RETROSPECTIVE SPATIOTEMPORAL AIR POLLUTION EXPOSURE ASSESSMENT FOR A NATIONAL CANADIAN LUNG CANCER CASE-CONTROL STUDY

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Background and Aims: Few epidemiological studies have used residential histories to conducted long-term retrospective exposure assessments of ambient air pollution, and even fewer have incorporating local exposures from vehicle or industrial sources. We conduct such an assessment for a Canadian national lung cancer case-control study of 8,353 individuals using self-reported residential histories from 1970 to study entry (1994-1998).
Methods: Annual ambient pollution concentrations were derived from fixed site monitors within 50km's of residential postal codes. For postal codes located farther than 50km's from a monitor, national spatial pollutant surfaces, created from recent satellite-based (for PM2.5 and NO2) and dispersion models (for O3), were calibrated with historical fixed site monitoring data to estimate annual ambient concentrations. Random effect models were developed from co-located PM10/PM2.5 and TSP monitors, along with geographic variables, to estimate PM10 and PM2.5 exposures back to 1970. In addition, proximity to highways and major roads, incorporating a temporal weighting factor based on Canadian mobile emission estimates, were calculated to assess vehicle emission exposures. A comprehensive inventory of approximately 16,000 geocoded industrial emissions sources from 1970 to study entry, representing fifty standard industrial classifications, was used to estimate exposure to industrial emissions.
Results: In total, 130,143 (65%) exposure-years occurred in urban areas and 70,755 (35%) in rural areas. No significant difference (p=0.43) was present for completeness of self-reported residential histories by case and control status. Mean (SD) exposures were PM2.5 15.7(3.3)ug/m3, NO2 16.7(9.3)ppb and O3 22.4(3.9)ppb. Study participants lived on average 3.8 years within 300m of a highway and 1.7 years within 1km of a major industrial source.
Conclusions: A spatiotemporal modeling approach was used to estimate air pollution exposures for a national Canadian lung cancer case-control study. Incorporating residential mobility was important for accurate exposure assessment.