Inquinamento atmosferico e salute respiratoria

Giovanni Viegi, MD, FERS, ATSF

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Senior Research Associate, CNR Institute of Clinical Physiology (IFC), Pisa
Professor of "Health Effects of Pollution", School of Environmental Sciences, University of Pisa
2005-06 President European Respiratory Society (ERS)
2017-22 WHO - GARD Planning Group Member
Member of the Scientific Council, ISDE-Italia

https://www.eea.europa.eu/publications/europes-air-quality-status-2023

Figure 1. Share of the EU urban population exposed to air pollutant concentrations above certain EU standards and WHO guidelines in 2021

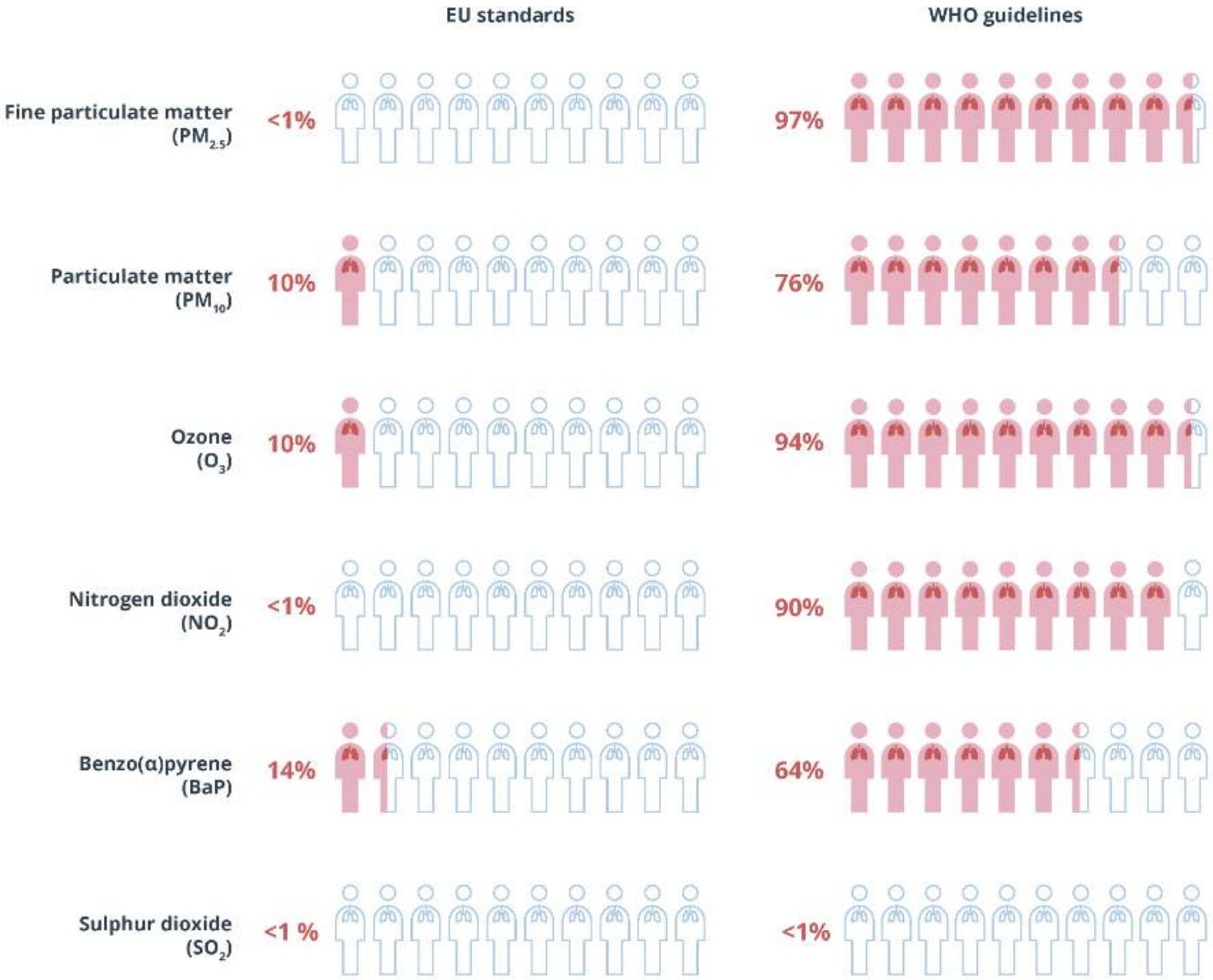
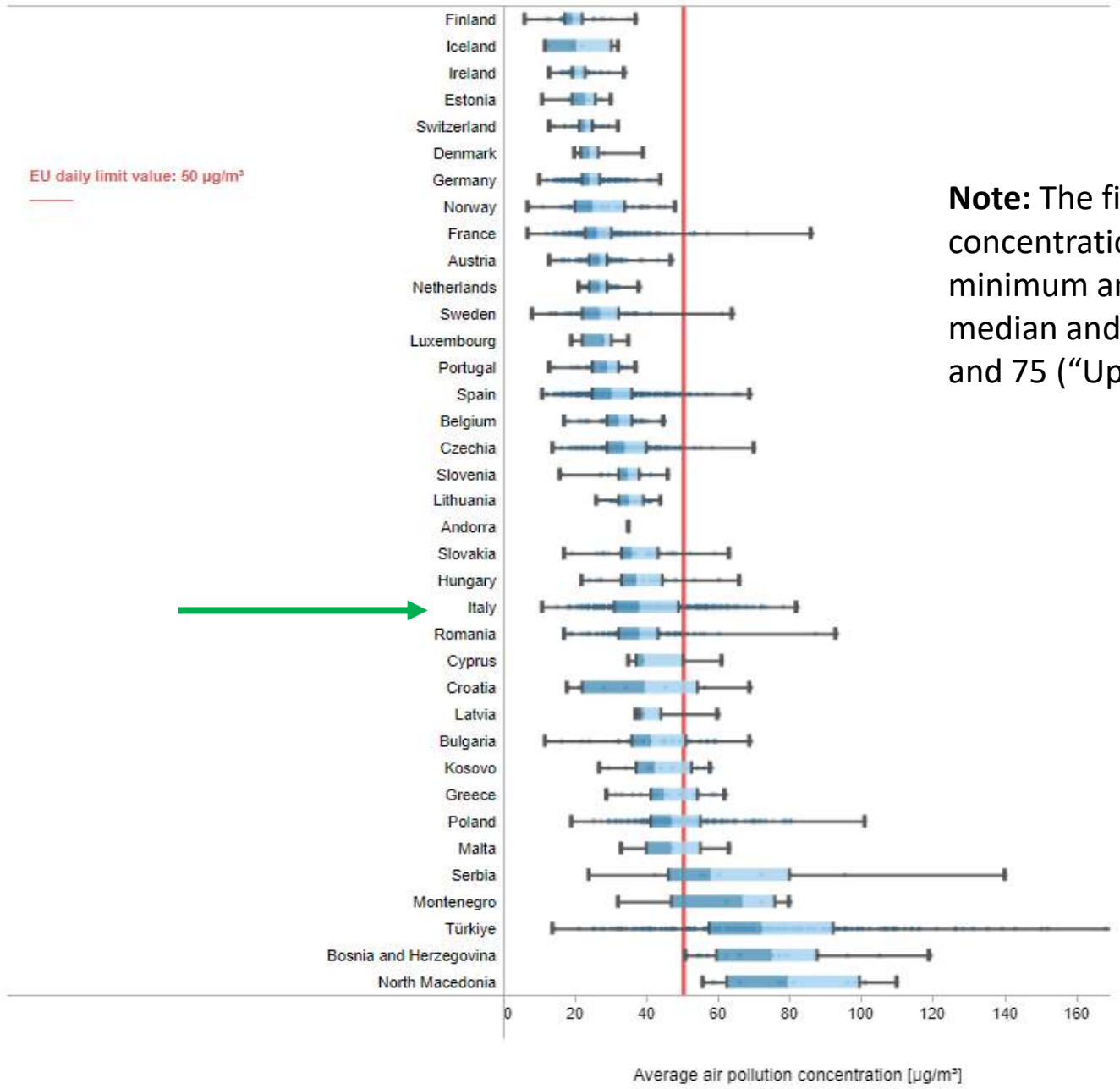
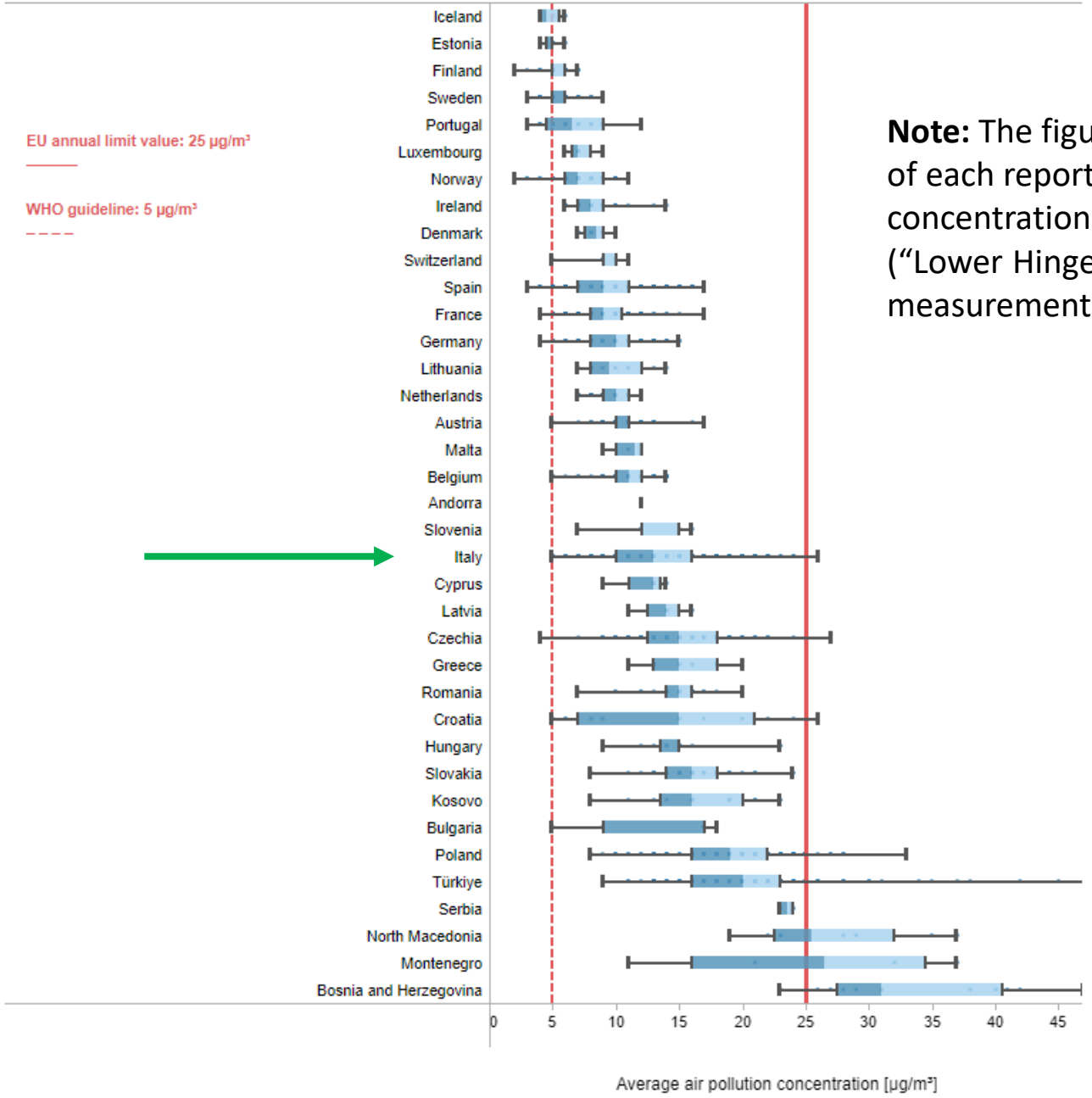


Figure 4. PM_{10} concentrations in 2021 by country in relation to the EU daily limit value



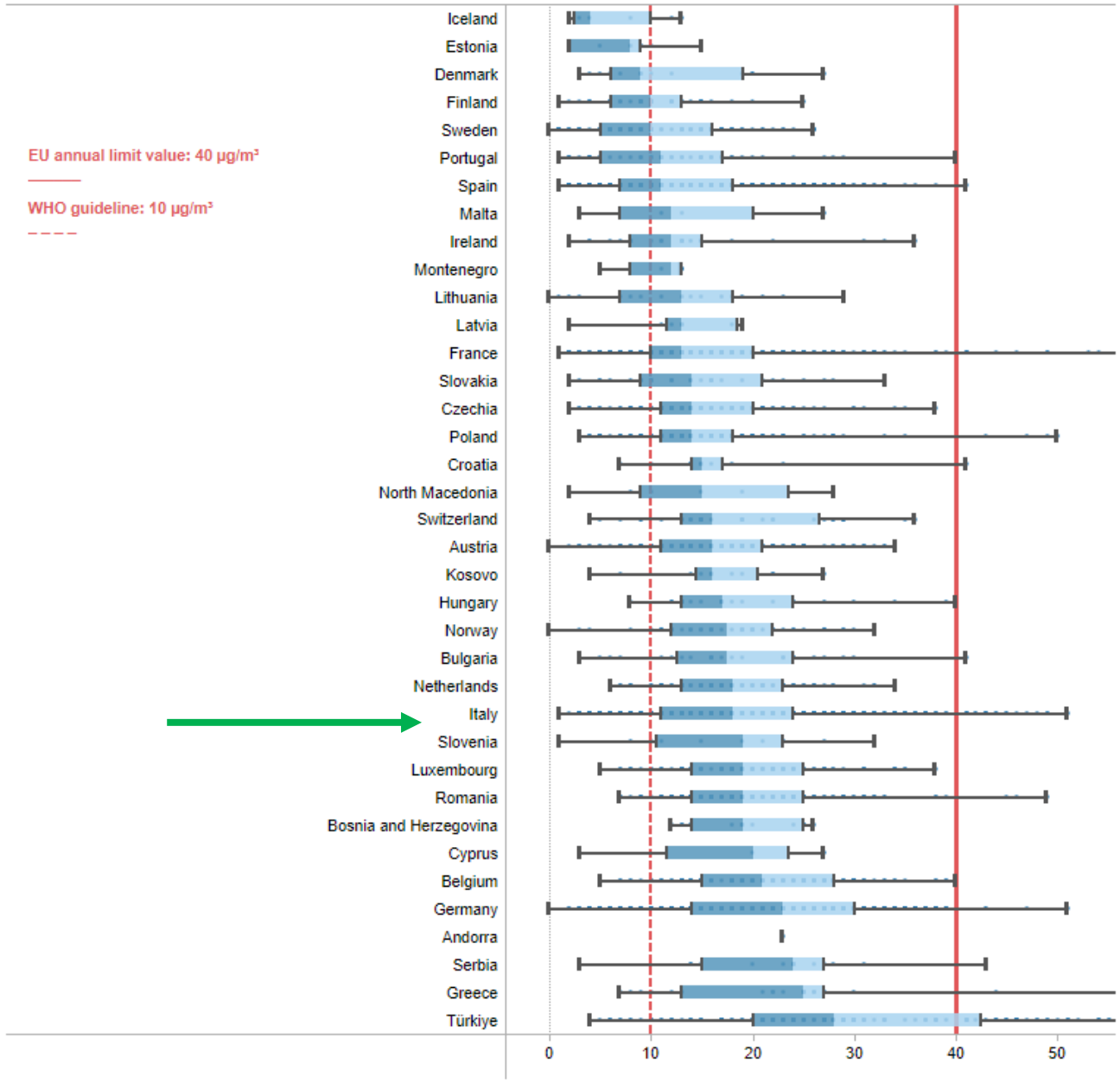
Note: The figure shows, per country, the concentrations of each reported station, the minimum and maximum concentrations, the median and the percentiles 25 (“Lower Hinge”) and 75 (“Upper Hinge”) of all the measurements

Figure 7: $PM_{2.5}$ concentrations in 2021 by country in relation to the EU annual limit value and the WHO annual guideline level



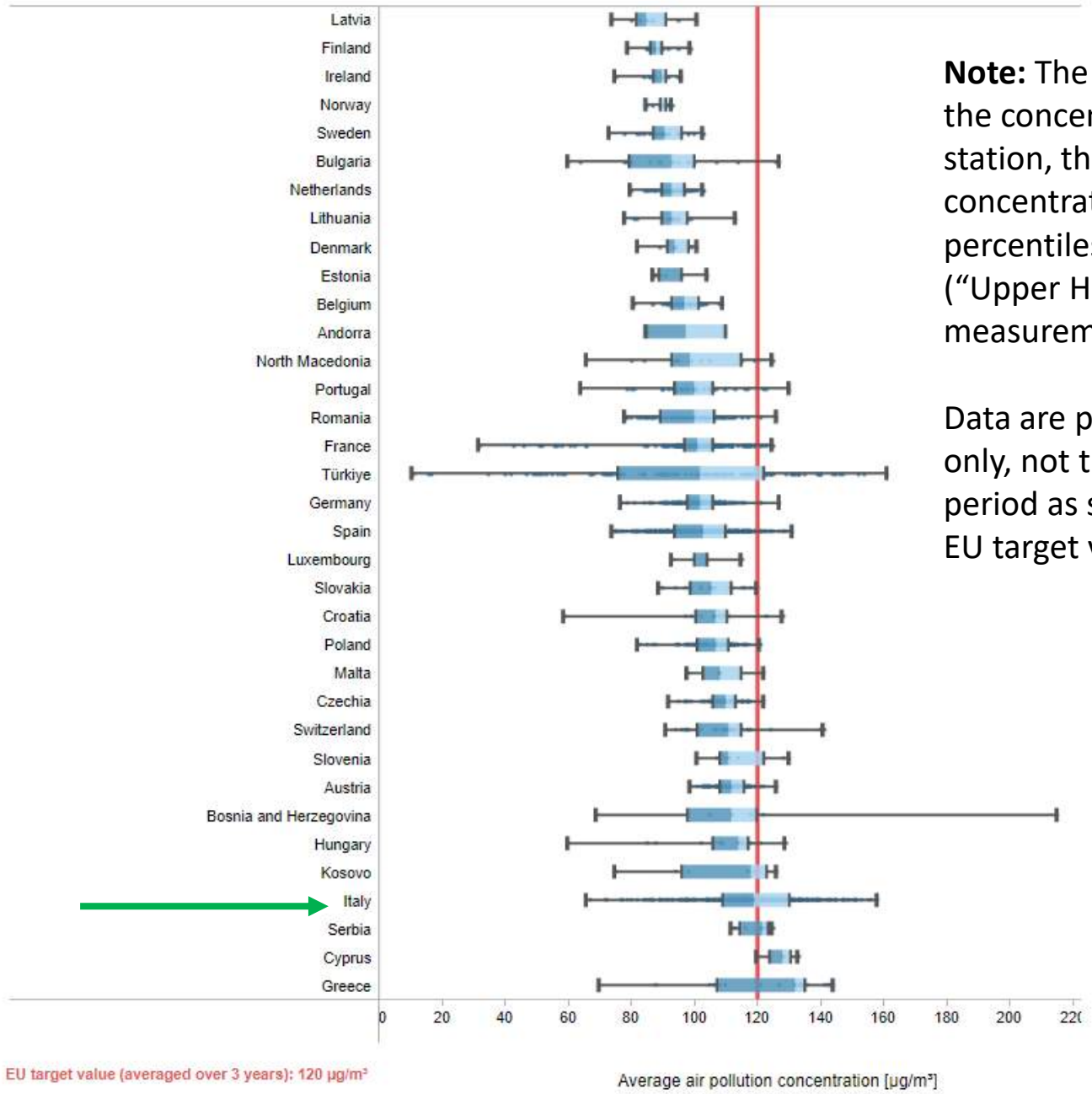
Note: The figure shows, per country, the concentrations of each reported station, the minimum and maximum concentrations, the median and the percentiles 25 (“Lower Hinge”) and 75 (“Upper Hinge”) of all the measurements.

Figure 13. NO_2 concentrations in 2021 by country and in relation to the EU annual limit value and the WHO annual guideline level



Note: The figure shows, per country, the concentrations of each reported station, the minimum and maximum concentrations, the median and the percentiles 25 (“Lower Hinge”) and 75 (“Upper Hinge”) of all the measurements

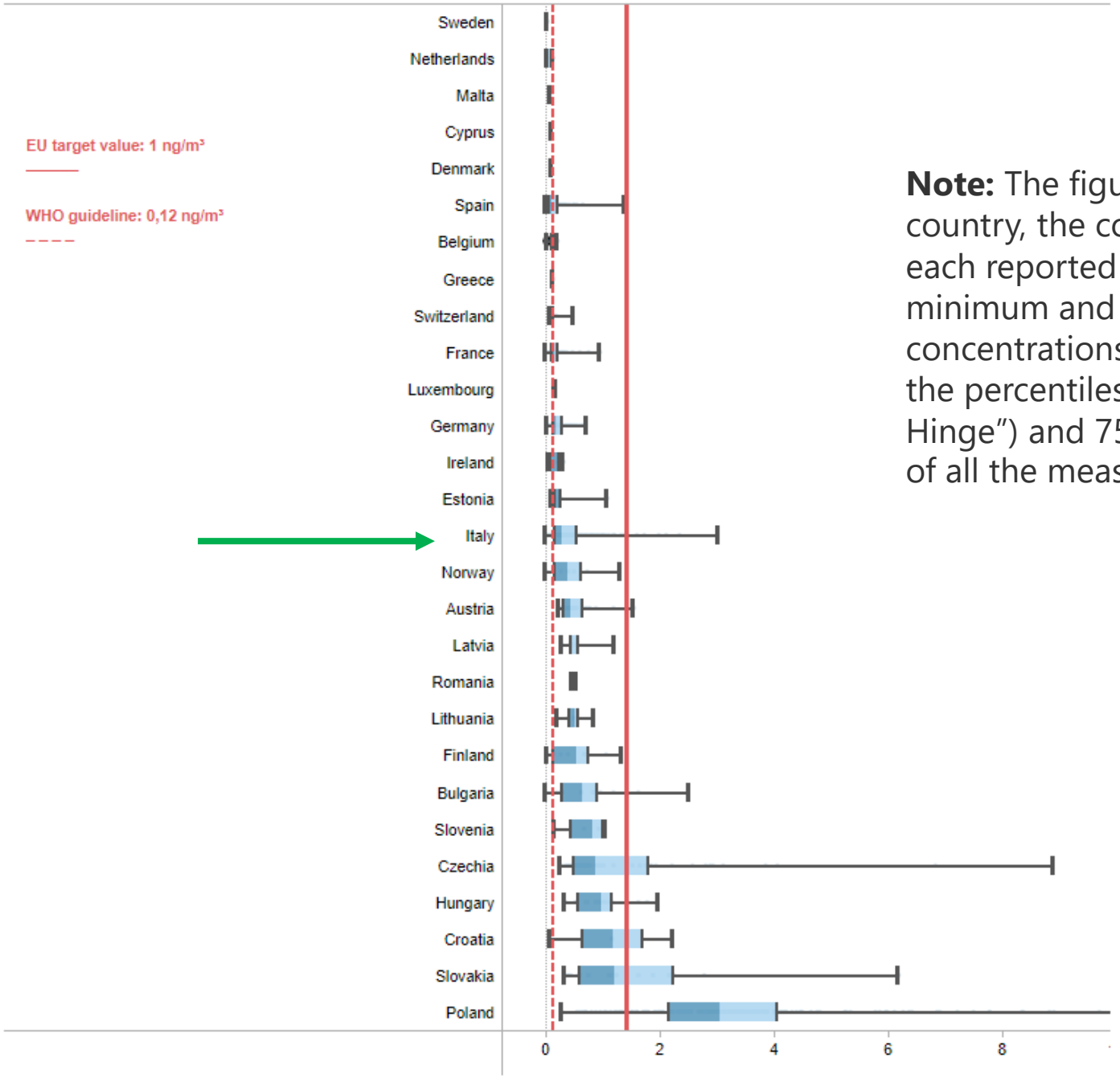
Figure 10. O_3 concentrations in 2021 by country in relation to the EU target value



Note: The figure shows, per country, the concentrations of each reported station, the minimum and maximum concentrations, the median and the percentiles 25 (“Lower Hinge”) and 75 (“Upper Hinge”) of all the measurements.

Data are presented here for one year only, not the average over a three-year period as stated in the definition of the EU target value for O_3.

Figure 15: BaP concentrations in 2021 by country



Note: The figure shows, per country, the concentrations of each reported station, the minimum and maximum concentrations, the median and the percentiles 25 (“Lower Hinge”) and 75 (“Upper Hinge”) of all the measurements

BRIEFING

Harm to human health from air pollution in Europe: burden of disease 2023

Air pollution is currently the most important environmental health risk factor in Europe. It remains an important cause of poor health and contributes in particular to respiratory and cardiovascular diseases. This briefing presents information for 2021 of the estimated harm to human health caused by three key air pollutants: fine particulate matter, nitrogen dioxide and ozone. This year's assessment also presents an estimation of the health impacts associated with specific diseases to which air pollution contributes. Such impacts are expressed using burden of disease metrics, namely 'morbidity' (the state of having a disease or disability) and 'mortality' (deaths that have occurred due to a specific disease or a group of diseases).

Published 24 Nov 2023 — Last modified 24 Nov 2023 — 17 min read — Photo: © Fani Papageorgiou, ZeroWaste PIX/ EEA

https://www.eea.europa.eu/publications/harm-to-human-health-from-air-pollution/harm-to-human-health-from

Table 2. Total country population, population-weighted mean concentrations and estimated number of attributable deaths, 2021

		$PM_{2.5}$		NO_2		O_3	
Country	POP. (1,000)	Annual mean	Deaths	Annual mean	Deaths	SOMO35	Deaths
Hungary	9,731	14.4	10,400	15.5	1,700	4,665	830
Ireland	5,006	7	460	8.4	60	1,866	70
Italy	59,236	13.9	46,800	17.8	11,300	6,149	5,100
Latvia	1,893	10.7	1,400	9.9	130	1,853	70
Lithuania	2,796	11.4	2,100	10.8	200	2,404	120
Luxembourg	635	7.4	80	14	40	2,380	10
Malta	516	11.6	190	10.3	10	6,649	30
Netherlands	17,475	9.7	5,700	15.5	1,800	2,312	430
Poland	37,840	18.1	47,300	13.7	4,200	3,309	1,900
Portugal	9,797	7.4	2,100	10.7	550	3,473	460
Romania	19,202	14.3	19,600	18.6	4,900	3,001	1,000
Slovakia	5,460	15.4	5,400	12.4	390	3,970	330
Slovenia	2,109	12.2	1,200	12.9	160	5,450	140
Spain	45,229	9.5	14,100	14.8	4,600	4,688	2,300
Sweden	10,379	5.6	650	6.5	40	1,976	220

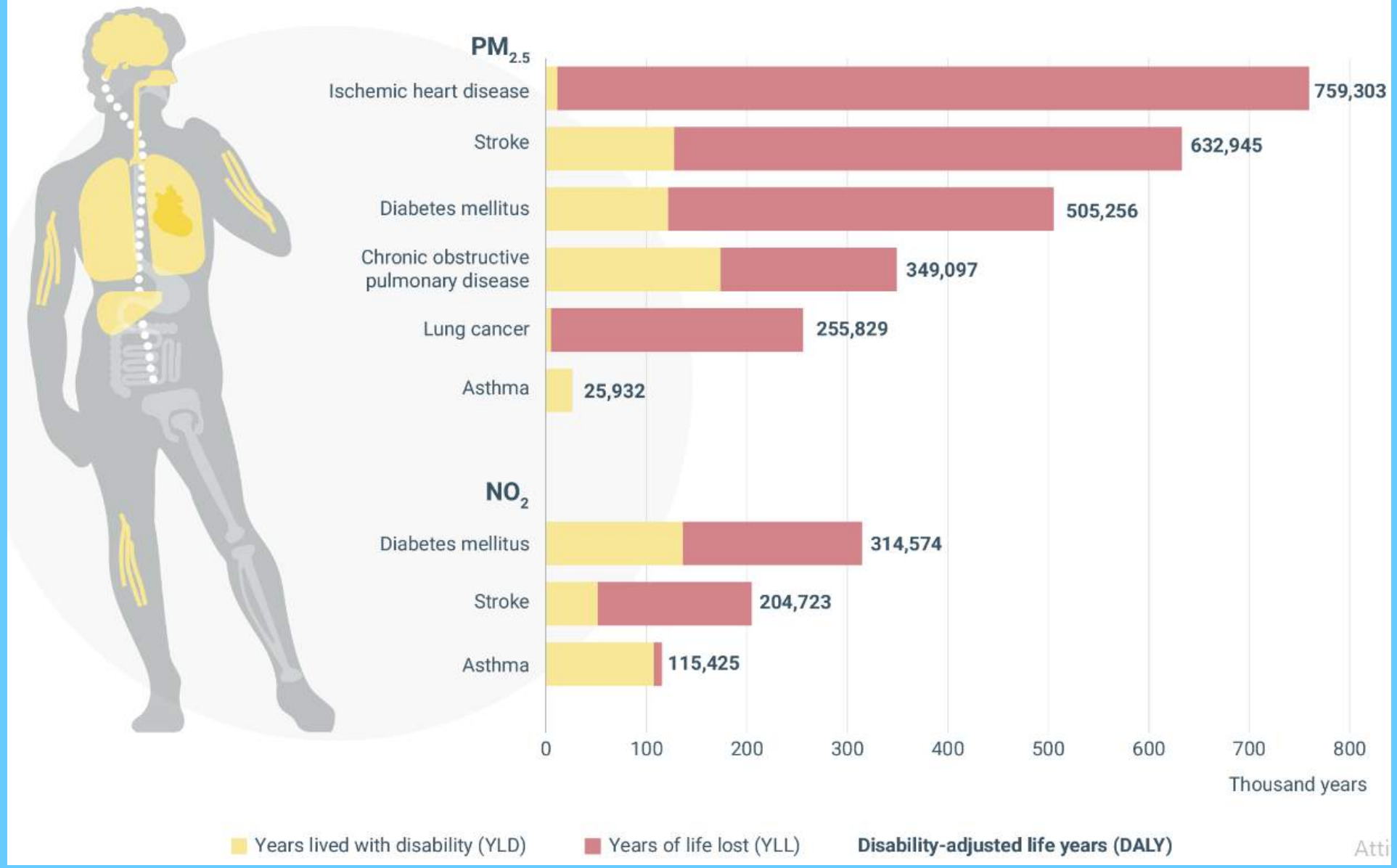
https://www.eea.europa.eu/publications/harm-to-human-health-from-air-pollution/harm-to-human-health-from

Table 3. Years of life lost (YLL) and the YLL per 100,000 inhabitants attributable to exposure to PM2.5, NO2 and O3, 2021

	$PM_{2.5}$		NO_2		O_3	
Country	YLL	YLL/100,000	YLL	YLL/100,000	YLL	YLL/100,000
Hungary	112,400	1,155	18,400	189	9,200	94
Ireland	5,500	110	800	16	850	17
Italy	415,400	701	100,300	169	46,700	79
Latvia	14,300	755	1,300	69	750	40
Lithuania	21,800	779	2,000	73	1,300	48
Luxembourg	890	140	420	66	140	22
Malta	2,200	426	110	21	350	68
Netherlands	59,000	338	18,300	105	4,700	27
Poland	519,000	1,372	45,700	121	21,900	58
Portugal	20,700	211	5,400	55	4,600	47
Romania	213,300	1,111	52,800	275	11,500	60
Slovakia	57,900	1,060	4,200	76	3,700	68
Slovenia	11,500	543	1,600	74	1,400	67
Spain	153,600	340	49,700	110	25,400	56
Sweden	5,900	57	370	4	2,100	20

https://www.eea.europa.eu/publications/harm-to-human-health-from-air-pollution/harm-to-human-health-from

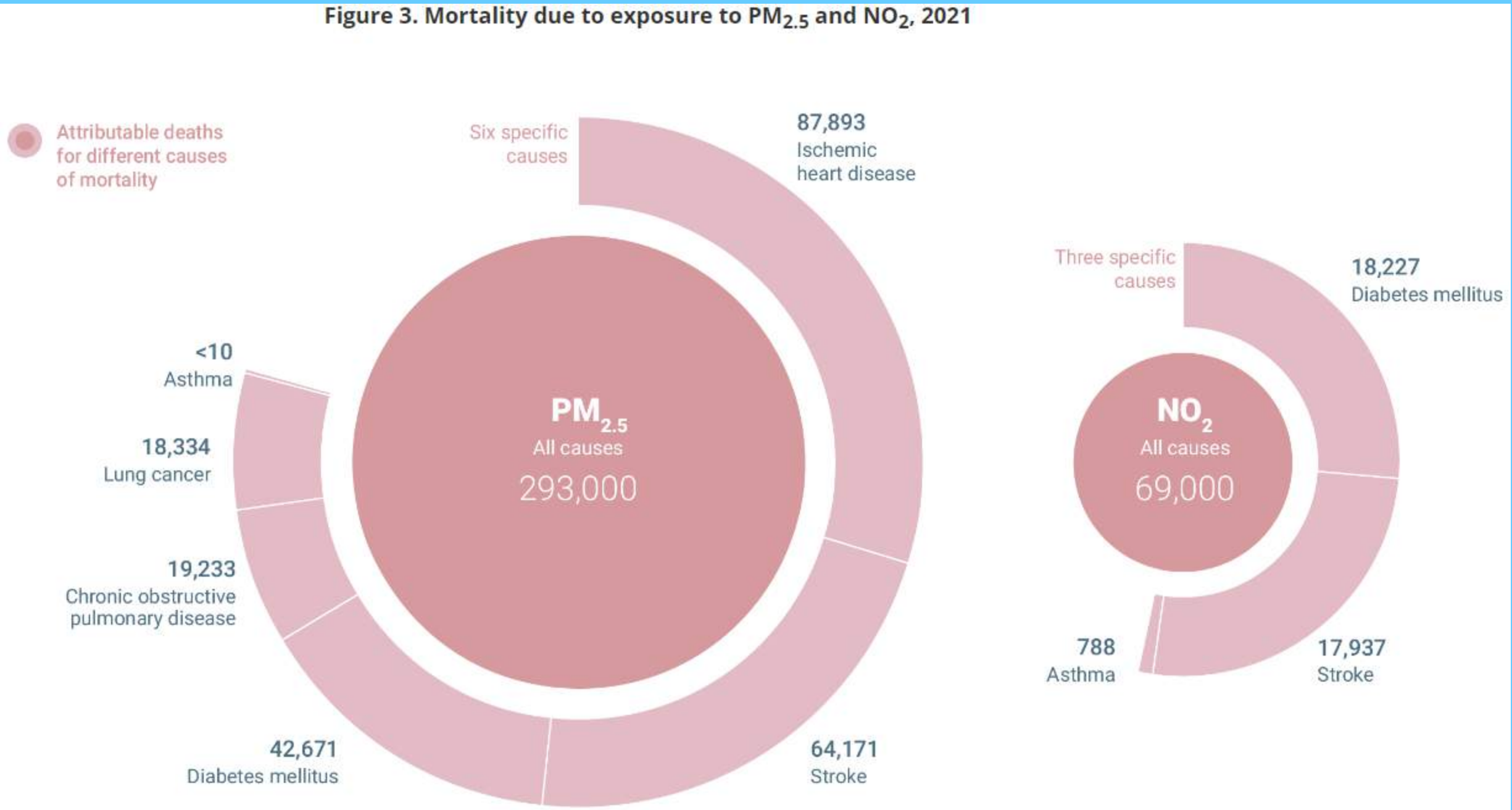
Figure 2. Burden of disease for $PM_{2.5}$ and NO_2, 2021



Note: For $PM_{2.5}$ the data relates to six specific identified diseases and covers 40 European countries, while for NO_2 the data relates to three specific identified diseases and covers 41 European countries.

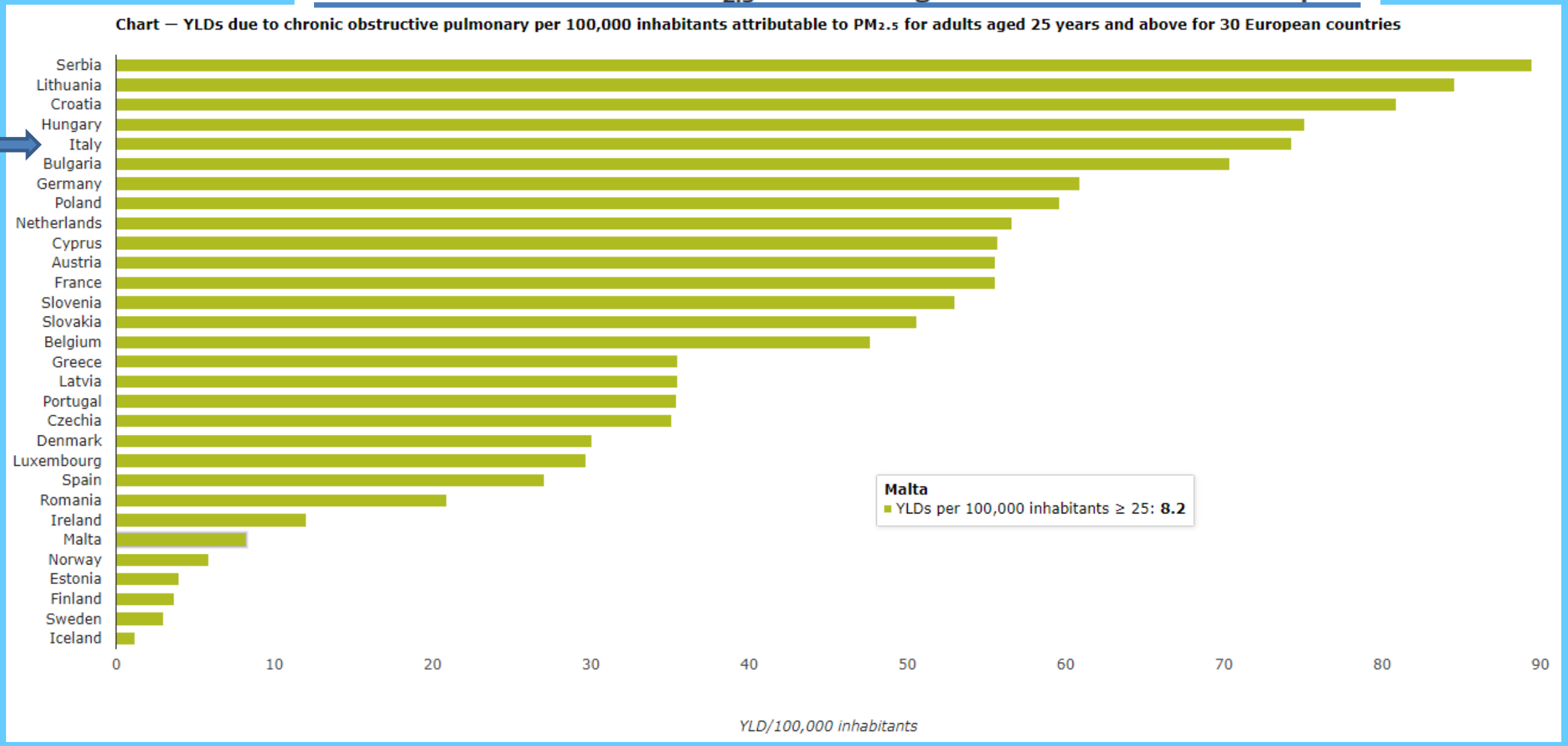
https://www.eea.europa.eu/publications/harm-to-human-health-from-air-pollution/harm-to-human-health-from

Figure 3. Mortality due to exposure to $PM_{2.5}$ and NO_2, 2021



https://www.eea.europa.eu/publications/harm-to-human-health-from-air-pollution/harm-to-human-health-from

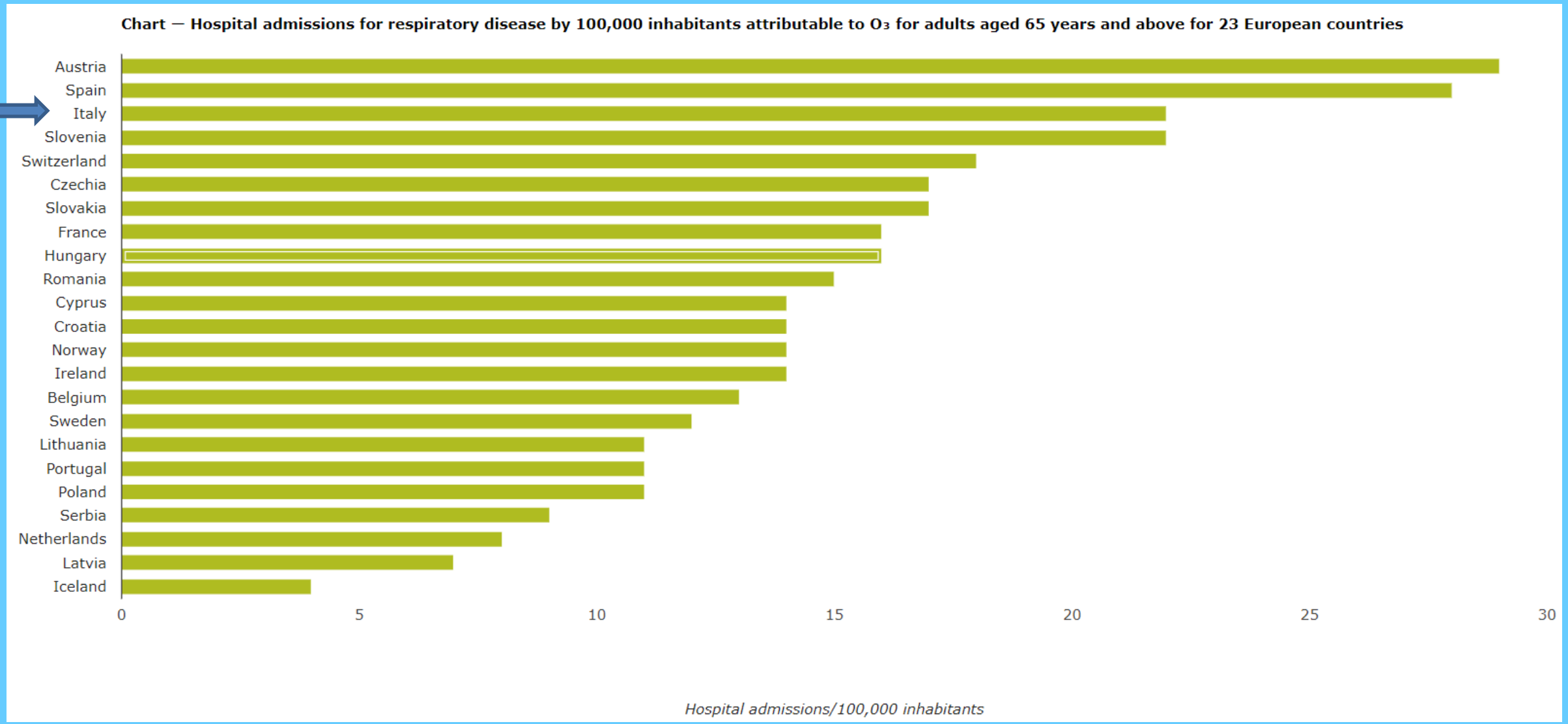
Figure 2. YLDs due to chronic obstructive pulmonary disease per 100,000 inhabitants attributable to $PM_{2.5}$ for adults aged 25 and above for 30 European



Note:
- YLDs: years lived with disability.
- Although 41 European countries have been considered, based on the data availability, there was only possible to estimate the COPD disease burden for 30.

https://www.eea.europa.eu/publications/air-quality-in-europe-2022/health-impacts-of-air-pollution

Figure 4. Hospital admissions for respiratory disease by 100,000 inhabitants attributable to O_3 for adults aged 65 and above for 23 European countries



Note:
Although 41 European countries have been considered, based on the data availability, there was only possible to estimate the hospital admissions for 23.

https://www.eea.europa.eu/publications/air-quality-in-europe-2022/health-impacts-of-air-pollution

Publications

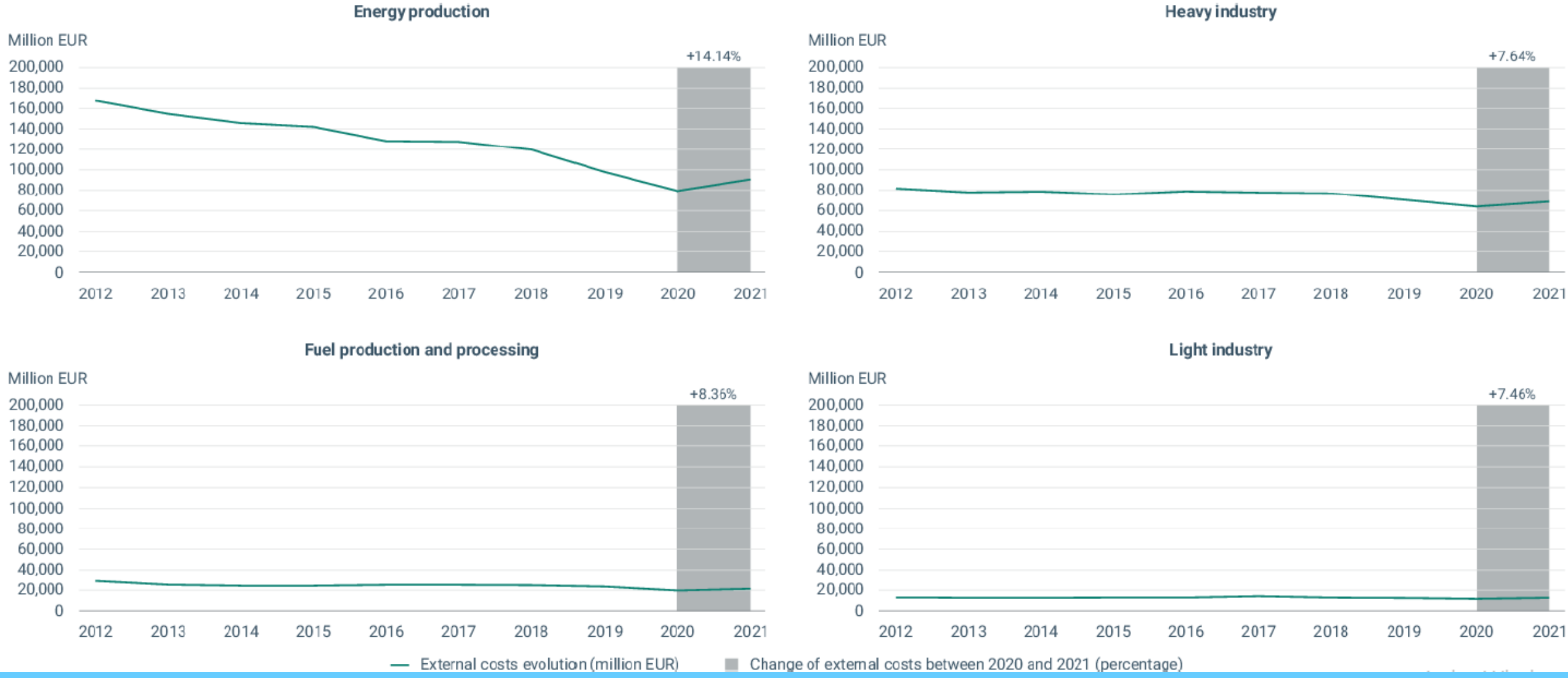
European Environment Agency

The costs to health and the environment from industrial air pollution in Europe – 2024 update

Key messages

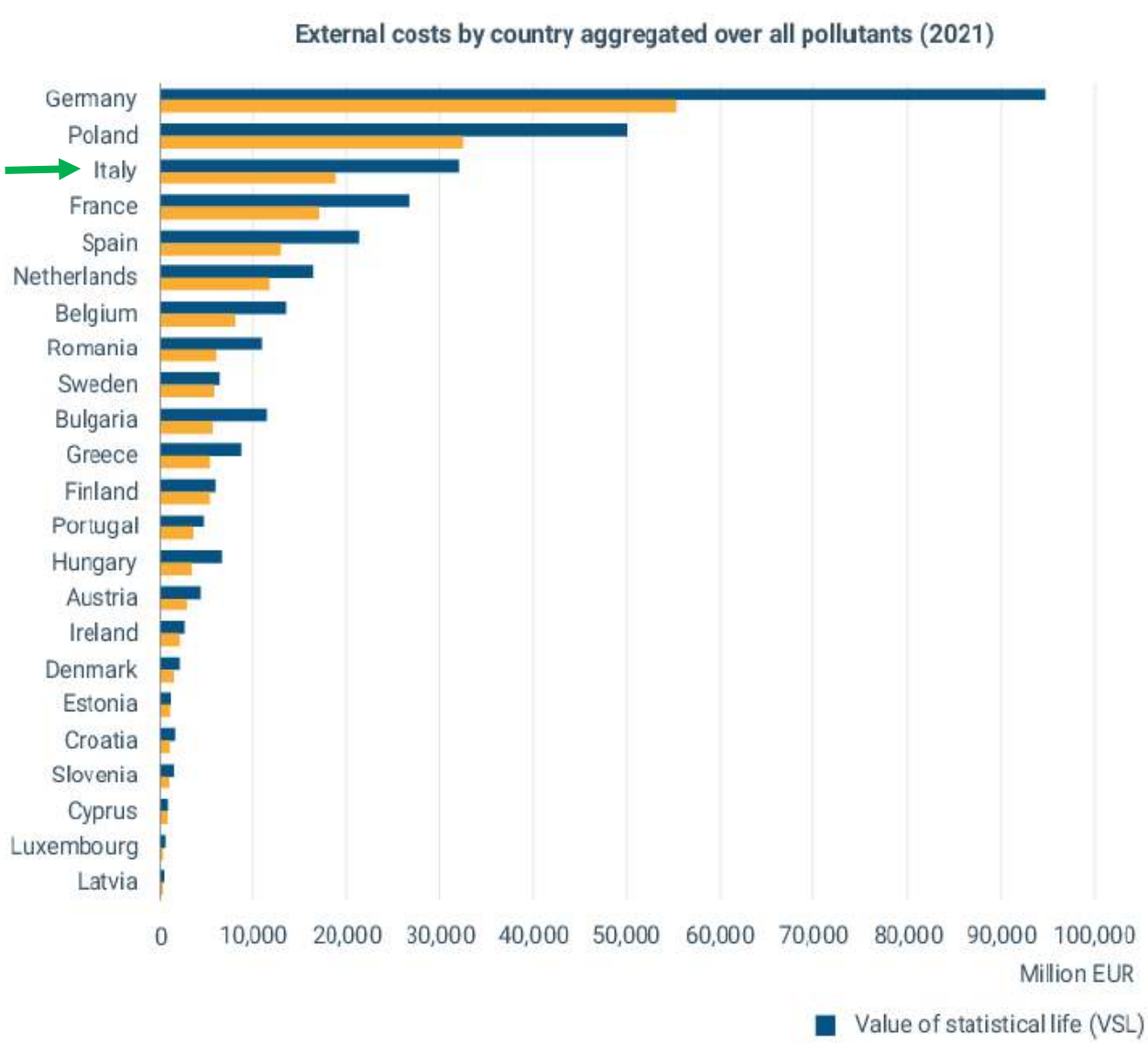
Europe's industry has made significant progress in reducing its environment and climate impacts. Over the last decade, external costs caused by air pollution from industry decreased by nearly 35%, although they rebounded somewhat after a drop in 2020 driven by lower economic activity in Europe during the COVID-19 pandemic.

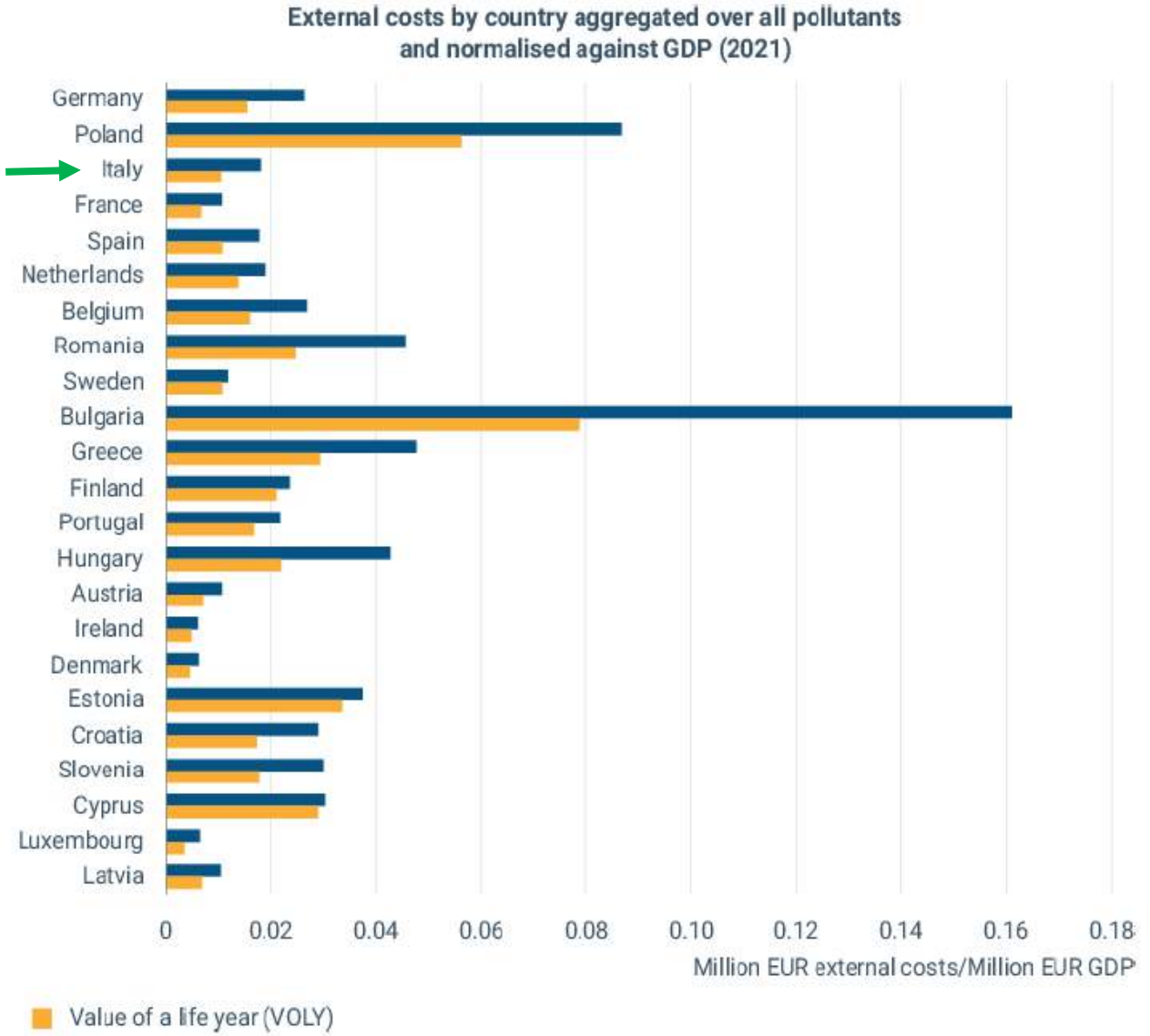
Figure 2. External costs by sector aggregated over all pollutants (2012-2021)



Notes: Mortality valued using the value of a life year (VOLY). Euro price base: 2021. Data gaps: Czechia (2021), Malta (2020-2021), Lithuania (2020-2021) and Slovakia (2018- 2021). This data has been projected using the latest reported year for the summaries at EU level (by pollutant group and by sector), but not when individual countries or facilities are presented. In addition to the sectors shown in the Figure 2, the analysis also covered livestock (i.e. intensive rearing of pigs and poultry on large farms), waste management and wastewater. Due to the nature of the sectors, the scope of the European Pollutant Release and Transfer Register (EPRTR) legislation and the selection of pollutants, these sectors represented a low amount of external costs to health and the environment, which could lead to misleading conclusions. Therefore, they have not been presented in this figure.

Figure 3. External costs by country aggregated over all pollutants (2021)





Value of statistical life (VSL) Value of a life year (VOLY)

Notes: Mortality valued using the value of a life year (VOLY) and the Value of Statistical Life (VSL). The order in the ranking is based on the VOLY. Euro price base: 2021. Data gaps: Czechia, Malta, Lithuania, and Slovakia. No data reported for 2021.

New evidence: Economic and societal burden from air pollution is high

Joint Statement by Medical, Public Health and Scientific Societies

factors [8]. In terms of economic burden, the estimated global health-related external costs (i.e., those borne by society as a whole) were US$ 5 trillion in 2013 with an additional US$ 225 billion in lost labour productivity [9]. For the WHO European Region, the overall annual economic cost of health impacts and mortality from air pollution, including estimates for morbidity costs, stood at US$ 1.575 trillion [10].

Costs from disease burden

Beneficial cost-benefit-ratio for clean air policies

Programmes that reduce air pollutant emissions provide enormous air quality and health benefits which increase over time. The estimated health benefits of improved air quality outweigh by far the implementation costs of air quality actions. For the US, it has been estimated that the benefits from decreased mortality, lower medical expenditures for air pollution-related diseases, and higher productivity of workers are around 30 times greater than the costs of the Clean Air Act, resulting in net improvements of economic growth and population welfare [19]. In China, public health benefits were

A joint ERS/ATS policy statement: what constitutes an adverse health effect of air pollution? An analytical framework

George D. Thurston[1], Howard Kipen[2], Isabella Annesi-Maesano[3], John Balmes[4,5], Robert D. Brook[6], Kevin Cromar[7], Sara De Matteis[8], Francesco Forastiere[9], Bertil Forsberg[10], Mark W. Frampton[11], Jonathan Grigg[12], Dick Heederik[13], Frank J. Kelly[14], Nino Kuenzli[15,16], Robert Laumbach[2], Annette Peters[17], Sanjay T. Rajagopalan[18], David Rich[19], Beate Ritz[20], Jonathan M. Samet[21], Thomas Sandstrom[11], Torben Sigsgaard[22], Jordi Sunyer[23] and Bert Brunekreef[13,24]

Eur Respir J 2017; 49: 1600419

Newer evidences:

Interstitial Pulmonary Fibrosis

Exacerbations

Incidence (?)

Cystic fibrosis

ELAPSE

Stafoggia, Lancet Planet Health 2022

Long-Term Exposure to Air Pollution and Risk of Acute Lower Respiratory Infections in the Danish Nurse Cohort

Jiawei Zhang, MSc[1], ORCID: 0000-0002-0779-6908; Youn-Hee Lim, PhD[1], ORCID: 0000-0002-1290-5814; Rina So, PhD[1,2], ORCID: 0000-0002-2113-3887; Laust H. Mortensen, PhD[3,4], ORCID: 0000-0002-6399-495X; George Maria Napolitano, PhD[1], ORCID: 0000-0002-1197-2599; Thomas Cole-Hunter, PhD[1]; Stéphane Tuffier, MD[1], ORCID: 0000-0003-1969-2070; Marie Bergmann, MSc[1], ORCID: 0000-0001-5743-5564; Matija Maric, MD[1]; Seyed Mahmood Taghavi Shahri, PhD[1]; Jørgen Brandt, PhD[5,6], ORCID: 0000-0002-7580-9547; Matthias Ketzel, PhD[5,7], ORCID: 0000-0001-9519-1935; Steffen Loft, PhD[1], ORCID: 0000-0001-9552-8518; Zorana Jovanovic Andersen, PhD[1], ORCID: 0000-0003-4138-9828;

ANNALSATS Articles in Press. Published March 21, 2024 as 10.1513/AnnalsATS.202401-074OC

Long-term exposure to air pollution at low levels was associated with risk of new and recurrent ALRIs

Early-Life Exposure to Air Pollution and Childhood Asthma Cumulative Incidence in the ECHO CREW Consortium

Antonella Zanobetti, PhD; Patrick H. Ryan, PhD; Brent A. Coull, PhD; Heike Luttmann-Gibson, PhD; Soma Datta, MS, MBA; Jeffrey Blossom, MA; Cole Brokamp, PhD; Nathan Lothrop, PhD; Rachel L. Miller, MD; Paloma I. Beamer, PhD; Cynthia M. Visness, PhD, MPH; Howard Andrews, PhD; Leonard B. Bacharier, MD; Tina Hartert, MD; Christine C. Johnson, PhD; Dennis R. Ownby, MD; Gurjit K. Khurana Hershey, MD, PhD; Christine L.M. Joseph, PhD; Eneida A. Mendonça, PhD; Daniel J. Jackson, MD; Edward M. Zoratti, MD; Anne L. Wright, PhD; Fernando D. Martinez, MD; Christine M. Seroogy, MD; Sima K. Ramratnam, MD; Agustin Calatroni, MS; James E. Gern, MD; Diane R. Gold, MD; For the ECHO Children's Respiratory and Environmental Workgroup

JAMA Network Open. 2024;7(2):e240535. doi:10.1001/jamanetworkopen.2024.0535

Ultrafine Particles and Hospital Visits for Chronic Lower Respiratory Diseases in New York State

Ian Trees[a] ORCID ID: 0000-0003-4747-6017, Fangqun Yu[b] ORCID ID: 0000-0001-8862-4835, Xinlei Deng[a] ORCID ID: 0000-0001-8129-6007, Gan Luo[b] ORCID ID: 0000-0002-9588-7008, Wangjian Zhang[c] ORCID ID: 0000-0001-9655-6385, Shao Lin[a,d,1*] ORCID ID: 0000-0002-5535-7504

ANNALSATS Articles in Press. Published March 06, 2024 as 10.1513/AnnalsATS.202303-267OC

UFP exposure increased chronic lower respiratory disease-related emergency department visits across all seasons and demographics

Urgent Call to Ensure Clean Air For All in Europe, Fight Health Inequalities and Oppose Delays in Action

Ebba Malmqvist[1], Zorana Jovanovic Andersen[2], Joseph Spadaro[3], Mark Nieuwenhuijsen[4,5,6], Klea Katsouyanni[7], Bertil Forsberg[8], Francesco Forastiere[7] and Barbara Hoffmann[9]*

Int J Public Health 69:1606958.
doi: 10.3389/ijph.2024.1606958

Inquinamento atmosferico e salute respiratoria

Giovanni Viegi, MD, FERS, ATSF

LE INDAGINI EPIDEMIOLOGICHE CONDOTTE/PARTECIPATE DAL CNR IN ITALIA

ITALIAN EPIDEMIOLOGICAL SURVEYS (1980-2011)

CNR-IFC Study design: longitudinal, general population studies

PO Delta 1
(1980-82, n=3284, 8-64 yrs**)**
. Sampling
. CNR questionnaire
. Lung function test

Pisa 1
(1985-88,n=3865, 5-97yrs**)**
. Sampling
. CNR questionnaire

PO Delta 2
(1988-91, n=2841, 8-73yrs)
. CNR questionnaire
. Lung function test.
. Bronchial responsiveness
. Skin prick tests - Total serum IgE
.Nested: indoor

Pisa 2
(1991-93, n=2841, 8-97 yrs**)**
. CNR questionnaire
. Lung function tests
. Bronchial responsiveness
. Skin prick tests - Total serum IgE
. Mutagenetic determinations
. Nested indoor

SEASD *
(1997-98**,** n=2335, 13-99)
. Sub - sampling
. CNR questionnaire
. Blood sample collection
Urine sample collection
. Blood pressure, height, weight

IMCAII °
(2006-11, n=1620, 18-103yrs)
. Sub - sampling
. CNR questionnaire
. Lung function test
. Blood sample. Pulseoximeter
. Blood pressure, height, weight

° **I**ndicators for **M**onitoring **C**OPD and **A**sthma in the EU

General Population: Urban vs rural factor

Epidemiological Studies of Po Delta and Pisa

General Population: Urban vs sub-urban factor

The Proportional Venn Diagram of Obstructive Lung Disease in the Italian General Population*

Chest 2004;126;1093-1101

Giovanni Viegi, MD; Gabriella Matteelli, MD; Anna Angino, BS; Antonio Scognamiglio, MD; Sandra Baldacci, BSc; Joan B. Soriano, MD, PhD; and Laura Carrozzi, MD

[CANCER RESEARCH 58, 4122–4126, September 15, 1998]

Serum Antibodies to Benzo(*a*)pyrene Diol Epoxide-DNA Adducts in the General Population: Effects of Air Pollution, Tobacco Smoking, and Family History of Lung Diseases[1]

Stefano Petruzzelli,[2] Alessandro Celi, Nolita Pulerà, Filomena Baliva, Giovanni Viegi, Laura Carrozzi, Gigliola Ciacchini, Matteo Bottai, Francesco Di Pede, Paolo Paoletti, and Carlo Giuntini

Urban residence is associated with bronchial hyper-responsiveness in Italian general population samples

Chest 2009;135;434-441

Sara Maio, Sandra Baldacci, Laura Carrozzi, Eva Polverino, Anna Angino, Francesco Pistelli, Francesco Di Pede, Marzia Simoni, Duane Sherrill and Giovanni Viegi

Geographical information system and environmental epidemiology: a cross-sectional spatial analysis of the effects of traffic-related air pollution on population respiratory health

Daniela Nuvolone[1,2*], Roberto della Maggiore[2], Sara Maio[3], Roberto Fresco[2], Sandra Baldacci[3], Laura Carrozzi[3], Francesco Pistelli[3], Giovanni Viegi[3,4]

Environmental Health 2011, **10**:12

Respiratory symptoms/diseases prevalence is still increasing: a 25-yr population study

Sara Maio [a, *], Sandra Baldacci [a], Laura Carrozzi [b], Francesco Pistelli [b], Anna Angino [a], Marzia Simoni [a], Giuseppe Sarno [a], Sonia Cerrai [a], Franca Martini [a], Martina Fresta [a], Patrizia Silvi [a], Francesco Di Pede [a], Massimo Guerriero [c], Giovanni Viegi [a, d]

Respiratory Medicine 110 (2016) 58–65

18-yr cumulative incidence of respiratory/allergic symptoms/diseases and risk factors in the Pisa epidemiological study

Sara Maio [a,b,*], Sandra Baldacci [a], Laura Carrozzi [c], Francesco Pistelli [d], Marzia Simoni [a], Anna Angino [a], Stefania La Grutta [e], Vito Muggeo [b], Giovanni Viegi [a,e]

Environ Res. 2022 Apr 15;206:112428. doi: 10.1016/j.envres.2021.112428. Epub 2021 Nov 24.

Urban grey spaces are associated with increased allergy in the general population

S Maio [1], S Baldacci [2], S Tagliaferro [2], A Angino [2], E Parmes [3], J Pärkkä [3], G Pesce [4], C N Maesano [5], I Annesi-Maesano [5], G Viegi [6]

INAIL
ISTITUTO NAZIONALE PER L'ASSICURAZIONE CONTRO GLI INFORTUNI SUL LAVORO

Bando Ricerche in Collaborazione (BRiC)
Piano Attività di Ricerca 2016-2018

The project

BEEP
Bigdata in Environmental and occupational EPidemiology

Coordinator:
Giovanni Viegi

June 29, 2017- December 28, 2019

Estimation of daily PM_{10} and $PM_{2.5}$ concentrations in Italy, 2013–2015, using a spatiotemporal land-use random-forest model

Massimo Stafoggia[a,b,*], Tom Bellander[b], Simone Bucci[a], Marina Davoli[a], Kees de Hoogh[c,d], Francesca de' Donato[a], Claudio Gariazzo[e], Alexei Lyapustin[f], Paola Michelozzi[a], Matteo Renzi[a], Matteo Scortichini[a], Alexandra Shtein[g], Giovanni Viegi[h], Itai Kloog[g], Joel Schwartz[i]

Environment International 124 (2019) 170–179

Effects of Particulate Matter on the Incidence of Respiratory Diseases in the Pisan Longitudinal Study

Salvatore Fasola [1,*], Sara Maio [2], Sandra Baldacci [2], Stefania La Grutta [1], Giuliana Ferrante [3], Francesco Forastiere [1], Massimo Stafoggia [4], Claudio Gariazzo [5], Giovanni Viegi [1,2] and on behalf of the BEEP Collaborative Group †

Int. J. Environ. Res. Public Health 2020, 17, 2540

Science of The Total Environment
Available online 17 October 2021, 151034
In Press, Journal Pre-proof

A nationwide study of air pollution from particulate matter and daily hospitalizations for respiratory diseases in Italy

Matteo Renzi [a], Matteo Scortichini [a], Francesco Forastiere [b, e], Francesca de' Donato [a], Paola Michelozzi [a], Marina Davoli [a], Claudio Gariazzo [c], Giovanni Viegi [b, d], Massimo Stafoggia [a], BEEP collaborative Group, Carla Ancona [f], Simone Bucci [f], Francesca de' Donato [f], Paola Michelozzi [f], Matteo Renzi [f], Matteo Scortichini [f], Massimo Stafoggia [f], Michela Bonafede [g] ... Giuseppe Carlino [g]

2022 Feb 10;807(Pt 3):151034

Relationship of long-term air pollution exposure with asthma and rhinitis in Italy: an innovative multipollutant approach

Sara Maio[1], Salvatore Fasola[2], Alessandro Marcon[3], Anna Angino[1], Sandra Baldacci[1], Maria Beatrice Bilò[4], Roberto Bono[5], Stefania La Grutta[2], Pierpaolo Marchetti[3], Giuseppe Sarno[1], Giulia Squillacioti[5], Ilaria Stanisci[1], Pietro Pirina[6], Sofia Tagliaferro[1], Giuseppe Verlato[3], Simona Villani[7], Claudio Gariazzo[8], Massimo Stafoggia[9], Giovanni Viegi[1], on behalf of the BIGEPI group*

Environmental Research 224 (2023) 115455

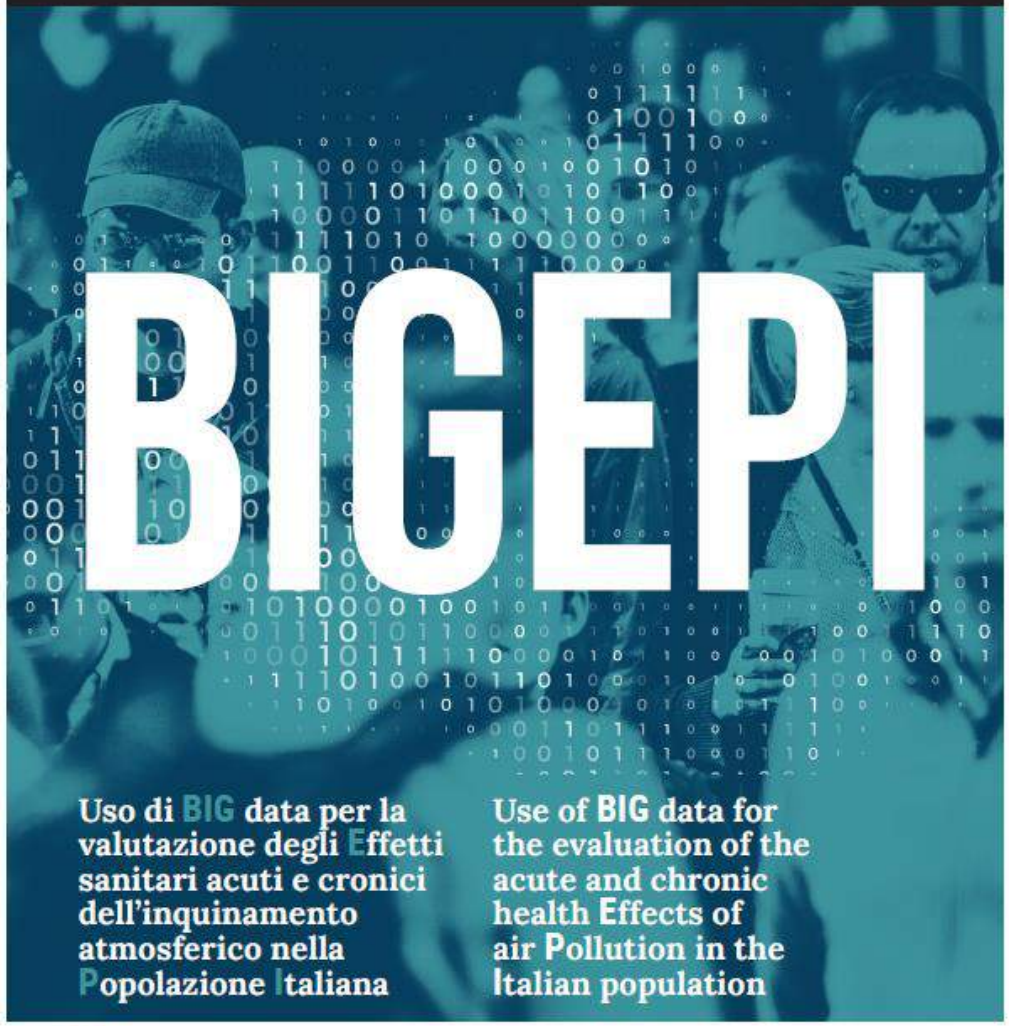
BIGEPI Project

Rivista dell'Associazione italiana di epidemiologia

ANNO 47 • N. 6 • NOVEMBRE-DICEMBRE 2023 • SUPPLEMENTO 3

e&p

EPIDEMIOLOGIA & PREVENZIONE



BIGEPI

Uso di BIG data per la valutazione degli Effetti sanitari acuti e cronici dell'inquinamento atmosferico nella Popolazione Italiana

Use of BIG data for the evaluation of the acute and chronic health Effects of air Pollution in the Italian population

BIGEPI · CNR-IFC · INAIL · DEP Lazio · ASL Roma 1 · Regione Lazio · Inferenze

Indice

Contents

GARD Italy
UN MONDO DOVE RESPIRARE LIBERAMENTE

NUOVE EVIDENZE A SUPPORTO DEL DOCUMENTO "INQUINAMENTO ATMOSFERICO E CAMBIAMENTI CLIMATICI

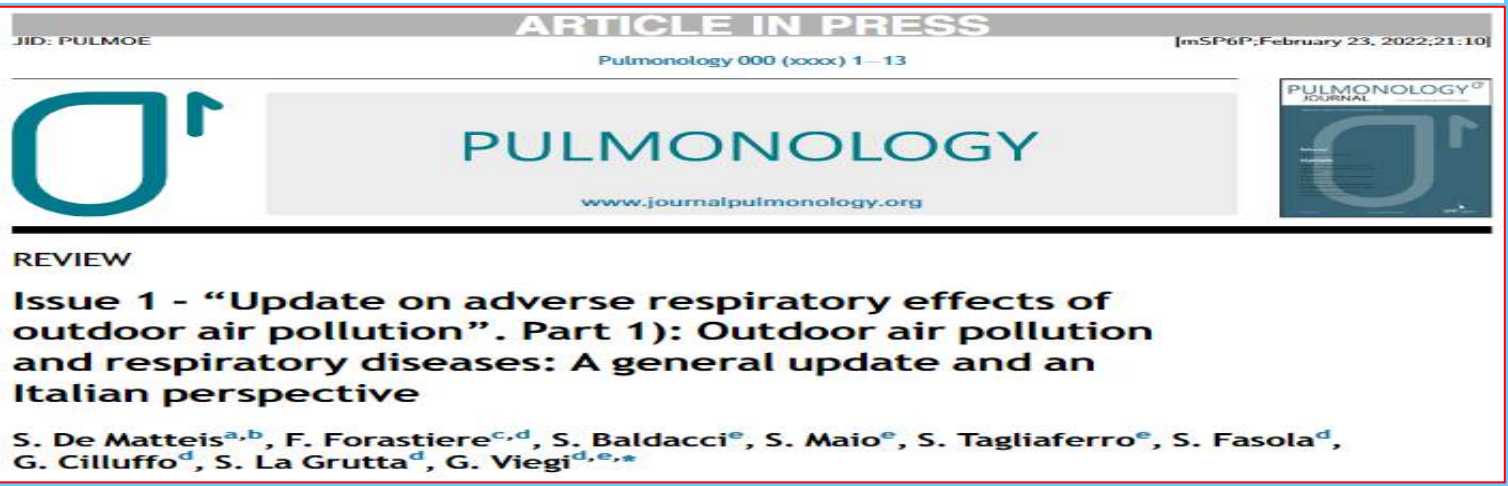
Elementi per una strategia nazionale di prevenzione"

Aggiornamento 2023

https://www.salute.gov.it/portale/gard/dettaglioPubblicazioniGard.jsp?lingua=italiano&id=3401

EDITORIAL

A series of narrative reviews on air pollution and respiratory health for Pulmonology: Why it is important and who should read it



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PULMONOLOGY

www.journalpulmonology.org

REVIEW

Issue 1 - "Update on adverse respiratory effects of outdoor air pollution". Part 1): Outdoor air pollution and respiratory diseases: A general update and an Italian perspective

S. De Matteis[a,b], F. Forastiere[c,d], S. Baldacci[e], S. Maio[e], S. Tagliaferro[e], S. Fasola[d], G. Cilluffo[d], S. La Grutta[d], G. Viegi[d,e,*]

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Pulmonology. 2022 Jul-Aug;28(4):284-296

REVIEW

Issue 2 - "Update on adverse respiratory effects of indoor air pollution". Part 2): Indoor air pollution and respiratory diseases: Perspectives from Italy and some other GARD countries

G. Sarno[a], I. Stanisci[a], S. Maio[a], S. Williams[b], E.M. Khoo[b], S.G. Diaz[c], E.V. Ponte[d], L.T.T. Lan[e], T. Soronbaev[f], D. Behera[g], S. Tagliaferro[a], S. Baldacci[a], G. Viegi[a,*]

Pulmonology (2023), https://doi.org/10.1016/j.pulmoe.2023.03.007

Outdoor air pollution and respiratory health

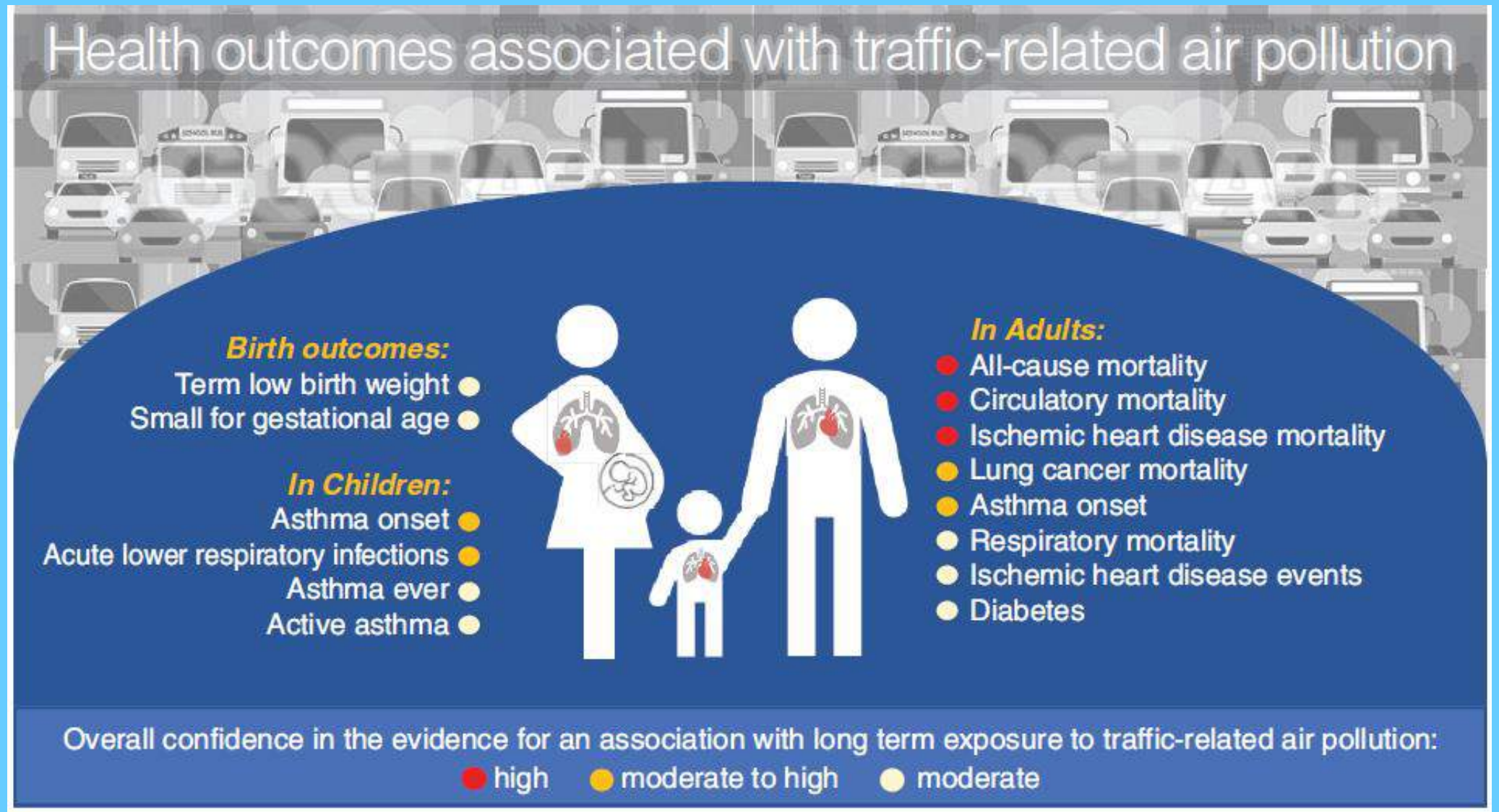
S. Maio, G. Sarno, S. Tagliaferro, F. Pirona, I. Stanisci, S. Baldacci, G. Viegi

INT J TUBERC LUNG DIS 27(1):7–12

Inquinamento atmosferico e salute respiratoria

Giovanni Viegi, MD, FERS, ATSF

RECENTI DOCUMENTI UTILI PER LA LOTTA ALL'INQUINAMENTO ATMOSFERICO



Executive Summary Figure. Overall confidence in the evidence for an association between long-term exposure to TRAP and selected health outcomes. Health outcomes for which the overall confidence in the evidence was low to moderate, low, or very low are not in the figure.

HEI Special Report 2023

Traffic Pollution and Your Health

Health Effects Institute

Key findings from the largest scientific review on traffic-related air pollution and health to date

Traffic is the main source of air pollution in many cities.

Breathing traffic-related pollution increases your risk of getting sick and dying early.

There is strong evidence linking traffic pollution with

- A higher overall risk of death
- A higher risk of death from heart disease
- A higher risk of death from lung cancer

People exposed to higher levels of traffic pollution are more likely to

- Develop asthma
- Suffer acute respiratory infections (children)

A pollution paradox

In many places, vehicle emissions are dropping, yet overall traffic pollution is rising.

What's reducing traffic pollution?

Policies limiting tailpipe emissions or where/when people drive

Technologies for lower-emission engines and cleaner-burning fuels

Increased use of electric vehicles and other modes of transport

What's increasing traffic pollution?

Population growth

Increased urbanization

Increased economic activity

The bottom line:

Reductions in per-vehicle emissions do not offset the effects of increasing traffic congestion.

Where you live matters

In high-income countries, some pollutants have dropped thanks to new technology and aggressive regulation.

But in many middle- and low-income countries — where rules are more lax and older cars are more prevalent — traffic pollution is holding steady or rising.

Even within high-income countries, historically marginalized communities tend to face worse pollution impacts. Lower-income neighborhoods are often closer to congested roadways due to persistent inequities and unfair housing and infrastructure decisions.

The bottom line:

People living in poorer areas generally suffer worse pollution and health effects.

Change is happening...

Understanding traffic pollution's impacts can inform policies that improve health. Many cities, states, and countries are already taking action to curb traffic pollution — and seeing health benefits.

...but it won't come fast.

Despite new mobility trends and the rapid growth in electric vehicles, older combustion vehicles are likely to stay on the road for many years. Much of the world's population is still exposed to heavy traffic pollution, and this is unlikely to change quickly at a global scale.

Many of the steps recommended to address the climate crisis will also reduce air pollution and its health effects.

There is clear need to prioritize benefits for environmental justice communities, which historically have borne the highest burdens from pollution.

The problems that lead to traffic pollution vary from place to place, and so do the optimal solutions. A local view is important.

Where does this information come from?

Special Report 23 of the Health Effects Institute is the most comprehensive review of the evidence on the health effects of traffic-related air pollution to date. It was produced by a panel of 13 experts who analyzed 353 studies conducted over four decades. ***https://tinyurl.com/HEITrafficReport***

What's next?

Traffic-related air pollution remains an important public health concern and deserves greater attention from the public and from policy makers across the globe.

Future HEI studies will help us understand how emerging trends and policies might influence exposures and effects. We're also thinking beyond the tailpipe to understand the impacts from a wider range of factors, such as noise, green space, greenhouse gas emissions, and pollutants generated through wear on roads, tires, and brakes.

HEI
Health Effects Institute

Health Effects Institute
@HEIresearch
www.healtheffects.org

Mal'Aria di città

LUCI ED OMBRE DELL'INQUINAMENTO ATMOSFERICO NELLE CITTÀ ITALIANE

2024

NELL'AMBITO DELLA CAMPAGNA

CleanCities

LEGAMBIENTE

Tabella 1

LA CLASSIFICA DEI CAPOLUOGHI DI PROVINCIA CHE HANNO SUPERATO CON ALMENO UNA CENTRALINA URBANA LA SOGLIA LIMITE DI POLVERI SOTTILI (PM10) alla data del 31 dicembre 2023; il D.lgs. 155/2010 prevede un numero massimo di 35 giorni/anno con concentrazioni superiori a 50µg/m³.

REGIONE	CITTÀ	CENTRALINA	PM10 SUPERAMENTI
LAZIO	FROSINONE	FROSINONE SCALO (T.U)	70
PIEMONTE	TORINO	GRASSI	66
VENETO	TREVISO	STRADA S.AGNESE	63
LOMBARDIA	MANTOVA	VIA ARIOSTO (T.U)	62
VENETO	PADOVA	ARCELLA	62
VENETO	VENEZIA	VIA BECCARIA	62
VENETO	ROVIGO	CENTRO	55
VENETO	VERONA	BORGO MILANO	55
VENETO	VICENZA	FERROVIERI	53
LOMBARDIA	MILANO	SENATO	49
PIEMONTE	ASTI	BAUSSANO	47
LOMBARDIA	CREMONA	P.ZZA CADORNA	46
LOMBARDIA	LODI	VIALE VIGNATI	43
LOMBARDIA	BRESCIA	VILLAGGIO SERENO	40
LOMBARDIA	MONZA	VIA MACHIAVELLI	40
PIEMONTE	ALESSANDRIA	D'ANNUNZIO	39
CAMPANIA	NAPOLI	OSPEDALE N. PELLEGRINI	36
EMILIA-ROMAGNA	FERRARA	ISONZO (T.U)	36

Fonte: elaborazione Legambiente su dati Arpa o Regioni

SCHEDE DI SINTESI DATI REGIONALI

Concentrazione media annuale nel 2023 di Polveri sottili (PM10 e PM2.5) e di Biossido di azoto (NO_2) nelle città capoluogo di provincia.

La media annuale della città è stata calcolata a partire delle medie annuali delle singole centraline di monitoraggio ufficiale delle Arpa classificate come urbane (fondo o traffico).

La "riduzione delle concentrazioni necessaria" (valore negativo) indica, per ciascun parametro, di quanto dovrà diminuire la concentrazione attuale, in percentuale, per raggiungere i valori normativi che entreranno in vigore a partire dal 2030.

EMILIA-ROMAGNA

	Medie annuali 2023 (µg/mc)			Riduzione delle concentrazioni necessaria (%)		
Città	PM10	PM2.5	NO_2	PM10	PM2.5	NO_2
BOLOGNA	21	13	25	-5%	-25%	-20%
CESENA	23	nc	18	-12%	-	0%
FERRARA	25	17	20	-19%	-41%	0%
FORLÌ	22	13	22	-9%	-24%	-7%
MODENA	28	18	27	-30%	-46%	-26%
PARMA	27	15	24	-25%	-35%	-15%
PIACENZA	26	19	20	-23%	-47%	-1%
RAVENNA	24	14	19	-18%	-30%	0%
REGGIO EMILIA	27	15	23	-26%	-34%	-15%
RIMINI	26	16	25	-22%	-36%	-20%

Fonte: elaborazione Legambiente su dati Arpa
***nc**: parametro non campionato /// **nd**: parametro non disponibile al momento dell'elaborazione del presente report*

Shaping urban environments to improve respiratory health: recommendations for research, planning, and policy

Mark Nieuwenhuijsen, Audrey de Nazelle, Judith Garcia-Aymerich, Haneen Khreis, Barbara Hoffmann

Lancet Respir Med 2024;
12: 247–54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SEVENTH
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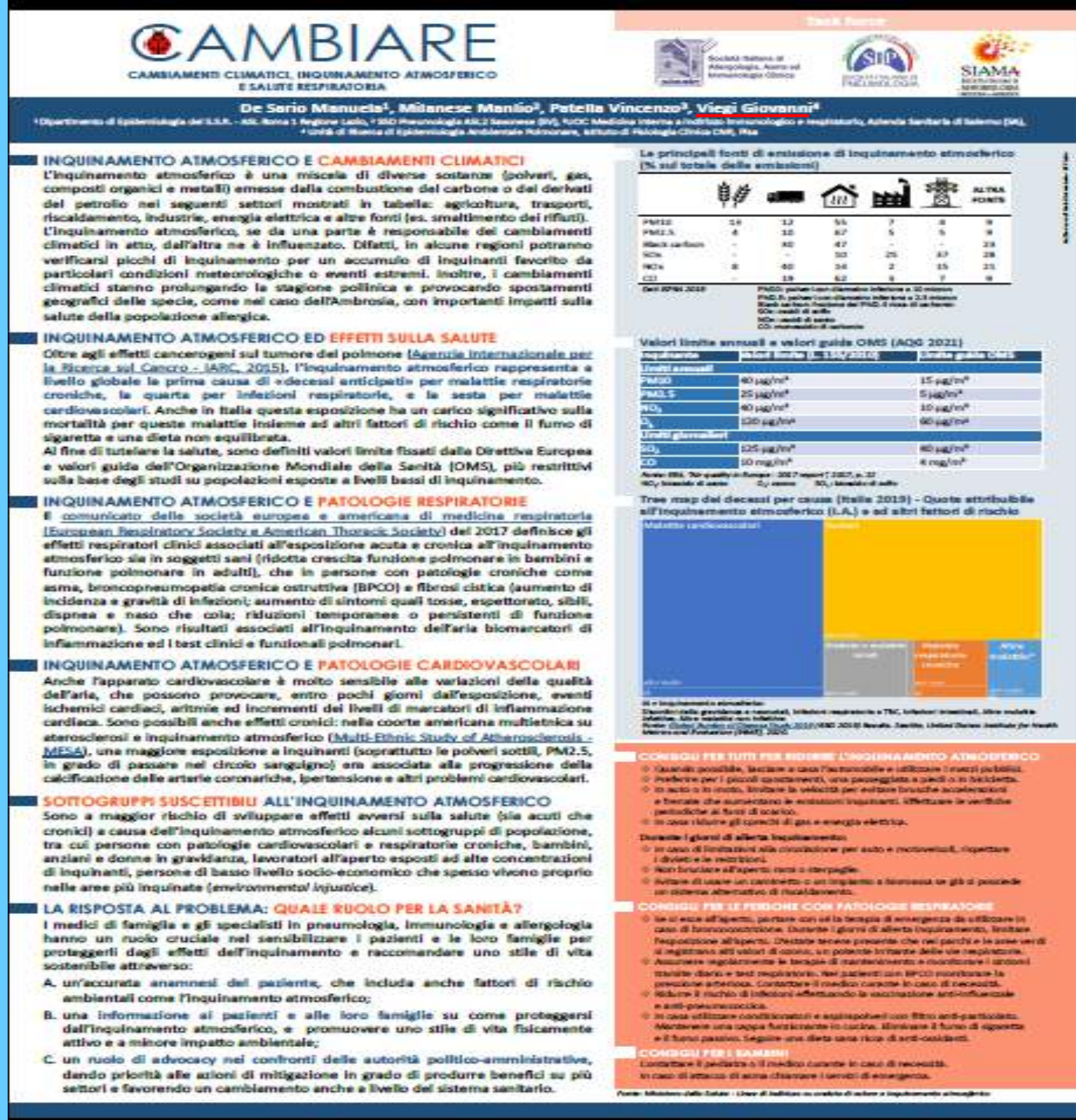
CONFERENCE
ON ENVIRONMENT
AND HEALTH
Budapest Declaration

CAMBIARE

CAMBIAMENTI CLIMATICI, INQUINAMENTO ATMOSFERICO
E SALUTE RESPIRATORIA

https://www.sipirs.it/cms/wp-content/uploads/2022/11/POSTER_CAMBIARE.pdf



CAMBIARE

CAMBIAMENTI CLIMATICI, INQUINAMENTO ATMOSFERICO
E SALUTE RESPIRATORIA

De Sario Manuela[1], Milanese Manlio[2], Patella Vincenzo[3], Viegi Giovanni[4]

INQUINAMENTO ATMOSFERICO E CAMBIAMENTI CLIMATICI

L'inquinamento atmosferico è una miscela di diverse sostanze (polveri, gas, composti organici e metalli) emesse dalla combustione del carbone o dei derivati del petrolio nei seguenti settori mostrati in tabella: agricoltura, trasporti, riscaldamento, industrie, energia elettrica e altre fonti (es. smaltimento dei rifiuti). L'inquinamento atmosferico, se da una parte è responsabile dei cambiamenti climatici in atto, dall'altra ne è influenzato. Difatti, in alcune regioni potranno verificarsi picchi di inquinamento per un accumulo di inquinanti favorito da particolari condizioni meteorologiche o eventi estremi. Inoltre, i cambiamenti climatici stanno prolungando la stagione pollinica e provocando spostamenti geografici delle specie, come nel caso dell'Ambrosia, con importanti impatti sulla salute della popolazione allergica.

INQUINAMENTO ATMOSFERICO ED EFFETTI SULLA SALUTE

Oltre agli effetti cancerogeni sul tumore del polmone (Agenzia Internazionale per la Ricerca sul Cancro - IARC, 2015), l'inquinamento atmosferico rappresenta a livello globale la prima causa di «decessi anticipati» per malattie respiratorie croniche, la quarta per infezioni respiratorie, e la sesta per malattie cardiovascolari. Anche in Italia questa esposizione ha un carico significativo sulla mortalità per queste malattie insieme ad altri fattori di rischio come il fumo di sigaretta e una dieta non equilibrata.
Al fine di tutelare la salute, sono definiti valori limite fissati dalla Direttiva Europea e valori guida dell'Organizzazione Mondiale della Sanità (OMS), più restrittivi sulla base degli studi su popolazioni esposte a livelli bassi di inquinamento.

INQUINAMENTO ATMOSFERICO E PATOLOGIE RESPIRATORIE

Il comunicato delle società europea e americana di medicina respiratoria (European Respiratory Society e American Thoracic Society) del 2017 definisce gli effetti respiratori clinici associati all'esposizione acuta e cronica all'inquinamento atmosferico sia in soggetti sani (ridotta crescita funzione polmonare in bambini e funzione polmonare in adulti), che in persone con patologie croniche come asma, broncopneumopatia cronica ostruttiva (BPCO) e fibrosi cistica (aumento di incidenza e gravità di infezioni; aumento di sintomi quali tosse, espettorato, sibili, dispnea e naso che cola; riduzioni temporanee o persistenti di funzione polmonare). Sono risultati associati all'inquinamento dell'aria biomarcatori di infiammazione ed i test clinici e funzionali polmonari.

INQUINAMENTO ATMOSFERICO E PATOLOGIE CARDIOVASCOLARI

Anche l'apparato cardiovascolare è molto sensibile alle variazioni della qualità dell'aria, che possono provocare, entro pochi giorni dall'esposizione, eventi ischemici cardiaci, aritmie ed incrementi dei livelli di marcatori di infiammazione cardiaca. Sono possibili anche effetti cronici: nella coorte americana multietnica su aterosclerosi e inquinamento atmosferico (Multi-Ethnic Study of Atherosclerosis - MESA), una maggiore esposizione a inquinanti (soprattutto le polveri sottili, PM2.5, in grado di passare nel circolo sanguigno) era associata alla progressione della calcificazione delle arterie coronariche, ipertensione e altri problemi cardiovascolari.

SOTTOGRUPPI SUSCETTIBILI ALL'INQUINAMENTO ATMOSFERICO

Sono a maggior rischio di sviluppare effetti avversi sulla salute (sia acuti che cronici) a causa dell'inquinamento atmosferico alcuni sottogruppi di popolazione, tra cui persone con patologie cardiovascolari e respiratorie croniche, bambini, anziani e donne in gravidanza, lavoratori all'aperto esposti ad alte concentrazioni di inquinanti, persone di basso livello socio-economico che spesso vivono proprio nelle aree più inquinate (environmental injustice).

LA RISPOSTA AL PROBLEMA: QUALE RUOLO PER LA SANITÀ?

I medici di famiglia e gli specialisti in pneumologia, immunologia e allergologia hanno un ruolo cruciale nel sensibilizzare i pazienti e le loro famiglie per proteggerli dagli effetti dell'inquinamento e raccomandare uno stile di vita sostenibile attraverso:

A. un'accurata anamnesi del paziente, che includa anche fattori di rischio ambientali come l'inquinamento atmosferico;
B. una informazione ai pazienti e alle loro famiglie su come proteggersi dall'inquinamento atmosferico, e promuovere uno stile di vita fisicamente attivo e a minore impatto ambientale;
C. un ruolo di advocacy nei confronti delle autorità politico-amministrative, dando priorità alle azioni di mitigazione in grado di produrre benefici su più settori e favorendo un cambiamento anche a livello del sistema sanitario.

Le principali fonti di emissione di inquinamento atmosferico
(% sul totale delle emissioni)

Valori limite annuali e valori guida OMS (AQG 2021)

Inquinante	Valori limite UE (µg/m³)	Valori guida OMS
Limiti annuali		
PM10	40 µg/m³	15 µg/m³
PM2.5	25 µg/m³	5 µg/m³
NO_2	40 µg/m³	10 µg/m³
O_3	120 µg/m³	60 µg/m³
Limiti giornalieri		
SO_2	125 µg/m³	40 µg/m³
CO	10 mg/m³	4 mg/m³

Tree map dei decessi per cause (Italia 2019) - Quote attribuibile all'inquinamento atmosferico (I.A.) e ad altri fattori di rischio

CONSIGLI PER TUTTI PER RIDURRE L'INQUINAMENTO ATMOSFERICO

- Quando possibile, lasciare a casa l'automobile e utilizzare i mezzi pubblici.
- Preferire per i piccoli spostamenti, una passeggiata a piedi o in bicicletta.
- In auto o in moto, limitare la velocità per evitare brusche accelerazioni e frenate che aumentano le emissioni inquinanti. Effettuare la verifiche periodiche ai fumi di scarico.
- In casa ridurre gli sprechi di gas e energia elettrica.

Durante i giorni di allerta inquinamento:

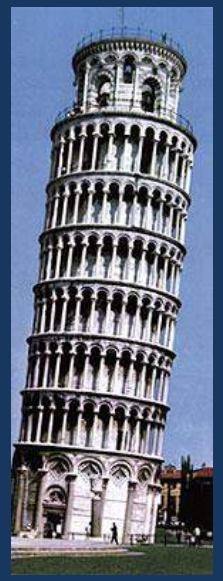
- In caso di limitazioni alla circolazione per auto e motoveicoli, rispettare i divieti e le restrizioni.
- Non bruciare all'aperto rami o sterpaglie.
- Evitare di usare un caminetto o un impianto a biomassa se già si possiede un sistema alternativo di riscaldamento.

CONSIGLI PER LE PERSONE CON PATOLOGIE RESPIRATORIE

- Se si esce all'aperto, portare con sé la terapia di emergenza da utilizzare in caso di broncocostrizione. Durante i giorni di allerta inquinamento, limitare l'esposizione all'aperto. Evitate tenere presente che nei parchi e le aree verdi si registrano alti valori di ozono, un potente irritante delle vie respiratorie.
- Assicurare regolarmente le terapie di mantenimento e monitorare i sintomi tramite diario e test respiratorio. Nei pazienti con BPCO monitorare la pressione arteriosa. Contattare il medico curante in caso di necessità.
- Ridurre il rischio di infezioni effettuando la vaccinazione anti-influenzale e anti-pneumococcica.
- In casa utilizzare condizionatori e aspirapolveri con filtro anti-particolato. Mantenere una cappa funzionante in cucina. Eliminare il fumo di sigaretta e il fumo passivo. Seguire una dieta sana ricca di anti-ossidanti.

CONSIGLI PER I BAMBINI

Contattare il pediatra o il medico curante in caso di necessità.
In caso di attacco di asma chiamare i servizi di emergenza.



“Grazie per l’invito e l’attenzione”.

Giovanni Viegi

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