Eur Respir J 2010; 35: 239–242
DOI: 10.1183/09031936.00070309

EDITORIAL

The social determinants of asthma

A.A. Cruz*, E.D. Bateman# and J. Bousquet¶

In all communities, poverty is strongly related to ill health [1]. This has not generally been the pattern for asthma, where the lifetime prevalence of symptoms is usually higher in more affluent societies [2, 3], and a rising prevalence of asthma is a price paid for increasing national prosperity. This trend is probably inevitable since to date, no public health strategy for large-scale primary prevention of asthma has yet proved feasible or effective.

The favoured reason for this apparent protective effect of low socioeconomic status (SES) and/or of a rural lifestyle for atopy and asthma is the hygiene hypothesis, which, in its simplest form, suggests that early life exposure to microbial products modulates the immune response away from mechanisms related to the development of atopy [4, 5]. In recent years, data from many studies have challenged this view [6]. There have been consistent demonstrations of a positive association between lower SES and risk of wheezing in children and adolescents, both in high- and low/middle-income countries (LMICs), indicating a more complex interaction between factors, some protective and others causative. While dichotomising society into either ''hygienic'' and ''unhygienic'' is appealing, it is an obvious oversimplification of the environment in which we all live. More importantly, for healthcare planners, all communities are at risk of rapid change in the prevalence of asthma as living conditions change, and the largest increases are being observed in some LMICs with large populations [3]. This represents a burden for which they are often ill-equipped. However, on more detailed review, the association between poverty and asthma prevalence is not fully understood and deserves further investigation.

POVERTY AND RISK OF ASTHMA

First of all a distinction must be made between risk of asthma ever (lifetime risk) and current symptoms [2]. Gross national product per capita is generally associated with both an increasing prevalence of wheezing ever and wheezing in the last 12 months [7]. However, the prevalence of current symptoms is modifiable by current exposures (to allergens and environmental pollution, as well as other factors) and by effective treatment. Thus, even where prevalence is low, the burden of disease may be high, and poverty emerges as an important risk factor for current symptoms of asthma. This might account for the high prevalence of asthma symptoms reported from several urban centres of Latin America where asthma is positively associated with low SES [8–11], and some underprivileged areas in high-income countries [12–17]. DA CUNHA *et al.* [18] performed an ecological study of the relationship between the prevalence of wheezing and common health and socioeconomic indicators measured at the population level in 20 cities in Brazil. Only surveys using methods from the International Study of Asthma and Allergies in Childhood (ISAAC) were included. SES indicators that bore a direct association with asthma symptoms in both children (6–7 yrs of age) and adolescents (13–14 yrs of age) were poor sanitation, infant mortality and availability of hospital beds per 10,000 subjects. In children living in US inner cities, the burden of asthma is high and appears to be independent of ethnicity and income [15]. In addition, the relationship between poverty and asthma may change over time. For example, a study from Sweden has shown a reversal of the association between SES and asthma prevalence; military conscripts of low SES had the lowest prevalence of asthma three decades ago but now have the highest prevalence, with prevalence increasing in successive generations [16]. A study performed in Germany demonstrated that the prevalence of asthma was higher among parents of high SES, but no association of SES and asthma was observed in their children [17].

In the current issue of the *European Respiratory Journal*, SEMBAJWE *et al.* [19] report the relationship between gross national income in purchasing power parity (GNI PPP), the prevalence of symptoms and doctor diagnosis of asthma. The data was obtained from the World Health Survey performed in 64 countries from 2002 [20]. A bimodal distribution of asthma symptoms was observed, higher in high- and low-income countries, and lower in middle-income countries. How do these observations fit with previous reports? The first consideration is the U-shaped curve of prevalence of current wheezing; second is the discrepancy between current wheezing and a history of doctor-diagnosed asthma. SEMBAJWE *et al.* [19] correctly attribute the former to the higher prevalence of asthma in the high-income countries, and the second peak to a mix of factors: uncontrolled asthma, confounding respiratory conditions in communities with high levels of pollution, and respiratory infections that might give rise to wheezing [7]. Furthermore, SEMBAJWE *et al.* [19] point to a wide range of prevalence of symptoms, even in high-income countries, probably reflecting the variation in SES and living conditions in each country. The variable correlations between wheezing symptoms and history of doctor-diagnosed asthma are also to be expected. In all asthma surveys, symptoms of asthma exceed previous asthma diagnosis, the ratio being positively correlated with the availability of health services and inversely related to societal and cultural factors such as social acceptability of a diagnosis of

*ProAR – Faculdade de Medicina da Bahia (UFBA) and CNPq, Salvador, Brazil. #Dept of Medicine, University of Cape Town, Rondebosch, South Africa. ¶INSERM and Hopital Arnaud De Villeneuve, Montpellier, France.

CORRESPONDENCE: A.A. Cruz, ProAR, Faculdade de Medicina da Bahia, R. Eduardo Santos, 147 conj.509, 41940-455 Salvador BA, Brazil. E-mail: cruz.proar@gmail.com

asthma [21]. Another consideration is differences in the significance of symptoms of asthma in different communities, within and across country boundaries. For example, a comparison of associations between symptoms of asthma and features of allergic sensitisation in Russia *versus* Finnish Karelia has revealed differences that are attributed to the varying living conditions of children in these neighboring regions [22]; however, they might be a consequence of a different perceptions of the disease. Wheezing may have different meanings in different countries, making international comparisons more difficult to interpret.

Interpretation of the relationship between asthma and GNI PPP in the study by SEMBAJWE *et al.* [19] is also limited by the paucity of information on other variables that may have an influence. First is inhomogeneity of populations within countries, and a secondly is the impact of urbanisation. As an example, Brazil, which has the highest reported prevalence of wheezing, is categorised as a middle-income country. This assessment is skewed by a small proportion of its very large population that has a high or very high income. A majority of the population are in the low-income category. This inequality is captured in figure 1, which clearly presents the contrast in housing between that of the majority and that of the privileged few in Salvador, Bahia, a large urban center in Brazil. Classifying a country according to a single measure is often uninformative and is usually an oversimplification.

A further consideration is the variation of SES as measured by GNI PPP and urbanisation. Urbanisation and the rate of urbanisation are both related to SES, and may be a stronger risk factor than SES *per se*. The processes of urbanisation and modernisation are part of social and economic development and are associated with the adoption of a modern lifestyle in LMICs. Urban populations are growing rapidly throughout the world. Urbanisation has a profound effect on people's living conditions and health status and has been linked to asthma risk in Africa [23]. Factors that contribute to this risk may include changes in diet and physical activity, infectious disease and microbial exposures, increased exposure to antibiotics and vaccines, allergen exposures, exposure to indoor irritants, the effects of industrial and motor vehicle pollution, and psychosocial stressors including violence [24]. Large differences in asthma prevalence have been reported from urban and rural areas in Africa [25] and Asia [26], with a much higher prevalence of asthma reported in urban compared to rural populations. A question of practical importance is whether risk factors and mechanisms of asthma differ in high- and low-income countries, rural and urban settings.

THE WAY FORWARD

Understanding the forces that determine the burden of asthma, especially in developing countries, is important in the prioritisation of public health measures and resources. Poverty can also be a consequence of this chronic ailment. The determinants of chronic disease burden in general are by-products of globalisation, urbanisation, population ageing and general policy environment [27]. A recent review of the social determinants of asthma in the USA draws attention to the fact that stress and violence are also emerging as significant risk factors [28]. Poverty is a complex condition and it is not easy to unravel the effects of the various environmental and lifestyle factors involved in asthma causation, nor indeed the impact of this chronic disease upon the perpetuation of poverty. Considering that asthma is associated with demographic and socioeconomic indicators clustered by areas of residence not readily explained by traditional genetic paradigms or physical environmental exposures alone, a transdisciplinary research approach with a shared conceptual framework that integrates analytical methods in multilevel, multimethod longitudinal studies has been proposed by the Asthma Coalition on Community, Environment and Social Stress Study (ACCESS) [29].

INACTION IS NOT AN OPTION

There are two great barriers to asthma prevention and control throughout the world. The first is a major gap in knowledge concerning causation and primary prevention. Asthma is a syndrome with multiple phenotypes related to complex gene–environment interactions. To address these gaps there is a need to scale up research on the topic worldwide. More funding, more collaboration and innovative approaches are urgently needed. Meanwhile, the outcomes of nationwide strategies based on plausible biological reasoning with simplification and standardisation of interventions and treatment such as those implemented in the Finnish Allergy Programme [26], should

FIGURE 1. Landscape of inequality in housing in Salvador (Bahia, Brazil), a city of 2.8 million inhabitants. The contrast between the majority of homes in an overcrowded underprivileged neighbourhood (a) and the ''minority household'' (b) located 500 m away. Both pictures were taken on 18 April 2009 from the same location on the top of a hill nearby.

be closely considered for their potential application in LMICs. Lack of control of asthma is associated with avoidable reliance and expenditure on emergency care by underprivileged families and health systems that can hardly afford it [30]. Simple interventions for management of asthma can control the disease, and reduce mortality, hospital admissions and costs [30–34], but they are not yet integrated to primary care policies or widely available. A crucial move towards feasibility and sustainability in LMICs would be the full integration of asthma management into primary healthcare routines, as reported in South Africa [35]. Moreover, most subjects with asthma have concomitant rhinitis [36], which has been strongly associated with lack of control of asthma [37] and is usually neglected by the health systems in LMICs.

In May 2008, the World Health Assembly, with representatives from 193 countries, endorsed the 2008–2013 Action Plan of the Global Strategy for the Prevention and Control of Noncommunicable Diseases proposed by the World Health Organization [38]. The Action Plan acknowledges four major groups of diseases that represent a leading threat to human health and development: cardiovascular diseases, cancer, chronic respiratory diseases and diabetes. Together, these cause 60% of all deaths globally, most of them in LMICs. All six objectives of the Action Plan 2008–2013 are highly relevant to the prevention and control of asthma, and two of them are directly related to the barriers mentioned above. Objective 2 of the Action Plan is to establish and strengthen national policies and plans for the prevention and control of noncommunicable diseases, and Objective 4 is to promote research for prevention and control of noncommunicable diseases. The Action Plan points to the need for partnerships between governmental and nongovernmental organisations in various sectors to address these objectives. The Action Plan has been adopted by the Global Alliance against chronic Respiratory Diseases (GARD) [39, 40], which has aligned its own action plan with this wider framework for disease control [38]. Nongovernmental organisations such as the Global Initiative for Asthma (GINA) [41] and the Allergic Rhinitis and its Impact on Asthma (ARIA) initiative [42] have made, over many years, a substantial contribution to the fight against asthma by developing and disseminating evidence-based guidelines that have been adopted or adapted widely and form the basis for many national and regional guidelines. ARIA and GINA, together with many major professional organisations and parties from other sectors, and national departments of health are key participants in GARD. This global network has the potential to provide expertise, contagious enthusiasm and a united effort to support implementation strategies tailored to specific country needs, where requested by health authorities.

''Social justice is a matter of life or death. It affects the way people live, the likelihood of being unhealthy and to die prematurely'' [43]. However, effective health policies and practices can mitigate the consequences of social inequalities.

It is time to change the way asthma is handled in LMICs. Inaction is not an option! ''You may say that I'm a dreamer, but I'm not the only one'' (John Lennon) [44].

SUPPORT STATEMENT

A.A. Cruz is a member of the Executive Committees of the Global Initiative for Asthma (GINA) and the Allergic Rhinitis and its Impact on Asthma (ARIA), and of the Planning Group of the Global Alliance against chronic Respiratory Diseases (GARD). E.D. Bateman is the Chairman of GINA and a member of the GARD Executive Committee. J. Bousquet is the Chairman of GARD and ARIA.

STATEMENT OF INTEREST

None declared.

REFERENCES

1 Global Forum for Health Research. Equitable access. Research challenges for health in developing countries. A report on Forum 11, 29 October – 2 November 2007, Beijing, People's Republic of China. World Health Organization, Geneva, 2008.
2 Poyser MA, Nelson H, Ehrlich RI, *et al*. Socioeconomic deprivation and asthma prevalence and severity in young adolescents. *Eur Respir J* 2002; 19: 892–898.
3 Asher MI, Montefort S, Bjorksten B, *et al*. Worldwide time trends in the prevalence of symptoms of asthma, allergic rhinoconjunctivitis, and eczema in childhood: ISAAC Phases One and Three repeat multicountry cross-sectional surveys. *Lancet* 2006; 368: 733–743.
4 Strachan DP. Hay fever, hygiene and household size. *BMJ* 1989; 299: 1259–1260.
5 Braun-Fahrländer C, Riedler J, Herz U, *et al*. Environmental exposure to endotoxin and its relation to asthma in school-age children. *N Engl J Med* 2002; 347: 869–877.
6 Douwes J, Pearce N. Commentary: the end of the hygiene hypothesis? *Int J Epidemiol* 2008; 37: 570–572.
7 Stewart AW, Mitchell EA, Pearce N, *et al*. International Study for Asthma and Allergy in Childhood: the relationship of per capita gross national product to the prevalence of symptoms of asthma and other atopic diseases in children (ISAAC). *Int J Epidemiol*, 2001: 173–179.
8 Cooper PJ, Rodrigues LC, Cruz AA, *et al*. Asthma in Latin America: a public heath challenge and research opportunity. *Allergy* 2009; 64: 5–17.
9 Pereira MU, Sly PD, Pitrez PM, *et al*. Nonatopic asthma is associated with helminth infections and bronchiolitis in poor children. *Eur Respir J* 2007; 29: 1154–1160.
10 Benício MH, Ferreira MU, Cardoso MR, *et al*. Wheezing conditions in early childhood: prevalence and risk factors in the city of São Paulo, Brazil. *Bull World Health Organ* 2004; 82: 516–522.
11 Solé D, Camelo-Nunes IC, Wandalsen GF, *et al*. Is the prevalence of asthma and related symptoms among brazilian children related to socioeconomic status? *J Asthma* 2008; 45: 19–25.
12 Hunninghake GM, Weiss ST, Celedón JC. Asthma in Hispanics. *Am J Respir Crit Care Med* 2006; 173: 143–163.
13 Rona RJ, Hughes JM, Chinn S. Association between asthma and family size between 1977 and 1994. *J Epidemiol Community Health* 1999; 53: 15–19.
14 Almqvist C, Pershagen G, Wickman M. Low socioeconomic status as a risk factor for asthma, rhinitis and sensitization at 4 years in a birth cohort. *Clin Exp Allergy* 2005; 35: 612–618.
15 Aligne CA, Auinger P, Byrd RS, *et al*. Risk factors for pediatric asthma. Contributions of poverty, race, and urban residence. *Am J Respir Crit Care Med* 2000; 162: 873–877.
16 Braback L, Hjern A, Rasmussen F. Social class in asthma and allergic rhinitis: a national cohort over three decades. *Eur Respir J* 2005; 26: 1–5.
17 Bergmann RL, Edenharter G, Bergmann KE, *et al*. Socioeconomic status is a risk factor for allergy in parents but not in their children. *Clin Exp Allergy* 2000; 30: 1740–1745.
18 da Cunha SS, Pujades-Rodriguez M, Barreto ML, *et al*. Ecological study of socio-economic indicators and prevalence of asthma in schoolchildren in urban Brazil. *BMC Public Health* 2007; 7: 205.

19 Sembajwe G, Cifuentes M, Tak SW, *et al.* National income, self-reported wheezing and asthma diagnosis from the World Health Survey. *Eur Respir J* 2010; 35: 279–286.
20 World Health Organization. World Health Survey 2002. WHO Multi-country Survey Study on Health and Responsiveness 2000-2001. Available from: www.who.int/healthinfo/survey/en/ Last accessed on April 19, 2009.
21 Zwarenstein M, Bheekie A, Lombard C, *et al.* Educational outreach to general practitioners reduces children's asthma symptoms: a cluster randomised controlled trial. *Implement Sci* 2007; 2: 30.
22 Pekkarinen PT, von Hertzen L, Laatikainen T, *et al.* A disparity in the association of asthma, rhinitis, and eczema with allergen-specific IgE between Finnish and Russian Karelia. *Allergy* 2007; 62: 281–287.
23 Weinberg EG. Urbanization and childhood asthma: an African perspective. *J Allergy Clin Immunol* 2000; 105: 224–231.
24 Wright RJ. Exploring biopsychosocial influences on asthma expression in both the family and community context. *Am J Respir Crit Care Med* 2008; 177: 129–130.
25 Nicolaou N, Siddique N, Custovic A. Allergic disease in urban and rural populations: increasing prevalence with increasing urbanization. *Allergy* 2005; 60: 1357–1360.
26 Viinanen A, Munhbayarlah S, Zevgee T, *et al.* Prevalence of asthma, allergic rhinoconjunctivitis and allergic sensitization in Mongolia. *Allergy* 2005; 60: 1370–1377.
27 World Health Organization. Preventing Chronic Diseases. A Vital Investment. World Health Organization, Geneva, 2005.
28 Williams DR, Sternthal M, Wright RJ. Social determinants: taking the social context of asthma seriously. *Pediatrics* 2009; 123: Suppl. 3, S174–S184.
29 Wright RJ, Suglia SF, Levy J, *et al.* Transdisciplinary research strategies for understanding socially patterned disease: the Asthma Coalition on Community, Environment, and Social Stress (ACCESS) project as a case study. *Cien Saude Colet* 2008; 13: 1729–1742.
30 Haahtela T, von Hertzen L, Mäkelä M, *et al.* Finnish Allergy Programme 2008-2018—time to act and change the course. *Allergy* 2008; 63: 634–645.
31 Franco R, Nascimento HF, Cruz AA, *et al.* The economic impact of severe asthma to low-income families. *Allergy* 2009; 64: 478–483.
32 Haahtela T, Tuomisto LE, Pietinalho A, *et al.* A 10 year asthma programme in Finland: major change for the better. *Thorax* 2006; 61: 663–670.
33 Cruz AA, Bousquet PJ. The unbearable cost of severe asthma in underprivileged populations. *Allergy* 2009; 64: 319–21.
34 Franco R, Santos AC, do Nascimento HF, *et al.* Cost-effectiveness analysis of a state funded programme for control of severe asthma. *BMC Public Health* 2007; 7: 82.
35 English RG, Bateman ED, Zwarenstein MF, *et al.* Development of a South African integrated syndromic respiratory disease guideline for primary care. *Prim Care Respir J* 2008; 17: 156–163.
36 Cruz AA, Popov T, Pawankar R, *et al.* Common characteristics of upper and lower airways in rhinitis and asthma: ARIA update, in collaboration with GA(2)LEN. *Allergy* 2007; 62: Suppl. 84, 1–41.
37 Ponte EV, Franco R, Nascimento HF, *et al.* Lack of control of severe asthma is associated with co-existence of moderate-to-severe rhinitis. *Allergy* 2008; 63: 564–569.
38 World Health Organization. 2008-2013 Action Plan of the Global Strategy for the Prevention and Control of Noncommunicable Diseases. World Health Organization, Geneva, 2008.
39 Bousquet J, Dahl R, Khaltaev N. Global alliance against chronic respiratory diseases. *Eur Respir J* 2007; 29: 233–239.
40 World Health Organization. Global Alliance against Chronic Respiratory Diseases Action Plan 2008-2013. World Health Organization, Geneva, 2008.
41 Bateman ED, Hurd SS, Barnes PJ, *et al.* Global strategy for asthma management and prevention: GINA executive summary. *Eur Respir J* 2008; 31: 143–178.
42 Bousquet J, Khaltaev N, Cruz AA, *et al.* Allergic Rhinitis and its Impact on Asthma (ARIA) 2008 update. *Allergy* 2008; 63: Suppl. 86, 8–160.
43 World Health Organization Commission on Social Determinants of Health. Closing the Gap in a Generation. World Health Organization, Geneva, 2008.
44 Lennon J. Imagine. *Imagine*, 1971.