



# Introduction

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Fifteen years ago, officers of the Occupation and Epidemiology Assembly of the European Respiratory Society (ERS) had the idea of disseminating the concepts and results of the respiratory epidemiological studies carried out in Europe to the membership of the ERS. Thus, in the year 2000 the Respiratory Epidemiology in Europe issue of the *ERS Monograph*, edited by Isabella Annesi-Maesano, Amund Gulsvik and Giovanni Viegi, was published [1]. It covered a broad spectrum of topics, including COPD, study design, and environmental and behavioural risk factors. In all, there were 21 chapters: seven were methodological, five were devoted to specific diseases, and nine dealt with risk factors. The book helped generate an understanding of the importance of epidemiology as a basic component of medical culture, and was an important advocacy tool. Indeed, a few years later, the ERS and the European Lung Foundation (ELF) published the first edition of the *European Lung White Book* [2], which was instrumental to the ERS' success in convincing the European Commission (EC) of the need for including respiratory and allergic diseases amongst the diseases for which funding was planned in FP7 (7th Framework Programme for EU Research) [3]. Last year, the ERS published the new version of *The European Lung White Book* [4], an updated advocacy tool that will generate more attention and research funding for respiratory medicine.

Respiratory epidemiology has greatly advanced in last 15 years. It has allowed us to fill gaps in the knowledge about major respiratory diseases and to investigate them further. It is now time to launch the updated edition of the Respiratory Epidemiology *ERS Monograph*.

This update of the *Monograph* considers the advances that have been accomplished by respiratory epidemiology in contributing to a better understanding of respiratory health and disease prevention. The updated version covers a broader spectrum of topics than the first version and includes 21 chapters: seven are devoted to the most commonly encountered respiratory diseases, 10 consider risk factors, two focus on methodology, and two discuss the economic burden of major respiratory diseases. In a changing world, the updated *Monograph* addresses new or poorly treated issues at the population level, such as poverty, air pollution (a growing burden due to climate change), rhinitis, interstitial lung diseases and obstructive sleep apnoea (which are increasing in prevalence), and also covers epigenetic–environment interactions when appropriate.

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Most of the authors are members of the Occupation and Epidemiology Assembly of the ERS. The Assembly is active in developing epidemiology and several leading persons from large-scale local and international studies, as well as research consortiums, such as ECRHS (European Community Respiratory Health Survey), ISAAC (International Study of Asthma and Allergies in Childhood), GA<sup>2</sup>LEN (Global Allergy and Asthma European Network), BOLD (Burden of Obstructive Lung Disease) and GOLD (Global Initiative for Chronic Obstructive Lung Disease), are members of the Assembly. The work of the Assembly increases knowledge about environmental, occupational and lifestyle factors, such as the risks of developing respiratory diseases, and also considers factors that contribute to respiratory health [5]. The Epidemiology Group and the Occupational and Environmental Health Group are deeply involved in these studies. Special interest is paid, among others, to the most important single risk factor for respiratory disease, smoking, and the work of the Tobacco, Smoking Control and Health Education Group focuses on the severe and hazardous effects of active and passive smoking. As a result of the increase in understanding about the importance of the interaction of genes and the environment, a fourth Group, Genes and Environment, recently started activities.

One of the most important tasks of the Occupation and Epidemiology Assembly is advocacy. During the presidency of Giovanni Viegi two important advocacy committees were established: the Tobacco Control Committee (TCC) and the Environment and Health Committee (EHC). The TCC was preceded by the Smoking Prevention Committee, established in 1998. The committees work closely with the ERS Brussels office, the ERS Headquarters and the ELF in lobbying for respiratory health in Europe, and worldwide *via* the World Health Organization (WHO). The Assembly collaborated with WHO in the foundation and management of the Global Alliance against Chronic Respiratory Diseases (GARD). Both committees organise evening sessions at the European Parliament and informative activities for the EC. Another example of the committees' activities was the EHC initiative to organise the first international conference held by a respiratory society on the health effects of climate change [6].

The Assembly has organised several conferences and task forces, and has produced *Monographs* and important position papers, among them position papers on the respiratory effects of air pollution and occupation [7, 8]. Recent task force reports include updated recommendations on epidemiological studies of COPD [9] and occupational asthma [10]. Members of the Assembly were also part of the Editorial Boards of both the first and the second editions of the *European Lung White Book* [2, 4].

## Perspectives

It is important that healthcare providers and society as a whole know about the prevalence and trends of prevalence and incidence of major disease, including the respiratory diseases. Large-scale population studies are necessary for the calculation of prevalence of, for example, COPD and asthma. Information from registry data is not enough to calculate the prevalence of COPD in society, as under-diagnosis is huge; large-scale epidemiological studies that include spirometry are required. The diagnosis of asthma is arbitrary, and irrespective of international guidelines, asthma has in reality been classified differently in many parts of the world, including Europe. Thus, population studies also provide important information about asthma, and international studies allow comparison of prevalence between areas and countries.

Prevalence studies, *i.e.* cross-sectional studies, may provide data about risk factors for diseases; however, a found association could be a cause, a consequence of disease or a parallel phenomenon. Thus, longitudinal studies of cohorts of the general population are needed as these studies provide more valid results regarding risks, and the probability of the associations being risks is greater than that of the associations that are derived from cross-sectional studies. These important methodological aspects have been explored in a chapter of this *Monograph*.

One important area that requires consideration is rare respiratory disease. In Europe, a disease or disorder is defined as rare when it affects less than one in 2000 people; however, as many as 30 million people may be affected by one of over 6000 rare diseases. It has been shown that many major diseases can be subdivided into individual diseases called phenotypes, some of which are classified as rare. This is often the case with respiratory disease. Rare diseases constitute appropriate models for the underlying mechanisms of other diseases. The specific features associated with rare diseases (low individual patient numbers, diversity, geographical location) mean that research needs to be developed at a large level in order to optimise funding, infrastructures and technological platforms. Patient registries and databases are key to the development of epidemiological and/or clinical research in this area, as they pool data and achieve a sufficient sample size, leading to improvements in patient care and healthcare planning. The creation of a rare respiratory disease registry would also be a powerful tool in creating a network of experts.

Due to the increasing difficulty and cost of carrying out new general population surveys, in which a progressively decreasing proportion of people agree to participate, it is likely that there will be rise in the epidemiological use of routinely collected statistics, as well as medical records stored by family practitioners. Data mining procedures within the huge database created by the widespread use of e-health instruments (patient diaries, electronic health cards, *etc.*) will help.

Another important issue that needs to be developed in the future is exposomics. Genetics have been found to account for only around 10% of diseases, and the remaining causes appear to be environmental. In order to understand the causes of respiratory disease and its prevention, the impact of the environment needs to be further investigated. Exposomics can be defined as the measure of all the exposures of an individual in a lifetime and how those exposures relate to his/her health. In respiratory disease, an individual's exposure begins before birth with passive smoking and includes insults from the environment, like air pollution, diet, lifestyle and occupational sources, and their interactions with characteristics such as genetics, epigenetics and physiology. This requires appropriate methodologies, such as epidemiology, biostatistics, omics and data mining.

Respiratory epidemiology also plays an important role in translational research, and molecular epidemiology is increasingly important. Modern translational research covers epidemiology, clinical aspects (including phenotyping or endotyping) and research on cellular mechanism (including inflammation, proteomics and genetics). The contribution of epidemiology can guarantee a representative sample for study. Studies of the gene-environment interaction play an increasing role in modern epidemiological research.

We believe that in this issue of the *Monograph* the reader will find methodological information and content that will be useful in forthcoming calls for research proposals issued by the EC within the framework of Horizon 2020, which includes relevant themes for public health and respiratory medicine.

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