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Linking air pollution and administrative health databases to examine health effects of wildfire smoke exposure in Calgary, Canada in 2015

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Introduction

Wildfires are increasing in frequency and severity due to climate change. Fine particulate matter (PM_{2.5}) in wildfire smoke is an important indicator of health effects of most combustion sources. The evidence based on adverse health impacts of PM_{2.5} from wildfire smoke are increasingly being studied but some gaps still remain.

Conclusion/Implications

Wildfire-related PM_{2.5} led to increased physician visits due to respiratory morbidity during and after the wildfires, particularly for asthma, acute bronchitis and acute respiratory infections in children. The absence of cardiovascular health impact in general population during wildfires provides useful information for targeted public health messaging during adverse air quality events.

Objectives and Approach

We examined the association of PM_{2.5} from Pacific Northwest wildfires with multiple respiratory and cardiovascular morbidity events related physician and emergency department visits, hospital admissions, health-link calls and medications dispensed among Calgary city population from August 1 – September 30, 2015. Physician billing claims, discharge abstract, Pharmaceutical Information Network, Health-link calls databases were linked with the air quality monitoring information database. Quasi-Poisson regression model for time lags of zero to five days and a three-day moving average, and conditional logistic regression model was used with adjustment for air pollutants and meteorological variables. Age and disease-specific stratified analyses were performed.

Results

Compared to the pre-wildfire period (Aug 1 – Aug 23), a 10 µg/m³ increase in PM_{2.5} increased the risk for respiratory physician visits by 54.8% (95% CI: 41.6% - 69.3%) and 32.6% (95% CI: 10.4% - 58.9%) in the respective post (Sep 1- Sep 30) and during (Aug 24 – Aug 31) wildfire periods. The strongest association of PM_{2.5} with respiratory physician visits was observed for children aged 0-9 years in the post-wildfire period (Relative Risk [RR] = 2.11, 95% CI: 1.86 - 2.39) compared to during wildfire period (RR = 1.56, 95% CI: 1.21 - 2.02) and was consistent for asthma, acute bronchitis and acute respiratory infection. Statistically significant effects of PM_{2.5} on cardiovascular hospitalizations, ED and physician visits were not observed during the wildfire period.