Respiratory Illness and Ozone

Finding their relationship in Champaign-Urbana with the use of Project Indicator
The purpose of this project is to examine the correspondence between short-term ozone exposure and respiratory illness-related hospital reports, adopting from the methods used in “Meta-analysis of the Association between Short-Term Exposure to Ambient Ozone and Respiratory Hospital Admissions” by Meng Ji, Daniel S. Cohan, and Michelle L. Bell. This meta-analysis was published in 2011 on studies that have connected asthma cases in hospitals and ozone measurements in air quality reports.
Research Question

What atmospheric factors will cause more respiratory cases than usual in Champaign-Urbana?
Why Project Indicator?

Project Indicator is a disease surveillance system that draws information from hospitals, the Champaign Urbana Public Health District, schools, and others data resources to provide alerts of outbreaks and the status of infectious diseases and other health problems that are documented within the Champaign-Urbana community.
A Data Journey

● Previously worked with
  o Only asthma-related cases
  o Christie Clinic and EPA Data
  o Regression Analysis

● Currently examining
  o Asthma and Respiratory Illness cases
  o Christie Clinic, Carle ER, EPA, and Cli-MATE Data
  o Classification and Regression algorithms
Data Processing Steps

● Indicator Data
  o Used mySQL for tables from Indicator.
  o Queried strictly for ICD-9 codes and corresponding phrases
  o Output created into CSV files and ran in R
  o Values eventually split in two ways, at/below average and above average

● Air Quality System Data
  o AQS data immediate came in CSV files
  o Still needed to harvest relevant columns
  o Air samples taken in one hour increments over a 24-hour cycle for the entire year and converted to a 24-hour mean
  o Values split multi-way
Data Processing Steps

- **Cli-MATE Data**
  - Data came in CSV files
  - Measurements taken in one hour increments over a 24-hour cycle for the entire year and converted to 24-hour means
  - Retrieved variables: air temperature, dew point temperature, wet bulb temperature, relative humidity, station level pressure, sea level pressure, and wind speed
  - Heat Index and Wind Chill retrieved using temperature, relative humidity, and wind speed variables
  - Values split multi-way
Regression Results (Ozone and Asthma)
Regression Results (Ozone and Respiratory Illness)

Respiratory Illness that is not asthma and Ozone Regression Analysis in Champaign Urbana, 2006-2009
Regression Results (Ozone and Respiratory Illness and Asthma)
Decision Tree Results (Asthma)

Node: 0
Prediction: at or below average
Support: 862 (100%)
Confidence: 64.97%
- at or below average: 560 (64.97%)
- above average: 302 (35.03%)
Split: MONTH

Node: 1
Prediction: at or below average
Support: 573 (66.47%)
Confidence: 73.82%
- at or below average: 423 (73.82%)
- above average: 150 (26.18%)

Node: 2
Prediction: above average
Support: 289 (33.53%)
Confidence: 52.6%
- at or below average: 137 (47.40%)
- above average: 152 (52.60%)
Decision Tree Results (Respiratory Illness)
Current Conclusions

- Ozone and different respiratory illness case scenarios show negative regression lines, suggesting that there is no correlation between the two in Champaign-Urbana.
- The time of year is noticeably significant though:
  - Fall for asthma cases
  - Winter and generally colder months surrounding it for respiratory cases
  - Spring and summer for ground ozone