Introduction

- Long-term air pollution exposure has been consistently associated with mortality
- Obtaining personal exposure information is not feasible
- Reliance on air pollution concentrations predicted by spatio-temporal models
- Different modeling choices in exposure and health models across studies

Motivation

- Although conclusions are relatively consistent across studies, there is variability in reported effect estimates
- Accurate and precise estimates are necessary for risk assessments and cost-benefit analyses of proposed policy actions

Goal: To rigorously assess the sensitivity of the reported results to modeling choices

Methods

PM$_{2.5}$ Exposure Aggregation

- Developed area- and population-weighted aggregations
- Using zonal statistics by performing a spatial merge

Modeling Choices

- Exposure Prediction Model
  1. Qian Di (QD)$^1$
  2. Aaron VanDonkelaar (AV)$^2$
  3. Itai Kloog (IK)$^3$

- Assignment of episode exposure
  1. Average of the four grids nearest to the zip-code centroid
  2. Area-weighted aggregation

- Health Model Parameterizations
  1. Cox hazards model with GEE
  2. Log-linear model with GEE

- Exposure Contrasts
  1. Categorical exposure: cut-off point as $(8, 10)$
  2. Continuous exposure

Confounding Adjustment

- Inclusion of confounders in the health model (Regression)
- Using GPS (GPS IPTW, GPS SBCL, GPS MTCH)

Exposure Comparisons

Example: 2010 zip-code level aggregated PM$_{2.5}$ surfaces using area weights

Model Comparisons: Continuous Exposure

Comparison of hazard ratios under different PM$_{2.5}$ models and aggregations

Conclusions

- Overall conclusion does not change depending on the modeling choices in this very large study
- These differences might be important for smaller sample sizes
- Obtaining accurate estimates would greatly inform risk assessments and cost-benefit analyses, impacting thus regulatory actions

References


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