ASSOCIATIONS OF SOURCE-RESOLVED PARTICULATE AIR POLLUTION MIXTURES AND CARDIORESPIRATORY EMERGENCY DEPARTMENT VISITS IN ST. LOUIS, MO-IL

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Background and Aims: Substantial evidence supports an association between broad measures of particulate matter (PM) and cardiorespiratory illnesses, but less is known regarding specific PM sources, components and mixtures that contribute to this association. We used source-indicative tracer and source apportionment analyses in a time-series investigation of emergency department (ED) visits in St. Louis, MO-IL to more fully examine the role of PM mixtures on acute health response.
Methods: Daily speciated $PM_{2.5}$ data were obtained from the St. Louis - Midwest Supersite for a 2-year period, and were used in an 11-factor positive matrix factorization analysis to obtain daily source contribution estimates. We selected a subset of elemental and organic molecular marker species as source tracers. Gaseous pollutant data were obtained from the adjacent U.S. Environmental Protection Agency site. Individual-level ED visit data were obtained from 36 acute-care hospitals in the study area. We used Poisson generalized linear models, controlling for long-term trends and meteorology, to examine associations between air quality parameters and ED outcomes.
Results: Asthma ED visits were strongly associated with ozone, nitrogen dioxide, and PM_{25}. In models using $PM_{2.5}$ species and source factors, we observed non-significant positive associations with elemental carbon (EC), organic carbon (OC), and sulfate, and strong positive associations with diesel, biomass, and carbon-rich sulfate source factors. For cardiovascular outcomes, associations with EC and OC were observed, particularly for congestive heart failure (CHF). Further CHF analyses indicated non-significant associations with diesel and gasoline factors and strong warm-season associations with mobile-source related organic markers, including benzo(a)pyrene.
Conclusions: Our analyses suggest that pollutant mixtures associated with both mobile-source emissions and regional sulfate production are associated with cardiorespiratory morbidity in St. Louis. Our approach of investigating pollutant sources is one of several methods for modeling complex pollutant mixtures in epidemiologic settings.