NICE National Institute for Health and Care Excellence

Expert testimony to inform NICE guideline development

Section A: Developer to complete	
Name:	**Dr Sotiris Vardoulakis**
Role:	**Head of Environmental Change Department** **Centre for Radiation, Chemical & Environmental Hazards**
Institution/Organisation (where applicable): **Contact information:**	Public Health England
Guideline title:	Transport Related Air Pollution
Guideline Committee:	PHAC E
Subject of expert testimony:	Brief introduction to key issues in the epidemiology of air pollution and health
Evidence gaps or uncertainties:	What are the key health impacts of transport related air pollution? What is known about the causal pathways? Who is most at risk from transport related air pollution? What are the main sources of pollution at background and local levels?

Section B: Expert to complete

Summary testimony:	[Please use the space below to summarise your testimony in 250–1000 words. Continue over page if necessary]

Introduction:

Both long- and short-term exposure to air pollution are known to adversely affect health. Short-term exposure (over hours or days) to elevated levels of air pollution can cause a range of effects including exacerbation of asthma, effects on lung function, increases in hospital admissions and mortality. Epidemiological studies have shown that long-term exposure (over several years) reduces life-expectancy, mainly due to increased risk of mortality from cardiovascular and respiratory causes and from lung cancer. The most consistent and convincing evidence suggests an important role for fine particulate matter (PM2.5) in causing the observed adverse health effects, although other outdoor air pollutants such as nitrogen dioxide and ground-level ozone are also known to cause adverse health effects.

Particulate matter (PM):

Particulate air pollution is a complex mixture of many chemical components which form particles of different sizes (PM2.5 and PM10 are the regulated size fractions). Particles are emitted directly from a range of human-made sources, such as road traffic, solid fuel combustion, and natural sources such as desert dust and sea salt, or are formed by chemical reactions in the atmosphere (AQEG, 2005). Epidemiological evidence for PM is supported by toxicological evidence for some health outcomes, thus allowing a causal interpretation of some associations with PM. Although it might be expected that some particle components are more harmful to health than others (e.g. diesel particles), the evidence available from epidemiological studies does not give a consistent view of their relative toxicity. It is estimated that long-term exposure to particulate air pollution (PM2.5) has an effect equivalent to around 25,000 deaths a year in England (around 29,000 deaths a year in the UK) (PHE, 2014; COMEAP, 2010a).

Nitrogen dioxide (NO2):

On average around 80% of oxide of nitrogen (NOx) emissions in areas where the UK is exceeding NO2 limit values is due to transport, although urban and regional background non-transport sources are still considerable (Defra, 2015). The largest source is emissions from diesel light duty vehicles (cars and vans) where both the emissions standards have had least impact and there has been significant growth in vehicle numbers over the last ten years in the UK.

Epidemiological studies have shown associations of NO2 in outdoor air with adverse effects on health, including reduced life expectancy. It has been unclear whether these effects are caused by NO2 itself or by other pollutants emitted by the same sources (such as road traffic). Evidence associating NO2 with health effects has strengthened substantially in recent years and we now think that, on the balance of probability, NO2 itself is responsible for some of the health impact found to be associated with it in epidemiological studies. The Committee on the Medical Effects of Air Pollutants (COMEAP) is due to publish this year an assessment on how changes in NO2 affect mortality in the UK.

Sensitive population groups:

Children, older people, and people with chronic health problems are among the most vulnerable to air pollution (RCP/ RCPCH, 2016). Short-term (e.g. day-to-day) peaks of elevated air pollution are associated with increases in hospital admissions for respiratory and cardiovascular conditions. Individuals with pre-existing cardiovascular and respiratory conditions may experience worsening of symptoms when air quality is poor. There are an estimated 3 million people living with chronic

obstructive pulmonary disease (COPD) in England, with around 2 million people undiagnosed. Evidence that air pollution causes COPD is not conclusive, but there is good evidence that air pollution triggers worsening of symptoms in those living with related conditions (COMEAP, 2016).

There is evidence associating exposure to air pollutants with a worsening of asthma symptoms. Traffic-related air pollution may play a role in inducing asthma in some individuals, particularly those who live near busy roads carrying high numbers of heavy goods vehicles (COMEAP, 2010b). A recent long term study of children's health in California reported improvements in lung development in children following a reduction in levels of air pollution (Gauderman et al. 2015). This study highlights that taking action to reduce levels of air pollutants could potentially allow more young people to achieve their maximum lung function growth potential.

Ancillary benefits of air pollution control

Road transport is also a source of atmospheric carbon dioxide (CO2), and many of the measures which will improve air quality will also reduce CO2 emissions, reducing thus long term climate change. Furthermore, interventions aiming to improve air quality by promoting a modal shift from private motor vehicle use to active travel (walking and cycling) and integrated public transport can help improve physical activity levels, which will provide additional public health benefits.

References to other work or publications to support your testimony' (if applicable):

AQEG (2012). Fine Particulate Matter (PM2.5) in the UK. Air Quality Expert Group. UK, available at: https://uk-air.defra.gov.uk/assets/documents/reports/cat11/1212141150_AQEG_Fine_Particulate_Matter_in_the_UK.pdf

COMEAP (2010a). The Mortality Effects of Long-Term Exposure to Particulate Air Pollution in the United Kingdom. Committee on the Medical Effects of Air Pollutants. Available at: http://www.comeap.org.uk/documents/reports

COMEAP (2010b). Statement and supporting papers on 'Does Outdoor Air Pollution Cause Asthma? Committee on the Medical Effects of Air Pollutants. Available at: http://www.comeap.org.uk/documents/reports

COMEAP (2016). Long-term exposure to air pollution and chronic bronchitis. Committee on the Medical Effects of Air Pollutants. Available at: http://www.comeap.org.uk/documents/reports

Defra (2015). Improving air quality in the UK: Tackling nitrogen dioxide in our towns and cities. UK, available at:
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/486636/aq-plan-2015-overview-document.pdf

Gauderman WJ, Urman R, Avol E, Berhane K, McConnell R, Rappaport E, Chang R, Lurmann F, Gilliland F. Association of improved air quality with lung development in children. N Engl J Med. 2015 Mar 5;372(10):905-13. doi: 10.1056/NEJMoa1414123

PHE (2014) Estimating Local Mortality Burdens Associated with Particulate Air Pollution, available at:
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/332854/PHE_CRCE_010.pdf

RCP/RCPCH (2016). Every breath we take: the lifelong impact of air pollution. Royal College of Physicians. Available at: https://www.rcplondon.ac.uk/projects/outputs/every-breath-we-take-lifelong-impact-air-pollution

Expert testimony papers are posted on the NICE website with other sources of evidence when the draft guideline is published. Any content that is academic in confidence should be highlighted and will be removed before publication if the status remains at this point in time.