

# Health Outcomes from Aggregate Particulate Matter

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## Overview/Introduction

Many areas of the United States have experienced frequent exceedances in surface-level air pollutants, yet fall below National Ambient Air Quality Standards. Research demonstrates strong associations between acute and chronic ambient exposure to poor air quality (AQ) and public health outcomes (Table 1). Air pollutants such as particulate matter [PM<sub>2.5</sub>] and ozone [O<sub>3</sub>] have been linked to increasing complications of cardiopulmonary diseases<sup>1</sup>.

Particulates	Acute Exposure (i.e. hrs - months)	Chronic Exposure (i.e. seasons - yrs)
PM <sub>2.5</sub>	<i>Causal / Likely</i>	Likely / <b>Suggestive</b>
PM <sub>10</sub>	<i>Causal / Likely</i>	Likely / <b>Suggestive</b>
NO <sub>2</sub>	<i>Causal / Suggestive</i>	Likely / <b>Suggestive</b>
SO <sub>2</sub>	<i>Causal / Suggestive</i>	<b>Suggestive</b>

PM<sub>2.5</sub> = Particulate Matter(>2.5 µm)  
PM<sub>10</sub> = Particulate Matter (2.5 µm– 10 µm)  
NO<sub>2</sub> = Nitrogen Dioxide  
SO<sub>2</sub> = Sulfur Dioxide

## Step 1: Data Acquisition

- Acquisition and migration of data from multiple sources into cloud-based storage.
- Healthcare data is sensitive, so there are special considerations and protections regarding the privacy of it.

## Current/Planned Data Sources:

- Centers for Medicare and Medicaid (CMS)**  
*Standard Analytical Files for beneficiaries of states (2014-2017)*
- Centers for Medicare and Medicaid Standard Analytical Files**, *Limited DataSets (5% national sample of all CMS beneficiaries, years 2014-2017)*
- Centers for Medicare and Medicaid Standard Analytical Files**, *Research Identifiable Files*
- Agency for Healthcare Research and Quality Healthcare Cost and Utilization Project [HCUP]**  
*(Nationwide Inpatient Sets, National Readmissions Database, National Emergency Department Sets) (years 2006-2015)*

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## Step 2: Data Processing

- Healthcare data often lacks accuracy and ease of use.
- HCUP and CMS prove to be more reliable but may contain multiple missing values across data elements.
- For example, 19 data elements from HCUP in 2012, identified percentages of missing values ranging from 0%-5.73% (n=7,296,968)<sup>2</sup>.



## Step 3: Data Analysis

- Use of cloud platform products is key with big data for its statistical and machine learning tools.
- It allows the prediction of the impact of AQ changes upon management of many diseases for patients, healthcare facilities, and other end users.

## Questions:

- What are trends for utilization of healthcare resources with respects to cardiopulmonary diseases nationally, regionally, and in a testbed state?
- What associations exist between trends in utilization of healthcare resources and changes in air quality for areas of non-attainment and increased threshold exceedances nationally, regionally, and in a testbed state?
- How can results of retrospective data analyses be incorporated into a model that can be used to predict risk of healthcare resource utilization geographically, temporally, and clinically?

## Step 4: End Products

- A web Application Provider Interface (API) will be created in the course of this project to improve methods of data storage and engagement.
- New and valuable insights that can be used across many healthcare settings dealing with air quality

## References:

- <http://www.hcup-us.ahrq.gov/reports/methods/methods.jsp>.
- <http://www.hcup-us.ahrq.gov/reports/methods/methods.jsp>
- <https://www.pexels.com/photo/photography-of-factory-929385/>