Exactly what do we know about tree pollen allergenicity?

Ecosystem services (benefits to humans) of urban trees are thought to include positive health outcomes resulting from their reduction of air temperature, pollution, and noise, and their promotion of physical activity and wellbeing. Trees, however, are also associated with disservices such as pollen-related allergies and asthma, which has led to questioning of the benefits of urban greening on respiratory health.[1] Surprisingly, the allergenic potency and cross-reactivity of most tree species are still largely unknown or based on undocumented methods. We argue that planning for healthy cities can be successful only with improved knowledge of the tree species that cause allergic responses and their distribution in urban spaces (figure).

Most studies and health guidelines on the allergenicity of tree pollens are based on limited evidence (eg, IMS Health's pollen data[2] or the European Aeroallergen Network pollen database[3]) and do not address pollen loads or periods of pollen production. These, in turn, depend on the type, abundance, and distribution of trees within a city. Furthermore, although the amount of each pollen type varies substantially within cities, the identification of relevant tree pollens for health advisories is largely based on pollen concentrations measured at a single sampling site and at the genus rather than the species level. Therefore, the pollen that causes health responses in residential areas is not captured by the sampler. The timing of pollen concentration peaks can also vary considerably within a genus. For instance, silver maple (*Acer saccharinum*, among the most planted tree species in northeastern North America) flowers very early in spring, well in advance of other maple species, but again this information is not considered in the prevention of allergies.

Studies on which planning and health guidelines are based also present contradictory information. Maple trees are graded as moderately allergenic by IMS Health,[2] whereas the European Aeroallergen Network characterises maple pollen as having low allergenicity.[3] Similarly, guidelines from the American Academy of Allergy, Asthma, and Immunology list maples as species to avoid,[4] but the National Public Health Institute of Quebec (Canada) considers maple pollen to have weak allergenic properties.[5]

Given that climate change might extend pollen seasons, and many cities are seeking to increase their tree canopy, we need to ensure that pollen allergenicity is scientifically validated if we are to include potential negative effects of urban greening in planning decisions. Cross-disciplinary conversations between health, natural, and social scientists are also needed to ensure that trees that are selected for health are tolerant to the changing climate and also favoured by city dwellers and urban planners.

We declare no competing interests. This work is funded in part by the Fonds de Recherche du Québec (2019-AUDC-262928). The funder had no role in the writing of the manuscript or decision to submit for publication.

*Rita Sousa-Silva, Audrey Smargiassi, Alain Paquette, David Kaiser, Dan Kneeshaw
silva.as.rita@gmail.com

Centre for Forest Research, Department of Biological Sciences, Université du Québec à Montréal, Montreal, QC, Canada (RS-S, AP, DKn); Department of Environmental and Occupational Health, School of Public Health (AS), Public Health Research Center (AS), and Department of Social and Preventive Medicine, School of Public Health (DKa), Université de Montréal, Montreal, QC, Canada; National Institute of Public Health of Quebec, Montreal, QC, Canada (AS); Montreal Public Health Department, Montreal, QC, Canada (DKa); and Department of Epidemiology, Biostatistics and Occupational Health, Faculty of Medicine, McGill University, Montreal, QC, Canada (DKa)

1 Eisenman TS, Jariwala SP, Lovasi GS. Urban trees and asthma: a call for epidemiological research. *Lancet Respir Med* 2019; **7:** e19–20.
2 IMS Health. Pollen library website. 2019. http://www.pollenlibrary.com/ (accessed Nov 22, 2019).
3 European Aeroallergen Network. Pollen Database. 2019. https://ean.polleninfo.eu/ (accessed Jan 10, 2020).
4 Green BJ, Levetin E, Horner WE, Codina R, Barnes CS, Filley WV. Landscape plant selection criteria for the allergic patient. *J Allergy Clin Immunol Pract* 2018; **6:** 1869–76.
5 Giguère M. Mesures de lutte aux îlots de chaleur urbains. 2009. https://www.inspq.qc.ca/pdf/publications/988_MesuresIlotsChaleur.pdf (accessed Nov 22, 2019).

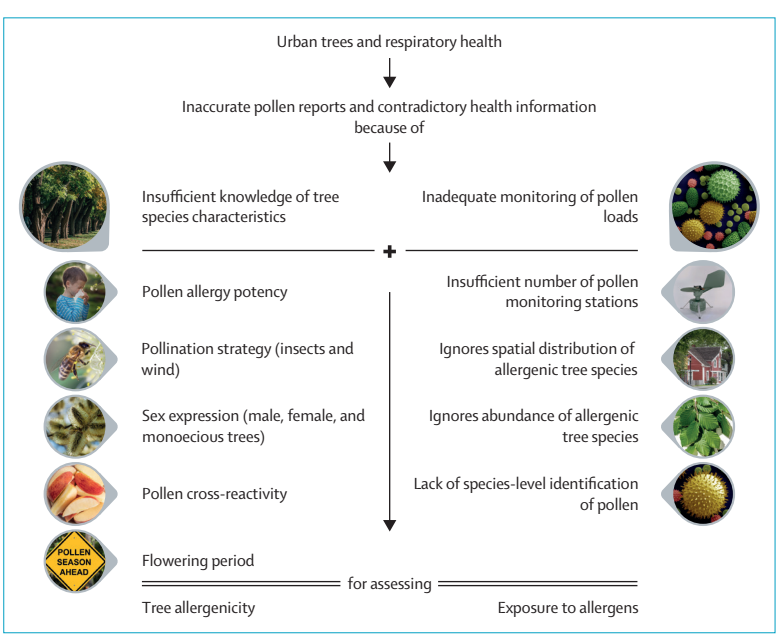

Figure: **Key knowledge and data gaps in identifying allergenic tree species and in capturing small-scale spatial variation in tree pollen exposure**