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Impact of poor air quality on chronic respiratory problems among the elderly

Extended Abstract #416

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INTRODUCTION

There is a considerable body of evidence that suggests poor ambient air quality contributes to increased mortality and morbidity.^{1,2,3,4,5} The impact of ambient air quality on different segments of the general population, including children and among the elderly has also been investigated.^{6,7,8,9} In light of the well documented public health significance of air pollution, it is imperative that investigators continue to evaluate details regarding the impact of poor air quality. In particular, it is interesting to note that some research has indicated an increased risk of the young and the elderly being admitted to the hospital for cardiac and pulmonary conditions when ozone and PM levels are elevated.¹⁰ Our study endeavored to use public data sources to assess the trends and potential impacts on a statewide basis.

We endeavored to evaluate trends in significant sources of air pollution in Virginia, link these trends to trends in ambient air quality, and further link ambient air quality in Virginia to potential impacts on asthma admissions on different age groups. In particular, we evaluated the hospital admissions among different age groups living in central Virginia and speculated about the impact of ambient ozone on the risk of admission for asthma.

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APPROACH & RESULTS

Methodology

This study was divided into three separate phases. The unique aspect of our study involved the use of publicly available data sets and demonstrates the value of this data in allowing access to information that can prove helpful in assessing the environment. In phase 1, sources of air pollution were assessed in the state of Virginia and statewide trends were compared to national trends. The source evaluation focused on the energy sector, mobile sources, and air toxics. For the energy sector, we utilized data provided by the Energy Information Agency State Energy Data System (SEDS) (<http://www.eia.gov/state/seds/seds-data-complete.cfm>). This data system tracks energy consumption across a broad range of fuel types and renewables on an annual basis for both individual states and nationally. Mobile source data was gathered from the Virginia Department of transportation and allowed an assessment and comparison of auto use in the state over time. This data was gathered from VA DOT vehicle statistics and the Virginia Department of Transportation 2040 Transportation Plan. The USEPA Toxics Release Inventory (TRI) was used to assess hazardous air pollutants recorded both nationally and statewide from 2008 – 2013 (http://iaspub.epa.gov/triexplorer/tri_release.chemical). Comparison of national trends with state trends only included hazardous air pollutants relevant to Virginia. In addition, the National Emissions Inventory database was also used for statewide and national comparisons recorded for 2008 and 2011 for the criteria pollutants (<http://www.epa.gov/ttn/chief/eiinformation.html>).

In phase 2 of this study, compliance with the NAAQS was assessed for each individual year from 2008 – 2013 based on reports from the Virginia State Department of Environmental Quality that summarize the monitoring results for the state (<http://www.deq.virginia.gov/Programs/Air/AirMonitoring/Publications.aspx>). In particular, data on ozone exceedance days from 2008 – 2013 were also obtained and evaluated. The ozone assessment included comparisons of exceedance days with meteorological observations recorded throughout the state by NOAA weather stations and recorded in the Locally Controlled Climatological Data system (<http://cdo.ncdc.noaa.gov/qclcd/QCLCD>). This assessment broadly focused on conditions, such as temperature and humidity, that may be associated with ozone exceedances.

In phase 3 of this study, we evaluated the rates of asthma admissions in central Virginia by age group and compared these values to national trends, with a particular focus on the elderly. The rates of asthma admissions were compared for 2008 and 2009, the two years where health data is available, and descriptive associations were drawn with ozone exceedance days for those years.

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Results and Discussion

While this work is still in progress, preliminary results suggest that Virginia in many ways mirrors national trends with some exceptions. Virginia has an energy portfolio mix that is similar to the national portfolio with the exception that the state generates a lower percentage of its energy from renewable sources. Hazardous air pollutant trends are similar to national trends and show a decrease in emissions that appears to mirror the downturn in the economy and subsequent reduction in production during the recent recession. Ozone does seem to be the one ambient pollutant with occasional exceedences that vary significantly from year to year and appears to be influenced significantly with overall weather patterns. Hospital admissions for asthma are currently undergoing analysis and will be reported in the near future.

SUMMARY

Virginia appears to track national trends very closely for the metrics analyzed in this project. Improvements can continue to be made for continuous improvement of air quality. This will likely benefit the health of state residents and in particular the young and the elderly. Our study supports the notion that asthma among the young and old is impacted by air quality and that these two age groups may be more vulnerable to these air quality impacts.

Keywords: trends, ozone, sources, energy sector, asthma, elderly

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