

Air Pollution and Lung Cancer – Protect Our Lungs and Prevent Cancer with Improved Ambient Air Quality Guidelines

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Key Points

- More than 300,000 people get lung cancer each year in the EU 27.
- Air-pollution is a well-established risk factor for lung cancer.
- Around 10-20% of all lung cancer cases in the EU 27 are associated with air pollution.
- The financial costs of lung cancer in the European Region are estimated to be over €100 billion annually, high costs that are preventable.
- Stricter ambient air quality limits are needed to reduce air pollution related lung cancer.

Background

Ten years ago, a Working Group convened by the International Agency for Research on Cancer (IARC) gathered in Lyon, France, and following a detailed review of the evidence, classified outdoor air pollution and particulate matter in outdoor air as a cause of lung cancer in humans (IARC 2013). Globally, outdoor air pollution is second only to tobacco as the greatest cause of lung and respiratory cancers (Ebrahimi et al 2019).

Cities are hotspots of air pollution and also where most people live in Europe, making cities a focal point for the prevention of air-pollution related lung cancer (Khomenko et al 2021, Berg et al 2023). Particulate matter, namely PM10 and PM2.5, are main contributors to outdoor air pollution and lung cancer (Berg et al 2023).

Lung cancer

In 2020, it was estimated that in EU 27 countries, lung cancer accounted for 12% of all new cancer diagnoses and 20% of all cancer deaths. Lung cancer is the 4th most frequently occurring cancer (after prostate, breast, and colorectal cancers) and the leading cause of cancer deaths (Bettio et al 2021). There were 113,074 new lung cancer cases in women and 205,253 in men, and 86,731 women and 170,562 men died from lung cancer in 2020.

The overall economic impact of lung cancer in Europe is substantial, with direct costs of caring for patients (including primary care, hospital care, and drugs/oxygen) amounting to more than €3 billion per year (ERS 2013). When costs related to disability and premature mortality are considered as well, total annual costs amount to more than €100 billion. However, these cost estimates tend not to recognize the high financial burden directly experienced by the patients and their caregivers as a result of the symptoms and associated psychological distress (ERS 2013).

Air pollution and lung cancer

In a recent European cohort study, Hvidtfeldt et al (2021) observed a 13% increased risk for lung cancer with a 5 µg/m³ increased exposure to PM_{2.5}. Risk estimates were clearly elevated for people with exposure below the EU limit value of 25 µg/m³. They did not observe associations between NO₂, BC or O₃ and lung cancer incidence. A recent meta-analysis by Ciabettini et al (2021) found a 16% increased risk in lung cancer for a 10 µg/m³ increase of PM_{2.5}. The increase for PM10 exposure was 23%. Furthermore, lung cancer prognosis and survival is reduced for people living in polluted areas (Turner et al 2020, McKeon et al 2022).

In a recent *Nature paper*, Hill et al (2023) helped explain the mechanism behind the observed lung cancer due to air pollution. They describe how environmental PM_{2.5} promotes lung cancer by acting on cells that harbour pre-existing oncogenic mutations in healthy lung tissue. This study focused on non-small-cell lung cancer, which is the type more commonly diagnosed in never-smokers or light smokers, and found a significant association between PM_{2.5} levels and the incidence of lung cancer.

Lung cancer rates in the EU are falling because of decreases in smoking, and therefore the percentage of lung cancer due to air pollution is rising. A conservative estimate of the proportion of lung cancer deaths attributable to air pollution is 9% (IHME, 2020), others have provided larger estimates closer to 17% (Prüss-Üstün et al., 2016; EEA, 2020). Air pollution exposure is not voluntary and is difficult to prevent or reduce at the individual level in most European contexts.

Action needed

Better air is within our reach. We urgently need to create safer and healthier environments in our cities and beyond. The EU has signalled its prioritization to address cancer through the creation and financing of the Cancer Mission, which proposes ambitious objectives to reverse the alarming trends in cancer. Reducing air pollution levels should be part of the Mission and requires action to prevent many potential lung cancer cases and deaths in the future. Adopting the new EU ambient air quality guidelines that are aligned with the WHO air quality guidelines is a critical step.

A renewed EU air ambient air quality directive is an essential opportunity to prevent cancer to protect the health and wellbeing of the European population and will provide the catalyst for member states and cities to take action.

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