A Methodology to Estimate Canadians' Exposure to Tetrachloroethylene in Outdoor Air Using Industrial and Micro-Emitter Databases

Alejandro Cervantes-Larios, *University of British Columbia, Canada*
Perry Hystad, *University of British Columbia, Canada*
Eleanor Setton, *University of Victoria, Canada*
Brian Klinkenberg, *University of British Columbia, Canada*
Paul A. Demers, *Cancer Care Ontario, Canada*

Background and Aims: As part of Carex Canada, we developed a methodology for estimating tetrachloroethylene (PERC) concentrations in outdoor air at approximately 478,000 street block centroids in Canada. We combined five different databases in a Geographic Information System: PERC levels measured at National Air Pollution Surveillance (NAPS) monitors, large emitter data from the National Pollutant Release Inventory (NPRI), small emitter information from Environment Canada's Annual Report for Dry Cleaners (DC) and the Dunn & Bradstreet (D&B) commercial registry, and population information from Census Canada.
Methods: Concentration estimates were assigned to each of 478,000 block centroids in three steps: first, a background concentration (rural or urban) was derived using data from NAPS air monitors (n = 53); second, Screen3 (a dispersion model developed by the U.S. Environmental Protection Agency) was applied to known industrial and micro-emitters; third, concentrations derived from the dispersion model were added to the background value at those street blocks that fell within the model's distance of influence. Micro-emitter emission rates ranged from 0.01 to 0.7g/s and were approximated considering yearly amounts of PERC consumed and type of equipment used.
Results: Concentrations are very heterogeneous across Canada, (min=0.12 µg/m3, max=132 µg/m3, mean=1.12 µg/m3, std. dev= 3.62µg/m3). On average, Canadians live 11.3 kilometres (km) from a PERC emitter and 71 km from a NAPS monitor that measures PERC. However, almost 5.5 million people live within 500 meters of a known emitter and those are on average at 23 Km from a monitoring station. Our preliminary results suggest that approximately 15% of all street blocks in Canada, where 31% of the population live, have PERC concentrations 10 to 20 times higher than those reported by the NAPS network.
Conclusions: We describe a novel approach for calculating environmental exposure to PERC by incorporating spatial data sets of known emitters. Our findings confirm that utilizing only the measured concentrations from the NAPS network is insufficient and would likely underestimate population exposures.