Project 18
Modeling Airport-Related Air Pollutant Concentrations and Health Impacts

Motivation and Objectives

- Impact of aviation emissions on public health varies widely across airports, given differences in population patterns, meteorology, and other factors
- Estimates of airport-specific health impacts per ton of emissions (**damage functions**) would allow for the health implications of any combination of emissions to be rapidly assessed
- Important to be able to place aviation health damage functions and health impacts in context by comparing with other source sectors
- **Objectives**
  - Estimate health damage functions for airports contributing 97.5% of fuel burned in the US
  - Apply health damage functions to evaluate implications of alternative emissions reduction scenarios
  - Estimate comparable health damage functions for power plants and residential combustion, and compare values

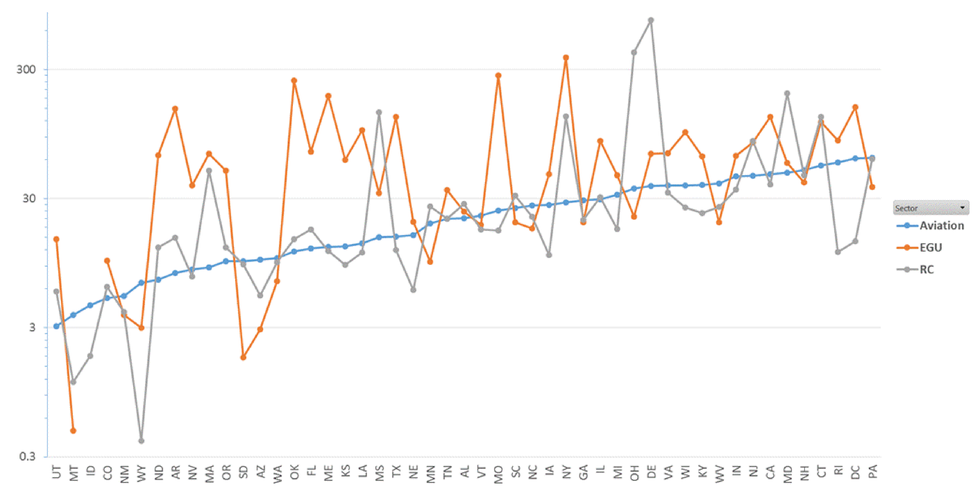
Methods and Materials

- CMAQ-DDM-3D modeling for 66 selected airports as well as state-resolution power plants and residential combustion in the continental US
  - See Project 19 for details
- Image segmentation algorithm to isolate effects of individual airports/states in multi-airport/state runs
- Concentration surfaces linked with Census population data, baseline mortality data from CDC WONDER, and concentration-response functions from the epidemiological literature
- Regression models used to explain airport health damage functions as a function of population patterns, meteorology, and atmospheric chemistry
- Health damage functions predicted for 203 additional airports across the US

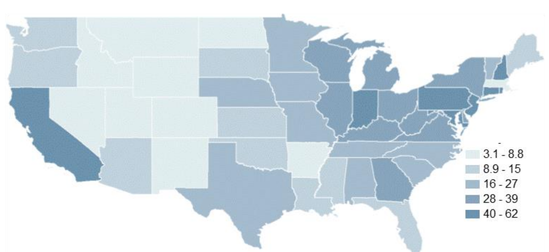
Results and Discussion

Health damage functions have been developed for all source types and states

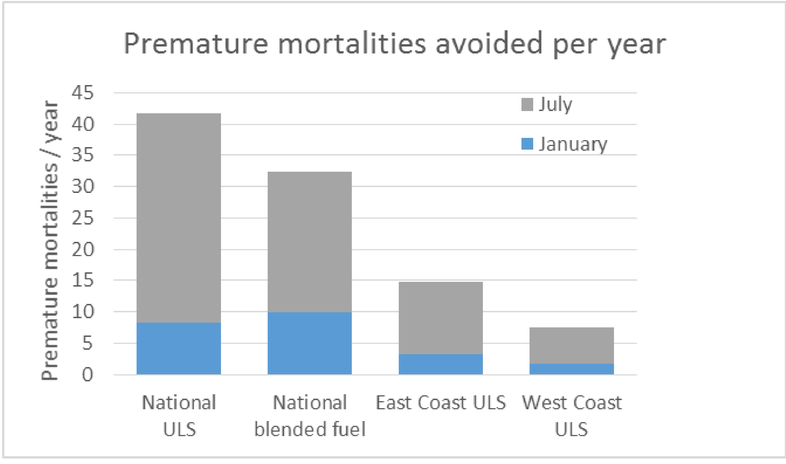
Example: Premature mortalities per 1000 tons of primary EC (January)



Aviation



Aviation health damage functions have been applied to LTO emissions reduction scenarios



Conclusions and Next Steps

- Preliminary findings indicate geographic variability in health damage functions and relationships among source sector impacts
- Illustrative application of aviation health damage functions reinforces value of approach for more refined analyses
  - Could be applied to more geographically focused emissions reduction scenarios
- Ongoing collaboration with Project 19 on CMAQ-DDM-3D work provides synergies and insights on air quality health effects
- Next steps include model application to a wider array of emissions control scenarios, and an investigation of factors that lead to differing health damage function patterns across states

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