

tive externalities that the article rightly does not attempt to quantify. Early intervention dominates delay.

We're among the lucky ones. We're lucky that we could afford the time and resources to move the process along a bit faster. We're lucky that we had the ability to focus solely on our son and his needs. We're lucky that our son began treatment when younger than 2 and a half years. The article sim-

ply puts some harder numbers around just how lucky we are, numbers that we can generally corroborate. The issue facing Ontario and other jurisdictions is whether the government should intervene on behalf of children affected by ASD to shorten or eliminate wait times and to accelerate the provision of treatment. As parents and as taxpayers, the answer seems obvious: take the luck out of it.

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Small Steps Toward Asthma-Friendly School Environments

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In this issue of *JAMA Pediatrics*, Sheehan et al¹ report findings from the School Inner-City Asthma Study, an observational study examining associations between the school environment and asthma morbidity. The authors found low levels of all major indoor allergens except mouse allergen in environmental samples from schools and report associations between mouse allergen in school dust and asthma symptoms and lung function that were independent of levels of mouse allergen in the children's homes.

One of the study's significant contributions is that it highlights the importance of collaborating with schools to understand the effect of the school environment on student health. Without such collaborations, the scientific framework for ensuring that school environments are safe for children is not possible. These collaborations, though, are not easy to forge and require that schools are willing to embark on a path that may identify potential hazards, perceived and real, in the school environment and that researchers are sensitive to the public arena in which schools operate. Although other studies have assessed school environments and reported concerning levels of pest allergens,^{2,3} Sheehan et al¹ collaborated with schools to study the effects of allergen exposure in schools on student health, which has been done in other countries,⁴ but not, to our knowledge, in the United States. With the growing focus on population and public health, schools should play an integral role in the research that aims to improve health and in the implementation of programs to ensure the health of the community that they serve. This study indicates that, with appropriate resources, such a role for schools is possible.

A second important contribution from the School Inner-City Asthma Study is the observation that schools had high levels of mouse allergen in dust samples, and that higher levels

of mouse allergen were associated with more asthma symptoms and lower lung function among students with asthma, independent of mouse allergen levels in the children's homes. Although these associations are not without important caveats, they support the notions that schools can have unhealthy levels of indoor allergens and that their environments can contribute to asthma morbidity. These findings raise many questions, such as: Should school environments be tested for allergens? If so, how should the results be interpreted, given that there are no clear "healthy" thresholds for allergens? Is it feasible to implement interventions to reduce allergen levels in schools, and how would such interventions be funded? These same questions can apply to indoor pollutants, which are also linked to asthma morbidity. These questions are difficult to answer from both a scientific and public policy standpoint, but should be considered by school systems, health departments, health systems, communities, public health and policy researchers, and others, especially in communities whose children have a high burden of asthma morbidity.

Although the median mouse allergen level in the schools in the School Inner-City Asthma Study¹ was above a level associated with asthma morbidity in other populations,⁵ the evidence provided by this study for a causal association between higher mouse allergen levels in schools and asthma morbidity is limited. The associations between mouse allergen exposure in school and asthma symptoms and lung function were observed among children who were sensitized to mouse allergen as well as those who were not sensitized. In previous community-based studies, the association between mouse allergen levels in the home and asthma morbidity was observed primarily, if not exclusively, among children who were sensitized to mouse allergen,⁵⁻⁷ which is consistent with the expected IgE-dependent mechanism of the effect of indoor allergen exposure on asthma, so it is puzzling that the results in



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this school-based study differ. Although the authors point out that mouse allergen exposure has been linked to symptoms among laboratory animal workers in an occupational setting who were not sensitized to mouse allergen,⁸ this association was explained by concomitant endotoxin exposure, whereas the school-based associations in the School Inner-City Asthma Study were independent of endotoxin exposure.

Given the context provided by these prior community and occupational studies, it is important to consider that mouse allergen may not be the cause of asthma symptoms in the children in this study. Instead, mouse allergen may be a marker for some other characteristic of the schools that is causing asthma morbidity. Although the authors accounted for some potential confounders, such as endotoxin levels in the schools, several environmental characteristics known to be associated with asthma morbidity, such as dampness,⁹ mold,¹⁰ indoor pollution,^{11,12} and outdoor pollution,¹³ were not accounted for, so it is possible that one of these other factors, instead of mouse allergen, is the cause of asthma symptoms and reduced lung function in the children in this study. The likelihood that mouse allergen exposure is an indicator of another environmental exposure known to be associated with asthma morbidity is important, as it provides a strong rationale for more research aimed at identifying the causal factor(s), which is a critical first step toward designing school-based interventions.

Another important consideration is the generalizability of the study. The schools are described as *inner-city*, but this term is not defined, making it difficult to understand what target school population the study sample is intended to represent. In previous studies, an inner-city neighborhood was defined

as an urban census tract in which at least 20% of the households were below the poverty level¹⁴; whether this definition was used as an inclusion criterion in the School Inner-City Asthma Study is not clear. Because the allergen(s) of greatest public health relevance vary among communities,^{6,7,15,16} mouse allergen exposure in schools may not be associated with asthma morbidity in communities in which other allergens are more important. Mouse allergen levels in the children's homes were relatively low,¹ so the findings may be most relevant to communities in which mouse allergen levels in schools are higher than mouse allergen levels in the children's homes. Alternatively, the effect on asthma of mouse allergen exposure in schools may have emerged in this population because mouse allergen levels in the children's homes were much lower than levels in the schools. Since there are likely to be communities in which allergen levels in homes and schools are highly correlated such that the independent effects of each are difficult to separate, it may be helpful to determine the individual and combined effects of home and school exposures on asthma morbidity so that we can understand the magnitude of the contribution of school (and home) exposures. Results from such studies would help inform the design of community-level interventions aimed at reducing asthma morbidity.

The School Inner-City Asthma Study has taken the first steps to study the effects of children's exposure to allergens in school on asthma, and the results underscore the fact that there is much to learn about the effects of school environmental exposures on asthma, as well as other health conditions. It is hoped that this study paves the way for future work aimed to ensure healthy school environments for our children.

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