

# Air pollution and migraine: Using smartphone app attack records to examine environmental exposures and a transient health outcome

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## Introduction

Migraine affects over 1 billion people.

- Causes debilitating pain, nausea, and sensitivity to light or sound.
- 2nd leading cause of years lived with disability worldwide.
- Little is known about environmental triggers.
- Most studies have been limited to single pollutants and/or relied on emergency-department visit data.

**Objective: Estimate the associations between air pollution and migraine events using smartphone app data in Ontario, Canada.**

## Materials and Methods

Migraine Buddy is a smartphone app with over 3 million users worldwide.

- Users may choose to share data.
- Individual-level, longitudinal, repeated-event data.

Environment and Climate Change Canada provided daily, 10 km<sup>2</sup> grids 2017-2019:

- NO<sub>2</sub>, PM<sub>2.5</sub>, O<sub>3</sub>, and SO<sub>2</sub>
- Temperature, barometric pressure, and humidity

The case time series is a newly developed modeling technique that harnesses longitudinal individual-level data in relation to multiple environmental exposures. Associations between air pollutants and migraine events will be estimated using the case time series method, accounting for meteorologic covariates.

## Preliminary results

80,907 migraine attacks reported by 10,215 research-consenting Migraine Buddy users.

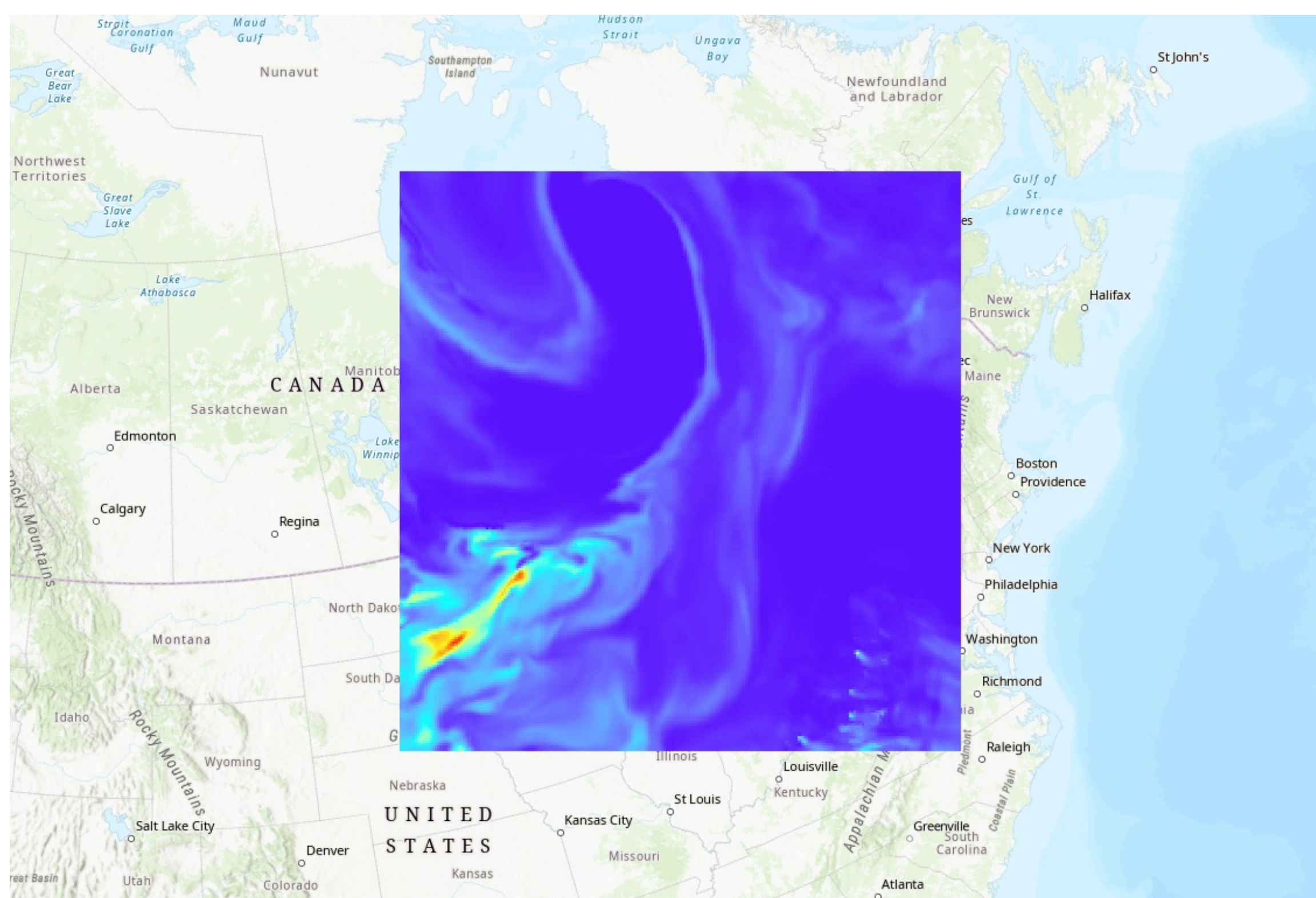


Figure 1: PM<sub>2.5</sub> over Ontario, April 1<sup>st</sup> 2017 at 12:00 UTC. Estimates modelled by Environment and Climate Change Canada and visualized in ArcGIS.

## References

James, S. L. *et al.* Global, regional, and national incidence, prevalence, and years lived with disability for 354 diseases and injuries for 195 countries and territories, a systematic analysis for the global burden of disease study 2017 The Lancet 392, 1789–1858 (2018).

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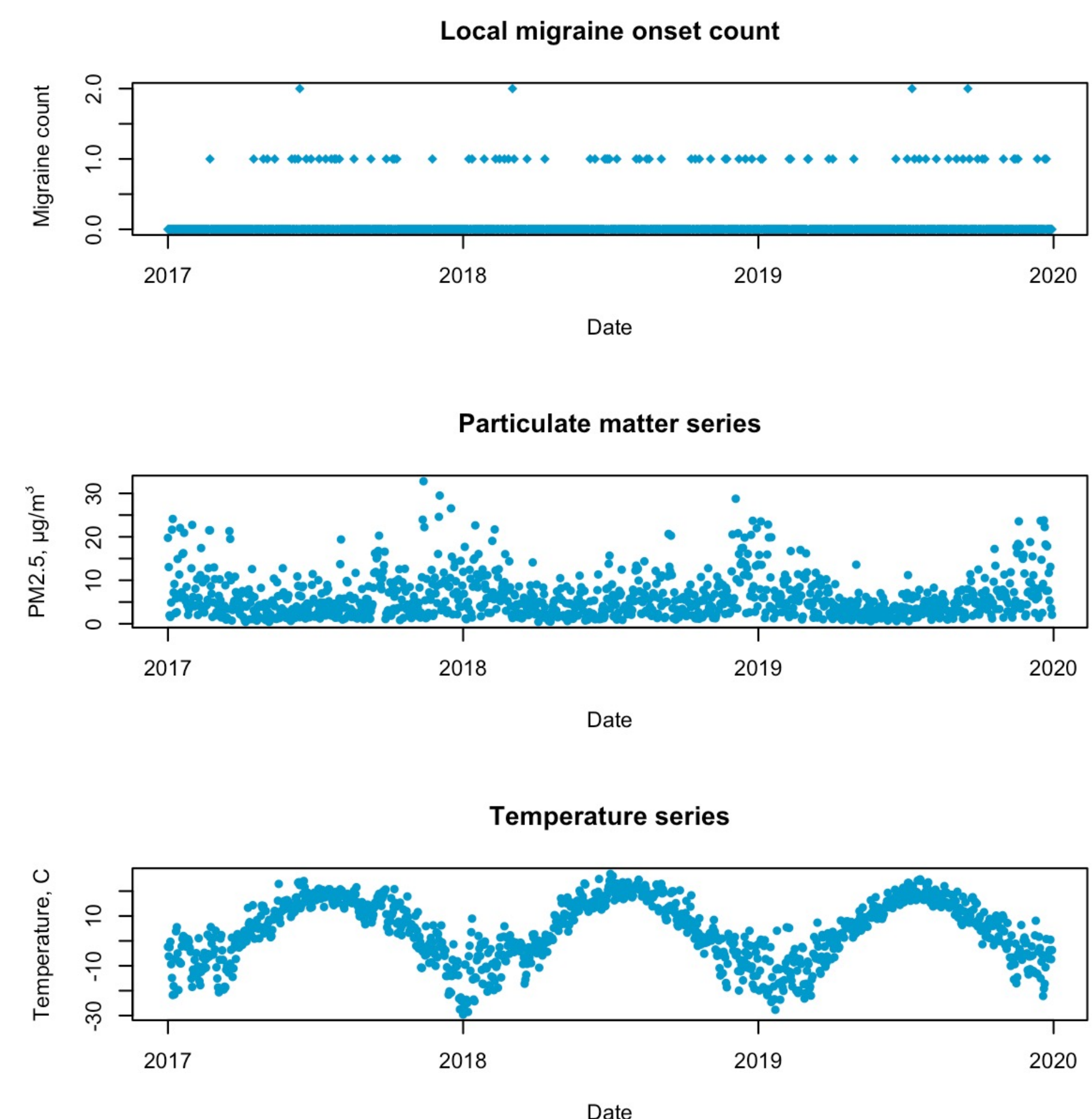


Figure 2: Time series of migraine events, PM<sub>2.5</sub>, and temperature in a subset location in Ontario, Canada.

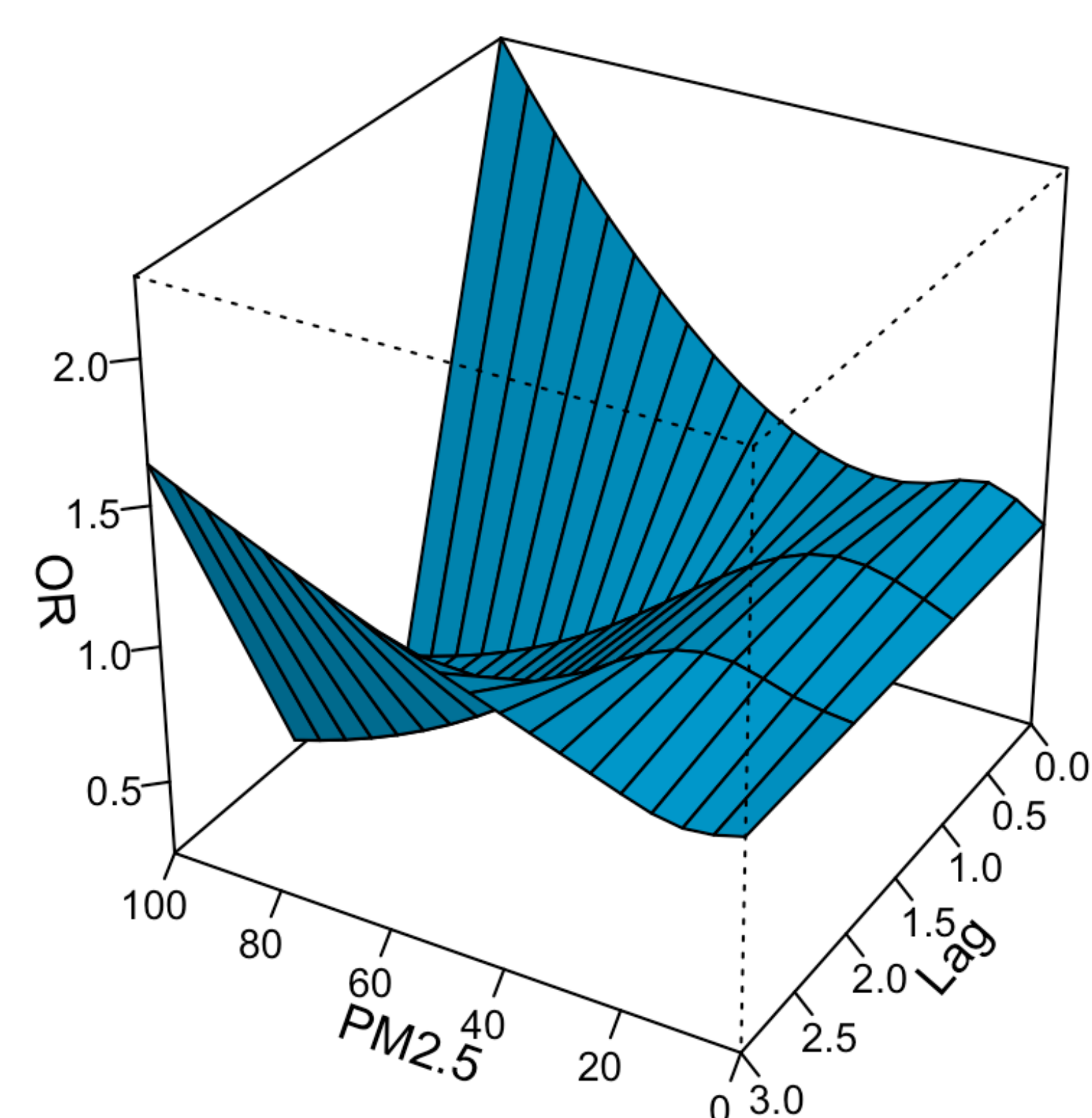


Figure 3: Exposure-lag response of migraine attack onsets with relation to PM<sub>2.5</sub> in a subset of 1000 participants, controlling for temperature.

## Conclusions

Preliminary results suggest that individuals are more likely to experience migraine onset on days (0 lag) with higher PM<sub>2.5</sub> compared to days with lower PM<sub>2.5</sub>.

Results of this study will inform the understanding of associations between air pollution and migraine, as well as the feasibility of smartphone app data for recording health events in epidemiologic research.

We expect the richness of the app data and the analytic strength of the case time series method to yield new insights into the effects of multiple air pollutants on migraine.

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