Associations between residential greenness and childhood allergic rhinitis and aeroallergen sensitization in seven birth cohorts

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Introduction: Inconsistent associations have been reported between the green environment and childhood asthma and allergic health outcomes. We conducted a meta-analysis on residential greenness and allergic rhinitis and aeroallergen sensitization based on data from Swedish (BAMSE), Australian (MACS), Dutch (PIAMA), Canadian (CAPPS and SAGE) and German (GINIplus and LISAplus) birth cohorts (N=13,016).

Methods: Allergic rhinitis (doctor diagnosis or symptoms) and aeroallergen sensitization were assessed in children aged 6-8 years in six cohorts and 10-12 years in five cohorts. Residential greenness was defined as the mean Normalized Difference Vegetation Index (NDVI) in 500m and 1000m buffers around the home address at the time of health assessment. Cohort-specific associations between NDVI (per 0.2 unit increase) and allergic rhinitis and aeroallergen sensitization were assessed using logistic regression models adjusted for host and environmental confounders. The findings were combined in a random-effects meta-analysis.

Results: Heterogeneous associations for a range of outcomes were observed across cohorts. Greenness in a 500 buffer was positively associated with allergic rhinitis at 6-8 years in BAMSE (odds ratio=1.42, 95% confidence interval [1.13, 1.79]) and GINI/LISA South (1.69, [1.19, 2.41]) but negatively associated in GINI/LISA North (0.61 [0.36, 1.01]) and PIAMA (0.67 [0.47, 0.95]). The direction of the effect estimates in the Canadian cohorts were also conflicting but not significant (0.63 [0.32, 1.23] and 1.22 [0.76, 1.95] for CAPPS and SAGE, respectively). All meta-analytic estimates were null. Results were similar for aeroallergen sensitization at 6-8 years and both outcomes at 10-12 years, and were independent of buffer size. Stratification by four urbanization markers (particulate matter smaller than 2.5µm concentrations, nitrogen dioxide concentrations, population density and urban versus rural surroundings) did not reveal consistent trends within subgroups.

Conclusions: Although residential greenness appears to be associated with childhood allergic rhinitis and aeroallergen sensitization, the direction of the effect varies by location.