result of accidents with vehicles licensed to transport coal.

d. Noise

There has been very little investigation of the noise impacts of coal mining in Australia. Noise is included in Environmental Impact Statements for some coal mines but is not well followed up. Local people complain about the noise impacts of coal mines in their local areas. Noise pollution is recognised as having an impact on health including causing hypertension, and impacting negatively on school performance.

e. Food and water security

Coal mining is increasingly occurring in areas of high food production. It is not difficult to imagine that this could impact negatively on food production.

Coal mining has been documented as causing contamination of water ways following floods in Queensland. There are also areas in Australia where there have been concerns about the impacts of coal mining on the water table. Coal mining also consumes a lot of water, particularly for dust mitigation and coal washing. In some parts of Australia, coal mining is a high priority for water use. This was a big issue in the Hunter Valley during drought.

f. Occupational health impacts

The occupational health risks of coal mining have been well described over years. Underground coal mining is the most dangerous. Coal miners die and suffer more injuries than other miners – through fires and structural instability. An example of a recent incident is the collapse of part of the Pike Hill coal mine in New Zealand in 2010. In this case, 29 miners died.

In China there were 6027 deaths among coal miners in 2004. In the USA there were 27 deaths in 2004. While Australia has seen some terrible incidents due to coal mining, in general there are better occupational health and safety regulations. In addition, most of our mines are open cast mines, and only 20% of coal mines in Australia are underground.

2. The impacts of coal combustion on health

a. Pollution

Studies in New England, USA, showed that people living within 30 miles of coal-fired power stations had two to five times increased rates of respiratory illness compared with people living further away. Burning coal releases a number of pollutants, including particulates PM10 and PM2.5. These particulates are increasingly recognised as being the biggest contributor to air pollution related health effects of all pollutants. They are produced from burning anything and all combustion including motor vehicles are important causes in urban areas as well as wood fires in winter.

Particulate pollution causes and exacerbates cardiovascular and respiratory disease. The composition of particulates is important, as well as the concentration, and work to measure composition is underway in a number of areas.

Ultrafine particulate matter (below PM2.5) has a high surface area and attracts other pollutants; this then enables the pollutants to reach other parts of the body. Very fine particles can get through the lung and into the bloodstream and hence cause cardiovascular effects. There is no apparent safe threshold level. Some studies have attempted to quantify the impact of particulate pollution. One study found that for every 10 ug/m3 increase in the concentration of PM2.5, there was an increase in mortality of 1.1 – in same year. Other studies, for example in Canada, found a 0.15 increase in all non-accidental cause mortality and 1.31 in ischaemic heart disease for every 10ug/m3 increase in the concentration of PM2.5. One study estimated that combustion emissions from UK sources cause 13,000 excess deaths per year in the United Kingdom, and 6000 annual excess deaths from non-UK EU causes. The leading domestic contributor of UK emissions is transport, estimated to cause 7500 deaths per year, and power generation 2500 per year.

There are other pollutants also released during the combustion of coal. These include NOx, (nitrous oxides), which can cause a high level of respiratory irritation including asthma, and SO2, which also causes respiratory irritation. The amount of sulphur released during the combustion of coal depends on the amount of sulphur in the coal and 'scrubbers' and other measures to reduce it. Heavy metals, such as mercury, are also released when coal is burnt. The amount depends on the amount that is in the coal. Australia apparently has low levels of mercury in coal but this is not well defined.

b. Water

Coal-fired power stations require a lot of water to operate, so that they can produce steam. During the previous prolonged drought in Queensland, water shortages potentially threatened the power supply. Using water to generate electricity reduces the amount of water available for other purposes, such as food production and environmental flows. In the Latrobe Valley, 50% of the available surface water is used for power generation.

c. Coal ash

There is very little information about what happens to coal ash in Australia, but in other countries, coal ash has contaminated waterways. Australia produces 13 tonnes of coal ash every year, much of which is sent to landfill. In Tennessee, USA, there was a large coal ash spill in December 2008. This contaminated the local river with lead and thallium.