

Assessing the environmental burden of disease related to air pollution in Europe in 2023



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Contents

Contents	3
Acknowledgements	4
Summary.....	5
1 Introduction	7
2 EBD estimations for 2023	12
2.1 PM _{2.5}	12
2.1.1 Population-weighted annual mean concentration	12
2.1.2 Burden of disease.....	13
2.1.3 Zero pollution action plan 2030 objective	23
2.2 NO ₂	24
2.2.1 Population-weighted annual mean concentration	24
2.2.2 Burden of disease.....	25
2.3 O ₃	34
2.3.1 Population-weighted peak season concentration	34
2.3.2 Burden of disease.....	35
3 Conclusions.....	38
List of abbreviations	40
References.....	41
Annex 1 Methodology	45
Annex 2 Input data and preparatory steps	47
Annex 3 Population at risk and exposure levels.....	53
Annex 4 Results for all-cause and cause-specific EBD analyses	55
PM _{2.5} (long-term effects) and all-cause mortality.....	55
PM _{2.5} (long-term effects) and total cause-specific disease burden (six causes, excluding dementia)	57
PM _{2.5} (long-term effects) and asthma (children and adolescents < 19 years).....	58
PM _{2.5} (long-term effects) and chronic obstructive pulmonary disease (adults ≥ 25 years)	62
PM _{2.5} (long-term effects) and diabetes mellitus disease (adults ≥ 25 years)	66
PM _{2.5} (long-term effects) and ischemic heart disease (adults ≥ 25 years)	70
PM _{2.5} (long-term effects) and lung cancer (adults ≥ 25 years)	74
PM _{2.5} (long-term effects) and stroke (adults ≥ 25 years).....	78
PM _{2.5} (long-term effects) and dementia morbidity (adults ≥ 60 years).....	82
NO ₂ (long-term effects) and all-cause mortality.....	83
NO ₂ (long-term effects) and total cause-specific disease burden (five causes)	85
NO ₂ (long-term effects) and asthma (adults ≥ 19 years)	86
NO ₂ (long-term effects) and asthma (children and adolescents < 19 years).....	90
NO ₂ (long-term effects) and diabetes mellitus (adults ≥ 25 years).....	94
NO ₂ (long-term effects) and COPD (adults ≥ 25 years).....	98
NO ₂ (long-term effects) and stroke (adults ≥ 25 years)	102
O ₃ (long-term effects, peak season) and all-cause mortality.....	106
O ₃ (long-term effects, peak season) and COPD mortality (adults ≥ 25 years)	108
Annex 5 Glossary	110
Annex 6 Country ISO2 code.....	112

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Summary

This report assesses the environmental burden of disease (EBD) attributable to long-term exposure to fine particulate matter ($PM_{2.5}$), nitrogen dioxide (NO_2), and ozone (O_3) across 41 European countries in 2023 (40 countries for $PM_{2.5}$). The burden is quantified using key health indicators—attributable deaths (AD), years of life lost (YLL), years lived with disability (YLD), and disability-adjusted life years (DALY)—providing a comprehensive overview of the impact of ambient air pollution on health in Europe. The cause-specific long-term burden attributable to $PM_{2.5}$ includes asthma in children and adolescents (in previous year, asthma in children was considered), chronic obstructive pulmonary disease (COPD), diabetes mellitus (DM), ischemic heart disease (IHD), lung cancer, stroke, and dementia (added this year and only for morbidity). For NO_2 , the assessment covers asthma in adults as well as children and adolescents (added this year), COPD (added this year), DM and stroke. Finally, COPD attributable to long-term exposure to O_3 is also included. These health outcomes were selected to the extent possible based on the best available toxicological and epidemiological evidence, indicating a statistical association between exposure to these pollutants and an increased risk of developing a disease or dying. The main results presented here consider only the impact of individual pollutants and populations exposed to concentration levels exceeding the World Health Organization's (WHO) air quality guidelines (AQG) levels. Using the guideline levels as cut-offs does not imply that there are no health effects below these values. It is only assumed that the evidence for the health effects is comparably lower for these lower concentration levels. Additionally, a sensitivity analysis was performed on all-cause mortality to evaluate the effects of exposure to two different levels of $PM_{2.5}$ and NO_2 , all levels and levels above the annual limit values specified in the revised Ambient Air Quality Directive 2024/2881, to be attained by 2030.

The concentration data in this assessment are based on air quality maps developed by the ETC HE, utilising a fusion of EEA Member States' validated monitoring data and additional modelling data, which produces consistent, standardised exposure estimates across Europe and ensures high comparability. The risk of mortality or morbidity in a population due to exposure to air pollution is represented by the concentration-response function (CRF), which is based on relative risk, hazard ratio, or odds ratio estimates derived from epidemiological studies. The mortality or morbidity due to each air pollutant is then quantified by combining pollutant-dependent CRFs with ambient air quality data, population data, and the baseline frequency of the health outcome, such as the number of deaths or the prevalence of a disease.

The analysis reveals that $PM_{2.5}$ is the most harmful pollutant, contributing to approximately 206,000 deaths (all-cause) in all 40 countries considered. Meanwhile, NO_2 and O_3 were responsible for around 56,000 and 71,000 deaths (all-cause) in 41 countries, respectively. The study estimates that $PM_{2.5}$ exposure resulted in 2.3 million DALY across the evaluated countries and diseases (excluding dementia), compared to 757,000 DALY from NO_2 . For O_3 , only mortality-associated effects were estimated, resulting in a cause-specific burden of 85,000 YLL, while no DALY were calculated. The high disease burden attributable to $PM_{2.5}$ stemmed partly from its link to multiple diseases with high baseline prevalence and mortality, whereas NO_2 and O_3 estimates considered fewer health outcomes. This is partly due to the strong historical research focus on $PM_{2.5}$. It is important to note, however, that the current epidemiological evidence for health effects associated with long-term O_3 exposure remains uncertain and prone to changes when new evidence becomes available (Huangfu and Atkinson 2020; Kasdagli et al. 2024). Therefore, the degree of uncertainty for the O_3 estimates is larger than that associated with $PM_{2.5}$. Findings also demonstrate regional disparities: South-Eastern Europe saw the highest relative impacts from $PM_{2.5}$ and NO_2 , while Southern Europe experienced elevated impacts from exposure to O_3 levels. The EU27's burden mirrored these trends but showed slightly lower rates overall. Cause-specific analysis, incorporating a broader range of health outcomes, enabled the report to reveal nuanced effects, particularly on cardiovascular and respiratory diseases for $PM_{2.5}$ and diabetes for NO_2 .

This report serves as a critical resource for understanding the pervasive health risks associated with ambient air pollution in Europe. By providing reliable, fine-scale estimates, it underlines the need for

targeted policy interventions to address pollutant-specific impacts and mitigate the substantial health burdens across populations in Europe.

1 Introduction

Exposure to ambient air pollution can result in adverse effects on human health. Epidemiological studies have shown that exposure to ubiquitous pollutants such as fine particulate matter ($PM_{2.5}$), ozone (O_3) and nitrogen dioxide (NO_2) is associated, among others, with cardiovascular, respiratory, metabolic and mental health outcomes, leading to an increase in morbidity, hospital admissions, and, in the worst case, to death (WHO, 2024; Hegelund et al., 2024; WHO, 2021, De Marco et al., 2019). The World Health Organization (WHO) developed the Environmental Burden of Disease (EBD) concept to comprehensively and comparably measure the health impacts of environmental risk factors on population health. EBD assessments use a systematic approach to estimate the proportion of disease burden in a population attributable to specific environmental risks, such as air pollution (Murray and Lopez, 1996). Assessing the burden of disease attributed to air pollutants is critical for managing air pollution-related risks and informing environmental health policy planning (Bruyneel et al., 2025; Chamberlain et al., 2022).

The European Environment Agency (EEA) and the European Topic Centre on Human Health and the Environment (ETC HE), and its predecessors, have conducted EBD assessments for air pollution since 2014, offering a standardised, objective, comprehensive and comparable estimate of the burden of disease due to ambient air pollution across European countries. These assessments started by presenting the quantification of the burden of disease of the individual pollutants - $PM_{2.5}$, NO_2 , and O_3 - associated with all-cause natural mortality. Since 2022, the estimation has been expanded to quantify cause-specific mortality and morbidity health outcomes.

In this assessment, the burden of disease attributable to long-term exposure to $PM_{2.5}$, NO_2 , and O_3 is quantified in terms of four burden of disease indicators. The estimates for all-cause natural mortality are presented by two indicators: attributable deaths (AD) and the resulting years of life lost (YLL). Cause-specific calculations are based on risk-outcome pairs and assess the effects on population health using the common indicator disability-adjusted life years (DALY). This measure combines the contributions from population mortality (YLL) and morbidity (years lived with disability, YLD). The indicators are quantified by combining pollutant-outcome-dependent concentration-response functions (CRFs) with gridded ambient air quality data, population data, and the baseline frequency of the health outcomes, such as the number of deaths or the number of prevalent cases of a disease. The estimation is performed at the grid-cell level, and then aggregated to the corresponding spatial level, i.e., country or group of countries. Since the CRFs are derived considering single-pollutant models, the burden is estimated for individual pollutants. This may partially capture effects caused by other pollutants. Therefore, for any specific health outcome and exposure period, adding the estimated impacts of multiple pollutants could result in an overestimation of the true impact. For example, the HRAPIE project (Health risks of air pollution in Europe; WHO, 2013) argued that adding the all-cause mortality results for $PM_{2.5}$ and NO_2 may lead to a double counting of the effects (WHO experts discussed an overlap of up to 30 %; the true overlap, however, was not yet finally quantified). Conversely, estimating impacts for only one pollutant may underestimate the true impact of the pollution mixture, especially if other pollutants contribute to the same health outcome or the co-occurrence of pollutants results in a stronger effect.

The risk of mortality or morbidity in a population attributable to exposure to air pollution is represented by the CRF, which is based on the change of relative risk (RR), hazard ratio (HR), or odds ratio (OR) estimates with increasing exposures, as derived from epidemiological studies. The nature of epidemiological studies to assess the effect measure (RR, HR, or OR) differs in the way it quantifies the risk (or chance) of having an outcome after a certain exposure, comparing an exposed group against a non-exposed or lower-exposed group. RR or HR are used in cohort studies, and OR in case-control studies. The EEA/ETC EBD assessments primarily consider CRFs for which the evidence provided by the epidemiological studies is high or reliable. However, scientific findings also suggest that additional diseases are linked with air pollutant exposure. To achieve a more comprehensive evaluation of the disease burden, certain outcomes with currently moderate or suggestive levels of evidence were also included. The all-cause natural mortality estimations consider the pollutant-specific CRF derived from epidemiological studies

referenced in the WHO's Air Quality Guidelines (AQG) recommendations (WHO, 2021), from now on referred to as "2021 WHO AQG". Cause-specific estimations mainly rely on pollutant-outcome-specific CRFs from the European ELAPSE project (Effects of Low-Level Air Pollution: A Study in Europe; Brunekreef et al., 2021). The project analysed pooled European cohort studies that focus on adverse health effects related to exposure to low concentrations and exposures to air pollution across Europe, including levels below the current European Union (EU) standards. Table 1.1 lists the CRFs for mortality and morbidity risk-outcome pairs and their associated 95 % confidence interval (CI) used for all-cause mortality and cause-specific mortality and morbidity estimations. This report proposes expanding the EBD assessment further by considering thirteen risk-outcome pairs covering both mortality and morbidity, instead of the ten reported in the ETC HE Report 2024/6 (Soares et al., 2024a). This assessment now includes dementia morbidity effects in people 60 years of age and over due to exposure to PM_{2.5}, and asthma in children and adolescents (up to 18 years old), and chronic obstructive pulmonary disease (COPD) in adults 25 years of age and older due to exposure to NO₂.

The EEA/ETC EBD quantification of the burden of disease assumes a linear increase of risk with an increase in concentration, as suggested by HRAPIE (WHO, 2013), since the 2021 WHO AQG has not proposed changes to the shape of the function. This means, for example, that if the CRF for all-cause mortality risk due to PM_{2.5} exposure is 1.08 per 10 µg/m³, a 10 µg/m³ linear increase in PM_{2.5} annual mean concentrations would raise the population risk of mortality by 8%.

One necessary parameter in the estimation is the counterfactual concentration. This value represents the hypothetical exposure associated with a lower risk or "no-risk" level (e.g. a relative risk of 1) against which the estimated population exposure is compared. When assuming a constant slope of the CRF (β , see Eq. A1.2 in Annex 1), varying the counterfactual concentration implies that the results will also vary. For example, a lower counterfactual level means that more people are likely to be at risk since the exposure will cover a larger range of concentration levels; thus, the estimate of the EBD will increase. Conversely, an increase in the counterfactual level is more likely to result in a reduction of the disease burden. The counterfactual concentration for assessing long-term exposure is based on the annual concentrations recommended as guideline levels by the 2021 WHO AQG for PM_{2.5} and NO₂, as well as the O₃ peak season (¹). These values are 5 µg/m³ for PM_{2.5}, 10 µg/m³ for NO₂ and 60 µg/m³ for O₃. Sensitivity analyses were conducted to assess the impact of changing the counterfactual concentration. One analysis considers all levels of concentration, therefore using a counterfactual concentration of 0 µg/m³ for both PM_{2.5} and NO₂. The HRAPIE report (WHO, 2013) states that the quantification of long-term impacts "should be calculated at all observed levels of PM_{2.5}" down to 0 µg/m³. Moreover, the Brunekreef et al. (2021) study indicates there is no evidence of a minimum concentration below which no effect is observed. However, the level of evidence for RRs at very low concentrations is based on a limited number of epidemiological observations and should therefore be interpreted with caution. Finally, assuming 0 µg/m³ as a counterfactual, it includes the impact of natural sources, such as Saharan dust, that are not controllable by pollution abatement strategies. The other sensitivity analysis considers as counterfactual concentrations the annual limit values in the revised Ambient Air quality Directive (EU) 2024/2881 (EU, 2024): 10 µg/m³ for PM_{2.5} and 20 µg/m³ for NO₂. No sensitivity analysis was conducted for O₃ because there is no meaningful counterfactual concentration nor EU legal standard associated with the O₃ peak season.

(¹) Six-month running average of the highest O₃ concentration over six consecutive months each year. The peak season period varies by country, but the concentration maps are based on measurement and modelling data from August 1, 2022, to December 31, 2023. The highest of these 12 values is used as the peak-season average of the maximum daily 8-hour means for the station.

Table 1.1 Concentration-response functions (hazard ratio (HR), relative risk (RR) and odds ratio (OR)) for mortality and morbidity risk-outcome pairs (age group: ≥ 25 years old, unless otherwise stated) and their associated 95 % confidence interval (CI)

Pollutant	Outcome	Effect measure (95 % CI)	Increment per unit ($\mu\text{g}/\text{m}^3$)	Reference
PM _{2.5}	All-cause (≥ 30 years old)	RR: 1.08 (1.06-1.09)	10	Chen and Hoek, 2020 ^(a)
	Asthma (< 19 years old)	HR: 1.03 (1.01-1.05)	1	Kreis et al., 2017
	COPD	HR: 1.131 (1.002-1.278)	5	Strak et al., 2021 ^(b)
	DM ^(c)	HR: 1.32 (1.14-1.51)	5	Strak et al., 2021 ^(b)
	IHD	HR: 1.11 (1.06-1.17)	5	Strak et al., 2021 ^(b)
	LC	HR: 1.10 (1.04-1.17)	5	Stafoggia et al., 2022 ^(b)
Mortality	Stroke	HR: 1.13 (1.05-1.21)	5	Strak et al., 2021 ^(b)
	All-cause (≥ 30 years old)	RR: 1.02 (1.0 -1.04)	10	Huangfu and Atkinson, 2020 ^(a)
	Asthma (< 19 years old)	OR: 1.05 (1.02-1.07)	4	Kreis et al., 2017
	Asthma (≥ 19 years old)	HR: 1.10 (1.01-1.21)	10	HEI, 2022 ^(d)
	COPD	HR: 1.141 (1.056-1.233)	10	Strak et al., 2021 ^(b)
	DM ^(c)	HR: 1.24 (1.11-1.38)	10	Strak et al., 2021 ^(b)
NO ₂	Stroke	HR: 1.07 (1.01-1.13)	10	Strak et al., 2021 ^(b)
	All-cause (≥ 25 years old)	RR: 1.01 (1.00-1.02)	10	Huangfu and Atkinson, 2020 ^(a)
	COPD	HR: 1.041 (1.039-1.044)	10	Breitner et al. 2021
	Asthma (< 19 years old)	HR: 1.03 (1.01-1.05)	1	Kreis et al., 2017
	COPD	HR: 1.17 (1.06-1.29)	5	Liu et al., 2021b ^(b)
	Dementia (≥ 60 years old)	RR: 1.46 (1.20 - 1.78) ^(e)	10	Forastiere et al., 2024 ^(d)
Morbidity	IHD	HR: 1.13 (1.05-1.22)	10	Forastiere et al., 2024 ^(d)
	LC	HR: 1.13 (1.05-1.23)	5	Hvidtfeldt et al., 2021 ^(b)
	Stroke	HR: 1.10 (1.01-1.21)	5	Wolf et al., 2021 ^(b)
	T2DM ^(f)	OR: 1.08 (1.04-1.12)	10	Yang et al., 2020
	Asthma (< 19 years old)	OR: 1.05 (1.02-1.07)	4	Kreis et al., 2017
	Asthma (≥ 19 years old)	HR: 1.10 (1.01-1.21)	10	HEI 2022 ^(d)
O ₃	COPD	HR: 1.11 (1.06-1.16)	10	Brunekreef et al., 2021
	T2DM ^(f)	OR: 1.07 (1.04-1.11)	10	Yang et al., 2020
	Stroke	HR: 1.08 (1.04-1.12)	10	Wolf et al., 2021 ^(b)
	All-cause (≥ 25 years old)	RR: 1.01 (1.00-1.02)	10	Huangfu and Atkinson, 2020 ^(a)
	COPD	HR: 1.041 (1.039-1.044)	10	Breitner et al. 2021
	Asthma (< 19 years old)	HR: 1.03 (1.01-1.05)	1	Kreis et al., 2017
PM _{2.5}	COPD	HR: 1.17 (1.06-1.29)	5	Liu et al., 2021b ^(b)
	Dementia (≥ 60 years old)	RR: 1.46 (1.20 - 1.78) ^(e)	10	Forastiere et al., 2024 ^(d)
	IHD	HR: 1.13 (1.05-1.22)	10	Forastiere et al., 2024 ^(d)
	LC	HR: 1.13 (1.05-1.23)	5	Hvidtfeldt et al., 2021 ^(b)
	Stroke	HR: 1.10 (1.01-1.21)	5	Wolf et al., 2021 ^(b)
	T2DM ^(f)	OR: 1.08 (1.04-1.12)	10	Yang et al., 2020
NO ₂	Asthma (< 19 years old)	OR: 1.05 (1.02-1.07)	4	Kreis et al., 2017
	Asthma (≥ 19 years old)	HR: 1.10 (1.01-1.21)	10	HEI 2022 ^(d)
	COPD	HR: 1.11 (1.06-1.16)	10	Brunekreef et al., 2021
	T2DM ^(f)	OR: 1.07 (1.04-1.11)	10	Yang et al., 2020
	Stroke	HR: 1.08 (1.04-1.12)	10	Wolf et al., 2021 ^(b)

Notes: ^(a) Recommended by 2021 WHO AQG

^(b) Proposed by the ELAPSE (Effects of Low-Level Air Pollution: A Study in Europe) study

^(c) For mortality, the effect measure refers to type 1 and type 2 diabetes mellitus (DM), in contrast to morbidity, which includes only type 2 diabetes mellitus (T2DM)

^(d) Proposed by the EMAPEC (Estimating the Morbidity from Air Pollution and its Economic Costs) study

^(e) This RR is considered appropriate only for exposure differences not larger than $10 \mu\text{g}/\text{m}^3$ PM_{2.5}

^(f) For morbidity, the effect measure refers to type 2 diabetes mellitus (T2DM), in contrast to mortality, which also includes type 1 diabetes mellitus (DM).

The population exposure is estimated using the ETC HE produced concentration maps with annual statistics for 2023 (Horálek et al., 2025): annual mean for PM_{2.5} and NO₂, and peak season for O₃. It is assumed that population exposure within a country did not vary by age group. The maps are generated through data fusion that combines monitoring data from rural and urban background stations for PM_{2.5}, NO₂, and O₃, as well as urban traffic station data for PM_{2.5} and NO₂, with results from the Copernicus Atmosphere Monitoring Service (CAMS) Ensemble, and other supplementary data, such as altitude, meteorology, and population density. All data supporting the data fusion pertains to 2023. These maps

are created on a 1x1 km² grid and cover the 41 European countries included in the assessment, excluding the overseas territories such as Madeira, Azores, Canary Islands, French Guiana, Guadeloupe, Martinique, Mayotte, and Réunion. Türkiye did not have sufficient PM_{2.5} monitoring data with the required quality for the fusion methodology to include the country in the PM_{2.5} map.

The population density data used for the 2023 EBD estimations have been updated. The estimations presented in past reports used the population density maps (gridded) based on the GEOSTAT 2011 dataset (Eurostat, 2014), which represents the European population distribution in 2011 at a 1 km x 1 km resolution. The population density data used for the 2023 estimation are based on 2021 data from the Global Human Settlement Layer (GHSL) project, supported by the European Commission, Joint Research Centre, and Directorate-General for Regional and Urban Policy (Pesaresi et al., 2024). The data represent population counts in 100 m x 100 m resolution. The population is always scaled to the assessment year using Eurostat data on each country's total population, independently of the population density maps used. The population was then mapped at the same grid resolution as the ambient air concentrations, facilitating the estimation of health outcomes per grid cell.

Health data to estimate the health indicators are available from the Eurostat database, which provides high-quality European statistics. The data were available at the country level; however, it is essential to note that data completeness depends on the availability of the raw data transmitted by the National Statistical Offices (ESS, 2012). Many countries report data with two or more years of delay or do not report data at all, which requires using a gap-filling methodology. The need for gap-filling is not ideal and may introduce additional uncertainty that cannot be quantified. Nonetheless, it is important to emphasise that gap-filling is necessary to provide results for each country included in the assessment. An overview of the health data sources for all-cause natural mortality and cause-specific mortality and morbidity is presented in Table 1.2, including the diseases considered in the health outcome assessment based on the WHO's International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10).

The EBD methodology has been thoroughly described across various ETC reports:

- The **ETC/ATNI Report 2019/13 (Soares et al., 2020)** and references therein outline the steps to estimate the all-cause mortality-related indicators, while the **ETC HE Report 2022/11 (Kienzler et al., 2022)** describes the calculation of cause-specific morbidity. The assessments in these reports focus on estimating long-term exposure to PM_{2.5} and NO₂ concentrations, and short-term exposure to O₃ concentrations. Although the demographic and concentration data, as well as the counterfactual concentrations used to estimate the risk, were aligned in the two reports, the demographic and health data were partly stratified differently by year, age intervals, and sex. Furthermore, the calculations varied on how the EBD was aggregated. All-cause mortality was estimated at the 1x1 km² grid cell level and then aggregated to provide health outcomes for individual countries. For cause-specific estimates, EBD was estimated at the country level.
- The **ETC HE Report 2023/7 (Soares et al., 2024a)** consolidates both approaches—all-cause and cause-specific—and calculates all-cause mortality impacts as well as cause-specific mortality and morbidity impacts at the grid cell level. It additionally provides supplementary estimates of cause-specific mortality.
- The **ETC HE Report 2024/6 (Soares et al., 2024b)** expanded the methodology to estimate mortality related to long-term O₃ exposure to align with the 2021 WHO AQG.

This report presents the EBD associated with long-term exposure to PM_{2.5}, NO₂, and O₃ in 2023 across 41 European countries (excluding Türkiye for PM_{2.5}-related burden of disease): the 27 Member States of the European Union (EU27) and 14 additional European countries (Albania, Andorra, Bosnia and Herzegovina, Iceland, Kosovo under UNSCR 1244/99, Liechtenstein, Monaco, Montenegro, North Macedonia, Norway, San Marino, Serbia, Switzerland, and Türkiye). The EBD results are presented in Chapter 2, which also includes sensitivity analyses for PM_{2.5} and NO₂, and evaluates the progress towards achieving the Zero Pollution Action Plan (ZPAP) 2030 objective. The conclusions and recommendations for further work are laid down in Chapter 3, with complementary information on the methodology available in Annex 1; the

data used and the gap-filling applied in Annex 2. Annex 3 presents the numbers estimated for the population at risk and exposure levels used for the all-cause mortality and cause-specific estimates, and the EBD estimates for individual countries and aggregated areas, including the respective rates per 100,000 inhabitants at risk, are presented in Annex 4. Annexes 5 and 6 include a glossary and the countries' iso codes, respectively.

Table 1.2 Health data sources for the considered outcomes (mortality and morbidity)

Health outcome	Data source ^(a)	ICD-10 code ^(b)	Explanation	Remarks
Mortality (causes of death)				
All-cause natural mortality	Eurostat	A-R, U (related to COVID-19)	All causes except injuries, poisoning, accidents or other external causes (S00-T98, V01-Y89)	Register-based
Asthma (children/adolescents, adults)	Eurostat	J45-46	Asthma and status asthmaticus	Register-based
COPD	Eurostat	J40-44, J47	Other lower respiratory diseases	Register-based
DM	Eurostat	E10-14	Type 1 and 2 diabetes	Register-based
IHD	Eurostat	I20-25		Register-based
LC	Eurostat	C33-34	Malignant neoplasm of trachea, bronchus and lung	Register-based
Stroke	Eurostat	I60-I69	Cerebrovascular diseases	Register-based
Morbidity (prevalence)				
Asthma (children <15 years)	GBD 2021 study	J45-46		Modelled
Asthma (adolescents, adults ≥15 years)	EHIS	J45-46	Allergic asthma included	Self-reported
COPD	EHIS	J40-44, J47	Chronic bronchitis, chronic obstructive pulmonary disease, emphysema	Self-reported
Dementia	Alzheimer Europe 2019	F01-F03, G30 ^(c)	European rate used, stratified by age and gender	Diagnoses confirmed clinically from epidemiological studies identified through a systematic review
DM	EHIS	E10-14	Type 1 and 2 diabetes (gestational diabetes excluded)	Self-reported
IHD	EHIS	I20-25	Coronary heart disease or angina pectoris	Self-reported
LC	IARC	C33-34		Register based
Stroke	EHIS	I60-69	Cerebral haemorrhage/ischaemia or chronic consequences of stroke	Self-reported

Notes: ^(a) GBD 2021 study: data for Serbia, including data for Kosovo, IARC: data for Serbia presumably including data for Kosovo, EHIS: data for Serbia excluding data for Kosovo, EUROSTAT: data for Serbia excluding data for Kosovo.

^(b) The ICD10 codes listed for self-reported health outcomes (morbidity) lack clinical precision and are only presented to allow comparisons of the outcomes with those for mortality (Eurostat, 2020).

^(c) Assumed ICD-10 codes, as these were not specified in the publication. According to Alzheimer Europe (2019), data were insufficient to reliably estimate the prevalence by dementia type or stage across Europe.

2 EBD estimations for 2023

In this assessment, the health effects attributable to long-term exposure to PM_{2.5}, NO₂, and O₃ were quantified using four burden of disease indicators across 41 (40 for PM_{2.5}) European countries:

- Number of attributable deaths (AD): quantifies a death which is statistically attributable to exposure to a risk factor.
- Years of life lost (YLL): quantifies the years lost due to dying before reaching a specifically selected life expectancy value (e.g. highest observed globally or in a country).
- Years lived with disability (YLD): quantifies years of life lost due to living in a state of reduced overall health.
- Disability-adjusted life years (DALY): quantifies losses of healthy life years resulting from a disease or attributable to a certain risk factor. The DALY indicator combines the cause-specific population-based mortality (YLL) and morbidity (YLD) effects and is a widely used summary measure of population health. It is used to compare the population's health impacts of diseases, injuries, and risk factors, and it is the sum of YLL and YLD.

The estimation is done for the population at risk of developing a disease or dying. In this context, the population at risk is the relevant age group covered in the epidemiological studies for each outcome (see Table 1.1). For example, if a CRF applies to the population of individuals 30 years of age and above, only individuals 30 years of age and above are included in the corresponding EBD indicator calculation. In addition to quantifying the burden in the population, a rate per 100,000 inhabitants at risk of developing a disease or dying was calculated for all indicators to facilitate comparison across European countries.

The estimates presented here are for individual countries and aggregated for EU27, EEA32, and all countries included in the assessment. EU27 comprises the 27 EU member states, and EEA32 includes the EU27 countries, as well as Iceland, Liechtenstein, Norway, Switzerland and Türkiye. All results are reported as the mean estimate along with the 95% CI to indicate the uncertainty associated with the CRFs.

2.1 PM_{2.5}

2.1.1 Population-weighted annual mean concentration

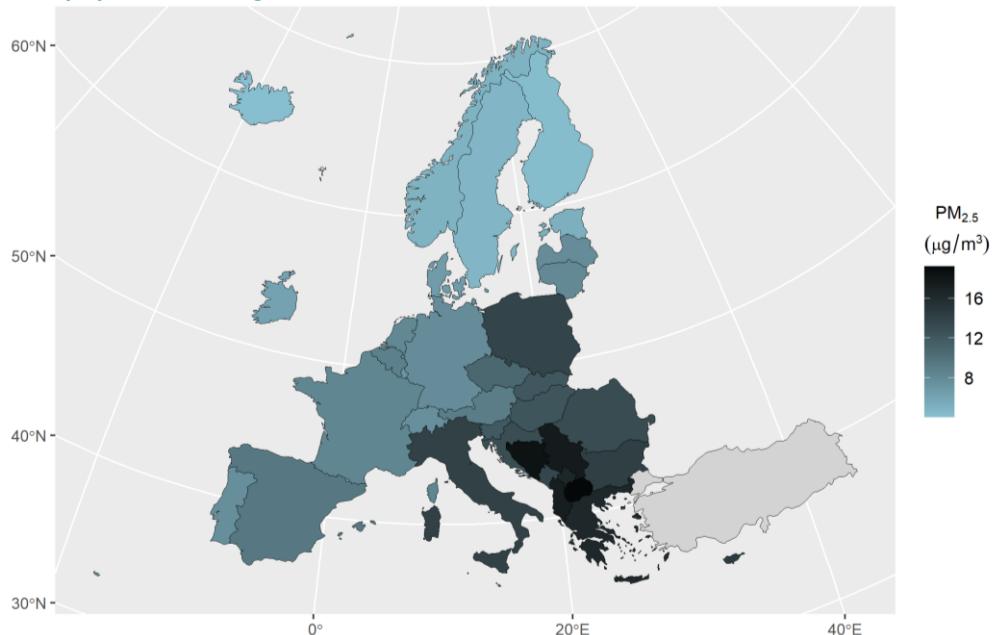
PM_{2.5} is emitted directly (primary aerosol) or formed in the atmosphere through gas-to-particle conversion processes (secondary aerosol). Major sources of PM_{2.5} include motor vehicle exhaust as well as tyre-, brake-, and road-wear, industrial emissions, and power plant combustion. Residential sources, such as wood-burning stoves and fireplaces, are a significant contributor to PM_{2.5} emissions, particularly during the winter months. Natural sources also contribute to PM_{2.5}, including volcanic emissions, wildfires and windblown dust. The primary precursors for secondary aerosols are ammonia from agriculture; nitrogen oxides from the combustion of solid fuels (e.g., residential heating), industrial activities, and road transport; sulfur dioxide from industrial activities and energy production, including power plants; and volatile organic compounds from both natural and anthropogenic sources, including industrial processes and vehicle emissions.

The variety of sources and the complexity of the physical and chemical processes that these aerosols undergo results in concentration levels that vary greatly geographically. PM_{2.5} emissions in the EU have been decreasing since 2005 due to requirements under the EU's obligations aimed at reducing emissions of these main air pollutants: the Gothenburg Protocol of the United Nations Economic Commission for Europe (UNECE), Convention on Long-range Transboundary Air Pollution (UNECE Air Convention), and the National Emission Reduction Commitments Directive (NECD). Overall, comparing 2023 levels to 2005, the EU emissions have decreased by 38 % (EEA, 2025). This difference varies across the EU27 countries, ranging from 17% to 63%, but all show a decrease. Emission reductions in the public electricity and heat production, residential fuel use and road transport are mainly responsible for these declines. This is partly

due to sector-specific emission limit values set by other EU legislation, such as the Industrial Emissions Directive and Euro standards for vehicles.

Map 2.1 displays the population-weighted mean concentration at the country level in 2023. This concentration is equivalent to the average exposure level of the population of an individual country. The population-weighted mean concentration for each individual country can be found in Annex 3 Table A3.1. For more detailed information on the population-weighted mean concentration maps and the supporting observation data, please refer to Horálek et al. (2025) and Targa et al. (2025). These numbers help to understand the results of the attributable EBD.

Map 2.1 PM_{2.5} population-weighted annual mean concentration in 2023



In general, Northern European populations are exposed to lower levels of fine particles, whereas Eastern European populations are exposed to higher levels. It is estimated that in 2023, a European citizen was exposed on average to a PM_{2.5} concentration of 10.3 μg/m³ (10.2 μg/m³ for an average EU27 citizen), with a minimum of 4.1 μg/m³ at the country level in Iceland and a maximum of 19.2 μg/m³ in North Macedonia (4.2 μg/m³ in Finland and 16.5 μg/m³ in Greece for EU27).

2.1.2 Burden of disease

This section presents the findings for all-cause and cause-specific analyses of the EBD attributed to long-term exposure to PM_{2.5}. The analyses cover 40 European countries, excluding Türkiye, due to a lack of PM_{2.5} data reported to produce population exposure maps. The cause-specific EBD analyses for PM_{2.5} encompass seven health outcomes: all-cause, asthma (< 19 years old), COPD, DM, IHD, LC, and stroke. The estimates are based on the CRFs listed in Table 1.1 and the counterfactual concentration of 5 μg/m³ (WHO, 2021), except for the sensitivity analysis that assumed 0 and 10 μg/m³.

All-cause mortality

The estimation of deaths due to all-cause mortality attributable to PM_{2.5} in 2023 indicated 206,465 (95% CI: 157,549-230,304) deaths for all countries considered and 182,400 (95% CI: 139,102-203,520) for the EU27. The YLL estimates were 2,160,351 (95% CI: 1,648,448-2,409,840) and 1,913,535 (95% CI: 1,459,256-2,135,135), respectively. The results for the all-cause mortality estimation for the EU27, EEA32 and all countries are presented in Table 2.1. The table includes the population at risk considered, the exposure level, the mean value and the lower and upper 95% CI values for the EBD indicators (AD and YLL).

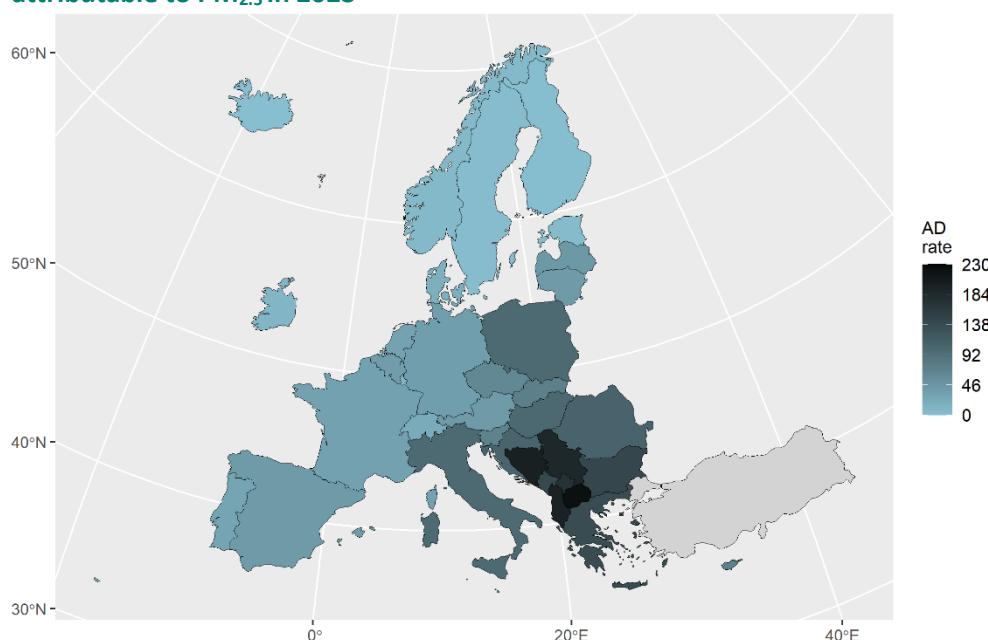
Table 2.1 Burden of disease due to all-cause mortality (AD, YLL, including the upper and lower 95 % CI) attributable to PM_{2.5} long-term exposure in the EU27, the EEA32 and all 40 European countries (“All countries”) in 2023

Area	Population ≥ 30 years old (in 1,000)	Exposure (µg/m ³)	AD			YLL		
			Mean	Lower 95% CI	Upper 95% CI	Mean	Lower 95% CI	Upper 95% CI
EU27	305,665	10.2	182,400	139,102	203,520	1,913,535	1,459,256	2,135,135
EEA32	315,507	10.1	183,999	140,316	205,308	1,929,606	1,471,459	2,153,104
All countries	327,293	10.3	206,465	157,549	230,304	2,160,351	1,648,448	2,409,840

Note: The counterfactual concentration was 5 µg/m³

Map 2.2 displays the AD per 100,000 inhabitants at risk across the 40 countries assessed. The results for AD are clearly correlated with the level of PM_{2.5} shown in Map 2.1. Similarly to the exposure levels, the Northern European countries had the lowest number of deaths attributable to PM_{2.5} per 100,000 inhabitants at risk. Sweden, Estonia, Norway and Ireland had fewer than 10.0 AD per 100,000 inhabitants at risk, and Iceland and Finland had fewer than 1.0. The country with the highest AD per 100,000 inhabitants at risk was North Macedonia (222.2, 95% CI: 170.7-247.0). Countries with 100 AD and over per 100,000 inhabitants at risk were Italy (100.6, 95% CI: 76.97-112.1), Hungary (102.0, 95% CI: 77.8-113.8), Croatia (107.3, 95% CI: 82.0-119.7), Romania (108.4, 95% CI: 82.7-120.9), Greece (137.7, 95% CI: 105.5-153.3), Montenegro (141.8, 95% CI: 108.4-158.1), Bulgaria (143.8, 95% CI: 109.9-160.3), Kosovo (172.4, 95% CI: 131.9-192.0), Serbia (188.3, 95% CI: 144.4-209.6), Albania (196.1, 95% CI: 150.3-218.3), and Bosnia and Herzegovina (199.0, 95% CI: 152.9-221.3).

Map 2.2 Burden of disease rate due to all-cause mortality (AD per 100,000 inhabitants at risk) attributable to PM_{2.5} in 2023



Spatial differences in YLL closely mirror the ones shown in Map 2.2. When the countries are ordered according to the indicators (AD and YLL rates) and the respective rankings are compared, there are a few shifts in the ordering. These shifts reflect differences in national life expectancy and mortality rates. For example, Poland had the 29th largest AD rate per 100,000 inhabitants at risk across the 40 countries and had the 32nd largest in terms of YLL rates.

AD and YLL estimations and the corresponding rates per 100,000 inhabitants at risk for individual countries are available in Annex 4 Tables A4.1 and A4.2, respectively. The exposure levels and the population at risk for each country are presented in Annex 3 Table A3.1 and Table A3.2, respectively.

As expected, the sensitivity analysis for all-cause mortality burden indicates that changing the counterfactual concentration had a strong impact on results. Increasing the PM_{2.5} counterfactual concentration from 5 to 10 µg/m³ decreases the estimated number of AD by 69.8 % in the EU27 and 66.5 % in all countries. If estimations consider the entire range of exposure levels in the population, assuming a counterfactual concentration of 0 µg/m³, the estimates for AD would increase by 89.8 % in the EU27 and by 85.2 % when all countries are aggregated.

The increase or decrease in AD when counterfactual concentrations were changed, as determined by the sensitivity analysis, varied across countries. Figure 2.1 shows the results of the sensitivity analysis for individual countries. Increasing the counterfactual concentration from 5 to 10 µg/m³ PM_{2.5} resulted in a more pronounced decrease in AD for countries with population-weighted concentrations closer to or below the counterfactual concentration. This included northern European countries, but not only. When all concentration levels were considered for the estimation, there was an increase for all countries, with the relative increase still being higher for countries whose populations were exposed to low levels of PM_{2.5}.

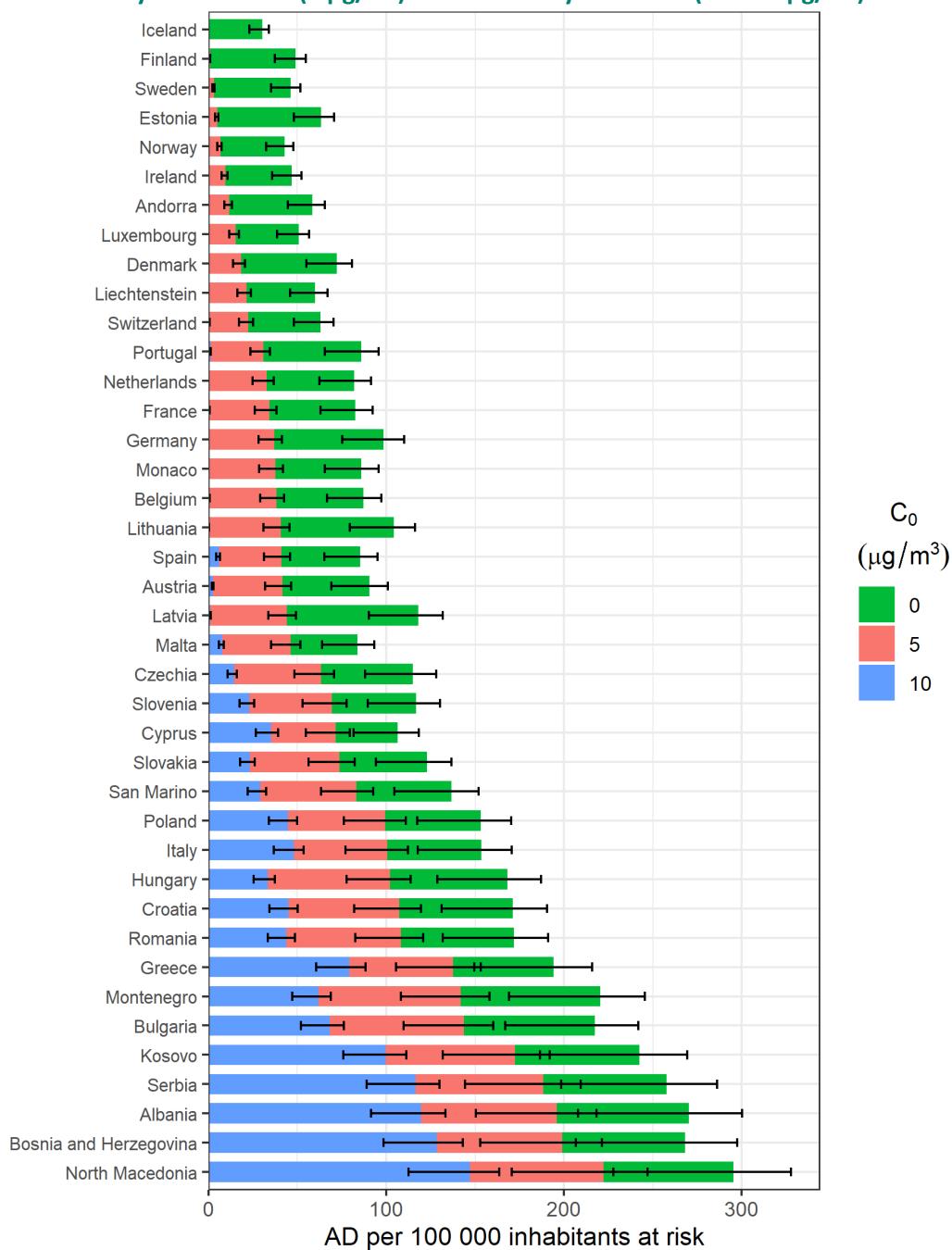
Table 2.2 shows the result of the sensitivity analysis for the EU27, EEA32 and all countries, and is to be compared with Table 2.1. Increasing the PM_{2.5} counterfactual concentration from 5 to 10 µg/m³ decreases the estimated number of AD by 69.8 % in the EU27 and 66.5 % in all countries. If estimations consider the entire range of exposure levels in the population, assuming a counterfactual concentration of 0 µg/m³, the estimates for AD would increase by 89.8 % in the EU27 and by 85.2 % when all countries are aggregated.

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Table 2.2 Burden of disease due to all-cause mortality (AD, YLL, including the upper and lower 95 % CI) attributable to PM_{2.5} long-term exposure in the EU27, the EEA32 and all 40 European countries in 2023, using the counterfactual concentration (C₀) of 0 and 10 µg/m³

Area	C ₀ (µg/m ³)	Mean	Lower 95% CI	Upper 95% CI	Mean	Lower 95% CI	Upper 95% CI
			Total AD			AD rate per 100,000 at risk	
EU27	0	346,202	264,939	385,631	113.3	86.7	126.2
EU27	10	55,112	41,965	61,539	18.0	13.7	20.1
EEA32	0	351,614	269,063	391,671	111.4	85.3	124.1
EEA32	10	55,145	41,991	61,576	17.5	13.3	19.5
All countries	0	382,406	292,780	425,863	116.8	89.5	130.1
All countries	10	69,055	52,621	77,081	21.1	16.1	23.6
			Total YLL			YLL rate per 100,000 at risk	
EU27	0	3,625,470	2,774,460	4,038,382	1,186.1	907.7	1,321.2
EU27	10	576,559	438,984	643,829	188.6	143.6	210.6
EEA32	0	3,679,925	2,815,966	4,099,160	1,166.4	892.5	1,299.2
EEA32	10	576,891	439,236	644,201	182.8	139.2	204.2
All countries	0	3,996,430	3,059,732	4,450,611	1,221.1	934.9	1,359.8
All countries	10	719,531	548,244	803,193	219.8	167.5	245.4

Figure 2.1 Attributable deaths (AD) to PM_{2.5} long-term exposure per 100,000 at risk, including the lower and upper 95% CI (error bars), in 2023 considering counterfactual concentrations (C₀) defined by the baseline (5 µg/m³) and sensitivity scenarios (0 or 10 µg/m³)



Cause-specific mortality and morbidity

In previous ETC HE Eionet reports on EBD (e.g., Soares et al., 2024b), the following six diseases had been considered for the cause-specific analysis: asthma in children, COPD, DM, IHD, lung cancer and stroke. This report presents an expanded analysis, extending the considered asthma cases to adolescents (all below 19 years of age) and introducing dementia morbidity effects. A growing body of toxicological and epidemiological evidence indicates a statistical association between exposure to PM_{2.5} pollution and increased risk of dementia (Forastiere et al., 2024; Huang et al., 2025, Best Rogowski et al. 2025). However, regarding the effect estimate used, there is greater uncertainty about the evidence-base of the CRF compared to other risk-outcome pairs considered in the analyses. To take this into account, the EBD results for dementia are presented separately from other diseases and are not included when adding cause-specific outcomes to estimate the total burden of disease. Further, only the morbidity component (YLD)

was calculated in the dementia analyses, as the selected effect estimate did not include studies on mortality. Detailed results (AD, YLL, YLD, DALY and the corresponding rates per 100,000 individuals at risk), disaggregated by the other diseases, are provided for each country and the EU27, EEA32 and all countries in Annex 4 Tables A4.3 to A4.27. Table A4.28 shows YLD attributable to dementia. The population at risk for the different health outcomes and the exposure levels for the individual countries used for the estimates are described in Annex 3 Table A3.1 and Table A3.2, respectively.

In 2023, the total cause-specific EBD of all selected outcomes attributable to PM_{2.5} (excluding dementia morbidity) amounted to 2,300,989 DALY (95% CI: 973,460-3,479,297) in all 40 countries considered and 2,074,951 DALY (95% CI: 874,342-3,148,806) in the EU27 (see Table 2.3 and Annex 4 Table A4.3 for the results of individual countries). For dementia, 315,391 YLD (95% CI: 163,573-447,863) were estimated in all countries and 293,195 YLD (95% CI: 151,603-417,445) in the EU27 attributable to PM_{2.5}-exposure.

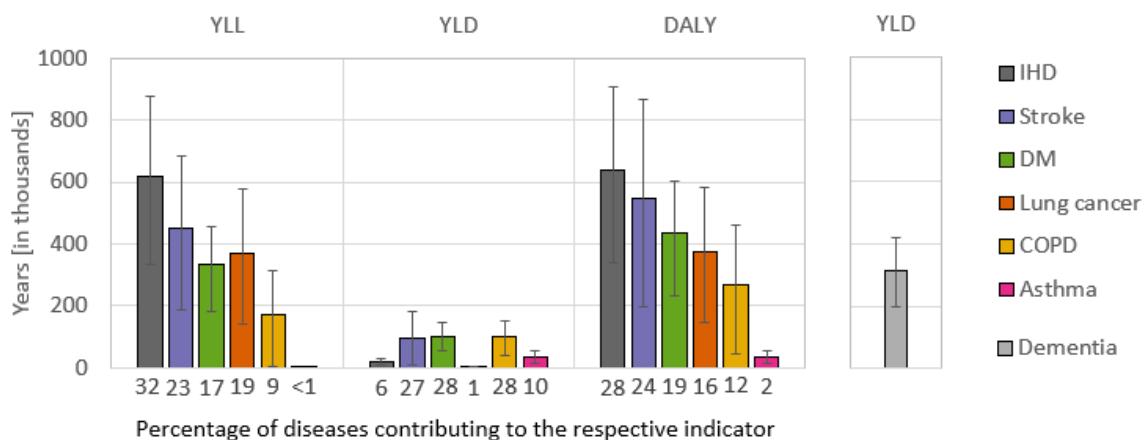
Table 2.3 Total cause-specific burden of disease (total AD, YLL, YLD, DALY, including the upper and lower 95 % CI) attributable to PM_{2.5} long-term exposure (excluding dementia) in the EU27, the EEA32 and all 40 European countries in 2023 for six outcomes. Exposure levels are available in Table 2.1

Areas	Mean	Lower 95% CI	Upper 95% CI	Mean	Lower 95% CI	Upper 95% CI
Total AD						
EU27	171,671	75,535	256,651	1,749,884	760,882	2,627,266
EEA32	172,895	76,021	258,578	1,762,597	765,764	2,647,430
All countries	190,854	84,273	284,312	1,944,576	848,203	2,909,362
Total YLD						
EU27	325,067	113,460	521,540	2,074,951	874,342	3,148,806
EEA32	328,892	114,728	527,811	2,091,489	880,492	3,175,311
All	356,413	125,256	569,936	2,300,989	973,460	3,479,297

Note: The counterfactual concentration was 5 µg/m³

Figure 2.2 presents both the absolute and percentage contribution of the respective outcomes to the overall disease burden for the 40 countries assessed. The magnitude varied substantially across the diseases, reflecting differences in baseline health data, affected age groups, and RR estimates. IHD in individuals aged 25 years and older accounted for the largest share of attributable DALY (637,074, 95% CI: 341,283-910,418), consistent with the high mortality of cardiovascular diseases in older populations. At the other end, asthma in children and adolescents represented the smallest burden (35,683 DALY; 95% CI: 12,938–54,965), primarily because only the population under 19 years of age was considered, in contrast to the older age groups (predominantly 25 and above) assessed for the other outcomes and because of low asthma mortality rates in this age group.

Figure 2.2 Burden of disease (YLL, YLD, DALY, including the upper and lower 95 % CI shown as error bars) attributable to PM_{2.5} long-term exposure for all 40 countries, differentiated by outcomes



Notes: asthma: asthma in children/adolescents; CI: confidence interval; COPD: chronic obstructive pulmonary disease; DALY: disability-adjusted life years; DM: diabetes mellitus (type 1 and type 2); IHD: ischemic heart disease; YLD: years lived with disability; YLL: years of life lost

For all outcomes except asthma in children and adolescents, the attributable burden was driven by mortality rather than morbidity. For lung cancer and IHD, almost all DALY were due to YLL (99% and 97%, respectively), while stroke, DM, and COPD showed smaller but still substantial mortality shares (82%, 77%, and 63%) considering all 40 European countries. DM was noteworthy in this context, because studies have shown a considerably higher mean RR for mortality (1.32 per 5 µg/m³) as compared to stroke (1.13 per 5 µg/m³), COPD (1.13 per 5 µg/m³), IHD (1.11 per 5 µg/m³) or lung cancer (1.10 per 5 µg/m³) (see Table 1.1). However, the overall disease burden attributable to PM_{2.5} remained lower for DM than for IHD or stroke. This is due to the substantially higher absolute number of IHD and stroke deaths in the population, particularly among older adults, so that the combination of high baseline mortality and additional PM_{2.5}-related risk resulted in a larger YLL and thus an increased DALY contribution for IHD and stroke.

Asthma in children and adolescents represented an exception, as morbidity accounted for nearly all attributable DALY (99% YLD). Moreover, mortality estimates for asthma were subject to a certain degree of methodological uncertainty due to the transfer of morbidity-based relative risks to mortality outcomes in the absence of mortality-specific effect estimates. However, the impact of this assumption is considered low given that asthma death cases are rare in younger populations.

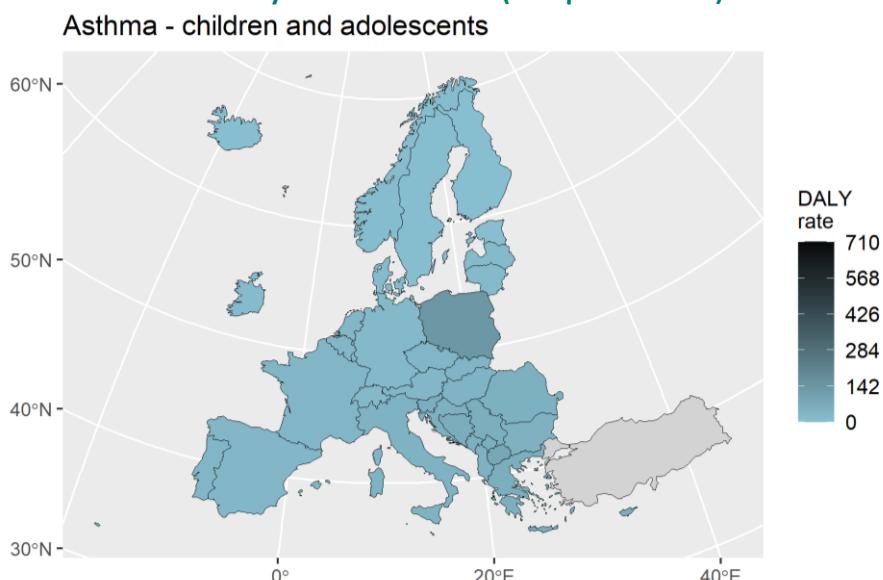
For dementia (in individuals aged 60 years and older), the mean morbidity burden — amounting to 315,391 YLD across all countries — was almost equivalent to the total YLD of all other outcomes combined (356,413 YLD). This is partly because, for the other diseases, the burden is mainly driven by mortality. However, the estimates for dementia should also be interpreted with caution. The comparatively high burden is partly explained by the relatively high mean RR (1.46 per 10 µg/m³ PM_{2.5} increase) (see Table 1.1). Moreover, this RR is considered appropriate only for exposure differences of around 10 µg/m³ PM_{2.5} (Forastiere et al. 2024), that is, from 5 to 15 µg/m³, a range that is exceeded by some countries in our European analyses. In these cases, the results should be regarded as highly uncertain. Further uncertainty arises from the input data on prevalence. A single European average prevalence rate, stratified by age and sex, was applied uniformly across all countries, unlike the other diseases for which country-specific prevalence rates stratified by age and sex were used. National data on disease frequency were not available beyond sex-specific adjustments. Together, these factors introduced substantial methodological uncertainty into the dementia burden estimates. Nonetheless, they should be seen as an important first step toward including dementia in such analyses, which was already done in the Global Burden of Disease assessment (GBD 2023 Disease and Injury and Risk Factor Collaborators, 2025).

A comparison of the cause-specific EBD, except dementia, across all countries (see Figure 2.3) reveals that certain Western Balkans and neighbouring countries in South-East Europe predominantly showed the highest DALY rates per 100,000 inhabitants at risk across all individual outcomes considered. The Map 2.4 shows a similar pattern for dementia morbidity. A significant proportion of these countries are among those with the highest population-weighted PM_{2.5} levels. Figure 2.3 also demonstrates a high impact of specific outcomes in certain countries, different to the general situation. Examples include asthma in children and adolescents in Poland, DM in Croatia, and stroke in Bulgaria.

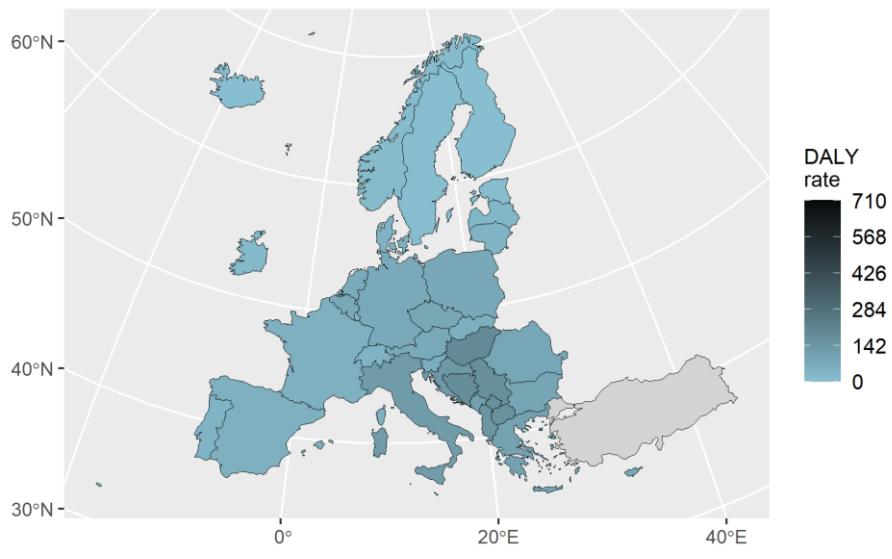
Map 2.3 combines the information in the maps shown in Figure 2.3 and presents the cause-specific outcome that contributed the most to the total burden of disease for individual countries in 2023. The mapping is based on the DALY for individual outcomes (except dementia) in each country. Dementia was not included to follow the same principle as in the analysis shown in Figure 2.2. The map indicates that IHD was the primary cause of the highest disease burden across countries, particularly in parts of Western, Central and Northern Europe. The exceptions to this were as follows. Norway and Denmark, which, together with Luxembourg and Liechtenstein, had COPD as the most dominant outcome. Bosnia and Herzegovina, Bulgaria, Kosovo, Portugal and Serbia had the highest estimated disease burden due to stroke. Lung cancer predominated in Andorra, Belgium, France, Monaco, the Netherlands and Spain. Finally, DM disease burden had the highest contribution to the burden of disease in Croatia, Cyprus, Italy and San Marino. As expected, asthma in children and adolescents was not among the leading causes of disease burden in any of the countries, as it was estimated to affect a smaller portion of the population. It is important to note that in some countries, the gap between the outcome with the highest contribution and the next highest was not necessarily significant.

Figure 2.4 helps in understanding how cause-specific outcomes contributed to the total burden of disease for the individual countries. Specifically, for IHD, some contributions were relatively high, exceeding 40%.

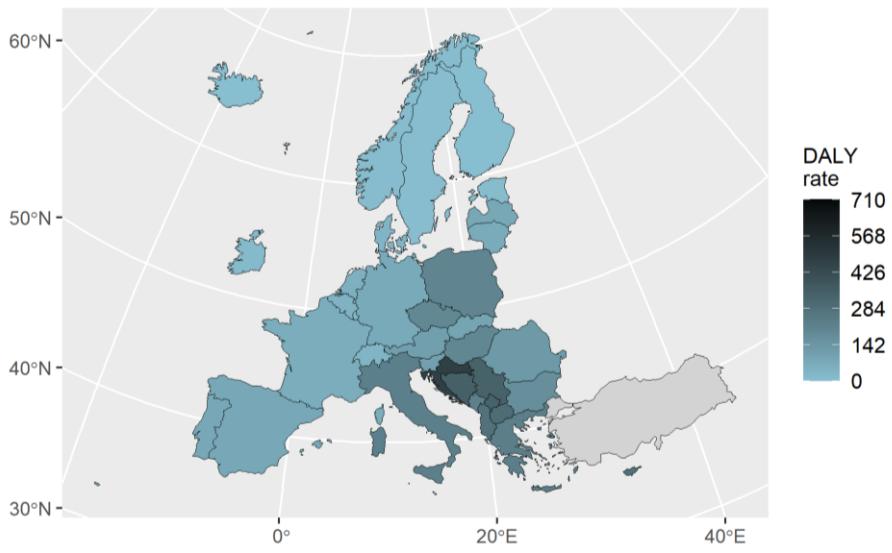
Figure 2.3 Burden of disease rates (DALY per 100,000 inhabitants at risk) attributable to PM_{2.5} long-term exposure differentiated by health outcomes (except dementia) in 2023



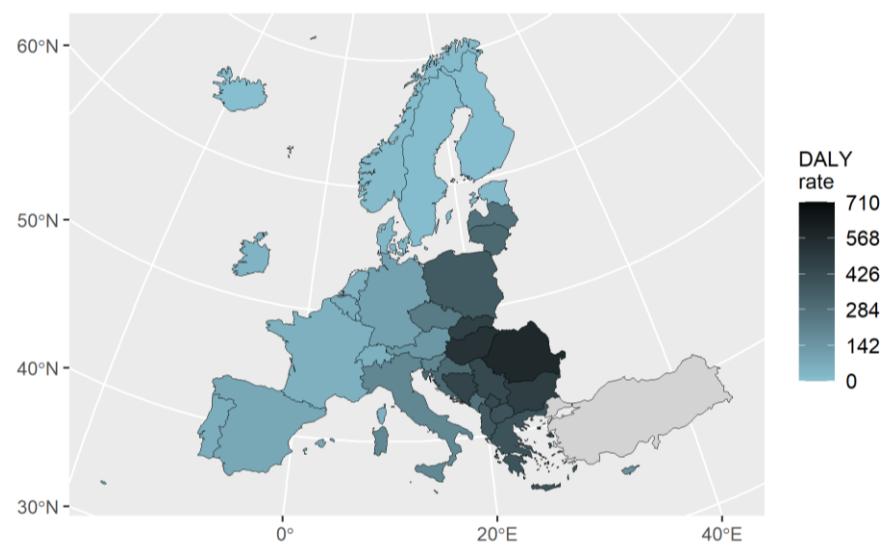
Chronic obstructive pulmonary disease



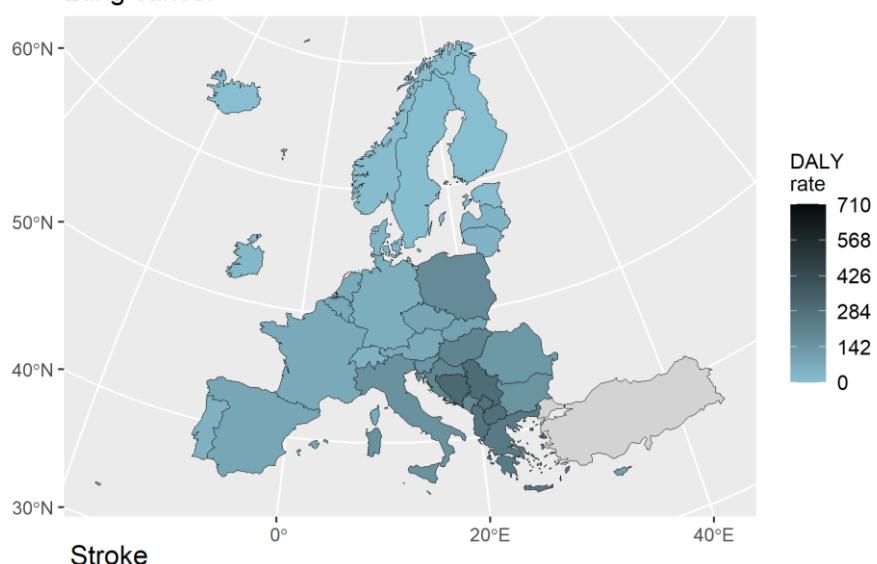
Diabetes Mellitus



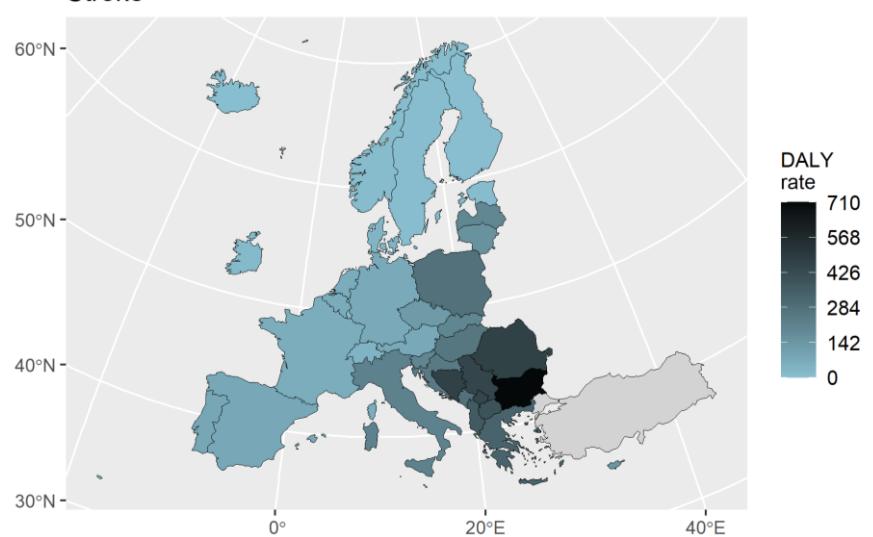
Ischemic heart disease



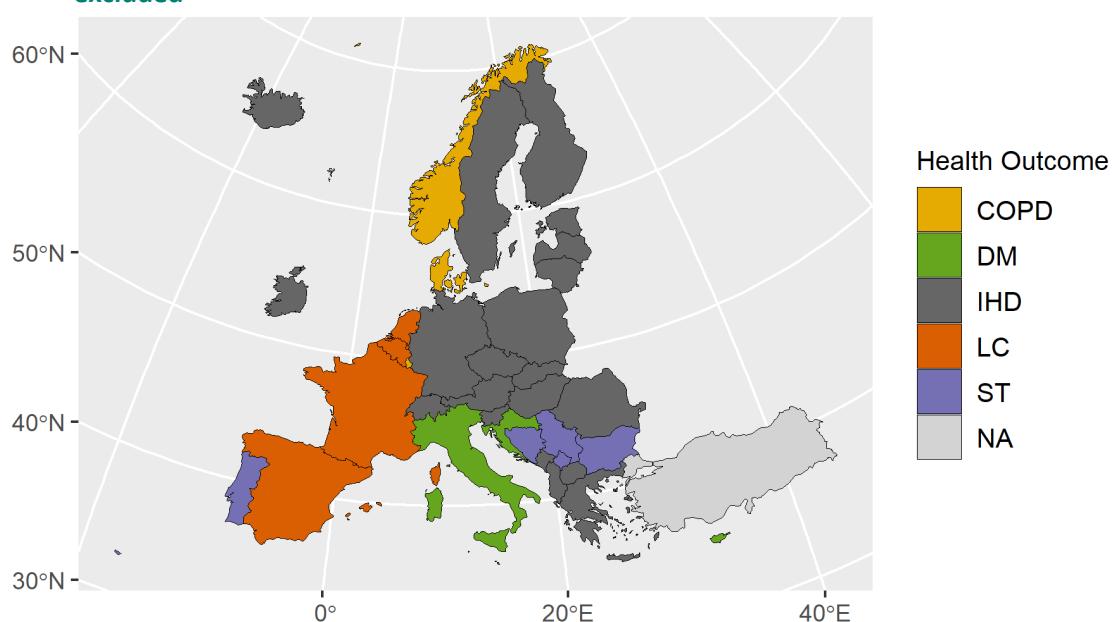
Lung cancer



Stroke

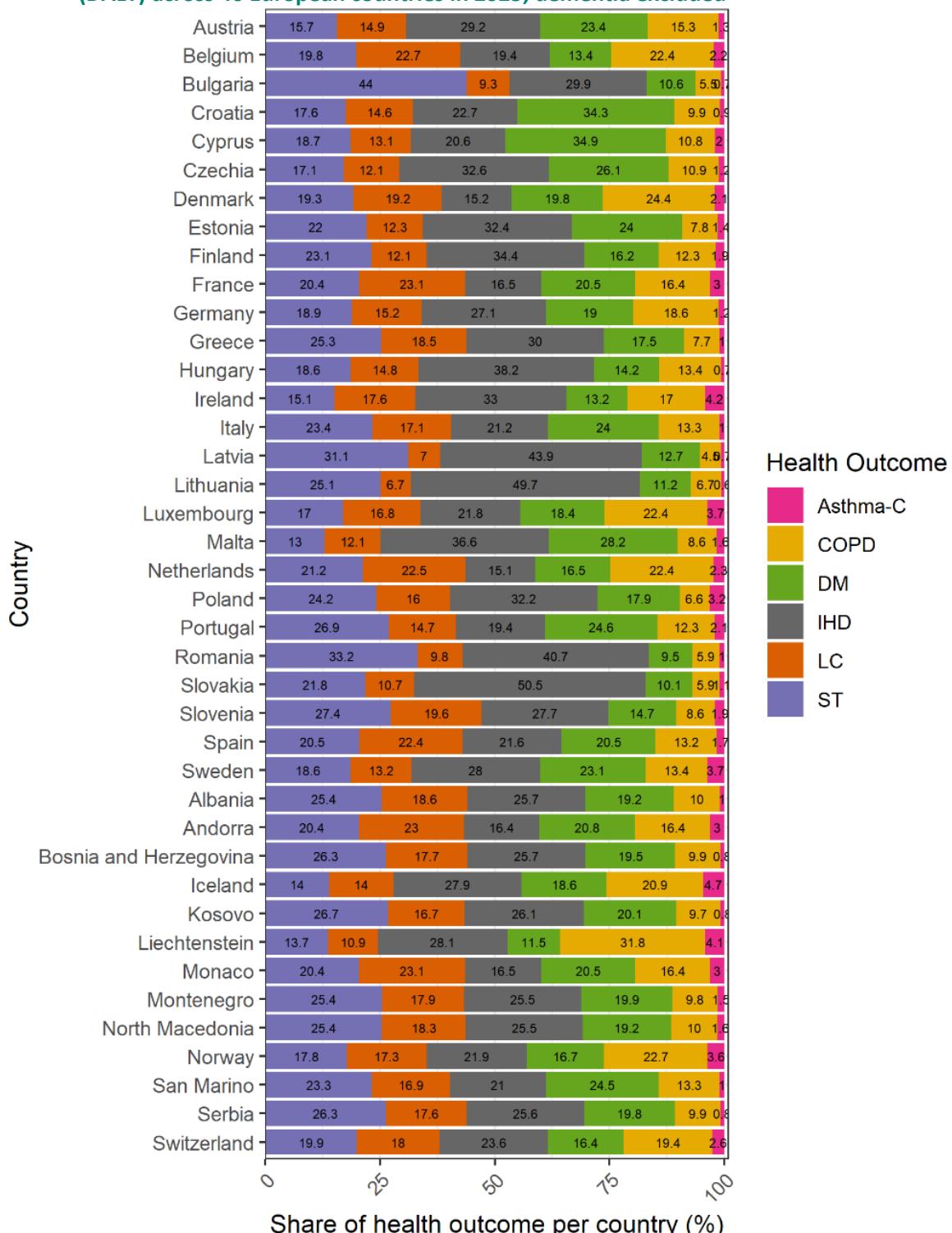


Map 2.3 Leading health outcome for PM_{2.5} attributable burden based on the DALY for 2023, dementia excluded



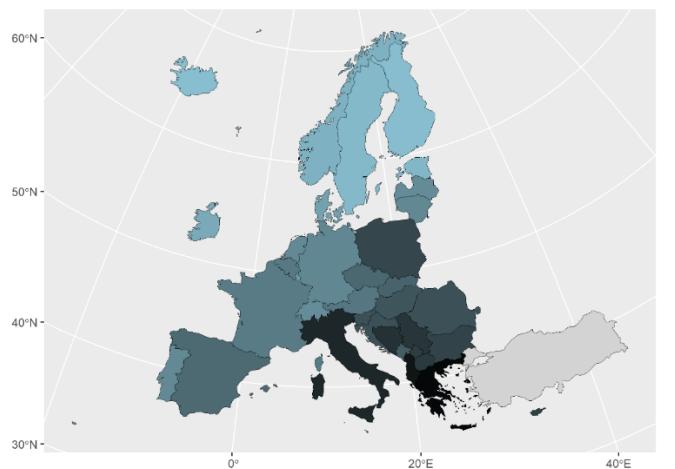
Notes: chronic obstructive pulmonary disease (COPD), diabetes mellitus (DM), ischemic heart disease (IHD), lung cancer (LC), stroke (ST); not available (NA)

Figure 2.4 Contribution of cause-specific outcomes to the total PM_{2.5} attributable burden of disease (DALY) across 40 European countries in 2023, dementia excluded



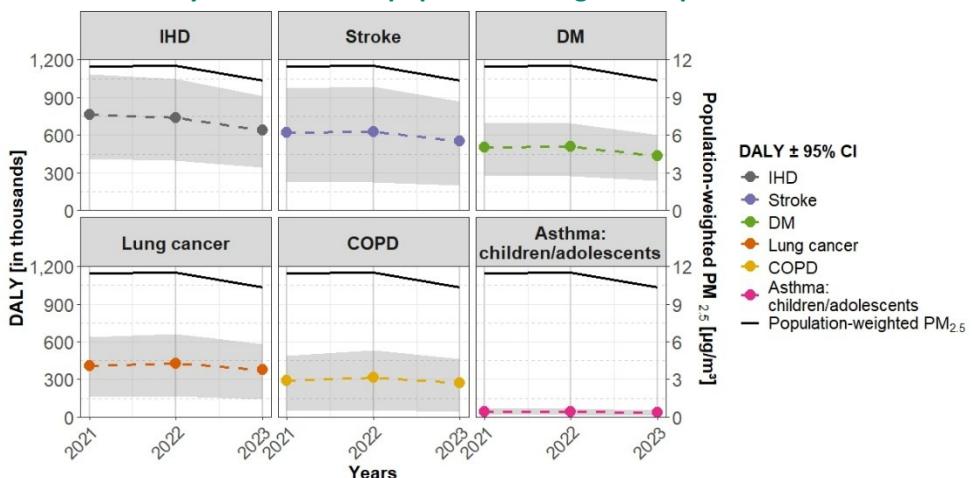
Notes: Asthma-C: asthma <19 years old, COPD: chronic obstructive pulmonary disease, DM: diabetes mellitus, IHD: ischemic heart disease, LC: lung cancer, ST: stroke

Map 2.4 Burden of disease rate due to dementia morbidity (YLD per 100,000 inhabitants at risk) attributable to PM_{2.5} in 2023



The assessment of cause-specific burden of disease has been conducted since 2021. Although the observation period from 2021 to 2023 is relatively short, a slight decrease in the disease burden attributable to PM_{2.5} was observed across the considered health outcomes. It can be assumed that this reduction is linked to the decline in population-weighted exposure to PM_{2.5} in Europe from 11.4 to 10.3 µg/m³ during the same period (Figure 2.5).

Figure 2.5 Changes in the burden of disease (DALY) attributable to PM_{2.5} (all 40 countries) differentiated by outcomes and population-weighted exposure from 2021 to 2023



Notes: CI: confidence interval, marked by the grey area; DALY: disability-adjusted life years; IHD: ischemic heart disease; DM: diabetes mellitus; COPD: chronic obstructive pulmonary disease

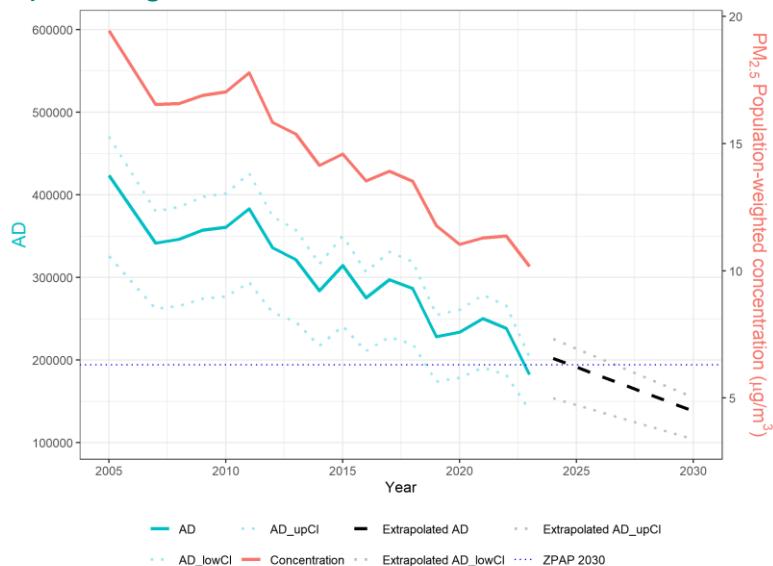
2.1.3 Zero pollution action plan 2030 objective

Within the framework of the European Green Deal, the ZPAP sets a 2030 objective to improve air quality, with a particular emphasis on reducing PM_{2.5} concentrations, aiming to lower premature mortality attributable to air pollution in the EU27 by at least 55% compared to 2005 levels. The number of preventable deaths was estimated, using the same methodology as described above for 2023, based on air quality maps produced by the ETC for the period from 2005 to 2023. The population-weighted mean concentration and the burden indicator (AD) development since 2005 are depicted in Figure 2.6.

The estimations show a decreasing trend of both concentrations and AD attributable to PM_{2.5} exposure above the WHO guideline level of 5 µg/m³, with the levels of AD for 2023 reaching the proposed ZPAP target, i.e., 194,000 (the 2023 mean AD estimated for the EU27 are 182,400). However, when considering

the upper 95% CI, the AD is 203,520. Nevertheless, even if the upper 95% CI is considered, the extrapolation of the AD confirms that the goal is likely to be surpassed by 2030 if EU policies on air, climate, and energy are properly implemented and maintained.

Figure 2.6 Deaths attributed (AD) to PM_{2.5} long-term exposure, including the lower (AD_lowCI) and upper (AD_upCI) 95% CI and the PM_{2.5} population-weighted concentration from 2005 to 2023. AD is linearly projected from 2023 to be compared against the Zero Pollution Action Plan (ZPAP) 2030 target



2.2 NO₂

2.2.1 Population-weighted annual mean concentration

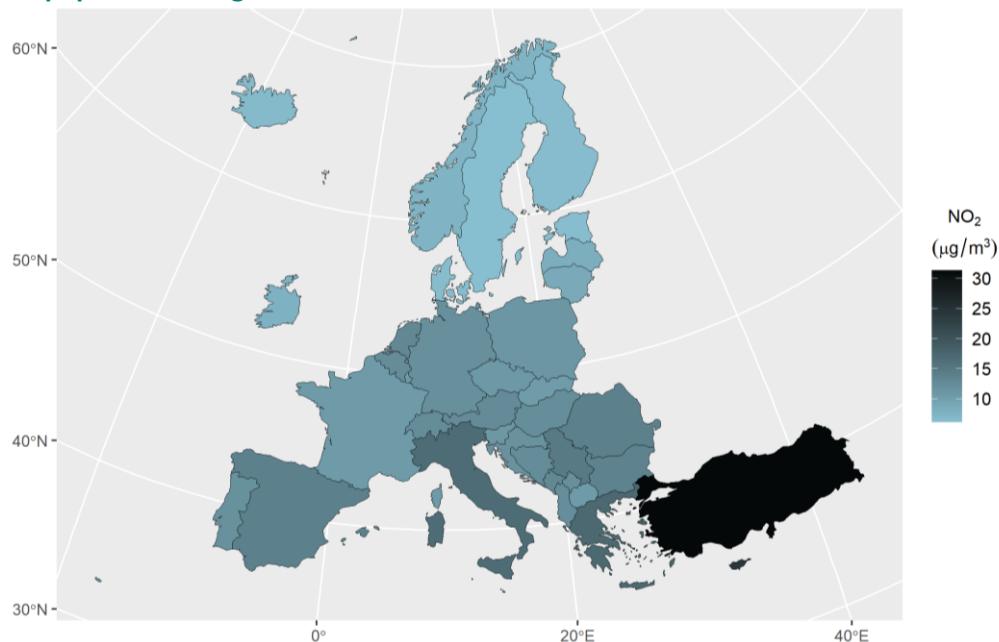
The main sources of NO₂ in Europe are road transport and combustion processes in industry and energy production. Road traffic, particularly in urban areas, is a major contributor to people's exposure because NO₂ is emitted close to the ground where people live. Enforced by the same EU obligations as PM_{2.5}, NO₂ emissions in the EU have decreased even further. For the EU27, the overall decrease in emissions since 2005 is 53%, with a range of 30% to 82% for individual countries. Since NO₂ is mostly emitted by traffic, the Euro standards introduced for vehicles had the largest impact on reducing NO₂ emissions.

Although Northern European countries were typically exposed to lower levels, there was no clear divide between Eastern and Western European countries, as in PM_{2.5}. The variation in concentration levels reflects the traffic density, the composition of the fleet, and the age of the vehicles. It is estimated that in 2023, a European citizen was exposed on average to a NO₂ concentration of 15.3 µg/m³ (12.5 µg/m³ for an average EU27 citizen), with a minimum at the country level of 6.1 µg/m³ in Sweden and a maximum of 31.3 µg/m³ in Türkiye (24.3 µg/m³ in Cyprus for the EU27). For more detailed information on the population-weighted mean concentration maps and the observation data supporting these maps, please refer to Horálek et al. (2025) and Targa et al. (2025).

Map 2.5 shows the population-weighted mean concentration at the country level in 2023. This concentration is equivalent to the average exposure level of the population of an individual country. The population-weighted mean concentration for each individual country can be found in Annex 3 Table A3.1. The distribution of NO₂ exposure levels differed significantly from that of PM_{2.5}. Although Northern European countries were typically exposed to lower levels, there was no clear divide between Eastern and Western European countries, as in PM_{2.5}. The variation in concentration levels reflects the traffic density, the composition of the fleet, and the age of the vehicles. It is estimated that in 2023, a European citizen

was exposed on average to a NO₂ concentration of 15.3 µg/m³ (12.5 µg/m³ for an average EU27 citizen), with a minimum at the country level of 6.1 µg/m³ in Sweden and a maximum of 31.3 µg/m³ in Türkiye (24.3 µg/m³ in Cyprus for the EU27). For more detailed information on the population-weighted mean concentration maps and the observation data supporting these maps, please refer to Horálek et al. (2025) and Targa et al. (2025).

Map 2.5 NO₂ population-weighted annual mean concentration in 2023



2.2.2 Burden of disease

This section presents the findings regarding all-cause and cause-specific EBD attributed to long-term exposure to NO₂, encompassing five health outcomes: all-cause, asthma in adults and asthma in children and adolescents, COPD, DM, and stroke. The assessment covers 41 European countries and is based on the CRFs listed in Table 1.1 and the counterfactual concentration of 10 µg/m³ (WHO, 2021), except for the sensitivity analysis that assumes 0 and 20 µg/m³.

All-cause mortality

The estimation of deaths due to all-cause mortality attributable to NO₂ in 2023 indicated 56,061 (95% CI: 28,402-109,256) deaths for all countries considered and 34,180 (95% CI: 17,264-67,004) for the EU27. The YLL estimates were 641,068 (95% CI: 324,973-1,247,971) and 351,191 (95% CI: 177,376-688,504), respectively. The results for the all-cause mortality estimation for EU27, EEA32 and all 41 countries considered are presented in Table 2.4. The table includes the population at risk considered, the exposure level, the mean value and the lower and upper 95% CI values for the EBD indicators (AD and YLL).

AD rates per 100,000 inhabitants at risk attributable to NO₂ across the 41 countries are shown in Map 2.6 and are closely correlated with the exposure levels depicted in Map 2.5. Although Northern European countries were typically exposed to lower levels, there was no clear divide between Eastern and Western European countries, as in PM2.5. The variation in concentration levels reflects the traffic density, the composition of the fleet, and the age of the vehicles. It is estimated that in 2023, a European citizen was exposed on average to a NO₂ concentration of 15.3 µg/m³ (12.5 µg/m³ for an average EU27 citizen), with a minimum at the country level of 6.1 µg/m³ in Sweden and a maximum of 31.3 µg/m³ in Türkiye (24.3 µg/m³ in Cyprus for the EU27). For more detailed information on the population-weighted mean concentration maps and the observation data supporting these maps, please refer to Horálek et al. (2025) and Targa et al. (2025).

Table 2.4 Burden of disease due to all-cause mortality (AD, YLL, including the lower and upper 95% CI) attributable to NO₂ long-term exposure in the EU27, the EEA32 and 41 European countries in 2023

Area	Population ≥ 30 years old (in 1,000)	AD			YLL			
		Exposure (µg/m ³)	Mean	Lower 95% CI	Upper 95% CI	Mean	Lower 95% CI	Upper 95% CI
EU27	305,665	12.5	34,180	17,264	67,004	351,191	177,376	688,504
EEA32	362,541	15.4	54,055	27,390	105,316	620,358	314,522	1,207,295
All countries	374,328	15.3	56,061	28,402	109,256	641,068	324,973	1,247,971

Note: The counterfactual concentration was 10 µg/m³

AD and YLL estimations and the corresponding rates per 100,000 inhabitants at risk for individual countries are available in Annex 4 Tables A4.29 and A4.30, respectively. The exposure levels and the population at risk for each country are presented in Annex 3 Table A3.1 and Table A3.2, respectively.

The highest AD rate was estimated for Türkiye (41.2, 95% CI: 21.0-79.5), followed by Cyprus (28.5, 95% CI: 14.4-55.4), Greece (27.0, 95% CI: 13.7-52.5), Serbia (22.4, 95% CI: 11.3-44.0), and Italy (21.2, 95% CI: 10.7-41.4), all of which have an AD-rate over 20.0. The lowest rates were estimated for Iceland, Sweden, Finland, Estonia and Denmark, with AD-rates lower than 1.0, and then Norway, Ireland, Luxembourg, Malta, Lithuania, Slovakia, Liechtenstein and San Marino with an AD-rate lower than 5.0 deaths per 100,000 inhabitants at risk. Like PM_{2.5}, spatial differences in YLL closely mirrored those shown for AD (Map 2.6), with only minor shifts when countries were ordered based on the indicators and the rankings compared. These shifts reflect differences in national life expectancy and mortality rates.

Like PM_{2.5}, the sensitivity analysis for the all-cause mortality burden indicates that changing the counterfactual concentration had a strong impact on results. The sensitivity analysis for all-cause mortality attributable to NO₂ for EU27, EEA32 and all 41 countries is presented in Table 2.5 and is to be compared with Table 2.4.

The results varied when assessing individual countries. Increasing the counterfactual concentration from 10 to 20 µg/m³ led to a more pronounced decrease in AD for countries with population-weighted concentrations closer to or below the counterfactual concentration. The share of countries with 0 or very low numbers of attributable deaths was much higher than that for PM_{2.5}. When all concentration levels were considered in the estimations, there was an increase for all countries, with the relative increase still being higher for countries whose populations were exposed to low levels of NO₂.

Map 2.6 Burden of disease rate due to all-cause mortality (AD per 100,000 inhabitants at risk) attributable to NO₂ in 2023

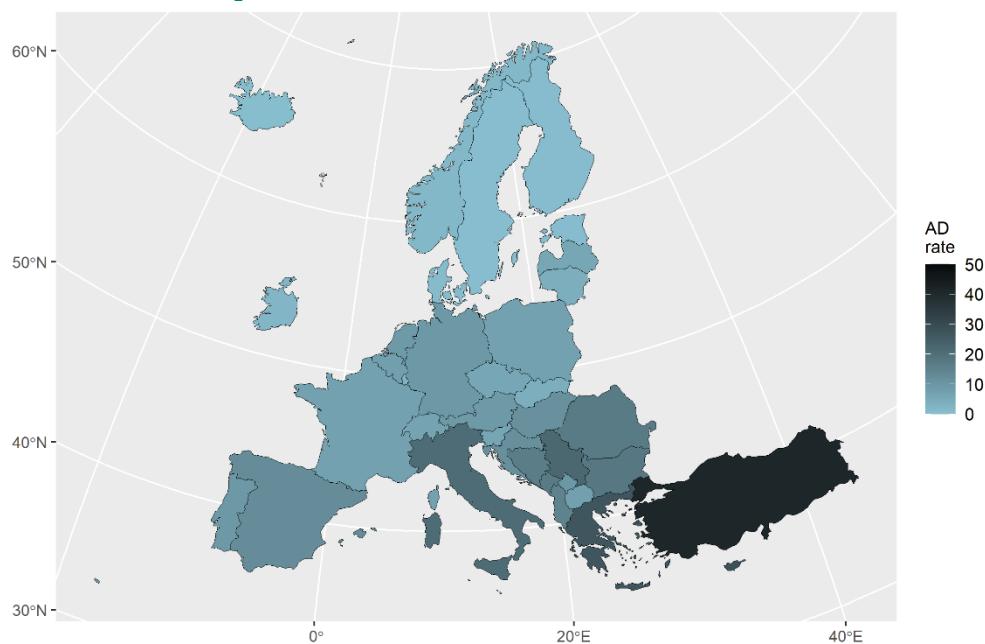
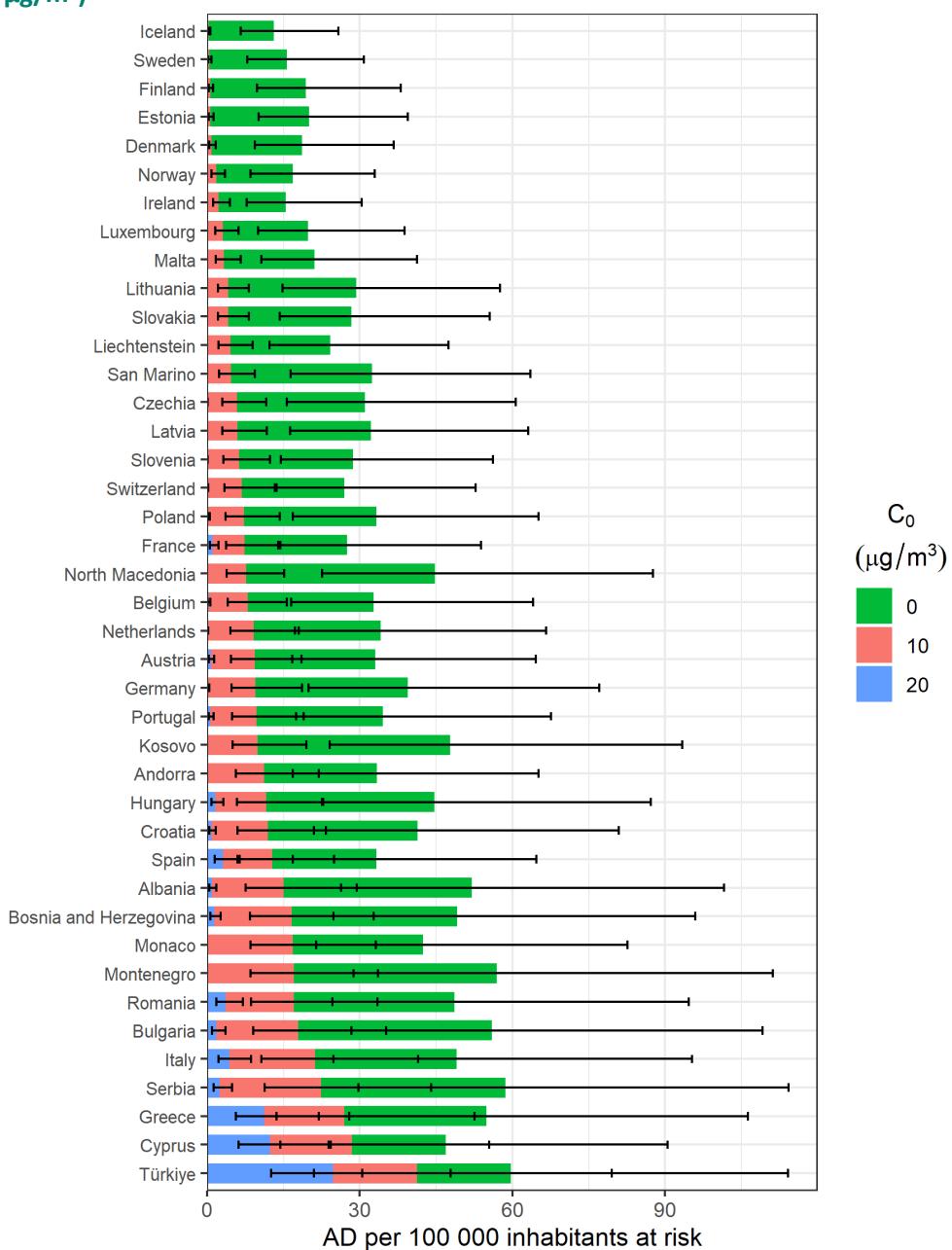


Table 2.5 Burden of disease due to all-cause mortality (AD, YLL, including the lower and upper 95% CI) attributable to NO₂ long-term exposure in the EU27, the EEA32 and all 41 European countries in 2023, using the counterfactual concentration (C₀) of 0 and 20 µg/m³

Area	C ₀ (µg/m ³)	Mean	Lower 95% CI	Upper 95% CI	Mean	Lower 95% CI	Upper 95% CI
Total AD				AD rate per 100,000 at risk			
EU27	0	111,806	56,613	218,115	36.6	18.5	71.4
EU27	20	5,340	2,695	10,485	1.7	0.9	3.4
EEA32	0	142,122	72,106	276,202	39.2	19.9	76.2
EEA32	20	16,956	8,595	33,011	4.7	2.4	9.1
All countries	0	148,351	75,260	288,357	39.6	20.1	77.0
All countries	20	17,122	8,678	33,337	4.6	2.3	8.9
Total YLL				YLL rate per 100,000 at risk			
EU27	0	1,161,121	587,901	2,265,365	379.9	192.3	741.1
EU27	20	54,018	27,260	106,074	17.7	8.9	34.7
EEA32	0	1,566,205	794,974	3,041,215	432.0	219.3	838.9
EEA32	20	212,308	107,661	413,015	58.6	29.7	113.9
All countries	0	1,630,440	827,496	3,166,552	435.6	221.1	845.9
All countries	20	214,012	108,519	416,374	57.2	29.0	111.2

Figure 2.7 Attributable deaths (AD) per 100,000 inhabitants at risk due to long-term exposure to NO₂ (including the lower and upper 95% CI shown as error bars) considering the counterfactual concentration defined for the baseline ($C_0 = 10 \mu\text{g}/\text{m}^3$) and sensitivity scenarios ($C_0 = 0$ or $20 \mu\text{g}/\text{m}^3$)



Cause-specific mortality and morbidity

This section outlines the EBD findings for five individual diseases attributable to NO₂ in 2023. In addition to the previously considered outcomes — adult asthma, DM, and stroke — two outcomes are included for the first time: asthma in children and adolescents (under 19 years) and COPD (25 years and older). The age group for adult asthma was changed to individuals aged 19 years and older. The evidence for a causal relationship with NO₂ is at least moderate for asthma (morbidity) and high for COPD (mortality) (Forastiere et al., 2024; U.S. EPA, 2016). Detailed results (AD, YLL, YLD, DALY and the corresponding rates per 100,000 individuals at risk), disaggregated by disease, are provided for each country and the EU27, EEA32, and all countries assessed in Annex 4 Tables A4.31 to A4.51.

Across all 41 countries, the total cause-specific EBD for the selected outcomes was estimated at 757,432 DALY (95% CI: 325,711-1,156,606), with approximately half this burden observed within the EU27 (376,464

DALY, 95% CI: 156,857-588,758) (Table 2.6 and Annex 4 Table A4.31 for the results of individual countries). A major contributor to this difference was Türkiye, which exhibited the highest overall relative impact (DALY per 100,000 inhabitants aged 25 years and older), accounting for 47% of the total DALY estimated (Table A4.31).

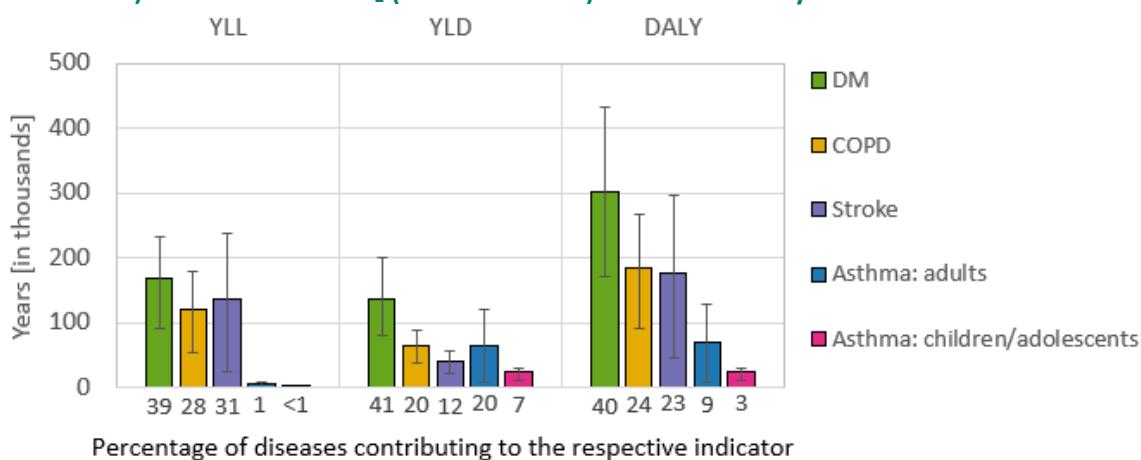
Table 2.6 Total cause-specific burden of disease (total AD, YLL, YLD, DALY, including the lower and upper 95% CI) attributable to NO₂ long-term exposure in the EU27, the EEA32 and all 41 European countries in 2023 for five outcomes

Countries	Mean	Lower 95% CI	Upper 95% CI	Mean	Lower 95% CI	Upper 95% CI
Total AD				Total YLL		
EU27	24,888	9,286	39,421	233,344	88,298	368,531
EEA32	40,836	15,856	63,080	415,402	163,920	637,926
All	42,281	16,376	65,401	429,134	168,917	659,919
Total YLD				Total DALY		
EU27	143,120	68,559	220,227	376,464	156,857	588,758
EEA32	322,782	154,050	488,230	738,184	317,971	1,126,156
All	328,298	156,795	496,688	757,432	325,711	1,156,606

Note: The counterfactual concentration was 10 µg/m³

Figure 2.8 presents the results for all 41 countries, showing the cause-specific YLL, YLD, and DALY for each health outcome. The percentages indicate the relative contribution of each outcome to the respective burden indicator. In 2023, the largest NO₂-attributable burden was estimated for DM, with 302,900 DALY (95% CI: 171,862-433,170). In contrast, asthma accounted for the lowest estimates, both in adults (70,876 DALY, 95% CI: 8,087-129,352) and in children and adolescents (23,356 DALY, 95% CI: 10,189-30,977). The higher values among adults are partly explained by the broader age group considered (19 years and older), encompassing a larger segment of the population than the population aged <19 years used to represent children and adolescents.

Figure 2.8 Burden of disease (YLL, YLD, DALY, including the lower and upper 95% CI shown as error bars) attributable to NO₂ (all 41 countries) differentiated by outcomes



Notes: COPD: chronic obstructive pulmonary disease; DM: diabetes mellitus (type 1 and type 2); YLD: years lived with disability; YLL: years of life lost

As with PM_{2.5}, mortality was the predominant driver of the attributable burden for all 41 countries for all outcomes except asthma (stroke: 77%, COPD: 65%, DM: 55%, asthma in adults: 7%, asthma in children and adolescents: 1%). Notably, and as a difference to the trends observed for PM_{2.5}, DM contributed more YLL than stroke, even though the baseline mortality rate for stroke was on average more than 2.5 times higher across Europe. This pattern — a lower baseline mortality combined with a higher RR for DM compared

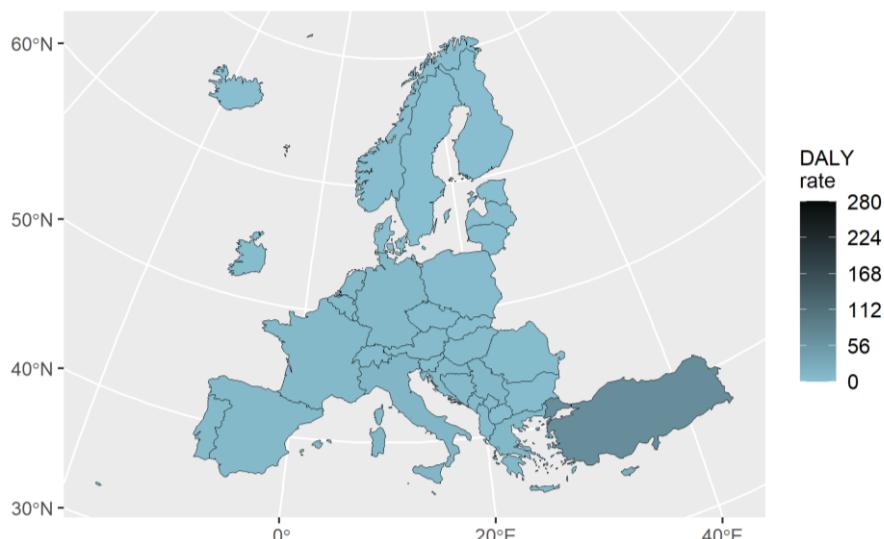
with stroke — is also observed for PM_{2.5} but is even more pronounced for NO₂: the mortality-related RR for DM was 1.24 per 10 µg/m³ NO₂ and thus substantially higher than for stroke (1.07) with the resulting increases of the effect measure per 10 µg/m³, 24% and 7%, presenting a ratio of about 3.4. This more than offsets the higher baseline mortality for stroke and resulted in relatively larger DALY estimates for DM attributable to NO₂. Thus, it is important to be transparent when it comes to the use of input parameters in the estimation. Different combinations of parameters might lead to unexpected results, which need to be interpreted carefully.

Figure 2.9 shows the burden of disease rate attributable to NO₂ at country level. The highest disease burden rates (DALY per 100,000 inhabitants at risk) were generally observed in countries with the highest population-weighted exposure levels, including Türkiye, Cyprus, Greece, Monaco and Italy. High DALY rates for stroke were noted not only in Türkiye but also in Bulgaria and Romania.

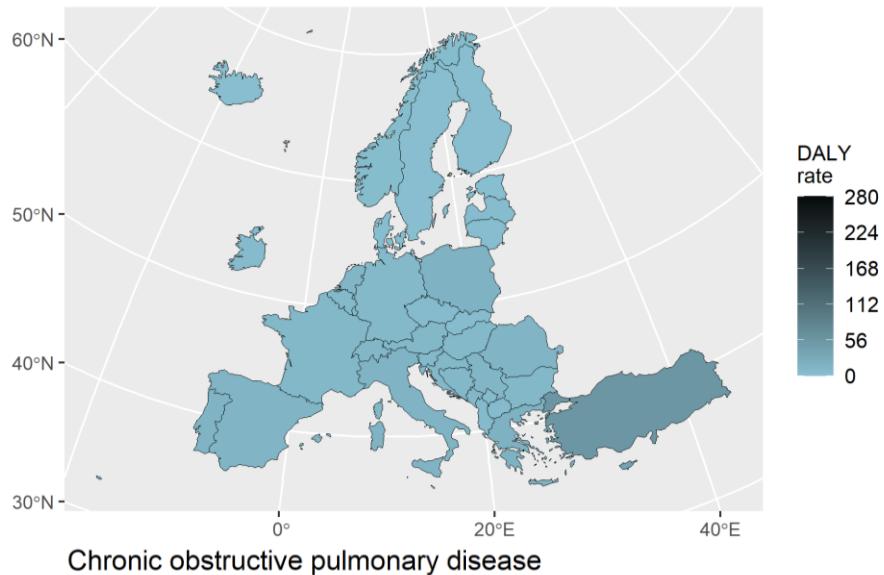
Map 2.7 combines the information in the maps shown in Figure 2.9, by presenting the cause-specific outcome that has the highest contribution to the total burden of disease for individual countries in 2023. The mapping is based on the DALY for individual outcomes in each country. The map indicates that DM was the major cause of the highest disease burden across most countries. Similar to PM_{2.5}, Denmark, Luxembourg, Liechtenstein and Norway had COPD as the most dominant outcome, along with Belgium, Iceland, Ireland, and the Netherlands. Bulgaria, Latvia, Lithuania, Romania and Slovakia had stroke as the leading outcome. The burden of disease caused by asthma, in both children/adolescents and adults, was not the leading cause in any country. However, in some countries, the gap between the outcome with the highest contribution and the next highest was not necessarily that significant, but it tended to be more significant than in PM_{2.5}. Figure 2.10 shows the percentage contribution of cause-specific outcomes to the total burden of disease (DALY) for the individual countries. Some of the outcomes had relatively high contributions, ranging from 40 to 60 %.

Figure 2.9 Burden of disease rate (DALY per 100,000 inhabitants at risk) attributable to NO₂ differentiated by outcomes in 2023

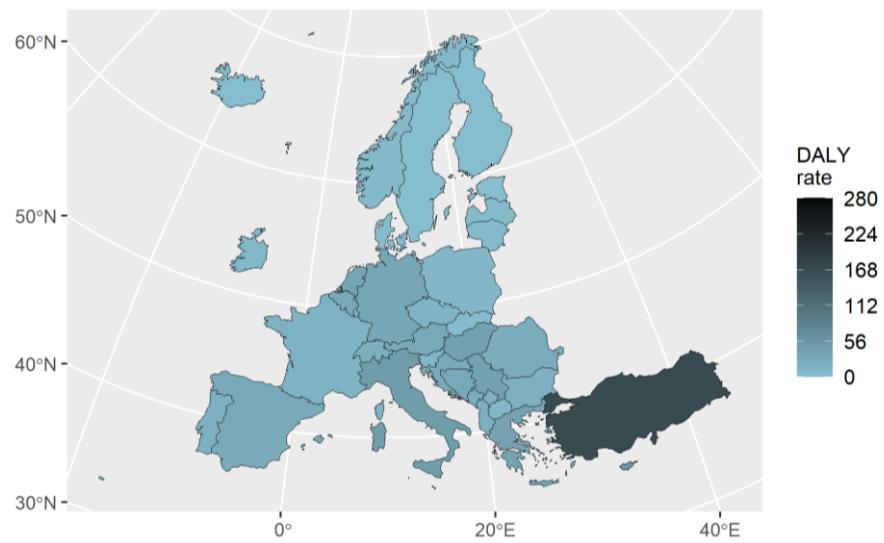
Asthma - adults



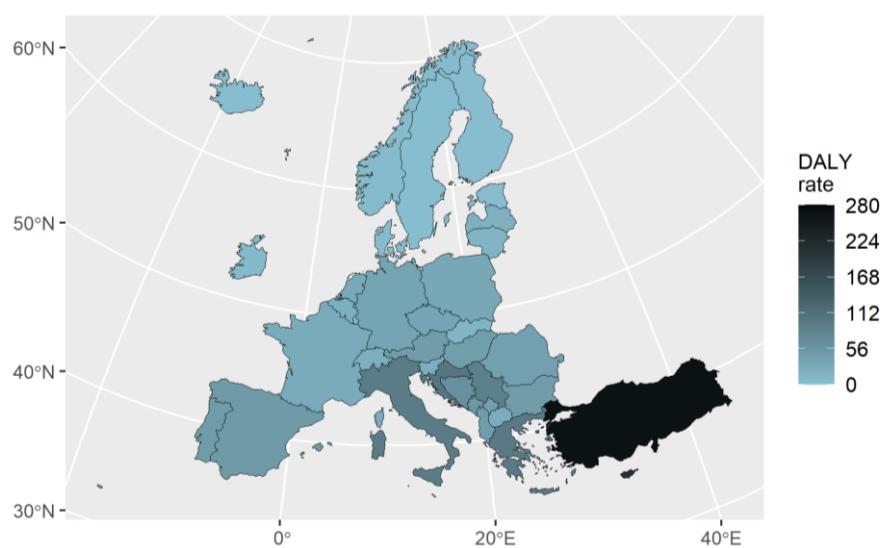
Asthma - children and adolescents

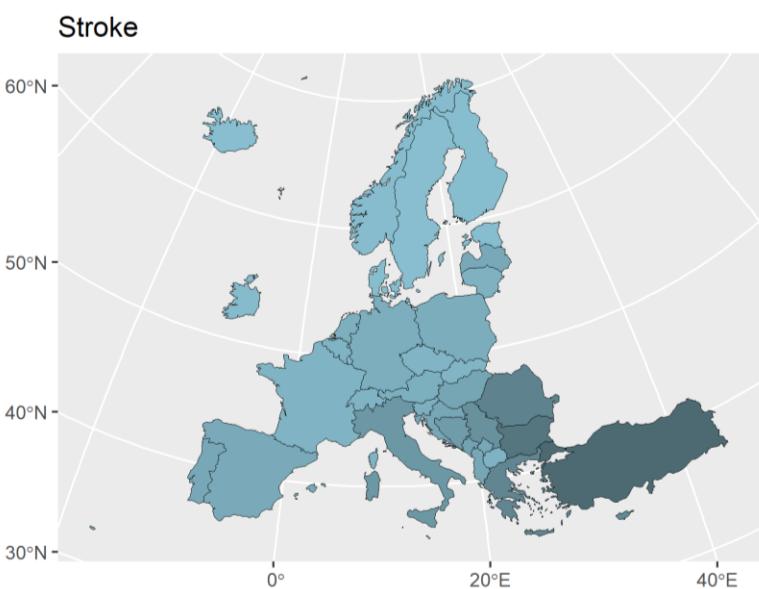


Chronic obstructive pulmonary disease

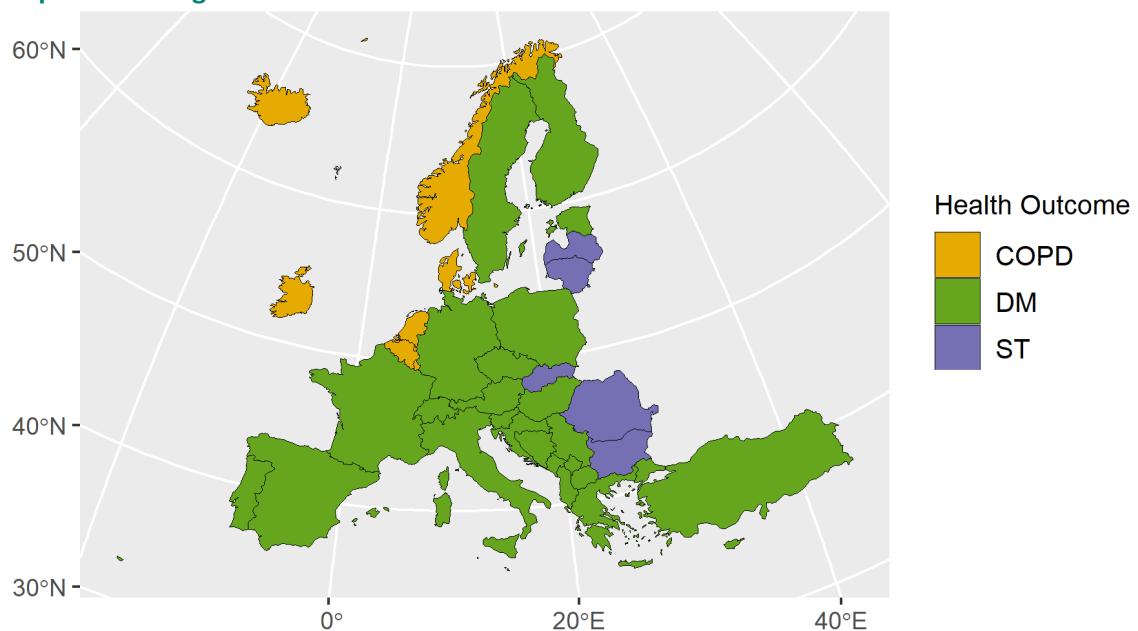


Diabetes Mellitus



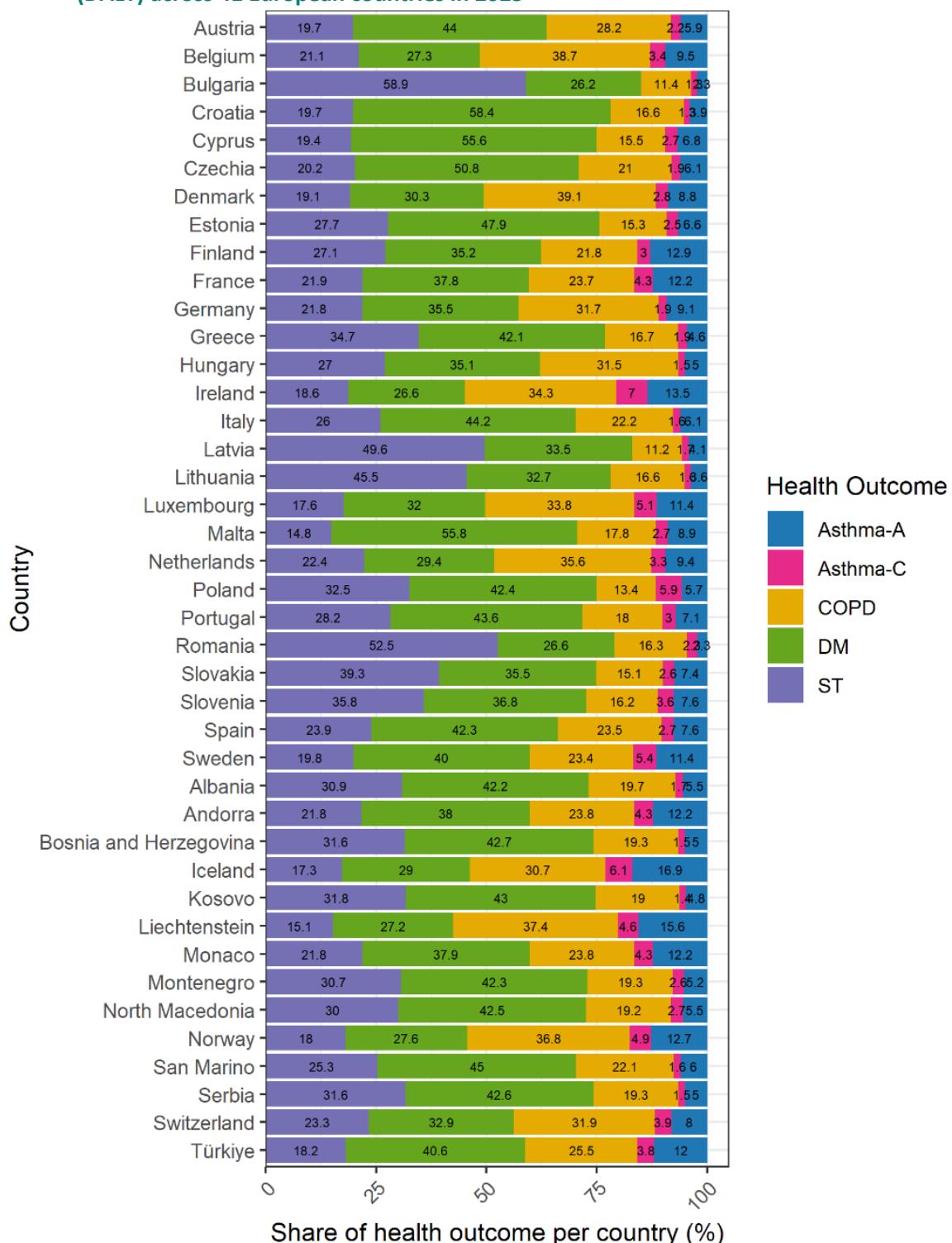


Map 2.7 Leading health outcome for NO₂ attributable burden based on the DALY for 2023



Notes: Chronic obstructive pulmonary disease (COPD), diabetes mellitus (DM), stroke (ST)

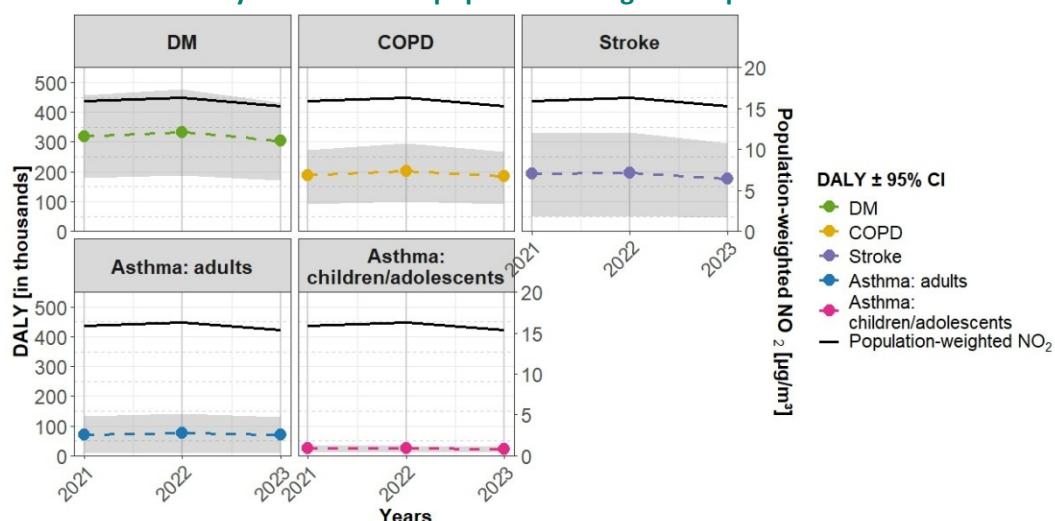
Figure 2.10 Contribution of cause-specific outcomes to the total NO₂ attributable burden of disease (DALY) across 41 European countries in 2023



Notes: Asthma-A: asthma in adults, Asthma-C: asthma in children and adolescents, COPD: chronic obstructive pulmonary disease, DM: diabetes mellitus, ST: stroke

As with PM_{2.5}, a decrease in the burden of disease (DALY) attributable to NO₂ was observed for the considered health outcomes, even though the observation period from 2021 to 2023 remained relatively short. It can be assumed that this development was influenced by the slight reduction in population-weighted NO₂ exposure in Europe during the same period, from 15.9 to 15.3 µg/m³ (Figure 2.11).

Figure 2.11 Changes in the burden of disease (DALY) attributable to NO₂ (all 41 countries) differentiated by outcomes and population-weighted exposure from 2021 to 2023



Notes: CI: confidence interval, marked by the grey area; DM: diabetes mellitus; COPD: chronic obstructive pulmonary disease; DALY: disability-adjusted life years

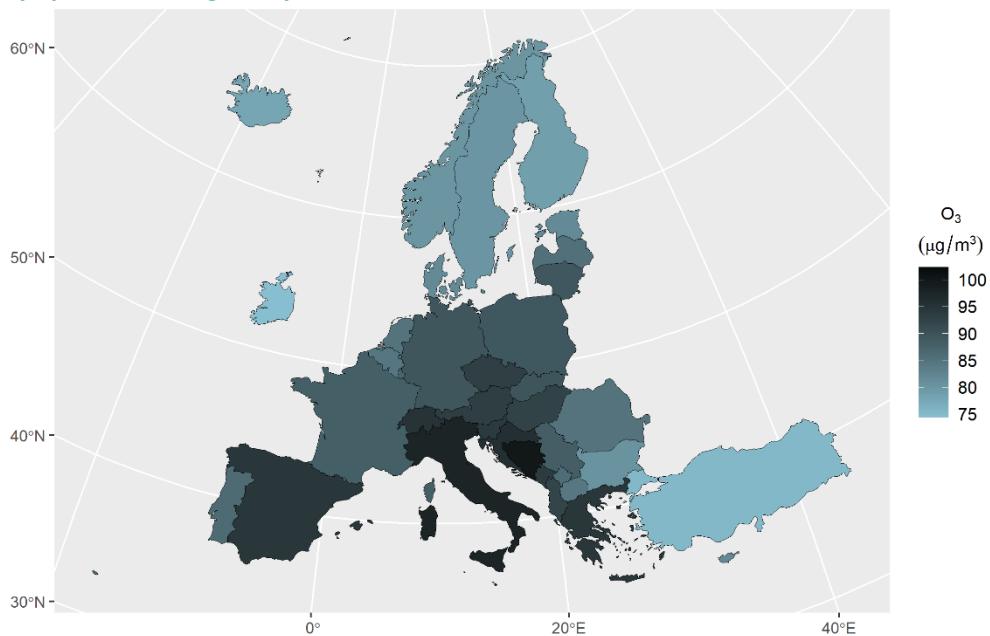
2.3 O₃

2.3.1 Population-weighted peak season concentration

O₃ is not emitted directly into the air, unlike the other pollutants in this study (NO₂ and PM_{2.5}). It is formed in the atmosphere when chemical reactions between nitrogen oxides (NOx) and volatile organic compounds, including methane, are enabled by heat and light. O₃ can also be transported from other parts of the Northern Hemisphere (long-range transport) and the upper atmosphere (intrusions). Therefore, meteorology plays a crucial role in influencing the interannual variations in O₃ concentrations, as shown in the population-weighted mean concentration maps and the observation data supporting these maps over the last five years, as presented in Horálek et al. (2025) and Targa et al. (2025), respectively.

Map 2.8 shows the population-weighted mean concentration at the country level in 2023. This concentration is equivalent to the average exposure level of the population of an individual country during the peak season. The peak season is the period during which the highest O₃ concentrations were observed for six consecutive months. The population-weighted mean concentration for each individual country can be found in Annex 3 Table A3.1. The distribution of O₃ levels correlated with higher temperatures, and, therefore, southern countries had higher levels of O₃ than the Northern European countries. It is estimated that in 2023, a European citizen was exposed on average to an O₃ peak season concentration of 87.8 µg/m³ (90.0 µg/m³ for an average EU27 citizen), with a minimum at the country level of 74.4 µg/m³ in Ireland and a maximum of 102.3 µg/m³ in Monaco (97.9 µg/m³ in Italy for EU27).

Map 2.8 O₃ population-weighted peak season concentration in 2023



2.3.2 Burden of disease

All-cause mortality

The estimation of deaths due to all-cause mortality attributable to O₃ in 2023 indicated 70,981 (95% CI: 0-139,096) deaths for all countries considered and 62,676 (95% CI: 0-122,805) for the EU27. The YLL estimates were 753,183 (95% CI: 0-1,476,142) and 654,707 (95% CI: 0-1,282,921), respectively. The lower bound of the disease burden was zero because the lower bound of the RR 95% CI, i.e., 1.0, corresponds to no attributable burden at the counterfactual concentrations. The results for the all-cause mortality EBD estimation for all aggregated areas considered are presented in Table 2.7. The table includes the population at risk considered, the exposure level, the mean value and the lower and upper 95% CI values for the EBD indicators (AD and YLL).

AD rates per 100,000 inhabitants at risk attributable to O₃ across the 41 countries are shown in Map 2.9 and correlated closely with the exposure levels depicted in Map 2.8. The lowest rate was estimated for Ireland (6.2, 95% CI: 0.0-12.2) and the highest rate was estimated for Bosnia and Herzegovina (34.2, 95% CI: 0.0-66.8). Besides Bosnia and Herzegovina, only Montenegro had an AD rate above 30.0 (31.2, 95% CI: 0.0-61.1). Other countries with rates lower than 10.0 AD were Türkiye (6.5, 95% CI: 0.0-12.7), Iceland (7.3, 95% CI: 0.0-14.3), Cyprus (8.6, 95% CI: 0.0-16.9) and Norway (9.8, 95% CI: 0.0-19.3). Besides Bosnia and Herzegovina, only Montenegro had an AD rate above 30.0 (31.2, 95% CI: 0.0-61.1).

Like PM_{2.5} and NO₂, the spatial differences in YLL closely mirrored those shown for AD (with only minor shifts when countries were ordered based on the indicators and the rankings compared). These shifts reflect differences in national life expectancy and mortality rates.

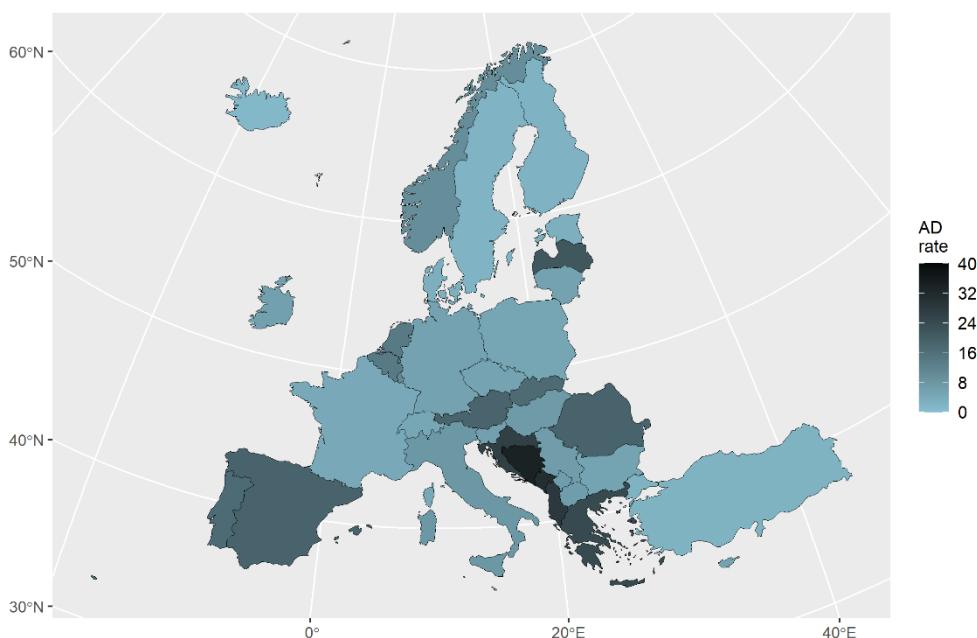
AD and YLL estimations and the corresponding rates per 100,000 inhabitants at risk for individual countries are available in Annex 4 Tables A4.52 and A4.53, respectively. The exposure levels and the population at risk for each country are presented in Annex 3 Table A3.1 and Table A3.2, respectively.

Table 2.7 Burden of disease due to all-cause mortality (AD, YLL, including the lower and upper 95% CI) attributable to O₃ long-term exposure (peak season) in the EU27, the EEA32 and 41 European countries in 2023

Territory	Population ≥ 25 years old (in 1,000)	Exposure (µg/m ³)	AD			YLL		
			Mean	Lower 95% CI	Upper 95% CI	Mean	Lower 95% CI	Upper 95% CI
EU27	330,548	90.0	62,676	0	122,805	654,707	0	1,282,921
EEA32	394,933	87.7	67,610	0	132,493	718,237	0	1,407,697
All countries	407,765	87.8	70,981	0	139,096	753,183	0	1,476,142

Note: The counterfactual concentration was 60 µg/m³

Map 2.9 Burden of disease rate due to all-cause mortality (AD per 100,000 inhabitants at risk) attributable to O₃ in 2023.



Cause-specific mortality

Long-term exposure to O₃ has been classified to be likely causally related to respiratory mortality (US EPA ISA, 2020), with supporting evidence for COPD mortality from epidemiological, experimental, and mechanistic studies (Breitner et al., 2021). At the same time, the strength of the epidemiological evidence remains limited, as recent meta-analyses report inconsistent findings across individual studies (Kasdagli et al., 2024).

The results for the EU27, EEA32 and all 41 countries are presented in Table 2.8. Detailed results (AD, YLL, and the corresponding rates per 100,000 inhabitants at risk) are provided for each country and country groupings in Annex 4 Tables A4.54–A4.55. As no YLD (morbidity) were calculated, DALY were not estimated.

In 2023, the number of COPD deaths attributable to O₃ exposure was estimated at 8,125 AD (95% CI: 7,760–8,669) across all 41 countries combined and 7,041 AD (95% CI: 6,724–7,511) within the EU27. The YLL estimates were 84,713 (95% CI: 80,894–90,385) and 73,245 (95% CI: 69,946–78,145), respectively. The lowest AD rate per 100,000 inhabitants aged 25 years or older was observed in Slovakia with <1.0 AD, and the highest in Hungary with 4.0 AD (95% CI: 3.9–4.1). Other countries with estimated AD rates <1.0 were

Bulgaria, Estonia, Latvia, Slovenia, Cyprus, Lithuania and Poland (Map 2.10). Less clearly than for all-cause mortality as well as for PM_{2.5} and NO₂ analyses, in many cases, the amount of burden of disease in countries did not coincide with those showing the lowest or highest population-weighted exposure levels. Combined with differences in baseline mortality across countries, this resulted in AD rates showing a very small variation between countries, making a thorough presentation of differences between countries, especially in maps, challenging.

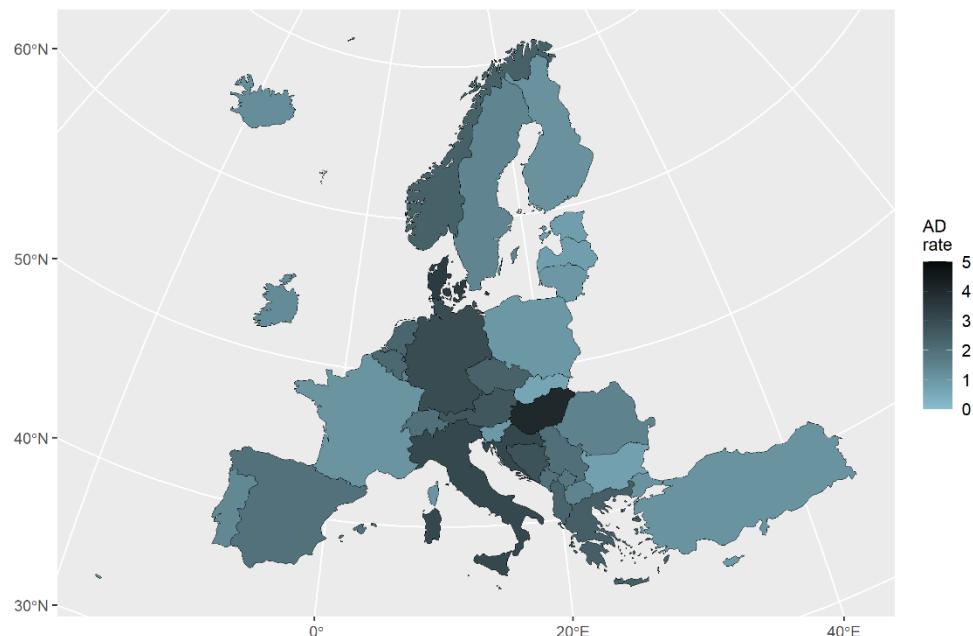
Table 2.8 Total burden of disease due to COPD mortality (total AD, YLL, including the lower and upper 95% CI) attributable to O₃ long-term exposure (peak season) in the EU27, the EEA32 and 41 European countries in 2023

Territory	Total AD			Total YLL		
	Mean	Lower 95%	Upper 95%	Mean	Lower 95%	Upper 95%
CI	CI	CI	CI	CI	CI	CI
EU27	7,041	6,724	7,511	73,245	69,946	78,145
EEA32	7,850	7,497	8,375	81,864	78,174	87,347
All countries	8,125	7,760	8,669	84,713	80,894	90,385

Note: The counterfactual concentration was 60 µg/m³

Comparable results on the temporal development of the disease burden attributable to peak O₃ are only available for 2022 and 2023. Across all countries, COPD mortality was about 5% (AD) and 1% (YLL) lower in 2023 compared with 2022. The slight decrease in peak O₃ exposure, from 90.3 to 87.8 µg/m³, was assumed to be a contributing factor.

Map 2.10 Burden of disease rate due to COPD mortality (AD per 100,000 inhabitants at risk) attributable to O₃ in 2023



3 Conclusions

The all-cause mortality analyses for all countries (40 for PM_{2.5} and 41 for NO₂ and O₃) in 2023 indicates that 206,465 (95% CI: 157,549-230,304) deaths were attributable to PM_{2.5}, 56,061 (95% CI: 28,402-109,256) to NO₂, and 70,981 (95% CI: 0-139,096) to O₃ in 2023. For the EU27, the same indicator was estimated, yielding 182,400 (95% CI: 139,102-203,520), 34,180 (95% CI: 17,264-67,004) and 62,676 (95% CI: 0-122,805) deaths for PM_{2.5}, NO₂, and O₃, respectively. The level of AD substantially varied across European countries, with the largest variation between the maximum and minimum values being for PM_{2.5} and the least varying being for O₃. PM_{2.5} exhibited a more pronounced northern and western European gradient, while O₃ displayed a north-south gradient. However, the estimates indicate that populations living in Northern European countries were generally at a lower risk than those in any other region in Europe due to a comparably low exposure to all three air pollutants. On a positive note, the estimation of deaths attributable to PM_{2.5}, considering 40 European countries, indicates that the ZPAP's 2030 objective, aiming to lower premature mortality attributable to air pollution in the EU27 by at least 55% compared to 2005 levels, has been achieved for 2023. The assessment indicates that the decreasing trend suggests this goal will be surpassed by 2030.

The cause-specific analysis, which integrates mortality and morbidity into the summary measure DALY, again highlighted PM_{2.5} as the pollutant with the greatest overall health impact, partly due to the inclusion of six diseases – several with high baseline prevalence or mortality – and a separate analysis dedicated to dementia. For all 40 countries, 2,300,989 DALY (95% CI: 973,460-3,479,297) attributable to PM_{2.5} were estimated and 2,074,951 DALY (95% CI: 874,342-3,148,806) for the EU27 (excluding dementia). NO₂, with five diseases considered, accounted for 757,432 DALY (95% CI: 325,711-1,156,606) across all 41 countries and 376,464 DALY (95% CI: 156,857-588,758) in the EU27. Peak season O₃ exposure, for which only one health outcome was included (COPD), resulted in 84,713 YLL (95% CI: 80,894-90,385) across all 41 countries and 73,245 YLL (95% CI: 69,946-78,145) within the EU27. IHD remained the dominant contributor to the PM_{2.5} burden, totalling 637,074 DALY (95% CI: 341,283-910,418) across the 40 countries and 579,409 DALY (95% CI: 309,930- 829,512) in the EU27. For NO₂, DM was the largest contributor (all 41 countries: 302,900 DALY (95% CI: 171,862-433,170); EU27: 148,302 DALY (95% CI: 81,534-216,549)). As observed for all-cause mortality, spatial variations in the cause-specific disease burden for PM_{2.5} and NO₂ largely reflected regional differences in exposure levels. Additionally, the leading health outcomes varied across countries, with IHD being the most common for PM_{2.5} and DM for NO₂. For O₃, the disease burden was less clearly aligned with exposure levels. Differences in baseline mortality across countries tended instead to even out the overall burden in the countries. Furthermore, for all three pollutants, decreases in population-weighted exposures were assumed to have contributed to reductions in disease burden. However, the relatively short time series of cause-specific EBD estimates currently limits the interpretability of these changes.

Several other methodological factors must also be considered. First, the epidemiological evidence underlying the risk-outcome pairs varied in strength across pollutants and health outcomes. While some associations, such as PM_{2.5} and COPD, are supported by a robust evidence base, others — such as PM_{2.5} and dementia, NO₂ and childhood asthma or O₃ and COPD — are associated with greater uncertainty due to fewer or less consistent studies. Consequently, the estimates reflect a mixture of well-established and less certain risk-outcome relationships, which should be considered when interpreting the results. Second, the analyses do not account for overlapping exposures to multiple pollutants; simple aggregation of the burden across pollutants would result in double-counting. Also, different exposure periods were applied: annual averages for PM_{2.5} and NO₂, and the six-month warm-season mean for O₃. Finally, differences in age group definitions for specific outcomes, such as asthma, also affect comparability across pollutants. All assumptions and the methodology used for the analyses are presented in Annex 1 and Annex 2 or previously published reports, resulting in transparent documentation of the EBD presented in this report.

One final caveat is the counterfactual concentration assumption. The sensitivity analysis assessing the impact of selecting different counterfactual concentrations on the estimates shows that using the WHO AQG 2021 levels as the threshold might exclude a significant fraction of the total health burden. Though there is only emerging evidence from epidemiological studies that levels below those thresholds are harmful to human health, that does not mean that there is no impact, particularly for vulnerable populations. Therefore, not considering the entire concentration range down to 0 $\mu\text{g}/\text{m}^3$ may result in an underestimation of the burden of disease associated with long-term exposure to PM_{2.5} and NO₂.

List of abbreviations

Abbreviation	Name	Reference
AD	Attributable death	
AQG	Air quality guidelines	
CAMS	Copernicus Atmosphere Monitoring Service	
CI	Confidence interval	
COPD	Chronic obstructive pulmonary disease	
CRF	Concentration-response function	
DALY	Disability-adjusted life years	
DM	Diabetes mellitus	
DW	Disability weight	
EBD	Environmental burden of disease	
EEA	European Environment Agency	www.eea.europa.eu
EHIS	European Health Interview Survey	
ELAPSE	Effects of low-level air pollution: a study in Europe	www.elapseproject.eu
EMAPEC	Estimating the Morbidity from Air Pollution and its Economic Costs	
ETC/ATNI	European Topic Centre on Air pollution, Transport, Noise and Industrial pollution	
ETC HE	European Topic Centre on Human Health and the Environment	
EU	European Union	www.european-union.europa.eu
GBD	Global burden of disease	
GHSL	Global Human Settlement Layer	
HR	Hazard ratio	
HRAPIE	Health risks of air pollution in Europe	https://iris.who.int/handle/10665/153692?show=full
IARC	International Agency for Research on Cancer	
ICD	International classification of diseases	
IHD	Ischemic heart disease	
LC	Lung cancer	
m³	Cubic meter	
N/A	Not Available	
NO ₂	Nitrogen dioxide	
O ₃	Ozone	
OR	Odds ratio	
PAF	Population attributable fraction	
PM _{2.5}	Fine particulate matter (diameter below 2.5 µm)	
ppb	Parts per billion	
RIMM	Regression-Interpolation-Merging Mapping	
RR	Relative risk	
T2DM	Type 2 diabetes mellitus	
WHO	World Health Organization	www.who.int
YLL	Year of life lost due to death	
YLD	Year lived with disability	
µg	Microgram	
µm	Micrometer	

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Annex 1 Methodology

In general terms, for European ambient air pollution levels, the relative risk (RR) in a population, whose exposure is estimated by an average concentration, can be described as a log-linear function that relates concentrations to mortality or morbidity (Ostro, 2004; WHO, 2013). The assessments in this report quantify the burden of disease attributable to three pollutants, PM_{2.5}, NO₂, and O₃, for all-natural cause mortality, and cause-specific mortality and morbidity health outcomes estimated based on the ambient air levels derived from gridded air quality maps. The burden is estimated for individual pollutants to avoid double-counting of the effects (WHO, 2013).

The log-linear function to express the relative risk for all (natural) causes or a specific outcome (o) at grid cell i , RR_{oi} , can be described as follows:

$$RR_{oi} = \exp [\beta (C_i - C_0)] \quad (\text{A1.1})$$

where C_i is the concentration at grid-cell i and C_0 is the counterfactual concentration, which can either be the background concentration (i.e., the level that would exist without any human-made pollution), a concentration below which no health effects are expected, or a hypothetical level; β is the relation between an effect measure and the change in concentration and is estimated as follows:

$$\beta = \frac{\ln (CRF_o)}{UC} \quad (\text{A1.2})$$

where CRF_o is the health outcome-dependent concentration-response function, and UC is the change in an effect measure to the change in the concentration of a specific air pollutant in the air.

According to WHO (2019a), the population attributable fraction (PAF) can be used as a metric to assess the contribution of a risk factor to a disease or a death. The PAF can be defined as the share of the total burden of disease in a population that is identified as being due to a certain risk factor, e.g. exposure to PM_{2.5}. This share may be zero if the risk factor (causative exposure) was eliminated or at least lower when the exposure is reduced to a less harmful level, i.e. the above-mentioned counterfactual concentration. Assuming that the population in grid cell i is exposed to a single concentration level over the assessed period, the PAF can be calculated based on the relative risk as follows:

$$PAF_{oi} = \frac{RR_{oi}-1}{RR_{oi}} \quad (\text{A1.3})$$

Generally, a burden of disease indicator (BoD) attributable to selected air pollutants is estimated by:

$$BoD = PAF \cdot R_o \cdot Pop \quad (\text{A1.4})$$

Where R_o is the baseline prevalence or mortality rate of the health effect expected for the population at risk (Pop). The assessments presented in this report are based on the estimation of four health indicators: number of attributable deaths (AD), years of life lost (YLL), years of life lived with disability (YLD), and disability-adjusted life years (DALY). After the estimation is performed at the grid level, the final pollutant-specific burden is estimated by aggregating the corresponding grids at the country level or any other area level.

The health indicators are estimated following adaptations of Equation A1.4 and described below.

Number of attributable deaths (AD)

This indicator quantifies deaths which are statistically attributable to exposure to a risk factor. The AD for all (natural) causes or a specific outcome (o) in a grid cell (i) were estimated by the following relation:

$$AD_{oi} = PAF_o \sum_{a,s} CDR_{a,s,o} * Pop_{a,s,o,i} \quad (\text{A1.5})$$

where $CDR_{a,s,o}$ is the crude death rate that describes the mortality rate by sex (s) and age (a) in a particular population due to all (natural) causes or a specific cause; $Pop_{a,s,i}$ is the population fraction at risk, stratified by age and sex, in grid-cell i .

The multiplication of $CDR_{a,s,o}$ and $Pop_{a,s,o,i}$ estimates the number of deaths and is multiplied by the corresponding PAF_o to calculate the share attributable to the risk factor.

Years of life lost (YLL)

This indicator quantifies the years lost due to death before reaching a specified life expectancy. YLL for all natural causes or a specific outcome (o) in a grid cell (i) were determined by the following relation:

$$YLL_{oi} = PAF_o \sum_{a,s} CDR_{a,s,o} * Pop_{a,s,i} * LE_{a,s} \quad (\text{A1.6})$$

where $LE_{a,s}$ is the average time a person is expected to live at the age of death, stratified by sex (s) and age (a). The multiplication of $\sum_{a,s} CDR_{a,s,o} * Pop_{a,s,i} * LE_{a,s}$ estimates the number of baseline YLL and is then multiplied by the corresponding PAF_o to calculate the attributable burden to the risk factor.

Years lived with disability (YLD)

This indicator quantifies years of life lost due to living in a state of reduced overall health. YLD for a specific outcome (o) in a grid cell (i) were estimated as follows:

$$YLD_{oi} = PAF_o \sum_{a,s} P_{a,s,o} DW_o * Pop_{a,s,i} \quad (\text{A1.7})$$

where $P_{a,s,o}$ is the sex and age group-specific prevalence of a disease for a specific outcome, and DW_o is the outcome-specific disability weight.

The DW_o represents the severity of a health outcome on a scale ranging from zero to one.

The multiplication of $\sum_{a,s} P_{a,s,o} DW_o * Pop_{a,s,i}$ estimates the number of baseline YLD and is then multiplied by the corresponding PAF_o to calculate the burden attributable to the risk factor.

Disability-adjusted life years (DALY)

This indicator quantifies losses of healthy life years resulting from a disease or attributable to a certain risk factor. The DALY combines the cause-specific population-based mortality (YLL) and morbidity (YLD) effects and is a widely used summary measure of population health. It is used to compare the population's health impacts of diseases, injuries, and risk factors, and it is the sum of YLL and YLD.

To provide a final estimate of the attributable burden, outcome-specific attributable YLD and YLL were summed up to estimate the outcome-specific (o) attributable DALY in a grid cell (i):

$$DALY_{oi} = YLL_{oi} + YLD_{oi} \quad (\text{A1.8})$$

After the estimation is performed at the grid level, the final pollutant-specific burden is estimated by aggregating all the corresponding grids at the country level or any other area level.

Annex 2 Input data and preparatory steps

Ambient air concentrations

Concentration maps were produced with annual statistics of the relevant pollutant metrics for 2023: annual mean for PM_{2.5} and NO₂, and peak season for O₃. The peak season is the average of the daily maximum 8-hour mean concentration in the six consecutive months with the highest six-month running-average O₃ concentration. Thus, the period defining the peak season may vary across stations. The maps were produced at a 1x1 km² grid resolution, covering most of Europe, except Belarus, Moldova, Ukraine, the European parts of Russia and Kazakhstan, and the overseas territories such as Madeira, Azores, Canary Islands, French Guiana, Guadeloupe, Martinique, Mayotte, and Réunion. The ETC HE Report 2025/5 (Horálek et al., 2025) includes an analysis of the maps for 2023, including the associated uncertainties.

The maps are a product of data fusion using the 'Regression – Interpolation – Merging Mapping' (RIMM) method, which performs a linear regression model followed by kriging of its residuals. The mapping method combines monitoring data from rural and urban background stations for PM_{2.5}, O₃, and NO₂ with results from chemical transport models and other supplementary data, such as altitude, meteorology, and population density. Urban traffic station data were also included for NO₂ and PM_{2.5} to account for hotspots, since traffic is the most important source of NO₂ and an important source of PM. Lastly, the rural and urban background map layers are merged into the final map and used as input data for the EBD assessment. Note that all the data supporting the RIMM refers to 2023. For more details on the methodology, the reader is referred to Horálek et al. (2025). Note that although monitoring data from Türkiye is reported, PM_{2.5} data are excluded from the PM_{2.5} mapping due to insufficient background stations measuring PM_{2.5} to produce it.

All the data supporting the RIMM refers to 2023. For more details on the methodology, the reader is referred to Horálek et al. (2025).

Population at risk

Gridded population data are used to estimate the EBD, as health outcomes result from the combination of concentration levels and population density. The data allow the estimation of the population at risk at grid-cell level and the population-weighted mean concentration at country level and at the aggregate areas (e.g., EU27).

The previous assessments have been based on population density maps from GEOSTAT 2011 (Eurostat, 2014), which are representative of 2011. The data were then scaled to the assessment year using Eurostat population national totals (Eurostat, 2025b).

The assessment in this report has been based on the GHSL project population data. In this way the population density data is as representative of the assessment year as possible. The GHSL data are produced by the Global Human Settlement Layer (GHSL) project, and supported by the European Commission, Joint Research Centre and Directorate-General for Regional and Urban Policy (Pesaresi et al., 2024). The GHSL data represent population counts at 100 m resolution for the period between 2000 and 2021 and are available in Carioli et al. (2023). For years after 2021, population figures were estimated by scaling the 2021 GHSL data with Eurostat national totals (Eurostat, 2025b). When the total population was missing for a specific country, data from neighbouring countries with similar socio-economic characteristics were used (see Table A1.1). Note that the GHSL data were re-projected by the EEA from EPSG:4326 to EPSG:3035 using the Nearest Neighbour resampling method to match the concentration maps' projection.

Table A1.1 Countries lacking total population data and the selected gap-filling proxies

Data set	Country (iso2 code)	Data used for gap-filling	Year of data used for gap-filling	Country of data used for gap-filling
Total population	AD, MC	Total population	2022	FR
Total population	AL, BA, XK	Total population	2022	RS
Total population	SM	Total population	2022	IT

Additional scaling factors were applied to account for population adjustments. A scaling factor of 0.968 was applied to scale France's population in Eurostat, since the data includes the overseas territories. This scaling factor is based on multiple data sources (INED, 2025). For Cyprus, since the administrative boundaries in the GSHL data cover the entire island, the population density of the whole island was used to estimate health outcomes up to 2021. Adjustments were made only for the population after 2021 based on the Republic of Cyprus data reported in Eurostat, by taking the ratio of the changes in the total population in Eurostat for the assessment year in relation to 2021 and apply it to the population density data in 2021. Contrary to previous assessments, e.g., last year, where GEOSTAT 2011 data were used, no adjustments were needed for the Portuguese and Spanish population since the overseas territories are included in the GSHL dataset.

Lastly, to fill any missing or zero values, interpolation was applied across countries and years to produce reasonable estimates.

The final dataset serves as the basis for further calculations, including aggregation to NUTS3 and other regional levels, and to estimate the population at risk. The population data for estimating the mortality and morbidity indicators represent only the population defined as *at risk* by the epidemiological studies from which the CRFs were derived or recommendations from international assessments (e.g. the HRAPIE project or the GBD study) (see Table 1.1). Population data per country, stratified by age and sex, is available for individual countries from Eurostat (Eurostat, 2025b), and is used to estimate the fraction of the population in a specific age group in 2023. This fraction of the population will be used to estimate the population at risk in each grid cell, which will then be used to estimate the burden of disease indicators. Again, when data on population stratification were missing for a specific country, data from neighbouring countries with similar socio-economic characteristics were used (see Table A1.1).

Demographic and health data for estimating all-cause mortality-related burden of disease

The assessments produced in this report include the burden of disease attributable to air pollution for all-cause natural mortality, and cause-specific mortality and morbidity. All-cause and cause-specific EBD estimations require different demographic and health data.

To calculate the all-cause mortality-related burden of disease, data on cause of death, the number of natural deaths, and life expectancy stratified by year, sex, and age groups are needed. Eurostat compiles most of the data needed. However, this information is only available at the country level and might not have been available for 2023 at the time of the analyses performed for this report. Many countries report data with two or more years of delay or do not report data at all, in which cases, using a gap-filling methodology is required.

Eurostat data on causes of death (Eurostat, 2025c) are available since 2011 for 5-year age-groups, from 'less than 1 year' to '80 years or over'. It is compiled based on the ICD10 Mortality Tabulation List, the latest tabulation existing for mortality data. According to the description of the concentration-response functions (see Table 1.2), only natural deaths should be considered. Therefore, it considers all ICD-10 codes except injuries, poisoning, accidents or other external causes (S00-T98, V01-Y89). The number of natural deaths is estimated for 1-year age groups. Estimating the number of natural deaths for 1-year groups is

based on interpolation using the ratio between all-natural deaths and all (natural + external) causes of death (5-year age-groups) and Eurostat data on the total number of deaths (Eurostat, 2025d) given with a 1-year age-grouping. After this operation, mortality data were aligned with life expectancy data, available from the Eurostat database (Eurostat, 2025e) in a 1-year age-group stratification, by age and sex, from 0 to 85+ years old, since 1960. Life expectancies are extrapolated for ages above 85, using regression on life expectancy data for age groups 79 – 85, to reflect all age groups available for mortality data (up to 95+).

Gap filling was done for countries where the data described above is unavailable in the Eurostat datasets. Causes of death data were available from 2011 onwards and this year is used as a proxy for years 2005 - 2010. Afterwards, gap filling is performed for missing data on external causes of deaths using an average number of deaths due to external causes from the previous 5 years (5-year rolling average). Then, the missing numbers of deaths due to natural causes are gap-filled by subtracting the number of deaths due to external causes from the totals.

Data on the number of deaths and life expectancy have been available for most countries since 2005. In the cases where the data were not available, gap filling is performed using relative age distribution numbers of mortality (mortality ratios, or the number of deaths per population in each age group) and YLL ratios, following a similar methodology as described for population numbers, i.e., a 5-year rolling average. Original data is used where possible, i.e., if the original life expectancy numbers exist, they are used for calculating YLL ratios, even if mortality ratios have to be gap-filled. Nevertheless, for cases where data is unavailable, mostly for the western Balkan countries and microstates, the same proxy countries as for the population data were used for gap filling, see Table A1.2.

Demographic and health data for estimating cause-specific burden of disease

For the cause-specific analyses, mortality data stratified by year, sex, age groups and cause of death were also obtained from the Eurostat database (Eurostat, 2025c). For morbidity analyses, the prevalence-based approach to estimate the YLD has been used. Therefore, outcome-specific prevalence data from different sources have been used. For asthma (in individuals aged 15 years and older), COPD, DM, and stroke, data from the European Health Interview Survey (EHIS; Eurostat, 2025f) were used. Since EHIS does not provide prevalence data on asthma in individuals under 15 years of age, prevalence data from the GBD 2021 study were used (GBD 2021 Diseases and Injuries Collaborators, 2024). Prevalence data on lung cancer were obtained from the International Agency for Research on Cancer (IARC, 2024). The data were stratified by sex and different age groups (EHIS: 15-75+ years, in 10-year age groups; GBD 2021 study and Eurostat: 0-95+ years, in 5-year age-groups; IARC: 0-85+ years, in 5-year age groups). Regarding dementia, a single European average prevalence rate, stratified by sex and age (60-90+ years; in 5-year age groups) from Alzheimer Europe (2019) was used across all countries, as national data on disease frequency were not available beyond sex-specific adjustments. All absolute numbers were converted into death or prevalence rates in 1-year age groups for further alignment with life expectancy data, as done for the analyses of all-cause mortality described above.

Additionally, it should be noted that in the GBD 2021 study and IARC, prevalence data on childhood asthma and lung cancer were presumably reported for Serbia, including Kosovo. However, the derived rates were applied for both countries individually. More details on the prevalence data and the selection process can be found in the ETC HE Report 2022/11 (Kienzler et al., 2022). An overview of the health data sources for cause-specific mortality and morbidity is presented in Table 1.2.

Prevalence and mortality data were not always available for all countries for the reference year 2023. Where data were missing, information from the two preceding years (2021 and 2022) was considered, and the most recent year available was used. The corresponding mortality and prevalence rates from that year were calculated (using population data reported by Eurostat, 2025b) and assumed to apply to 2023. For

some European countries, no suitable data were available from either 2021 or 2022. In these cases, data from neighbouring countries were used as proxies to fill in the gaps. Where necessary, estimates from the GBD 2021 study (GBD 2021 Diseases and Injuries Collaborators, 2024) were consulted to assess the suitability of proxy countries by comparing prevalence or mortality patterns.

Table A1.2 shows the gap-filling proxies for countries lacking life expectancy and other health data for all-cause and cause-specific mortality and morbidity assessments.

Table A1.2: Countries lacking health data and the corresponding gap-filling proxies for all-cause mortality, cause-specific mortality, and morbidity (ISO2 codes in Annex 6). In case the country is the same, data from previous years were used.

Data set	Country (iso2 code)	Data used for gap-filling	Country of data used for gap-filling
All cause			
Life expectancy	AD, MC	YLL rates	FR
Life expectancy	BA, XK	YLL rates	RS
Life expectancy	LI	YLL rates	AT
Life expectancy	SM	YLL rates	IT
Life expectancy	TR	Life expectancy ^(a)	TR
Asthma (in individuals younger than 15 years)			
Mortality	AL, BA, ME, MK, XK	Mortality rate	RS
Mortality	BE, DK, GR, IE, IT, LV, MT, PT, RO, SE, TR	Mortality rate ^(a)	BE, DK, GR, IE, IT, LV, MT, PT, RO, SE, TR
Mortality	AD, MC	Mortality rate	FR
Mortality	CY	Mortality rate	GR
Mortality	IS	Mortality rate	DK
Mortality	EE	Mortality rate	LV
Mortality	LU	Mortality rate	BE
Mortality	SM, MT	Mortality rate	IT
Mortality	SI	Mortality rate	SK
Prevalence	LI	Prevalence rate	AT
Prevalence	RS	Prevalence rate	RS+XK
Prevalence	XK	Prevalence rate	RS+XK
Data set	Country (iso2 code)	Data used for gap-filling	Country of data used for gap-filling
Asthma (in individuals 15 years and older), COPD, DM, IHD, Stroke			
Mortality	BE, DK, GR, IE, IT, LV, MT, PT, RO, SE, TR	Mortality rate ^(a)	BE, DK, GR, IE, IT, LV, MT, PT, RO, SE, TR
Mortality	AL, BA, ME, MK, XK	Mortality rate	RS
Mortality	AD, MC	Mortality rate	FR
Mortality	SM	Mortality rate	IT

Only for asthma (15-24 years): Mortality	IS	Mortality rate (15- 24 years)	DK
Only for asthma (15-24 years): Mortality	LU	Mortality rate (15- 24 years)	BE
Only for asthma (15-24 years): Mortality	MT	Mortality rate (15- 24 years)	IT
Prevalence	AL, BA, ME, MK, XK	Prevalence rate	RS
Prevalence	CH	Prevalence rate	AT
Prevalence	LI	Prevalence rate	AT
Prevalence	SM	Prevalence rate	IT
Dementia			
Prevalence	AD, AL, AT, BA, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GR, HR, HU, IE, IS, IT, LI, LT, LU, LV, MC, ME, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR, XK	Prevalence rate	Europe
LC			
Mortality	BE, BG, CH, CY, DE, DK, EE, FI, FR, GR, HR, HU, IE, IS, IT, LV, MT, NL, NO, PT, RO, RS, SE, SI, TR	Mortality rate ^(a)	BE, BG, CH, CY, DE, DK, EE, FI, FR, GR, HR, HU, IE, IS, IT, LV, MT, NL, NO, PT, RO, RS, SE, SI, TR
Mortality	AL, BA, ME, MK, XK	Mortality rate	RS
Mortality	AD, MC	Mortality rate	FR
Mortality	SM	Mortality rate	IT
Prevalence	AD, MC	Prevalence rate	FR
Prevalence	LI	Prevalence rate	AT
Prevalence	SM	Prevalence rate	IT
Prevalence	RS	Prevalence rate	RS+XK

Note: ^(a)For the listed countries, available mortality data referred to years prior to 2023. Mortality rates from the most recent year available were calculated and assumed to apply to 2023

Disability weights (DW)

For the calculation of the YLDs, the number of prevalent cases of a cause-specific health outcome was multiplied by the respective DW (Equation A1.7). The DW is a weighting factor for the severity of a disease on a scale ranging from zero (no reduction of health) to one (the worst imaginable health state, sometimes set equal to death). The DW are based on the outcome and are sex and age group specific. The values used in the calculation were derived from the Global Burden of Disease 2021 study (GBD 2021 Diseases and Injuries Collaborators, 2025). This data is accessible via: <https://vizhub.healthdata.org/gbd-results/>.

The respective DWs were calculated by dividing the annual YLDs by the prevalence data for the considered diseases for the WHO European Region:

$$DW = \frac{YLD_o}{P_o} \quad (\text{A2.1})$$

These were available in 5-year age groups stratified by sex and were applied to all individual countries. Estimating the DWs from YLD and prevalence data allows the use of a weight that is adjusted for the severity distributions and co-morbidity.

It should be noted that the DW calculated for Diabetes Mellitus (DM) is a combined DW for both type 1 and type 2 DM.

Concentration-response functions

Compared with the previous report, several changes were made to the CRFs for different risk-outcome pairs. First, the age groups defined for asthma analyses were revised. Children and adolescents were now classified as individuals younger than 19 years (previously <15 years), while adults were defined as those aged 19 years and older (previously ≥15 years). Second, the RR applied to NO₂ and asthma mortality in adults was adjusted. The same RR was now used for both asthma morbidity and asthma mortality.

In addition, new risk-outcome pairs were introduced, including:

- PM_{2.5} and dementia morbidity
- NO₂ and asthma in children and adolescents
- NO₂ and COPD

The level of epidemiological evidence supporting the RRs varied across all risk-outcome pairs, reflecting differences in the number and quality of available studies. For instance, the association between PM_{2.5} and dementia is linked with greater uncertainty compared to other outcomes. In this context, large European cohort studies and high-quality meta-analyses, such as ELAPSE, EMAPEC, or HRAPIE, represent valuable resources for evaluating and consolidating the evidence base.

Correction factors for EBD due to long-term O₃ exposure (peak season)

Because O₃ formation is favoured by strong sunlight and high temperatures, concentrations are typically highest during the warm months. Meta-analyses indicate that associations between long-term O₃ exposure and health outcomes are more robust when using “summer” exposure metrics rather than annual averages (Huangfu and Atkinson, 2020). Accordingly, following WHO (2021), long-term O₃ concentration in this report is defined as the average of the daily maximum 8-hour mean over the six consecutive months with the highest running six-month O₃ average (peak season). Consequently, the EBD for O₃ was calculated for these six peak months in 2023, rather than for the full year as for PM_{2.5} and NO₂. This approach better aligns exposure with the occurrence of health effects and the corresponding CRFs.

Because monthly cause-specific mortality data for 2023 were not available for all countries, annual death data were adjusted using a correction factor that reflects the share of deaths occurring during the O₃ peak season. To derive this factor, all-cause mortality (ICD-10 excluding S00-T98 and V01-Y89) and COPD mortality (ICD-10 J40-44, J47) by month were compiled for 27 European countries with available 2022 data from Eurostat (2025h). Even if the peak season period can be different for each station, a uniform peak season from April to September was applied, consistent with most studies in Huangfu and Atkinson (2020). Alternative definitions (March-August, May-October) produced similar factors.

Average correction factors of 0.464 (all-cause) and 0.456 (COPD) derived from the 27 reporting countries were applied to all countries included in the analysis.

Annex 3 Population at risk and exposure levels

Table A3.1: Population-weighted concentration levels ($\mu\text{g}/\text{m}^3$) for 40 or 41 European countries, the EU27 and EEA32 in 2023

Country	PM _{2.5} annual mean	NO ₂ annual mean	O ₃ peak season mean
Austria	9.1	12.7	93.4
Belgium	8.8	12.5	84.6
Bulgaria	14.3	13.7	80.5
Croatia	13.0	11.8	96.0
Cyprus	14.7	24.3	81.9
Czechia	10.9	11.0	93.3
Denmark	6.6	6.5	81.7
Estonia	5.2	6.4	81.8
Finland	4.2	6.4	78.9
France	8.4	10.7	88.2
Germany	7.9	12.1	89.5
Greece	16.5	17.3	94.7
Hungary	12.4	12.3	92.6
Ireland	6.2	7.9	74.4
Italy	14.1	16.8	97.9
Latvia	7.9	8.2	85.5
Lithuania	8.1	8.7	89.3
Luxembourg	7.1	10.6	87.3
Malta	10.9	10.4	97.2
Netherlands	8.2	13.1	85.1
Poland	13.8	11.2	89.5
Portugal	7.7	11.8	86.4
Romania	13.1	13.9	85.1
Slovakia	12.2	10.5	89.8
Slovenia	12.0	11.1	94.0
Spain	9.5	14.0	94.6
Sweden	4.7	6.1	80.2
Albania	17.4	12.3	92.4
Andorra	5.9	12.9	87.6
Bosnia and Herzegovina	18.6	12.4	100.3
Iceland	4.1	6.8	77.9
Kosovo	16.6	12.0	86.0
Liechtenstein	7.7	11.8	93.4
Monaco	8.7	16.5	102.3
Montenegro	13.6	13.1	93.9
North Macedonia	19.2	10.6	84.3
Norway	5.0	7.5	80.3
San Marino	12.4	11.0	97.7
Serbia	17.7	14.8	88.4
Switzerland	7.6	12.5	95.2
Türkiye	--	31.3	75.4
EU27	10.2	12.5	90.0
EEA32	--	15.4	87.7
EEA32 (no TR)	10.1		
All countries		15.3	87.8
All countries (no TR)	10.3	--	--

Table A3.2: Population at risk (in 1,000) for 40 or 41 European countries, in the EU27 and EEA32 in 2023. Age groups represent the age of the cohorts in the epidemiological studies, on which the OR, HR or RR are based.

Country/age group	< 19 years	≥ 19	≥ 25	≥ 30	≥ 60
Austria	1,670	7,435	6,841	6,248	2,411
Belgium	2,479	9,257	8,440	7,707	3,066
Bulgaria	1,159	5,289	4,960	4,680	1,974
Croatia	702	3,149	2,910	2,689	1,158
Cyprus	248	1,034	949	856	299
Czechia	2,204	8,624	8,015	7,445	2,804
Denmark	1,224	4,701	4,256	3,847	1,570
Estonia	283	1,082	1,004	933	364
Finland	1,087	4,475	4,110	3,765	1,649
France	14,679	51,406	46,799	43,124	18,031
Germany	14,701	68,414	63,225	58,399	24,647
Greece	1,817	8,594	7,965	7,443	3,097
Hungary	1,782	7,817	7,202	6,634	2,529
Ireland	1,298	3,973	3,594	3,284	1,084
Italy	9,662	49,334	45,818	42,823	18,343
Latvia	379	1,503	1,399	1,309	530
Lithuania	535	2,322	2,159	1,999	794
Luxembourg	132	529	483	433	136
Malta	86	456	420	373	132
Netherlands	3,524	14,286	12,893	11,738	4,782
Poland	7,087	29,666	27,523	25,394	9,715
Portugal	1,694	8,323	7,681	7,152	3,084
Romania	3,939	15,111	13,939	12,978	4,899
Slovakia	1,087	4,342	4,024	3,709	1310
Slovenia	398	1,719	1,598	1,486	598
Spain	8,203	37,720	34,842	32,385	12,268
Sweden	2,312	8,201	7,498	6,832	2,720
Albania	589	2,271	2,034	1,811	711
Andorra	18	63	58	53	22
Bosnia and Herzegovina	635	2,806	2,595	2,403	1,005
Iceland	89	298	267	235	80
Kosovo	327	1,447	1,338	1,239	518
Liechtenstein	7	32	30	28	11
Monaco	9	30	27	25	10
Montenegro	140	477	431	392	141
North Macedonia	389	1,440	1,313	1,200	446
Norway	1,176	4,308	3,910	3,542	1,326
San Marino	6	28	26	25	11
Serbia	1,225	5,416	5,009	4,638	1,940
Switzerland	1,670	7,146	6,592	6,037	2,254
Türkiye (TR)	23,820	61,447	53,587	47,034	--
EU27	84,370	358,759	330,548	305,665	123,994
EEA32 (no TR)	87,313	--	341,346	315,507	127,665
EEA32	111,132	431,990	394,933	362,541	--
All countries (no TR)	90,650	--	354,179	327,293	132,469
All countries	114,470	445,969	407,765	374,328	--

Annex 4 Results for all-cause and cause-specific EBD analyses

PM_{2.5} (long-term effects) and all-cause mortality

Table A4.1: All-cause mortality disease burden (AD) attributable to PM_{2.5} for adults ≥ 30 years for 40 European countries (individual and total countries), in the EU27 and EEA32 in 2023

Country	AD (95 % CI: low, high) ^(a)			AD/10 ⁵ inhabitants ≥ 30 years (95 % CI: low, high) ^(b)		
	mean	low	high	mean	low	high
Austria	2,609	1,984	2,915	41.8	31.8	46.7
Belgium	2,941	2,235	3,287	38.2	29.0	42.6
Bulgaria	6,729	5,143	7,501	143.8	109.9	160.3
Croatia	2,886	2,205	3,218	107.3	82.0	119.7
Cyprus	612	468	682	71.5	54.6	79.7
Czechia	4,715	3,592	5,264	63.3	48.2	70.7
Denmark	704	534	787	18.3	13.9	20.5
Estonia	46	35	52	5.0	3.8	5.5
Finland	35	26	39	<1.0	<1.0	1.0
France	14,742	11,202	16,478	34.2	26.0	38.2
Germany	21,640	16,433	24,197	37.1	28.1	41.4
Greece	10,250	7,850	11,413	137.7	105.5	153.3
Hungary	6,768	5,160	7,552	102.0	77.8	113.8
Ireland	317	240	355	9.7	7.3	10.8
Italy	43,084	32,944	48,010	100.6	76.9	112.1
Latvia	578	439	646	44.1	33.5	49.3
Lithuania	815	619	911	40.7	30.9	45.5
Luxembourg	67	51	75	15.4	11.7	17.2
Malta	173	132	193	46.3	35.2	51.7
Netherlands	3,847	2,922	4,301	32.8	24.9	36.6
Poland	25,268	19,303	28,170	99.5	76.0	110.9
Portugal	2,221	1,688	2,483	31.1	23.6	34.7
Romania	14,066	10,737	15,687	108.4	82.7	120.9
Slovakia	2,732	2,083	3,049	73.7	56.2	82.2
Slovenia	1,034	789	1,154	69.6	53.1	77.6
Spain	13,318	10,135	14,875	41.1	31.3	45.9
Sweden	205	155	229	3.0	2.3	3.4
Albania	3,552	2,723	3,953	196.1	150.3	218.3
Andorra	<10	<10	<10	11.8	8.9	13.2
Bosnia and Herzegovina	4,784	3,675	5,319	199.0	152.9	221.3
Iceland	0	0	0	<1.0	<1.0	<1.0
Kosovo	2,135	1,635	2,378	172.4	131.9	192.0
Liechtenstein	<10	<10	<10	21.5	16.3	24.0
Monaco	<10	<10	10	37.5	28.5	41.9
Montenegro	556	425	620	141.8	108.4	158.1
North Macedonia	2,667	2,049	2,966	222.2	170.7	247.0
Norway	235	179	263	6.6	5.0	7.4
San Marino	20	16	23	83.1	63.3	92.7
Serbia	8,736	6,699	9,721	188.3	144.4	209.6
Switzerland	1,358	1,031	1,518	22.5	17.1	25.1
Türkiye (TR)	--	--	--	--	--	--
EU27	182,400	139,102	203,520	59.7	45.5	66.6
EEA32 (no TR)	183,999	140,316	205,308	58.3	44.5	65.1
All countries (no TR)	206,465	157,549	230,304	63.1	48.1	70.4

Notes: ^(a) Total and national data are rounded to the nearest integer; ^(b) Total and national data are rounded to one decimal place.

Table A4.2: All-cause mortality disease burden (YLL) attributable to PM_{2.5} for adults ≥ 30 years for 40 European countries (individual and total countries), in the EU27 and EEA32 in 2023

Country	YLL (95 % CI: low, high) ^(a)			YLL/10 ⁵ inhabitants ≥ 30 years (95 % CI: low, high) ^(b)		
	mean	low	high	mean	low	high
Austria	25,924	19,716	28,965	414.9	315.6	463.6
Belgium	30,396	23,104	33,971	394.4	299.8	440.8
Bulgaria	72,782	55,622	81,125	2055.9	1579.4	2285.7
Croatia	28,877	22,055	32,196	1555.2	1188.5	1733.5
Cyprus	6,579	5,027	7,334	1073.9	820.2	1197.3
Czechia	51,363	39,127	57,342	768.3	587.1	856.4
Denmark	7,334	5,562	8,205	689.9	525.6	770.2
Estonia	502	380	561	190.6	144.6	213.3
Finland	339	257	380	53.8	40.7	60.2
France	160,875	122,245	179,820	9.0	6.8	10.1
Germany	216,546	164,439	242,126	373.1	283.5	417.0
Greece	97,856	74,942	108,961	370.8	281.6	414.6
Hungary	72,680	55,418	81,102	1314.8	1006.9	1464.0
Ireland	3,614	2,741	4,043	1095.6	835.4	1222.6
Italy	407,950	311,943	454,590	110.0	83.5	123.1
Latvia	6,316	4,800	7,059	952.7	728.5	1061.6
Lithuania	9,117	6,925	10,192	482.4	366.6	539.1
Luxembourg	744	564	832	456.0	346.4	509.8
Malta	1,926	1,466	2,150	172.0	130.5	192.4
Netherlands	39,747	30,187	44,439	516.0	392.8	576.2
Poland	302,511	231,094	337,255	338.6	257.2	378.6
Portugal	22,894	17,397	25,590	1191.3	910.0	1328.1
Romania	160,029	122,153	178,478	320.1	243.2	357.8
Slovakia	33,239	25,343	37,092	1233.1	941.2	1375.2
Slovenia	11,163	8,515	12,455	896.3	683.4	1000.2
Spain	140,262	106,739	156,665	751.0	572.8	837.9
Sweden	1,971	1,493	2,205	433.1	329.6	483.8
Albania	35,817	27,457	39,863	28.8	21.9	32.3
Andorra	68	52	76	1977.8	1516.2	2201.2
Bosnia and Herzegovina	49,410	37,959	54,933	128.3	97.3	143.6
Iceland	<1	<1	<1	<1.0	<1.0	<1.0
Kosovo	23,877	18,279	26,592	1927.2	1475.3	2146.4
Liechtenstein	72	55	80	261.2	198.3	292.1
Monaco	102	78	114	409.3	310.9	457.5
Montenegro	6,038	4,613	6,731	1540.5	1177.0	1717.3
North Macedonia	25,012	19,214	27,808	2083.6	1600.7	2316.6
Norway	2,367	1,796	2,649	66.8	50.7	74.8
San Marino	193	147	215	786.4	599.7	877.5
Serbia	90,228	69,190	100,403	1945.3	1491.7	2164.7
Switzerland	13,631	10,352	15,240	225.8	171.5	252.4
Türkiye (TR)	--	--	--	--	--	--
EU27	1,913,535	1,459,256	2,135,135	626.0	477.4	698.5
EEA32 (no TR)	1,929,606	1,471,459	2,153,104	611.6	466.4	682.4
All countries (no TR)	2,160,351	1,648,448	2,409,840	660.1	503.7	736.3

Notes: ^(a)Total and national data are rounded to the nearest integer; ^(b)Total and national data are rounded to one decimal place.

PM_{2.5} (long-term effects) and total cause-specific disease burden (six causes, excluding dementia)

Table A4.3: Total cause-specific disease burden (DALY) attributable to PM_{2.5} (asthma in children/adolescents, COPD, diabetes mellitus, ischemic heart disease, lung cancer and stroke) for 40 European countries (individual and total countries), in the EU27 and EEA32 in 2023

Country	DALY (95 % CI: low, high) ^(a)		
	mean	low	high
Austria	32,862	13,462	50,898
Belgium	28,735	10,442	45,856
Bulgaria	79,987	34,986	119,199
Croatia	40,486	17,961	59,821
Cyprus	7,591	3,361	11,183
Czechia	59,643	25,784	90,233
Denmark	7,913	2,689	13,007
Estonia	488	208	766
Finland	379	152	606
France	144,218	56,982	226,567
Germany	243,827	93,833	387,334
Greece	105,916	46,688	155,547
Hungary	100,736	42,296	152,968
Ireland	4,231	1,624	6,767
Italy	428,124	182,802	635,947
Latvia	8,995	4,093	13,636
Lithuania	13,609	6,148	20,759
Luxembourg	718	269	1,152
Malta	2,594	1,165	3,891
Netherlands	40,080	14,189	64,731
Poland	317,074	140,400	471,311
Portugal	24,523	9,986	38,278
Romania	196,867	88,080	293,198
Slovakia	37,669	17,087	56,437
Slovenia	11,737	4,984	17,796
Spain	133,851	53,842	207,569
Sweden	2,097	828	3,350
Albania	29,677	13,080	43,252
Andorra	63	24	100
Bosnia and Herzegovina	46,124	20,680	66,305
Iceland	<1	<1	<1
Kosovo	22,453	9,886	32,925
Liechtenstein	31	11	52
Monaco	92	36	145
Montenegro	4,747	2,052	7,072
North Macedonia	20,554	9,187	29,561
Norway	2,558	901	4,172
San Marino	208	87	315
Serbia	85,583	37,934	124,312
Switzerland	13,948	5,238	22,281
Türkiye (TR)	--	--	--
EU27	2,074,951	874,342	3,148,806
EEA32 (no TR)	2,091,489	880,492	3,175,311
All countries (no TR)	2,300,989	973,460	3,479,297

Notes: ^(a) Total and national data are rounded to the nearest integer; ^(b) Total and national data are rounded to one decimal place.

PM_{2.5} (long-term effects) and asthma (children and adolescents < 19 years)

Table A4.4: Asthma disease burden (AD) attributable to PM_{2.5} for children and adolescents < 19 years for 40 European countries (individual and total countries), in the EU27 and EEA32 in 2023

Country	AD (95 % CI: low, high) ^(a)			AD/10 ⁵ inhabitants < 19 years (95 % CI: low, high) ^(b)		
	mean	low	high	mean	low	high
Austria	<1	<1	<1	<1.0	<1.0	<1.0
Belgium	0	0	0	0.0	0.0	0.0
Bulgaria	0	0	0	0.0	0.0	0.0
Croatia	0	0	0	0.0	0.0	0.0
Cyprus	0	0	0	0.0	0.0	0.0
Czechia	0	0	0	0.0	0.0	0.0
Denmark	<1	<1	<1	<1.0	<1.0	<1.0
Estonia	<1	<1	<1	<1.0	<1.0	<1.0
Finland	0	0	0	0.0	0.0	0.0
France	<1	<1	<10	<1.0	<1.0	<1.0
Germany	<1	<1	<1	<1.0	<1.0	<1.0
Greece	0	0	0	0.0	0.0	0.0
Hungary	<1	<1	<1	<1.0	<1.0	<1.0
Ireland	<1	<1	<1	<1.0	<1.0	<1.0
Italy	<10	<1	<10	<1.0	<1.0	<1.0
Latvia	<1	<1	<1	<1.0	<1.0	<1.0
Lithuania	0	0	0	0.0	0.0	0.0
Luxembourg	0	0	0	0.0	0.0	0.0
Malta	<1	<1	<1	<1.0	<1.0	<1.0
Netherlands	<1	<1	<1	<1.0	<1.0	<1.0
Poland	0	0	0	0.0	0.0	0.0
Portugal	<1	<1	<1	<1.0	<1.0	<1.0
Romania	0	0	0	0.0	0.0	0.0
Slovakia	<1	<1	<1	<1.0	<1.0	<1.0
Slovenia	0	0	0	0.0	0.0	0.0
Spain	<1	<1	<1	<1.0	<1.0	<1.0
Sweden	0	0	0	0.0	0.0	0.0
Albania	0	0	0	0.0	0.0	0.0
Andorra	0	0	0	0.0	0.0	0.0
Bosnia and Herzegovina	0	0	0	0.0	0.0	0.0
Iceland	0	0	0	0.0	0.0	0.0
Kosovo	0	0	0	0.0	0.0	0.0
Liechtenstein	0	0	0	0.0	0.0	0.0
Monaco	0	0	<1	0.0	0.0	<1.0
Montenegro	0	0	0	0.0	0.0	0.0
North Macedonia	0	0	0	0.0	0.0	0.0
Norway	0	0	0	0.0	0.0	0.0
San Marino	0	0	0	0.0	0.0	0.0
Serbia	0	0	0	0.0	0.0	0.0
Switzerland	<1	<1	<1	<1.0	<1.0	<1.0
Türkiye (TR)	--	--	--	--	--	--
EU27	<10	<1	<10	<1.0	<1.0	<1.0
EEA32 (no TR)	<10	<1	<10	<1.0	<1.0	<1.0
All countries (no TR)	<10	<1	<10	<1.0	<1.0	<1.0

Notes: ^(a)Total and national data are rounded to the nearest integer; ^(b)Total and national data are rounded to one decimal place.

Table A4.5: Asthma disease burden (YLL) attributable to PM_{2.5} for children and adolescents < 19 years for 40 European countries (individual and total countries), in the EU27 and EEA32 in 2023

Country	YLL (95 % CI: low, high) ^(a)			YLL/10 ⁵ inhabitants < 19 years (95 % CI: low, high) ^(b)		
	mean	low	high	mean	low	high
Austria	<10	<10	<10	<1.0	<1.0	<1.0
Belgium	0	0	0	0.0	0.0	0.0
Bulgaria	0	0	0	0.0	0.0	0.0
Croatia	0	0	0	0.0	0.0	0.0
Cyprus	0	0	0	0.0	0.0	0.0
Czechia	0	0	0	0.0	0.0	0.0
Denmark	<10	<10	<10	<1.0	<1.0	<1.0
Estonia	<1	<1	<10	<1.0	<1.0	<1.0
Finland	0	0	0	0.0	0.0	0.0
France	76	26	120	<1.0	<1.0	<1.0
Germany	25	<10	40	<1.0	<1.0	<1.0
Greece	0	0	0	0.0	0.0	0.0
Hungary	<10	<10	14	<1.0	<1.0	<1.0
Ireland	<10	<1	<10	<1.0	<1.0	<1.0
Italy	79	29	119	<1.0	<1.0	1.2
Latvia	<10	<10	<10	1.4	<1.0	2.2
Lithuania	0	0	0	0.0	0.0	0.0
Luxembourg	0	0	0	0.0	0.0	0.0
Malta	<1	<1	<1	<1.0	<1.0	<1.0
Netherlands	22	<10	35	<1.0	<1.0	<1.0
Poland	0	0	0	0.0	0.0	0.0
Portugal	15	<10	23	<1.0	<1.0	1.4
Romania	0	0	0	0.0	0.0	0.0
Slovakia	10	<10	16	<1.0	<1.0	1.4
Slovenia	0	0	0	0.0	0.0	0.0
Spain	13	<10	21	<1.0	<1.0	<1.0
Sweden	0	0	0	0.0	0.0	0.0
Albania	0	0	0	0.0	0.0	0.0
Andorra	<1	<1	<1	<1.0	<1.0	<1.0
Bosnia and Herzegovina	0	0	0	0.0	0.0	0.0
Iceland	0	0	0	0.0	0.0	0.0
Kosovo	0	0	0	0.0	0.0	0.0
Liechtenstein	0	0	0	0.0	0.0	0.0
Monaco	<1	<1	<1	<1.0	<1.0	<1.0
Montenegro	0	0	0	0.0	0.0	0.0
North Macedonia	0	0	0	0.0	0.0	0.0
Norway	0	0	0	0.0	0.0	0.0
San Marino	<1	<1	<1	<1.0	<1.0	1.0
Serbia	0	0	0	0.0	0.0	0.0
Switzerland	<10	<10	16	<1.0	<1.0	<1.0
Türkiye (TR)	--	--	--	--	--	--
EU27	269	96	421	<1.0	<1.0	<1.0
EEA32 (no TR)	279	99	436	<1.0	<1.0	<1.0
All countries (no TR)	279	99	436	<1.0	<1.0	<1.0

Notes: ^(a) Total and national data are rounded to the nearest integer; ^(b) Total and national data are rounded to one decimal place.

Table A4.6: Asthma disease burden (YLD) attributable to PM_{2.5} for children and adolescents < 19 years for 40 European countries (individual and total countries), in the EU27 and EEA32 in 2023

Country	YLD (95 % CI: low, high) ^(a)			YLD/10 ⁵ inhabitants < 19 years (95 % CI: low, high) ^(b)		
	mean	low	high	mean	low	high
Austria	435	153	688	26.1	9.2	41.2
Belgium	644	226	1,023	26.0	9.1	41.3
Bulgaria	548	203	827	47.3	17.5	71.4
Croatia	361	133	548	51.4	18.9	78.1
Cyprus	153	57	231	61.5	22.8	92.9
Czechia	699	251	1,087	31.7	11.4	49.3
Denmark	160	55	260	13.1	4.5	21.2
Estonia	<10	<10	10	2.2	<1.0	3.6
Finland	<10	<10	12	<1.0	<1.0	1.1
France	4,251	1,486	6,767	29.0	10.1	46.1
Germany	2,977	1,033	4,769	20.2	7.0	32.4
Greece	1,061	401	1,572	58.4	22.1	86.5
Hungary	727	263	1,120	40.8	14.8	62.9
Ireland	174	60	282	13.4	4.6	21.7
Italy	4,264	1,587	6,411	44.1	16.4	66.4
Latvia	60	21	96	15.8	5.5	25.2
Lithuania	84	29	134	15.6	5.4	25.0
Luxembourg	26	<10	42	19.9	6.9	32.1
Malta	41	15	64	47.4	16.9	74.0
Netherlands	907	315	1,451	25.7	8.9	41.2
Poland	9,993	3,685	15,139	141.0	52.0	213.6
Portugal	511	179	813	30.1	10.5	48.0
Romania	1,963	718	2,995	49.8	18.2	76.0
Slovakia	392	142	604	36.1	13.1	55.6
Slovenia	228	83	351	57.4	20.8	88.2
Spain	2,247	797	3,526	27.4	9.7	43.0
Sweden	77	26	126	3.3	1.1	5.5
Albania	288	110	423	48.9	18.7	71.9
Andorra	<10	<1	<10	10.2	3.5	16.6
Bosnia and Herzegovina	386	150	559	60.9	23.7	88.0
Iceland	<1	0	<1	<1.0	0.0	<1.0
Kosovo	179	67	266	54.7	20.6	81.3
Liechtenstein	<10	<1	<10	17.5	6.0	28.0
Monaco	<10	<1	<10	31.8	11.1	50.7
Montenegro	69	25	104	49.4	18.2	74.8
North Macedonia	319	124	461	82.0	31.9	118.4
Norway	92	31	149	7.8	2.7	12.7
San Marino	<10	<1	<10	37.5	13.6	57.8
Serbia	719	275	1,054	58.7	22.5	86.0
Switzerland	346	120	554	20.7	7.2	33.2
Türkiye (TR)	--	--	--	--	--	--
EU27	32,997	11,931	50,946	39.1	14.1	60.4
EEA32 (no TR)	33,436	12,083	51,650	38.3	13.8	59.2
All countries (no TR)	35,404	12,839	54,529	39.1	14.2	60.2

Notes: ^(a) Total and national data are rounded to the nearest integer; ^(b) Total and national data are rounded to one decimal place.

Table A4.7: Asthma disease burden (DALY) attributable to PM_{2.5} for children and adolescents < 19 years for 40 European countries (individual and total countries), in the EU27 and EEA32 in 2023

Country	DALY (95 % CI: low, high) ^(a)			DALY/10 ⁵ inhabitants < 19 years (95 % CI: low, high) ^(b)		
	mean	low	high	mean	low	high
Austria	441	155	696	26.4	9.3	41.7
Belgium	644	226	1,023	26.0	9.1	41.3
Bulgaria	548	203	827	47.3	17.5	71.4
Croatia	361	133	548	51.4	18.9	78.1
Cyprus	153	57	231	61.5	22.8	92.9
Czechia	699	251	1,087	31.7	11.4	49.3
Denmark	166	57	270	13.6	4.7	22.0
Estonia	<10	<10	11	2.4	<1.0	4.0
Finland	<10	<10	12	<1.0	<1.0	1.1
France	4,327	1,512	6,887	29.5	10.3	46.9
Germany	3,002	1,042	4,809	20.4	7.1	32.7
Greece	1,061	401	1,572	58.4	22.1	86.5
Hungary	736	267	1,134	41.3	15.0	63.6
Ireland	176	60	285	13.6	4.7	22.0
Italy	4,343	1,616	6,530	45.0	16.7	67.6
Latvia	65	23	104	17.2	6.0	27.4
Lithuania	84	29	134	15.6	5.4	25.0
Luxembourg	26	<10	42	19.9	6.9	32.1
Malta	41	15	65	47.9	17.1	74.8
Netherlands	929	323	1,486	26.4	9.2	42.2
Poland	9,993	3,685	15,139	141.0	52.0	213.6
Portugal	525	184	837	31.0	10.8	49.4
Romania	1,963	718	2,995	49.8	18.2	76.0
Slovakia	402	145	620	37.0	13.4	57.0
Slovenia	228	83	351	57.4	20.8	88.2
Spain	2,260	802	3,546	27.5	9.8	43.2
Sweden	77	26	126	3.3	1.1	5.5
Albania	288	110	423	48.9	18.7	71.9
Andorra	<10	<1	<10	10.4	3.5	16.9
Bosnia and Herzegovina	386	150	559	60.9	23.7	88.0
Iceland	<1	0	<1.0	<1.0	0.0	<1.0
Kosovo	179	67	266	54.7	20.6	81.3
Liechtenstein	<10	<1	<10	17.5	6.0	28.0
Monaco	<10	<1	<10	32.4	11.3	51.6
Montenegro	69	25	104	49.4	18.2	74.8
North Macedonia	319	124	461	82.0	31.9	118.4
Norway	92	31	149	7.8	2.7	12.7
San Marino	<10	<1	<10	38.2	13.8	58.8
Serbia	719	275	1,054	58.7	22.5	86.0
Switzerland	356	124	569	21.3	7.4	34.1
Türkiye (TR)	--	--	--	--	--	--
EU27	33,266	12,027	51,366	39.4	14.3	60.9
EEA32 (no TR)	33,715	12,183	52,087	38.6	14.0	59.7
All countries (no TR)	35,683	12,938	54,965	39.4	14.3	60.6

Notes: ^(a) Total and national data are rounded to the nearest integer; ^(b) Total and national data are rounded to one decimal place.

PM_{2.5} (long-term effects) and chronic obstructive pulmonary disease (adults ≥ 25 years)

Table A4.8: COPD disease burden (AD) attributable to PM_{2.5} for adults ≥ 25 years for 40 European countries (individual and total countries), in the EU27 and EEA32 in 2023

Country	AD (95 % CI: low, high) ^(a)			AD/10 ⁵ inhabitants ≥ 25 years (95 % CI: low, high) ^(b)		
	mean	low	high	mean	low	high
Austria	291	<10	549	4.3	<1.0	8.0
Belgium	377	<10	715	4.5	<1.0	8.5
Bulgaria	228	<10	405	4.6	<1.0	8.2
Croatia	274	<10	491	9.4	<1.0	16.9
Cyprus	48	<1	85	5.0	<1.0	8.9
Czechia	451	<10	832	5.6	<1.0	10.4
Denmark	149	<10	291	3.5	<1.0	6.8
Estonia	<10	<1	<10	<1.0	<1.0	<1.0
Finland	<10	<1	<10	<1.0	<1.0	<1.0
France	850	14	1,618	1.8	<1.0	3.5
Germany	2,574	43	4,938	4.1	<1.0	7.8
Greece	758	14	1,314	9.5	<1.0	16.5
Hungary	883	16	1,611	12.3	<1.0	22.4
Ireland	55	<1	106	1.5	<1.0	3.0
Italy	4,353	80	7,698	9.5	<1.0	16.8
Latvia	17	<1	33	1.2	<1.0	2.4
Lithuania	29	<1	56	1.4	<1.0	2.6
Luxembourg	<10	<1	16	1.7	<1.0	3.3
Malta	18	<1	34	4.3	<1.0	8.0
Netherlands	520	<10	996	4.0	<1.0	7.7
Poland	1,045	19	1,866	3.8	<1.0	6.8
Portugal	153	<10	292	2.0	<1.0	3.8
Romania	883	16	1,591	6.3	<1.0	11.4
Slovakia	83	<10	152	2.1	<1.0	3.8
Slovenia	44	<1	80	2.8	<1.0	5.0
Spain	1,167	20	2,180	3.3	<1.0	6.3
Sweden	23	<1	44	<1.0	<1.0	<1.0
Albania	221	<10	379	10.8	<1.0	18.6
Andorra	<1	<1	<1	0.6	<1.0	1.2
Bosnia and Herzegovina	294	<10	495	11.3	<1.0	19.1
Iceland	0	0	0	0.0	0.0	0.0
Kosovo	135	<10	236	10.1	<1.0	17.6
Liechtenstein	<1	<1	<10	3.3	<1.0	6.4
Monaco	<1	<1	<10	2.0	<1.0	3.8
Montenegro	27	<1	49	6.4	<1.0	11.3
North Macedonia	133	<10	224	10.1	<1.0	17.0
Norway	44	<1	86	1.1	<1.0	2.2
San Marino	<10	<1	<10	8.0	<1.0	14.6
Serbia	546	10	934	10.9	<1.0	18.6
Switzerland	139	<10	265	2.1	<1.0	4.0
Türkiye (TR)	--	--	--	--	--	--
EU27	15,286	271	28,001	4.6	<1.0	8.5
EEA32 (no TR)	15,470	274	28,355	4.5	<1.0	8.3
All countries (no TR)	16,830	300	30,676	4.8	<1.0	8.7

Notes: ^(a) Total and national data are rounded to the nearest integer; ^(b) Total and national data are rounded to one decimal place.

Table A4.9: COPD disease burden (YLL) attributable to PM_{2.5} for adults ≥ 25 years for 40 European countries (individual and total countries), in the EU27 and EEA32 in 2023

Country	YLL (95 % CI: low, high) ^(a)			YLL/10 ⁵ inhabitants ≥ 25 years (95 % CI: low, high) ^(b)		
	mean	low	high	mean	low	high
Austria	3,237	56	6,096	47.3	<1.0	89.1
Belgium	4,617	79	8,754	54.7	<1.0	103.7
Bulgaria	2,471	45	4,392	49.8	<1.0	88.5
Croatia	2,591	47	4,640	89.0	1.6	159.5
Cyprus	448	<10	796	47.2	<1.0	83.9
Czechia	5,133	90	9,477	64.0	1.1	118.2
Denmark	1,572	26	3,065	36.9	<1.0	72.0
Estonia	23	<1	46	2.3	<1.0	4.6
Finland	30	<1	59	<1.0	<1.0	1.4
France	9,733	166	18,519	20.8	0.4	39.6
Germany	29,661	500	56,901	46.9	<1.0	90.0
Greece	6,051	114	10,499	76.0	1.4	131.8
Hungary	10,488	186	19,129	145.6	2.6	265.6
Ireland	573	<10	1,115	15.9	<1.0	31.0
Italy	33,376	615	59,024	72.8	1.3	128.8
Latvia	205	<10	389	14.6	<1.0	27.8
Lithuania	319	<10	610	14.8	<1.0	28.2
Luxembourg	92	<10	179	19.1	<1.0	37.0
Malta	202	<10	375	48.1	<1.0	89.4
Netherlands	5,980	101	11,450	46.4	<1.0	88.8
Poland	12,247	223	21,872	44.5	<1.0	79.5
Portugal	1,391	24	2,647	18.1	<1.0	34.5
Romania	9,948	179	17,923	71.4	1.3	128.6
Slovakia	1,078	19	1,968	26.8	<1.0	48.9
Slovenia	482	<10	876	30.1	<1.0	54.8
Spain	11,866	206	22,173	34.1	<1.0	63.6
Sweden	227	<10	446	3.0	<1.0	5.9
Albania	1,983	38	3,403	97.5	1.9	167.3
Andorra	<10	<1	<10	7.3	<1.0	14.3
Bosnia and Herzegovina	3,115	61	5,237	120.0	2.3	201.8
Iceland	<1	0	<1	<1.0	0.0	<1.0
Kosovo	1,500	28	2,613	112.1	2.1	195.3
Liechtenstein	<10	<1	<10	15.4	<1.0	29.7
Monaco	<10	<1	12	22.8	<1.0	43.5
Montenegro	314	<10	561	72.9	1.3	130.1
North Macedonia	1,345	26	2,259	102.4	2.0	172.0
Norway	465	<10	905	11.9	<1.0	23.1
San Marino	16	<1	29	61.6	1.1	112.2
Serbia	5,774	110	9,878	115.3	2.2	197.2
Switzerland	1,583	27	3,032	24.0	<1.0	46.0
Türkiye (TR)	--	--	--	--	--	--
EU27	154,039	2,720	283,417	46.6	0.8	85.7
EEA32 (no TR)	156,091	2,754	287,362	45.7	0.8	84.2
All countries (no TR)	170,148	3,024	311,364	48.0	0.9	87.9

Notes: ^(a)Total and national data are rounded to the nearest integer; ^(b)Total and national data are rounded to one decimal place.

Table A4.10: COPD disease burden (YLD) attributable to PM_{2.5} for adults ≥ 25 years for 40 European countries (individual and total countries), in the EU27 and EEA32 in 2023

Country	YLD (95 % CI: low, high) ^(a)			YLD/10 ⁵ inhabitants ≥ 25 years (95 % CI: low, high) ^(b)		
	mean	low	high	mean	low	high
Austria	1,807	703	2,803	26.4	10.3	41.0
Belgium	1,813	701	2,826	21.5	8.3	33.5
Bulgaria	1,943	793	2,879	39.2	16.0	58.0
Croatia	1,431	581	2,133	49.2	20.0	73.3
Cyprus	370	151	548	39.0	15.9	57.7
Czechia	1,390	550	2,122	17.3	6.9	26.5
Denmark	357	135	569	8.4	3.2	13.4
Estonia	15	<10	24	1.5	<1.0	2.4
Finland	17	<10	28	<1.0	<1.0	<1.0
France	13,918	5,365	21,759	29.7	11.5	46.5
Germany	15,695	6,009	24,697	24.8	9.5	39.1
Greece	2,136	891	3,106	26.8	11.2	39.0
Hungary	3,026	1,208	4,575	42.0	16.8	63.5
Ireland	146	55	232	4.1	1.5	6.5
Italy	23,545	9,662	34,752	51.4	21.1	75.8
Latvia	203	79	318	14.5	5.6	22.7
Lithuania	588	226	922	27.2	10.5	42.7
Luxembourg	68	26	109	14.2	5.4	22.5
Malta	20	<10	30	4.7	1.9	7.3
Netherlands	3,014	1,156	4,735	23.4	9.0	36.7
Poland	8,608	3,501	12,801	31.3	12.7	46.5
Portugal	1,631	629	2,551	21.2	8.2	33.2
Romania	1,733	699	2,596	12.4	5.0	18.6
Slovakia	1,140	455	1,725	28.3	11.3	42.9
Slovenia	528	212	797	33.1	13.2	49.9
Spain	5,864	2,295	9,037	16.8	6.6	25.9
Sweden	55	21	88	<1.0	<1.0	1.2
Albania	993	418	1,432	48.8	20.5	70.4
Andorra	<10	<10	<10	10.5	4.0	16.8
Bosnia and Herzegovina	1,442	619	2,046	55.5	23.8	78.8
Iceland	<1	<1	<1	<1.0	<1.0	<1.0
Kosovo	670	278	977	50.1	20.8	73.0
Liechtenstein	<10	<10	<10	18.0	6.9	28.4
Monaco	<10	<10	14	32.7	12.6	51.1
Montenegro	152	62	226	35.2	14.4	52.4
North Macedonia	720	309	1,020	54.8	23.5	77.7
Norway	115	44	183	2.9	1.1	4.7
San Marino	12	<10	17	43.8	17.5	66.2
Serbia	2,687	1,134	3,864	53.6	22.6	77.1
Switzerland	1,129	433	1,775	17.1	6.6	26.9
Türkiye (TR)	--	--	--	--	--	--
EU27	91,063	36,118	138,763	27.5	10.9	42.0
EEA32 (no TR)	92,313	36,597	140,730	27.0	10.7	41.2
All countries (no TR)	99,002	39,428	150,336	28.0	11.1	42.4

Notes: ^(a)Total and national data are rounded to the nearest integer; ^(b)Total and national data are rounded to one decimal place.

Table A4.11: COPD disease burden (DALY) attributable to PM_{2.5} for adults ≥ 25 years for 40 European countries (individual and total countries), in the EU27 and EEA32 in 2023

Country	DALY (95 % CI: low, high) ^(a)			DALY/10 ⁵ inhabitants ≥ 25 years (95 % CI: low, high) ^(b)		
	mean	low	high	mean	low	high
Austria	5,044	758	8,899	73.7	11.1	130.1
Belgium	6,430	780	11,580	76.2	9.2	137.2
Bulgaria	4,414	839	7,271	89.0	16.9	146.6
Croatia	4,022	628	6,773	138.2	21.6	232.8
Cyprus	817	159	1,344	86.1	16.8	141.6
Czechia	6,523	640	11,599	81.4	8.0	144.7
Denmark	1,930	161	3,635	45.3	3.8	85.4
Estonia	38	<10	70	3.8	<1.0	6.9
Finland	47	<10	86	1.1	<1.0	2.1
France	23,652	5,530	40,278	50.5	11.8	86.1
Germany	45,357	6,509	81,598	71.7	10.3	129.1
Greece	8,187	1,004	13,605	102.8	12.6	170.8
Hungary	13,513	1,395	23,704	187.6	19.4	329.1
Ireland	719	65	1,347	20.0	1.8	37.5
Italy	56,921	10,277	93,776	124.2	22.4	204.7
Latvia	408	82	707	29.2	5.9	50.5
Lithuania	907	231	1,531	42.0	10.7	70.9
Luxembourg	161	28	287	33.3	5.7	59.5
Malta	222	11	406	52.9	2.7	96.7
Netherlands	8,994	1,257	16,185	69.8	9.7	125.5
Poland	20,855	3,723	34,673	75.8	13.5	126.0
Portugal	3,022	652	5,198	39.3	8.5	67.7
Romania	11,681	879	20,519	83.8	6.3	147.2
Slovakia	2,218	474	3,693	55.1	11.8	91.8
Slovenia	1,010	220	1,673	63.2	13.8	104.7
Spain	17,730	2,500	31,210	50.9	7.2	89.6
Sweden	282	24	534	3.8	<1.0	7.1
Albania	2,976	456	4,835	146.3	22.4	237.7
Andorra	10	<10	18	17.8	4.1	31.1
Bosnia and Herzegovina	4,556	680	7,284	175.5	26.2	280.6
Iceland	<1	<1	<1	<1.0	<1.0	<1.0
Kosovo	2,170	306	3,590	162.2	22.9	268.3
Liechtenstein	10	<10	17	33.4	7.1	58.1
Monaco	15	<10	26	55.5	13.0	94.7
Montenegro	466	68	786	108.2	15.7	182.5
North Macedonia	2,064	335	3,279	157.2	25.5	249.7
Norway	580	51	1,088	14.8	1.3	27.8
San Marino	28	<10	47	105.4	18.6	178.3
Serbia	8,461	1,245	13,742	168.9	24.8	274.4
Switzerland	2,712	460	4,807	41.1	7.0	72.9
Türkiye (TR)	--	--	--	--	--	--
EU27	245,102	38,838	422,180	74.2	11.7	127.7
EEA32 (no TR)	248,404	39,351	428,092	72.8	11.5	125.4
All countries (no TR)	269,150	42,451	461,699	76.0	12.0	130.4

Notes: ^(a)Total and national data are rounded to the nearest integer; ^(b)Total and national data are rounded to one decimal place.

PM_{2.5} (long-term effects) and diabetes mellitus disease (adults ≥ 25 years)

Table A4.12: DM disease burden (AD) attributable to PM_{2.5} for adults ≥ 25 years for 40 European countries (individual and total countries), in the EU27 and EEA32 in 2023

Country	AD (95 % CI: low, high) ^(a)			AD/10 ⁵ inhabitants ≥ 25 years (95 % CI: low, high) ^(b)		
	mean	low	high	mean	low	high
Austria	673	352	955	9.8	5.1	14.0
Belgium	255	132	364	3.0	1.6	4.3
Bulgaria	545	304	729	11.0	6.1	14.7
Croatia	1,379	762	1,859	47.4	26.2	63.9
Cyprus	230	128	307	24.2	13.5	32.3
Czechia	1,321	706	1,836	16.5	8.8	22.9
Denmark	118	59	174	2.8	1.4	4.1
Estonia	<10	<10	14	<1.0	<1.0	1.3
Finland	<10	<10	<10	<1.0	<1.0	<1.0
France	1,997	1,031	2,865	4.3	2.2	6.1
Germany	3,771	1,929	5,458	6.0	3.1	8.6
Greece	1,240	710	1,618	15.6	8.9	20.3
Hungary	1,019	552	1,397	14.1	7.7	19.4
Ireland	43	22	64	1.2	<1.0	1.8
Italy	9,513	5,336	12,672	20.8	11.6	27.7
Latvia	86	44	123	6.1	3.2	8.8
Lithuania	98	51	142	4.6	2.3	6.6
Luxembourg	<10	<10	13	1.8	<1.0	2.7
Malta	51	27	72	12.3	6.5	17.1
Netherlands	461	236	665	3.6	1.8	5.2
Poland	3,657	2,029	4,913	13.3	7.4	17.9
Portugal	489	252	702	6.4	3.3	9.1
Romania	1,261	693	1,709	9.0	5.0	12.3
Slovakia	163	88	224	4.1	2.2	5.6
Slovenia	100	54	137	6.2	3.4	8.5
Spain	2,171	1,144	3,055	6.2	3.3	8.8
Sweden	38	19	57	<1.0	<1.0	<1.0
Albania	601	348	776	29.5	17.1	38.2
Andorra	<1	<1	<10	1.5	<1.0	2.3
Bosnia and Herzegovina	724	430	921	27.9	16.6	35.5
Iceland	0	0	0	0.0	0.0	0.0
Kosovo	347	198	455	26.0	14.8	34.0
Liechtenstein	<10	<10	<10	6.7	3.4	9.8
Monaco	<10	<1	<10	4.7	2.4	6.7
Montenegro	72	40	97	16.7	9.3	22.4
North Macedonia	318	189	404	24.2	14.4	30.7
Norway	32	16	47	<1.0	<1.0	1.2
San Marino	<10	<10	<10	18.2	9.9	24.9
Serbia	1,371	798	1,766	27.4	15.9	35.3
Switzerland	161	83	233	2.4	1.3	3.5
Türkiye (TR)	--	--	--	--	--	--
EU27	30,698	16,673	42,124	9.3	5.0	12.7
EEA32 (no TR)	30,893	16,773	42,407	9.1	4.9	12.4
All countries (no TR)	34,333	18,780	46,836	9.7	5.3	13.2

Notes: ^(a)Total and national data are rounded to the nearest integer; ^(b)Total and national data are rounded to one decimal place.

Table A4.13: DM disease burden (YLL) attributable to PM_{2.5} for adults ≥ 25 years for 40 European countries (individual and total countries), in the EU27 and EEA32 in 2023

Country	YLL (95 % CI: low, high) ^(a)			YLL/10 ⁵ inhabitants ≥ 25 years (95 % CI: low, high) ^(b)		
	mean	low	high	mean	low	high
Austria	6,461	3,376	9,168	94.4	49.3	134.0
Belgium	2,526	1,310	3,610	29.9	15.5	42.8
Bulgaria	6,159	3,436	8,234	124.2	69.3	166.0
Croatia	12,264	6,782	16,536	421.5	233.1	568.3
Cyprus	2,154	1,201	2,877	226.9	126.5	303.1
Czechia	12,525	6,693	17,405	156.3	83.5	217.2
Denmark	1,305	656	1,922	30.7	15.4	45.2
Estonia	100	49	149	9.9	4.9	14.8
Finland	39	19	58	<1.0	<1.0	1.4
France	20,913	10,801	30,001	44.7	23.1	64.1
Germany	34,999	17,908	50,657	55.4	28.3	80.1
Greece	13,383	7,671	17,474	168.0	96.3	219.4
Hungary	11,022	5,972	15,114	153.0	82.9	209.9
Ireland	439	221	646	12.2	6.2	18.0
Italy	83,323	46,737	110,999	181.9	102.0	242.3
Latvia	980	507	1,404	70.0	36.2	100.3
Lithuania	1,271	653	1,832	58.9	30.2	84.8
Luxembourg	98	50	143	20.3	10.3	29.7
Malta	600	319	839	143.0	75.9	199.8
Netherlands	4,794	2,458	6,922	37.2	19.1	53.7
Poland	42,353	23,500	56,894	153.9	85.4	206.7
Portugal	4,461	2,303	6,404	58.1	30.0	83.4
Romania	14,399	7,910	19,509	103.3	56.8	140.0
Slovakia	2,231	1,208	3,063	55.5	30.0	76.1
Slovenia	1,085	590	1,485	67.9	36.9	92.9
Spain	18,858	9,942	26,540	54.1	28.5	76.2
Sweden	381	190	567	5.1	2.5	7.6
Albania	4,459	2,586	5,763	219.2	127.1	283.3
Andorra	<10	<10	14	16.2	8.1	24.0
Bosnia and Herzegovina	7,077	4,199	8,999	272.7	161.8	346.7
Iceland	<1	<1	<1	<1.0	<1.0	<1.0
Kosovo	3,651	2,084	4,779	272.9	155.8	357.2
Liechtenstein	0	0	0	0.0	0.0	0.0
Monaco	13	<10	19	49.2	25.4	70.6
Montenegro	763	424	1,024	176.9	98.3	237.6
North Macedonia	3,015	1,791	3,824	229.6	136.4	291.2
Norway	328	165	483	8.4	4.2	12.4
San Marino	42	23	57	159.4	86.5	218.3
Serbia	13,394	7,799	17,260	267.4	155.7	344.6
Switzerland	1,531	785	2,213	23.2	11.9	33.6
Türkiye (TR)	--	--	--	--	--	--
EU27	299,124	162,460	410,453	90.5	49.1	124.2
EEA32 (no TR)	300,982	163,409	413,149	88.2	47.9	121.0
All countries (no TR)	333,405	182,327	454,889	94.1	51.5	128.4

Notes: (a) Total and national data are rounded to the nearest integer; (b) Total and national data are rounded to one decimal place.

Table A4.14: DM disease burden (YLD) attributable to PM_{2.5} for adults ≥ 25 years for 40 European countries (individual and total countries), in the EU27 and EEA32 in 2023

Country	YLD (95 % CI: low, high) ^(a)			YLD/10 ⁵ inhabitants ≥ 25 years (95 % CI: low, high) ^(b)		
	mean	low	high	mean	low	high
Austria	1,231	633	1,797	18.0	9.3	26.3
Belgium	1,337	687	1,954	15.8	8.1	23.1
Bulgaria	2,332	1,211	3,372	47.0	24.4	68.0
Croatia	1,619	840	2,344	55.6	28.9	80.6
Cyprus	496	258	718	52.3	27.1	75.6
Czechia	3,014	1,555	4,385	37.6	19.4	54.7
Denmark	264	135	388	6.2	3.2	9.1
Estonia	18	<10	26	1.7	<1.0	2.6
Finland	23	12	33	<1.0	<1.0	<1.0
France	8,623	4,427	12,608	18.4	9.5	26.9
Germany	11,351	5,819	16,619	18.0	9.2	26.3
Greece	5,168	2,695	7,444	64.9	33.8	93.4
Hungary	3,309	1,711	4,806	45.9	23.8	66.7
Ireland	119	61	174	3.3	1.7	4.8
Italy	19,459	10,117	28,111	42.5	22.1	61.4
Latvia	164	84	240	11.7	6.0	17.2
Lithuania	253	130	370	11.7	6.0	17.1
Luxembourg	34	17	50	7.1	3.6	10.4
Malta	130	67	189	30.9	15.9	45.0
Netherlands	1,803	925	2,639	14.0	7.2	20.5
Poland	14,284	7,412	20,673	51.9	26.9	75.1
Portugal	1,572	807	2,298	20.5	10.5	29.9
Romania	4,255	2,204	6,168	30.5	15.8	44.2
Slovakia	1,589	821	2,309	39.5	20.4	57.4
Slovenia	640	331	929	40.0	20.7	58.1
Spain	8,569	4,412	12,494	24.6	12.7	35.9
Sweden	103	52	151	1.4	<1.0	2.0
Albania	1,252	654	1,800	61.6	32.2	88.5
Andorra	<10	<10	<10	6.3	3.2	9.3
Bosnia and Herzegovina	1,928	1,012	2,761	74.3	39.0	106.4
Iceland	<1	0	<1	<1.0	0.0	<1.0
Kosovo	861	449	1,241	64.3	33.5	92.7
Liechtenstein	<10	<10	<10	12.1	6.2	17.7
Monaco	<10	<10	<10	20.2	10.4	29.6
Montenegro	184	96	267	42.8	22.2	61.9
North Macedonia	937	492	1,342	71.4	37.5	102.2
Norway	99	51	145	2.5	1.3	3.7
San Marino	<10	<10	13	35.1	18.1	50.9
Serbia	3,522	1,842	5,060	70.3	36.8	101.0
Switzerland	758	388	1,109	11.5	5.9	16.8
Türkiye (TR)	--	--	--	--	--	--
EU27	91,755	47,432	133,287	27.8	14.3	40.3
EEA32 (no TR)	92,615	47,873	134,547	27.1	14.0	39.4
All countries (no TR)	101,319	52,427	147,044	28.6	14.8	41.5

Notes: (a) Total and national data are rounded to the nearest integer; (b) Total and national data are rounded to one decimal place.

Table A4.15: DM disease burden (DALY) attributable to PM_{2.5} for adults ≥ 25 years for 40 European countries (individual and total countries), in the EU27 and EEA32 in 2023

Country	DALY (95 % CI: low, high) ^(a)			DALY/10 ⁵ inhabitants ≥ 25 years (95 % CI: low, high) ^(b)		
	mean	low	high	mean	low	high
Austria	7,692	4,009	10,965	112.4	58.6	160.3
Belgium	3,863	1,997	5,564	45.8	23.7	65.9
Bulgaria	8,491	4,647	11,606	171.2	93.7	234.0
Croatia	13,883	7,622	18,880	477.1	261.9	648.8
Cyprus	2,650	1,459	3,594	279.2	153.7	378.7
Czechia	15,538	8,248	21,790	193.9	102.9	271.9
Denmark	1,569	791	2,310	36.9	18.6	54.3
Estonia	117	58	175	11.7	5.8	17.4
Finland	61	31	91	1.5	<1.0	2.2
France	29,535	15,227	42,609	63.1	32.5	91.0
Germany	46,350	23,727	67,276	73.3	37.5	106.4
Greece	18,551	10,366	24,918	232.9	130.1	312.8
Hungary	14,331	7,683	19,920	199.0	106.7	276.6
Ireland	558	282	820	15.5	7.8	22.8
Italy	102,782	56,854	139,110	224.3	124.1	303.6
Latvia	1,144	591	1,644	81.8	42.3	117.5
Lithuania	1,523	783	2,201	70.6	36.2	102.0
Luxembourg	132	67	193	27.3	13.9	40.0
Malta	730	386	1,028	173.9	91.9	244.9
Netherlands	6,596	3,383	9,561	51.2	26.2	74.2
Poland	56,637	30,912	77,567	205.8	112.3	281.8
Portugal	6,033	3,110	8,702	78.5	40.5	113.3
Romania	18,654	10,115	25,677	133.8	72.6	184.2
Slovakia	3,820	2,029	5,372	94.9	50.4	133.5
Slovenia	1,725	921	2,414	107.9	57.6	151.0
Spain	27,428	14,354	39,034	78.7	41.2	112.0
Sweden	484	242	718	6.5	3.2	9.6
Albania	5,711	3,241	7,564	280.7	159.3	371.8
Andorra	13	<10	19	22.6	11.4	33.3
Bosnia and Herzegovina	9,006	5,211	11,760	347.0	200.8	453.1
Iceland	<1	<1	<1	<1.0	<1.0	<1.0
Kosovo	4,512	2,533	6,020	337.2	189.3	449.9
Liechtenstein	<10	<10	<10	12.1	6.2	17.7
Monaco	19	<10	27	69.4	35.7	100.2
Montenegro	947	519	1,291	219.7	120.5	299.4
North Macedonia	3,952	2,283	5,166	301.0	173.9	393.4
Norway	427	216	628	10.9	5.5	16.1
San Marino	51	27	71	194.4	104.6	269.2
Serbia	16,916	9,640	22,320	337.7	192.5	445.6
Switzerland	2,288	1,173	3,321	34.7	17.8	50.4
Türkiye (TR)	--	--	--	--	--	--
EU27	390,879	209,892	543,741	118.3	63.5	164.5
EEA32 (no TR)	393,598	211,282	547,696	115.3	61.9	160.5
All countries (no TR)	434,724	234,754	601,933	122.7	66.3	170.0

Notes: (a) Total and national data are rounded to the nearest integer; (b) Total and national data are rounded to one decimal place.

PM_{2.5} (long-term effects) and ischemic heart disease (adults ≥ 25 years)

Table A4.16: IHD disease burden (AD) attributable to PM_{2.5} for adults ≥ 25 years for 40 European countries (individual and total countries), in the EU27 and EEA32 in 2023

Country	AD (95 % CI: low, high) ^(a)			AD/10 ⁵ inhabitants ≥ 25 years (95 % CI: low, high) ^(b)		
	mean	low	high	mean	low	high
Austria	1,032	547	1,495	15.1	8.0	21.9
Belgium	486	257	706	5.8	3.0	8.4
Bulgaria	2,189	1,191	3,094	44.1	24.0	62.4
Croatia	929	504	1,317	31.9	17.3	45.3
Cyprus	116	63	164	12.2	6.7	17.3
Czechia	2,107	1,127	3,026	26.3	14.1	37.8
Denmark	114	60	168	2.7	1.4	3.9
Estonia	17	<10	25	1.7	<1.0	2.5
Finland	14	<10	21	<1.0	<1.0	<1.0
France	2,019	1,066	2,938	4.3	2.3	6.3
Germany	7,157	3,765	10,450	11.3	6.0	16.5
Greece	2,833	1,558	3,961	35.6	19.6	49.7
Hungary	4,223	2,271	6,035	58.6	31.5	83.8
Ireland	121	63	178	3.4	1.8	4.9
Italy	10,174	5,550	14,340	22.2	12.1	31.3
Latvia	406	215	590	29.0	15.3	42.2
Lithuania	762	401	1,111	35.3	18.6	51.4
Luxembourg	12	<10	17	2.4	1.2	3.5
Malta	79	42	114	18.8	10.0	27.1
Netherlands	541	285	789	4.2	2.2	6.1
Poland	10,395	5,643	14,717	37.8	20.5	53.5
Portugal	371	196	540	4.8	2.6	7.0
Romania	8,025	4,339	11,406	57.6	31.1	81.8
Slovakia	1,912	1,027	2,733	47.5	25.5	67.9
Slovenia	271	146	387	16.9	9.1	24.2
Spain	2,356	1,254	3,402	6.8	3.6	9.8
Sweden	60	31	88	<1.0	<1.0	1.2
Albania	1,006	556	1,400	49.4	27.3	68.8
Andorra	<1	<1	<10	1.5	<1.0	2.2
Bosnia and Herzegovina	1,091	610	1,503	42.0	23.5	57.9
Iceland	<1.0	0	<1.0	<1.0	0.0	<1.0
Kosovo	499	274	698	37.3	20.5	52.2
Liechtenstein	<10	<1	<10	5.8	3.0	8.4
Monaco	<10	<1	<10	4.7	2.5	6.9
Montenegro	104	56	147	24.0	13.1	34.0
North Macedonia	484	270	667	36.9	20.6	50.8
Norway	52	27	76	1.3	<1.0	2.0
San Marino	<10	<10	<10	18.7	10.0	26.7
Serbia	2,016	1,117	2,801	40.3	22.3	55.9
Switzerland	351	185	512	5.3	2.8	7.8
Türkiye (TR)	--	--	--	--	--	--
EU27	58,721	31,623	83,808	17.8	9.6	25.4
EEA32 (no TR)	59,126	31,835	84,399	17.3	9.3	24.7
All countries (no TR)	64,332	34,722	91,626	18.2	9.8	25.9

Notes: (a) Total and national data are rounded to the nearest integer; (b) Total and national data are rounded to one decimal place.

Table A4.17: IHD disease burden (YLL) attributable to PM_{2.5} for adults ≥ 25 years for 40 European countries (individual and total countries), in the EU27 and EEA32 in 2023

Country	YLL (95 % CI: low, high) ^(a)			YLL/10 ⁵ inhabitants ≥ 25 years (95 % CI: low, high) ^(b)		
	mean	low	high	mean	low	high
Austria	9,364	4,965	13,565	136.9	72.6	198.3
Belgium	5,464	2,889	7,938	64.7	34.2	94.1
Bulgaria	23,051	12,541	32,569	464.7	252.8	656.6
Croatia	8,764	4,753	12,422	301.2	163.3	426.9
Cyprus	1,507	820	2,130	158.8	86.3	224.4
Czechia	19,083	10,207	27,408	238.1	127.4	342.0
Denmark	1,178	615	1,731	27.7	14.5	40.7
Estonia	153	80	226	15.2	7.9	22.5
Finland	125	65	185	3.0	1.6	4.5
France	22,884	12,080	33,294	48.9	25.8	71.1
Germany	63,786	33,552	93,127	100.9	53.1	147.3
Greece	31,019	17,062	43,367	389.4	214.2	544.4
Hungary	37,950	20,403	54,230	527.0	283.3	753.0
Ireland	1,371	717	2,013	38.1	19.9	56.0
Italy	88,185	48,108	124,295	192.5	105.0	271.3
Latvia	3,885	2,052	5,649	277.6	146.7	403.7
Lithuania	6,664	3,511	9,713	308.6	162.6	449.9
Luxembourg	152	79	222	31.4	16.4	46.0
Malta	933	497	1,343	222.1	118.5	319.9
Netherlands	5,740	3,022	8,373	44.5	23.4	64.9
Poland	97,007	52,663	137,343	352.5	191.3	499.0
Portugal	4,513	2,382	6,566	58.8	31.0	85.5
Romania	79,603	43,039	113,141	571.1	308.8	811.7
Slovakia	18,540	9,964	26,503	460.8	247.6	658.7
Slovenia	3,151	1,697	4,496	197.1	106.2	281.3
Spain	28,667	15,252	41,388	82.3	43.8	118.8
Sweden	578	301	852	7.7	4.0	11.4
Albania	7,103	3,927	9,883	349.1	193.0	485.8
Andorra	<10	<10	15	17.1	8.9	25.1
Bosnia and Herzegovina	11,066	6,184	15,250	426.4	238.2	587.6
Iceland	<1	<1	<1	<1.0	<1.0	<1.0
Kosovo	5,490	3,014	7,689	410.3	225.2	574.7
Liechtenstein	<10	<10	12	27.2	14.3	39.8
Monaco	15	<10	21	53.7	28.3	78.2
Montenegro	1,134	616	1,605	263.2	143.0	372.3
North Macedonia	4,860	2,716	6,696	370.1	206.8	509.9
Norway	549	287	807	14.0	7.3	20.6
San Marino	43	23	61	161.9	87.1	231.2
Serbia	20,454	11,327	28,418	408.4	226.1	567.3
Switzerland	3,141	1,653	4,582	47.6	25.1	69.5
Türkiye (TR)	--	--	--	--	--	--
EU27	563,314	303,316	804,090	170.4	91.8	243.3
EEA32 (no TR)	567,012	305,260	809,491	166.1	89.4	237.1
All countries (no TR)	617,186	333,078	879,128	174.3	94.0	248.2

Notes: (a) Total and national data are rounded to the nearest integer; (b) Total and national data are rounded to one decimal place.

Table A4.18: IHD disease burden (YLD) attributable to PM_{2.5} for adults ≥ 25 years for 40 European countries (individual and total countries), in the EU27 and EEA32 in 2023

Country	YLD (95 % CI: low, high) ^(a)			YLD/10 ⁵ inhabitants ≥ 25 years (95 % CI: low, high) ^(b)		
	mean	low	high	mean	low	high
Austria	247	101	395	3.6	1.5	5.8
Belgium	118	48	189	1.4	<1.0	2.2
Bulgaria	891	369	1,397	18.0	7.4	28.2
Croatia	426	176	669	14.6	6.0	23.0
Cyprus	53	22	83	5.6	2.3	8.8
Czechia	374	153	594	4.7	1.9	7.4
Denmark	26	11	43	<1.0	<1.0	1.0
Estonia	<10	<10	<10	<1.0	<1.0	<1.0
Finland	<10	<10	<10	<1.0	<1.0	<1.0
France	954	386	1,530	2.0	<1.0	3.3
Germany	2,214	894	3,559	3.5	1.4	5.6
Greece	708	296	1,100	8.9	3.7	13.8
Hungary	524	215	829	7.3	3.0	11.5
Ireland	26	11	43	<1.0	<1.0	1.2
Italy	2,418	1,003	3,782	5.3	2.2	8.3
Latvia	62	25	99	4.4	1.8	7.1
Lithuania	106	43	170	4.9	2.0	7.9
Luxembourg	<10	<10	<10	<1.0	<1.0	1.5
Malta	16	<10	25	3.7	1.5	6.0
Netherlands	313	126	502	2.4	<1.0	3.9
Poland	5,023	2,077	7,884	18.3	7.5	28.6
Portugal	246	99	394	3.2	1.3	5.1
Romania	450	185	708	3.2	1.3	5.1
Slovakia	471	193	745	11.7	4.8	18.5
Slovenia	99	41	156	6.2	2.5	9.8
Spain	305	124	486	<1.0	<1.0	1.4
Sweden	<10	<10	14	<1.0	<1.0	<1.0
Albania	535	224	829	26.3	11.0	40.7
Andorra	<1	<1	<1	<1.0	<1.0	1.1
Bosnia and Herzegovina	802	339	1,232	30.9	13.1	47.5
Iceland	0	0	0	0.0	0.0	0.0
Kosovo	361	151	562	27.0	11.3	42.0
Liechtenstein	<1	<1	<10	2.4	<1.0	3.8
Monaco	<1	<1	<1	2.2	<1.0	3.6
Montenegro	75	31	117	17.4	7.2	27.2
North Macedonia	378	160	580	28.8	12.2	44.2
Norway	11	<10	19	<1.0	<1.0	<1.0
San Marino	<10	<1	<10	4.4	1.8	6.9
Serbia	1,472	618	2,276	29.4	12.3	45.4
Switzerland	155	63	249	2.4	<1.0	3.8
Türkiye (TR)	--	--	--	--	--	--
EU27	16,095	6,614	25,421	4.9	2.0	7.7
EEA32 (no TR)	16,262	6,682	25,690	4.8	2.0	7.5
All countries (no TR)	19,888	8,205	31,290	5.6	2.3	8.8

Notes: (a) Total and national data are rounded to the nearest integer; (b) Total and national data are rounded to one decimal place.

Table A4.19: IHD disease burden (DALY) attributable to PM_{2.5} for adults ≥ 25 years for 40 European countries (individual and total countries), in the EU27 and EEA32 in 2023

Country	DALY (95 % CI: low, high) ^(a)			DALY/10 ⁵ inhabitants ≥ 25 years (95 % CI: low, high) ^(b)		
	mean	low	high	mean	low	high
Austria	9,612	5,066	13,961	140.5	74.1	204.1
Belgium	5,583	2,937	8,128	66.1	34.8	96.3
Bulgaria	23,943	12,910	33,966	482.7	260.3	684.8
Croatia	9,190	4,929	13,091	315.8	169.4	449.9
Cyprus	1,560	842	2,213	164.4	88.7	233.2
Czechia	19,457	10,360	28,002	242.8	129.3	349.4
Denmark	1,204	626	1,774	28.3	14.7	41.7
Estonia	158	82	235	15.8	8.1	23.4
Finland	130	67	193	3.2	1.6	4.7
France	23,838	12,466	34,824	50.9	26.6	74.4
Germany	66,000	34,446	96,687	104.4	54.5	152.9
Greece	31,727	17,358	44,467	398.3	217.9	558.2
Hungary	38,474	20,619	55,059	534.2	286.3	764.5
Ireland	1,397	727	2,055	38.9	20.2	57.2
Italy	90,603	49,112	128,076	197.7	107.2	279.5
Latvia	3,947	2,077	5,748	282.0	148.4	410.7
Lithuania	6,770	3,554	9,883	313.5	164.6	457.8
Luxembourg	156	81	230	32.4	16.8	47.6
Malta	948	504	1,368	225.9	120.0	325.9
Netherlands	6,052	3,148	8,875	46.9	24.4	68.8
Poland	102,030	54,740	145,227	370.7	198.9	527.7
Portugal	4,758	2,481	6,960	61.9	32.3	90.6
Romania	80,053	43,225	113,849	574.3	310.1	816.8
Slovakia	19,011	10,158	27,249	472.5	252.4	677.2
Slovenia	3,250	1,737	4,653	203.3	108.7	291.1
Spain	28,972	15,377	41,874	83.2	44.1	120.2
Sweden	586	304	866	7.8	4.1	11.5
Albania	7,638	4,151	10,711	375.4	204.0	526.5
Andorra	10	<10	15	17.8	9.2	26.3
Bosnia and Herzegovina	11,869	6,523	16,483	457.3	251.3	635.1
Iceland	<1	<1	<1	<1.0	<1.0	<1.0
Kosovo	5,851	3,164	8,251	437.3	236.5	616.7
Liechtenstein	<10	<10	13	29.6	15.3	43.6
Monaco	15	<10	22	55.9	29.2	81.8
Montenegro	1,209	647	1,722	280.5	150.2	399.6
North Macedonia	5,237	2,875	7,276	398.8	219.0	554.1
Norway	561	292	825	14.3	7.5	21.1
San Marino	44	23	63	166.3	88.9	238.2
Serbia	21,926	11,944	30,694	437.7	238.5	612.8
Switzerland	3,296	1,716	4,831	50.0	26.0	73.3
Türkiye (TR)	--	--	--	--	--	--
EU27	579,409	309,930	829,512	175.3	93.8	251.0
EEA32 (no TR)	583,275	311,942	835,181	170.9	91.4	244.7
All countries (no TR)	637,074	341,283	910,418	179.9	96.4	257.1

Notes: (a) Total and national data are rounded to the nearest integer; (b) Total and national data are rounded to one decimal place.

PM_{2.5} (long-term effects) and lung cancer (adults ≥ 25 years)

Table A4.20: LC disease burden (AD) attributable to PM_{2.5} for adults ≥ 25 years for 40 European countries (individual and total countries), in the EU27 and EEA32 in 2023

Country	AD (95 % CI: low, high) ^(a)			AD/10 ⁵ inhabitants ≥ 25 years (95 % CI: low, high) ^(b)		
	mean	low	high	mean	low	high
Austria	321	120	509	4.7	1.8	7.4
Belgium	417	156	664	4.9	1.8	7.9
Bulgaria	515	199	793	10.4	4.0	16.0
Croatia	416	160	643	14.3	5.5	22.1
Cyprus	66	26	102	7.0	2.7	10.8
Czechia	529	201	832	6.6	2.5	10.4
Denmark	110	41	178	2.6	<1.0	4.2
Estonia	<10	<10	<10	<1.0	<1.0	<1.0
Finland	<10	<10	<10	<1.0	<1.0	<1.0
France	1,933	721	3,085	4.1	1.5	6.6
Germany	2,481	921	3,977	3.9	1.5	6.3
Greece	1,338	525	2,035	16.8	6.6	25.6
Hungary	1,071	408	1,672	14.9	5.7	23.2
Ireland	49	18	78	1.4	<1.0	2.2
Italy	5,148	1,999	7,907	11.2	4.4	17.3
Latvia	49	18	78	3.5	1.3	5.6
Lithuania	64	24	103	3.0	1.1	4.8
Luxembourg	<10	<10	12	1.5	<1.0	2.5
Malta	21	<10	33	5.0	1.9	7.9
Netherlands	605	225	968	4.7	1.7	7.5
Poland	3,464	1,337	5,350	12.6	4.9	19.4
Portugal	220	82	351	2.9	1.1	4.6
Romania	1,265	486	1,963	9.1	3.5	14.1
Slovakia	274	104	428	6.8	2.6	10.6
Slovenia	151	58	235	9.4	3.6	14.7
Spain	1,798	677	2,842	5.2	1.9	8.2
Sweden	21	<10	34	<1.0	<1.0	<1.0
Albania	368	145	556	18.1	7.1	27.3
Andorra	<1	<1	<10	1.4	<1.0	2.3
Bosnia and Herzegovina	567	227	848	21.9	8.7	32.7
Iceland	0	0	0	0.0	0.0	0.0
Kosovo	259	101	394	19.3	7.6	29.5
Liechtenstein	<1	<1	<10	3.0	1.1	4.8
Monaco	<10	<1	<10	4.5	1.7	7.2
Montenegro	54	21	84	12.6	4.9	19.4
North Macedonia	276	110	412	21.0	8.4	31.4
Norway	31	11	50	<1.0	<1.0	1.3
San Marino	<10	<1	<10	9.4	3.6	14.7
Serbia	1,048	414	1,581	20.9	8.3	31.6
Switzerland	160	59	256	2.4	<1.0	3.9
Türkiye (TR)	--	--	--	--	--	--
EU27	22,341	8,527	34,886	6.8	2.6	10.6
EEA32 (no TR)	22,532	8,598	35,194	6.6	2.5	10.3
All countries (no TR)	25,109	9,619	39,076	7.1	2.7	11.0

Notes: (a) Total and national data are rounded to the nearest integer; (b) Total and national data are rounded to one decimal place.

Table A4.21: LC disease burden (YLL) attributable to PM_{2.5} for adults ≥ 25 years for 40 European countries (individual and total countries), in the EU27 and EEA32 in 2023

Country	YLL (95 % CI: low, high) ^(a)			YLL/10 ⁵ inhabitants ≥ 25 years (95 % CI: low, high) ^(b)		
	mean	low	high	mean	low	high
Austria	4,859	1,822	7,715	71.0	26.6	112.8
Belgium	6,450	2,410	10,276	76.4	28.5	121.8
Bulgaria	7,360	2,848	11,337	148.4	57.4	228.5
Croatia	5,849	2,254	9,044	201.0	77.5	310.8
Cyprus	981	379	1,512	103.4	40.0	159.3
Czechia	7,155	2,712	11,242	89.3	33.8	140.3
Denmark	1,502	553	2,427	35.3	13.0	57.0
Estonia	60	22	97	5.9	2.2	9.6
Finland	45	17	74	1.1	<1.0	1.8
France	33,046	12,323	52,744	70.6	26.3	112.7
Germany	36,704	13,629	58,831	58.1	21.6	93.1
Greece	19,436	7,624	29,558	244.0	95.7	371.1
Hungary	14,790	5,641	23,097	205.4	78.3	320.7
Ireland	735	271	1,187	20.5	7.5	33.0
Italy	72,583	28,185	111,475	158.4	61.5	243.3
Latvia	627	234	1,000	44.8	16.7	71.4
Lithuania	905	337	1,448	41.9	15.6	67.1
Luxembourg	119	44	192	24.6	9.1	39.7
Malta	312	118	492	74.4	28.1	117.3
Netherlands	8,923	3,316	14,288	69.2	25.7	110.8
Poland	50,300	19,414	77,675	182.8	70.5	282.2
Portugal	3,561	1,328	5,685	46.4	17.3	74.0
Romania	19,059	7,319	29,571	136.7	52.5	212.1
Slovakia	3,985	1,519	6,226	99.0	37.8	154.7
Slovenia	2,283	872	3,559	142.8	54.6	222.7
Spain	29,728	11,194	47,008	85.3	32.1	134.9
Sweden	274	101	445	3.7	1.3	5.9
Albania	5,488	2,166	8,297	269.7	106.5	407.8
Andorra	14	<10	23	24.6	9.1	39.9
Bosnia and Herzegovina	8,099	3,240	12,104	312.1	124.8	466.4
Iceland	<1	<1	<1	<1.0	<1.0	<1.0
Kosovo	3,707	1,450	5,650	277.1	108.4	422.3
Liechtenstein	<10	<10	<10	11.0	4.1	17.7
Monaco	21	<10	34	77.5	28.9	123.8
Montenegro	841	325	1,298	195.2	75.4	301.2
North Macedonia	3,735	1,494	5,581	284.5	113.8	425.0
Norway	438	161	707	11.2	4.1	18.1
San Marino	35	13	54	133.0	50.7	207.5
Serbia	14,950	5,913	22,564	298.5	118.0	450.5
Switzerland	2,489	925	3,986	37.8	14.0	60.5
Türkiye (TR)	--	--	--	--	--	--
EU27	331,630	126,485	518,203	100.3	38.3	156.8
EEA32 (no TR)	334,560	127,573	522,901	98.0	37.4	153.2
All countries (no TR)	371,452	142,188	578,507	104.9	40.1	163.3

Notes: (a) Total and national data are rounded to the nearest integer; (b) Total and national data are rounded to one decimal place.

Table A4.22: LC disease burden (YLD) attributable to PM_{2.5} for adults ≥ 25 years for 40 European countries (individual and total countries), in the EU27 and EEA32 in 2023

Country	YLD (95 % CI: low, high) ^(a)			YLD/10 ⁵ inhabitants ≥ 25 years (95 % CI: low, high) ^(b)		
	mean	low	high	mean	low	high
Austria	44	18	72	<1.0	<1.0	1.0
Belgium	65	27	106	<1.0	<1.0	1.3
Bulgaria	67	29	105	1,4	<1.0	2.1
Croatia	54	23	84	1,8	<1.0	2.9
Cyprus	13	<10	21	1,4	<1.0	2.2
Czechia	70	29	113	<1.0	<1.0	1.4
Denmark	17	<10	29	<1.0	<1.0	<1.0
Estonia	<1	<1	<10	<1.0	<1.0	<1.0
Finland	<1	<1	<1	<1.0	<1.0	<1.0
France	336	138	551	<1.0	<1.0	1.2
Germany	361	147	595	<1.0	<1.0	<1.0
Greece	179	78	275	2,2	<1.0	3.5
Hungary	138	58	221	1,9	<1.0	3.1
Ireland	<10	<10	14	<1.0	<1.0	<1.0
Italy	724	312	1.127	1,6	<1.0	2.5
Latvia	<10	<10	<10	<1.0	<1.0	<1.0
Lithuania	<10	<10	16	<1.0	<1.0	<1.0
Luxembourg	<10	<1.0	<10	<1.0	<1.0	<1.0
Malta	<10	<10	<10	<1.0	<1.0	1.0
Netherlands	98	40	161	<1.0	<1.0	1.2
Poland	482	206	756	1,8	<1.0	2.7
Portugal	34	14	55	<1.0	<1.0	<1.0
Romania	177	75	280	1,3	<1.0	2.0
Slovakia	36	15	58	<1.0	<1.0	1.4
Slovenia	23	<10	37	1,5	<1.0	2.3
Spain	250	104	406	<1.0	<1.0	1.2
Sweden	<10	<10	<10	<1.0	<1.0	<1.0
Albania	33	15	51	1,6	<1.0	2.5
Andorra	<1	<1	<1	<1.0	<1.0	<1.0
Bosnia and Herzegovina	71	32	107	2,7	1,2	4.1
Iceland	0	0	0	0,0	0,0	0,0
Kosovo	33	14	50	2,4	1,1	3.8
Liechtenstein	<1	<1	<1	<1.0	<1.0	<1.0
Monaco	<1	<1	<1	<1.0	<1.0	1.3
Montenegro	<10	<10	10	1,5	<1.0	2.4
North Macedonia	27	12	41	2,1	<1.0	3.1
Norway	<10	<10	<10	<1.0	<1.0	<1.0
San Marino	<1	<1	<1	1,3	<1.0	2.1
Serbia	132	58	201	2,6	1,2	4.0
Switzerland	26	11	44	<1.0	<1.0	<1.0
Türkiye (TR)	--	--	--	--	--	--
EU27	3,201	1,349	5,104	<1.0	<1.0	1.5
EEA32 (no TR)	3,233	1,363	5,158	<1.0	<1.0	1.5
All countries (no TR)	3,537	1,496	5,619	<1.0	<1.0	1.6

Notes: (a) Total and national data are rounded to the nearest integer; (b) Total and national data are rounded to one decimal place.

Table A4.23: LC disease burden (DALY) attributable to PM_{2.5} for adults ≥ 25 years for 40 European countries (individual and total countries), in the EU27 and EEA32 in 2023

Country	DALY (95 % CI: low, high) ^(a)			DALY/10 ⁵ inhabitants ≥ 25 years (95 % CI: low, high) ^(b)		
	mean	low	high	mean	low	high
Austria	4,903	1,840	7,787	71.7	26.9	113.8
Belgium	6,514	2,436	10,382	77.2	28.9	123.0
Bulgaria	7,427	2,877	11,442	149.7	58.0	230.7
Croatia	5,902	2,277	9,128	202.8	78.3	313.7
Cyprus	994	385	1,533	104.8	40.6	161.5
Czechia	7,225	2,741	11,356	90.1	34.2	141.7
Denmark	1,519	560	2,455	35.7	13.2	57.7
Estonia	60	22	98	6.0	2.2	9.8
Finland	46	17	75	1.1	<1.0	1.8
France	33,382	12,461	53,295	71.3	26.6	113.9
Germany	37,065	13,776	59,427	58.6	21.8	94.0
Greece	19,615	7,702	29,833	246.3	96.7	374.5
Hungary	14,928	5,699	23,318	207.3	79.1	323.8
Ireland	744	274	1,201	20.7	7.6	33.4
Italy	73,306	28,497	112,602	160.0	62.2	245.8
Latvia	633	236	1,009	45.2	16.9	72.1
Lithuania	915	341	1,464	42.4	15.8	67.8
Luxembourg	121	45	194	25.0	9.2	40.2
Malta	315	119	497	75.1	28.4	118.3
Netherlands	9,021	3,356	14,449	70.0	26.0	112.1
Poland	50,782	19,620	78,430	184.5	71.3	285.0
Portugal	3,595	1,342	5,740	46.8	17.5	74.7
Romania	19,236	7,395	29,850	138.0	53.1	214.2
Slovakia	4,021	1,534	6,284	99.9	38.1	156.2
Slovenia	2,306	882	3,596	144.3	55.2	225.0
Spain	29,979	11,298	47,414	86.0	32.4	136.1
Sweden	277	102	450	3.7	1.4	6.0
Albania	5,521	2,181	8,348	271.4	107.2	410.3
Andorra	14	<10	23	24.9	9.2	40.3
Bosnia and Herzegovina	8,171	3,272	12,211	314.8	126.1	470.5
Iceland	<1	<1	<1	<1.0	<1.0	<1.0
Kosovo	3,740	1,465	5,701	279.5	109.5	426.1
Liechtenstein	<10	<10	<10	11.5	4.3	18.4
Monaco	21	<10	34	78.3	29.2	125.1
Montenegro	848	328	1,309	196.7	76.1	303.6
North Macedonia	3,762	1,506	5,621	286.5	114.7	428.1
Norway	443	164	716	11.3	4.2	18.3
San Marino	35	13	55	134.3	51.3	209.7
Serbia	15,082	5,971	22,764	301.1	119.2	454.5
Switzerland	2,516	936	4,030	38.2	14.2	61.1
Türkiye (TR)	--	--	--	--	--	--
EU27	334,831	127,835	523,307	101.3	38.7	158.3
EEA32 (no TR)	337,794	128,936	528,059	99.0	37.8	154.7
All countries (no TR)	374,989	143,684	584,125	105.9	40.6	164.9

Notes: (a) Total and national data are rounded to the nearest integer; (b) Total and national data are rounded to one decimal place.

PM_{2.5} (long-term effects) and stroke (adults ≥ 25 years)

Table A4.24: Stroke disease burden (AD) attributable to PM_{2.5} for adults ≥ 25 years for 40 European countries (individual and total countries), in the EU27 and EEA32 in 2023

Country	AD (95 % CI: low, high) ^(a)			AD/10 ⁵ inhabitants ≥ 25 years (95 % CI: low, high) ^(b)		
	mean	low	high	mean	low	high
Austria	411	165	639	6.0	2.4	9.3
Belgium	530	213	828	6.3	2.5	9.8
Bulgaria	3,557	1,488	5,343	71.7	30.0	107.7
Croatia	572	238	863	19.7	8.2	29.7
Cyprus	94	39	141	9.9	4.1	14.8
Czechia	856	349	1,316	10.7	4.4	16.4
Denmark	122	48	194	2.9	1.1	4.6
Estonia	<10	<10	15	<1.0	<1.0	1.5
Finland	<10	<10	12	<1.0	<1.0	<1.0
France	2,336	935	3,657	5.0	2.0	7.8
Germany	3,611	1,439	5,682	5.7	2.3	9.0
Greece	2,743	1,166	4,058	34.4	14.6	50.9
Hungary	1,615	664	2,465	22.4	9.2	34.2
Ireland	51	20	81	1.4	<1.0	2.2
Italy	10,591	4,447	15,854	23.1	9.7	34.6
Latvia	323	130	506	23.1	9.3	36.1
Lithuania	330	132	519	15.3	6.1	24.0
Luxembourg	<10	<10	15	2.0	<1.0	3.2
Malta	31	13	48	7.5	3.0	11.5
Netherlands	698	278	1,096	5.4	2.2	8.5
Poland	5,790	2,414	8,720	21.0	8.8	31.7
Portugal	588	236	921	7.7	3.1	12.0
Romania	6,611	2,740	10,012	47.4	19.7	71.8
Slovakia	545	224	833	13.6	5.6	20.7
Slovenia	297	122	453	18.6	7.7	28.3
Spain	2,257	914	3,496	6.5	2.6	10.0
Sweden	36	14	58	<1.0	<1.0	<1.0
Albania	953	408	1,400	46.8	20.0	68.8
Andorra	<10	<1	<10	1.7	<1.0	2.8
Bosnia and Herzegovina	1,149	500	1,668	44.3	19.3	64.3
Iceland	0	0	0	0.0	0.0	0.0
Kosovo	528	224	783	39.5	16.7	58.5
Liechtenstein	<10	<1	<10	4.0	1.6	6.3
Monaco	<10	<1	<10	5.5	2.2	8.6
Montenegro	106	44	160	24.6	10.3	37.1
North Macedonia	502	218	728	38.3	16.6	55.5
Norway	37	15	58	<1.0	<1.0	1.5
San Marino	<10	<10	<10	19.5	8.0	29.8
Serbia	2,130	914	3,124	42.5	18.2	62.4
Switzerland	211	84	331	3.2	1.3	5.0
Türkiye (TR)	--	--	--	--	--	--
EU27	44,622	18,440	67,825	13.5	5.6	20.5
EEA32 (no TR)	44,871	18,539	68,217	13.1	5.4	20.0
All countries (no TR)	50,248	20,851	76,092	14.2	5.9	21.5

Notes: (a) Total and national data are rounded to the nearest integer; (b) Total and national data are rounded to one decimal place.

Table A4.25: Stroke disease burden (YLL) attributable to PM_{2.5} for adults ≥ 25 years for 40 European countries (individual and total countries), in the EU27 and EEA32 in 2023

Country	YLL (95 % CI: low, high) ^(a)			YLL/10 ⁵ inhabitants ≥ 25 years (95 % CI: low, high) ^(b)		
	mean	low	high	mean	low	high
Austria	3,641	1,467	5,666	53.2	21.5	82.8
Belgium	4,947	1,985	7,728	58.6	23.5	91.6
Bulgaria	31,235	13,065	46,912	629.7	263.4	945.8
Croatia	5,167	2,151	7,796	177.6	73.9	267.9
Cyprus	984	411	1,479	103.7	43.4	155.8
Czechia	8,120	3,314	12,482	101.3	41.3	155.7
Denmark	1,154	455	1,833	27.1	10.7	43.1
Estonia	93	36	149	9.3	3.6	14.8
Finland	66	26	106	1.6	<1.0	2.6
France	22,573	9,039	35,342	48.2	19.3	75.5
Germany	32,266	12,854	50,772	51.0	20.3	80.3
Greece	21,852	9,287	32,335	274.3	116.6	405.9
Hungary	15,164	6,235	23,140	210.6	86.6	321.3
Ireland	511	202	811	14.2	5.6	22.6
Italy	81,798	34,350	122,449	178.5	75.0	267.3
Latvia	2,668	1,069	4,173	190.6	76.4	298.2
Lithuania	2,891	1,155	4,539	133.9	53.5	210.2
Luxembourg	92	36	145	19.0	7.5	30.1
Malta	315	128	486	75.0	30.5	115.7
Netherlands	6,213	2,478	9,765	48.2	19.2	75.7
Poland	62,636	26,119	94,346	227.6	94.9	342.8
Portugal	5,146	2,061	8,059	67.0	26.8	104.9
Romania	60,935	25,260	92,286	437.2	181.2	662.1
Slovakia	6,120	2,515	9,344	152.1	62.5	232.2
Slovenia	2,603	1,073	3,966	162.9	67.1	248.1
Spain	22,008	8,913	34,081	63.2	25.6	97.8
Sweden	308	121	492	4.1	1.6	6.6
Albania	6,622	2,835	9,733	325.5	139.3	478.4
Andorra	<10	<10	16	16.9	6.7	26.9
Bosnia and Herzegovina	10,769	4,682	15,623	414.9	180.4	602.0
Iceland	<1	<1	<1	<1.0	<1.0	<1.0
Kosovo	5,378	2,279	7,977	401.9	170.3	596.2
Liechtenstein	0	0	0	0.0	0.0	0.0
Monaco	14	<10	23	53.0	21.2	83.0
Montenegro	1,077	450	1,621	250.0	104.4	376.2
North Macedonia	4,567	1,986	6,623	347.8	151.2	504.3
Norway	343	136	545	8.8	3.5	13.9
San Marino	40	16	60	150.8	62.0	229.9
Serbia	19,956	8,563	29,272	398.4	171.0	584.4
Switzerland	1,821	726	2,863	27.6	11.0	43.4
Türkiye (TR)	--	--	--	--	--	--
EU27	401,508	165,806	610,682	121.5	50.2	184.7
EEA32 (no TR)	403,672	166,668	614,090	118.3	48.8	179.9
All countries (no TR)	452,106	187,487	685,038	127.6	52.9	193.4

Notes: (a) Total and national data are rounded to the nearest integer; (b) Total and national data are rounded to one decimal place.

Table A4.26: Stroke disease burden (YLD) attributable to PM_{2.5} for adults ≥ 25 years for 40 European countries (individual and total countries), in the EU27 and EEA32 in 2023

Country	YLD (95 % CI: low, high) ^(a)			YLD/10 ⁵ inhabitants ≥ 25 years (95 % CI: low, high) ^(b)		
	mean	low	high	mean	low	high
Austria	1,529	166	2,925	22.3	2.4	42.8
Belgium	754	82	1,450	8.9	<1.0	17.2
Bulgaria	3,929	446	7,176	79.2	9.0	144.7
Croatia	1,961	222	3,603	67.4	7.6	123.8
Cyprus	432	49	789	45.5	5.2	83.1
Czechia	2,081	230	3,918	26.0	2.9	48.9
Denmark	372	39	730	8.7	<1.0	17.2
Estonia	14	<10	29	1.4	<1.0	2.9
Finland	21	<10	43	<1.0	<1.0	1.0
France	6,912	746	13,331	14.8	1.6	28.5
Germany	13,788	1,479	26,766	21.8	2.3	42.3
Greece	4,923	570	8,817	61.8	7.2	110.7
Hungary	3,588	399	6,693	49.8	5.5	92.9
Ireland	126	13	247	3.5	<1.0	6.9
Italy	18,370	2,097	33,404	40.1	4.6	72.9
Latvia	130	14	251	9.3	1.0	17.9
Lithuania	520	56	1,007	24.1	2.6	46.6
Luxembourg	30	<10	60	6.3	<1.0	12.3
Malta	22	<10	41	5.2	<1.0	9.9
Netherlands	2,275	244	4,410	17.6	1.9	34.2
Poland	14,142	1,601	25,928	51.4	5.8	94.2
Portugal	1,443	156	2,783	18.8	2.0	36.2
Romania	4,345	488	8,023	31.2	3.5	57.6
Slovakia	2,076	231	3,875	51.6	5.7	96.3
Slovenia	615	69	1,144	38.5	4.3	71.6
Spain	5,476	599	10,411	15.7	1.7	29.9
Sweden	83	<10	164	1.1	<1.0	2.2
Albania	922	108	1,637	45.3	5.3	80.5
Andorra	<10	<1	<10	5.1	<1.0	10.1
Bosnia and Herzegovina	1,367	163	2,385	52.7	6.3	91.9
Iceland	<1	0	<1	<1.0	0.0	<1.0
Kosovo	623	72	1,119	46.6	5.4	83.7
Liechtenstein	<10	<1	<10	14.4	1.5	28.0
Monaco	<10	<1	<10	16.2	1.7	31.3
Montenegro	130	15	239	30.2	3.4	55.4
North Macedonia	651	77	1,134	49.5	5.9	86.4
Norway	112	12	220	2.9	<1.0	5.6
San Marino	<10	<1	16	33.6	3.7	62.7
Serbia	2,523	296	4,467	50.4	5.9	89.2
Switzerland	959	103	1,859	14.5	1.6	28.2
Türkiye (TR)	--	--	--	--	--	--
EU27	89,956	10,015	168,018	27.2	3.0	50.8
EEA32 (no TR)	91,032	10,130	170,106	26.7	3.0	49.8
All countries (no TR)	97,264	10,862	181,118	27.5	3.1	51.1

Notes: (a) Total and national data are rounded to the nearest integer; (b) Total and national data are rounded to one decimal place.

Table A4.27: Stroke disease burden (DALY) attributable to PM_{2.5} for adults ≥ 25 years for 40 European countries (individual and total countries), in the EU27 and EEA32 in 2023

Country	DALY (95 % CI: low, high) ^(a)			DALY/10 ⁵ inhabitants ≥ 25 years (95 % CI: low, high) ^(b)		
	mean	low	high	mean	low	high
Austria	5,170	1,634	8,591	75.6	23.9	125.6
Belgium	5,701	2,067	9,179	67.5	24.5	108.7
Bulgaria	35,165	13,511	54,088	708.9	272.4	1,090.4
Croatia	7,128	2,373	11,400	245.0	81.5	391.8
Cyprus	1,416	460	2,268	149.2	48.5	238.9
Czechia	10,201	3,544	16,400	127.3	44.2	204.6
Denmark	1,525	495	2,564	35.8	11.6	60.2
Estonia	108	38	178	10.7	3.8	17.7
Finland	88	28	149	2.1	<1.0	3.6
France	29,485	9,785	48,674	63.0	20.9	104.0
Germany	46,054	14,333	77,538	72.8	22.7	122.6
Greece	26,775	9,857	41,152	336.1	123.7	516.6
Hungary	18,752	6,635	29,833	260.4	92.1	414.2
Ireland	637	215	1,059	17.7	6.0	29.5
Italy	100,168	36,447	155,853	218.6	79.5	340.2
Latvia	2,798	1,083	4,424	199.9	77.4	316.1
Lithuania	3,411	1,211	5,546	158.0	56.1	256.9
Luxembourg	122	40	205	25.3	8.2	42.4
Malta	337	130	527	80.2	31.0	125.5
Netherlands	8,488	2,722	14,175	65.8	21.1	109.9
Poland	76,778	27,720	120,274	279.0	100.7	437.0
Portugal	6,589	2,216	10,842	85.8	28.9	141.2
Romania	65,280	25,749	100,309	468.3	184.7	719.6
Slovakia	8,196	2,746	13,220	203.7	68.2	328.5
Slovenia	3,218	1,141	5,109	201.3	71.4	319.7
Spain	27,483	9,512	44,491	78.9	27.3	127.7
Sweden	391	130	655	5.2	1.7	8.7
Albania	7,544	2,942	11,370	370.8	144.6	558.9
Andorra	13	<10	21	22.1	7.2	37.1
Bosnia and Herzegovina	12,137	4,844	18,009	467.6	186.6	693.8
Iceland	<1	<1	<1	<1.0	<1.0	<1.0
Kosovo	6,001	2,351	9,097	448.5	175.7	679.9
Liechtenstein	<10	<1	<10	14.4	1.5	28.0
Monaco	19	<10	31	69.2	22.9	114.3
Montenegro	1,208	465	1,860	280.2	107.8	431.6
North Macedonia	5,218	2,063	7,757	397.4	157.1	590.7
Norway	455	147	765	11.6	3.8	19.6
San Marino	48	17	77	184.4	65.8	292.6
Serbia	22,479	8,858	33,738	448.8	176.9	673.6
Switzerland	2,780	829	4,722	42.2	12.6	71.6
Türkiye (TR)	--	--	--	--	--	--
EU27	491,464	175,821	778,700	148.7	53.2	235.6
EEA32 (no TR)	494,704	176,798	784,196	144.9	51.8	229.7
All countries (no TR)	549,370	198,349	866,156	155.1	56.0	244.6

Notes: (a) Total and national data are rounded to the nearest integer; (b) Total and national data are rounded to one decimal place.

PM_{2.5} (long-term effects) and dementia morbidity (adults ≥ 60 years)

Table A4.28: Dementia disease burden (YLD) attributable to PM_{2.5} for adults ≥ 60 years for 40 European countries (individual and total countries), in the EU27 and EEA32 in 2023

Country	YLD (95 % CI: low, high) ^(a)			YLD/10 ⁵ inhabitants ≥ 60 years (95 % CI: low, high) ^(b)		
	mean	low	high	mean	low	high
Austria	4,570	2,305	6,656	189.5	95.6	276.0
Belgium	5,628	2,823	8,239	183.6	92.1	268.8
Bulgaria	6,636	3,510	9,237	336.1	177.8	467.8
Croatia	3,471	1,825	4,862	299.7	157.5	419.7
Cyprus	1,044	552	1,453	348.8	184.4	485.4
Czechia	6,557	3,361	9,400	233.9	119.9	335.3
Denmark	1,216	596	1,820	77.5	38.0	115.9
Estonia	77	37	116	21.1	10.2	31.9
Finland	66	32	100	4.0	1.9	6.0
France	32,310	16,159	47,437	179.2	89.6	263.1
Germany	35,962	17,865	53,144	145.9	72.5	215.6
Greece	16,097	8,688	21,993	519.7	280.5	710.1
Hungary	7,186	3,720	10,204	284.2	147.1	403.5
Ireland	578	284	864	53.4	26.2	79.7
Italy	78,792	41,872	109,286	429.5	228.3	595.8
Latvia	722	361	1,059	136.1	68.2	199.6
Lithuania	1,133	564	1,669	142.7	71.1	210.2
Luxembourg	132	65	196	96.6	47.6	143.8
Malta	315	161	453	238.6	121.7	343.6
Netherlands	6,728	3,348	9,927	140.7	70.0	207.6
Poland	31,717	16,712	44,311	326.5	172.0	456.1
Portugal	4,289	2,145	6,299	139.1	69.5	204.2
Romania	14,665	7,670	20,628	299.3	156.6	421.0
Slovakia	3,195	1,653	4,540	243.8	126.1	346.5
Slovenia	1,781	924	2,524	298.0	154.7	422.4
Spain	27,904	14,163	40,387	227.4	115.4	329.2
Sweden	425	207	641	15.6	7.6	23.6
Albania	3,474	1,892	4,708	488.7	266.2	662.3
Andorra	14	<10	21	63.8	31.2	95.8
Bosnia and Herzegovina	3,949	2,190	5,273	392.9	217.9	524.6
Iceland	<1	<1	<1	<1.0	<1.0	<1.0
Kosovo	1,853	997	2,538	357.5	192.3	489.7
Liechtenstein	12	<10	17	109.5	54.3	162.1
Monaco	21	10	30	197.0	98.4	289.5
Montenegro	369	195	515	261.8	138.1	365.5
North Macedonia	1,632	906	2,177	365.9	203.1	488.0
Norway	471	231	704	35.5	17.4	53.1
San Marino	39	20	55	369.1	191.3	523.7
Serbia	7,394	4,039	9,995	381.2	208.2	515.3
Switzerland	2,969	1,477	4,382	131.7	65.5	194.5
Türkiye (TR)	--	--	--	--	--	--
EU27	293,195	151,603	417,445	236.5	122.3	336.7
EEA32 (no TR)	296,647	153,317	422,550	232.4	120.1	331.0
All countries (no TR)	315,391	163,573	447,863	238.1	123.5	338.1

Notes: (a) Total and national data are rounded to the nearest integer; (b) Total and national data are rounded to one decimal place.

NO₂ (long-term effects) and all-cause mortality

Table A4.29: All-cause mortality disease burden (AD) attributable to NO₂ for adults ≥ 30 years for 41 European countries (individual and total countries), in the EU27 and EEA32 in 2023

Country	AD (95 % CI: low, high) ^(a)			AD/10 ⁵ inhabitants ≥ 30 years (95 % CI: low, high) ^(b)		
	mean	low	high	mean	low	high
Austria	589	297	1,157	9.4	4.8	18.5
Belgium	615	310	1,210	8.0	4.0	15.7
Bulgaria	838	423	1,646	17.9	9.0	35.2
Croatia	320	162	629	11.9	6.0	23.4
Cyprus	244	124	475	28.5	14.4	55.4
Czechia	441	222	869	5.9	3.0	11.7
Denmark	33	17	65	<1.0	<1.0	1.7
Estonia	<10	<10	12	<1.0	<1.0	1.3
Finland	23	12	45	<1.0	<1.0	1.2
France	3,160	1,596	6,195	7.3	3.7	14.4
Germany	5,553	2,799	10,928	9.5	4.8	18.7
Greece	2,010	1,019	3,910	27.0	13.7	52.5
Hungary	772	390	1,516	11.6	5.9	22.9
Ireland	75	38	148	2.3	1.2	4.5
Italy	9,064	4,583	17,738	21.2	10.7	41.4
Latvia	78	39	153	5.9	3.0	11.7
Lithuania	83	42	164	4.2	2.1	8.2
Luxembourg	14	<10	27	3.2	1.6	6.2
Malta	12	<10	25	3.3	1.7	6.6
Netherlands	1,075	542	2,116	9.2	4.6	18.0
Poland	1,851	933	3,640	7.3	3.7	14.3
Portugal	692	349	1,360	9.7	4.9	19.0
Romania	2,218	1,121	4,341	17.1	8.6	33.4
Slovakia	155	78	306	4.2	2.1	8.3
Slovenia	94	47	184	6.3	3.2	12.4
Spain	4,135	2,091	8,087	12.8	6.5	25.0
Sweden	30	15	59	<1.0	<1.0	<1.0
Albania	271	137	533	15.0	7.6	29.4
Andorra	<10	<10	12	11.2	5.6	21.9
Bosnia and Herzegovina	401	202	787	16.7	8.4	32.8
Iceland	<10	<1	<10	<1.0	<1.0	<1.0
Kosovo	123	62	242	9.9	5.0	19.5
Liechtenstein	<10	<10	<10	4.6	2.3	9.0
Monaco	<10	<10	<10	16.8	8.5	33.1
Montenegro	67	34	132	17.0	8.6	33.6
North Macedonia	92	47	182	7.7	3.9	15.2
Norway	64	32	126	1.8	<1.0	3.6
San Marino	<10	<10	<10	4.7	2.4	9.3
Serbia	1,041	525	2,042	22.4	11.3	44.0
Switzerland	409	206	806	6.8	3.4	13.4
Türkiye	19,400	9,887	37,376	41.2	21.0	79.5
EU27	34,180	17,264	67,004	11.2	5.6	21.9
EEA32	54,055	27,390	105,316	14.9	7.6	29.0
All countries	56,061	28,402	109,256	15.0	7.6	29.2

Notes: (a) Total and national data are rounded to the nearest integer; (b) Total and national data are rounded to one decimal place.

Table A4.30: All-cause mortality disease burden (YLL) attributable to NO₂ for adults ≥ 30 years for 41 European countries (individual and total countries), in the EU27 and EEA32 in 2023

Country	YLL (95 % CI: low, high) ^(a)			YLL/10 ⁵ inhabitants ≥ 30 years (95 % CI: low, high) ^(b)		
	mean	low	high	mean	low	high
Austria	5,850	2,952	11,494	93.6	47.2	184.0
Belgium	6,356	3,204	12,505	82.5	41.6	162.3
Bulgaria	9,069	4,577	17,802	193.8	97.8	380.4
Croatia	3,203	1,616	6,293	119.1	60.1	234.0
Cyprus	2,622	1,329	5,104	306.2	155.2	596.1
Czechia	4,806	2,422	9,464	64.6	32.5	127.1
Denmark	344	173	678	8.9	4.5	17.6
Estonia	65	33	128	7.0	3.5	13.8
Finland	224	113	442	5.9	3.0	11.7
France	34,483	17,415	67,611	80.0	40.4	156.8
Germany	55,562	28,008	109,348	95.1	48.0	187.2
Greece	19,188	9,730	37,327	257.8	130.7	501.5
Hungary	8,296	4,188	16,279	125.1	63.1	245.4
Ireland	855	431	1,684	26.0	13.1	51.3
Italy	85,829	43,391	167,952	200.4	101.3	392.2
Latvia	851	429	1,676	65.0	32.7	128.0
Lithuania	929	468	1,832	46.5	23.4	91.6
Luxembourg	152	77	301	35.2	17.7	69.5
Malta	139	70	274	37.2	18.7	73.4
Netherlands	11,103	5,595	21,864	94.6	47.7	186.3
Poland	22,155	11,170	43,582	87.2	44.0	171.6
Portugal	7,134	3,599	14,014	99.7	50.3	195.9
Romania	25,235	12,757	49,386	194.4	98.3	380.5
Slovakia	1,888	951	3,725	50.9	25.6	100.4
Slovenia	1,011	509	1,991	68.0	34.3	133.9
Spain	43,553	22,025	85,175	134.5	68.0	263.0
Sweden	290	146	573	4.2	2.1	8.4
Albania	2,737	1,381	5,378	151.2	76.3	297.0
Andorra	65	33	128	121.7	61.4	239.5
Bosnia and Herzegovina	4,140	2,089	8,130	172.3	86.9	338.3
Iceland	<10	<10	18	3.8	1.9	7.5
Kosovo	1,371	690	2,704	110.6	55.7	218.2
Liechtenstein	15	<10	30	55.4	27.9	109.4
Monaco	46	23	90	183.7	92.6	361.4
Montenegro	725	365	1,428	185.1	93.3	364.5
North Macedonia	867	437	1,707	72.2	36.4	142.2
Norway	643	324	1,268	18.1	9.1	35.8
San Marino	11	<10	22	44.8	22.5	88.5
Serbia	10,748	5,426	21,090	231.7	117.0	454.7
Switzerland	4,109	2,070	8,091	68.1	34.3	134.0
Türkiye	264,391	134,740	509,384	562.1	286.5	1083.0
EU27	351,191	177,376	688,504	114.9	58.0	225.2
EEA32	620,358	314,522	1,207,295	171.1	86.8	333.0
All countries	641,068	324,973	1,247,971	171.3	86.8	333.4

Notes: (a) Total and national data are rounded to the nearest integer; (b) Total and national data are rounded to one decimal place.

NO₂ (long-term effects) and total cause-specific disease burden (five causes)

Table A4.31: Total cause-specific disease burden (DALY) attributable to NO₂ (asthma in children/adolescents, asthma in adults, COPD, diabetes mellitus and stroke) for 41 European countries (individual and total countries), in the EU27 and EEA32 in 2023

Country	DALY (95 % CI: low, high) ^(a)		
	mean	low	high
Austria	7,279	3,223	11,211
Belgium	6,465	2,582	10,299
Bulgaria	8,790	2,967	14,437
Croatia	5,039	2,298	7,685
Cyprus	3,630	1,697	5,400
Czechia	5,701	2,468	8,923
Denmark	446	181	710
Estonia	57	23	92
Finland	252	99	411
France	34,115	14,336	53,353
Germany	66,170	27,944	104,113
Greece	18,287	7,690	28,090
Hungary	9,489	3,940	14,861
Ireland	944	365	1,512
Italy	98,199	42,063	151,520
Latvia	840	284	1,387
Lithuania	884	333	1,428
Luxembourg	170	70	270
Malta	186	79	295
Netherlands	12,812	5,271	20,272
Poland	21,085	8,581	33,316
Portugal	8,618	3,655	13,508
Romania	22,353	7,588	36,337
Slovakia	1,474	586	2,377
Slovenia	986	390	1,582
Spain	41,855	18,007	64,827
Sweden	339	137	544
Albania	2,270	915	3,594
Andorra	65	27	103
Bosnia and Herzegovina	3,969	1,596	6,275
Iceland	12	<10	20
Kosovo	1,309	516	2,102
Liechtenstein	10	<10	15
Monaco	46	19	73
Montenegro	561	223	895
North Macedonia	751	302	1,197
Norway	818	323	1,311
San Marino	13	<10	21
Serbia	10,263	4,137	16,191
Switzerland	4,495	1,929	7,046
Türkiye	356,386	158,853	529,005
EU27	376,464	156,857	588,758
EEA32	738,184	317,971	1,126,156
All countries	757,432	325,711	1,156,606

Notes: (a) Total and national data are rounded to the nearest integer; (b) Total and national data are rounded to one decimal place.

NO₂ (long-term effects) and asthma (adults ≥ 19 years)

Table A4.32: Asthma disease burden (AD) attributable to NO₂ for adults ≥ 19 years for 41 European countries (individual and total countries), in the EU27 and EEA32 in 2023

Country	AD (95 % CI: low, high) ^(a)			AD/10 ⁵ inhabitants ≥ 19 years (95 % CI: low, high) ^(b)		
	mean	Low	high	mean	low	high
Austria	<10	<1	<10	<1.0	<1.0	<1.0
Belgium	<10	<1	<10	<1.0	<1.0	<1.0
Bulgaria	<10	<1	<10	<1.0	<1.0	<1.0
Croatia	<10	<1	<10	<1.0	<1.0	<1.0
Cyprus	<10	<1	<10	<1.0	<1.0	<1.0
Czechia	<10	<1	<10	<1.0	<1.0	<1.0
Denmark	<1	<1	<1	<1.0	<1.0	<1.0
Estonia	<1	<1	<1	<1.0	<1.0	<1.0
Finland	<1	<1	<1	<1.0	<1.0	<1.0
France	19	<10	36	<1.0	<1.0	<1.0
Germany	35	<10	68	<1.0	<1.0	<1.0
Greece	<10	<1.0	<10	<1.0	<1.0	<1.0
Hungary	<10	<1.0	<10	<1.0	<1.0	<1.0
Ireland	<1	<1	<10	<1.0	<1.0	<1.0
Italy	31	<10	58	<1.0	<1.0	<1.0
Latvia	<1	<1	<1	<1.0	<1.0	<1.0
Lithuania	<1	<1	<1	<1.0	<1.0	<1.0
Luxembourg	<1	<1	<1	<1.0	<1.0	<1.0
Malta	<1	<1	<1	<1.0	<1.0	<1.0
Netherlands	<10	<1	13	<1.0	<1.0	<1.0
Poland	13	<10	24	<1.0	<1.0	<1.0
Portugal	<10	<1	<10	<1.0	<1.0	<1.0
Romania	12	<10	22	<1.0	<1.0	<1.0
Slovakia	<1	<1	<10	<1.0	<1.0	<1.0
Slovenia	<1	<1	<10	<1.0	<1.0	<1.0
Spain	40	<10	76	<1.0	<1.0	<1.0
Sweden	<1	<1	<1	<1.0	<1.0	<1.0
Albania	<10	<1	<10	<1.0	<1.0	<1.0
Andorra	<1	<1	<1	<1.0	<1.0	<1.0
Bosnia and Herzegovina	<10	<1	<10	<1.0	<1.0	<1.0
Iceland	<1	0	<1	<1.0	<1.0	<1.0
Kosovo	<10	<1	<10	<1.0	<1.0	<1.0
Liechtenstein	<1	0	<1	<1.0	0	<1.0
Monaco	<1	<1	<1	<1.0	<1.0	<1.0
Montenegro	<1	<1	<10	<1.0	<1.0	<1.0
North Macedonia	<1	<1	<10	<1.0	<1.0	<1.0
Norway	<1	<1	<10	<1.0	<1.0	<1.0
San Marino	<1	0	<1	<1.0	0	<1.0
Serbia	12	<10	23	<1.0	<1.0	<1.0
Switzerland	<10	<1	<10	<1.0	<1.0	<1.0
Türkiye	270	32	478	<1.0	<1.0	<1.0
EU27	187	20	358	<1.0	<1.0	<1.0
EEA32	461	52	842	<1.0	<1.0	<1.0
All countries	484	55	886	<1.0	<1.0	<1.0

Notes: (a) Total and national data are rounded to the nearest integer; (b) Total and national data are rounded to one decimal place.

Table A4.33: Asthma disease burden (YLL) attributable to NO₂ for adults ≥ 19 years for 41 European countries (individual and total countries), in the EU27 and EEA32 in 2023

Country	YLL (95 % CI: low, high) ^(a)			YLL/10 ⁵ inhabitants ≥ 19 years (95 % CI: low, high) ^(b)		
	mean	low	high	mean	low	high
Austria	31	<10	60	<1.0	<1.0	<1.0
Belgium	45	<10	87	<1.0	<1.0	<1.0
Bulgaria	11	<10	22	<1.0	<1.0	<1.0
Croatia	26	<10	49	<1.0	<1.0	1.6
Cyprus	33	<10	60	3.2	<1.0	5.8
Czechia	48	<10	93	<1.0	<1.0	1.1
Denmark	<10	<1	<10	<1.0	<1.0	<1.0
Estonia	<1	<1	<10	<1.0	<1.0	<1.0
Finland	<10	<1	<10	<1.0	<1.0	<1.0
France	248	27	474	<1.0	<1.0	<1.0
Germany	426	46	826	<1.0	<1.0	1.2
Greece	40	<10	73	<1.0	<1.0	<1.0
Hungary	37	<10	71	<1.0	<1.0	<1.0
Ireland	11	<10	22	<1.0	<1.0	<1.0
Italy	337	37	637	<1.0	<1.0	1.3
Latvia	<10	<1	<10	<1.0	<1.0	<1.0
Lithuania	<10	<1	<10	<1.0	<1.0	<1.0
Luxembourg	<1	<1	<1	<1.0	<1.0	<1.0
Malta	<1	<1	<10	<1.0	<1.0	<1.0
Netherlands	71	<10	138	<1.0	<1.0	1.0
Poland	147	16	284	<1.0	<1.0	1.0
Portugal	41	<10	80	<1.0	<1.0	1.0
Romania	119	13	225	<1.0	<1.0	1.5
Slovakia	<10	<10	19	<1.0	<1.0	<1.0
Slovenia	<10	<1	<10	<1.0	<1.0	<1.0
Spain	357	39	674	<1.0	<1.0	1.8
Sweden	<10	<1	<10	<1.0	<1.0	<1.0
Albania	27	<10	51	1.2	<1.0	2.3
Andorra	<1	<1	<1	<1.0	<1.0	1.4
Bosnia and Herzegovina	47	<10	90	1.7	<1.0	3.2
Iceland	<1	<1	<1	<1.0	<1.0	<1.0
Kosovo	16	<10	31	1.1	<1.0	2.2
Liechtenstein	<1	<1	<1	1.2	<1.0	2.3
Monaco	<1	<1	<1	1.1	<1.0	2.2
Montenegro	<10	<1	13	1.4	<1.0	2.8
North Macedonia	<10	<1	17	<1.0	<1.0	1.2
Norway	<10	<1	12	<1.0	<1.0	<1.0
San Marino	<1	<1	<1	<1.0	<1.0	<1.0
Serbia	121	13	232	2.2	<1.0	4.3
Switzerland	25	<10	49	<1.0	<1.0	<1.0
Türkiye	2,870	337	5,071	4.7	<1.0	8.3
EU27	2,056	224	3,929	<1.0	<1.0	1.1
EEA32	4,957	565	9,063	1.1	<1.0	2.1
All countries	5,184	589	9,499	1.2	<1.0	2.1

Notes: (a) Total and national data are rounded to the nearest integer; (b) Total and national data are rounded to one decimal place.

Table A4.34: Asthma disease burden (YLD) attributable to NO₂ for adults ≥ 19 years for 41 European countries (individual and total countries), in the EU27 and EEA32 in 2023

Country	YLD (95 % CI: low, high) ^(a)			YLD/10 ⁵ inhabitants ≥ 19 years (95 % CI: low, high) ^(b)		
	mean	low	high	mean	low	high
Austria	401	43	772	5.4	<1.0	10.4
Belgium	567	61	1,098	6.1	<1.0	11.9
Bulgaria	188	20	361	3.6	<1.0	6.8
Croatia	169	18	325	5.4	<1.0	10.3
Cyprus	213	24	392	20.6	2.3	37.9
Czechia	300	32	585	3.5	<1.0	6.8
Denmark	36	<10	72	<1.0	<1.0	1.5
Estonia	<10	<1	<10	<1.0	<1.0	<1.0
Finland	31	<10	62	<1.0	<1.0	1.4
France	3,928	428	7,493	7.6	<1.0	14.6
Germany	5,609	602	10,882	8.2	<1.0	15.9
Greece	811	91	1,492	9.4	1.1	17.4
Hungary	434	47	832	5.6	<1.0	10.6
Ireland	116	12	227	2.9	<1.0	5.7
Italy	5,638	620	10,657	11.4	1.3	21.6
Latvia	30	<10	59	2.0	<1.0	3.9
Lithuania	28	<10	54	1.2	<1.0	2.3
Luxembourg	19	<10	38	3.6	<1.0	7.1
Malta	16	<10	31	3.5	<1.0	6.8
Netherlands	1,130	121	2,198	7.9	<1.0	15.4
Poland	1,054	113	2,040	3.6	<1.0	6.9
Portugal	572	62	1,101	6.9	<1.0	13.2
Romania	388	43	734	2.6	<1.0	4.9
Slovakia	100	11	196	2.3	<1.0	4.5
Slovenia	72	<10	140	4.2	<1.0	8.1
Spain	2,830	312	5,335	7.5	<1.0	14.1
Sweden	38	<10	74	<1.0	<1.0	<1.0
Albania	98	11	188	4.3	<1.0	8.3
Andorra	7	<1	15	11.8	1.3	22.9
Bosnia and Herzegovina	151	16	289	5.4	<1.0	10.3
Iceland	<10	<1	<10	<1.0	<1.0	1.3
Kosovo	47	<10	92	3.2	<1.0	6.4
Liechtenstein	<10	<1	<10	3.4	<1.0	6.7
Monaco	<10	<1	10	17.8	1.9	34.4
Montenegro	23	<10	44	4.7	<1.0	9.2
North Macedonia	32	<10	63	2.3	<1.0	4.4
Norway	97	10	191	2.3	<1.0	4.4
San Marino	<1	<1	<10	2.6	<1.0	5.2
Serbia	390	42	747	7.2	<1.0	13.8
Switzerland	336	36	654	4.7	<1.0	9.2
Türkiye	39,779	4,678	70,298	64.7	7.6	114.4
EU27	24,722	2,692	47,255	6.9	<1.0	13.2
EEA32	64,937	7,417	118,404	15.0	1.7	27.4
All countries	65,691	7,498	119,853	14.7	1.7	26.9

Notes: (a) Total and national data are rounded to the nearest integer; (b) Total and national data are rounded to one decimal place.

Table A4.35: Asthma disease burden (DALY) attributable to NO₂ for adults ≥ 19 years for 41 European countries (individual and total countries), in the EU27 and EEA32 in 2023

Country	DALY (95 % CI: low, high) ^(a)			DALY/10 ⁵ inhabitants ≥ 19 years (95 % CI: low, high) ^(b)		
	mean	low	high	mean	low	high
Austria	432	47	831	5.8	<1.0	11.2
Belgium	612	66	1,186	6.6	<1.0	12.8
Bulgaria	200	22	383	3.8	<1.0	7.2
Croatia	194	21	374	6.2	<1.0	11.9
Cyprus	246	28	453	23.7	2.7	43.8
Czechia	348	37	678	4.0	<1.0	7.9
Denmark	39	<10	77	<1.0	<1.0	1.6
Estonia	<10	<1	<10	<1.0	<1.0	<1.0
Finland	32	<10	64	<1.0	<1.0	1.4
France	4,176	456	7,966	8.1	<1.0	15.5
Germany	6,034	648	11,707	8.8	<1.0	17.1
Greece	850	96	1,565	9.9	1.1	18.2
Hungary	471	51	903	6.0	<1.0	11.5
Ireland	128	14	249	3.2	<1.0	6.3
Italy	5,976	657	11,295	12.1	1.3	22.9
Latvia	34	<10	67	2.3	<1.0	4.4
Lithuania	32	<10	62	1.4	<1.0	2.7
Luxembourg	19	<10	38	3.7	<1.0	7.2
Malta	17	<10	33	3.6	<1.0	7.2
Netherlands	1,201	129	2,336	8.4	<1.0	16.4
Poland	1,201	129	2,324	4.0	<1.0	7.8
Portugal	614	66	1,181	7.4	<1.0	14.2
Romania	507	56	959	3.4	<1.0	6.3
Slovakia	110	12	215	2.5	<1.0	4.9
Slovenia	75	<10	146	4.4	<1.0	8.5
Spain	3,187	352	6,008	8.5	<1.0	15.9
Sweden	39	<10	77	<1.0	<1.0	<1.0
Albania	124	13	239	5.5	<1.0	10.5
Andorra	<10	<1	15	12.5	1.3	24.3
Bosnia and Herzegovina	198	21	379	7.0	<1.0	13.5
Iceland	<10	<1	<10	<1.0	<1.0	1.4
Kosovo	63	<10	123	4.3	<1.0	8.5
Liechtenstein	<10	<1	<10	4.6	<1.0	9.1
Monaco	<10	<1	11	18.9	2.0	36.6
Montenegro	29	<10	57	6.1	<1.0	12.0
North Macedonia	41	<10	80	2.9	<1.0	5.6
Norway	104	11	203	2.4	<1.0	4.7
San Marino	<1	<1	<10	2.8	<1.0	5.5
Serbia	512	56	979	9.4	1.0	18.1
Switzerland	361	39	703	5.1	<1.0	9.8
Türkiye	42,648	5,016	75,369	69.4	8.2	122.7
EU27	26,778	2,915	51,184	7.5	<1.0	14.3
EEA32	69,894	7,981	127,466	16.2	1.8	29.5
All countries	70,876	8,087	129,352	15.9	1.8	29.0

Notes: (a) Total and national data are rounded to the nearest integer; (b) Total and national data are rounded to one decimal place.

NO₂ (long-term effects) and asthma (children and adolescents < 19 years)

Table A4.36: Asthma disease burden (AD) attributable to NO₂ for children and adolescents < 19 years for 41 European countries (individual and total countries), in the EU27 and EEA32 in 2023

Country	AD (95 % CI: low, high) ^(a)			AD/10 ⁵ inhabitants < 19 years (95 % CI: low, high) ^(b)		
	mean	Low	high	mean	low	high
Austria	<1	<1	<1	<1.0	<1.0	<1.0
Belgium	0	0	0	0	0	0
Bulgaria	0	0	0	0	0	0
Croatia	0	0	0	0	0	0
Cyprus	0	0	0	0	0	0
Czechia	0	0	0	0	0	0
Denmark	<1	<1	<1	<1.0	<1.0	<1.0
Estonia	<1	<1	<1	<1.0	<1.0	<1.0
Finland	0	0	0	0	0	0
France	<1	<1	<1	<1.0	<1.0	<1.0
Germany	<1	<1	<1	<1.0	<1.0	<1.0
Greece	0	0	0	0	0	0
Hungary	<1	<1	<1	<1.0	<1.0	<1.0
Ireland	<1	<1	<1	<1.0	<1.0	<1.0
Italy	<1	<1	<1	<1.0	<1.0	<1.0
Latvia	<1	<1	<1	<1.0	<1.0	<1.0
Lithuania	0	0	0	0	0	0
Luxembourg	0	0	0	0	0	0
Malta	0	0	<1	0	0	<1.0
Netherlands	<1	<1	<1	<1.0	<1.0	<1.0
Poland	0	0	0	0	0	0
Portugal	<1	<1	<1	<1.0	<1.0	<1.0
Romania	0	0	0	0	0	0
Slovakia	<1	<1	<1	<1.0	<1.0	<1.0
Slovenia	0	0	0	0	0	0
Spain	<1	<1	<1	<1.0	<1.0	<1.0
Sweden	0	0	0	0	0	0
Albania	0	0	0	0	0	0
Andorra	0	0	0	0	0	0
Bosnia and Herzegovina	0	0	0	0	0	0
Iceland	0	0	0	0	0	0
Kosovo	0	0	0	0	0	0
Liechtenstein	0	0	0	0	0	0
Monaco	0	0	0	0	0	0
Montenegro	0	0	0	0	0	0
North Macedonia	0	0	0	0	0	0
Norway	0	0	0	0	0	0
San Marino	0	0	0	0	0	0
Serbia	0	0	0	0	0	0
Switzerland	<1	<1	<1	<1.0	<1.0	<1.0
Türkiye	<10	<1	<10	<1.0	<1.0	<1.0
EU27	<10	<1	<10	<1.0	<1.0	<1.0
EEA32	<10	<10	<10	<1.0	<1.0	<1.0
All countries	<10	<10	<10	<1.0	<1.0	<1.0

Notes: (a) Total and national data are rounded to the nearest integer; (b) Total and national data are rounded to one decimal place.

Table A4.37: Asthma disease burden (YLL) attributable to NO₂ for children and adolescents < 19 years for 41 European countries (individual and total countries), in the EU27 and EEA32 in 2023

Country	YLL (95 % CI: low, high) ^(a)			YLL/10 ⁵ inhabitants < 19 years (95 % CI: low, high) ^(b)		
	mean	low	high	mean	low	high
Austria	<10	<1	<10	<1.0	<1.0	<1.0
Belgium	0	0	0	0	0	0
Bulgaria	0	0	0	0	0	0
Croatia	0	0	0	0	0	0
Cyprus	0	0	0	0	0	0
Czechia	0	0	0	0	0	0
Denmark	<1	<1	<1	<1.0	<1.0	<1.0
Estonia	<1	<1	<1	<1.0	<1.0	<1.0
Finland	0	0	0	0	0	0
France	26	11	35	<1.0	<1.0	<1.0
Germany	10	<10	14	<1.0	<1.0	<1.0
Greece	0	0	0	0	0	0
Hungary	<10	<1	<10	<1.0	<1.0	<1.0
Ireland	<1	<1	<10	<1.0	<1.0	<1.0
Italy	28	12	38	<1.0	<1.0	<1.0
Latvia	<10	<1	<10	<1.0	<1.0	<1.0
Lithuania	0	0	0	0	0	0
Luxembourg	0	0	0	0	0	0
Malta	<1	<1	<1	<1.0	<1.0	<1.0
Netherlands	<10	<10	13	<1.0	<1.0	<1.0
Poland	0	0	0	0	0	0
Portugal	<10	<10	<10	<1.0	<1.0	<1.0
Romania	0	0	0	0	0	0
Slovakia	<1	<1	<10	<1.0	<1.0	<1.0
Slovenia	0	0	0	0	0	0
Spain	<10	<10	<10	<1.0	<1.0	<1.0
Sweden	0	0	0	0	0	0
Albania	0	0	0	0	0	0
Andorra	<1	<1	<1	<1.0	<1.0	<1.0
Bosnia and Herzegovina	0	0	0	0	0	0
Iceland	<1	<1	<1	<1.0	<1.0	<1.0
Kosovo	0	0	0	0	0	0
Liechtenstein	0	0	0	0	0	0
Monaco	<1	<1	<1	<1.0	<1.0	<1.0
Montenegro	0	0	0	0	0	0
North Macedonia	0	0	0	0	0	0
Norway	0	0	0	0	0	0
San Marino	<1	<1	<1	<1.0	<1.0	<1.0
Serbia	0	0	0	0	0	0
Switzerland	<10	<10	<10	<1.0	<1.0	<1.0
Türkiye	120	54	156	<1.0	<1.0	<1.0
EU27	95	40	129	<1.0	<1.0	<1.0
EEA32	219	95	292	<1.0	<1.0	<1.0
All countries	220	95	292	<1.0	<1.0	<1.0

Notes: (a) Total and national data are rounded to the nearest integer; (b) Total and national data are rounded to one decimal place.

Table A4.38: Asthma disease burden (YLD) attributable to NO₂ for children and adolescents < 19 years for 41 European countries (individual and total countries), in the EU27 and EEA32 in 2023

Country	YLD (95 % CI: low, high) ^(a)			YLD/10 ⁵ inhabitants < 19 years (95 % CI: low, high) ^(b)		
	mean	low	high	mean	low	high
Austria	159	67	216	9.5	4.0	13.0
Belgium	218	91	298	8.8	3.7	12.0
Bulgaria	116	49	158	10.0	4.2	13.6
Croatia	68	28	93	9.7	4.1	13.2
Cyprus	99	43	132	39.9	17.3	53.2
Czechia	109	45	149	5.0	2.1	6.8
Denmark	12	<10	17	<1.0	<1.0	1.4
Estonia	<10	<1	<10	<1.0	<1.0	<1.0
Finland	<10	<10	10	<1.0	<1.0	<1.0
France	1,447	609	1,960	9.9	4.1	13.3
Germany	1,226	510	1,675	8.3	3.5	11.4
Greece	346	150	461	19.1	8.3	25.4
Hungary	138	58	187	7.7	3.2	10.5
Ireland	66	27	90	5.1	2.1	6.9
Italy	1,512	641	2,039	15.7	6.6	21.1
Latvia	13	<10	18	3.5	1.4	4.7
Lithuania	14	<10	19	2.6	1.1	3.5
Luxembourg	<10	<10	12	6.6	2.7	9.0
Malta	<10	<10	<10	5.7	2.4	7.9
Netherlands	409	169	559	11.6	4.8	15.9
Poland	1,254	522	1,712	17.7	7.4	24.2
Portugal	255	107	347	15.1	6.3	20.5
Romania	512	217	691	13.0	5.5	17.6
Slovakia	38	16	52	3.5	1.4	4.8
Slovenia	35	15	48	8.8	3.7	12.0
Spain	1,111	472	1,497	13.5	5.8	18.2
Sweden	18	<10	25	<1.0	<1.0	1.1
Albania	39	16	53	6.6	2.8	9.0
Andorra	<10	<10	<10	15.3	6.3	20.9
Bosnia and Herzegovina	58	24	79	9.2	3.9	12.5
Iceland	<1	<1	<1	<1.0	<1.0	1.1
Kosovo	18	<10	25	5.6	2.3	7.7
Liechtenstein	<1	<1	<1	6.0	2.5	8.3
Monaco	<10	<1	<10	23.0	9.6	31.4
Montenegro	14	<10	20	10.2	4.2	14.0
North Macedonia	20	<10	28	5.2	2.2	7.1
Norway	40	16	55	3.4	1.4	4.7
San Marino	<1	<1	<1	3.7	1.5	5.1
Serbia	151	63	205	12.3	5.2	16.7
Switzerland	168	70	230	10.1	4.2	13.8
Türkiye	13,421	6,011	17,508	56.3	25.2	73.5
EU27	9,200	3,868	12,474	10.9	4.6	14.8
EEA32	22,830	9,966	30,269	20.5	9.0	27.2
All countries	23,136	10,094	30,686	20.2	8.8	26.8

Notes: (a) Total and national data are rounded to the nearest integer; (b) Total and national data are rounded to one decimal place.

Table A4.39: Asthma disease burden (DALY) attributable to NO₂ for children and adolescents < 19 years for 41 European countries (individual and total countries), in the EU27 and EEA32 in 2023

Country	DALY (95 % CI: low, high) ^(a)			DALY/10 ⁵ inhabitants < 19 years (95 % CI: low, high) ^(b)		
	mean	low	high	mean	low	high
Austria	161	67	219	9.7	4.0	13.1
Belgium	218	91	298	8.8	3.7	12.0
Bulgaria	116	49	158	10.0	4.2	13.6
Croatia	68	28	93	9.7	4.1	13.2
Cyprus	99	43	132	39.9	17.3	53.2
Czechia	109	45	149	5.0	2.1	6.8
Denmark	13	<10	17	1.0	<1.0	1.4
Estonia	<10	<1.0	<10	<1.0	<1.0	<1.0
Finland	<10	<10	10	<1.0	<1.0	<1.0
France	1,472	620	1,994	10.0	4.2	13.6
Germany	1,237	514	1,689	8.4	3.5	11.5
Greece	346	150	461	19.1	8.3	25.4
Hungary	139	58	189	7.8	3.3	10.6
Ireland	66	28	91	5.1	2.1	7.0
Italy	1,540	653	2,077	15.9	6.8	21.5
Latvia	14	<10	20	3.8	1.6	5.2
Lithuania	14	<10	19	2.6	1.1	3.5
Luxembourg	<10	<10	12	6.6	2.7	9.0
Malta	<10	<10	<10	5.8	2.4	7.9
Netherlands	419	174	573	11.9	4.9	16.2
Poland	1,254	522	1,712	17.7	7.4	24.2
Portugal	262	110	357	15.5	6.5	21.1
Romania	512	217	691	13.0	5.5	17.6
Slovakia	39	16	53	3.6	1.5	4.9
Slovenia	35	15	48	8.8	3.7	12.0
Spain	1,118	475	1,505	13.6	5.8	18.4
Sweden	18	<10	25	<1.0	<1.0	1.1
Albania	39	16	53	6.6	2.8	9.0
Andorra	<10	<10	<10	15.6	6.5	21.3
Bosnia and Herzegovina	58	24	79	9.2	3.9	12.5
Iceland	<1	<1	<10	<1.0	<1.0	1.1
Kosovo	18	<10	25	5.6	2.3	7.7
Liechtenstein	<1	<1	<1	6.0	2.5	8.3
Monaco	<10	<1	<10	23.4	9.8	32.0
Montenegro	14	<10	20	10.2	4.2	14.0
North Macedonia	20	<10	28	5.2	2.2	7.1
Norway	40	16	55	3.4	1.4	4.7
San Marino	<1	<1	<1	3.7	1.5	5.1
Serbia	151	63	205	12.3	5.2	16.7
Switzerland	173	72	237	10.4	4.3	14.2
Türkiye	13,541	6,064	17,664	56.8	25.5	74.2
EU27	9,295	3,908	12,603	11.0	4.6	14.9
EEA32	23,049	10,061	30,560	20.7	9.1	27.5
All countries	23,356	10,189	30,977	20.4	8.9	27.1

Notes: (a) Total and national data are rounded to the nearest integer; (b) Total and national data are rounded to one decimal place.

NO₂ (long-term effects) and diabetes mellitus (adults ≥ 25 years)

Table A4.40: DM disease burden (AD) attributable to NO₂ for adults ≥ 25 years for 41 European countries (individual and total countries), in the EU27 and EEA32 in 2023

Country	AD (95 % CI: low, high) ^(a)			AD/10 ⁵ inhabitants ≥ 25 years (95 % CI: low, high) ^(b)		
	mean	low	high	mean	low	high
Austria	237	123	341	3.5	1.8	5.0
Belgium	83	43	121	<1.0	<1.0	1.4
Bulgaria	118	61	169	2.4	1.2	3.4
Croatia	263	137	379	9.0	4.7	13.0
Cyprus	146	80	201	15.4	8.4	21.2
Czechia	205	105	299	2.6	1.3	3.7
Denmark	<10	<10	12	<1.0	<1.0	<1.0
Estonia	<10	<1	<10	<1.0	<1.0	<1.0
Finland	<10	<10	<10	<1.0	<1.0	<1.0
France	642	337	916	1.4	<1.0	2.0
Germany	1,479	761	2,148	2.3	1.2	3.4
Greece	406	221	558	5.1	2.8	7.0
Hungary	191	100	274	2.7	1.4	3.8
Ireland	15	<10	22	<1.0	<1.0	<1.0
Italy	3,403	1,802	4,811	7.4	3.9	10.5
Latvia	18	<10	26	1.3	<1.0	1.9
Lithuania	16	<10	23	<1.0	<1.0	1.1
Luxembourg	<10	<10	<10	<1.0	<1.0	<1.0
Malta	<10	<10	<10	1.5	<1.0	2.2
Netherlands	198	102	289	1.5	<1.0	2.2
Poland	469	242	680	1.7	<1.0	2.5
Portugal	232	121	335	3.0	1.6	4.4
Romania	326	173	462	2.3	1.2	3.3
Slovakia	16	<10	23	<1.0	<1.0	<1.0
Slovenia	15	<10	22	<1.0	<1.0	1.4
Spain	1,022	543	1,440	2.9	1.6	4.1
Sweden	<10	<10	12	<1.0	<1.0	<1.0
Albania	86	45	124	4.2	2.2	6.1
Andorra	<10	<1	<10	2.2	1.1	3.1
Bosnia and Herzegovina	118	61	169	4.5	2.4	6.5
Iceland	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Kosovo	38	19	55	2.8	1.4	4.1
Liechtenstein	<1	<1	<1	2.2	1.1	3.3
Monaco	<1	<1	<10	3.2	1.7	4.7
Montenegro	15	<10	22	3.6	1.8	5.2
North Macedonia	22	11	32	1.7	<1.0	2.5
Norway	13	<10	19	<1.0	<1.0	<1.0
San Marino	<1	<1	<1	1.8	<1.0	2.7
Serbia	304	159	435	6.1	3.2	8.7
Switzerland	75	38	109	1.1	<1.0	1.7
Türkiye	5,808	3,314	7,685	10.8	6.2	14.3
EU27	9,531	5,006	13,585	2.9	1.5	4.1
EEA32	15,428	8,365	21,401	3.9	2.1	5.4
All countries	16,013	8,669	22,243	3.9	2.1	5.5

Notes: (a) Total and national data are rounded to the nearest integer; (b) Total and national data are rounded to one decimal place.

Table A4.41: DM disease burden (YLL) attributable to NO₂ for adults ≥ 25 years for 41 European countries (individual and total countries), in the EU27 and EEA32 in 2023

Country	YLL (95 % CI: low, high) ^(a)			YLL/10 ⁵ inhabitants ≥ 25 years (95 % CI: low, high) ^(b)		
	mean	low	high	mean	low	high
Austria	2,273	1,180	3,274	33.2	17.2	47.9
Belgium	824	424	1,195	9.8	5.0	14.2
Bulgaria	1,329	693	1,907	26.8	14.0	38.4
Croatia	2,342	1,216	3,375	80.5	41.8	116.0
Cyprus	1,370	747	1,885	144.4	78.7	198.6
Czechia	1,943	996	2,833	24.2	12.4	35.3
Denmark	93	47	137	2.2	1.1	3.2
Estonia	20	<10	29	1.9	<1.0	2.9
Finland	38	19	57	<1.0	<1.0	1.4
France	6,722	3,524	9,596	14.4	7.5	20.5
Germany	13,724	7,061	19,937	21.7	11.2	31.5
Greece	4,382	2,391	6,028	55.0	30.0	75.7
Hungary	2,066	1,078	2,961	28.7	15.0	41.1
Ireland	156	80	228	4.4	2.2	6.4
Italy	29,806	15,788	42,139	65.1	34.5	92.0
Latvia	207	106	301	14.8	7.6	21.5
Lithuania	202	103	296	9.4	4.8	13.7
Luxembourg	31	16	45	6.4	3.2	9.4
Malta	72	37	106	17.2	8.7	25.3
Netherlands	2,066	1,060	3,009	16.0	8.2	23.3
Poland	5,433	2,802	7,875	19.7	10.2	28.6
Portugal	2,121	1,102	3,054	27.6	14.3	39.8
Romania	3,725	1,971	5,276	26.7	14.1	37.8
Slovakia	218	111	321	5.4	2.8	8.0
Slovenia	168	86	244	10.5	5.4	15.3
Spain	8,876	4,716	12,513	25.5	13.5	35.9
Sweden	84	43	125	1.1	<1.0	1.7
Albania	638	331	918	31.3	16.3	45.1
Andorra	13	<10	19	22.6	11.7	32.9
Bosnia and Herzegovina	1,152	600	1,655	44.4	23.1	63.7
Iceland	<10	<10	<10	<1.0	<1.0	1.2
Kosovo	395	201	581	29.6	15.0	43.4
Liechtenstein	0	0	0	0.0	0.0	0.0
Monaco	<10	<10	13	34.0	17.5	49.3
Montenegro	163	83	237	37.7	19.3	55.0
North Macedonia	210	107	307	16.0	8.2	23.3
Norway	135	69	199	3.5	1.8	5.1
San Marino	<10	<10	<10	15.9	8.0	23.6
Serbia	2,970	1,552	4,250	59.3	31.0	84.8
Switzerland	712	365	1,037	10.8	5.5	15.7
Türkiye	71,166	40,605	94,173	132.8	75.8	175.7
EU27	90,294	47,406	128,748	27.3	14.3	38.9
EEA32	162,309	88,445	224,160	41.1	22.4	56.8
All countries	167,862	91,333	232,145	41.2	22.4	56.9

Notes: (a) Total and national data are rounded to the nearest integer; (b) Total and national data are rounded to one decimal place.

Table A4.42: DM disease burden (YLD) attributable to NO₂ for adults ≥ 25 years for 41 European countries (individual and total countries), in the EU27 and EEA32 in 2023

Country	YLD (95 % CI: low, high) ^(a)			YLD/10 ⁵ inhabitants ≥ 25 years (95 % CI: low, high) ^(b)		
	mean	low	high	mean	low	high
Austria	930	546	1,414	13.6	8.0	20.7
Belgium	940	550	1,432	11.1	6.5	17.0
Bulgaria	971	570	1,473	19.6	11.5	29.7
Croatia	602	353	914	20.7	12.1	31.4
Cyprus	647	385	967	68.2	40.5	101.9
Czechia	950	555	1,450	11.9	6.9	18.1
Denmark	42	24	64	<1.0	<1.0	1.5
Estonia	<10	<10	12	<1.0	<1.0	1.2
Finland	51	29	78	1.2	<1.0	1.9
France	6,161	3,624	9,327	13.2	7.7	19.9
Germany	9,797	5,732	14,933	15.5	9.1	23.6
Greece	3,313	1,971	4,945	41.6	24.7	62.1
Hungary	1,261	741	1,913	17.5	10.3	26.6
Ireland	95	55	145	2.6	1.5	4.0
Italy	13,580	8,011	20,486	29.6	17.5	44.7
Latvia	75	44	114	5.3	3.1	8.1
Lithuania	87	51	133	4.0	2.4	6.2
Luxembourg	24	14	36	4.9	2.9	7.5
Malta	32	18	49	7.5	4.4	11.6
Netherlands	1,696	992	2,589	13.2	7.7	20.1
Poland	3,515	2,058	5,353	12.8	7.5	19.5
Portugal	1,640	962	2,492	21.4	12.5	32.4
Romania	2,226	1,313	3,359	16.0	9.4	24.1
Slovakia	305	178	468	7.6	4.4	11.6
Slovenia	195	114	298	12.2	7.1	18.6
Spain	8,814	5,204	13,281	25.3	14.9	38.1
Sweden	51	30	79	<1.0	<1.0	1.0
Albania	321	188	487	15.8	9.2	23.9
Andorra	12	<10	18	20.2	11.8	30.8
Bosnia and Herzegovina	541	317	821	20.8	12.2	31.6
Iceland	<10	<1	<10	<1.0	<1.0	<1.0
Kosovo	167	97	256	12.5	7.3	19.1
Liechtenstein	<10	<10	<10	8.7	5.1	13.3
Monaco	<10	<10	13	30.5	17.9	46.4
Montenegro	75	44	114	17.3	10.1	26.4
North Macedonia	110	64	167	8.3	4.9	12.7
Norway	91	53	139	2.3	1.4	3.6
San Marino	<10	<10	<10	6.8	3.9	10.4
Serbia	1,401	823	2,123	28.0	16.4	42.4
Switzerland	769	450	1,174	11.7	6.8	17.8
Türkiye	73,531	44,348	107,904	137.2	82.8	201.4
EU27	58,008	34,129	87,801	17.5	10.3	26.6
EEA32	132,403	78,982	197,024	33.5	20.0	49.9
All countries	135,037	80,528	201,025	33.1	19.7	49.3

Notes: (a) Total and national data are rounded to the nearest integer; (b) Total and national data are rounded to one decimal place.

Table A4.43: DM disease burden (DALY) attributable to NO₂ for adults ≥ 25 years for 41 European countries (individual and total countries), in the EU27 and EEA32 in 2023

Country	DALY (95 % CI: low, high) ^(a)			DALY/10 ⁵ inhabitants ≥ 25 years (95 % CI: low, high) ^(b)		
	mean	low	high	mean	low	high
Austria	3,203	1,725	4,688	46.8	25.2	68.5
Belgium	1,764	974	2,627	20.9	11.5	31.1
Bulgaria	2,301	1,264	3,380	46.4	25.5	68.1
Croatia	2,944	1,568	4,289	101.2	53.9	147.4
Cyprus	2,018	1,131	2,852	212.6	119.2	300.5
Czechia	2,893	1,552	4,283	36.1	19.4	53.4
Denmark	135	72	201	3.2	1.7	4.7
Estonia	27	14	41	2.7	1.4	4.1
Finland	89	49	135	2.2	1.2	3.3
France	12,883	7,148	18,923	27.5	15.3	40.4
Germany	23,521	12,793	34,869	37.2	20.2	55.2
Greece	7,696	4,362	10,973	96.6	54.8	137.8
Hungary	3,327	1,819	4,874	46.2	25.3	67.7
Ireland	251	135	373	7.0	3.8	10.4
Italy	43,387	23,799	62,624	94.7	51.9	136.7
Latvia	281	150	415	20.1	10.7	29.6
Lithuania	289	154	429	13.4	7.1	19.9
Luxembourg	54	29	81	11.3	6.1	16.9
Malta	104	55	155	24.7	13.1	36.8
Netherlands	3,762	2,051	5,597	29.2	15.9	43.4
Poland	8,948	4,860	13,229	32.5	17.7	48.1
Portugal	3,762	2,064	5,546	49.0	26.9	72.2
Romania	5,952	3,284	8,635	42.7	23.6	61.9
Slovakia	524	289	788	13.0	7.2	19.6
Slovenia	363	200	542	22.7	12.5	33.9
Spain	17,690	9,920	25,794	50.8	28.5	74.0
Sweden	136	72	203	1.8	<1.0	2.7
Albania	958	519	1,405	47.1	25.5	69.1
Andorra	25	14	37	42.9	23.5	63.7
Bosnia and Herzegovina	1,693	917	2,475	65.2	35.3	95.4
Iceland	<10	<10	<10	1.3	<1.0	2.0
Kosovo	563	299	836	42.0	22.3	62.5
Liechtenstein	<10	<10	<10	8.7	5.1	13.3
Monaco	18	<10	26	64.5	35.4	95.7
Montenegro	237	127	351	55.0	29.5	81.4
North Macedonia	319	171	474	24.3	13.0	36.1
Norway	226	122	338	5.8	3.1	8.6
San Marino	<10	<10	<10	22.7	12.0	34.0
Serbia	4,371	2,375	6,373	87.3	47.4	127.2
Switzerland	1,481	815	2,211	22.5	12.4	33.5
Türkiye	144,696	84,953	202,077	270.0	158.5	377.1
EU27	148,302	81,534	216,549	44.9	24.7	65.5
EEA32	294,711	167,427	421,184	74.6	42.4	106.6
All countries	302,900	171,862	433,170	74.3	42.1	106.2

Notes: (a) Total and national data are rounded to the nearest integer; (b) Total and national data are rounded to one decimal place.

NO₂ (long-term effects) and COPD (adults ≥ 25 years)

Table A4.44: COPD disease burden (AD) attributable to NO₂ for adults ≥ 25 years for 41 European countries (individual and total countries), in the EU27 and EEA32 in 2023

Country	AD (95 % CI: low, high) ^(a)			AD/10 ⁵ inhabitants ≥ 25 years (95 % CI: low, high) ^(b)		
	mean	low	high	mean	low	high
Austria	136	58	210	2.0	<1.0	3.1
Belgium	164	69	253	1.9	<1.0	3.0
Bulgaria	61	26	94	1.2	<1.0	1.9
Croatia	65	28	101	2.2	<1.0	3.5
Cyprus	39	17	58	4.1	1.8	6.1
Czechia	90	38	139	1.1	<1.0	1.7
Denmark	14	<10	23	<1.0	<1.0	<1.0
Estonia	<1	<1	<1	<1.0	<1.0	<1.0
Finland	<10	<10	<10	<1.0	<1.0	<1.0
France	370	159	566	<1.0	<1.0	1.2
Germany	1,362	577	2,110	2.2	<1.0	3.3
Greece	309	137	459	3.9	1.7	5.8
Hungary	212	91	325	2.9	1.3	4.5
Ireland	27	11	41	<1.0	<1.0	1.1
Italy	1,944	841	2,949	4.2	1.8	6.4
Latvia	<10	<10	<10	<1.0	<1.0	<1.0
Lithuania	<10	<10	<10	<1.0	<1.0	<1.0
Luxembourg	<10	<10	<10	<1.0	<1.0	1.1
Malta	<10	<10	<10	<1.0	<1.0	1.0
Netherlands	301	127	467	2.3	<1.0	3.6
Poland	166	70	257	<1.0	<1.0	<1.0
Portugal	98	42	151	1.3	<1.0	2.0
Romania	291	126	442	2.1	<1.0	3.2
Slovakia	10	<10	16	<1.0	<1.0	<1.0
Slovenia	<10	<10	13	<1.0	<1.0	<1.0
Spain	735	319	1,113	2.1	<1.0	3.2
Sweden	<10	<10	11	<1.0	<1.0	<1.0
Albania	37	16	58	1.8	<1.0	2.8
Andorra	<1	<1	<10	1.2	<1.0	1.9
Bosnia and Herzegovina	56	24	85	2.1	<1.0	3.3
Iceland	<1	<1	<1	<1.0	<1.0	<1.0
Kosovo	17	<10	27	1.3	<1.0	2.0
Liechtenstein	<1	<1	<1	1.5	<1.0	2.3
Monaco	<1	<1	<1	1.9	<1.0	2.9
Montenegro	<10	<10	11	1.7	<1.0	2.6
North Macedonia	11	<10	16	<1.0	<1.0	1.3
Norway	25	10	39	<1.0	<1.0	<1.0
San Marino	<1	<1	<1	1.0	<1.0	1.6
Serbia	144	62	220	2.9	1.2	4.4
Switzerland	87	37	134	1.3	<1.0	2.0
Türkiye	5,003	2,294	7,199	9.3	4.3	13.4
EU27	6,432	2,763	9,832	1.9	<1.0	3.0
EEA32	11,547	5,105	17,206	2.9	1.3	4.4
All countries	11,820	5,221	17,626	2.9	1.3	4.3

Notes: (a) Total and national data are rounded to the nearest integer; (b) Total and national data are rounded to one decimal place.

Table A4.45: COPD disease burden (YLL) attributable to NO₂ for adults ≥ 25 years for 41 European countries (individual and total countries), in the EU27 and EEA32 in 2023

Country	YLL (95 % CI: low, high) ^(a)			YLL/10 ⁵ inhabitants ≥ 25 years (95 % CI: low, high) ^(b)		
	mean	low	high	mean	low	high
Austria	1,512	645	2,328	22.1	9.4	34.0
Belgium	2,005	850	3,103	23.7	10.1	36.8
Bulgaria	662	283	1,016	13.3	5.7	20.5
Croatia	618	263	951	21.2	9.0	32.7
Cyprus	366	162	544	38.5	17.0	57.3
Czechia	1,022	432	1,588	12.8	5.4	19.8
Denmark	153	64	239	3.6	1.5	5.6
Estonia	<10	<10	<10	<1.0	<1.0	<1.0
Finland	41	17	64	<1.0	<1.0	1.6
France	4,239	1,821	6,479	9.1	3.9	13.8
Germany	15,695	6,647	24,316	24.8	10.5	38.5
Greece	2,470	1,094	3,669	31.0	13.7	46.1
Hungary	2,519	1,079	3,863	35.0	15.0	53.6
Ireland	279	117	434	7.8	3.3	12.1
Italy	14,903	6,451	22,613	32.5	14.1	49.4
Latvia	58	24	89	4.1	1.7	6.4
Lithuania	68	29	106	3.1	1.3	4.9
Luxembourg	39	16	61	8.1	3.4	12.7
Malta	31	13	49	7.4	3.1	11.6
Netherlands	3,461	1,463	5,374	26.8	11.3	41.7
Poland	1,945	825	3,008	7.1	3.0	10.9
Portugal	890	379	1,370	11.6	4.9	17.8
Romania	3,283	1,420	4,986	23.6	10.2	35.8
Slovakia	133	56	207	3.3	1.4	5.2
Slovenia	94	40	146	5.9	2.5	9.1
Spain	7,475	3,243	11,318	21.5	9.3	32.5
Sweden	69	29	108	<1.0	<1.0	1.4
Albania	336	143	517	16.5	7.0	25.4
Andorra	<10	<10	13	14.1	6.0	21.8
Bosnia and Herzegovina	588	251	903	22.6	9.7	34.8
Iceland	<10	<10	<10	1.0	<1.0	1.6
Kosovo	193	81	302	14.4	6.1	22.5
Liechtenstein	<10	<1	<10	6.9	2.9	10.8
Monaco	<10	<10	<10	21.2	9.0	32.8
Montenegro	83	35	128	19.1	8.1	29.7
North Macedonia	107	45	166	8.1	3.4	12.7
Norway	261	109	407	6.7	2.8	10.4
San Marino	<10	<1	<10	7.7	3.2	12.1
Serbia	1,519	651	2,327	30.3	13.0	46.5
Switzerland	989	418	1,535	15.0	6.3	23.3
Türkiye	52,563	24,106	75,634	98.1	45.0	141.1
EU27	64,032	27,464	98,035	19.4	8.3	29.7
EEA32	117,850	52,099	175,619	29.8	13.2	44.5
All countries	120,691	53,312	179,987	29.6	13.1	44.1

Notes: (a) Total and national data are rounded to the nearest integer; (b) Total and national data are rounded to one decimal place.

Table A4.46: COPD disease burden (YLD) attributable to NO₂ for adults ≥ 25 years for 41 European countries (individual and total countries), in the EU27 and EEA32 in 2023

Country	YLD (95 % CI: low, high) ^(a)			YLD/10 ⁵ inhabitants ≥ 25 years (95 % CI: low, high) ^(b)		
	mean	low	high	mean	low	high
Austria	538	306	752	7.9	4.5	11.0
Belgium	500	283	700	5.9	3.4	8.3
Bulgaria	338	192	471	6.8	3.9	9.5
Croatia	221	125	308	7.6	4.3	10.6
Cyprus	198	115	271	20.9	12.1	28.6
Czechia	177	100	248	2.2	1.2	3.1
Denmark	22	12	31	<1.0	<1.0	<1.0
Estonia	<10	<10	<10	<1.0	<1.0	<1.0
Finland	15	<10	21	<1.0	<1.0	<1.0
France	3,862	2,207	5,373	8.3	4.7	11.5
Germany	5,253	2,977	7,366	8.3	4.7	11.7
Greece	577	336	789	7.2	4.2	9.9
Hungary	468	267	652	6.5	3.7	9.1
Ireland	45	25	63	1.2	<1.0	1.7
Italy	6,859	3,938	9,501	15.0	8.6	20.7
Latvia	36	20	51	2.6	1.5	3.6
Lithuania	79	45	111	3.7	2.1	5.1
Luxembourg	18	10	26	3.8	2.1	5.3
Malta	<10	<10	<10	<1.0	<1.0	<1.0
Netherlands	1,103	624	1,549	8.6	4.8	12.0
Poland	883	501	1,237	3.2	1.8	4.5
Portugal	663	378	927	8.6	4.9	12.1
Romania	371	213	514	2.7	1.5	3.7
Slovakia	90	51	126	2.2	1.3	3.1
Slovenia	66	37	93	4.1	2.3	5.8
Spain	2,374	1,365	3,284	6.8	3.9	9.4
Sweden	10	<10	15	<1.0	<1.0	<1.0
Albania	110	63	154	5.4	3.1	7.6
Andorra	<10	<10	10	12.8	7.2	17.9
Bosnia and Herzegovina	179	102	250	6.9	3.9	9.6
Iceland	<1.0	<1.0	<10	<1.0	<1.0	<1.0
Kosovo	56	32	79	4.2	2.4	5.9
Liechtenstein	<10	<1.0	<10	5.0	2.8	7.1
Monaco	<10	<10	<10	19.2	10.9	26.9
Montenegro	26	15	36	6.0	3.4	8.4
North Macedonia	38	21	53	2.9	1.6	4.0
Norway	41	23	57	1.0	<1.0	1.5
San Marino	<1.0	<1.0	<10	3.5	2.0	4.9
Serbia	464	265	646	9.3	5.3	12.9
Switzerland	446	252	626	6.8	3.8	9.5
Türkiye	38,216	22,721	51,291	71.3	42.4	95.7
EU27	24,768	14,146	34,484	7.5	4.3	10.4
EEA32	63,473	37,144	86,462	16.1	9.4	21.9
All countries	64,359	37,648	87,699	15.8	9.2	21.5

Notes: (a) Total and national data are rounded to the nearest integer; (b) Total and national data are rounded to one decimal place.

Table A4.47: COPD disease burden (DALY) attributable to NO₂ for adults ≥ 25 years for 41 European countries (individual and total countries), in the EU27 and EEA32 in 2023

Country	DALY (95 % CI: low, high) ^(a)			DALY/10 ⁵ inhabitants ≥ 25 years (95 % CI: low, high) ^(b)		
	mean	low	high	mean	low	high
Austria	2,050	951	3,080	30.0	13.9	45.0
Belgium	2,504	1,133	3,803	29.7	13.4	45.1
Bulgaria	999	476	1,486	20.1	9.6	30.0
Croatia	838	389	1,259	28.8	13.4	43.3
Cyprus	564	277	815	59.4	29.1	85.8
Czechia	1,199	532	1,836	15.0	6.6	22.9
Denmark	174	76	270	4.1	1.8	6.3
Estonia	<10	<10	13	<1.0	<1.0	1.3
Finland	55	25	84	1.3	<1.0	2.1
France	8,100	4,028	11,852	17.3	8.6	25.3
Germany	20,947	9,624	31,682	33.1	15.2	50.1
Greece	3,047	1,429	4,458	38.2	17.9	56.0
Hungary	2,987	1,346	4,516	41.5	18.7	62.7
Ireland	323	143	496	9.0	4.0	13.8
Italy	21,762	10,390	32,114	47.5	22.7	70.1
Latvia	94	45	140	6.7	3.2	10.0
Lithuania	147	73	217	6.8	3.4	10.0
Luxembourg	57	27	87	11.9	5.5	18.0
Malta	33	14	52	7.9	3.4	12.3
Netherlands	4,564	2,087	6,922	35.4	16.2	53.7
Poland	2,828	1,326	4,245	10.3	4.8	15.4
Portugal	1,553	757	2,296	20.2	9.9	29.9
Romania	3,654	1,633	5,500	26.2	11.7	39.5
Slovakia	222	106	334	5.5	2.6	8.3
Slovenia	160	77	238	10.0	4.8	14.9
Spain	9,849	4,608	14,602	28.3	13.2	41.9
Sweden	79	35	123	1.1	<1.0	1.6
Albania	446	206	671	21.9	10.1	33.0
Andorra	16	<10	23	26.8	13.2	39.7
Bosnia and Herzegovina	767	353	1,153	29.5	13.6	44.4
Iceland	<10	<10	<10	1.4	<1.0	2.1
Kosovo	249	113	380	18.6	8.4	28.4
Liechtenstein	<10	<10	<10	11.9	5.7	17.9
Monaco	11	<10	16	40.4	19.9	59.7
Montenegro	108	49	164	25.1	11.5	38.1
North Macedonia	144	66	219	11.0	5.0	16.7
Norway	301	132	464	7.7	3.4	11.9
San Marino	<10	<10	<10	11.2	5.2	17.0
Serbia	1,983	916	2,973	39.6	18.3	59.4
Switzerland	1,435	670	2,162	21.8	10.2	32.8
Türkiye	90,779	46,827	126,925	169.4	87.4	236.9
EU27	88,800	41,610	132,520	26.9	12.6	40.1
EEA32	181,323	89,242	262,081	45.9	22.6	66.4
All countries	185,050	90,960	267,686	45.4	22.3	65.6

Notes: (a) Total and national data are rounded to the nearest integer; (b) Total and national data are rounded to one decimal place.

NO₂ (long-term effects) and stroke (adults ≥ 25 years)

Table A4.48: Stroke disease burden (AD) attributable to NO₂ for adults ≥ 25 years for 41 European countries (individual and total countries), in the EU27 and EEA32 in 2023

Country	AD (95 % CI: low, high) ^(a)			AD/10 ⁵ inhabitants ≥ 25 years (95 % CI: low, high) ^(b)		
	mean	low	high	mean	low	high
Austria	100	17	181	1.5	<1.0	2.6
Belgium	120	20	217	1.4	<1.0	2.6
Bulgaria	499	85	898	10.1	1.7	18.1
Croatia	71	12	128	2.4	<1.0	4.4
Cyprus	41	<10	72	4.3	<1.0	7.6
Czechia	88	15	161	1.1	<1.0	2.0
Denmark	<10	<10	11	<1.0	<1.0	<1.0
Estonia	<10	<1.0	<10	<1.0	<1.0	<1.0
Finland	<10	<1.0	<10	<1.0	<1.0	<1.0
France	536	92	960	1.1	<1.0	2.1
Germany	994	168	1,801	1.6	<1.0	2.8
Greece	604	106	1,059	7.6	1.3	13.3
Hungary	204	35	366	2.8	<1.0	5.1
Ireland	13	<10	23	<1.0	<1.0	<1.0
Italy	2,502	430	4,462	5.5	<1.0	9.7
Latvia	47	<10	85	3.4	<1.0	6.1
Lithuania	36	<10	66	1.7	<1.0	3.1
Luxembourg	<10	<1.0	<10	<1.0	<1.0	<1.0
Malta	<10	<1.0	<10	<1.0	<1.0	1.1
Netherlands	210	35	380	1.6	<1.0	3.0
Poland	478	81	865	1.7	<1.0	3.1
Portugal	197	34	355	2.6	<1.0	4.6
Romania	1,154	198	2,059	8.3	1.4	14.8
Slovakia	35	<10	63	<1.0	<1.0	1.6
Slovenia	30	<10	55	1.9	<1.0	3.4
Spain	755	130	1,344	2.2	<1.0	3.9
Sweden	<10	<1.0	10	<1.0	<1.0	<1.0
Albania	84	14	152	4.1	<1.0	7.5
Andorra	<10	<1.0	<10	1.8	<1.0	3.2
Bosnia and Herzegovina	113	19	204	4.4	<1.0	7.9
Iceland	<1.0	<1.0	<1.0	<1.0	<1.0	0.1
Kosovo	35	<10	64	2.6	<1.0	4.8
Liechtenstein	<1.0	<1.0	<1.0	<1.0	<1.0	1.7
Monaco	<1.0	<1.0	<10	2.7	<1.0	4.8
Montenegro	14	<10	26	3.4	<1.0	6.1
North Macedonia	21	<10	38	1.6	<1.0	2.9
Norway	11	<10	19	<1.0	<1.0	<1.0
San Marino	<1.0	<1.0	<1.0	1.2	<1.0	2.3
Serbia	294	50	528	5.9	1.0	10.5
Switzerland	68	12	124	1.0	<1.0	1.9
Türkiye	4,582	823	7,840	8.6	1.5	14.6
EU27	8,736	1,497	15,643	2.6	<1.0	4.7
EEA32	13,398	2,333	23,628	3.4	<1.0	6.0
All countries	13,961	2,429	24,643	3.4	<1.0	6.0

Notes: (a) Total and national data are rounded to the nearest integer; (b) Total and national data are rounded to one decimal place.

Table A4.49: Stroke disease burden (YLL) attributable to NO₂ for adults ≥ 25 years for 41 European countries (individual and total countries), in the EU27 and EEA32 in 2023

Country	YLL (95 % CI: low, high) ^(a)			YLL/10 ⁵ inhabitants ≥ 25 years (95 % CI: low, high) ^(b)		
	mean	low	high	mean	low	high
Austria	890	151	1,604	13.0	2.2	23.4
Belgium	1,118	189	2,024	13.2	2.2	24.0
Bulgaria	4,383	747	7,883	88.4	15.1	158.9
Croatia	643	109	1,160	22.1	3.8	39.9
Cyprus	433	76	761	45.6	8.0	80.1
Czechia	839	142	1,523	10.5	1.8	19.0
Denmark	58	<10	105	1.4	<1.0	2.5
Estonia	13	<10	24	1.3	<1.0	2.3
Finland	46	<10	85	1.1	<1.0	2.1
France	5,176	885	9,281	11.1	1.9	19.8
Germany	8,883	1,504	16,092	14.0	2.4	25.5
Greece	4,809	841	8,439	60.4	10.6	105.9
Hungary	1,911	326	3,434	26.5	4.5	47.7
Ireland	129	22	234	3.6	<1.0	6.5
Italy	19,324	3,324	34,462	42.2	7.3	75.2
Latvia	389	66	705	27.8	4.7	50.4
Lithuania	318	54	579	14.7	2.5	26.8
Luxembourg	20	<10	37	4.2	<1.0	7.6
Malta	25	<10	46	6.0	1.0	10.9
Netherlands	1,867	316	3,388	14.5	2.4	26.3
Poland	5,174	877	9,362	18.8	3.2	34.0
Portugal	1,723	293	3,106	22.4	3.8	40.4
Romania	10,638	1,829	18,980	76.3	13.1	136.2
Slovakia	388	65	708	9.7	1.6	17.6
Slovenia	263	44	477	16.5	2.8	29.9
Spain	7,359	1,268	13,102	21.1	3.6	37.6
Sweden	48	<10	88	<1.0	<1.0	1.2
Albania	586	100	1,056	28.8	4.9	51.9
Andorra	<10	<10	18	17.0	2.9	30.8
Bosnia and Herzegovina	1,062	181	1,912	40.9	7.0	73.6
Iceland	<10	<1.0	<10	<1.0	<1.0	<1.0
Kosovo	357	60	650	26.7	4.5	48.6
Liechtenstein	0	0	0	0	0	0
Monaco	<10	<10	13	25.6	4.3	46.3
Montenegro	147	25	266	34.0	5.7	61.7
North Macedonia	188	32	341	14.3	2.4	26.0
Norway	100	17	181	2.5	<1.0	4.6
San Marino	<10	<1.0	<10	9.6	1.6	17.7
Serbia	2,752	470	4,944	54.9	9.4	98.7
Switzerland	591	100	1,072	9.0	1.5	16.3
Türkiye	52,509	9,435	89,848	98.0	17.6	167.7
EU27	76,866	13,165	137,689	23.3	4.0	41.7
EEA32	130,067	22,717	228,793	32.9	5.8	57.9
All countries	135,177	23,587	237,996	33.2	5.8	58.4

Notes: (a) Total and national data are rounded to the nearest integer; (b) Total and national data are rounded to one decimal place.

Table A4.50: Stroke disease burden (YLD) attributable to NO₂ for adults ≥ 25 years for 41 European countries (individual and total countries), in the EU27 and EEA32 in 2023

Country	YLD (95 % CI: low, high) ^(a)			YLD/10 ⁵ inhabitants ≥ 25 years (95 % CI: low, high) ^(b)		
	mean	low	high	mean	low	high
Austria	543	281	788	7.9	4.1	11.5
Belgium	248	128	361	2.9	1.5	4.3
Bulgaria	791	410	1,147	16.0	8.3	23.1
Croatia	351	182	510	12.1	6.2	17.5
Cyprus	271	143	387	28.6	15.1	40.8
Czechia	312	161	454	3.9	2.0	5.7
Denmark	27	14	40	<1.0	<1.0	<1.0
Estonia	<10	<10	<10	<1.0	<1.0	<1.0
Finland	22	11	33	<1.0	<1.0	<1.0
France	2,307	1,199	3,336	4.9	2.6	7.1
Germany	5,547	2,862	8,073	8.8	4.5	12.8
Greece	1,539	812	2,194	19.3	10.2	27.5
Hungary	653	339	945	9.1	4.7	13.1
Ireland	47	24	68	1.3	<1.0	1.9
Italy	6,211	3,239	8,947	13.6	7.1	19.5
Latvia	28	14	40	2.0	1.0	2.9
Lithuania	84	43	122	3.9	2.0	5.7
Luxembourg	<10	<10	14	2.0	1.0	3.0
Malta	<10	<10	<10	<1.0	<1.0	<1.0
Netherlands	999	515	1,456	7.8	4.0	11.3
Poland	1,681	868	2,444	6.1	3.2	8.9
Portugal	704	364	1,021	9.2	4.7	13.3
Romania	1,090	568	1,571	7.8	4.1	11.3
Slovakia	191	98	279	4.7	2.4	6.9
Slovenia	90	46	131	5.6	2.9	8.2
Spain	2,652	1,385	3,816	7.6	4.0	11.0
Sweden	19	<10	28	<1.0	<1.0	<1.0
Albania	116	60	169	5.7	3.0	8.3
Andorra	<10	<10	<10	7.6	3.9	11.0
Bosnia and Herzegovina	191	99	277	7.4	3.8	10.7
Iceland	<1.0	<1.0	<10	<1.0	<1.0	<1.0
Kosovo	59	30	87	4.4	2.3	6.5
Liechtenstein	<10	<1.0	<10	4.8	2.5	7.1
Monaco	<10	<10	<10	11.4	5.9	16.6
Montenegro	26	13	37	5.9	3.0	8.6
North Macedonia	38	20	55	2.9	1.5	4.2
Norway	48	24	70	1.2	<1.0	1.8
San Marino	<1.0	<1.0	<10	3.1	1.6	4.6
Serbia	495	257	717	9.9	5.1	14.3
Switzerland	455	234	662	6.9	3.6	10.0
Türkiye	12,212	6,558	17,123	22.8	12.2	32.0
EU27	26,423	13,724	38,213	8.0	4.2	11.6
EEA32	39,140	20,543	56,071	9.9	5.2	14.2
All countries	40,073	21,026	57,425	9.8	5.2	14.1

Notes: (a) Total and national data are rounded to the nearest integer; (b) Total and national data are rounded to one decimal place.

Table A4.51: Stroke disease burden (DALY) attributable to NO₂ for adults ≥ 25 years for 41 European countries (individual and total countries), in the EU27 and EEA32 in 2023

Country	DALY (95 % CI: low, high) ^(a)			DALY/10 ⁵ inhabitants ≥ 25 years (95 % CI: low, high) ^(b)		
	mean	low	high	mean	low	high
Austria	1,433	432	2,392	20.9	6.3	35.0
Belgium	1,366	318	2,385	16.2	3.8	28.3
Bulgaria	5,174	1,158	9,030	104.3	23.3	182.0
Croatia	995	291	1,670	34.2	10.0	57.4
Cyprus	704	218	1,148	74.2	23.0	120.9
Czechia	1,151	302	1,977	14.4	3.8	24.7
Denmark	85	24	145	2.0	<1.0	3.4
Estonia	16	<10	28	1.6	<1.0	2.8
Finland	68	19	117	1.7	<1.0	2.9
France	7,483	2,084	12,617	16.0	4.5	27.0
Germany	14,430	4,366	24,165	22.8	6.9	38.2
Greece	6,348	1,653	10,633	79.7	20.8	133.5
Hungary	2,564	665	4,380	35.6	9.2	60.8
Ireland	176	46	302	4.9	1.3	8.4
Italy	25,535	6,564	43,410	55.7	14.3	94.7
Latvia	416	80	746	29.8	5.7	53.3
Lithuania	402	97	701	18.6	4.5	32.5
Luxembourg	30	<10	51	6.2	1.7	10.6
Malta	28	<10	49	6.6	1.3	11.8
Netherlands	2,866	831	4,844	22.2	6.4	37.6
Poland	6,855	1,745	11,806	24.9	6.3	42.9
Portugal	2,427	658	4,128	31.6	8.6	53.7
Romania	11,728	2,398	20,551	84.1	17.2	147.4
Slovakia	579	163	987	14.4	4.1	24.5
Slovenia	353	91	608	22.1	5.7	38.1
Spain	10,010	2,653	16,918	28.7	7.6	48.6
Sweden	67	18	116	<1.0	<1.0	1.5
Albania	702	160	1,225	34.5	7.9	60.2
Andorra	14	<10	24	24.6	6.8	41.8
Bosnia and Herzegovina	1,253	280	2,189	48.3	10.8	84.3
Iceland	<10	<1.0	<10	<1.0	<1.0	1.3
Kosovo	416	90	737	31.1	6.8	55.1
Liechtenstein	<10	<1.0	<10	4.8	2.5	7.1
Monaco	10	<10	17	37.0	10.2	63.0
Montenegro	172	38	303	39.9	8.8	70.4
North Macedonia	226	51	396	17.2	3.9	30.2
Norway	147	41	251	3.8	1.1	6.4
San Marino	<10	<1.0	<10	12.8	3.2	22.2
Serbia	3,247	727	5,660	64.8	14.5	113.0
Switzerland	1,045	334	1,734	15.9	5.1	26.3
Türkiye	64,721	15,993	106,970	120.8	29.8	199.6
EU27	103,289	26,889	175,902	31.2	8.1	53.2
EEA32	169,207	43,259	284,864	42.8	11.0	72.1
All countries	175,250	44,613	295,421	43.0	10.9	72.4

Notes: (a) Total and national data are rounded to the nearest integer; (b) Total and national data are rounded to one decimal place.

O₃ (long-term effects, peak season) and all-cause mortality

Table A4.52: All-cause mortality disease burden (AD) attributable to O₃ for adults ≥ 25 years for 41 European countries (individual and total countries), in the EU27 and EEA32 in 2023

Country	AD (95 % CI: low, high) ^(a)			AD/10 ⁵ inhabitants ≥ 25 years (95 % CI: low, high) ^(b)		
	mean	low	high	mean	low	high
Austria	1,278	0	2,502	18.7	0.0	36.6
Belgium	1,173	0	2,307	13.9	0.0	27.3
Bulgaria	861	0	1,695	17.4	0.0	34.2
Croatia	776	0	1,515	26.7	0.0	52.1
Cyprus	82	0	160	8.6	0.0	16.9
Czechia	1,626	0	3,183	20.3	0.0	39.7
Denmark	564	0	1,111	13.3	0.0	26.1
Estonia	147	0	290	14.6	0.0	28.8
Finland	505	0	996	12.3	0.0	24.2
France	7,262	0	14,250	15.5	0.0	30.4
Germany	13,063	0	25,620	20.7	0.0	40.5
Greece	1,953	0	3,818	24.5	0.0	47.9
Hungary	1,811	0	3,547	25.1	0.0	49.3
Ireland	223	0	440	6.2	0.0	12.2
Italy	11,230	0	21,918	24.5	0.0	47.8
Latvia	301	0	592	21.5	0.0	42.3
Lithuania	455	0	892	21.1	0.0	41.3
Luxembourg	52	0	102	10.8	0.0	21.1
Malta	63	0	124	15.1	0.0	29.6
Netherlands	1,795	0	3,529	13.9	0.0	27.4
Poland	5,187	0	10,173	18.8	0.0	37.0
Portugal	1,321	0	2,594	17.2	0.0	33.8
Romania	2,612	0	5,133	18.7	0.0	36.8
Slovakia	692	0	1,356	17.2	0.0	33.7
Slovenia	298	0	583	18.6	0.0	36.5
Spain	6,527	0	12,761	18.7	0.0	36.6
Sweden	819	0	1,613	10.9	0.0	21.5
Albania	576	0	1,128	28.3	0.0	55.5
Andorra	9	0	17	15.3	0.0	30.0
Bosnia and Herzegovina	889	0	1,734	34.2	0.0	66.8
Iceland	19	0	38	7.3	0.0	14.3
Kosovo	298	0	585	22.3	0.0	43.7
Liechtenstein	4	0	9	14.7	0.0	28.8
Monaco	6	0	12	23.3	0.0	45.4
Montenegro	135	0	263	31.2	0.0	61.1
North Macedonia	288	0	565	21.9	0.0	43.1
Norway	383	0	754	9.8	0.0	19.3
San Marino	6	0	12	24.0	0.0	46.9
Serbia	1,165	0	2,286	23.3	0.0	45.6
Switzerland	1,070	0	2,093	16.2	0.0	31.7
Türkiye	3,457	0	6,794	6.5	0.0	12.7
EU27	62,676	0	122,805	19.0	0.0	37.2
EEA32	67,610	0	132,493	17.1	0.0	33.5
All countries	70,981	0	139,096	17.4	0.0	34.1

Notes: (a) Total and national data are rounded to the nearest integer; (b) Total and national data are rounded to one decimal place.

Table A4.53: All-cause mortality disease burden (YLL) attributable to O₃ for adults ≥ 25 years for 41 European countries (individual and total countries), in the EU27 and EEA32 in 2023

Country	YLL (95 % CI: low, high) ^(a)			YLL/10 ⁵ inhabitants ≥ 25 years (95 % CI: low, high) ^(b)		
	mean	low	high	mean	low	high
Austria	12,759	0	24,977	186.5	0.0	365.1
Belgium	12,166	0	23,920	144.1	0.0	283.4
Bulgaria	9,356	0	18,412	188.6	0.0	371.2
Croatia	7,792	0	15,225	267.8	0.0	523.2
Cyprus	888	0	1,745	93.5	0.0	183.8
Czechia	17,795	0	34,842	222.0	0.0	434.7
Denmark	5,910	0	11,636	138.9	0.0	273.4
Estonia	1,601	0	3,153	159.4	0.0	313.9
Finland	4,937	0	9,734	120.1	0.0	236.8
France	79,724	0	156,424	170.4	0.0	334.2
Germany	131,254	0	257,434	207.6	0.0	407.2
Greece	18,709	0	36,581	234.9	0.0	459.2
Hungary	19,540	0	38,268	271.3	0.0	531.4
Ireland	2,553	0	5,042	71.0	0.0	140.3
Italy	106,745	0	208,330	233.0	0.0	454.7
Latvia	3,304	0	6,494	236.1	0.0	464.1
Lithuania	5,112	0	10,029	236.8	0.0	464.5
Luxembourg	582	0	1,143	120.5	0.0	236.7
Malta	711	0	1,390	169.5	0.0	331.2
Netherlands	18,639	0	36,639	144.6	0.0	284.2
Poland	62,481	0	122,552	227.0	0.0	445.3
Portugal	13,682	0	26,870	178.1	0.0	349.8
Romania	29,854	0	58,666	214.2	0.0	420.9
Slovakia	8,469	0	16,606	210.5	0.0	412.7
Slovenia	3,228	0	6,318	202.0	0.0	395.3
Spain	69,007	0	134,915	198.1	0.0	387.2
Sweden	7,906	0	15,578	105.4	0.0	207.7
Albania	5,848	0	11,454	287.5	0.0	563.0
Andorra	97	0	190	168.0	0.0	329.7
Bosnia and Herzegovina	9,235	0	18,013	355.8	0.0	694.0
Iceland	213	0	419	79.7	0.0	157.2
Kosovo	3,348	0	6,575	250.2	0.0	491.4
Liechtenstein	54	0	106	180.8	0.0	354.0
Monaco	69	0	135	255.8	0.0	498.6
Montenegro	1,470	0	2,876	341.0	0.0	667.4
North Macedonia	2,716	0	5,337	206.8	0.0	406.4
Norway	3,869	0	7,623	98.9	0.0	194.9
San Marino	60	0	117	228.0	0.0	445.4
Serbia	12,104	0	23,747	241.6	0.0	474.1
Switzerland	10,795	0	21,115	163.8	0.0	320.3
Türkiye	48,599	0	95,513	90.7	0.0	178.2
EU27	654,707	0	1,282,921	198.1	0.0	388.1
EEA32	718,237	0	1,407,697	181.9	0.0	356.4
All countries	753,183	0	1,476,142	184.7	0.0	362.0

Notes: (a) Total and national data are rounded to the nearest integer; (b) Total and national data are rounded to one decimal place.

O₃ (long-term effects, peak season) and COPD mortality (adults ≥ 25 years)

Table A4.54: COPD mortality disease burden (AD) attributable to O₃ for adults ≥ 25 years for 41 European countries (individual and total countries), in the EU27 and EEA32 in 2023

Country	AD (95 % CI: low, high) ^(a)			AD/10 ⁵ inhabitants ≥ 25 years (95 % CI: low, high) ^(b)		
	mean	low	high	mean	low	high
Austria	184	176	196	2.7	2.6	2.9
Belgium	186	177	198	2.2	2.1	2.4
Bulgaria	38	36	40	<1.0	<1.0	<1.0
Croatia	92	88	98	3.2	3.0	3.4
Cyprus	<10	<10	<10	<1.0	<1.0	1.0
Czechia	191	182	204	2.4	2.3	2.5
Denmark	148	141	158	3.5	3.3	3.7
Estonia	<10	<10	<10	<1.0	<1.0	<1.0
Finland	46	44	50	1.1	1.1	1.2
France	504	482	538	1.1	1.0	1.2
Germany	1,892	1,807	2,019	3.0	2.9	3.2
Greece	196	187	209	2.5	2.3	2.6
Hungary	291	278	310	4.0	3.9	4.3
Ireland	46	44	49	1.3	1.2	1.4
Italy	1,430	1,367	1,524	3.1	3.0	3.3
Latvia	11	11	12	<1.0	<1.0	<1.0
Lithuania	21	20	23	<1.0	<1.0	1.0
Luxembourg	<10	<10	<10	1.5	1.4	1.6
Malta	<10	<10	<10	1.8	1.7	1.9
Netherlands	298	284	318	2.3	2.2	2.5
Poland	275	263	294	<1.0	<1.0	1.1
Portugal	106	102	114	1.4	1.3	1.5
Romania	211	202	225	1.5	1.4	1.6
Slovakia	26	25	28	<1.0	<1.0	<1.0
Slovenia	15	15	16	<1.0	<1.0	1.0
Spain	691	660	737	2.0	1.9	2.1
Sweden	110	105	117	1.5	1.4	1.6
Albania	47	45	50	2.3	2.2	2.5
Andorra	<1.0	<1.0	<1.0	1.1	1.0	1.2
Bosnia and Herzegovina	72	69	77	2.8	2.7	3.0
Iceland	<10	<10	<10	1.2	1.2	1.3
Kosovo	25	24	26	1.9	1.8	2.0
Liechtenstein	<1.0	<1.0	<1.0	3.0	2.8	3.2
Monaco	<1.0	<1.0	<1.0	1.6	1.5	1.7
Montenegro	<10	<10	<10	2.0	1.9	2.1
North Macedonia	19	19	21	1.5	1.4	1.6
Norway	94	90	101	2.4	2.3	2.6
San Marino	<1.0	<1.0	<1.0	3.1	3.0	3.3
Serbia	101	97	108	2.0	1.9	2.2
Switzerland	132	126	141	2.0	1.9	2.1
Türkiye	579	553	618	1.1	1.0	1.2
EU27	7,041	6,724	7,511	2.1	2.0	2.3
EEA32	7,850	7,497	8,375	2.0	1.9	2.1
All countries	8,125	7,760	8,669	2.0	1.9	2.1

Notes: (a) Total and national data are rounded to the nearest integer; (b) Total and national data are rounded to one decimal place.

Table A4.55: COPD mortality disease burden (YLL) attributable to O₃ for adults ≥ 25 years for 41 European countries (individual and total countries), in the EU27 and EEA32 in 2023

Country	YLL (95 % CI: low, high) ^(a)			YLL/10 ⁵ inhabitants ≥ 25 years (95 % CI: low, high) ^(b)		
	mean	low	high	mean	low	high
Austria	2,042	1,950	2,177	29.8	28.5	31.8
Belgium	2,275	2,171	2,430	27.0	25.7	28.8
Bulgaria	408	389	436	8.2	7.8	8.8
Croatia	868	829	925	29.8	28.5	31.8
Cyprus	86	82	92	9.1	8.7	9.7
Czechia	2,174	2,076	2,318	27.1	25.9	28.9
Denmark	1,559	1,488	1,666	36.6	35.0	39.1
Estonia	96	91	102	9.5	9.1	10.2
Finland	539	514	576	13.1	12.5	14.0
France	5,774	5,512	6,162	12.3	11.8	13.2
Germany	21,804	20,819	23,268	34.5	32.9	36.8
Greece	1,563	1,493	1,666	19.6	18.7	20.9
Hungary	3,456	3,301	3,686	48.0	45.8	51.2
Ireland	484	462	518	13.5	12.8	14.4
Italy	10,965	10,479	11,685	23.9	22.9	25.5
Latvia	132	126	141	9.5	9.0	10.1
Lithuania	231	220	246	10.7	10.2	11.4
Luxembourg	82	79	88	17.0	16.3	18.2
Malta	83	80	89	19.9	19.0	21.2
Netherlands	3,426	3,270	3,658	26.6	25.4	28.4
Poland	3,224	3,078	3,441	11.7	11.2	12.5
Portugal	966	922	1,032	12.6	12.0	13.4
Romania	2,379	2,271	2,540	17.1	16.3	18.2
Slovakia	335	320	358	8.3	8.0	8.9
Slovenia	167	160	178	10.5	10.0	11.2
Spain	7,026	6,713	7,491	20.2	19.3	21.5
Sweden	1,102	1,051	1,177	14.7	14.0	15.7
Albania	423	404	452	20.8	19.9	22.2
Andorra	<10	<10	<10	12.4	11.8	13.2
Bosnia and Herzegovina	766	732	816	29.5	28.2	31.4
Iceland	36	34	38	13.5	12.8	14.4
Kosovo	275	262	293	20.5	19.6	21.9
Liechtenstein	<10	<10	<10	13.8	13.2	14.7
Monaco	<10	<10	<10	18.5	17.7	19.7
Montenegro	97	93	104	22.5	21.5	24.0
North Macedonia	196	187	210	15.0	14.3	16.0
Norway	986	941	1,054	25.2	24.1	26.9
San Marino	<10	<10	<10	23.8	22.7	25.3
Serbia	1,073	1,024	1,145	21.4	20.4	22.9
Switzerland	1,508	1,441	1,608	22.9	21.9	24.4
Türkiye	6,085	5,807	6,497	11.4	10.8	12.1
EU27	73,245	69,946	78,145	22.2	21.2	23.6
EEA32	81,864	78,174	87,347	20.7	19.8	22.1
All countries	84,713	80,894	90,385	20.8	19.8	22.2

Notes: (a) Total and national data are rounded to the nearest integer; (b) Total and national data are rounded to one decimal place.

Annex 5 Glossary

Table A5.1: Terms used in this report and their description

Term	Description
All-cause mortality vs. cause-specific mortality	EBD mortality estimates for air pollutants can be calculated on the basis of all-cause natural mortality and cause-specific mortality. For the all-cause mortality approach, the effect measures from epidemiological studies are combined with data on the overall non-accidental natural mortality in a population. For the cause-specific approach, only effect estimates for single diseases, showing a clear causal relationship with the risk factor, are combined with the relevant health data. Both approaches have their strengths and limitations. The all-cause mortality approach includes diseases that are probably not causally related to air pollutants, which might result in an overestimation of the disease burden. On the other hand, in the cause-specific approach risk-outcome-pairs can be missed out, probably leading to an underestimation of the disease burden.
Attributable Death	An attributable death is defined as a death which is statistically attributable to the exposure towards a risk factor, e.g. PM _{2.5} . The attribution is based on the evidence from studies for the causal link between a risk factor and the health outcome leading to death.
Concentration-Response Function (CRF)	The Concentration-Response Function (CRF) is the mathematical representation of the association between a risk factor (e.g. PM _{2.5} concentration) and a health outcome (e.g. lung cancer). The simplest relationship is a linear regression, but many studies have shown a supralinear relationship between air pollution and the risk for health outcomes. A CRF describes the change of an effect measure (e.g. HR, RR) associated with the change of e.g. the concentration of a certain air pollutant in the air.
Counterfactual exposure	In the estimation of the environmental burden of disease, a counterfactual exposure describes an alternative hypothetical exposure compared to the one currently observed in a population. The hypothetical exposure is mostly associated with a lower risk and often with a "no-risk" defined as a Relative Risk of 1. Synonyms are also counterfactual value or counterfactual concentration.
Disability	Disability is understood as any reduction from the state of full health due to a disease or injury.
Disability Weight	The disability weight is a weighting factor representing the severity of a disease or an injury on a scale from 0 (full health) to 1 (most severe health state equivalent to death).
Disability-Adjusted Life Year (DALY)	The Disability-Adjusted Life Year is an indicator of the burden of disease and counts losses of healthy life years resulting from a disease or attributable to a certain risk factor. The DALY combines the population-based mortality (YLL) and morbidity (YLD) effects and is a widely used summary measure of population health. It is used to compare the population health impacts of diseases, injuries and risk factors.
Effect measure such as Hazard Ratio or Relative Risk	Effect measures in the field of epidemiology are used to quantify the strength of the association between exposures and outcomes. For example, Hazard Ratios (HR) or Relative Risk (RR) are used in cohort studies and quantify the risk of an outcome after exposure, comparing an exposed against a non- or lower-exposed group. A value of 1, for both a HR or RR, would mean no additional risk, a value of 1.08 would mean an increase of risk (e.g. risk of death) in the exposed group by 8% as compared to a non- or lower exposed group. For the estimation of the population attributable fraction (PAF), an effect measure, e.g. Relative Risk (RR), is needed. The basis of such an effect estimate are epidemiological studies. Such observational studies record the exposure to a risk factor and the onset of health outcomes after a certain time of follow-up.
Environmental Burden of Disease Assessment (EBD)	The Environmental Burden of Disease concept is an evolution of the Comparative Risk Assessment (CRA) and allows to estimate the share of the disease burden (deaths, years of life lost due to death, healthy years lost due to disability or disability-adjusted life years) that can be attributed to the exposure towards an environmental risk factor (e.g. the exposure of a population to certain PM _{2.5} concentrations). In general, the Comparative Risk Assessment methodology, as introduced in the Global Burden of Disease Study, allows to be used for all kinds of risk factors such as behavioral, metabolic or occupational risks.
Incidence	Incidence represents the number of individuals developing a disease or experiencing a certain health event during a particular time period (e.g. day, week, month)
Incidence-based DALY approach	In the incidence-based DALY approach, the incidence of a disease is used to estimate the YLD-component. Here, the number of incident cases is multiplied by the disability weight and the duration of a health state.
Population Attributable Fraction (PAF)	The share of the total burden of disease in a population that is attributable to a certain risk factor. This share may be zero if the risk factor was eliminated or at least lower when the exposure is reduced to a less harmful level also called the counterfactual value in the EBD approach.
Prevalence	Prevalence represents the total number of individuals in a certain population having a disease or health outcome. Prevalence can either be described as a point prevalence or period prevalence. Point prevalence, refers to the number of existing cases at a specific time point (e.g. mid-year prevalence).

	Period prevalence refers to the number of existing cases over a range of time (e.g. days, weeks, months).
Prevalence-based DALY approach	In the prevalence-based DALY approach the prevalence of a disease is used to estimate the YLD-component. Compared to the incidence-based DALY approach, the number of prevalent cases is multiplied only by the disability weight, as a duration of one year is assumed for each prevalent case. The use of the prevalence-based approach is currently recommended by the Global Burden of Disease Study protocol and is followed in the ETC/EEA analyses.
Remaining Life Expectancy	The statistically remaining number of years to live at an exact age (for instance, the age of death).
Study designs	In cohort studies people are followed over time (prospective) to see how exposures affect health, while case-control studies compare (retrospective) people with and without a disease to identify possible causes.
Years lived with Disability (YLD)	The morbidity component of the DALY that measures years of healthy life lost due to living in a state of reduced overall health.
Years of Life Lost (YLL)	The mortality component of the DALY that measures the years lost due to death before reaching a predefined life expectancy value.

Annex 6 Country ISO2 code

Table A6.1: country name and respective ISO2 code

Country name	Country ISO2 code
Austria	AT
Albania	AL
Andorra	AD
Belgium	BE
Bosnia and Herzegovina	BA
Bulgaria	BG
Croatia	HR
Cyprus	CY
Czechia	CZ
Denmark	DK
Estonia	EE
Finland	FI
France	FR
Germany	DE
Greece	GR
Hungary	HU
Iceland	IS
Ireland	IE
Italy	IT
Kosovo (under UNSCR 1244/99)	XK
Latvia	LV
Liechtenstein	LI
Lithuania	LT
Luxembourg	LU
Malta	MT
Monaco	MC
Montenegro	ME
Netherlands	NL
North Macedonia	MK
Norway	NO
Poland	PL
Portugal	PT
Romania	RO
San Marino	SM
Serbia	RS
Slovakia	SK
Slovenia	SI
Spain	ES
Sweden	SE
Switzerland	CH
Türkiye	TR

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