



# Symposium on Causal Methods in Epidemiological Studies of Particulate Matter and Mortality

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**Gradient**

October 3, 2018  
Chapel Hill, NC

# Exposure to PM<sub>2.5</sub> and Mortality

- Associations observed using conventional regression analyses
- Considerable geographical variation
- Toxicities of PM constituents differ
- Co-pollutants and unmeasured confounders
- Shape of dose-response curve uncertain (low-dose effects?)
- Project goals
  - Apply causal methods to PM<sub>2.5</sub> and mortality
  - Compare findings from different methods

# Dataset

## Medicare beneficiary mortality data

- National data from the Centers for Medicare & Medicaid Services (CMS)
- Individual-level mortality data
- Aggregated mortality data: daily death counts by county

## Air pollution data

- Monitored data from US EPA Air Quality System (AQS)
- Daily county-level average 24-hour  $PM_{2.5}$  and 8-hour max ozone concentrations

# Dataset

## Meteorology data

- National Oceanic Atmospheric Administration (NOAA)
- County level
- Daily maximum, minimum, and average temperature
- Average and maximum wind speed
- Dew point temperature
- Barometric pressure

## Census data

- National census data
- Population size by county

# Projects Should Address

- Is ambient  $PM_{2.5}$  causally related to mortality?
- Does/will reducing ambient  $PM_{2.5}$  benefit public health?
- What are the uncertainties in quantitative  $PM_{2.5}$  risk estimates?
- What are the potential explanations for geographical heterogeneity in the risk estimates for  $PM_{2.5}$ ?

# Project History: RfP

- Funders
  - American Petroleum Institute
  - American Forest & Paper Association
  - American Wood Council
  - National Council for Air and Stream Improvement
  - Electric Power Research Institute
  - ExxonMobil Corporation
  - Other Consortium Support
- Request for Proposals (RfP) sent out in 2015
  - > 100 recipients
  - 13 submitted intention-to-bid letters
  - 7 submitted proposals

# Project History: Proposal Review

- Proposal review committee
  - Francesca Dominici, Harvard T.H. Chan School of Public Health
  - Sander Greenland, UCLA emeritus
  - Ana Rappold, US Environmental Protection Agency
- Proposal review meeting on January 14, 2016
  - Structured review form with scores for innovation, approach, and feasibility
  - Forms updated after lengthy discussion
  - Three proposals with the highest scores selected
  - Follow-up Q&As between the proposal review committee and the three selected research groups

# Project History: Data Application

- Communication with ResDAC
  - Initial consultation in the fall of 2015
  - Data policy change in 2016
  - Indiana University became the data requesting organization and custodian
- Data application
  - Application documents submitted in early 2017
  - Data received in the fall of 2017



# Project History: IU Data Center

- Indiana University Data Center
  - Assumes the role of Data Custodian
  - Provides and operates cyberinfrastructure for data storage and analysis
  - Provides technical support to research teams



# Project History: Project Review

- Project review committee
  - Stephen Cole, UNC-Chapel Hill Gillings School of Global Public Health
  - Eric J. Tchetgen, Wharton School, University of Pennsylvania
  - Ana Rappold, US Environmental Protection Agency

# Agenda: Wednesday, October 3

Time	Session	Speakers
1:00 – 1:30 PM	Welcome and Introductions	<b>Julie E. Goodman, Ph.D., DABT, FACE, ATS</b> <i>Gradient</i> <b>G. Bruce Copley, Ph.D., MPH</b> <i>ExxonMobil Biosciences, Inc.</i>
1:30 – 3:15 PM	Causal Estimates of the Relationship between Fine Particulate Matter and Mortality using Attainment Status under the Clean Air Act Amendments	<b>Matthew Neidell, Ph.D.</b> <i>Columbia University</i> <b>Nicholas Sanders, Ph.D.</b> <i>Cornell University</i> <b>Alan Barreca, Ph.D.</b> <i>UCLA</i>
3:15 – 3:45 PM	Break	
3:45 – 5:50 PM	The Impact of PM <sub>2.5</sub> on Mortality - Evidence from a Natural Experiment	<b>Yi Wang, Ph.D.</b> <i>Indiana University</i> <b>Maoyong Fan, Ph.D.</b> <i>Ball State University</i>
6:00 – 7:00 PM	Reception	Meadowmont Grill

# Agenda: Thursday, October 4 (Morning)

Time	Session	Speakers
8:00 – 9:15 AM	<b>Keynote: State of the Science Seeking the Holy Grail: Searching for Causality in Health and Air Pollution Data</b>	<b>Daniel Greenbaum, M.C.P.</b> <i>President, Health Effects Institute</i>
9:15 – 11:15 AM	<b>A Counterfactual Approach to Quantify the Causal Effect of Fine Particulate Matter on Mortality Using a Novel Approach</b>	<b>Zhengyuan Zhu, Ph.D.</b> <i>Iowa State University</i> <b>Zhulin He, Ph.D.</b> <i>Iowa State University</i> <b>Richard Smith, Ph.D.</b> <i>University of North Carolina at Chapel Hill</i>
11:15 – 11:30 PM	<b>Break</b>	
11:30 – 12:30 PM	<b>Perspectives from Other Causal Research</b>	<b>Tony Cox, Ph.D.</b> <i>Cox Associates</i> <b>Julie E. Goodman, Ph.D., DABT, FACE, ATS</b> <i>Gradient</i>

# Agenda: Thursday, October 4 (Afternoon)

Time	Session	Speakers
12:30 – 1:30 PM	Lunch	DeBose Home
1:30 – 3:30 PM	<b>Roundtable with the Researchers: Future Directions and Data Needs for Quasi-Experimental and Counterfactual Research</b>	<b>Giffe Johnson, Ph.D., M.P.H.</b> <i>National Council for Air and Stream Improvement</i> <b>Jason Sacks, M.P.H.</b> <i>US Environmental Protection Agency</i> <b>David Savitz, Ph.D.</b> <i>Brown University</i> <b>Matthew Neidell, Ph.D.</b> <i>Columbia University</i> <b>Yi Wang, Ph.D.</b> <i>Indiana University</i> <b>Zhengyuan Zhu, Ph.D.</b> <i>Iowa State University</i> <b>Richard Smith, Ph.D.</b> <i>University of North Carolina at Chapel Hill</i>
3:30 – 3:45 PM	Closing Remarks	