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D G Fullerton and S Semple

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LETTERS

Air pollution and health: indoor air pollution in the developing world is the real key to reducing the burden of ill health

We welcome the editorial by Thurston highlighting the effects of air pollution on health.¹ Air pollution has been shown to have an important effect on the mortality of those with pre-existing respiratory and cardiovascular conditions.²

Outdoor sources of air pollution are important contributors to indoor air pollution concentrations, particularly in developed countries. However, global human exposure to particulate matter (PM)—in terms of the number of people, exposure intensity and time spent exposed in various microenvironments—varies greatly in different parts of the world. In industrialised countries, only 1% of global PM exposure occurs in outdoor environments with a further 9% occurring indoors (fig 1). In the developing world, 14% occurs outdoors while 76% of human exposure to PM occurs in indoor environments.³

As a result of energy poverty, almost one-half of the world population burns organic material such as wood, dung or charcoal for household cooking, heating and lighting. This form of energy is associated with very high levels of indoor PM concentrations (perhaps 2–3 orders of magnitude higher than those found outdoors) and an increased incidence of acute lower respiratory infections, tuberculosis and chronic obstructive pulmonary disease. Women and children, who spend much of their time indoors cooking and preparing food, are disproportionately affected by indoor air pollution.⁴ The World Health Organization lists indoor air pollution from burning solid fuels as one of the top 10 global health risks, responsible for 1.6 million premature deaths per year, 2.7% of the global burden of disease

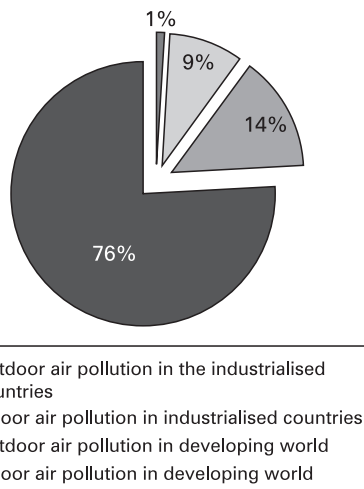


Figure 1 Total global exposure to particulate matter. Data from Smith.³

and an annual loss of over 38.5 million disability-adjusted life-years.⁵ Compare this with the 800 000 deaths and 4.6 million lost life-years resulting from outdoor air pollution cited in Thurston's editorial.

Thurston is correct to call scientists and physicians to act on climate change and health. Industrialised countries currently top the table of carbon dioxide emissions per capita (with the USA ranked first and the UK ranked eighth).⁶ Paradoxically, however, they suffer least from the effects of polluted air. Therefore, while it is important to investigate the effects of outdoor air quality on health, we think that there is a clear and urgent need to expend at least as much effort on attempting to understand and control indoor air pollution in the developing world.

D G Fullerton,¹ S Semple²

¹ Pulmonary Immunology, Liverpool School of Tropical Medicine, Liverpool, UK; ² Department of Environmental and Occupational Medicine, University of Aberdeen, Aberdeen, UK

Correspondence to: Dr D G Fullerton, Pulmonary Immunology, Liverpool School of Tropical Medicine, Liverpool L3 5QA, UK; duncan.fullerton@liverpool.ac.uk

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Author's reply

I agree with Fullerton and Semple that indoor air pollution is another major environmental concern—in addition to outdoor air pollution—that affects both human health and climate change. But calling indoor air pollution the “real key to reducing the burden of ill health” carries their point too far. While these are both important factors, there are also many other causes of ill health throughout the world besides indoor and outdoor air pollution, including malnutrition, obesity, sexual and reproductive health risks, tobacco use, unsafe water, and the list goes on from there.¹

In my editorial I focused especially on outdoor air pollution, not because indoor air

pollution and the other causes of global ill health are less important, but because outdoor air pollution was the topic of the *Thorax* journal article by Ko *et al*² about which I was writing.

However, since the issue has been raised, it is important for the reader to note that the health impact numbers cited by Fullerton and Semple for indoor air pollution are highly uncertain. Indeed, a recent review concluded that one of the key research questions in this field is: “What is the quantitative relationship between exposure to indoor air pollution and the incidence of disease (ie, the exposure–response relationship)?”³ Even the reference that Fullerton and Semple rely upon⁴ acknowledges that: “It is questionable, however, whether exposure–response relationships derived from pollutant-based investigations are applicable to populations exposed to indoor air pollution in rural areas of developing countries, since most pollutant-based epidemiological studies were conducted outdoors in urban areas of developed countries. Potential problems include differences in pollutant mix and composition, exposure patterns and levels, and population characteristics. The chemical pollutants produced by burning solid fuels, for example, are different from those produced by burning fossil fuels.” In fact, to address just this need for better estimates for use by policy makers, there is a commendable new major effort to improve and update such estimates being initiated (<http://www.globalburden.org>). Thus, given the large uncertainties surrounding present such global estimates, using them to rank the importance of various causes of ill health seems inappropriate at this time.

In conclusion, I would agree with Fullerton and Semple that indoor air pollution is also a concern regarding both human health effects and climate change, but one that needs—and deserves—much more extensive direct research regarding the size of its potential for human health effects as a function of both fuel type and population.

G D Thurston

Correspondence to: Dr G D Thurston, New York University School of Medicine, New York, NY 10018, USA; Thurston@env.med.nyu.edu

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