

Online Resource 1, Additional details on exposure surfaces

Stieb DM\*, Yao J, Henderson SB, Pinault L, Smith-Doiron MH, Robichaud A, van Donkelaar A, Martin RV, Ménard R, Brook JR. Variability in ambient ozone and fine particle concentrations and population susceptibility among Canadian health regions. *Can J Public Health*

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PM<sub>2.5</sub> exposures were estimated from the total column aerosol optical depth (AOD) measured by satellite, using relationships between AOD and near-surface PM<sub>2.5</sub> derived from a chemical transport model.<sup>1</sup> Yearly average surface layers of approximately 1 km<sup>2</sup> resolution were obtained by applying geographically weighted regression for the 2004-2012 period. Estimates of PM<sub>2.5</sub> over 20 µg/m<sup>3</sup> were excluded from the analysis because they are believed to be due to inaccurate satellite retrievals.<sup>2</sup>

8-hour daily maximum O<sub>3</sub> exposures were estimated for the months of May to October (the period during which concentrations are generally highest due to O<sub>3</sub>'s atmospheric chemistry) during the 2002-2009 period using data assimilation techniques (optimum interpolation) to generate a 21 km<sup>2</sup> grid.<sup>2</sup> This approach combines O<sub>3</sub> concentrations from the Canadian Hemispheric Regional O<sub>3</sub> and NO<sub>x</sub> system (CHRONOS), an operational regional air quality forecast model,<sup>3</sup> and ground-based observations from monitors in Canada and the United States. The O<sub>3</sub> estimates were adjusted for annual differences using a time series of ground measurements from 24 census divisions (CD) over the 1981-2012 period. For each of the 24 CDs, a cubic spline function was fitted to model the association between year and air pollutant. Ratios were determined for each year relative to the source data year. All locations were matched to the closest CD using Geographic Information Systems (GIS; ArcGIS v.10, ESRI 2010), and the corresponding time adjustment ratio was used to adjust data for annual differences in concentration.

Population-weighted pollutant concentration estimates for each health region were calculated using the residential locations of 2011 Census respondents, determined using the residential postal codes reported on the census files and the Postal Code Conversion File plus (PCCF+) v.6c.<sup>4</sup>

## References

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2. Robichaud A, Ménard R. Multi-year objective analyses of warm season ground-level ozone and PM<sub>2.5</sub> over North America using real-time observations and Canadian operational air quality models. *Atmospheric Chem Phys Discuss*. 2013;13:13967–4035.
3. Pudykiewicz JA, Kallaur A, Smolarkiewicz PK. Semi-Lagrangian modelling of tropospheric ozone. *Tellus B Chem Phys Meteorol*. 1997;49(3):231–48.
4. Statistics Canada. *Postal Code Conversion File Plus (PCCF+) Version 6C, Reference Guide* Cat no. 82-F0086-XDB. 2016.