The Relationship between Proximity to Sources of Industrial-Related Outdoor Air Pollution and Children Emergency Department Visits for Asthma in the Census Metropolitan Area of Edmonton, Canada, 2004/2005 to 2009/2010

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Abstract : Introduction/Objectives: The Census Metropolitan Area of Edmonton (CMAE) has important industrial emissions to the air from the Industrial Heartland Alberta (IHA) at the Northeast and the coal-fired power plants (CFPP) at the West. The objective of the study was to explore the presence of clusters of children asthma ED visits in the areas around the IHA and the CFPP. Methods: Retrospective data on children asthma ED visits was collected at the dissemination area (DA) level for children between 2 and 14 years of age, living in the CMAE between April 1, 2004, and March 31, 2010. We conducted a spatial analysis of disease clusters around putative sources with count (ecological) data using descriptive, hypothesis testing, and multivariable modeling analysis. Results: The mean crude rate of asthma ED visits was 9.3/1,000 children population per year during the study period. Circular spatial scan test for cases and events identified a cluster of children asthma ED visits in the DA where the CFPP are located in the Wabamum area. No clusters were identified around the IHA area. The multivariable models suggest that there is a significant decline in risk for children asthma ED visits as distance increases around the CFPP area this effect is modified at the SE direction with mean angle 125.58 degrees, where the risk increases with distance. In contrast, the regression models for IHA suggest that there is a significant increase in risk for children asthma ED visits as distance increases around the IHA area and this effect is modified at SW direction with mean angle 216.52 degrees, where the risk increases at shorter distances. Conclusions: Different methods for detecting clusters of disease consistently suggested the existence of a cluster of children asthma ED visits around the CFPP but not around the IHA within the CMAE. These results are probably explained by the direction of the air pollutants dispersion caused by the predominant and subdominant wind direction at each point. The use of different approaches to detect clusters of disease is valuable to have a better understanding of the presence, shape, direction and size of clusters of disease around pollution sources.

Keywords : air pollution, asthma, disease cluster, industry