AIR POLLUTION IS ASSOCIATED WITH PREVALENCE OF MULTIPLE SCLEROSIS: AN ECOLOGICAL STUDY

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HIGHLIGHTS

- We previously found regional variation in rates of multiple sclerosis (MS) in New Brunswick (NB)
- We conducted an ecological analysis to assess associations between air pollution and MS prevalence
- Across NB average pollutant levels were all below established Canadian air quality standards
- Prevalence of MS is positively associated with $PM_{2.5}$

BACKGROUND

- MS is a chronic and progressive autoimmune disease of the brain and spinal cord, which commonly leads to significant physical and cognitive disability
- Individuals between age 20 and 50 years and who are female are at greater risk
- While MS is rare, it is most common in Canada with NB having among the highest rates
- We recently identified regional variation in MS prevalence in NB and are exploring several hypothesis focused on environmental exposures
- Previous studies implicate exposure to air pollution as a risk and prognostic factor
- Air pollutants have negative impacts on both the immune and central nervous system
- Here we report on ecological-level associations between four commonly studied air pollutants and MS prevalence in NB

HYPOTHESIS

Geographic areas with higher levels of air pollution will have higher MS prevalence

METHODS

Study Design

- Ecological study using all 33 health council community (HCC) in NB comparing average air pollutant levels and crude MS prevalence across HCCs

NB-Institute of Research, Data and Training (NB-IRDT)

- We used administrative data accessed within the NB-IRDT secure data facility at UNB

Canadian Chronic Disease Surveillance System-MS (CCDSS-MS)

- Prevalent MS cases ≥20 years of age (1995-2011) were identified using the ICD-10 code G35 in the Discharge Abstract Database (DAD) and keywords suggestive of an MS diagnosis in the Physician Billing Database
- Cases were defined based on 1 DAD record or 5 physician visits within 2 years

Citizen Database

- Registry of all NB residents with a Medicare card that includes postal code of residence, which we used to derive HCC of residence in 2011 using PCCF+
- Also used to derived population counts, by HCC, for those ≥20 years of age

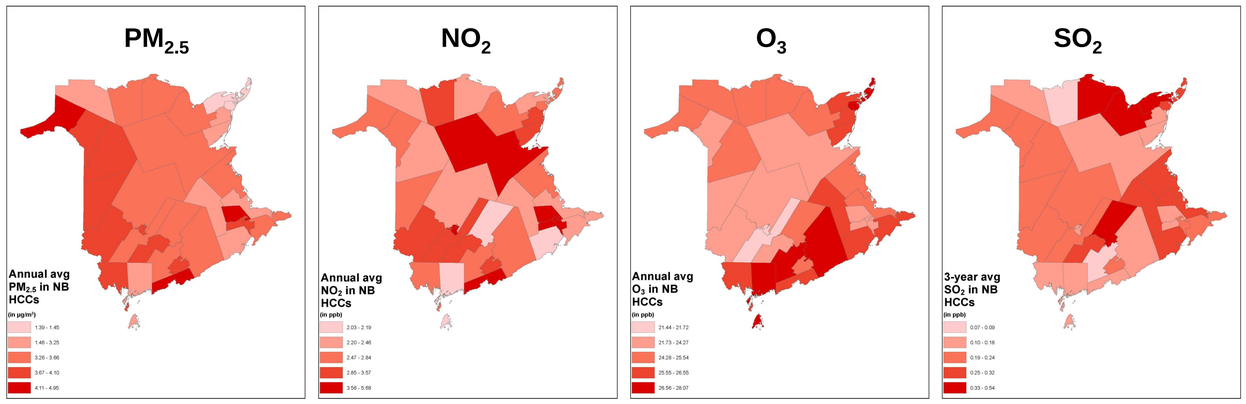
Canadian Urban Environmental Health Research Consortium (CANUE)

- Long-term pollutant levels for each postal code in NB were obtained from CANUE
- Four pollutants were examined: particulate matter <2.5µm ($PM_{2.5}$), nitrogen dioxide (NO_2), sulphur dioxide (SO_2) and ozone (O_3)

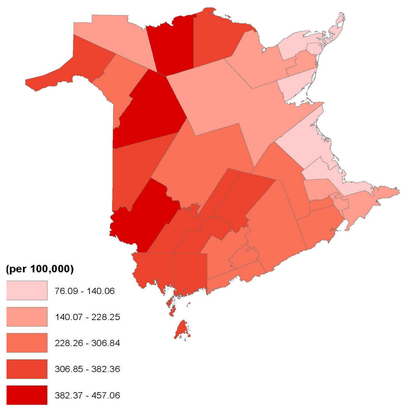
Statistical Analyses

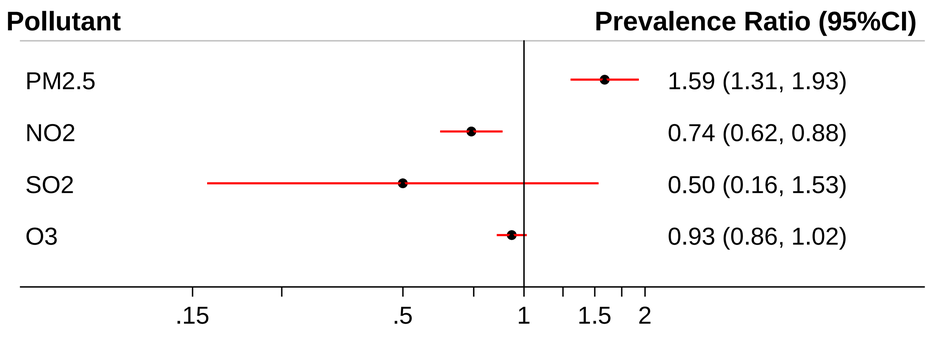
- Negative binomial regression was used due to over dispersion
- Prevalence ratios are reported between average air pollutant levels at the HCC-level and MS prevalence in 2011

Regional Variation of Air Pollution



Regional Variation of MS Prevalence (per 100.000 population)





RESULTS AND DISCUSSION

- We identified 1532 prevalent MS cases in NB in 2011 (261 per 100,000 95%CI: 229-301)
- Across NB the number of MS cases varied greatly and was lowest in Kedgwick and Neguac, but highest in Saint John and Fredericton
- As has been shown previously, $PM_{2.5}$ was most strongly associated with MS prevalence
- We found a 1.5-fold increase in prevalence for every 1µg/m^3 increase in $PM_{2.5}$
- $PM_{2.5}$ exposure negatively impacts immune function and impairs integrity of the blood-brain barrier
- Our future research will examine this relationship using individual-level exposure assignment employing a more rigorous study design, a population-based cohort study

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