

Impacts of ambient air quality on acute asthma hospital admissions during the COVID-19 pandemic in Oxford City

Ajit Singh

(on behalf of OxAria and TRANSITION Clean Air Network study teams)



UNIVERSITY OF
BIRMINGHAM



UNIVERSITY OF
OXFORD



OXFORD
CITY
COUNCIL



OXFORDSHIRE
COUNTY COUNCIL

Clean Air Networks' Conference 2023

5-6 July 2023, University of Birmingham

Design, setting and methods

❑ Study Design

- ❑ Retrospective time-series study
Jan 2015 – Dec 2020

❑ Study population

- ❑ Adults >18 years living in Oxford City (OX1 – OX4)

❑ Methodology:

- ❑ Poisson linear regression analysis (single and multi-pollutant models)



Oxford postcode districts OX1, OX2, OX3 and OX4.

Air quality trends (Jan 2015-Dec 2020) in Oxford City

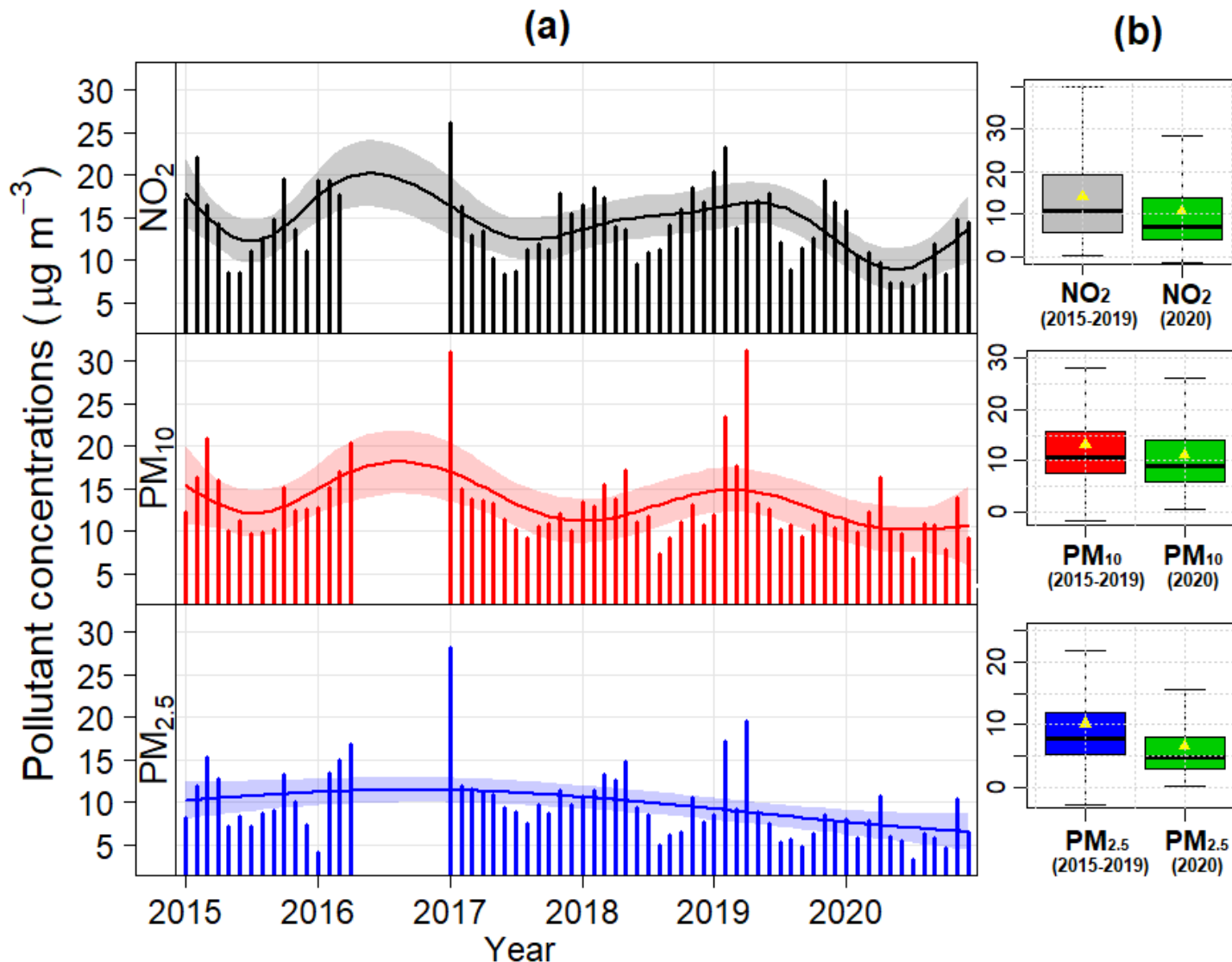
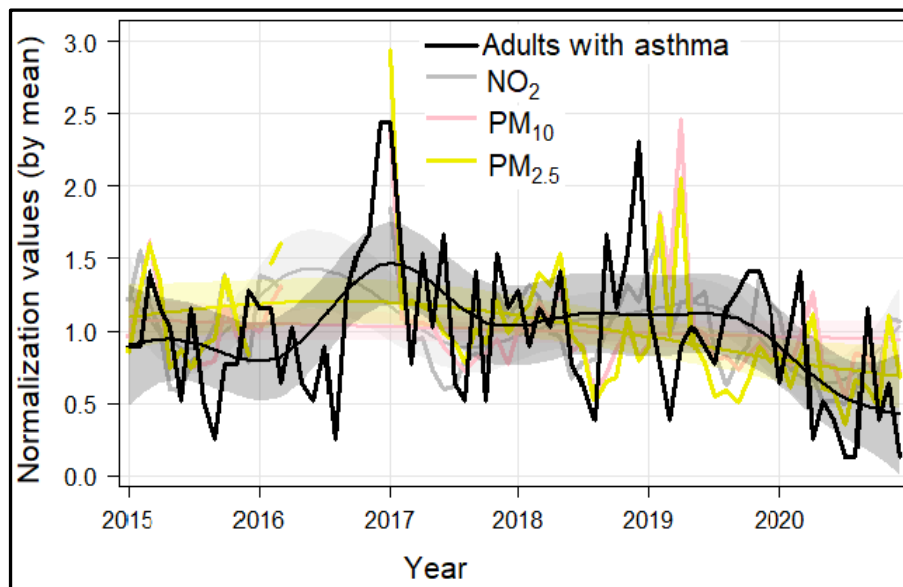


Figure (a) Time-series (2015 – 2020) of monthly mean observed pollutant concentrations at urban background site in Oxford, **(b)** box plots of the daily averaged air pollutant concentrations in 2020 versus 2015 – 2019.



Effect of COVID-19 lockdown measures on air quality and asthma admissions among adults living in Oxford

Normalized time series of monthly asthma admissions and air pollutant concentrations 2015 – 2020.



Incidence rate ratio (IRR) for adult asthma admissions and air pollutant concentrations

| Pollutants | Single-pollutant model | | | Multi-pollutant model | | |
|-------------------|------------------------|---------------|---------|-----------------------|---------------|---------|
| | IRR | 95% CI | p value | IRR | 95% CI | p value |
| NO ₂ | 1.040 | 1.009 – 1.072 | p=0.012 | 1.026 | 0.987 – 1.067 | p=0.188 |
| PM _{2.5} | 1.029 | 1.006 – 1.052 | p=0.013 | 1.017 | 0.988 – 1.045 | p=0.254 |
| PM ₁₀ | 1.018 | 0.999 – 1.038 | p=0.07 | NA | NA | NA |
| Temperature | 0.98 | 0.950 – 1.020 | p=0.340 | 0.99 | 0.960 – 1.030 | p=0.620 |
| Relative Humidity | 1.01 | 0.990 – 1.020 | p=0.466 | 1.00 | 0.990 – 1.020 | p=0.826 |



Conclusions

- ❑ Ambient NO_2 and $\text{PM}_{2.5}$ air pollution was associated with an increased the risk of asthma related hospital admissions in this study setting.
- ❑ Improvements in air quality during COVID-19 lockdown periods may have contributed to a substantially reduced acute asthma disease burden.
- ❑ Large-scale measures to improve air quality have potential to protect vulnerable people living with chronic asthma in urban areas.