

Effect of environmental factors on cancer in Europe

EUROPEAN CANCER INEQUALITIES REGISTRY

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HIGHLIGHTS

- Roughly, 10% of the cancer burden in Europe is attributable to environmental factors.
- Approximately 97% of the EU urban population live in areas that exceed the WHO recommended level for ambient air pollution exposure, increasing the risk of poor health, including lung cancer.
- Considerable differences between countries are observed in estimated lung cancer deaths

attributable to ambient air pollution, residential radon, and second-hand smoke.

- On average, men are affected twice as much by the environmental pollutants as compared to women.
- The Zero Pollution Action Plan and the European Green Deal aim to reduce exposure to environmental pollutants and their detrimental effects on the health of European citizens.

CHALLENGES

Environmental cancer risks

Exposure to environmental carcinogens ^{1, 2} (air pollution, carcinogenic chemicals, residential radon, UV radiation and second-hand smoke) is estimated to be responsible for over 10% of new cancer cases ³ and around 9% of overall cancer deaths ⁴ in Europe. The cancer types linked to environmental carcinogens exposure include lung, skin, bladder and mesothelioma cancers, among others ⁵. Air pollution, residential radon and second-hand smoke exposures are the leading causes of lung cancers after smoking.





*In this factsheet Europe refers to EU27 + EFTA (excluding Liechtenstein). This factsheet does not include contribution of occupational risk factors. Ambient air pollution refers to ambient particulate matter (PM) pollution. Household air pollution refers to the use of solid fuels for cooking, including coal, charcoal, wood, agricultural residue, and animal dung. Radon is a gas that is drawn into homes from the ground.

Lung cancer deaths due to exposure to environmental carcinogens

Lung cancer is the most common cause of cancer deaths and the fourth most common cancer in both sexes in Europe. It is estimated that in 2020 in the EU27 countries, lung cancer contributed over 318 thousand new cancer cases and nearly 260 thousand cancer deaths⁶.



Figure 2 - Burden of lung cancer in EU27 in men and women in 2020⁶.

In 2019 in Europe *, over 56 thousand lung cancer deaths were estimated to occur due to environmental exposures ⁴.



Figure 3 – Number of lung cancer deaths in 2019 in Europe^{*} due to exposure to environmental carcinogens⁴.

Given the high burden of lung cancer and its established association with environmental carcinogens, limiting exposure will contribute to a substantial reduction of the cancer burden in Europe. Understanding the inequalities in population exposure and the detrimental health effects of the environmental carcinogens will help countries provide tailored-made policies to mitigate this burden.

INEQUALITIES

Geographical inequalities

EXPOSURE TO AIR POLLUTION, RESIDENTIAL RADON AND SECOND-HAND SMOKE

The concentration of carcinogenic air pollutants and residential radon differs between countries, affecting an individual's exposure and consequently the risk of lung cancer, among other cancers (Figure 4-6).

Notably, 97% of the EU urban population is exposed to ambient air pollution that exceeds the WHO recommended level for exposure, so live in areas with increased risk of poor health, including lung cancer (Figure 4b)⁷.



Figure 4a – Annual mean concentration (μ g/m³) of particulate matter 2.5 (PM_{25}) at urban background stations in agglomerations (2019) by country in Europe[®]. PM_{25} is a major component of ambient air pollution. The darker the shade, the higher the PM_{25} concentration in a country.



Figure 4b – % population exposed to PM_{25} levels above WHO Air Quality Guidelines thresholds (5 µg/m³) in 3 years average 2018-2020 in the EU⁷.



Figure 4c – Annual mean concentration (μ g/m³) of particulate matter 10 (PM₁₀) at urban background stations in agglomerations (2019) by country in Europe⁸. Particulate matter is a major component of ambient air pollution. The darker the shade, the higher the PM₁₀ concentration in a country.

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EU countries are also not uniformly affected by exposure to indoor radon (Figure 5 a, b).



Figure 5a – Annual indoor radon concentration measured in groundfloor rooms (arithmetic means over 10 km x 10 km grid cells, November 2021) $^{\circ}$.



Figure 5b - Population-weighted average of indoor radon concentration in Europe (2021)⁸

Also exposure to tobacco smoke indoors (called second-hand or passive smoking) is different across Europe (Figure 6), with the south-east region being most affected ⁸.



Figure 6 - Daily exposure to tobacco smoke indoors in Europe in 2019⁸.

CANCER DEATHS ATTRIBUTABLE TO CARCINOGENIC ENVIRONMENTAL EXPOSURES

The contribution of environmental carcinogens to estimated lung cancer deaths varies considerably in Europe* (Figure 7)⁴. For example, the difference can be as high as 16-fold for ambient air pollution (EU average: 2.5), 17-fold for residential radon (EU average: 1.7), and 6-fold for second-hand smoking (EU average: 1.4).

For most EU countries (most notably for Poland, Hungary and Bulgaria) the biggest single environmental risk factor contributing to lung cancer deaths is ambient air pollution; however in Estonia, Sweden, Finland and Norway, air pollution had less impact on lung cancer deaths than the other types of exposure considered in this factsheet. Cancer deaths from household air pollution are of less prominence.



Figure 7 – Lung cancer deaths (per 100 thousand inhabitants) attributable to environmental factors in Europe * in 2019⁴.

Inequalities by sex

Men in Europe die of lung cancer due to exposure to environmental carcinogens twice as much as women (Figure 8).



Figure 8 – Number of lung cancer deaths due to selected environmental exposures for men and women in Europe* in 2019⁴.

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Inequalities by income

There are also inequalities by the Gross Domestic Product (GDP) per capita in Europe. The map (reproduced from the European environment and health atlas⁷) shows that the 20% most polluted areas (with highest average PM2.5 levels) often overlap with those regions with lower GDP per capita.



PM2.5 Population weighted average µg/m3 Most polluted 20% GDP per capita, Euro latest year available GDP per capita Very high (top 20%) High (60-80%) Average (40-60%)

Low (20-40%)

Verv low (0-20%)

No data

Figure 9 - The income levels (in terms of GDP per capita), on which the 20% most polluted (from particles in air) regions is overlaid 7.

CLOSING THE GAP

The inequalities highlighted here, between EU countries and socioeconomic groups, show the need for action – from governments and public health authorities - to mitigate the detrimental impact of environmental carcinogens on health.

Commission initiatives, such as Zero Pollution Action Plan and the European Green Deal strive to support this action.

The revision of the Ambient Air Quality Directives aims to achieve a 60% reduction in air pollution by 2030 and will align the current air quality standards with the 2021 recommendations of the World Health Organization (WHO Air Quality Guidelines).

The Zero Pollution Action Plan aims to reduce by 2030 the number of premature deaths caused by air pollution by at least 55% compared with 2005 levels.

Zero Pollution Action Plan Flagships:

Reducing health inequalities through zero pollution Supporting urban zero pollution action

Local and National authorities can be supported ¹⁰ in their implementation of interventions in the areas of mobility and clean public transport, walking and biking as well as management of traffic and parking spaces, speed limits and low-emission zones for example. As well, interventions at industrial and agriculture level can have great impact in reduction of PM levels 11.

The Europe's Beating Cancer Plan aims to help create a 'Tobacco-Free Generation' where less than 5% of the population uses tobacco by 2040, compared to around 25% today.

The revision of the Council recommendation on smoke-free environments (2009) and the further implementation of the WHO Framework Convention on Tobacco Control and the guidelines, policies and recommendations will contribute towards this goal.

The Plan also supports Member States in implementing the requirements on protection from ionising radiation, particularly radon.

The European Code against Cancer (ECAC) informs individuals on how to reduce their risk of cancer, including how to reduce exposure to environmental carcinogens at home or in the workplace.

ECAC recommendations:

Make your home smoke free. Support smoke-free policies in your workplace.

Find out if you are exposed to radiation from naturally high radon levels in your home. Take action to reduce high radon levels

FOR MORE INFORMATION -

- The European Cancer Inequalities Registry is a flagship initiative of the Europe's Beating Cancer Plan.
- More information about Tobacco and Smoking effects on health and examples of policy recommendations and implemented policies aiming to decrease tobacco use or exposure to tobacco smoke can be found in the Health Promotion and **Disease Prevention Knowledge Gateway.**
- Other relevant EU resources: Horizon Europe Mission for Climate Neutral and Smart Cities, New European Bauhaus initiative, Covenant of Mayors, Europe's air quality status 2023.

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