

March 8, 2013

Committee Secretary
Senate Standing Committees on Community Affairs
Parliament House, Canberra

The impacts on health of air quality in Australia

Dear Sir/Madam,

I have no objection to my submission or contact details being made publicly available.

Summary

- Traffic is a major source of air pollution in Australia
- Miners have a particularly high exposure to diesel fumes
- Workers at fast food drive-through windows are exposed to high levels of exhaust fumes
- There have been no recent improvements in PM10 or ozone levels in Australia's major cities
- New policies are needed to lower particulate matter levels
- There is no safe level of air pollution, and any reduction in pollution levels will have health benefits

Who I am

I am an Associate Professor at the Institute of Health and Biomedical Innovation at Queensland University of Technology. I have been working in the field of environmental epidemiology for nine years. I have published a book and 39 peer reviewed papers in environmental epidemiology, including 9 papers on the health effects of air pollution. I have a degree in statistics from University College London and PhD in mathematics from The University of Queensland. I am on the editorial review board of the journal *Environmental Health Perspectives* and the editorial board of *Epidemiology*, which are the world's second and fourth best journals in the field of public and environmental health, respectively.

Terms of reference

The impacts on health of air quality in Australia, including

(a) particulate matter, its sources and effects

Particulate matter is usually graded by its size into particulate matter of less than 10 microns in diameter (PM10) and particulate matter of less than 2.5 microns in diameter (PM2.5). More recent studies have examined tiny “ultrafine” particles of less than 100 nanometres in diameter. Many particles are invisible and odourless, which increases the risk of unwitting exposure.

The particles’ constituents can have a huge range, from naturally occurring dust and sea spray to heavy metals such as mercury.

Both the **size** and **constituents** of the particles have implications for health. Smaller particles are thought to be more dangerous because they penetrate deep into the lungs from where their chemical constituents can be absorbed into the blood.

Particles made from elemental carbon (created by combustion processes) are more dangerous than particles made from organic carbon in terms of the risks of hospitalisation for cardiovascular or respiratory disease.

A major source of particles in Australia are **vehicle exhausts**. Particles are created by both diesel and petrol engines, and the constituents of vehicle exhaust particles are particularly damaging to health as they often contain metals and sulfates. Filters on modern vehicles stop some particles escaping, but the filters mainly stop larger particles and the smaller particles—which are potentially more damaging to health—still escape in large numbers.

(b) those populations most at risk and the causes that put those populations at risk

There are many groups at risk of air pollution exposure in Australia. This is because every Australian is exposed to some air pollution every day, and because air pollution contains a wide variety of toxic chemicals with a broad range of adverse health effects.

Miners

An occupational group at clearly increased risk of negative health effects due to air pollution exposure are **miners**. Some miners spend many hours underground in poorly ventilated areas close to machinery burning diesel fuel. Diesel exhausts release benzene, sulphur dioxide, carbon monoxide, nitrogen dioxide, polycyclic aromatic hydrocarbons and particulate matter, all of which have known adverse health effects. In June 2012 the World Health Organization classified diesel exhaust fumes as a known carcinogen, a change that was mainly in response to studies of the health effects of exposure in miners.

Protective equipment is used in mines, but there are anecdotal reports from miners that this equipment frequently breaks down and that exposure levels are noticeably high.

Drive-through workers

An occupational group for whom exposure to air pollution has been overlooked are workers at **drive-through windows**, usually in fast food restaurants but also in bottle-shops. Drive-through workers spend many hours next to vehicles with their engines idling. Drive-through areas are often poorly ventilated because of their enclosed shape. This combination of idling engines and poor ventilation may mean that workers at drive-through

windows are exposed to potentially dangerous levels of exhaust fumes. This is particularly concerning as many workers in fast food restaurants are teenagers, whose lungs are still developing. Long-term exposure to traffic pollution has been shown to impair lung growth in children aged 10 to 18.

Pregnant women

Air pollution is now known to be particularly damaging to **pregnant women**. Exposure to air pollution increases the risk of preterm birth and reduces birth weight. Having a preterm or low birth baby can be traumatic for families, as the child may need to spend many days in pediatric intensive care. Preterm babies also spend more time in hospital throughout their childhood and are more likely to have lifelong health conditions such as deafness. Recent studies from the US have linked air pollution exposure during pregnancy with autism.

Children

Children are particularly vulnerable to pollution exposure because their lungs and immune system are still developing. Children also spend more time outdoors, and so have a generally greater pollution exposure than adults. Our study of children in Australia and New Zealand found that daily increases in PM2.5, PM10, nitrogen dioxide and sulphur dioxide were associated with hospital admissions for pneumonia, bronchitis, respiratory disease and asthma.

The recent ACHAPS (Australian Child Health and Air Pollution) study found that children exposed to nitrogen dioxide had an increased risk of asthma-like symptoms, increased airway inflammation and reduced lung volumes (most of the nitrogen dioxide in cities comes from motor vehicle exhausts). Lifetime exposure to PM10 was associated with reduced lung function, as was recent exposure to PM2.5.

The elderly

The elderly are particularly vulnerable to air pollution as they are more likely to have chronic disease, particularly cardiovascular disease. This means they have less reserve to cope with the physiological changes of air pollution exposure, such as an increased heart and respiratory rate. Our study in Australia found exposure to carbon monoxide, nitrogen dioxide and PM10 were all associated with increased risks of hospitalisation for cardiovascular disease in those aged 65 years and over.

(c) the standards, monitoring and regulation of air quality at all levels of government

Given the high risks of pollution exposure for **miners**, the health and pollution exposure of Australian miners should be prospectively monitored. The recent closure of the mine health surveillance program by the Western Australia Department of Mines was, in my opinion, the wrong decision. This program should be restarted because prospectively collected data will give a better understanding of the long-term health effects of diesel exposure. The program was closed because no short-term health effects were found, but there can be a long delay between exposure to diesel fumes and the onset of lung cancer. Similar delays occur with smoking and exposure to asbestos.

There have been no Australian studies of **fast food workers** health or the levels of

exposure at drive-through windows. Our research group have been trying to engage the Australian fast-food industry to collaborate on exposure studies since June 2012, but with no success. Monitoring studies are urgently needed as current practices could be putting large numbers of young workers at unnecessary risk.

National air quality standards

The National Environment Protection Measures (NEPMs) are one of Australia's principal measures to improve air quality. The air quality NEPMs are a set of standards for six criteria pollutants. The NEPMs were introduced in 1998 and updated in 2003. They required the setting up of monitoring networks to assess compliance with the standards, and for action to be taken to ensure that the standards were met. Air quality standards are not a direct intervention, and will only lead to improved air quality if they promote effective interventions.

Standards are useful for putting downward pressure on pollution levels, but they are often misinterpreted as "safe" thresholds below which there are no adverse health effects. This is clearly not true for Australia, as most of the negative health effects shown by our studies occur at levels well below the standards. There is no known "safe" level for air pollution, just like there is no safe level of smoking.

(d) any other related matters

I recently published estimates of the **long-term trends** in four major pollutants for Brisbane, Melbourne, Perth and Sydney for the years 1996 to 2011. There were long-term improvements in carbon monoxide (reductions of 33% to 79%) and sulphur dioxide (reductions of 0% to 95%). Particulate matter levels (PM10) remained relatively constant, and ozone levels increased in two cities by between 10% and 26%. So the overall picture of urban air quality is mixed. The improvements in carbon monoxide and sulphur dioxide were probably due to improvements in vehicles and fuels, and tighter standards. The lack of improvement in PM10 and ozone is concerning, as these two pollutants are particularly damaging to health.

New policies are needed to tackle particulate matter and ozone. These policies need to come from governments, as the market will not initiate change because those who benefit from creating pollution (e.g., vehicle and petrol companies) do not incur the health costs. Policies to reduce pollution levels could include: tighter standards, changes to land-use planning, vehicle congestion charges, and encouraging active transport.

Any reductions in air pollution in Australia would benefit health, with potentially large benefits given the number of people exposed to air pollution every day, and the great number of health conditions associated with air pollution.

I would be happy to discuss any of these important health issues further.

Yours faithfully,

Associate Professor Adrian Barnett

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