Submission No 210

INQUIRY INTO IMPACT OF THE WESTCONNEX PROJECT

Name: Dr Raymond Nassar

Date Received: 30 August 2018

30/08/2018

To whom it may concern,

I, Dr Raymond Nassar, am willing to appear as a witness in this parliamentary enquiry if it is requested by the investigating body.

Dear Honorable Members of Parliament and members of the parliamentary enquiry,

My name is Dr Raymond Nassar. I am a specialist anaesthetist practicing in Sydney, NSW. I wish to present to you my submission regarding the health effects of air pollution associated with motorised traffic especially in reference to road tunnels.

Infrastructure projects in NSW are currently undergoing a boom. It is of great concern, however, that public health seems to be placed low down on the list of priorities when designing and approving many of these projects. Public health reassurances frequently accompany such projects, however the science behind these reassurances is often questionable.

Projects designed for large and small vehicular transport users pose a special risk for public health. All motorised vehicles, especially diesel vehicles emit dangerous substances which contribute to a worsening of overall air quality. As a result of these types of projects, the overall number of vehicle users increases. As the dangers of air pollution become more and more evident, infrastructure projects such as road tunnels pose special risks to public health. Especially at risk are users of tunnels who are exposed to dangerous levels of in-tunnel pollutant levels, as well as people in the surrounding vicinity of ventilation facilities (stacks), portals and entry and exit ramps. The overall increase in air pollution emitted from such projects acts to worsen the overall air quality of the entire urban area, ie the Sydney Basin.

My background knowledge regarding this topic arises from personal research and peer review of the scientific literature into air pollution and the resultant health effects. I authored an evidence based summary and petition of the health effects in 2014 which was co-signed by over 200 medical practitioners. I also chaired an independent health forum regarding health impacts of air pollution in 2014. Guest speakers included leading researcher into respiratory impacts of air pollution Professor Bin Jalaludin, as well as the CEO of the NSW AMA Ms Fiona Davis, senior lecturer and cardiothoracic surgeon Professor Richard Chard, as well as the CEO of the Asthma Foundation Mrs Michele Goldman. I have been involved in raising public awareness of the dangers of air pollution by providing radio and television interviews, printed media interviews and speaking at public meetings.

My key message is that the medical and scientific world is waking up to the dangers of air pollution.

We are seeing an explosion in the number of large and significant scientific articles which are finding adverse impacts on health from air pollution globally. The popular media is increasingly reporting these results and communities around the world are realizing the potentially devastating effects of exposure to air borne toxins.

Environmental Protection Agencies around the world have exposure limits for some of the known toxic particles and molecules. These levels act as a protective public health measure. However, upper or “safe” limits of exposure to differing particles vary from country to country. The scientific research is showing that major health impacts are occurring with exposure to levels that are considered “safe”. In other words, there is currently no safe exposure level to air pollution.

As the scientific evidence becomes clearer about the health effects of air pollution, we are seeing more and more reports of individual occurrences being linked to air

A nine-year-old girl's fatal asthma attack has been linked to illegally high levels of air pollution.

pollution. The recent tragic death of a 9 year old girl in England is the world's first directly linked death to exposure to air pollution.

As these links are being established, we are seeing a greater incidence of institutions and individuals being held accountable for the adverse impacts that their decisions or policies are having.

A recent example of this is the well reported intentional breach of emission restrictions on new vehicles by major Automotive companies resulting in criminal charges being laid and heavy fines being imposed.

The initial catalyst, in 2014, for my public health campaigning was the announcement of the NorthConnex road tunnel. This was going to be Australia's longest road tunnel at 9km length, with an emphasis on heavy vehicle use. There are two ventilation facilities for this tunnel. One at either end - Wahroonga and West Pennant Hills. The most unique design feature of this tunnel was that the unfiltered ventilation stacks would be placed in a residential area within close proximity of 7000 school students. I could find no other example of this occurring anywhere else in the world. Common and best practise in developed countries is to install filtration systems in urban tunnels or to place ventilation stacks away from sensitive receptors, such as children.

As this tunnel is intended to carry large numbers of trucks, the overall diesel particle emissions would be significantly greater than in any previous tunnel project in Australia. Not only was I concerned about the public health impacts of levels of pollution around the ventilation facilities, but I was also concerned about in-tunnel pollution levels.

During the subsequent public health campaign, I approached local members of parliament, both State and Federal, as well as the minister for Planning to raise my concerns. I met with the project managers but my concerns were not addressed. The responses were predictable and repetitive. The strategy was to create false reassurance by using engineering jargon and by quoting health statistics which had been calculated using assumptive data, ie: they were a best case scenario guess. Again, the science behind these attempts at reassuring the impacted communities was very weak. Ultimately, the NorthConnex EIS did admit three important points:

1. Levels of in tunnel air pollution would reach very high concentrations.
2. Background levels of air pollution would increase around the stack sites, and
3. An increase in mortality could be calculated in the surrounding communities as a result of the project.

These conclusions are

The bulk of my submission consists of a power point presentation with slides and accompanying transcript which I gave to a community group concerned about the Northern Beaches Link. It is based on recent medical and scientific data concerning the health impacts of air pollution. The slides are referenced.

The key points are:

- There is no safe level of exposure to air pollution. The majority of deaths in the UK from air pollution occurred in people with exposure to “safe” current levels.
- Air pollution is now known to cause numerous health problems including cancer, heart attacks, strokes, asthma, impaired lung growth.
- It is also linked to atherosclerosis, Alzheimer’s disease, diabetes, obesity, autism, and low birth weights
- Both short terms exposure and long term exposure have been found to have health impacts.
- More and more adverse effects from air pollution exposure are becoming evident as further research is conducted.
- All residents of urban centers are affected by air pollution. In Sydney, air pollution is often trapped in the Sydney Basin. Ventilation stacks act to disperse pollution into the air, however, particles are subject to gravity and fall back to ground level, thereby increasing pollution (see slides).
- Tunnel users are at particular risk of adverse effects of air pollution. NorthConnex EIS demonstrates very high levels of particulate matter along the length of the tunnels. Likely scenarios of in-tunnel traffic jams would increase these levels and tunnel user exposure further. Air pollution has been shown to penetrate into vehicle cabins even when all windows are shut.

Health Effects of Air Pollution

March 2018

When my family and I found out that we were going to live within 500m of a pollution stack from one of the road tunnels, the nine-kilometre-long NorthConnex road tunnel. I had a 2- and a 4-year-old child at the time, and I really wanted to stay where we were living, so I started to research all the health impacts to try to reassure my wife and my family that it was going to be safe to stay in this area. However, the more research I did and the more literature I read, the more worried I got.

There was nothing in the medical literature that reassured me that it was going to be safe to live near an exhaust stack, with pollution radiating from it, so we ended up moving.

Even as a specialist anaesthetist, a lot of the information available was very new to me, and it is quite amazing how this field of medicine is evolving so rapidly at the moment. There are more and more landmark studies coming out almost on a monthly basis from all around the world that outline the detrimental effects of air pollution.

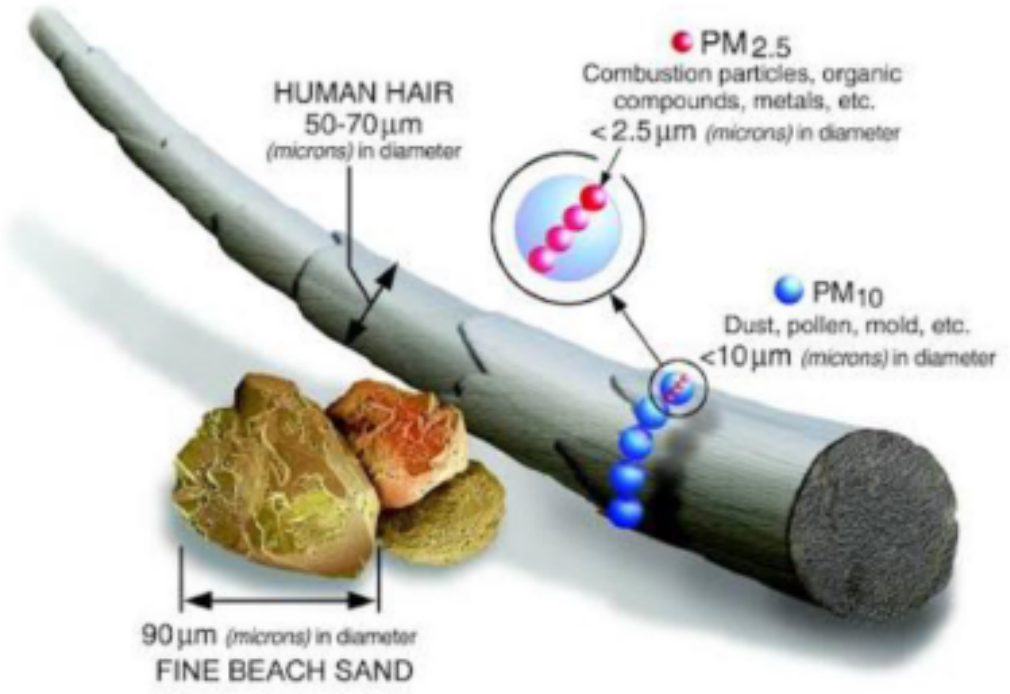
This slide is from the WHMO and shows that air pollution causes 1 in 9 deaths around the world at the moment.

Types of Air Pollution

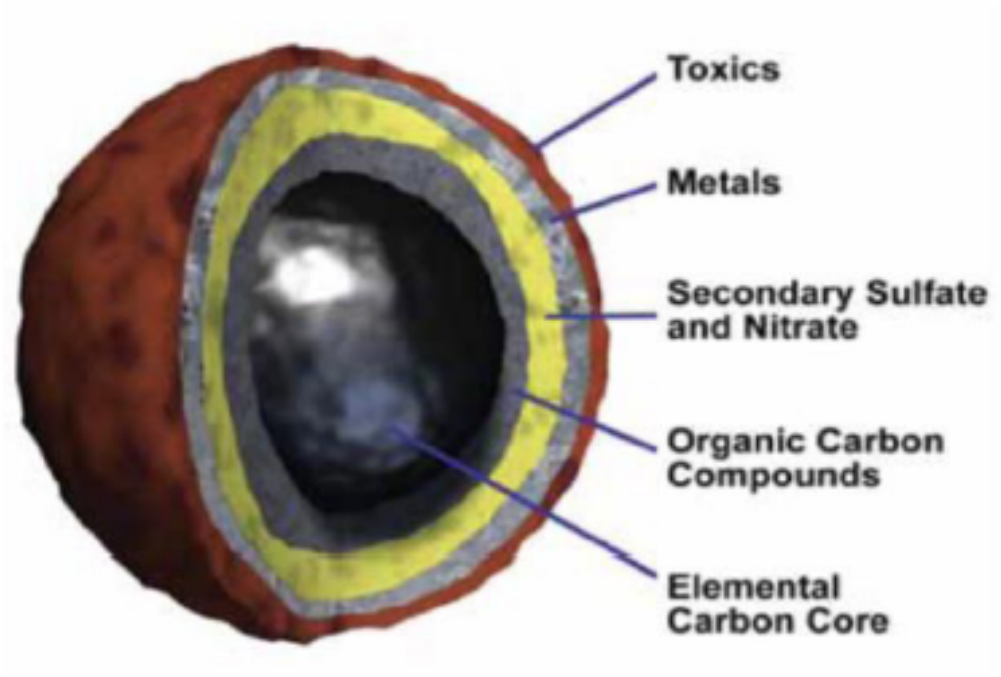
- Molecules:
  - Sulphur dioxide (SO2)
  - Nitrogen Dioxide (NO2)
  - Carbon Monoxide (CO)
  - Carbon Dioxide (CO2)
  - Benzene, Formaldahyde, Lead, Toluene

- Particles:
  - PM10
  - PM2.5
  - PM<1 (Ultrafine)

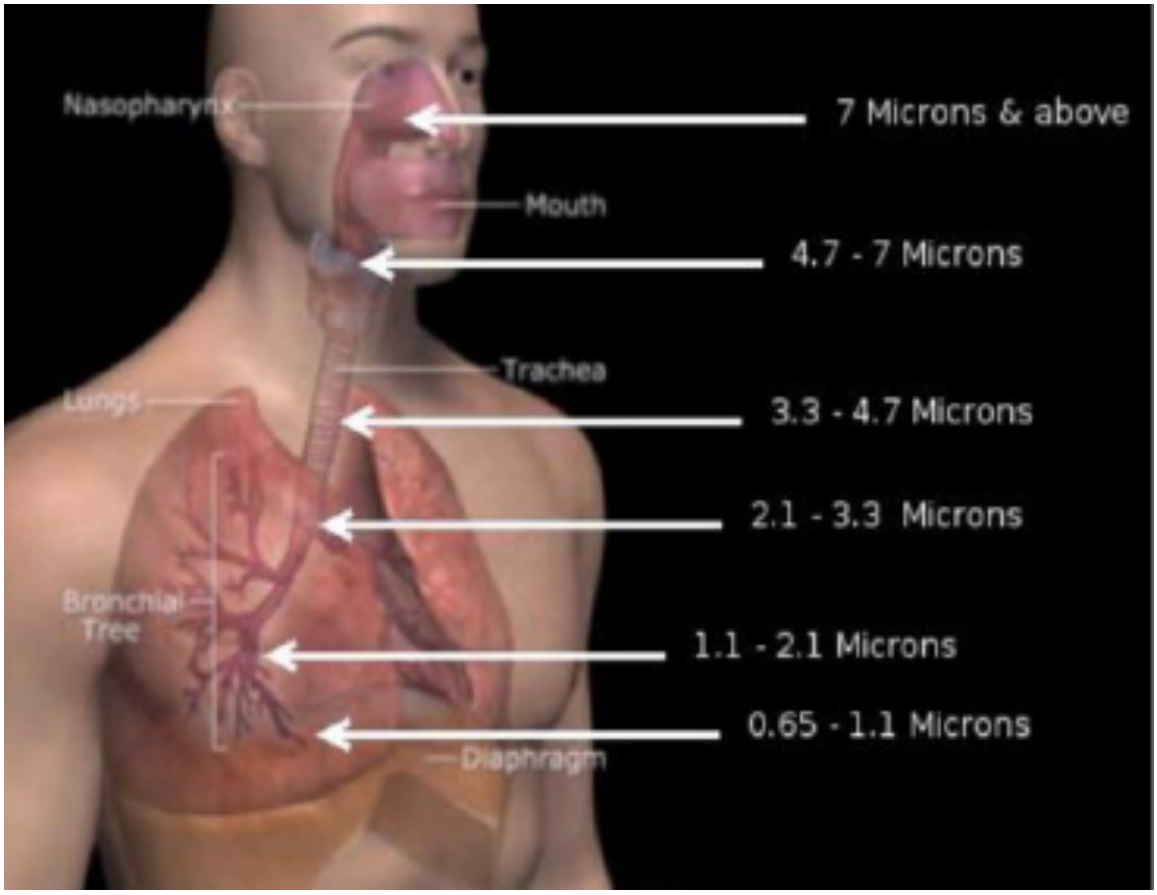
There are 2 types of air pollution: molecules and particles. I'll focus on particles today as they are the ones about which the new literature is coming out. The most important is PM2.5, which means particles of less than 2.5 microns in diameter. Medical literature has also identified ultrafine particles as being very harmful, and they are mostly produced by diesel engines.



To give you an idea of the size of these: to the left is a grain of sand, the blue circles are the PM10s, the pink circles are PM2.5s – they are so small you can't see them with the naked eye.



These particles are made of shells of substances, including heavy metals, such as lead and arsenic. Not only do the particles have an effect by being the shape and size they are, the lead and arsenic by themselves also have an effect. And these particles come from a diesel combustion engine.



What happens to these particles when we breathe them in – the smaller they are, the further they penetrate into the lungs. The upper airways will capture most of the larger particles, but the smaller they are, the further the particles will penetrate into the depths of the lungs and there they get absorbed into the blood stream. Our lungs are there for exchanging substances -mostly oxygen and carbon dioxide - but small particles will also enter the blood stream and from there travel around your whole body and have an effect. Asbestos only stays in the lungs and has an effect on the lungs. Unlike asbestos, these particulates stay in the lungs, but also enter the blood stream and that's what makes them so dangerous.

International Agency for Research on Cancer

World Health Organization

PRESS RELEASE
N° 213

12 June 2012

IARC: DIESEL ENGINE EXHAUST CARCINOGENIC

Lyon, France, June 12, 2012 – After a week-long meeting of international experts, the International Agency for Research on Cancer (IARC), which is part of the World Health Organization (WHO), today classified diesel engine exhaust as **carcinogenic to humans (Group 1)**, based on sufficient evidence that exposure is associated with an increased risk for lung cancer.

The World Health Organisation released this statement about 6 years ago: diesel engine exhaust is a class 1 carcinogen to humans, which means it is proven to cause cancer in humans.

International Agency for Research on Cancer

World Health Organization

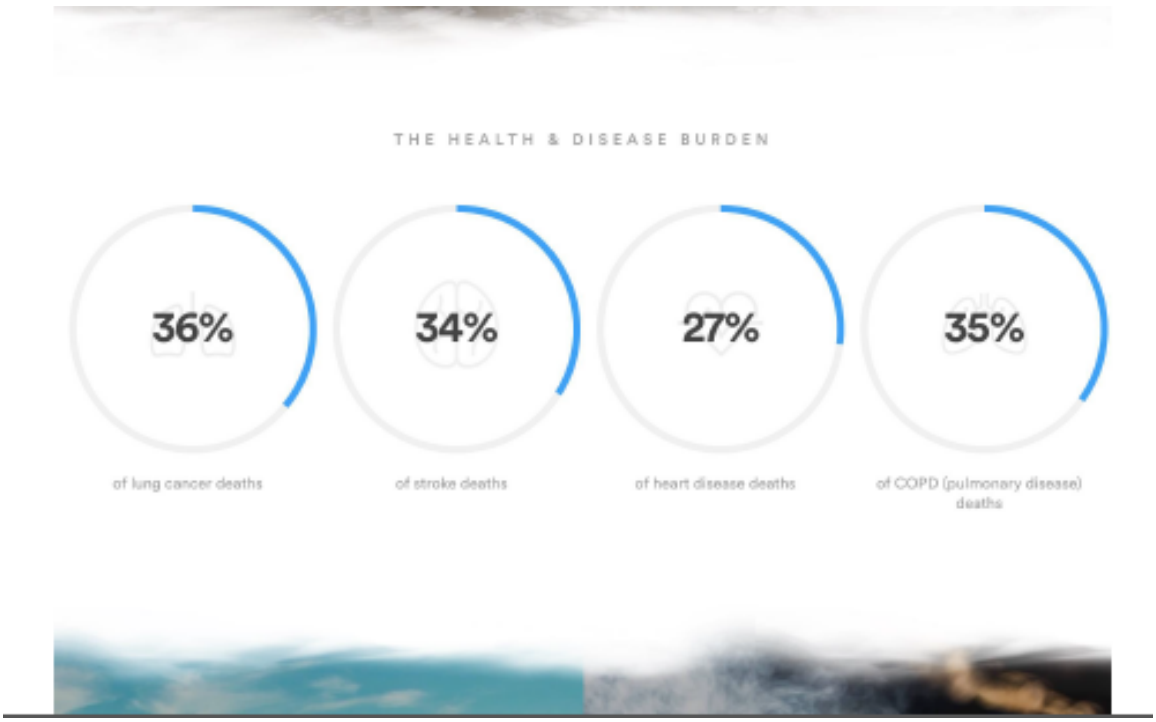
PRESS RELEASE
N° 221

17 October 2013

IARC: Outdoor air pollution a leading environmental cause of cancer deaths

Lyon/Geneva, 17 October 2013 – The specialized cancer agency of the World Health Organization, the International Agency for Research on Cancer (IARC), announced today that it has classified outdoor air pollution as *carcinogenic to humans* (Group 1).[1]

A year later that was expanded to encompass all outdoor air pollution being considered a class 1 carcinogenic material.



Around the world the WHO states that about a third of all lung cancer deaths, stroke deaths, heart disease deaths and pulmonary deaths are due to air pollution.

Children, pregnant women, unborn children, elderly people and people with chronic disease are more susceptible. Children are so susceptible because they breathe at a faster rate than adults and they circulate their blood more frequently. So when children are often playing outdoors, breathing harder, they tend to absorb a lot more pollution and that gets carried around their bodies. Elderly people and people with chronic disease are probably most at risk of cardiovascular side-effects. So when these particles enter the blood stream, they seem to have an inflammatory effect, which means they make your blood more sticky or thicker, which predisposes people to heart attacks and strokes.

Enivromental Justice Australia estimate that 3000 Australians die every year from air pollution.

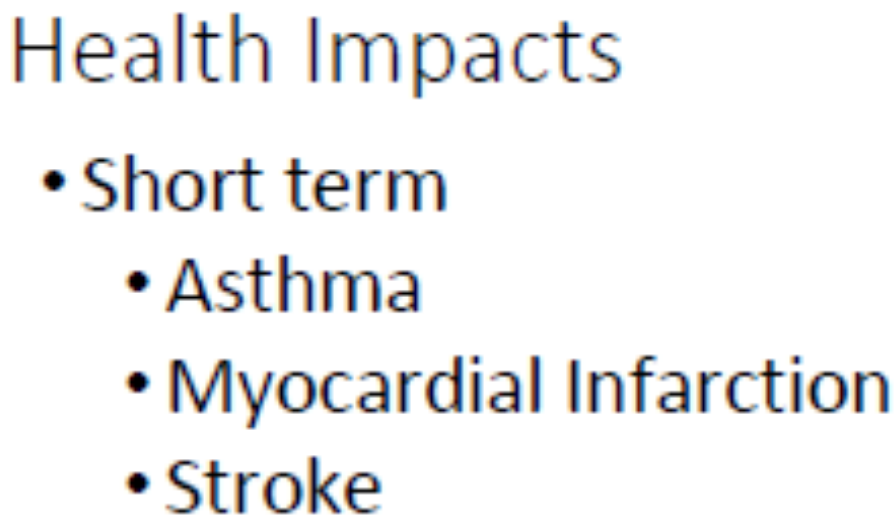
Enivromental Justice Australia estimate that air pollution costs Sydney $8.4 billion a year.

There is no safe level of exposure to any of these substances.

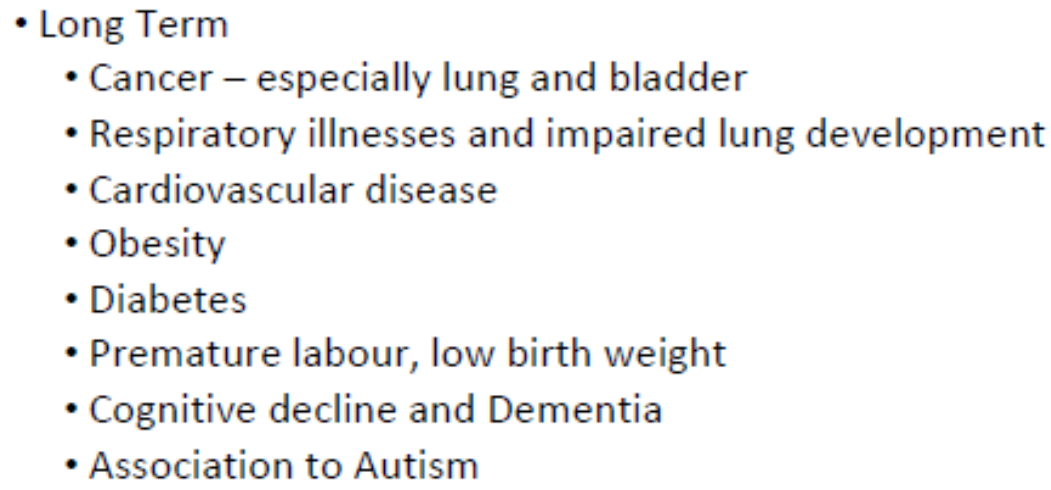
Most countries around the world have guidelines and recommendations in which they try to stay within, but evidence shows that the majority of cases of health impacts occur when people have exposure to the so-called ‘safe’ level – people living in normal communities where the air quality is within the guidelines are still having a lot of these problems.

This document has been put together by two of the most respected medical groups in the worlds, the British Royal College of Physicians and the Royal College of Paediatrics and Child Health. It is a summary of a lot of the health impacts and was released in 2016.

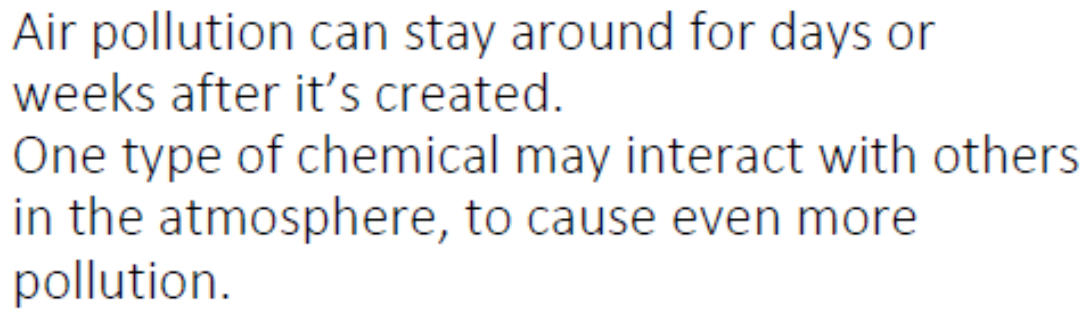
Impacts of air pollution can be divided into short-term and long-term categories.



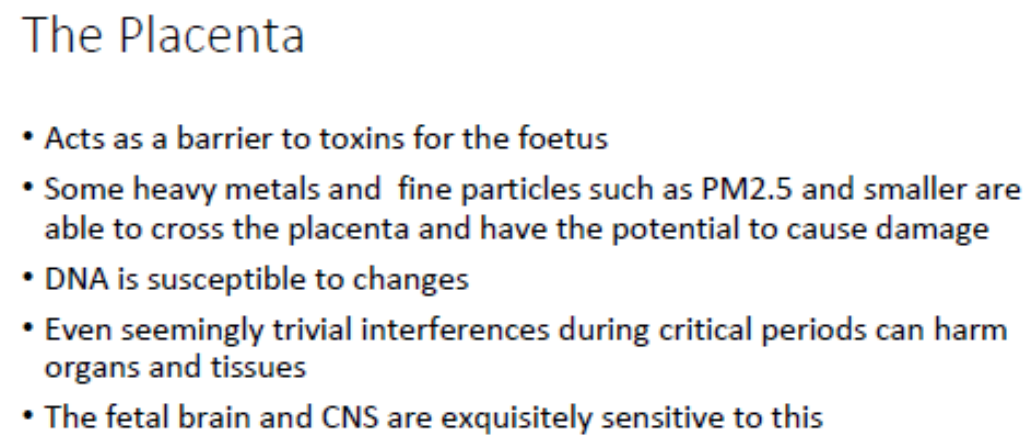
In the short term people are affected by asthma, myocardial infarction and strokes.



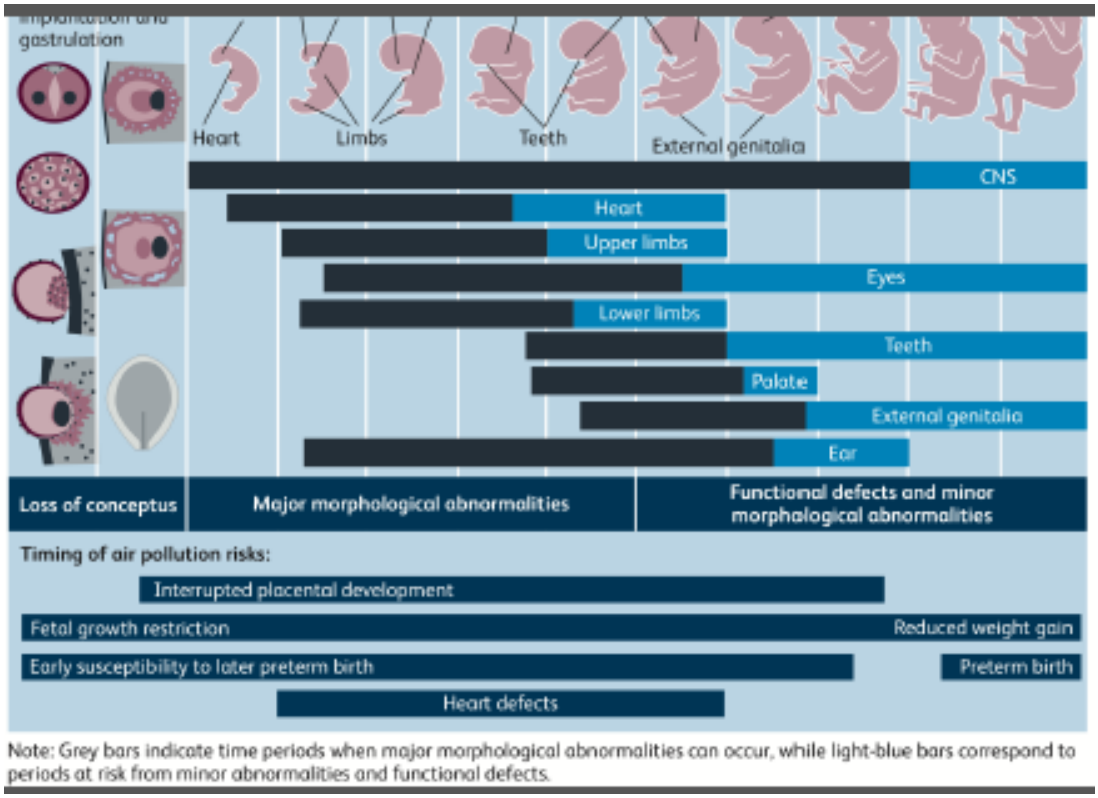
In the long term people are affected by cancer – especially lung and bladder, respiratory illnesses and impaired lung develeopment, cardiovascular disease, obesity, diabetes, premature labour, low birth weight, cognitive decline, dementia and autism.



The Royal College of Physicians note that air pollution can stay around for days or weeks after it's created. They further note that one type of chemical may interact with others in the atmosphere to cause even more pollution.

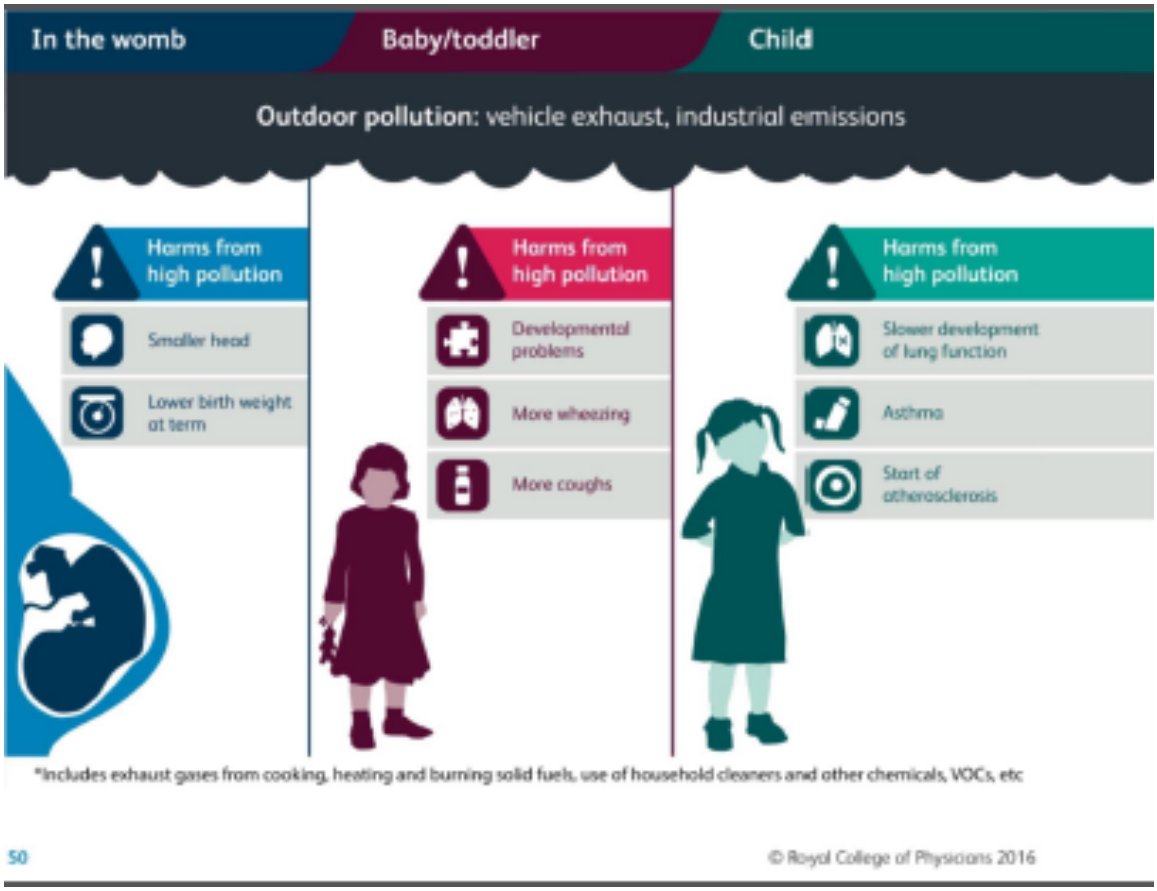


The placenta's role is to provide nutrition to the foetus as well as a barrier to toxins. However, some of these particles, including some heavy metals and fine particles such as PM2.5 and smaller can penetrate the barrier, cross the placenta, enter the foetal blood circulation and potentially cause damage there. DNA is susceptable to changes at this stage. Even seemingly trivial interferences during critical periods of development can harm organs and tissues. The foetal brain and central nervous system are exquisitively sensitive to this.



Note: Grey bars indicate time periods when major morphological abnormalities can occur, while light-blue bars correspond to periods at risk from minor abnormalities and functional defects.

This schematic shows the gestational period with times when major morphological abnormalities can occur in dark blue and minor abnormalities in light blue which result in birth defects.



Throughout a human's life, they are susceptable to air pollution. Toddlers can have developmental problems, more wheezing and more coughs, whilst school-age children can have slower lung development, asthma and the start of atherosclerosis.

FEV1 Growth vs NO2 average over 8 years in School children

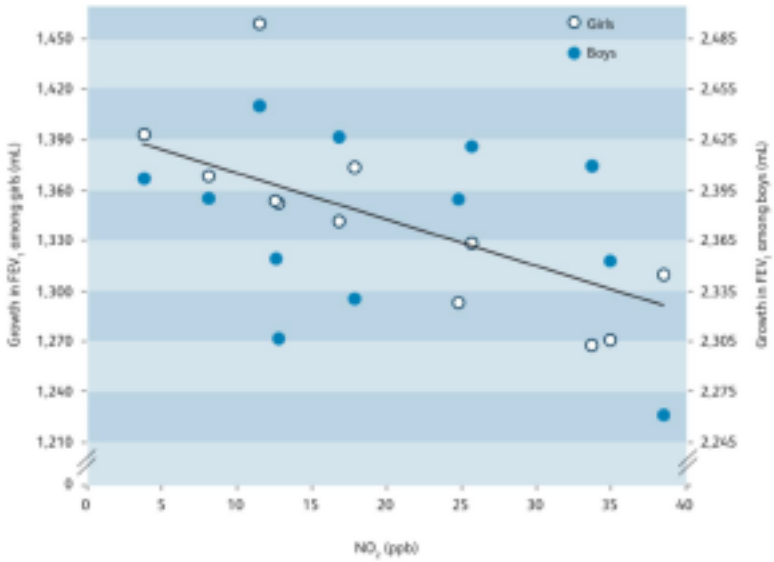


Fig 11. Average growth in FEV_1 in school-age girls (open circles) and boys (closed circles) during an 8-year period, plotted against average NO_2. Each dot represents a separate community. As background NO_2 increases in communities, the rate of growth in FEV_1 decreases. A similar effect was observed for background PM. Adapted with permission from Gauderman *et al*[5] © 2004 Massachusetts Medical Society.

This graph shows the permanent, irreversible inhibition of lung growth in children who were exposed to air pollution. The graph shows nitrogen dioxide levels on the x axis, on the left is the girls, on the right are the boys, and it shows that over a 8-year period – as you increase the levels of background air pollution, the less your lung growth develops.

More direct evidence that air pollution causes suppression of lung function growth is provided by a cross-sectional study of healthy schoolchildren in Leicester, UK.[7] This study used the capacity of macrophages resident on the mucosal surface of the lower airways to take up inhaled material, including pollution particles (PM) (Fig 12).

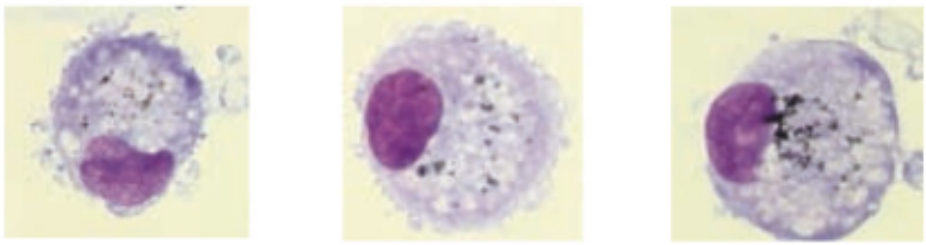


Fig 12. Examples of macrophages recovered from the lower airways of healthy children living in Leicester. The black spots in some of the cells are inhaled fossil fuel-derived particles.

In this study, each 1 μm^2 increase in the area of macrophage black carbon was associated with a 17% reduction in the expected FEV_1 (Fig 13).

This shows a white blood cell from a healthy child's lung. Inside the white cells you can see the black dots, which shouldn't be there as they are air pollution, which have been taken up by a healthy child's lungs. For a certain increase in the area of air pollution in the white blood cells, a 17% reduction in lung function.

Pre school Children

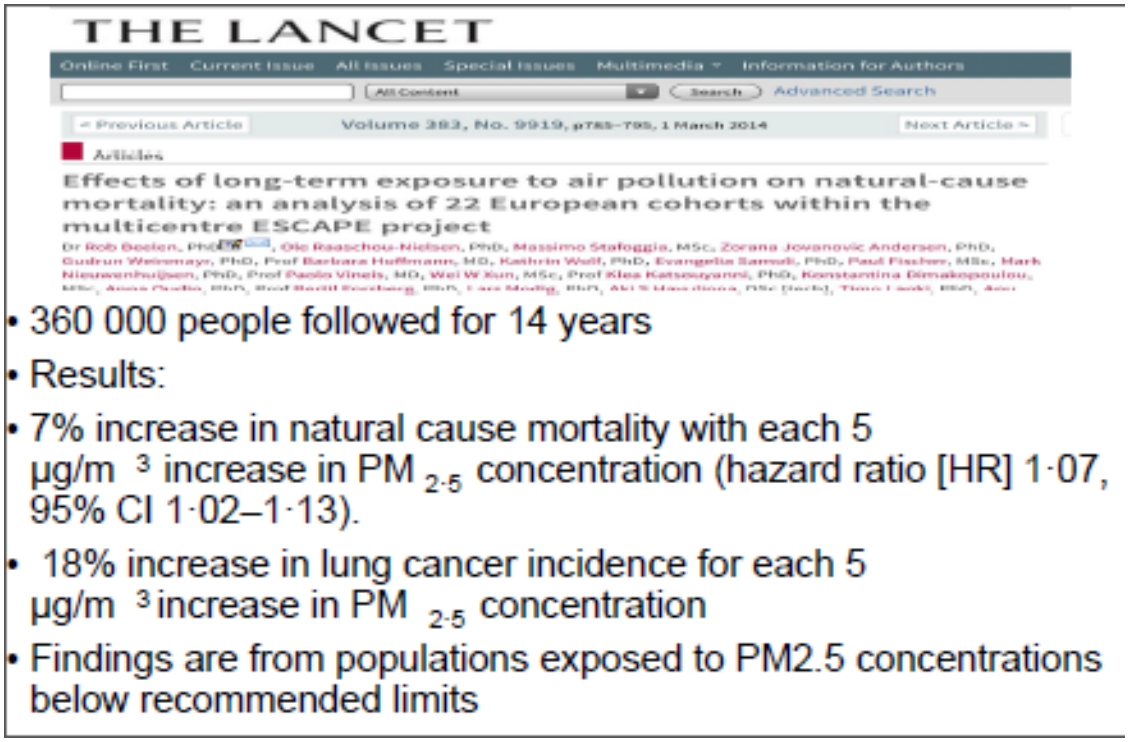
- Increased risk of pre school asthma with increased NO2 and PM10 exposure during both gestation and first year of life.
- Increased risk of developing early school aged asthma with higher markers of traffic associated outdoor air pollution near the home and with exposure to background NO2

It is clear that preschool children have an increased risk of wheeze and asthma if they have an exposure to air pollution such as NO2 and PM10 during both gestation and first year of life.

Schoolchildren

- Exposure to higher NO2 concentration associated with new-onset asthma (Californian Children's Health Study)
- Lifetime risk of asthma higher if living near major highway
- 1.5 fold increased risk of new-onset asthma with increased traffic-related air pollution near home and school
- 19 studies show that :
  - Increased exposure to NO2 is associated with new-onset asthma
  - Increased exposer to PM is associated with new-onset wheeze

School children also have an increased risk of wheeze and asthma which continues with age.



The Lancet has studied the effects of air pollution on 360,000 people for 14 years and has found a dose dependent relationship, so that the more air pollution that was breathed in, the worse the results were; there was a 7% increase in mortality with every 5 microgram per metre cubed increase in the PM2.5 air pollution. There was also an 18% increase in lung cancer incidence for every 5 microgram per metre cubed increase in the PM2.5 air pollution. It is important to note that these findings were from populations exposed to PM2.5 concentrations below recommended limits; so they were within so-called safe limits.

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 OCTOBER 21, 2004 VOL. 351 NO. 17

Exposure to Traffic and the Onset of Myocardial Infarction

Annette Peters, Ph.D., Stephanie von Klot, M.P.H., Margit Heier, M.D.,
Ines Trentinaglia, B.S., Allmut Hörmann, M.S., H. Erich Wichmann, M.D., Ph.D., and Hannelore Löwel, M.D.,
for the Cooperative Health Research in the Region of Augsburg Study Group

ABSTRACT

BACKGROUND

An association between exposure to vehicular traffic in urban areas and the exacerbation of cardiovascular disease has been suggested in previous studies. This study was designed to assess whether exposure to traffic can trigger myocardial infarction.

METHODS

We conducted a case–crossover study in which cases of myocardial infarction were identified with the use of data from the Cooperative Health Research in the Region of

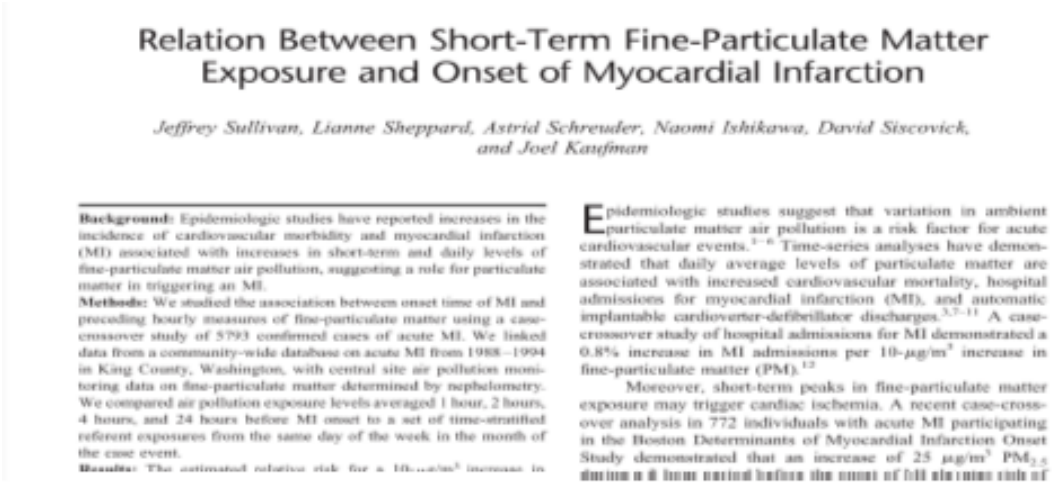
From the Institute of Epidemiology (A.P., S.K., M.H., I.T., H.E.W., H.L.) and the Institute for Health Economics (A.H.), GSF–National Research Center for Environment and Health, Neuherberg; and the Department of Epidemiology, Medical Faculty, Ludwig-Maximilians-Universität, Munich (H.E.W.) — all in Germany. Address reprint requests to Dr. Peters at the Institute of Epidemiology, GSF–National Research

The *New England Journal of Medicine* and numerous other publications have found evidence of links between heart attacks, strokes and air pollution.

Results:

- Association found between exposure to traffic and onset of Myocardial Infarction within 1 hour of exposure.
- Time spent in traffic was consistently linked with an increased risk of MI

Ths study found an onset of myocardial infarction (MI or heart attack) within one hour of exposure to air pollution and that was consistent with time spent in traffic.



Relation Between Short-Term Fine-Particulate Matter Exposure and Onset of Myocardial Infarction

Jeffrey Sullivan, Lianne Sheppard, Astrid Schreuder, Naomi Ishikawa, David Siscovick, and Joel Kaufman

Background: Epidemiologic studies have reported increases in the incidence of cardiovascular morbidity and myocardial infarction (MI) associated with increases in short-term and daily levels of fine-particulate matter air pollution, suggesting a role for particulate matter in triggering an MI.

Methods: We studied the association between onset time of MI and preceding hourly measures of fine-particulate matter using a case-crossover study of 5793 confirmed cases of acute MI. We linked data from a community-wide database on acute MI from 1988–1994 in King County, Washington, with central site air pollution monitoring data on fine-particulate matter determined by nephelometry. We compared air pollution exposure levels averaged 1 hour, 2 hours, 4 hours, and 24 hours before MI onset to a set of time-stratified referent exposures from the same day of the week in the month of the case event.

Epidemiologic studies suggest that variation in ambient particulate matter air pollution is a risk factor for acute cardiovascular events.[1–6] Time-series analyses have demonstrated that daily average levels of particulate matter are associated with increased cardiovascular mortality, hospital admissions for myocardial infarction (MI), and automatic implantable cardioverter-defibrillator discharges.[3,7–11] A case-crossover study of hospital admissions for MI demonstrated a 0.8% increase in MI admissions per 10-$\mu g/m^3$ increase in fine-particulate matter (PM).[12]

Moreover, short-term peaks in fine-particulate matter exposure may trigger cardiac ischemia. A recent case-crossover analysis in 772 individuals with acute MI participating in the Boston Determinants of Myocardial Infarction Onset Study demonstrated that an increase of 25 $\mu g/m^3$ $PM_{2.5}$

Result: 0.8% increase in MI per 10mcg/m3 increase in PM

This study shows that for every 10 micrograms per metre cubed increase in particulate matter (PM), there is a 0.8% increase in the risk of heart attack (MI).

The Lancet 2016 – progression of atherosclerosis

- J. Kaufman looked at Coronary artery calcification in 7000 people over 10 years
- He compared this to long term measured background PM2.5 levels
- Ranges of PM2.5 were 9.6-22.6mcg/m3 (WITHIN "SAFE" LEVELS)
- Average rate of CAC progression was 24 Agatston units
- CAC was accelerated by 4.1 units per year for every 5mcg/m3 increase in PM2.5
- Therefore Coronary atherosclerosis progressed 38% faster for levels of 22mcg/m3 compared to 11 mcg/m3

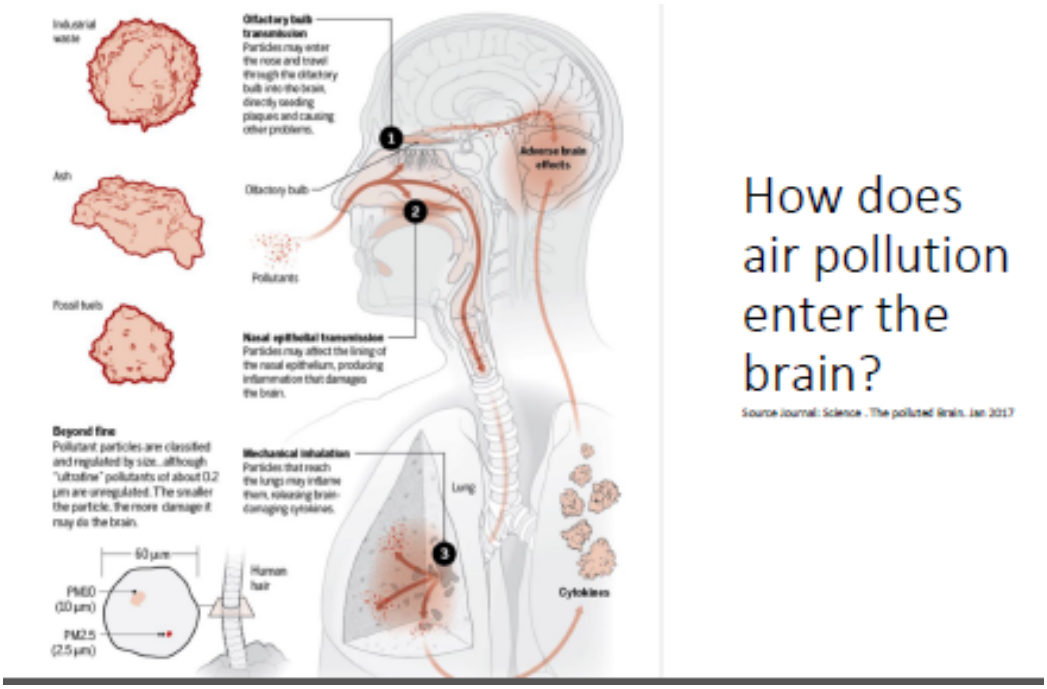
Atherosclerosis is plaques on vessel walls, which predisposes people to heart attacks and strokes. This recent article in *The Lancet* shows that there were two communities, one in a low exposure group, one in a high exposure group. Their atherosclerosis growth was studied, and it was found that even if you lived in an area still within the 'safe' limits of PM2.5 ranges of less than 22.6 micrograms per metre cubed, you still had a 38% faster growth in atherosclerosis compared to people that had half that level of exposure.

Alzheimer's Disease

- Evidence is early but mounting for association B/W AD and pollution
- Epidemiological studies have found that in some cases women exposed to higher levels of PM2.5 had faster rates of cognitive decline and a higher risk of developing dementia.
- Older women living in places where PM2.5 levels exceeded the U.S. Environmental Protection Agency's standard (>12mcg/m3) had an 81 percent greater risk of global cognitive decline and were 92 percent more likely to develop dementia, including Alzheimer's.
- This environmental risk raised by long-term PM2.5 exposure was two to three times higher among older women with two copies of the APOE4 gene, compared with women who had only the background genetic risk with no APOE4 gene.
- Mouse studies found that exposure to nano particles lead to increased levels of beta-amyloid in the brains of the mice. These levels were greater in mice with the APOE4 gene. Beta-amyloid levels are raised in Alzheimer's in humans.

The evidence is early but mounting for an association between Alzheimer's disease and air pollution, especially in females and especially in females and the elderly who have a genetic predisposition; those people are 2 to 3 times more likely to devleop dementia.

There are numerous animal studies that show protein growths in brains which we use to identify and monitor Alzheimer's Disease.



This slide shows some of the possibilities of how air pollution actually enters your brain. It can enter through your olfactric bulbs, which are your nerves that give you smell sensation. Air pollution can cause inflammation in the lining of your nose, or it can be breathed into your lungs, which causes inflammation, which causes proteins to enter your brain and cause damage that way.

34% of deaths from stroke are due to air pollution.

- The Global Burden of Disease study ranks exposure to outdoor air pollution as the ninth leading risk factor for mortality, respectively, with outdoor air pollution accounting for 3·2 million deaths each year

There are about 3.2 million deaths per year from air pollution.

3000 Australians die every year from air pollution.

FULL TEXT ARTICLE

Air pollution and mortality in Europe

Jeremy P Langrish and Nicholas L Mills

Lancet, The, 2014-03-01, Volume 383, Issue 9919, Pages 758-760,

Air pollution has long been associated with detrimental effects on human health, from the treaty presented by John Evelyn, a founding member of the Royal Society, to

THE LANCET

Lancet, The
Volume 383,
Issue 9919

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Finding:

With each 10mcg/m3 reduction in PM there is a increase in life expectancy of 0.61 years.

With every 10 micrograms per cubic metre decrease in air pollution, you get an increase in life expectancy of 0.61 years.

National Environment Protection Measure Guidelines (NEPM) 2014

Table 3: Air NEPM advisory standard for $PM_{2.5}$

Pollutant	Averaging period	Maximum concentration	Goal
Particles as $PM_{2.5}$	1 day 1 year	25 µg/m³ 8 µg/m³	Goal is to gather sufficient data nationally to facilitate a review of the Advisory Reporting Standards as part of the review of this Measure scheduled to commence in 2005.*

ppm = parts per million
µg/m³ = micrograms per cubic metre
*The review was completed in 2011

The Australian guidelines for air pollution PM2.5 currently stands at 25 micrograms per cubic metre for one day exposure.

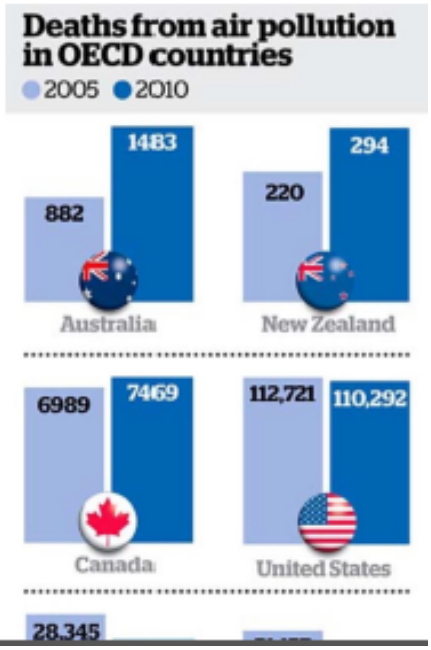
There is no safe exposure limit

- Legislated concentration limits do not represent a “safe” level for the population as a whole, but are considered to not pose a ”significant risk” to health
- Estimated 29000 deaths annually in UK from exposure to PM2.5.
- Only a small fraction of these are due to exposure in excess of legal limits.

However there are no safe exposure levels. In the UK there are an estimated 29,000 deaths annually in the UK from exposure to PM2.5. Only a fraction of those deaths are due to exposure in excess of the so-called safe levels.

Australian air getting worse

- Organisation for Economic Co-operation and Development, report called *The Cost of Air Pollution: Health Impacts of Road Transport*, shows Australia has failed to halt the dangerous rise in air pollution.
- It estimates the economic cost of that failure has run into the billions.
- The report shows that between 2005 and 2010, the number of deaths from air pollution in Australia jumped from 882 to 1483, representing a 68 per cent rise.



The OECD report shows that Australia is actually having an increase in the number of deaths due to air pollution.

No Safe levels

- All predictions of air quality for infrastructure projects are modelled using computer software
- Not based on actual measured data
- Dependent on input factors such as topography, wind speeds etc
- Statement such as “Levels of pollutants will be closely monitored to ensure that they are within acceptable levels” are misleading
- There are no acceptable levels

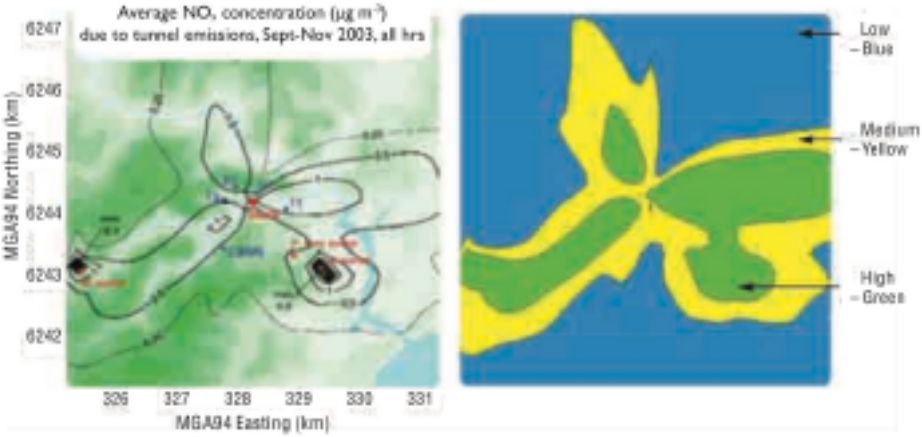
There are no safe levels of air pollution.

Question?

- Is it not better to get the air pollution away from the ground level and shoot it into the sky?

The shape of the 'high' exposure zone describes the interaction of prevailing meteorology with the emitted NO_x plumes from these three sources.

FIGURE 5.1 Modelled average NO_x concentrations (left) and resulting assigned NO_x exposure zones (right) for the M5 East tunnel

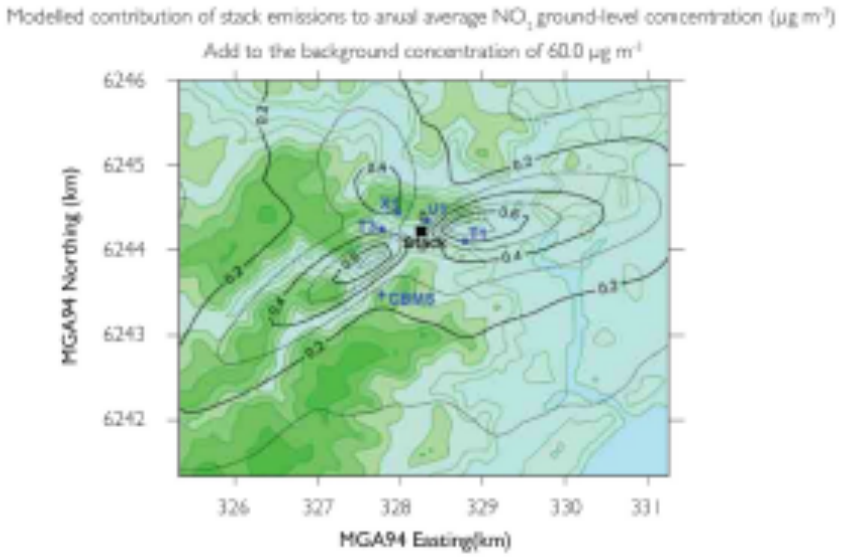


Source: Investigation into the possible health impacts of the M5 East motorway stack on the Turella community – reanalysis report by NSW Health, November 2006 (see Chapter 6)

This slide shows some of the data from the NHMRC document on the M5 East, and it shows an increase in ground-level air pollution around ventilation shaft sites due to tunnel emissions, with high exposure > 0.54 micrograms per cubic metre of Nitrogen Oxide in green, medium exposure > 0.30 and < 0.54 micrograms per cubic metre of Nitrogen Oxide in yellow, and low exposure < 0.30 micrograms per cubic metre of Nitrogen Oxide in blue.

Source: http://www.health.nsw.gov.au/environment/Publications/m5-health-impact.pdf

FIGURE 5.6 **Modelled contribution of stack emissions to annual average NO_2 ground-level concentrations around the M5 East tunnel stack, February 2002 – January 2003**



CBM5, T1, T3, U, X1 and X1 are pollutant monitoring stations.

Source: Hibberd (2003)

This study indicated that the maximum ground-level concentrations of PM_{10}, NO_2 and NMVOC were found 600–1200 m downwind of the stack during daytime. The spatial pattern reflected the trends in prevailing winds (Figure 5.4). Most importantly, the highest concentrations

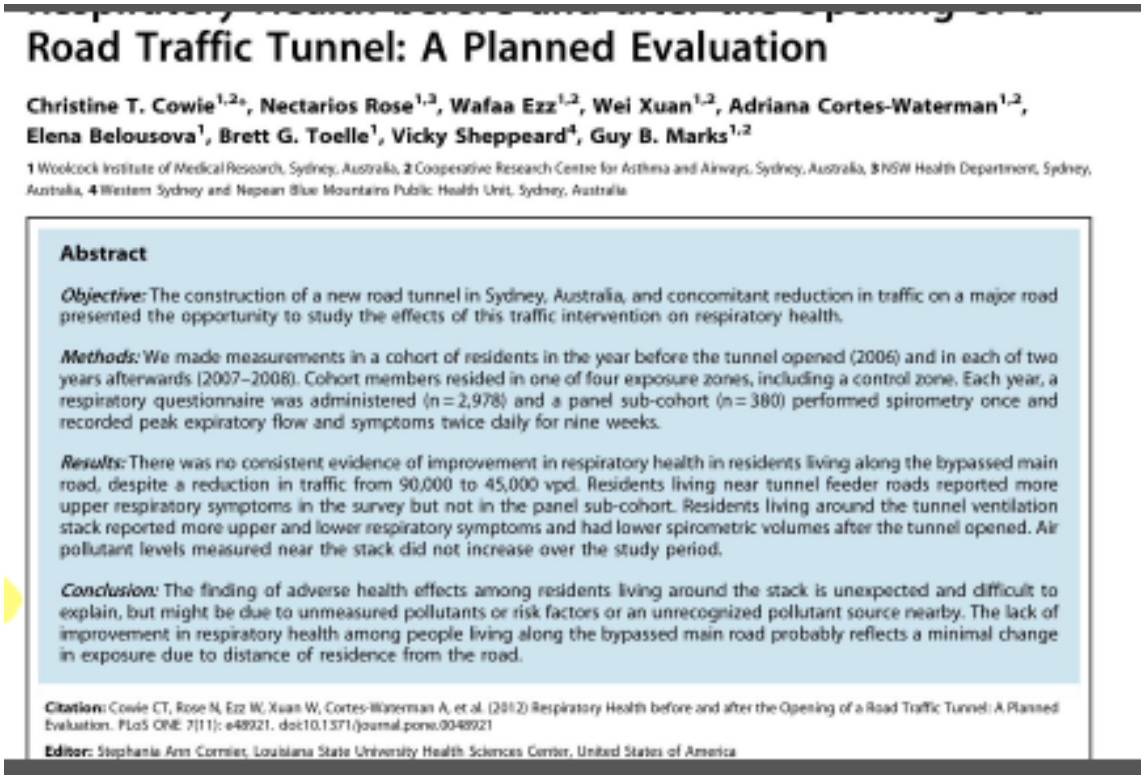
This study indicated that the maximum ground-level concentrations of PM2.5 from Nitrogen Oxide and NMVOC were found 600 to 1200 m downwind of the ventilation shaft during daytime. The spatial pattern reflected the trends in prevailing winds

- Increased traffic around tunnel access routes and local streets
- Portal emissions potentially worse than stack emissions
- Poor public health practise to improve air quality in one area in exchange for worsening air quality elsewhere.
- Dispersion problems in urban areas
- Particles have mass and are subjected to gravity
- Sydney basin geography “collects” pollution over entire city
- Cowie study showed no improved health in people living near now bypassed roads.
- Tunnels concentrate pollution and offer an opportunity to mostly remove that pollution from the atmosphere through filtration

You will get some pollution coming back, but it’s so small that you can’t see it, can’t smell it; these air pollution molecules do have mass, so they will be subject to gravity. They don’t just disappear into thin air and are gone, they are not biodegradable.

When there are tunnels, there must be on ramps and off ramps, and they attract traffic.

It’s not good public policy practice to say that air quality will be improved for one group of people, but punish another group of people. That’s not how public health works. Governments and developers should adopt a cautionary principle: when there is doubt about the safety of something, you don’t go ahead with it.



Road Traffic Tunnel: A Planned Evaluation

Christine T. Cowie[1,2]*, Nectarios Rose[1,3], Wafaa Ezz[1,2], Wei Xuan[1,2], Adriana Cortes-Waterman[1,2], Elena Belousova[1], Brett G. Toelle[1], Vicky Sheppeard[4], Guy B. Marks[1,2]

1 Woolcock Institute of Medical Research, Sydney, Australia, **2** Cooperative Research Centre for Asthma and Airways, Sydney, Australia, **3** NSW Health Department, Sydney, Australia, **4** Western Sydney and Nepean Blue Mountains Public Health Unit, Sydney, Australia

Abstract

Objective: The construction of a new road tunnel in Sydney, Australia, and concomitant reduction in traffic on a major road presented the opportunity to study the effects of this traffic intervention on respiratory health.

Methods: We made measurements in a cohort of residents in the year before the tunnel opened (2006) and in each of two years afterwards (2007–2008). Cohort members resided in one of four exposure zones, including a control zone. Each year, a respiratory questionnaire was administered (n = 2,978) and a panel sub-cohort (n = 380) performed spirometry once and recorded peak expiratory flow and symptoms twice daily for nine weeks.

Results: There was no consistent evidence of improvement in respiratory health in residents living along the bypassed main road, despite a reduction in traffic from 90,000 to 45,000 vpd. Residents living near tunnel feeder roads reported more upper respiratory symptoms in the survey but not in the panel sub-cohort. Residents living around the tunnel ventilation stack reported more upper and lower respiratory symptoms and had lower spirometric volumes after the tunnel opened. Air pollutant levels measured near the stack did not increase over the study period.

Conclusion: The finding of adverse health effects among residents living around the stack is unexpected and difficult to explain, but might be due to unmeasured pollutants or risk factors or an unrecognized pollutant source nearby. The lack of improvement in respiratory health among people living along the bypassed main road probably reflects a minimal change in exposure due to distance of residence from the road.

Citation: Cowie CT, Rose N, Ezz W, Xuan W, Cortes-Waterman A, et al. (2012) Respiratory Health before and after the Opening of a Road Traffic Tunnel: A Planned Evaluation. PLoS ONE 7(11): e48921. doi:10.1371/journal.pone.0048921

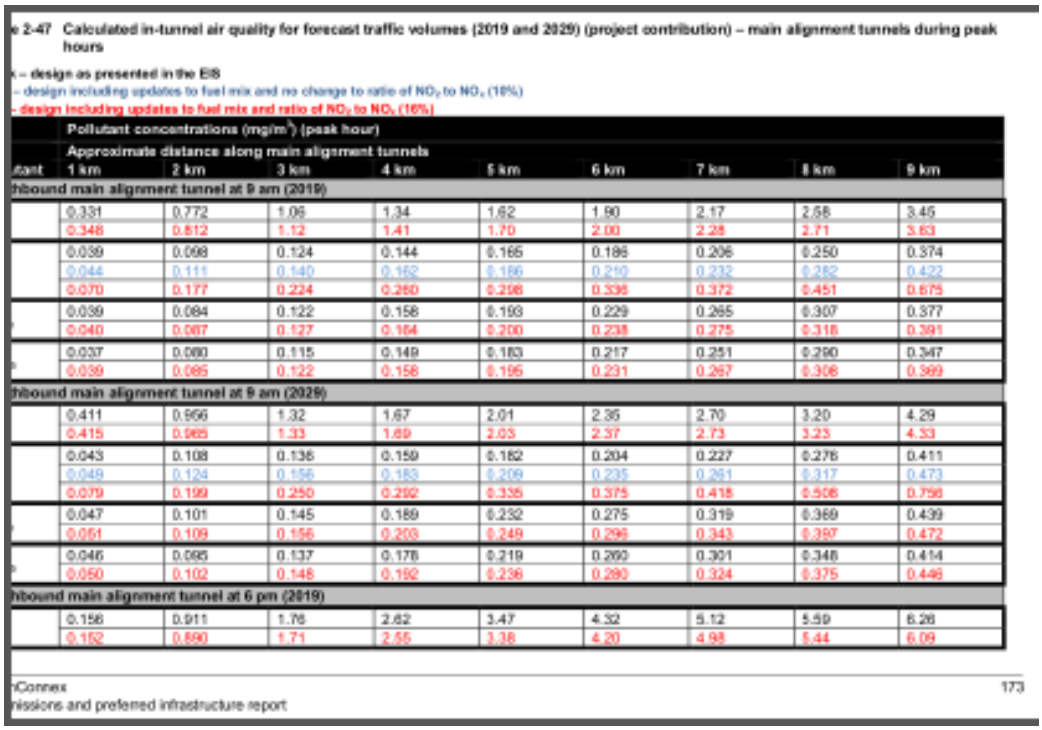
Editor: Stephania Ann Cormier, Louisiana State University Health Sciences Center, United States of America

This slide shows a study done on the Lane Cove tunnel which shows that there is no improvement in the health of people that were now living on a by-passed road after the tunnel opened, and there were respiratory problems in people who lived near the stacks, and they couldn't explain it.

Northconnex EIS

- Tunnel users will be exposed to very high levels of pollution

For those of you who are looking forward to these tunnels: tunnel users will be exposed to very high levels of pollution.



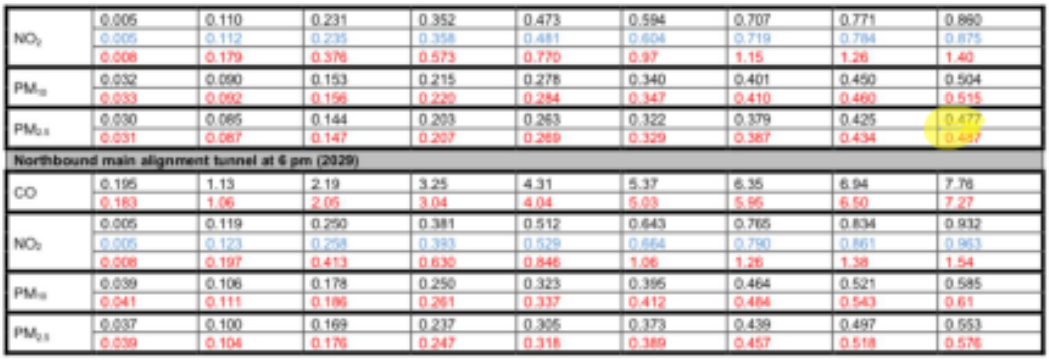
e 2-47 Calculated in-tunnel air quality for forecast traffic volumes (2019 and 2029) (project contribution) – main alignment tunnels during peak hours

x – design as presented in the EIS
– design including updates to fuel mix and no change to ratio of NO_2 to NO_x (18%)
– design including updates to fuel mix and ratio of NO_2 to NO_x (16%)

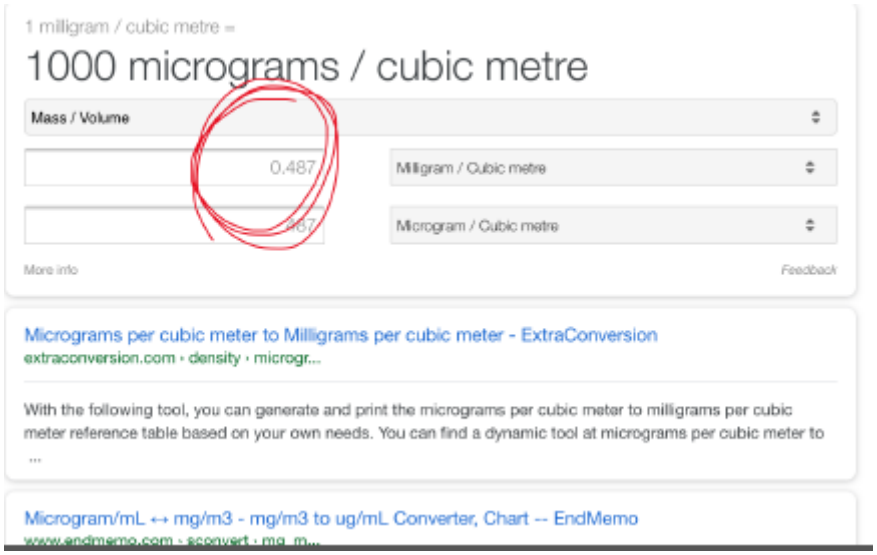
	Pollutant concentrations (mg/m³) (peak hour)								
	Approximate distance along main alignment tunnels								
tant	1 km	2 km	3 km	4 km	5 km	6 km	7 km	8 km	9 km
hbound main alignment tunnel at 9 am (2019)									
	0.331	0.772	1.06	1.34	1.62	1.90	2.17	2.58	3.45
	0.348	0.812	1.12	1.41	1.70	2.00	2.28	2.71	3.63
	0.039	0.068	0.124	0.144	0.165	0.186	0.206	0.250	0.374
	0.044	0.111	0.140	0.162	0.186	0.210	0.232	0.282	0.422
	0.070	0.177	0.224	0.260	0.298	0.336	0.372	0.451	0.675
	0.039	0.084	0.122	0.158	0.193	0.229	0.265	0.307	0.377
	0.040	0.087	0.127	0.164	0.200	0.238	0.275	0.318	0.391
	0.037	0.080	0.115	0.149	0.183	0.217	0.251	0.290	0.347
	0.039	0.085	0.122	0.158	0.195	0.231	0.267	0.308	0.369
hbound main alignment tunnel at 9 am (2029)									
	0.411	0.966	1.32	1.67	2.01	2.35	2.70	3.20	4.29
	0.415	0.965	1.33	1.69	2.03	2.37	2.73	3.23	4.33
	0.043	0.108	0.136	0.159	0.182	0.204	0.227	0.276	0.411
	0.048	0.124	0.156	0.183	0.209	0.235	0.261	0.317	0.473
	0.079	0.199	0.250	0.292	0.335	0.375	0.418	0.508	0.756
	0.047	0.101	0.145	0.189	0.232	0.275	0.319	0.389	0.439
	0.051	0.109	0.156	0.203	0.249	0.296	0.343	0.397	0.472
	0.046	0.095	0.137	0.178	0.219	0.260	0.301	0.348	0.414
	0.050	0.102	0.148	0.192	0.236	0.280	0.324	0.375	0.446
hbound main alignment tunnel at 6 pm (2019)									
	0.156	0.911	1.76	2.62	3.47	4.32	5.12	5.59	6.26
	0.152	0.890	1.71	2.55	3.38	4.20	4.98	5.44	6.09

nConnex 173
nissions and preferred infrastructure report

The NorthConnex EIS shows the predicted levels of pollution for the North bound and South bound tunnels in 2019 and 2029, with PM2.5 at 0.477 and 0.487 in one tunnel and 0.553 and 0.576 milligrams per cubic metre in the other tunnel. After conversion from milligrams to micrograms per cubic metre these measurements equate to 477 and 487 micrograms per cubic metre in one tunnel and 553 and 576 micrograms per cubic metre in the other tunnel, where we've talked about safe levels of PM2.5 of less than 25 micrograms per cubic metre.



NO_2	0.005	0.110	0.231	0.352	0.473	0.594	0.707	0.771	0.890
	0.005	0.112	0.235	0.358	0.481	0.604	0.719	0.784	0.875
	0.008	0.179	0.376	0.573	0.770	0.97	1.15	1.26	1.40
PM_{10}	0.032	0.090	0.153	0.215	0.278	0.340	0.401	0.450	0.504
	0.033	0.092	0.156	0.220	0.284	0.347	0.410	0.460	0.515
$PM_{2.5}$	0.030	0.085	0.144	0.203	0.263	0.322	0.379	0.425	0.477
	0.031	0.087	0.147	0.207	0.269	0.329	0.387	0.434	0.487
Northbound main alignment tunnel at 6 pm (2029)									
CO	0.195	1.13	2.19	3.25	4.31	5.37	6.35	6.94	7.76
	0.183	1.06	2.05	3.04	4.04	5.03	5.95	6.50	7.27
NO_2	0.005	0.119	0.250	0.381	0.512	0.643	0.765	0.834	0.932
	0.005	0.123	0.258	0.393	0.529	0.664	0.790	0.861	0.963
	0.008	0.197	0.413	0.630	0.846	1.06	1.26	1.38	1.54
PM_{10}	0.039	0.106	0.178	0.250	0.323	0.395	0.464	0.521	0.585
	0.041	0.111	0.186	0.261	0.337	0.412	0.484	0.543	0.61
$PM_{2.5}$	0.037	0.100	0.169	0.237	0.305	0.373	0.439	0.497	0.553
	0.039	0.104	0.176	0.247	0.318	0.389	0.457	0.518	0.576



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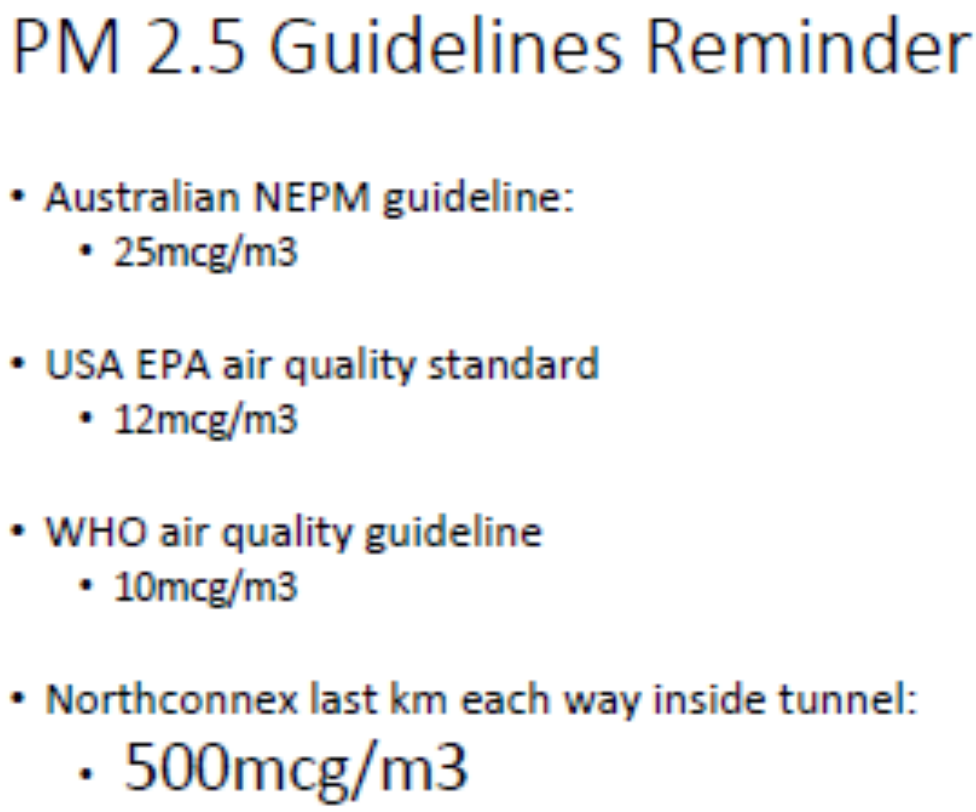

(Note: error on slide. WHO air quality guideline for 24 hours should read 25mcg/m3 and USA EPA should read 35mcg/m3)

Australia recommends 25 micrograms per cubic metre of PM2.5, the USA recommends 12 micrograms per cubic metre of PM2.5, the World Health Organisation (WHO) recommends 25 micrograms per cubic metre of PM2.5, so if you're sitting in a traffic jam in the NorthConnex tunnel, you're breathing in almost 20 times the level of particulate matter recommended by the WHO.

In conclusion, I would like to reemphasise the fact that medical and scientific evidence is showing, without a doubt, that air pollution from motor vehicle traffic is responsible for major adverse health effects.

These health effects can occur from short term as well as long term exposure to air pollution.

Research is finding that a large proportion of adverse health event occur with exposure to what is considered "safe" levels which fall within current guidelines. This has prompted the statement that there is no safe level of exposure.

Air pollution is a major public health issue in many developed countries and governments are facing great challenges in reversing and correcting the causes of urban pollution.

Projects, such as road tunnels, encourage motor vehicle traffic and lead to an overall increase in traffic related pollution. Tunnels concentrate pollutants within them and around the ventilation facilities and portals. These projects lead to an overall increase in urban pollution and pose health risks to their users as well as surrounding communities.

Tunnel projects pose a unique opportunity to remove many of these pollutants entirely from the urban environment by the use of adequate filtration systems.