The webinar will begin shortly.

If you experience any logistical difficulties, please contact us using the “Chat” box or by email: qpham@healtheffects.org

Please put your questions in the Q&A box.
Why Study the Health Effects of Low Levels of Air Pollution?
HEI’s Low Level Research Program

HEI Webinar, August 23, 2022
Eva Tanner, Health Effects Institute
Why Study the Health Effects of Low Levels of Ambient Air Pollution?

- Ambient air pollution levels have decreased over the past few decades in many high-income countries.

- In the 2010s, several studies reported associations between health outcomes and air pollution at levels below then-current air quality standards.

- Limited evidence on exposure-response functions at the lower exposures.
Why Study the Health Effects of Low Levels of Ambient Air Pollution?

- Ambient air pollution levels have decreased over the past few decades in many high-income countries
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![Graph showing relative risk of death vs. PM2.5 levels]
Critical Questions to Answer for Risk Assessment and Regulation

- At what level should ambient air quality standards be set?
- To what level of exposure should we estimate health effects, and benefits of further reduction?
Overall Objectives of RFA 14-3

- Assess the health effects of long-term exposure to low levels of ambient air pollution (all-cause and cause-specific mortality and morbidity)

- Investigate exposure-response functions for PM$_{2.5}$ and other pollutants at low levels

- Develop statistical and other methods
Key Features of the Three Selected Studies

- Large Populations
- High-quality Exposure Assessment Models
- Novel Statistical Methods
  
  - Relative Risk of Death
  
  ![Graph showing relative risk of death vs. PM$_{2.5}$ concentration]
HEI Studies Estimating the Health Effects of Low Levels of Air Pollution

PI: Michael Brauer
Census-based cohort of 7 million Canadian adults
PM$_{2.5}$ = 7 µg/m$^3$

PI: Francesca Dominici
68 million older Americans Enrolled in Medicare
PM$_{2.5}$ = 11 µg/m$^3$

PI: Bert Brunekreef
Cohort consortium of 28 million Europeans across 11 countries
PM$_{2.5}$ = 15 µg/m$^3$
Study Teams

Michael Brauer  
(University of British Columbia)  
Jeff Brook (University of Toronto)  
Rick Burnett (Health Canada)  
Dan Crouse (University of New Brunswick)  
Anders Erickson (University of British Columbia)  
Perry Hystad (Oregon State University)  
Randall Martin, Aaron van Donkelaar (Dalhousie University)  
Mike Tjepkema (Statistics Canada)  
Scott Weichenthal (McGill University)

Bert Brunekreef  
(Utrecht University)  
Richard Atkinson (University of London, UK)  
Marie-Christine Boutron-Ruault (French Institute of Health and Medical Research)  
Kees de Hoogh (Swiss Tropical and Public Health Institute)  
Francesco Forastiere (King's College London)  
John Gulliver (Imperial College, UK)  
Ole Hertel (University of Aarhus, Denmark)  
Gerard Hoek, Maciej Strak (Utrecht University, Netherlands)  
Barbara Hoffman (University of Düsseldorf, Germany)  
Nicole Janssen (National Institute of Public Health and the Environment)  
Klea Katsouyanni (University of Athens, Greece)  
Goran Pershagen (Karolinska Institute, Sweden)  
Annette Peters (Helmholtz Zentrum, Germany)  
Ole Raaschou-Nielsen (Danish Cancer Society)  
Per Schwarze (Norwegian Institute of Public Health)  
Danielle Vienneau (Swiss Tropical and Public Health Institute)  
Gudrun Weinmayr (University of Ulm, Germany)

Francesca Dominici  
(Harvard University)  
Joey Antonelli (Harvard University)  
Danielle Braun (Harvard University)  
Christine Choirat (Harvard University)  
Brent Coull (Harvard University)  
Qian Di (Harvard University)  
Marianthi Kioumourtzoglou (Harvard University)  
Itai Kkloog (Ben-Gurion University)  
Petros Koutrakis (Harvard University)  
Rachel Nethery  
Ben Sabbath (Harvard University)  
Joel Schwartz (Harvard University)  
Richard Yun Wang (Harvard University)  
Thomas Ander Wilson (Harvard University)  
Xiao Wu (Harvard University)  
Antonella Zanobetti (Harvard University)
Ensuring the Highest Quality Research

Detailed Oversight

✓ Oversight Committee
  - Bi-annual progress reports
  - Annual requests for contract renewal
  - Webinars and presentations at HEI Annual Conference

✓ QA/QC audits

Intensive Review of Final Reports

✓ Independent Panel to review and prepare Commentaries
Mortality and Morbidity Effects of Long-Term Exposure to Low-Level PM$_{2.5}$, BC, NO$_2$, and O$_3$: An Analysis of European Cohorts in the ELAPSE Project
by Bert Brunekreef and Colleagues

- Developed new exposure models for PM$_{2.5}$, BC, NO$_2$, and O$_3$ across Europe
- Health data from 11 European countries to analyze (a) pooled cohort of 15 well-characterized cohorts and (b) 7 administrative cohorts
- Both approaches showed PM$_{2.5}$, BC, and NO$_2$ exposures associated with natural-cause, cardiovascular, respiratory, and lung cancer mortality
- Found increased risks for natural-cause mortality at even the lowest observed concentrations for PM$_{2.5}$, BC, and NO$_2$
Assessing Adverse Health Effects of Long-Term Exposure to Low Levels of Ambient Pollution: Implementation of Causal Inference Methods by Francesca Dominici and Colleagues

- Developed exposure models for PM$_{2.5}$, NO$_2$, and O$_3$ across the contiguous U.S.
- Medicare claims data from 68 million older Americans
- Applied 3 newly developed causal inference approaches and 2 traditional regression approaches
- All approaches showed PM$_{2.5}$ and NO$_2$ exposures associated with increased risks for all-cause mortality
- Larger effect estimates at the lowest PM$_{2.5}$ concentrations
For today…

Mortality–Air Pollution Associations in Low Exposure Environments
by Michael Brauer and Colleagues

✓ Census-based cohort of 7 million Canadian adults
✓ Annual exposures to PM$_{2.5}$, NO$_2$, O$_3$
✓ traditional linear regression and 3 nonlinear modeling approaches