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METADATA – BURDEN OF AIR POLLUTION

Description	The air pollution-attributable mortality rate refers to the number of deaths attributed to ambient air pollution per 100,000 people. This measure estimates the portion of the overall mortality burden linked to 3 air pollutants: Particulate matter with a diameter smaller than 2.5 micrometres ($PM_{2.5}$), nitrogen dioxide (NO_2) and ozone (O_3). The inclusion of rates allows for standardized comparisons across different regions, age groups and sex.
Rationale	Poor air quality constitutes the single biggest environmental health risk, responsible for millions of premature deaths and healthy life years lost worldwide. Exposure to air pollution has been associated with respiratory disease, cardiovascular disorders and lung cancer. It disproportionally affects vulnerable groups, including young children, the elderly and people with lung diseases and asthma [1]. Measuring and understanding this impact is crucial for informing public health interventions and policies. For this end, we calculated the burden attributable to the selected air pollutants. We consulted the scientific literature for well-evidenced links between air pollution and specific health outcomes. In a next step, we assessed socio-economic inequalities in the air pollution-related burden, by paring the estimates with an index of multiple deprivation.
Primary Data source	• The concentration of $PM_{2.5}$, NO_2 and O_3 from the RIO model provided by IRCEL-CELINE [2]. • Population data and mortality data from Statistics Belgium. • The Belgian Index of Multiple Deprivation (BIMD) [3]. The selected dose-response functions used to estimate the mortality burden attributable to air pollution can be consulted in the methodological report [4].
Indicator source	Estimate for air pollution-attributable deaths by age, sex and region from the Belgian Burden of Disease study, Sciensano.
Periodicity	Annual estimates from 2013.
Calculation, technical definitions and limitations	The attributable burden is calculated using comparative risk assessment, which compares exposure to a risk factor in the population against a "counterfactual" situation associated with minimal risk, here zero concentration. First, the regional population exposure to each air pollutant is calculated as the population-weighted average concentration. Secondly, the population attributable fraction (PAF) is calculated by age, sex and region and BIMD for each cause of death, according to the following formula: $$PAF = \frac{RR - 1}{RR}$$ *RR* refers to the relative risk of the outcome in function of exposure, calculated according to the dose-response function. The mortality burden attributable to each air pollutant is then obtained by multiplying the PAF with the total burden for the cause. Subsequently, aggregations are made to have estimates for Belgium, both sexes and for all ages. In the last step, we calculated the fraction of the air pollution burden attributable to deprivation, by comparing the burden in the population at large with that of the 10% most affluent (BIMD 10).
International comparability	To ensure comparability of burden attributable to air pollution, the values used in the international comparison are based on a European dataset provided by the European Environment Agency [5]. These values publicly available and receive annual updates.

[1] WHO Global Air Quality Guidelines. World Health Organisation, 2021. https://www.who.int/news-room/questions-and-answers/item/who-global-air-quality-guidelines

[2] The RIO model. IRCEL-CELINE, n.d. https://www.irceline.be/en/documentation/models/models?set_language=en#assessment_models
[3] Otavova, M., Masquelier, B., Faes, C., Van den Borre, L., Bouland, C., De Clercq, E., Vandeninden, B., De Bleser, A., & Devleesschauwer, B. (2023). Measuring small-area level deprivation in Belgium: The Belgian Index of Multiple Deprivation, 2023. https://doi.org/10.1016/j.sste.2023.100587
[4] Pauwels, A., Demoury, C., De Clercq, E. M., Devleesschauwer, B. EBoD-FL. Guidelines for mapping the environmental burden of disease in Flanders, 2024. https://www.sciensano.be/fr/biblio/ebod-fl-guidelines-mapping-environmental-burden-disease-flanders-2024
[5] Soares, J., Plass, D., Kienzler, S., González Ortiz, A., Gsella, A., Horálek, J. (2023). Health Risk Assessment of Air Pollution: assessing the environmental burden of disease in Europe in 2021 (Eionet Report – ETC HE 2023/7). European Topic Centre on Human Health and the Environment. https://www.eionet.europa.eu/etcs/etc-he/products/etc-he-products/etc-he-reports/etc-he-report-2023-7-health-risk-assessment-of-air-pollution-assessing-the-environmental-burden-of-disease-in-europe-in-2021.