*Project SENSOR. News

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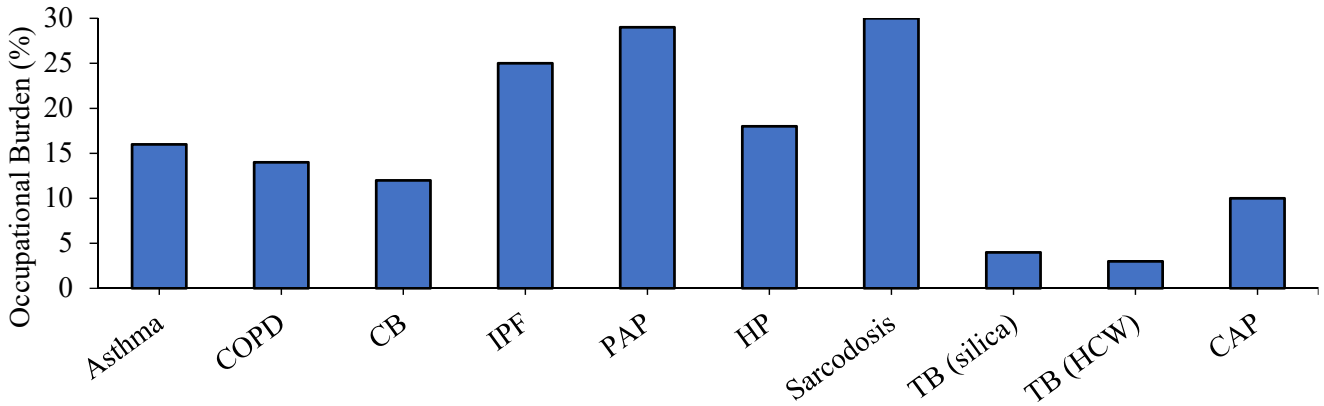
Occupational Burden of Respiratory Disease

The American Thoracic Society (ATS) in consensus documents from 2003 and 2011 reviewed the medical literature and estimated that 15% of asthma in adults was caused by work exposure, 21% of asthma was aggravated by work and work was a significant contributor in the cause of 15% of COPD[1,2]. A consensus statement from ATS and the European Respiratory Society (ERS) published in 2019 updated the literature review and confirmed the previous ATS consensus statements about the occupational contribution to the cause of new onset asthma in adults and for COPD[3]. In addition, the new ATS/ERS consensus document expanded the conditions reviewed to include chronic bronchitis (CB), idiopathic fibrosis (IPF), pulmonary alveolar proteinosis (PAP), hypersensitivity pneumonitis (HP), sarcoidosis, tuberculosis (TB) in silica exposed workers (silica), and healthcare workers (HCW), and community acquired pneumonia (CAP). Figure 1 summarizes the occupational contribution for all these conditions.

Figure 1. Summary of the Occupational Burden of Nonmalignant Respiratory Disease, by Condition

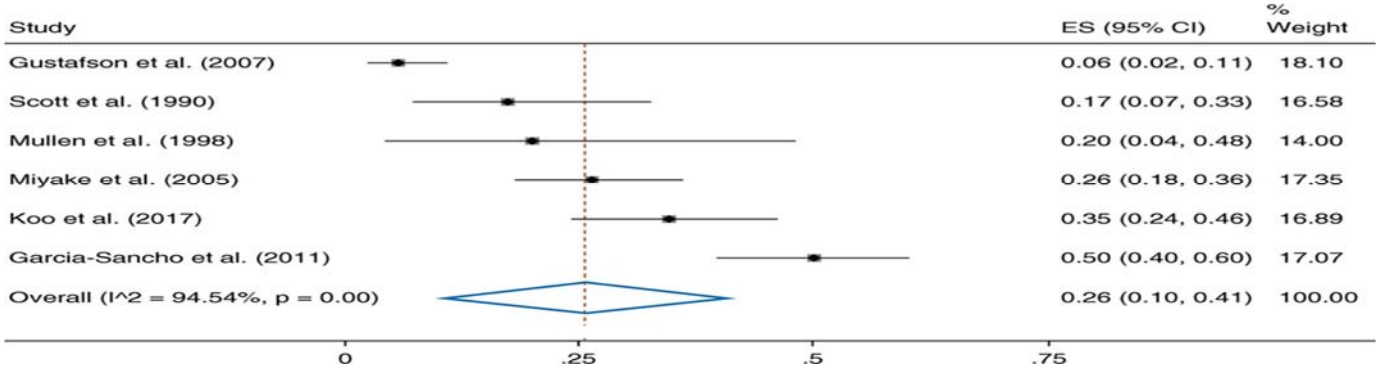


Am J Respir Crit Care Med, 2019 https://www.atsjournals.org/doi/abs/10.1164/rccm.201904-0717ST Copyright © 2019 by the American Thoracic Society

The methodology used in this latest consensus statement was a comprehensive literature review and calculation of population attributable fractions or occupational exposure percentages with calculation of pooled estimates after excluding the studies with the highest and lowest estimates[3].

Figure 2 shows how the data were presented. The calculated pooled attributable risk for IPF was 26% (95% CI, 10–41%).

Figure 2. IPF Population Attributable Fraction from Vapors, Gas, Dust, or Fumes (VGDF)



The calculated pooled PAF (red dashed line) for VGDF is 26% (95% CI, 10–41%). ES = effect size.Am J Respir Crit Care Med, 2019https://www.atsjournals.org/doi/abs/10.1164/rccm.201904-0717ST

Because of both disease and exposure misclassification there are uncertainties with the estimates. For example, IPF is a disease of exclusion where no exposure is identified and the patient has usual interstitial pneumonia (UIP) on biopsy or a consistent chest radiograph. Asbestos also causes UIP so that the patient may actually be misclassified as having IPF when they have asbestosis[4]. Exposure misclassification can also occur because asbestos exposure can occur in multiple industries, which may not be appreciated in an exposure history based on review of industries or occupations without review of the patient's actual exposures in those occupations/industries. Another example of the difficulty in estimating of the occupational burden of a lung disease is with HP where in half the cases the etiologic agent cannot be identfied[5].

Additional lung conditions associated with occupational exposure, which were listed in the ATS/ERJ consensus statement, but which were not reviewed, are shown in Figure 3.

Figure 3. Examples of Other Pulmonary Disorders Reported in Association with Occupational Exposures[3]

Disease	Exposure (s)
Acute eosinophilic pneumonia	**Indoor renovation, gasoline tank cleaning, tear gas, World Trade Center dust[6]**
Bronchiolitis (obliterative, proliferative, lymphocytic)	**Oxides of nitrogen, flock, diacetyl, sulfur mustard, fiberglass-reinforced plastics[7, 8]**
Cryptogenic organizing pneumonia (COP)	**Textile dye ("Ardystil syndrome")[9]**
Desquamative interstitial pneumonia (DIP)	**Aluminum[10]**
Diffuse pulmonary hemorrhage	**Trimellitic anhydride[11]**
Lipoid pneumonia	**Mineral oil, paraffin[12]**
Non-specific interstitial pneumonia (NSIP)	**Pyrethrin[13]**
Respiratory bronchiolitis interstitial lung disease (RB-ILD)	**Solder flux, workplace secondhand smoke[14]**

Other lung conditions not included in the recent burden article were lung diseases associated with autoimmune connective tissue diseases such as scleroderma or rheumatoid arthritis. These autoimmune diseases are more common in women and studies indicate that when they occur in men, there should be a high level of suspicion for the causal role of an occupational exposure[15].

Also, the pneumoconioses such as coal workers' pneumoconiosis or silicosis were not included in the review since these conditions are generally 100% work-related.

Other authors have calculated estimated occupational attributable fractions for the malignant lung conditions of laryngeal cancer, lung cancer and mesothelioma (Figure 4)[16]. In men, the attributable fraction for occupation for lung cancer was 21.1%.

Figure 4. Respiratory Occupational Cancer Burden in Britain Estimation Results For Men And Women

	Attributable Fraction men (95% CI)	Attributable Fraction women (95% CI)
Laryngeal Cancer	**2.9 % (1.4–5.7)**	**1.6 % (0.6–3.5)**
Lung Cancer	**21.1 % (19.2– 24.6)**	**5.3 % (4.3 – 6.9)**
Mesothelioma	**97 % (96–98)**	**83 % (75– 90)**

How does the recognition of the occupational component of a lung condition affect clinical care? In asthma and HP, it is important to recognize the exposure to be able to make recommendations/write restrictions to eliminate/minimize the inciting exposure so as to reduce morbidity and possibly completely reverse the condition[5,17]. For COPD and CB, minimization/elimination of aggravating occupational exposures can reduce symptoms and morbidity[18].

Recognizing the contribution of occupational exposure to the development of lung cancer, particularly for asbestos exposure, expands the current recommendation for CT screening for lung cancer beyond current cigarette smokers or those who have quit within the last 15 years. Patients with parenchymal asbestosis whether or not they have ever smoked cigarettes and individuals with a history of high asbestos exposure even after more than 15 years of not smoking have similar risks for lung cancer as smokers/ex-smokers for whom CT screening of lung cancer is recommended[19].

For many of the conditions, recognizing the occupational contribution potentially makes the patient eligible for workers' compensation. Wage replacement provided by workers' compensation makes it financially feasible for an asthma or COPD patient to change a job and cease exposure to the causal or aggravating exposure. It also provides coverage of medical costs, including medications, with no deductible.

The first step in considering a possible association with exposure is to take a detailed current exposure history for acute onset diseases like asthma, HP and a lifetime exposure history for diseases like lung cancer and the pneumoconioses, which have a long duration of exposure and/or latency from first exposure to the development of disease. Knowledge about the exposure(s) and the disease of the patient can then be used to make appropriate treatment/management decisions.

As always, if you have questions regarding possible occupational lung conditions, please contact Kenneth Rosenman, MD at rosenman@msu.edu or 1-800-446-7805.

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