

Research article

Association Between Ambient Air Pollution and Hospitalization for Respiratory Diseases in Perth, Australia

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Abstract

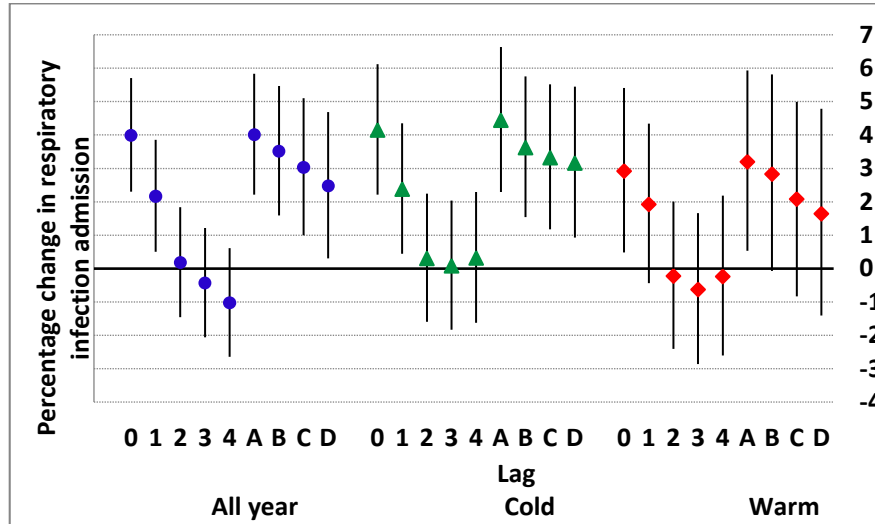
Background: Numerous studies continue to demonstrate that air pollution is a significant contributor for respiratory hospitalizations among adults and children.

Methods: We examined the associations between daily changes in exposure levels of selected air pollutants including nitrogen dioxide (NO₂), particulate matter with <10µm (PM₁₀) and <2.5µm in aerodynamic diameter (PM_{2.5}), and hospitalization for respiratory symptoms, respiratory infections and asthma in Perth, Western Australia for a 5-year period. A Poisson model allowing for autocorrelation and over-dispersion was applied in the analysis for each air pollutant and also carried out separately for different seasons, defined as “warm” (November to April) and “cold” (May to October) seasons.

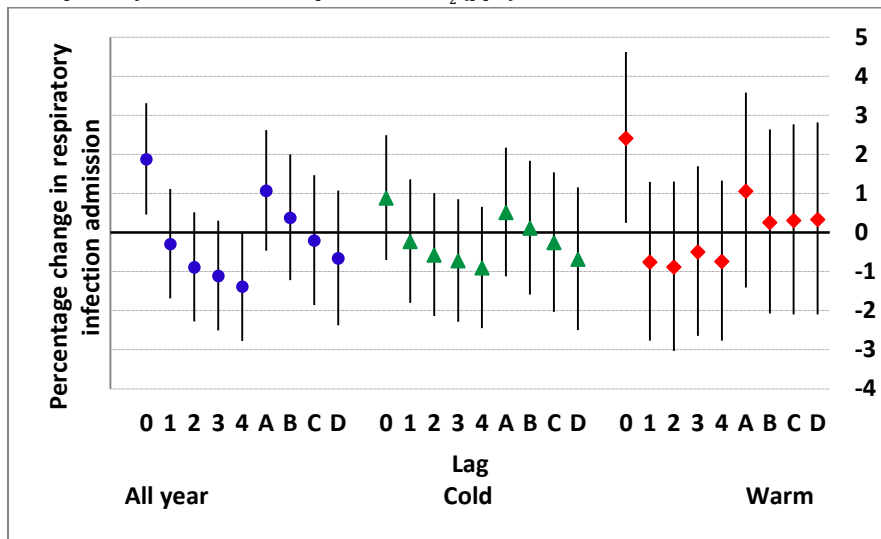
Results: Daily hospital admissions due to respiratory infections were significantly related to daily changes in concentrations of NO₂, PM₁₀ and PM_{2.5}. Significant lagged effects on hospitalization for asthma and respiratory symptoms were established for PM_{2.5}. Respiratory symptoms hospitalization was also significantly affected by NO₂ at longer lags.

Conclusions: Our findings have important public health implications as we established significant associations between air pollutants and respiratory hospitalization in a city where the average concentrations of NO₂, PM₁₀ and PM_{2.5} are below the national standards.

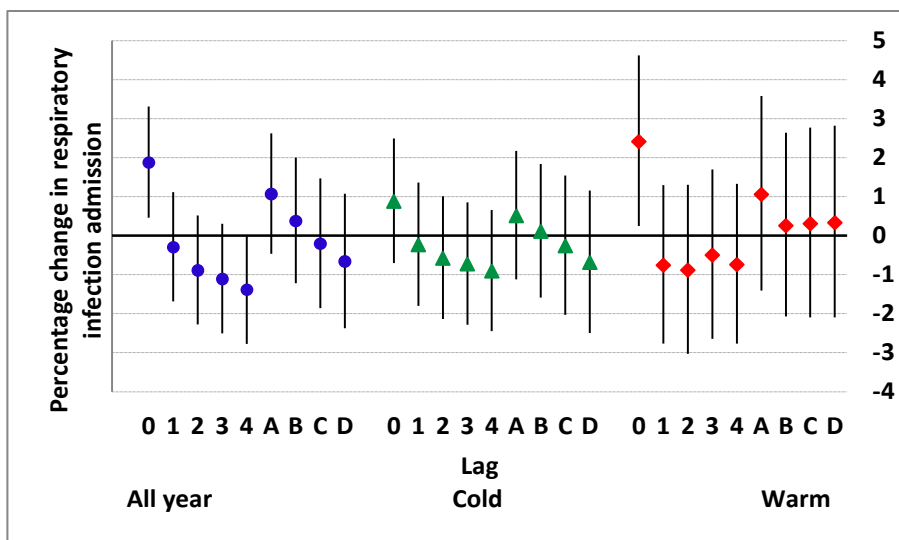
Keywords: Air Pollution; Hospital Admissions; Respiratory Symptoms; Australia



(a) Hospital admissions for respiratory infection and exposure to NO_2 (ppb)

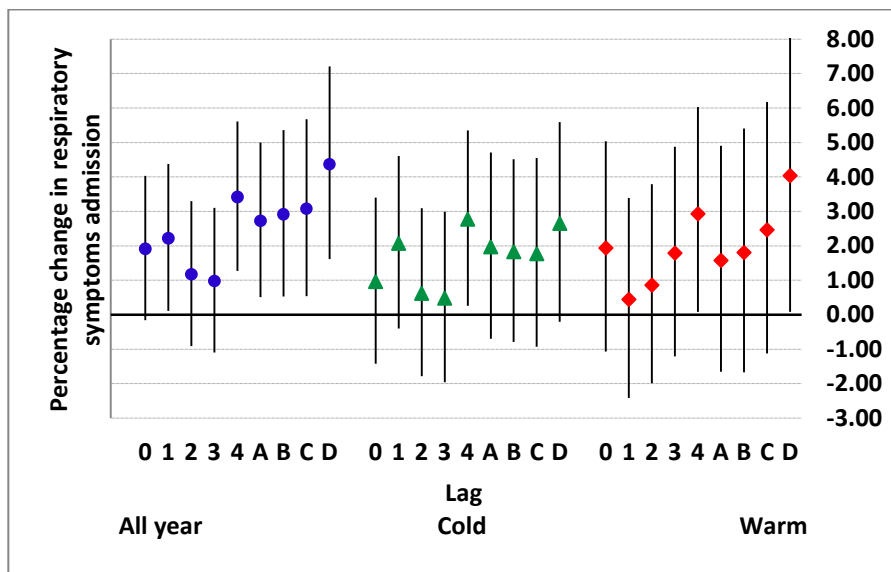


(b) Hospital admissions for respiratory infection and exposure to PM_{10} ($\mu\text{g}/\text{m}^3$)

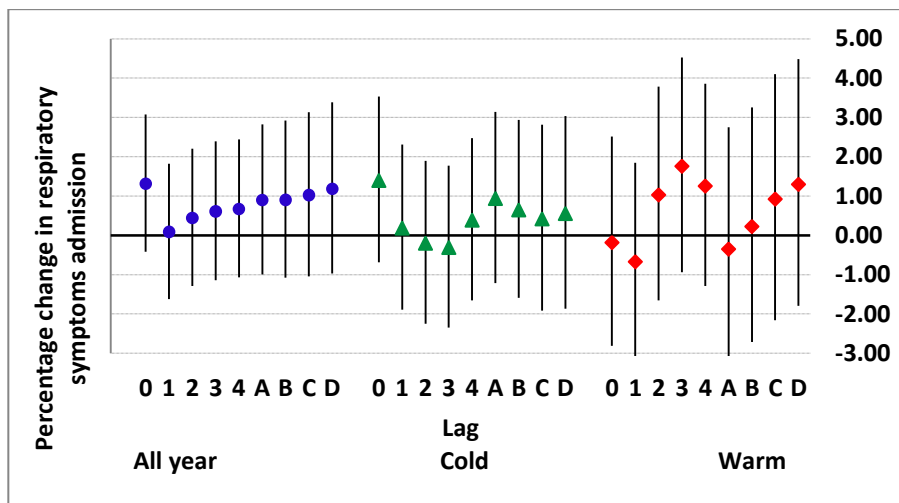


(c) Hospital admissions for respiratory infection and exposure to $\text{PM}_{2.5}$ ($\mu\text{g}/\text{m}^3$)

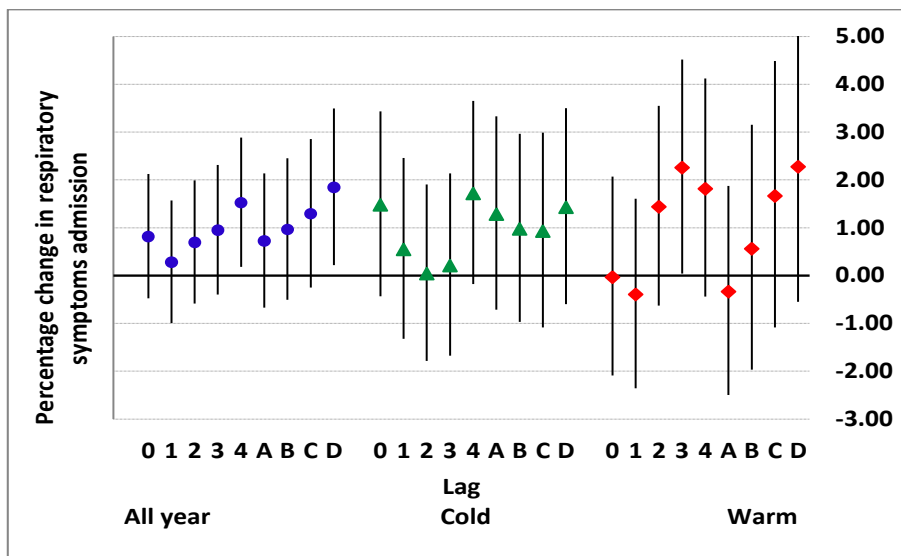
Figure 1. Changes (95%CI) in respiratory infection admission by all year and cold/warm periods per interquartile range increases in NO_2 , PM_{10} , and $\text{PM}_{2.5}$ (Note A = average of lag0 and lag1, B = average of lag0 to lag2, C = average of lag0 to lag3 and D = average of lag0 to lag4).



(a) Hospital admissions for respiratory symptoms and exposure to NO₂ (ppb)

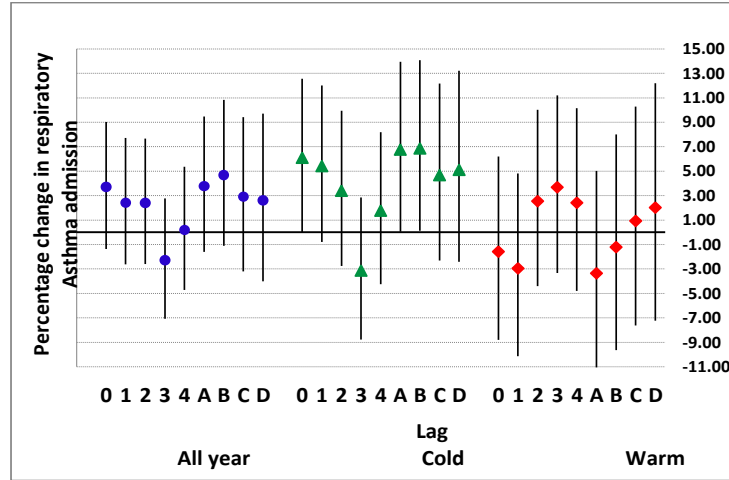


(b) Hospital admissions for respiratory symptoms and exposure to PM₁₀ (µg/m³)

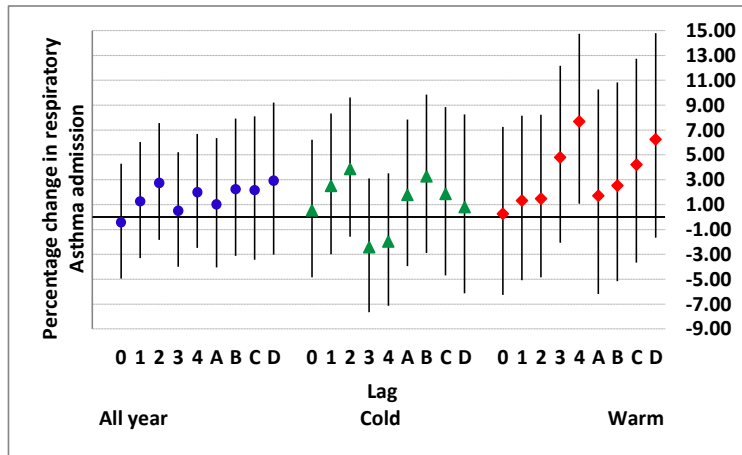


(c) Hospital admissions for respiratory symptoms and exposure to PM_{2.5} (µg/m³)

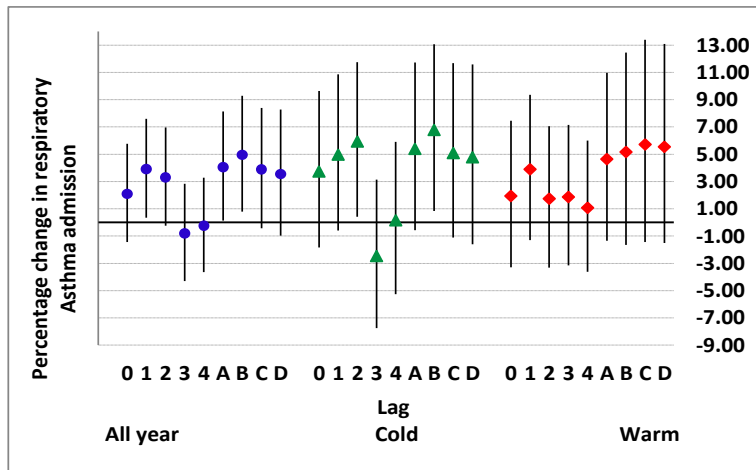
Figure 2. Percentage change (95%CI) in respiratory symptoms admission by all year and cold/warm periods per interquartile increases in NO₂, PM₁₀, and PM_{2.5} (Note A = average of lag0 and lag1, B = average of lag0 to lag2, C = average of lag0 to lag3 and C = average of lag0 to lag4).



(a) Hospital admissions for asthma and exposure to NO₂



(b) Hospital admissions for asthma and exposure to PM₁₀ (µg/m³)



(c) Hospital admissions for asthma and exposure to PM_{2.5} (µg/m³)

Figure 3. Percentage change (95%CI) in asthma admission by all year and cold/warm periods per interquartile range increases in (a) NO₂, (b) PM₁₀, and (c) PM_{2.5} (Note A = average of lag0 and lag1, B = average of lag0 to lag2, C = average of lag0 to lag3 and C = average of lag0 to lag4).