

An Exploration of New Uses of Traditional Data within an Ecological Study: Air Quality Effects on Pediatric Asthma Exacerbation Analysis

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OBJECTIVE

The study objective was to provide the Centers for Disease Control and Prevention (CDC) results from the Environmental Public Health Tracking Program (EPHTP) on quantifying the relationship between air quality and pediatric emergency department (ED) visits for asthma among DC residents over a 3 year period. This effort also explored novel uses of traditional data to understand background disease patterns so that unexpected fluctuations could be better detected in community disease trends and thereby identify early disease outbreaks.

BACKGROUND

Under a grant from the CDC, the DC DOH established the EPHTP to monitor specific environmental and public health indicators and to investigate any potential links for the purpose of guiding policy development, resource allocation, and decision-making on disease prevention and treatment activities. This information improves understanding of the immediate and short-term effects of airborne pollutants on health care usage. In a collaborative project between JHU/APL and DC DOH, investigators explored and quantified correlations between ambient air quality measurements from five DC stations between October 2001 and March 2004 and DC hospital pediatric ED visits for asthma exacerbations.

METHODS

Daily maximum ozone and PM_{2.5} concentrations were derived for each station. Daily ED data were filtered for DC residents seen during the study period and divided into age groups 0-4 yrs, 5-12 yrs and 13-17 yrs. Time series plots for ED visits, ozone and PM_{2.5} concentrations and aeroallergen data were made for daily, weekly, and monthly averages, showing seasonal variations. A cubic spline fitted to the overall ED data was used to mitigate long-term low frequency variations in the ED data so that we could focus on short-term impacts using a Poisson regression. In addition, spatial analysis by zip code was performed. ED

visit rates by zip code were derived using the 2000 US census data. ED visit data from zip codes with more than 30% of children in families below the poverty level were compared in a case control manner with other zip code ED visits to provide some measure of relative risk.

RESULTS

Of risk factors considered for pediatric ED visits, ozone and tree pollen were found to have statistically significant associations. Ozone effects were seen mostly in the 5-12 age group. However, PM_{2.5} did not appear to be a risk factor, perhaps because concentrations were not particularly high during the 3 year period of this study. Weed, grass, and mold were not found to be significant risk factors. Residence in zip code with high child poverty was a risk factor for both pediatric ED visits and admissions.

CONCLUSIONS

Air quality effects on public health may explain certain seasonal and day-to-day variations in traditional and non-traditional health care data. When conducting surveillance for bioterrorist (BT) events, diseases such as asthma can act as confounders. Understanding how asthma exacerbations and seasonality present in the community by conducting studies such as this one can help with controlling for background variability. Recognizing these air quality impacts should make it less likely to confuse them with a BT event and, conversely, less likely for a BT event to be masked by these effects. Therefore, there are several added benefits to conducting similar studies beyond quantifying ambient air quality effects on human health. Furthermore, routine gathering and frequent analysis of ambient air quality indicators has the added benefit of providing a good, understanding of "expected" values that can provide for setting appropriate baselines and alerting thresholds for reporting unusual measurements. Most of these expanded uses are attainable at minimal additional costs with existing resources.

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