



CHAPTER 1

PREVENTION

Most of the chronic disability and death in Europe can be accounted for by four major health determinants: tobacco, physical inactivity, alcohol and poor diet. All four of these can be successfully addressed to prevent disease and promote the health of the European population, but more of the investment in healthcare services must be directed towards disease prevention.



Of all deaths worldwide, 17% are accounted for by respiratory diseases (table 1), such as lower respiratory infections, chronic obstructive pulmonary disease (COPD), tuberculosis (TB), and cancers of the lung and airways. In Europe, it is estimated that lung diseases are among the leading causes of mortality and morbidity. They result in a yearly financial burden of over €100 billion in Europe [2] and are a considerable contributor to the disease toll.

This section of the *European Respiratory Roadmap* pinpoints specific areas that have been identified as key to preventing lung disease in the future, and to reduce the overall societal burden from these diseases. An attempt has also been made, where possible, to place these in the context of current policies and actions at the European Union (EU) level.

AWARENESS

There are more than 40 respiratory diseases that affect both children and adults. Some are common, such as asthma, COPD, pneumonia and sleep apnoea, and others are rare, such as interstitial lung disease, pulmonary arterial hypertension and orphan diseases.

According to the latest World Health Organization (WHO) estimates (2007), currently 300 million people have asthma and 210 million have COPD, while millions more have allergic rhinitis and others live with underdiagnosed chronic respiratory diseases [3]. Despite these alarming figures, respiratory disease still suffers from a general lack of understanding among patients and the general public at large. As an

example, although COPD may be the primary cause of death, it is often only recorded as a contributing cause or it is omitted from the death certificate, and death is attributed to another disease [4].

Lungs and breathing problems do not appear to have the same emotional impact on people's consciousness as the heart and heart disease, or cancer; while lung cancer, however, remains the leading cause of cancer deaths in men. This is reflected in many ways and is extremely obvious when comparing fundraising success in those fields (fig. 1): direct giving in 2009–2010 to the British Lung Foundation was £3,790,447 [5], to the British Heart Foundation was £38,600,000 [6] and to Cancer Research UK was £94,000,000 [7]. These differences are also apparent from the experience of the European Lung Foundation (ELF) at a European level.

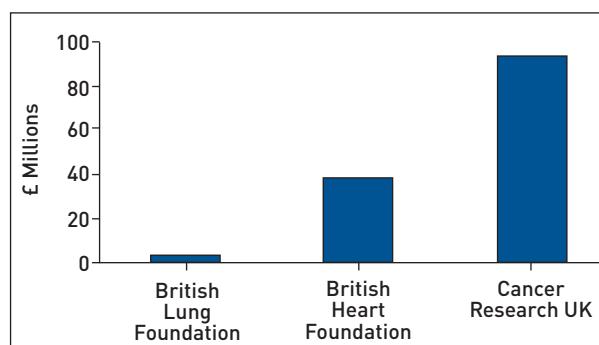


Figure 1. Direct giving to the British Lung Foundation, British Heart Foundation and Cancer Research UK in 2009–2010.

Table 1. Leading causes of death worldwide, 2008.

	Deaths in millions	% of deaths
Coronary heart disease	7.20	12.2
Stroke and other cerebrovascular disease	5.71	9.7
Lower respiratory infection	4.18	7.1
Chronic obstructive pulmonary disease	3.02	5.1
Diarrhoeal disease	2.16	3.7
HIV/AIDS	2.04	3.5
Tuberculosis	1.46	2.5
Trachea/bronchus/lung cancer	1.32	2.3
Road traffic accidents	1.27	2.2
Prematurity and low birth weight	1.18	2.0

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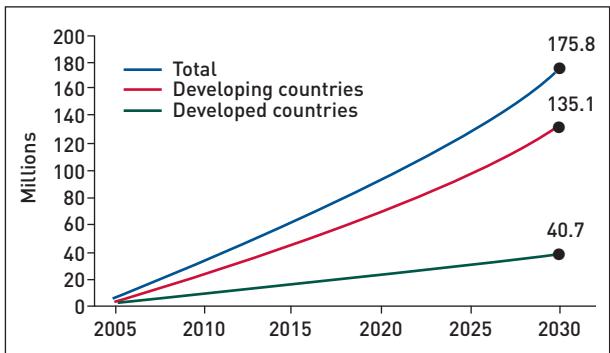


Figure 2. Cumulative tobacco-related deaths, worldwide 2005–2030. Reproduced with permission from the publisher [11].

A communication strategy involving scientific societies, medical associations and patient organisations across Europe is required to draw public attention to the key points of prevention of all lung diseases. In addition, a consensus on common terminology across Europe would aid in the overall understanding and awareness of lung disease.

HEALTH DETERMINANTS

Four major health determinants, *i.e.* tobacco, physical inactivity, poor diet and alcohol, account for most of the chronic disability and death in Europe. All of them can be successfully addressed to prevent disease and promote the health of the European population. However, 97% of health expenses are presently spent on treatment, with only 3% invested in prevention [8].

Although this roadmap is about respiratory disease, such diseases often present along with other comorbidities; this cross-disease approach to the future of lung health must be considered in all future actions. To this end, the European Respiratory Society (ERS) has joined forces in an unprecedented prevention alliance, the European Chronic Disease Alliance, which consists of 10 European organisations representing over 100,000 health professionals, to put the case for immediate political action to reverse the alarming rise in chronic non-communicable diseases, which affects more than a third of the population of Europe [9].

Tobacco

Smoking is the leading preventable cause of death in Europe and kills half of all lifetime users. Worldwide,

if current smokers' patterns continue, tobacco will kill about 10 million people every year by 2020 [10]. Figure 2 shows the projected global and cumulative deaths from tobacco-related disease between 2005 and 2030. The majority of these deaths will happen because of pulmonary malignancy and lung diseases (fig. 3). Tobacco dependence in young people will decrease in Europe in the next decade but there will be no decrease in smoking-related respiratory diseases unless people who are already smokers quit.

Furthermore, there is no safe level of exposure to secondhand smoke. A recent study published in the *Lancet* found that more than 600,000 non-smokers worldwide die each year as a result of their exposure to secondhand smoke and a total of 10.9 million years of disability-adjusted life years (DALYs) are lost annually because of diseases caused by exposure to secondhand smoke. DALYs measure years lost to ill health, disability or early death; 61% of DALYs lost were among children, mainly because of lower respiratory infections (5,939,000) and asthma (651,000) [12]. Apart from lower respiratory infections and asthma, pre- and/or postnatal passive smoking also increases the risk for sudden infant death syndrome and middle ear disease [13].

One of the best ways to combat secondhand smoke is to introduce smoke-free laws (including for schools and day care centres) and respiratory professionals have been, in synergy with other organisations and health stakeholders, at the forefront in calling for comprehensive smoke-free laws across Europe. Collaboration is needed worldwide in order to see the

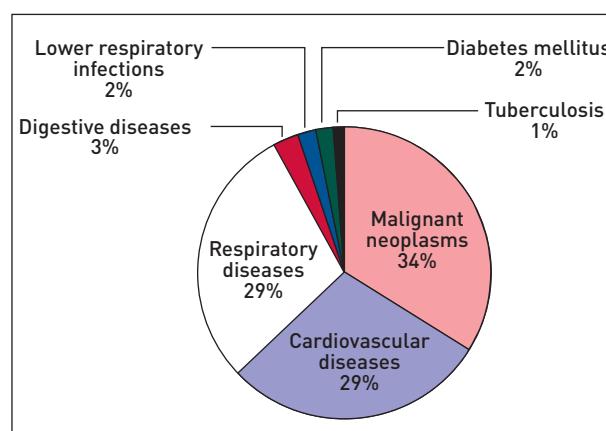


Figure 3. Deaths due to tobacco, 2015 projection. Reproduced with permission from the publisher [11].

full implementation of the global public health treaty: the Framework Convention on Tobacco Control, which over 170 countries have ratified. Europe has a huge responsibility in this regard and the ERS has a huge opportunity and duty.

Since its foundation in 1990, the ERS has had a very strong commitment to tobacco control. The ERS has a dedicated standing tobacco control committee, an assembly of expert scientists, and a strong advocacy partnership with cancer and heart organisations in the Smokefree Partnership. The ERS employs a very strict code of conduct for relationships with the tobacco industry. The ERS has worked on tobacco control at the European and international level, and at the local level through its members, doctors and allied health professionals in hospitals, clinics and universities.

Environment

Citizens are entitled to clean air that is safe to breathe, just as they are entitled to clean water and safe food. The core environmental concern in the respiratory field continues to be outdoor air pollution, which is the biggest environmental threat in Europe. The best control strategy from the standpoint of human health, supported by the scientific evidence to date, is to significantly reduce outdoor levels of air pollutants, the most serious ones being particles and ozone.

Current levels of air pollution cause severe health impacts in the EU, resulting in hundreds of thousands of premature deaths each year, increased hospital admissions, extra medication and millions of lost working days. Members of the ERS environment and health committee have recently produced a booklet on air pollution and health that is an elegant attempt to explain, to a wide audience, what air pollution is at the current time, and what damage it still does to our health [14]. The authors have achieved a welcome mix of scientific authority and clarity that will appeal to clinicians, public health practitioners, patient organisations, stakeholder representatives and informed members of the public.

It is time that regulators take account of the adverse health impacts and premature deaths associated with air pollutant exposure, because pollution levels in many areas in Europe are still far above what the WHO considers acceptable. Eurobarometer polls consistently show that the public continues to be

concerned about how environmental factors may be harming their health. The Eurobarometer survey published in May 2010, the “Perception survey on quality of life in European cities”, concluded that air pollution appeared among the three most important problems in 21 cities [15]. Better air quality standards need to be promoted, in order to better defend the health needs of citizens and to advise patients about this continuing environmental problem. For this to happen, the EU member states must follow the WHO recommended air quality guidelines [16].

The fundamental right to clean indoor air is a key concern for respiratory health. Indoor air quality is a major issue globally, with over one half of the world’s population being exposed to smoke from biomass burning on a daily basis; an exposure which is effectively only seen in the developing world.

Member states must be continually reminded of their commitment to act and implement the WHO indoor air quality statements, as agreed during the WHO Fifth Ministerial Conference on Environment and Health, in Parma, Italy. In general, all workplaces should have an indoor air environment that is suitable for all people, including patients with respiratory impairment. Working environments such as schools require special attention and protection.

Future health threats arising from climate change in Europe are likely to be substantial. The Earth’s climate will change due to rising atmospheric concentrations of greenhouse gases, which will result in higher levels of ozone and, possibly, particles. These changes, in combination with higher mean summer temperatures and colder winters, will affect human respiratory health very significantly and adaptive approaches to reduce this impact are needed.

The ERS was the first professional medical association to adopt a position on climate change, highlighting the potential effects on respiratory health [17]. The aim of this position paper is to identify areas of concern arising from climate change for individuals with respiratory disease, healthcare workers in the respiratory sector and policy makers.

Pollution arising from fine particles is associated with more than 455,000 premature deaths due to cardio-respiratory effects every year in the 27 EU member states [18], corresponding to almost 4.5 million years of life lost (fig. 4).

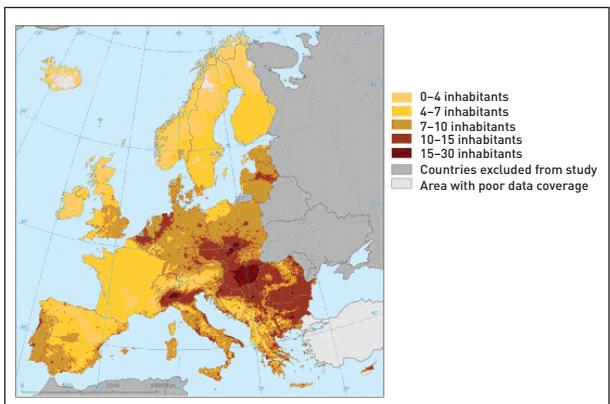


Figure 4. Premature mortality (per 10,000 per year) attributable to PM_{2.5} exposure (reference year 2005). Reproduced with permission from the publisher [18].

Occupational health

Occupational exposures remain an important factor for lung health for a number of reasons and result in the loss of approximately €6 billion annually [19]. The WHO comparative risk assessment methodology enabled the assessment of global mortality and morbidity resulting from exposures to selected occupational hazards in the year 2000, and found occupation to be responsible for 11% of all asthma and 9% of lung cancer cases [20]. Occupational risk factors were responsible for the occurrence of all pneumoconioses and mesothelioma [21]. As an example, we are facing an epidemic of mesothelioma caused by the intensive use of asbestos up to the late 1980s. The number of annual cases is predicted to rise for the coming decade.

Considerable differences exist between regions depending on their industrial structure, industrial processes and exposure controls. Several challenges exist for the different work-related respiratory diseases, which are going to become more pronounced with the ageing of the workforce.

Even though some of the traditional occupations, such as mining and quarrying, have diminished rapidly, new techniques and tools have increased the exposure of known hazards to new groups of workers. One example of this is the recurrence of silicotic lesions in construction workers, paralleled by an increased risk for COPD, shown to coincide with the use of new hand-held high-speed tools now common on construction sites. These new mechanisms are a

challenge to us all, since they introduce a potentially dangerous exposure to groups of workers unaware of the associated risk.

Allergy rates have increased in the population, to 20% for allergy and 8% for asthma. This will lead to new challenges for industry, as the occurrence of work-aggravated asthma is expected to rise. A great variation in the prevalence rates of asthma across Europe between countries, as well as within countries, has been found [22]. The increasing number of asthmatics entering the workforce is creating new challenges for industries that traditionally excluded asthmatics from employment. Occupational allergens and irritants are responsible for specific occupational asthma, which confers a substantial economic cost on both the affected individual and the state. It is critical that practices proposed for recognition and management of occupational asthma will be implemented in medical practice. For several allergens and irritants exposure-response relationships have been observed and these indicate that primary prevention should lead to a reduced burden of disease. Existing knowledge has not yet been translated into so-called occupational exposure limits for these agents. There is a strong need to translate scientific insights into proposals for occupational exposure limits at the European level and there is a potential role for the ERS to promote primary prevention by the EU.

Because smoking has, for decades, been regarded as the major determinant of COPD, the role of occupational exposures has been ignored or underestimated. However, new research from the EU and the USA has unequivocally shown that occupational exposures are responsible for a substantial fraction of COPD. The population attributable risk from occupational exposure is now estimated at 15–20% [23, 24] and COPD is a major category of comorbidity in workers with a “classical” high dust exposure profession, for example working in mines and foundries, and also in agriculture.

Physical activity

Keeping people healthy will help improve Europe's productivity: in developed regions, 28% of DALYs are attributable to risk factors common to chronic diseases. The chronic disease challenge facing Europe goes far beyond public health. If not addressed, they threaten the “Europe 2020 strategy”, especially the

goal to have 75% of the working population employed and productive.

Physical activities need to be supported not only in the healthy population, but also in patients with lung diseases (e.g. through rehabilitation programmes and regular exercise training). Regular physical activity improves quality of life and fitness, both in healthy individuals and in patients with various types of respiratory disease. An increase in physical activity has been shown to be related to a decreased rate of decline of lung function over 25 years of follow-up [25]. Symptoms of dyspnoea and/or fatigue limit patients' engagement in physical activity. This is seen very early in the disease and leads to increased morbidity of the lung disease. Observations of reduced physical activity are made in COPD, asthma, cystic fibrosis and restrictive lung disease. Screening physical activity levels and encouraging patients to remain as active as possible may lead to prevention of the systemic consequences of several lung diseases. Further studies are needed to optimise the effect of physical training in patients with lung diseases.

As well as potentially delaying the onset of COPD, physical activity is also important for reducing severity of disease. A meta-analysis of people with COPD who attended a programme of pulmonary rehabilitation for at least 4 weeks demonstrated an improvement in terms of quality of life and exercise capacity [26]. In asthmatic children it has been shown that physical activity and fitness improves self-perception [27]. Physical training programmes combining aerobic and anaerobic training improve exercise capacity in people with cystic fibrosis and may have other health benefits [28]. There is also evidence suggesting that increased physical activity is associated with a reduction in the risk of lung cancer [29]. Unfortunately, many individuals suffering from lung disease, e.g. COPD, tend to exercise less. However, these patients need specific targeting, since physical activity and pulmonary rehabilitation will improve their health.

There is a great need for specific programmes, such as pulmonary rehabilitation, to be tailored and made accessible to patients. Physical activity needs to be considered as a normal part of healthcare for patients and must include guidance on how to translate general public health recommendations on physical activity into levels that correspond to the capacity of the

patient (e.g. 30 minutes of moderate physical activity 5 days per week or 20 minutes of vigorous intensity on 3 days per week; it is important to include activities to promote strength and bone health).

Physical inactivity is a major risk factor for obesity, which in turn is associated with an increased risk of asthma. A variety of studies have demonstrated that obese people are at higher risk of developing asthma and airway hyperresponsiveness while having decreased lung function. This is an important area for further study, since one estimate from the USA indicated that 15–38% of asthma in adults might be caused by obesity and, therefore, be preventable [30].

Disorders of sleep and breathing, particularly obstructive sleep apnoea (OSA), have increased steadily over the past decade across all EU countries [31]. Untreated OSA has dangerous health consequences. Severe OSA is associated with an increased risk of death from any cause in middle-aged adults, especially men [32], and is closely related to increases in body weight and, as a result, the tendency to produce upper airway obstruction during sleep. The EU and member states need to do more to raise awareness of respiratory sleep disorders, as they affect millions of people across Europe, in particular with the increasing rise in obesity across the region (fig. 5).

There is a need to develop robust and cost-effective methods of identifying people who suffer from sleep apnoea. This could be done by a combination of questionnaires and telemonitoring, and operational research to establish the simplest and most effective ways of doing this is important [34].

There is a need to conduct studies about the most effective way of preventing venous thromboembolism, which leads to many premature deaths in hospitalised people and in those undergoing surgery [35]. Applying modern molecular techniques to refine current clinical risk assessments would have considerable value here.

Migration and health inequalities

Health equals wealth: investing in health means investing in people and, ultimately, in the European economy. A primary priority of the Europe 2020 strategy is to emphasise that a major effort will be needed to combat poverty and social exclusion, and reduce health inequalities to ensure that everybody can benefit from growth [36]. Social inequality causes a higher proportion of deaths in respiratory

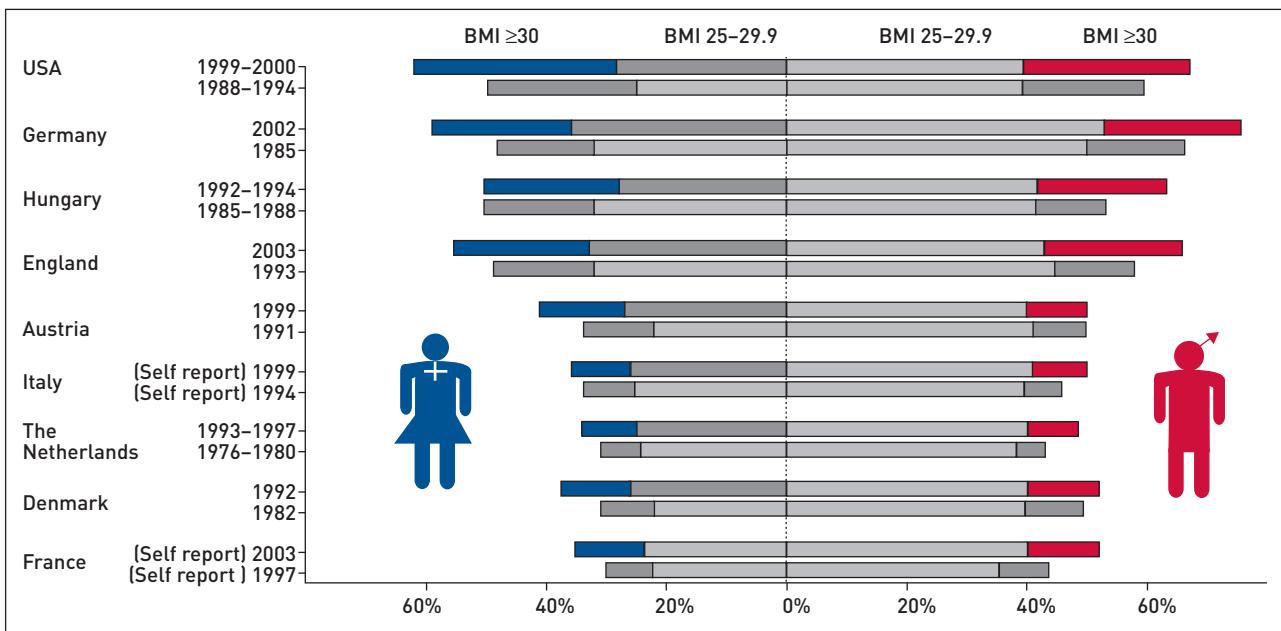


Figure 5. Changes in adult overweight and obesity in selected countries. Reproduced with permission from the publisher [33].

disease than in any other disease [8]. This includes chronic and acute, as well as communicable and non-communicable respiratory diseases.

In January 2006, third-country nationals residing in the EU numbered about 18.5 million, *i.e.* 3.8% of the total population of almost 493 million [37]. Immigration is still a leading element in EU demographic growth and positive net migration is recorded in most member states [38]. Europe's importance as a region of destination will increase, as European countries recruit migrants to fill the labour and skills shortages that are predicted to rise in the coming decades. The related respiratory health issues are relevant, mainly due to different cultural backgrounds and concepts of health and prevention.

Lower respiratory infections are the third most common cause of death worldwide, and communicable respiratory diseases place a significant burden on society. The ERS has been active in prevention through its cooperation with the European Centre for Disease Control and Prevention and through its research projects on respiratory infections such as TB and pneumonia. Prevention of respiratory infections is essential now more than ever. Such infections are often associated with social inequalities.

Respiratory diseases are associated with social inequalities in all age groups, particularly in children [39–42].

In Europe alone, there were 62,000 deaths recorded from TB in 2009 [43]. Reducing health inequalities could make an important contribution to the prevention of respiratory infections and there needs to be more concerted action in this area in the future.

Diet and nutrition

There is evidence that diet has an impact on respiratory diseases and that the prevalence and severity of some chronic respiratory conditions, such as asthma and COPD, can be reduced thanks to a healthy food intake. Increased consumption of fruit and vegetables, antioxidants, flavonoids, fish and omega-3 (n-3) fatty acids are all associated with better lung function. High fruit intake [44]; higher intake of cruciferous vegetables, such as broccoli and cabbage, in individuals with a specific genotype [45]; and a diet high in phytoestrogens [46] have all been shown to be associated with a lower risk of lung cancer. It has been estimated that low fruit and vegetable intake may account for up to 8% of airway and lung cancers in high income countries [47]. Some intervention studies show that a diet high in salt may increase the severity of disease in those with asthma [48], and that pulmonary function may improve in people with asthma who adopt a low salt diet [49].

A randomised trial demonstrated a reduced risk of influenza A in children taking vitamin D supplements [50].

Vitamin D supplementation might also be a preventive strategy for wheeze and atopic eczema [51]. Reduced vitamin D levels appear to be associated with an increased requirement for corticosteroid treatment as well as with an increased risk of severe asthma exacerbations [52, 53].

In a non-selected community setting, children (particularly boys) with inadequate vitamin D are at increased risk of developing atopy, and subsequently bronchial hyperresponsiveness and asthma. In a large unselected cohort, males with inadequate vitamin D at 14 and 6 years had increased atopy and bronchial hyperresponsiveness. Low vitamin D at age 6 years was a predictor of atopy and asthma at age 14 years [54].

Screening for nutritional status and awareness of the importance of being over- and underweight is of particular relevance in respiratory conditions. Regular monitoring in all areas of child and adolescent growth and development, *e.g.* height, weight and lung capacity, should be initiated in the EU member states.

In order to promote changes in lifestyle and the need for a better diet and increased physical activity, health professionals' involvement is required as they play an important role in improving patients' understanding of the relationship between diet, physical activity and health, and in promoting changes in lifestyle.

Further research is required in order to establish more accurate scientific evidence on links between respiratory diseases and diet. Specifically, more studies should be carried out in order to determine whether diet influences the severity of respiratory diseases and, if there is any effect, whether there is a reversible component.

EARLY DETECTION AND DIAGNOSIS

In many areas of respiratory medicine, treatment is more efficacious in the early stages of disease than in the later stages. It cannot be overemphasised that, for the next decade, early detection and diagnosis, greater international collaboration, lung function testing as part of a regular health check, implementation of population-based quality-assured screening programmes, evaluation of social inequalities and development of novel tools to detect lung disease in at-risk populations are all measures that should be encouraged.

Spirometry

Asthma and COPD are among the most prevalent diseases in Europe and both are increasing, placing a major burden on healthcare costs. Community surveys show that over 50% of patients with COPD, including some with advanced disease, are undiagnosed and therefore untreated [55]. Furthermore, many patients with COPD are treated as if they have asthma, and asthma in the elderly is currently under-recognised [56].

World Spirometry Day 2010 was an occasion when the global respiratory community rallied to make lung function testing, specifically spirometry, freely available to all. This occurred in general practices, hospital foyers, supermarkets and high streets across the world. More than 100,000 tests, of which more than 80% were in Europe, were performed and an alarming 23.1% of participants were referred to their practitioner with an abnormal result. This event, along with the annual spirometry events held each year during the ERS congress [57], has shown that the public want to have their lungs tested and know more about their lung health, but they do not realise that it is possible and that the test is so easy when performed by competent professionals trained according to harmonised certification initiatives in spirometry, such as the ERS European spirometry driving licence [58].

Regular lung health check

Taking this further would be the concept of assessing lung health routinely for the people of Europe. If every citizen had a regular lung health check, it would be possible to plan for those likely to require respiratory healthcare or show that an individual had developed a pathological respiratory disease (fig. 6). This would enable us to anticipate respiratory health burdens of the future. It is a simple message about getting the public to understand the most basic function of their respiratory system (spirometry) and to convince them that we can help to preserve the optimum lung capacity for each individual. Cardiology and diabetology have managed to train patients to monitor their disorder and the healthy to look out for key changes: we need to build on our current resources (guidelines for primary care spirometry, the European spirometry driving licence [58] and standards of spirometry testing, *etc.*) and by 2020 establish a lung health check at regular intervals for every European citizen.

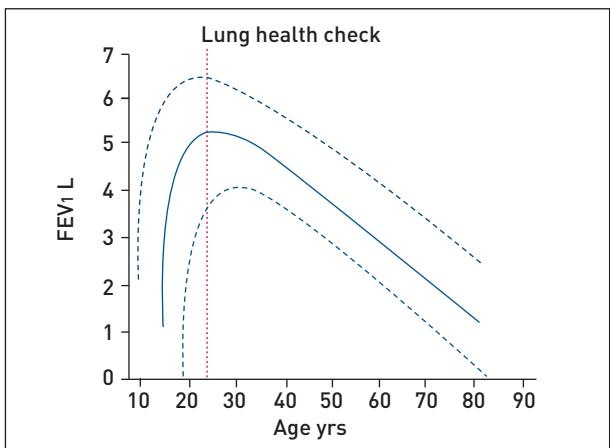


Figure 6. This diagram shows an approximate representation of the change in forced expiratory volume in 1 second (FEV₁) with age in normal subjects with the blue (solid) curve representing the mean value. The upper and lower dotted curves show the upper and lower ranges for the population. The vertical dotted line shows the age of the lung health check (25 years).

Lung cancer

Lung cancer is a major health problem in Europe [59] and cases are still on the rise. It is the third most common form of cancer (after colorectal and breast cancer) with 391,000 new cases in 1998, and is responsible for more deaths than any other cancer: 342,000, or 19.9% of all deaths attributable to cancers. Risk factors are manifold: increased prevalence of smoking in women, environmental factors, from endocrine disrupters [60, 61] to air pollution [62, 63], workplace factors, such as asbestos, and perhaps new technologies, such as nanotechnology fibres, to mention just a few [64–69].

The effectiveness of screening for lung cancer has not yet been demonstrated [70], but recent studies show that use of low-dose computed tomography results in a reduced mortality compared with that observed for spontaneously detected tumours [71–73]. For lung cancer, more international research collaboration (including thoracic imaging and/or biomarkers) with adequate methodology and large populations is needed [74, 75]. For effective screening for lung cancer the following need to be developed: endoscopic lung cancer detection techniques and their implementation in screening algorithms [76], validation of algorithms

for screening of lung cancer with high-resolution computed tomography [72], and, in the future, application of modern molecular techniques for people at risk. Also in terms of prevention, risk assessments with regard to nanotechnology applied in daily life (e.g. silver impregnated fabrics and water repellent sprays) have to be refined.

The incidence of mesothelioma is undergoing a major increase [77]. Previously considered to be rare, malignant pleural mesothelioma is a highly aggressive tumour that has become a very important issue over recent years. Asbestos exposure is the main factor involved in pathogenesis; this can explain the rise in incidence of malignant pleural mesothelioma since the 1960s. Despite the prohibition of asbestos use in Europe in 2005, as in most other developed countries, epidemiological projections estimate that the incidence of malignant pleural mesothelioma is still increasing and will peak over the next 10 years. For mesothelioma, no tool is today available for screening. The usefulness of thoracic imaging and/or biological markers should be further evaluated in selected highly exposed populations included in voluntary surveillance protocols.

Early life events

The great many prospective birth cohort studies have shed light on the different patterns of wheezing, their risk factors and their evolution through childhood. It is becoming increasingly clear that even for “adult” diseases, such as COPD, antenatal and early life events are at least as important as smoking in adulthood [78].

The number of children born very prematurely (before 27 weeks gestational age) who survive will continue to increase over the coming years. The consequence could be an increase in children with chronic lung disease (bronchopulmonary dysplasia/chronic lung disease), of prematurity and of children with multiple handicaps, including lung disease and other respiratory complications [79].

For infants and preschool children, virus-induced bronchitis and bronchiolitis, airway infections, and episodic and multiple-trigger wheeze will continue to be a cause of respiratory morbidity and a burden on healthcare services, both hospital and community based. In schoolchildren, asthma is, and will be, the most common chronic disease [80]. Between 5 and

10% of these children will develop severe asthma. Most children will also have allergic manifestations in combination with asthma. In adolescents, asthma might recur in those who had asthma during preschool years.

Prevention in paediatric care

In the future, bacterial respiratory infections will be as prevalent as they are today. An increase of meticillin-resistant *Staphylococcus aureus* infections and TB with treatment-resistant mycobacteria is likely. Oncology therapeutics and transplantations will improve the prognosis of malignant diseases and progressive lung diseases, such as interstitial lung disease, in children as well as adults. Conversely, an increase in pulmonary complications is likely, *i.e.* infections due to immune deficiencies and complications due to serious side-effects of therapy (chemotherapy and therapy to prevent loss of transplanted organs).

An increased demand for non-invasive ventilation is likely in several groups of children, such as those with neuromuscular conditions. Patients with rare lung diseases, such as pulmonary fibrosis without known origin, autoimmune diseases with lung complications, interstitial lung disease and congenital malformations of the respiratory tract, will continue to require highly specialised tertiary care centres.

Immunisation

There is a need to develop new vaccines to prevent rhinovirus and respiratory syncytial virus infections, in addition to the available vaccines against whooping cough, epiglottitis and pneumococcal infections. The benefit of the decrease in invasive bacterial infections due to vaccination programmes for infants is among the most important achievements of the past. Development of vaccines for prevention of early infections could have a major impact on the risk of asthma later in childhood.

There are many other paediatric lung conditions for which early detection and screening is or would be beneficial, including: 1) PCR for quick identification of some 20 viruses that cause airway infections in young children; 2) improved diagnostic tools for bacterial infections in cystic fibrosis, primary ciliary dyskinesia

and TB; 3) new lung function tests applicable for young children; and 4) newborn screening for cystic fibrosis and prevention of early deterioration and irreversible lung injury.

Childhood asthma will continue to be a main focus of the specialty. Asthma is, and will be, the most common chronic disease in schoolchildren and adolescents. In allergic rhinitis and asthma, new individualised allergy vaccines could become a possible treatment for the prevention of asthma and/or its deterioration.

PATIENT EMPOWERMENT

A survey carried out by the ELF in 2006, among more than 900 ERS members, found that some 43% of the respondents reported that the information found by the patient was poor or very poor. When asked how trustworthy the ERS members thought the sources of information being used were, more than 40% had concerns and 96.3% wanted to be able to provide better patient information. It was from this survey that the concept of the ELF as an information provider was born. The aim of the ERS was to ensure that, through the ELF, all the advances in science and in the clinic that were discussed at their conference, published in their journals and summarised in their guidelines would be freely accessible to those outside of the professional respiratory arena. The ELF website is available in eight European languages and is now accessed by more than 30,000 people each month.

The quality and amount of information available in different countries varies and public awareness is still low. The European Medicines Agency (EMA) roadmap and the recommendations and proposals for action of the EMA/CHMP working group with patients' organisations have also emphasised the important challenge of providing adequate information on the benefits and risks of medicines [81]. Patients and the public seeking information on the internet need to become more discerning with the information they use. There is an ongoing need to ensure that the public are accessing reliable information and a necessity to coordinate this at a central level. However, there is not sufficient funding available across Europe for this type of initiative.



RECOMMENDATIONS FOR PREVENTION

Awareness

- Develop a communication strategy to draw public attention to the key points of prevention and management of all lung diseases.
- Form a consensus with all stakeholders on common respiratory terminology across Europe.
- Join with other organisations and health stakeholders in forming coalitions to raise awareness.
- Respiratory healthcare professionals are trusted in the community and they must use this asset to raise awareness and resources for respiratory diseases.

Occupational health

- Respiratory diseases constitute a priority action in the context of the need for a healthy and productive workforce and in particular with regard to demographic change and the 2020 agenda of inclusive and sustainable growth.
- Promote the concept of exposure standards for allergens and respiratory irritants as a major primary prevention initiative. There is a clear need because many allergens are not regulated by REACH, the European Community Regulation on chemicals and their safe use, *e.g.* for cereals, enzymes and endotoxins.
- Strengthen research on the effect of interventions on the burden of occupational asthma [19].
- Strengthen research on the effectiveness of surveillance for occupational asthma and COPD in the work environment.
- Advocate for coordinated research and EU programmes on occupational respiratory diseases.
- Exposure to nanoparticles in the product process is a concern that necessitates further research.

Tobacco

- Ensure full implementation of all aspects of the Framework Convention on Tobacco Control, in particular a smoke-free Europe.

Environment

- Support adherence of EU member states to the WHO recommended air quality guidelines.
- Develop legislation to support the WHO indoor air quality statements.
- Monitor and act upon the effects of climate change on those with respiratory disease.

Physical activity

- Promote physical activity as a normal part of healthcare.
- Encourage people with lung conditions to continue to exercise.
- Optimise physical training in patients with lung disease.

Migration and health inequalities

- Respiratory health issues are relevant and due regard needs to be taken in view of Europe's importance as a region of international migration flows and the resulting diverse cultural backgrounds, including different concepts of health and prevention.
- Promote social support and educational programmes to improve uptake among low socioeconomic status patients, and ensure that patient education programmes are better tailored for low socioeconomic status people in order to increase patient treatment initiation and adherence.

Diet and nutrition

- Encourage screening for nutritional status for those with a respiratory condition.
- Produce more accurate scientific evidence of the link between diet and lung diseases.
- Improve patient understanding of the relationship between diet and health needs.





Spirometry

- Ensure spirometry is used for accurate diagnosis of COPD and asthma, e.g. ERS European spirometry driving licence initiative.
- Raise awareness and understanding of spirometry among the general public.

Regular lung health check

- Establish regular intervals for a lung health check for all European citizens.

Lung cancer

- For effective screening for cancer, develop: endoscopic lung cancer detection techniques and their implementation in screening algorithms, validation of algorithms for screening of lung cancer with high-resolution computed tomography, and, in the future, application of modern molecular techniques for people at risk.
- Clarify the risk of nanotechnologies applied in everyday life (silver impregnated fabrics and water repellent sprays).
- Develop screening tools for mesothelioma.

Paediatrics

- Develop improved use of vaccines to prevent whooping cough, epiglottitis and pneumococcal infections, and develop new vaccines against common respiratory viruses.
- Develop PCR for quick identification of viruses that cause airway infection.
- Improve diagnostic tools for bacterial infections in cystic fibrosis, primary ciliary dyskinesia and TB.
- Develop new lung function tests for infants and pre-school children.
- Improve newborn screening for cystic fibrosis.

Patient information

- Improve the content and quality of patient information by working in partnerships with patient groups and the EMA.
- Source funding for the production of quality patient information.

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