

22 September, 2021

## **WHO Air Quality Guidelines 2021 – Aiming for healthier air for all**

A joint statement by medical, public health, scientific societies and patient representative organisations

After years of intensive research and deliberations with experts across the globe, the World Health Organization (WHO) updated its 2005 Global Air Quality Guidelines (AQG) in September 2021 (WHO 2021; WHO 2017). The new air quality guidelines (WHO AQG) are ambitious and reflect the large impact that air pollution has on global health. They recommend aiming for annual mean concentrations of PM<sub>2.5</sub> not exceeding 5 µg/m<sup>3</sup> and NO<sub>2</sub> not exceeding 10 µg/m<sup>3</sup>, and the peak season mean 8-hr ozone concentration not exceeding 60 µg/m<sup>3</sup> (WHO 2021). For reference, the corresponding 2005 WHO guideline values for PM<sub>2.5</sub> and NO<sub>2</sub> were, respectively, 10 µg/m<sup>3</sup> and 40 µg/m<sup>3</sup> with no recommendation issued for long-term ozone concentrations (WHO 2006). While the guidelines are not legally binding, we hope they will influence air quality policy across the globe for many years to come.

The updated WHO AQG have become so necessary as an overwhelming body of evidence has accumulated over the past two decades, demonstrating that health effects of air pollution are serious and can affect nearly all organ systems of the human body (Thurston et al. 2017). Importantly, recent studies and large research programmes consistently show that the adverse effects of air pollution are not only limited to high exposures; harmful health effects can be observed all the way down to very low concentration levels, with no observable thresholds below which exposure can be considered safe (Brauer et al. 2019; Brunekreef et al. 2021; Dominici et al. 2019).

There is now broad expert consensus that air pollution is a major global public health risk factor and puts an enormous financial burden on societies. Outdoor and household air pollution together accounted for approximately 12% of all deaths in 2019. Air pollution currently ranks fourth among major risk factors for global disease and

mortality, only behind hypertension, smoking and dietary factors (Murray et al. 2020). 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 (World Bank Group 2016). 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 (WHO Regional Office for Europe, OECD 2015).

The most important message of the updated WHO AQG is that each reduction in the outdoor concentrations of key air pollutants brings health benefits to the surrounding population, even in places which already have low pollution concentrations. Moreover, linear exposure-response relationships down to the lowest observable concentrations show that every individual will benefit from cleaner air (Huangfu and Atkinson 2020; Lee et al. 2020; Chen and Hoek 2020; Orellano et al. 2020; Zheng et al. 2021). These findings provide critical input into clean air policies and regulation around the world. They also are key to estimating the potential health and economic benefits from policies that reduce exposure to air pollution.

Recognising that the adverse health effects of pollution exposure can be seen at all, even at the lowest observed levels of pollution concentrations, is a milestone for cleaner air and better health policies. It offers a wake-up call, to reconsider current air quality legislation and regulations. To maximise health benefits, we now understand better the importance of implementing measures to reduce average exposures of all people. Such an approach must complement reductions in exposure at “hotspots” with high levels of air pollution, in particular to address known inequities owing to socioeconomic conditions, increased vulnerability of the residential population, and economic activities (Hooper and Kaufman, 2018). To tackle the health effects of air pollution, bold air quality actions are needed at all levels – international, national, local – and across all sectors such as transport, energy, industry, agriculture and residential.

Most jurisdictions with clean air regulations have relied on fixed limit values with little incentive to further reduce air pollution levels once compliance with the limit value is achieved (Kutlar Joss et al. 2017). Given the evidence that health effects occur all the way down to very low concentration levels, future clean air policies must include

incentives for progressive lowering of exposures of the entire population, thereby improving health for all. What is needed is a paradigm change from relying solely on fixed limit values, with a shift towards the concept of combining fixed limit values with a continuous reduction of the average exposure. For example, the current European Union (EU) Ambient Air Quality Directive already contains a non-binding average exposure reduction target (European Commission 2008). The upcoming 2022 revision of the EU Ambient Air Quality Directive will offer the chance to lead the way and implement binding average exposure reduction goals for air pollutants in combination with lowered fixed limit values.

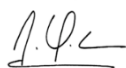
Programmes that reduce air pollutant emissions provide enormous air quality and health benefits which increase over time. The estimated health benefits of improved air quality outweigh by far the implementation costs of air quality actions. For the US, it has been estimated that the benefits from decreased 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 (U.S. E.P.A. 2015). In China, public health benefits were 50% greater than the costs for air quality improvement measures (Zhang et al. 2019). Similarly, for the EU, additional clean air and climate policies beyond the current obligations will lead to net benefits with positive macro-economic implications (Amann et al. 2017). Indeed, the cost effectiveness of air quality actions is enhanced by the close link between air pollution and greenhouse gas emissions. A reduction of air pollution emissions will also feed into efforts for climate neutrality and vice versa, making benefits from investments in one area count twice (Amann et al. 2014, IPCC 2021).

## Conclusions

Air pollution is a major global public health threat that causes a range of adverse health effects, even at the lowest observable concentrations. There is ample evidence to strongly support government action to reduce air pollution and address climate change simultaneously. The updated WHO AQG are bold and stress the importance of lowering air pollution concentrations at every level. The benefits are clear: lowering air pollution levels will lead to enormous improvements in public health for people of all ages breathing cleaner air. We support the recommendations of the new WHO AQG, and

urge nations to use the WHO AQG as a guide for ambitious air quality and emission reduction policies around the world.

***Signatures of the undersigned organisations:***



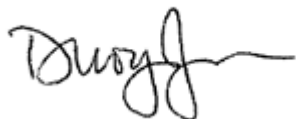
Prof. Marc Humbert, President, European Respiratory Society



Mark Nieuwenhuijsen, President, International Society of Environmental Epidemiology



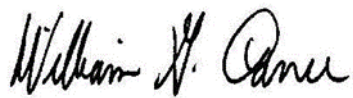
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Prof. Lynn Schnapp, President, American Thoracic Society



William G. Cance, MD FACS, Chief Medical and Scientific Officer, American Cancer Society, Inc.



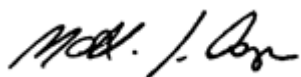
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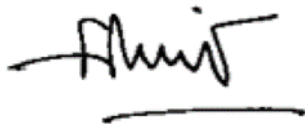
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European Society of Cardiology

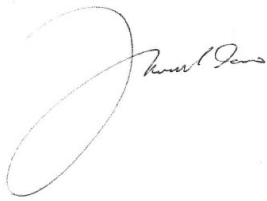


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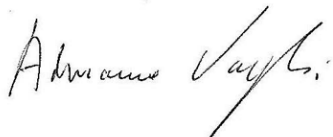
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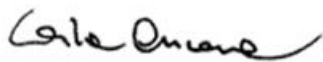
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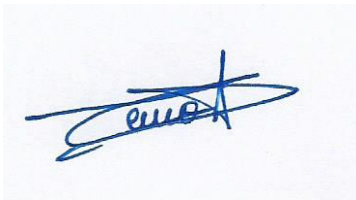
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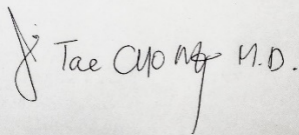
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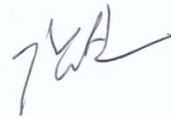
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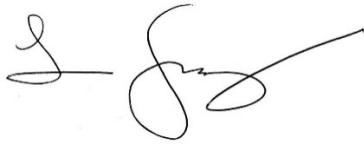
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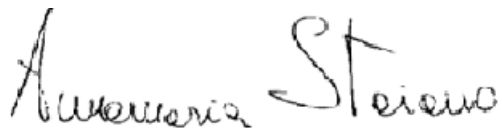


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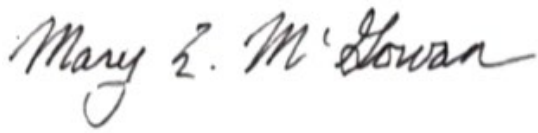
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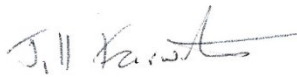


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German Society for Public Health

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A handwritten signature in blue ink, appearing to be 'M. Ferro', written in a cursive style.

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Netherlands Respiratory Society

A handwritten signature in black ink, appearing to be 'Steve Jones', written in a cursive style.

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Healthy Lungs-Nepal

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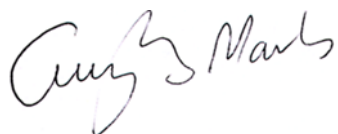
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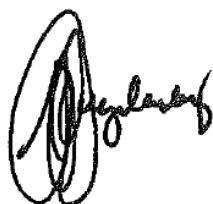


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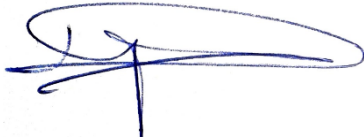
APH Macedonia "Moment plus"



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German Association for Medical Informatics, Biometry and Epidemiology

German Society for Social Medicine and Prevention



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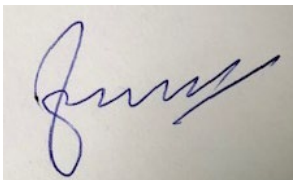
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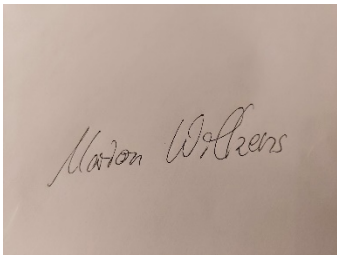


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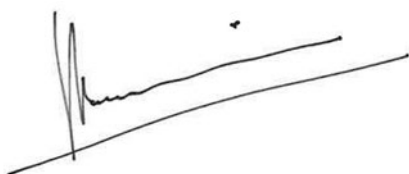
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Polish Allergology Society

Polish Society of Environmental Medicine

Polish Federation of Asthma, Allergy and COPD Patients' Associations

Coalition of Medical Doctors and Scientists for Healthy Air

Polish Society of Public Health

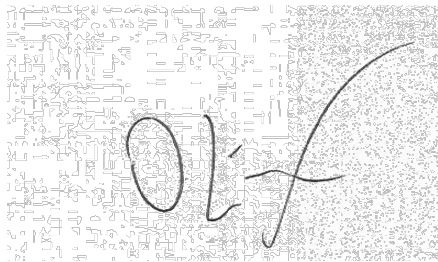
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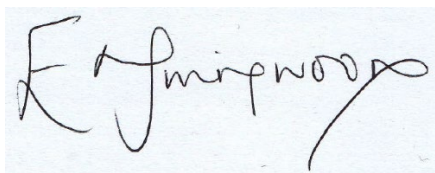


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European Public Health Association (GB)

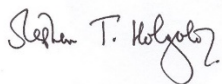
The British Society for Allergy & Clinical Immunology



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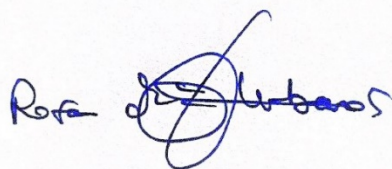
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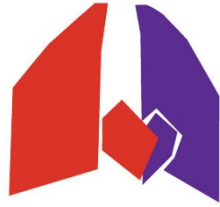
The German Association for Medical Sociology

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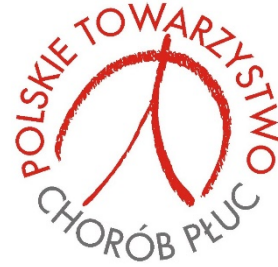








Türk Toraks Derneği  
Turkish Thoracic Society



Korean Academy of  
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대한예방의학회  
The Korean Society for Preventive Medicine



**KSE**  
KOREAN SOCIETY  
OF EPIDEMIOLOGY



대한직업환경의학회  
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Turkish  
Respiratory  
Society



DA VENIAM SCRIPTIS QUORUM NON GLORIA NOBIS  
CAUSA, SED UTILITAS OFFICIUMQUE FUT

BREATH E  
the lung association



ΕΛΛΗΝΙΚΗ ΠΝΕΥΜΟΝΟΛΟΓΙΚΗ ΕΤΑΙΡΕΙΑ  
HELLENIC THORACIC SOCIETY



FOUNDATION FOR  
SARCOIDOSIS RESEARCH



Associazione Italiana Bronchiectasie

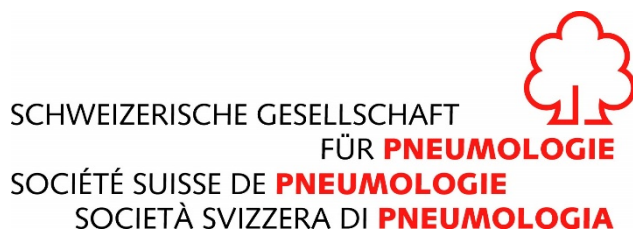


Fundación  
Lovexair  
cuida tus pulmones



Aspergillosis  
Trust







Healthy Lungs-Nepal



LAM ACTION

Supporting women with  
Lymphangioleiomyomatosis



A MEMBERSHIP ORGANISATION  
FIGHTING CANCER TOGETHER



ASOCIACION ARGENTINA DE  
MEDICINA RESPIRATORIA



Sociedad Española  
de **Neumología**  
y **Cirugía Torácica**  
SEPAR

The Union

International Union Against  
Tuberculosis and Lung Disease



Lung Cancer Europe

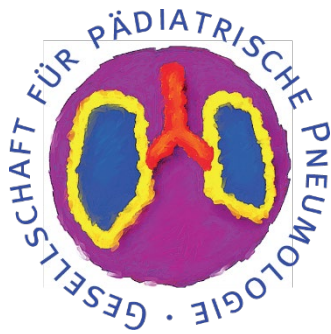


Federazione Italiana Pazienti



Deutsche Gesellschaft für Sozialmedizin und Prävention







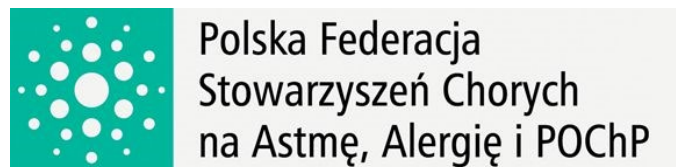
United to reverse the rise in chronic disease



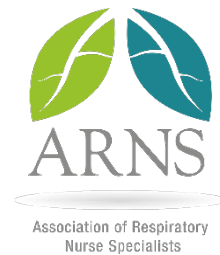
中国清洁空气政策伙伴关系  
China Clean Air Policy Partnership



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# DGMS

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Dominici, Francesca; Schwartz, Joel; Di, Qian; Braun, Danielle; Choirat, Christine; Zanobetti, Antonella (2019): Assessing Adverse Health Effects of Long-Term Exposure to Low Levels of Ambient Air Pollution: Phase 1. In *Research Reports: Health Effects Institute* 2019.

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