

# COMMITTEE ON CARCINOGENICITY OF CHEMICALS IN FOOD, CONSUMER PRODUCTS AND THE ENVIRONMENT

## Air pollution and lung cancer morbidity – update for COC

### Introduction

1. This short paper is intended to make COC members aware of recent World Health Organization recommendations regarding quantifying lung cancer attributable to particulate air pollution.

### Background

#### World Health Organization EMAPEC project

2. The World Health Organization's ongoing ([Estimating the morbidity from air pollution and its economic costs](#), EMAPEC) project is intended to update and expand WHO's recommendations for quantifying morbidity attributable to air pollutants.

3. An umbrella review of morbidity outcomes was undertaken to inform the recommendations made by EMAPEC project and has been published in the peer-reviewed literature (Forastiere et al, 2024 [Choices of morbidity outcomes and concentration-response functions for health risk assessment of long-term exposure to air pollution](#)). Forastiere et al (2024) recommended a concentration-response function (CRF) for incidence of lung cancer of RR 1.16 (95% CI 1.10, 1.23) per 10 µg/m<sup>3</sup> PM<sub>2.5</sub> (fine particulate air pollution).

4. Although the report of the EMAPEC project has not yet been published, a summary of the recommendations arising from the project has been included in the report of a sister project by WHO [Health risks of air pollution in Europe: HRAPIE-2 project: updated guidance on concentration-response functions for health risk assessment of air pollution in the WHO European Region](#) which was published in November 2025.

#### Previous COMEAP and COC/COM discussions

5. COMEAP noted the link between PM and lung cancer mortality in its 2009 report Long-Term Exposure to Air Pollution: Effect on Mortality and recommended a CRF that could be used for quantification. A CRF based on concentrations nearly two decades before the end of the follow-up period of the key study was regarded as

being the most relevant, because it was considered likely that there would be a long latency between exposure and the development, and subsequent death from, lung cancer ([COMEAP, 2009](#)).

6. In 2012, The WHO's International Agency for Research on Cancer (IARC) classified diesel-engine exhaust and some nitroarenes (nitro-PAHs, found in particulate emissions from combustion sources such as diesel exhausts) in Group 1: carcinogenic to humans ([Benbrahim-Tallaa et al, 2012](#)). The following year, outdoor air pollution and particulate matter in outdoor air pollution were also classified by IARC as carcinogenic (Group 1) ([Loomis et al, 2013](#)).

7. More recently, COMEAP, COC and COM have discussed research from the Swanton Lab at the Francis Crick Institute and UCL ([Hill et al, 2023](#)). The work included an epidemiological study in England, South Korea and Taiwan, experiments in mice models and examination of biopsy material from lung tissue. The researchers concluded that the findings suggested that PM<sub>2.5</sub> increases lung cancer risk by the promotion of tumours arising from existing mutations, rather than by acting as a mutagen itself.

8. Committee Members regarded this research as well-conducted and a valuable contribution to the scientific evidence. Nonetheless, they considered it likely that particulate air pollution also has mutagenic potential and therefore increases lung cancer risk via more than one mechanism.

### **Possible up-coming work by COMEAP**

9. COMEAP has been asked for views on the suitability of the recommendations arising from the EMAPEC project for use, in UK policy analysis, to quantify morbidity attributable to air pollutants. COMEAP intends to update the umbrella review by Forastiere et al (2024) as part of this work. For the pollutant-outcome pairs examined, COMEAP will also need to consider other aspects relevant to quantification of the benefits expected to accrue from the implementation of policies to reduce air pollution, such as the lag between the reduction in pollutant concentrations and a reduction of population risk of incident disease.

10. However, the umbrella review by Forastiere et al (2024) contains recommendations for a large number of pollutant-outcome pairs (see Table 1) and it is unlikely that COMEAP will be able to consider all of the pollutant-outcome pairs in the timescales required. Therefore, detailed examination of the link between air pollution and lung cancer incidence might not be included in the first tranche of pollutant-outcome pairs examined by COMEAP.

This is a background paper for information.  
It does not reflect the views of the Committee and should not be cited.

Table 1 (Table 2 from Forastiere et al, (2024)

<b>Table 2.</b>						
<b>Relative risk estimates for incidence of diseases from selected systematic reviews recommended for health risk assessment of PM<sub>2.5</sub> and NO<sub>2</sub></b>						
<b>Outcome (incidence)</b>	<b>ICD-10 codes</b>	<b>Age (yrs)</b>	<b>List</b>	<b>RR (95% CI) per 10 µg/m<sup>3</sup></b>	<b>Mean exposure range (µg/m<sup>3</sup>)</b>	<b>SR reference</b>
Long-term exposure to PM <sub>2.5</sub>						
Asthma in children	J45	0–18	A	1.34 (1.10, 1.63)	5–38	Khreis et al <sup>37</sup>
COPD	J41–J44	30+	A	1.18 (1.13, 1.23)	5–26	Park et al <sup>38</sup>
IHD events <sup>a</sup>	I21–I22	30+	A	1.13 (1.05, 1.22) <sup>b</sup>	5–65	Zhu et al <sup>39</sup>
Stroke	I60–I64	30+	A	1.16 (1.12, 1.20) <sup>b</sup>	5–36	Yuan et al <sup>40</sup>
Hypertension	I10–I11	30+	A	1.17 (1.05, 1.30) <sup>b</sup>	5–77	Qin et al <sup>41</sup>
Diabetes (type 2)	E11–E14	30+	B+	1.10 (1.03, 1.18) <sup>b</sup>	5–79	Yang et al <sup>42</sup>
Dementia	F00–F03, G30	60+	B+	1.46 (1.20, 1.78) <sup>b</sup>	5–25 <sup>c</sup>	Cheng et al <sup>43</sup>
ASD	F84.0, F84.1, F84.5, F84.8, F84.9	2–12	B+	1.66 (1.23, 2.25) <sup>b</sup>	5–30 <sup>c</sup>	Lin et al <sup>44</sup>
Lung cancer	C34	30+	A	1.16 (1.10, 1.23)	5–44	Yu et al <sup>45</sup>
Long-term exposure to NO <sub>2</sub>						
Asthma in children	J45	0–18	A	1.10 (1.05, 1.18)	10–39	Khreis et al <sup>37</sup>
Asthma in adults	J45	19+	A	1.10 (1.01, 1.21)	10–40	HEI <sup>34</sup>
ALRI in children	J12–J18, J20–J22	0–12	A	1.09 (1.03, 1.16)	10–56	HEI <sup>34</sup>

<sup>a</sup>Acute myocardial infarction (AMI).

<sup>b</sup>Relative risk estimates from revised meta-analysis.

<sup>c</sup>Restrict applicability of the CRFs of these conditions to exposure differences not larger than 10 µg/m<sup>3</sup> within the indicated concentration ranges (see discussion in eAppendix 2; <http://links.lww.com/EE/A280>).

## Actions for COC

11. This paper is provided largely for information, however COC Members are asked to be aware of the WHO recommendations for quantification of lung cancer attributable to exposure to fine particulate air pollution (PM<sub>2.5</sub>), and of possible future work on this topic by COMEAP.

**COMEAP Secretariat**  
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