

International Journal of Population Data Science

Journal Website: www.ijpds.org



Antenatal Exposure to Ambient Fine Particulate Matter Pollution and Amoxicillin Dispensing in Infants: National Birth Cohort Study in Scotland

Selin Akaraci¹, Amal Rammah¹, Caroline Hart¹, Bianca De Stavola¹, Alison Macfarlane², Chris Dibben³, Jonathan Taylor⁴, Linda Wijlaars¹, Tom Clemens³, Steve Cunningham³, and Pia Hardelid³

¹University College London, London, United Kingdom

²London School of Hygiene and Tropical Medicine, London, United Kingdom

³University of Edinburgh, Edinburgh, United Kingdom

⁴Tampere University, Tampere, Finland

Background

Exposure to ambient air pollution has been linked to increased risk of respiratory infections in children, which may require antibiotics. However, the impact of prenatal exposure to air pollution on antibiotic use in infancy remains unexplored.

Methods

We linked maternal postcode at delivery to modelled annual fine particulate matter ambient air pollution (PM_{2.5}) concentration data and national birth and community pharmacy dispensing data for all singleton children born in Scotland from 2009 to 2018. The association between PM_{2.5} exposure and amoxicillin and phenoxymethylpenicillin dispensing for children under one year old, was estimated using logistic regression (odds ratio (OR) for ever dispensed) and negative binomial regression models (incidence rate ratio (IRR) for total dispensed). Models were adjusted for birth year, season, infant sex, maternal age, and smoking during pregnancy.

Results

Antenatal PM_{2.5} concentrations for 421,289 children ranged from 2.9 to 16.5 µg/m³. The amoxicillin dispensing rate was 450/1000 child-years during year 1 (95% CI: 448, 451); 32.4% of children were dispensed at least one dose. A unit and interquartile range (IQR) increase in PM_{2.5} was associated with a 4% (OR:1.04, 95% CI: 1.03-1.05) and 8% (OR:1.08, 95% CI:1.06-1.10) increase in odds of amoxicillin dispensing and a 4% (IRR: 1.04, 95% CI: 1.03-1.04) and 7% (IRR:1.07, 95% CI:1.06-1.08) increase in dispensing rates. For phenoxymethylpenicillin, the dispensing rate was 343/1000 child-years (95% CI: 384, 396), 3% of children received at least one dose. A unit increase in PM_{2.5} was associated with a 6% increase in odds of dispensing (OR:1.06, 95% CI:1.04-1.08), and an IQR increase with a 13% increase (OR:1.13, 95% CI:1.08-1.17). Similarly, negative binomial regression showed a 9%

(IRR:1.09, 95%CI:1.07-1.11) and 18% (IRR:1.18, 95%CI:1.14-1.23) increase with unit and IQR increases in PM_{2.5}.

Conclusion

Antenatal exposure to PM_{2.5} was associated with an increased likelihood and frequency of amoxicillin and phenoxymethylpenicillin dispensing during infancy, reflecting its potential impact on early life respiratory health. Targeted interventions to improve air quality during pregnancy may reduce the burden of antibiotic use.

