



Review

Social Disadvantage and Asthma Control in Children

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EDUCATIONAL AIMS

- To define social disadvantage and the elements that constitute it
- To describe the most recent and relevant literature linking elements of social disadvantage (socioeconomic status, psychosocial stress/violence exposure, minority affiliation, and environmental exposures) with asthma control in children
- To explore possible mechanisms explaining why these associations exist
- To draw the reader's attention to community-based and environmental interventions that have reported asthma outcomes among socially disadvantaged paediatric patients

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SUMMARY

This review discusses various aspects of social disadvantage and their association with poor asthma control, including socioeconomic status, exposure to psychosocial stress and violence, minority affiliation, environmental concerns such as allergens and pollution, and poverty in rural settings. Each of these elements has been linked with worsened asthma outcomes in children. Known and hypothesized mechanisms behind these associations are described in an effort to further understand the complex entity of poorly controlled asthma among socially deprived children. Intervention studies to improve asthma outcomes in these vulnerable populations are also described.

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INTRODUCTION

Social disadvantage is defined as being subjected to racial or ethnic prejudice or discrimination because of identification as a member of a group, while neglecting the person's qualities as an individual. [1] In the medical literature this description has been expanded to include other social inequalities among the population associated with health disparities, such as socioeconomic status (SES). [2] Poor asthma control includes asthma symptoms,

activity limitations, rescue medication use, missed school or work, exacerbations requiring systemic corticosteroids and health care utilization. In this review, we will dissect social disadvantage into its individual elements and explore their relationships with asthma control in children (see Box 1). Additionally, we will describe interventions that have been designed to improve asthma morbidity in this vulnerable population.

SOCIOECONOMIC STATUS AND ASTHMA CONTROL

SES defines the complex relationship of the individual or group within the hierarchy of society. While SES is not a single finite entity, the measurement of a child's SES can be approximated by consideration of household income, caregiver employment or education status, living conditions, or habitation in geographic locations with a predominantly poor population. [2] These variables have each been linked with childhood asthma control.

On a global scale, ecological data suggest that while wheezing is more prevalent in children from high-income countries, severe

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Box 1. Factors of social disadvantage that may be related to asthma control in children

Socioeconomic Status
 Access to quality healthcare
 Access to medications
 Environmental exposures (including allergens, pollution, environmental tobacco smoke)
 Psychosocial stress
 Exposure to Violence
 Minority affiliation

symptoms among current-wheezers are more prevalent in less affluent countries. [3] In the United States (US), studies have shown clearly that asthmatic children living in impoverished areas and the inner-city have higher rates of emergency department (ED) visits and hospitalizations for asthma. [4,5] Proposed explanations for this phenomenon have included poor access to primary care and maintenance medications [6] due to lack of private insurance or disruptions in coverage. [7] However, even in Canada and the United Kingdom (UK), where universal healthcare coverage virtually eliminates financial barriers to healthcare access, there are higher hospitalization rates and ED visits among children from low SES backgrounds. [8,9] This suggests that ability to pay for healthcare and medications is not the principal explanation for worsened asthma morbidity among children from lower-income households. The presence of this effect in communities with guaranteed access to healthcare may imply that greater weight is attributable to the impoverished environment and the ability of the family to address the healthcare needs of the child.

Interestingly, caregiver perception of the financial situation at home may play an important role in determining the child's asthma morbidity. One study demonstrated that among children whose parents perceived financial burden in managing their asthma, there were increased odds of ED visits, hospitalizations, and missed school due to asthma in the prior year. This increase in exacerbations and absenteeism was independent of disease severity, access to healthcare, and the actual financial status of the family. [10] This highlights a key role for parental *perception* of the social situation and indicates that there is likely a complex interplay between the actual financial climate in the home and the perceived threat of that climate, which is ultimately influencing health outcomes among asthmatic children.

Educational status of the caregiver has been shown to be a risk factor for asthma exacerbations. A study segregating communities by zipcodes in impoverished regions demonstrated that those who live in zip codes with the lowest adult educational attainment rates are more likely to visit the ED or be admitted for asthma. [4] Adult education may be a true risk factor for poor management of childhood asthma, perhaps through lack of understanding of the disease and its treatments or easily manoeuvring through the medical system. However, it is difficult to disentangle the effect from the potential association with lower level of employment, financial instability and healthcare access, each of which may independently lead to increased asthma morbidity.

Environmental exposures specific to social disadvantage are discussed below. However, while exposure to environmental tobacco smoke (ETS) pervades many parts of society, there is a disproportionately high exposure rate among low-income youth. [11] In the National Cooperative Inner-City Asthma Study (NCICAS), 59% of families included at least one smoker, 39% of caretakers reported that they smoked, and 48% of the asthmatic children had significant tobacco smoke exposure in the previous 24 hours, as measured by urinary cotinine/creatinine ratio. [12]

Other risk factors for poor asthma control related to SES that have been identified include household crowding and health status of the caregiver.

PSYCHOSOCIAL STRESS, EXPOSURE TO VIOLENCE, AND ASTHMA CONTROL

Psychosocial stress among children with asthma and/or their caregivers is linked to asthma morbidity. [13] It is conceivable that social disadvantage itself represents a group of stressors which influence this relationship. Parental panic, fear, sense of being alone, and lack of confidence in the general practitioner were shown to be major determinants of use of emergency services for asthmatic children in London. [9] Children with asthma, themselves, who experience an acute negative life event are at increased risk for a subsequent asthma attack, and the risk is increased among those children with chronic stress. [14]

Exposure to violence is pervasive in inner-city children [15] and has been linked to asthma morbidity. [16] Caregiver report of violence and perception of unsafe neighbourhoods have been associated with increased asthma symptoms in inner-city children. [17,18] Across cultures, children who report being victimized or feeling unsafe have higher odds of having an asthma episode, medication and healthcare use. [19,20] The healthcare use tends to be weighted towards emergency services, despite reportedly good access to the primary physician's office. [21]

The reasons for worsened asthma morbidity among children exposed to stressful or violent environments are not fully understood. One prevailing theory is that stress affects the inflammatory response. Young children exposed to higher degrees of caregiver stress during infancy have heightened IgE expression, allergen-specific proliferative responses, and inflammatory markers. [22] Clinical evidence for the relationship to inflammation was demonstrated by Chen and colleagues as they reported an increase in exhaled nitric oxide in asthmatic subjects after an acutely stressful event compared to prior – an effect that was not seen in healthy children – and the effect was augmented in children of low SES. [23] Biologic mechanisms relating poverty, inflammation and psychosocial stress have demonstrated increased allergic inflammatory markers and overexpression of inflammatory genes in children from low SES backgrounds. This suggests that, while stress itself affects asthma morbidity through effects on airway inflammation, socially disadvantaged children are particularly susceptible.

Other proposed hypotheses to explain the link between stress and asthma morbidity in children include increased susceptibility to viral infections, [14] lower cortisol levels which lead to loss of the inhibitory response to inflammation, [24] and effects of stress on the hypothalamic-pituitary-adrenal axis and the sympathetic-adrenal-medullary axis. [25]

MINORITY AFFILIATIONS AND ASTHMA CONTROL

Asthma severity is worse among particular racial and ethnic groups. For instance, in the US, African Americans and Puerto Ricans have higher rates of exacerbations and ED visits for asthma. [26] In the UK, Black African and Black Caribbean inner-city asthmatic children are also more likely to visit the ED compared with White children. [9] It has been hypothesized that since ethnicity and SES are related and low SES is associated with worsened asthma outcomes, that SES may explain ethnic health disparities in minority populations. However, in reality, the reasons for worsened asthma outcomes among ethnic minorities are complex, incompletely understood, and likely multifactorial.

Lack of adequate insurance has been proposed as a possible explanation; among children who visited the ED or were admitted

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