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No. 3 Air pollution exposure on the school journey and route change information[1]

Top Line: There is a clear potential for pollutant exposure information to result in route changes and so reduce exposure on the school journey for many children.

Exposure to ultrafine particulate air pollution (UFP) contributes to adverse health effects in sensitive population groups such as children. There is a need to explore UFP exposure in terms of respiratory dosage, which leverages the effect of activity-specific ventilation rates. Commute-related dosage, which describes the dosage that occurs during travel between fixed locations on a routine schedule (i.e. morning school commute), is often underrepresented in air pollution studies.

While the concept of "low-dosage routing" is attractive, it first requires an in depth understanding of current dosage mechanisms. The use of simulated routes for active transport school commutes and implemented dosage models that accounted for physiology, travel gradient, and the ambient environmental conditions of UFP were developed.[2] By presenting route dosage as the sum of individual periods of high and low-dosage on the commute, researchers explored low-dosage optimisation techniques. When accounting for the increased dosage duration and the effect of terrain-enforced ventilation rate, Canadian researchers reported that the shortest route to school is the lowest-dosage route for most students in the city of Toronto. This highlights the importance of implementing a respiratory dosage approach to air pollution exposure modelling.

In the UK a school was chosen in Bradford, in order to measure UFPs on the walk commute.[3] The largest reductions in exposure for pedestrians can be achieved by avoiding close proximity to traffic queuing up at intersections, and, where possible, walking on the side of the road opposite the traffic, especially during the morning commuting period. The researchers also recommended avoiding major intersections as they were associated with peak exposures. In a Flemish study customized information was provided to each individual about the active school travel choices with the possible personal benefits achieved such as reduced pollutant exposure.[4] It was found that around 34 % of the participants in the study group had the availability of walking/cycling routes with significantly less pollutant exposure as compared to current routes. Based on the responses in the feedback questionnaire, for those participants where lower polluted alternatives were available, 77 % of such participants started following the suggested alternatives school routes.

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[1] See also No 5 in this series.

[2] Elford, S., Adams, M. 2019. Exposure to ultrafine particulate air pollution in the school commute: Examining low-dose route optimization with terrain-enforced dosage modelling, *Environmental Research,* 178: https://doi.org/10.1016/j.envres.2019.108674

[3] Dirks, K. et al, 2016. Air Pollution Exposure in Relation to the Commute to School: A Bradford UK Case Study, *International Journal of Environmental Research & Public Health*, 13(11): 1064.

[4] Ahmded, S. et al, 2020. A route to school informational intervention for air pollution exposure reduction, *Sustainable Cities and Society*, 53: https://doi.org/10.1016/j.scs.2019.101965