



## EDITORIAL

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



### Air pollution in Europe

Environmental air pollution is a worldwide problem with significant proportions of the population exposed to air pollutant levels exceeding accepted air quality standards. The European Environment Agency (EEA) in its 2020 annual report on “Air quality in Europe”<sup>1</sup> also confirmed that many Europeans living in cities are exposed to elevated levels of air pollution exceeding acceptable thresholds, although the latter differ between EU and the WHO. In fact, the percentage of the urban population in the EU-28 countries exposed to air pollution above EU standards was generally much lower than the proportion estimated to be above the 2005 WHO Air Quality Guidelines (AQG), since threshold levels are different according to these two systems.<sup>2</sup> For PM<sub>2.5</sub>, 4% exceeded the EU standards whereas 74% exceeded the WHO AQG. For O<sub>3</sub>, 34% exceeded the EU standards whereas 99% exceeded the WHO AQG. The NO<sub>2</sub> values are identical (4%) because the EU and the 2005 WHO AQG reference values were the same. These differences are expected to increase, considering the lower threshold levels of the 2021 WHO AQG.<sup>3</sup>

Chronic exposure to air pollution can clearly have deleterious effects. Among the health effect indicators published by the EEA, the yearly numbers of premature deaths attributable to PM<sub>2.5</sub>, NO<sub>2</sub> and O<sub>3</sub> in 2018 are striking: 379,000 for PM<sub>2.5</sub>, 54,000 for NO<sub>2</sub> and 19,400 for O<sub>3</sub>, in the EU-28 countries. The specific figures for our two countries were: 52,300 for PM<sub>2.5</sub>, 10,400 for NO<sub>2</sub> and 3,000 for O<sub>3</sub>, in Italy; 4,900 for PM<sub>2.5</sub>, 750 for NO<sub>2</sub> and 370 for O<sub>3</sub>, in Portugal.

Another relevant indicator is the years of life lost (YLL) attributable to PM<sub>2.5</sub>, NO<sub>2</sub> and O<sub>3</sub>: for the EU-28, YLL were 4,381,000 for PM<sub>2.5</sub>, 610,000 for NO<sub>2</sub> and 232,000 for O<sub>3</sub>. The specific figures for our two countries were: 556,700 for PM<sub>2.5</sub>, 110,400 for NO<sub>2</sub> and 33,500 for

O<sub>3</sub>, in Italy; 53,000 for PM<sub>2.5</sub>, 8,200 for NO<sub>2</sub> and 4,100 for O<sub>3</sub>, in Portugal.

### The joint ATS-ERS statement

A comprehensive review on what constitutes an adverse effect of air pollution was jointly published by the American Thoracic Society (ATS) and the European Respiratory Society (ERS) in 2017.<sup>4</sup> It followed up other important documents published by ATS in 1985 and 2000.<sup>5,6</sup> The report integrated the latest scientific evidence into a general framework for interpreting the adverse effects of air pollution on human health. It gave an overview of diseases, conditions and biomarkers influenced by outdoor air pollution showing that air pollution affects almost all systems of the human body, including the respiratory, cardiovascular, central nervous, and endocrine systems. In addition, it causes adverse effects to the fetus.

Various other notions should be borne in mind. First of all, the adverse respiratory effects of air pollution span the life cycle and affect an array of illnesses (namely asthma and chronic obstructive pulmonary disease - COPD) not only in terms of clinical worsening, but also regarding risk of disease development and even premature mortality. Symptoms such as cough, sputum, wheeze, and dyspnea have an increased frequency in association with exposure to various air pollutants. Furthermore, morbidity, as measured by hospital admissions, and prevalence of disease, based on diagnoses of asthma and COPD, are all significantly related to air pollution. In this context, although many studies exist, further research is warranted. The ATS/ERS document<sup>4</sup> pointed out clinical and biological biomarkers, such as lung function tests, bronchial responsiveness, and the fractional concentration of exhaled nitric oxide (FeNO), that can be used to assess the detrimental pollution effects in analytical epidemiological studies in the general population.

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## Why this series is important

After almost five years since the last publications cited in the ATS-ERS statement,<sup>4</sup> new evidence is accumulating on the health effects of air pollution, especially at low levels. The first Global Conference on Air Pollution and Health was held at WHO Headquarters in Geneva between 30 October and 1 November 2018.<sup>7</sup> Thus, re-analysing evidence about air pollution and its respiratory effects produced in the past five years will be one of the objectives of the current Series.

In addition, various relevant aspects affecting the relationship between air pollution and respiratory health and disease will also be analysed in this Series. This will include risk factors other than outdoor air pollution, such as indoor air pollution, occupational air pollution, climate change, urbanization and greenness. Other important aspects will also be scrutinized, including the relationship between air pollution and novel and emergent infectious diseases, as well as how inequalities in health care and communities may affect exposure, prevention and mitigation approaches to air pollution. Finally, the quite relevant issue of how to protect individuals from air pollution will also be covered.

The Global Alliance against chronic Respiratory Diseases (GARD) was launched in Beijing on March 28, 2006, as a partnership among the WHO, governmental institutions, scientific societies and patients' associations. The GARD motto is "a world where all people breathe freely." Air pollution is one of the most important risk factors to health and reducing it is a priority for the prevention and control of chronic respiratory diseases.<sup>8</sup>

Thus, some GARD country representatives will give their contribution to this series.

## Who should read the review articles of this series

Clinicians are increasingly busy in providing health care to the aging European population. In addition, they have been asked since the beginning of 2020 to make an extraordinary effort in order to cope with the Covid-19 pandemic.<sup>9</sup> Thus, they may not have enough time to keep updated with all the relevant aspects of scientific literature, especially if not immediately related to their day-to-day clinical activities.

On the other hand, if one looks at the GOLD<sup>10</sup> and GINA<sup>11</sup> documents, one sees that it is recommended to take a medical history which includes environmental and occupational risk factors for COPD and asthma, respectively. Thus, we believe that reading the articles of this series will help clinicians to better understand the role of such risk factors and the importance of their removal, which may sometimes be more effective than just using a medication-based approach.

Indeed, to advocate for clean air should be a must for all health professionals, especially after the publication by WHO of the new AQG on September 22, 2021,<sup>3</sup> indicating

levels which are largely lower than the previous 2005 WHO AQG and the current EU standards.<sup>1</sup>

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G. Viegi<sup>a,b,\*</sup>, L. Taborda-Barata<sup>c,d,e</sup>

<sup>a</sup> CNR Institute for Biomedical Research and Innovation (IRIB), Via U. La Malfa, 153 - 90146 Palermo, Italy

<sup>b</sup> CNR Institute of Clinical Physiology (IFC), Via Trieste 41 - 56126 Pisa, Italy

<sup>c</sup> NuESA-Health and Environment Study Unit, Faculty of Health Sciences, University of Beira Interior, Avenida Infante D. Henrique, 6200-506 Covilhã, Portugal

<sup>d</sup> UBIAir-Clinical & Experimental Lung Centre, UBIMedical, University of Beira Interior, EM506, 6200-000 Covilhã, Portugal

<sup>e</sup> CICS-Health Sciences Research Centre, University of Beira Interior, Avenida Infante D. Henrique, 6200-506 Covilhã, Portugal

\* Corresponding author.

E-mail addresses: [viiegig@ifc.cnr.it](mailto:viiegig@ifc.cnr.it) (G. Viegi), [tabordabarata@fcsaude.ubi.pt](mailto:tabordabarata@fcsaude.ubi.pt) (L. Taborda-Barata).

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