



# Air pollution exposure from wildfires in Alberta, Canada and respiratory emergency visits among children

Authors: Nandi S Mwase<sup>1,2</sup>, Chunhui Tian<sup>2</sup>, Alvaro Osornio Vargas<sup>3</sup>, William Craig<sup>3</sup>, Yan Yuan<sup>2</sup>, Shelby Yamamoto<sup>2</sup>

Affiliation: <sup>1</sup> Department of Family Medicine and Primary Care, Witwatersrand University, Johannesburg, South Africa

<sup>2</sup> School of Public Health, University of Alberta, Edmonton, Canada

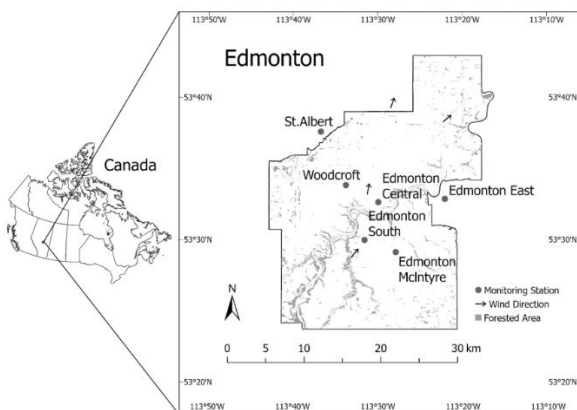
<sup>3</sup> Department of Pediatrics, University of Alberta, Edmonton, Canada

## Introduction

Ambient air pollution remains a significant global public health concern.<sup>1-2</sup> Exposure to air pollution is associated with numerous adverse respiratory effects in vulnerable groups such as children, especially wheezing, asthma, and bronchitis.<sup>3</sup> Over the past few years, Edmonton, Canada has experienced and increasing number of poor air quality days due to wildfire activity in Alberta, Canada and neighbouring provinces and states.<sup>4-5</sup>

## Materials and Methods

Time-series regression analysis with negative binomial regression was used to explore associations between daily pollutants; carbon monoxide (CO), nitrogen dioxide (NO<sub>2</sub>), ozone (O<sub>3</sub>), fine particulate matter (PM<sub>2.5</sub>), and sulfur dioxide (SO<sub>2</sub>), and daily respiratory emergency visits among children (under 17 years of age) in the Edmonton area between 2016 to 2018, a period of heightened wildfire smoke activity.



## Results

- Stronger associations between daily respiratory ED visits among children in Edmonton, Canada and exposures were found in the wildfire season than in the non-wildfire season during the study period.

Table 1: Results of time-series wildfire model of associations between daily respiratory ED visits among children under 17 ages and exposure to O<sub>3</sub> and O<sub>3</sub> in Edmonton between 2016 to 2018

Variable	IRR	p-value	[95% Conf	Interval]	Sig
NO <sub>2</sub> _lag0	1.08	0.04	1.01	1.16	**
NO <sub>2</sub> _lag5	1.08	0.04	1.01	1.16	**
NO <sub>2</sub> _lag6	1.15	0.02	1.02	1.29	**
NO <sub>2</sub> _lag10	1.08	0.04	1.01	1.16	**
O <sub>3</sub> _lag5	1.12	0.05	1.00	1.26	**
O <sub>3</sub> _lag11	1.12	0.05	1.00	1.26	**

- During wildfire seasons, the daily respiratory ED visits increased significantly among children when exposed to NO<sub>2</sub> and O<sub>3</sub> at different lags (seen in Table 1)
- The greatest number of wildfire activities and the strongest wildfire-related air pollution was found in 2016, the year of the Fort McMurray wildfire

## Conclusions

The study showed positive associations between air pollution levels and increases in daily respiratory ED visits among children under 17 years old in Edmonton between 2016 and 2018. However, a one limitation to the study is seasonality and long-term trends may not have been completely controlled for using periodic functions (Fourier terms) due to challenges in applying spline functions in our models.

## References

- Rodriguez-Villamizar LA, Magico A, Osornio-Vargas A, Rowe BH. The effects of outdoor air pollution on the respiratory health of Canadian children: A systematic review of epidemiological studies. *Can Respir J*. 2015;22(5):282-292. doi:10.1155/2015/263427
- Piyush Jain, Dante Castellanos-Acuna, Sean C. P. Coogan JTA& MDF. Observed increases in extreme fire weather driven by atmospheric humidity and temperature. *Nat Clim Chang*. 2021;109(2):1877-1897. doi:https://doi.org/10.1038/s41558-021-01224-1
- Matz CJ, Egyed M, Xi G, et al. Health impact analysis of PM<sub>2.5</sub> from wildfire smoke in Canada (2013–2015, 2017–2018). *Sci Total Environ*. 2020;725:138506. doi:10.1016/j.scitotenv.2020.138506
- Alberta government. Historical Wildfire Database: Alberta wildfire records. Alberta wildfire. Published 2020. <https://wildfire.alberta.ca/resources/historical-data/historicalwildfire-database.aspx>
- Villeneuve PJ, Chen L, Rowe BH, Coates F. Outdoor air pollution and emergency department visits for asthma among children and adults: A case-crossover study in northern Alberta, Canada. *Environ Heal A Glob Access Sci Source*. 2007;6:1-15. doi:10.1186/1476-069X-6-40