



Evidence of air pollution exposure and new asthma onset: further justification for cleaner air

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Further evidence that new onset asthma can occur from air pollution, even below prevailing air quality standards. It is time the ERS and ATS release a formal statement on the evidence for the link between long-term air pollution and new incident asthma. <https://bit.ly/30uAjNN>

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The relationship between air pollution and health is being questioned by some, and the cost of further progress increases as the ambient levels decline, so it is important to document all the health benefits associated with cleaner air. It is well-established in the medical literature that exposure to outdoor air pollution is associated with multiple adverse health outcomes in adults [1–3]. But, in practice, we are largely restricted to “looking under the lamppost” of published studies of a limited list of routinely documented acute health outcomes (such as daily hospital admissions and death counts) in quantifying the health impacts of air pollution, and are therefore prevented from considering the full range of health benefits from cleaner air and their fiscal valuations to society. Indeed, the regulatory cost–benefit process usually does not account for any effects of air pollution on increased incidence of new disease, including asthma. Compared to the human health cost of acutely exacerbating a pre-existing lung or heart disease due to air pollution exposure, the long-term financial valuation of a new onset disease such as asthma is much greater from a public health standpoint, because initiation of chronic disease entails many years of diminished capacity, medical treatments, and lowered productivity.

In this issue of the *European Respiratory Journal*, Liu *et al.* [4] present a pooled analysis of 98326 adult participants with no history of asthma at baseline from three European cohorts. Over 16.6 years, on average, of prospective follow-up, 1965 adults developed asthma, as defined by a new ICD-9 or ICD-10 diagnosis following an inpatient, outpatient or emergency room visit. By assigning historical residential address air pollution exposures to each participant, Liu and colleagues demonstrate that increases in fine particulate matter (PM_{2.5}) (HR 1.22, 95% CI 1.04–1.43 per 5 µg·m⁻³), nitrogen dioxide (NO₂) (HR 1.17, 95% CI 1.10–1.25 per 10 µg·m⁻³) and black carbon (BC) (HR 1.15, 95% CI 1.08–1.23 per 0.5×10⁻⁵ m⁻¹) exposures, considered separately, were associated with increased risk for new-onset asthma in adulthood. By finding a consistent association across multiple pollutants with new-onset adult asthma, as defined by an objective measure (*e.g.* ICD codes), these results build on prior evidence consistent with a causal association between chronic air pollution exposure and adult incident asthma [5]. Prior evidence from studies reliant on self-reported asthma diagnosis is mixed (a summary of evidence to date is presented in

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table S1 in the manuscript). In combination with strong evidence from pregnancy and birth cohorts [6–12], these new results validate the importance of air pollution exposure and asthma risk over the human life course.

Notably, Liu *et al.* [4] present analyses of a cohort with long-term exposures below the current World Health Organization limit values, and their analyses exploring different thresholds of air pollution exposures found no safe threshold, validating the need for more stringent control of air pollution. The study also gave indications as to which sources of pollution would give the greatest public health benefits, as the strongest associations were found with pollutants emitted by fossil fuel combustion sources, such as motorised traffic. Air pollution from fossil fuel combustion sources shares some of the same toxic components, such as metals and sulfur, that induce oxidative stress [13]. Thus, in this study, the association between BC, NO₂ and PM_{2.5} exposures and new asthma incidence could well be indicative of a broader relationship with air pollution derived from fossil-fuel combustion emissions, more generally.

This study is particularly timely, as it comes when the World Health Organization air quality guidelines are under review for the first time since 2005 [14], and also when the last US administration's Environmental Protection Agency irresponsibly chose not to set a more protective PM_{2.5} air quality standard [15]. In combination with the other published medical literature linking long-term air pollution exposure and risk of new onset asthma, this work provides robust evidence that new onset asthma is worthy of inclusion in cost–benefit policy analyses of future regulatory efforts to control fossil fuel combustion, and that these severe and long-lasting health impacts can occur at levels below the prevailing air quality standards and guidelines. It is time that the European Respiratory Society and the American Thoracic Society (ATS) follow up on the recent ATS workshop on this topic [5], and release a formal statement evaluating the evidence for the link between long-term air pollution and new incident asthma.

Conflict of interest: G.D. Thurston has nothing to disclose. A. Lee has nothing to disclose.

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