What have we learnt from studies on the association between urbanisation and asthma prevalence?

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The world's urban population is growing rapidly. In 1950, only 751 million individuals resided in urban areas whereas by 2018 this had increased to 4.2 billion, with 828 million estimated to be living in urban slums.[1 2] Current projections show that urbanisation could add 2.5 billion people to urban settings by 2050, a figure which translates to approximately two-thirds of the global population.[1] The pace of urbanisation presents important challenges to development for many cities in Africa, Asia and Latin America, where much of this expansion is unplanned or poorly planned, and exacerbates socioeconomic disparities and unsanitary conditions.[3] Slum environments bear the largest burden of inadequate urban infrastructure, which in turn results in a confluence of distal and proximal causes of human disease. A better understanding of risk factors related to urbanisation can help to prevent or treat common chronic diseases like asthma.

Multiple studies have linked asthma outcomes to increased urbanisation. Approximately 14% of children worldwide experience asthma symptoms each year, making it the most common chronic disease in childhood.[4] In this issue of *Thorax*, Rodriguez *et al*[5] conducted a systematic review and meta-analysis of epidemiological studies that evaluated the association between urbanisation and the prevalence of asthma. Their findings were not entirely surprising: they found that urban residence was associated with a 40–100 per cent increase in asthma, depending on the definition used. However, their conclusions and lessons learnt from this review merit further discussion.

First, Rodriguez *et al*[5] challenge the notion of how to define urbanisation in epidemiological studies and ask readers and investigators alike to dig deeper into the root causes of disease. According to the authors, the approach used in many epidemiological studies of 'I know it when I see it' is simply not enough. I agree with their conclusion. However, I too am guilty of using this approach in some of my studies.[6–8] In a recent study of urbanisation and chronic lung diseases that we conducted in Uganda by studying two disparate settings,[8] one reviewer asked us "how [do we know that] these two areas represent other urban and rural areas of Uganda?" We provided satellite images of the two study areas to back up our claim. The satellite images clearly showed the difference in urbanisation between the two study areas but, as discussed by Rodriguez *et al*,[5] they failed to capture the multidimensional nature of urbanisation. Furthermore, ecological data and analyses alone cannot provide this information, as they are by nature designed to compare basic causes of disease across settings. Risk factors associated with asthma, such as early childhood respiratory infections, poor diet and micronutrient deficiencies, high body mass index, exposure to high levels of ambient and household air pollution, exposure to cigarette smoke including secondhand and prenatal exposures, exposure to allergens and sensitisation, lack of exercise, and lack of access to healthcare among others[9] are all likely affected by poor urban planning. A better look at the association between urbanisation and asthma requires a more in-depth understanding of a conceptual framework that encapsulates basic, underlying and immediate risk factors (figure 1).

Second, Rodriguez *et al*[5] call for the development of a standardised, operational definition of asthma for epidemiological studies; however, first a consensus on a standard epidemiological definition of asthma needs to be achieved. Moreover, no single clinical test or biomarker can confirm the presence or absence of asthma in epidemiological studies. International guidelines advise that asthma diagnosis be based on both the presence of symptoms and objective measurements of variable airflow obstruction[10]; however, they do not provide practical guidance on how to implement this recommendation in different settings. As a result, epidemiological studies have used combinations of self-reported wheezing, physician diagnosis or use of asthma medications to define disease status. However, previous studies have demonstrated that up to 30% of individuals with physician-diagnosed asthma were excluded from having the disease when objectively assessed.[11] Improvements to the operational diagnosis of asthma likely require sequential evaluations of asthma symptoms and lung function over a specific time period,[12] like what is done for hypertension and diabetes. We also need to consider the potential for under-diagnosis of asthma by geographical context which may be related to barriers to health care access, or through differences in diagnostic labelling. With this in mind, investigators need to carefully weigh the choice and accuracy of definitions used against their practicality when implementing epidemiological studies. However, the best science involves choices that reduce misclassification of

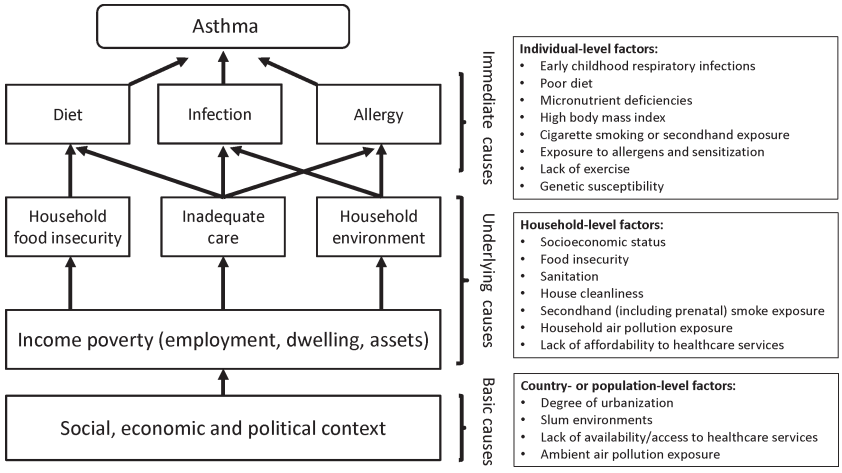

Figure 1 Conceptual hierarchical framework of individual, household, and country- or population-level factors associated with asthma prevalence.

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both exposures (eg, urbanisation) and outcomes (eg, asthma).

The growing problem of unplanned urbanisation around the world will continue to increase. Governments must prioritise urban planning to ensure the health and well-being of individuals living in urban communities. The United Nations has made the development of sustainable cities and communities as a Sustainable Development Goal.[13] However, the investment required to ensure access to safe housing is substantial: it is estimated that an investment of US$57 trillion in global infrastructure is required by 2030 to provide housing that meets the minimal standards of comfort and sanitation.[14] A well-conceived conceptual framework can help to identify targeted interventions in urban planning that can help to reduce the global asthma burden and have positive effects in other health outcomes.

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