New HEI studies assessing health effects of low levels of air pollution

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Key Features

Very large populations drawn from administrative databases (e.g., national census) or multiple (traditional) cohort studies

Exposure models at fine spatial resolution

Development and application of new statistical methods (e.g., indirect confounder control, causal modeling, exposure measurement error)

Geographical areas

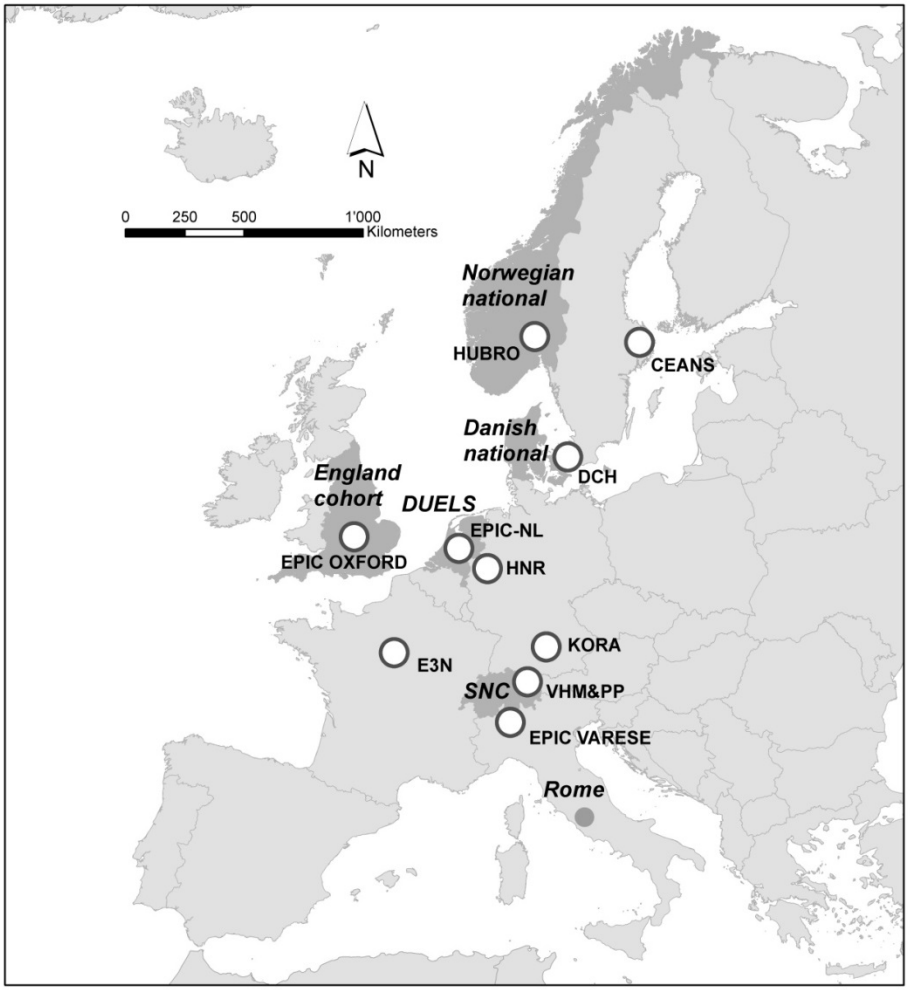
Large Study Populations

Large Study Populations

The European Study of Cohorts for Air Pollution Effects (ESCAPE) was recently completed

Data of 10 ESCAPE cohorts will be pooled

6 large administrative cohorts will be used as well



Health Outcomes

All cause and cause-specific mortality

Lung cancer incidence

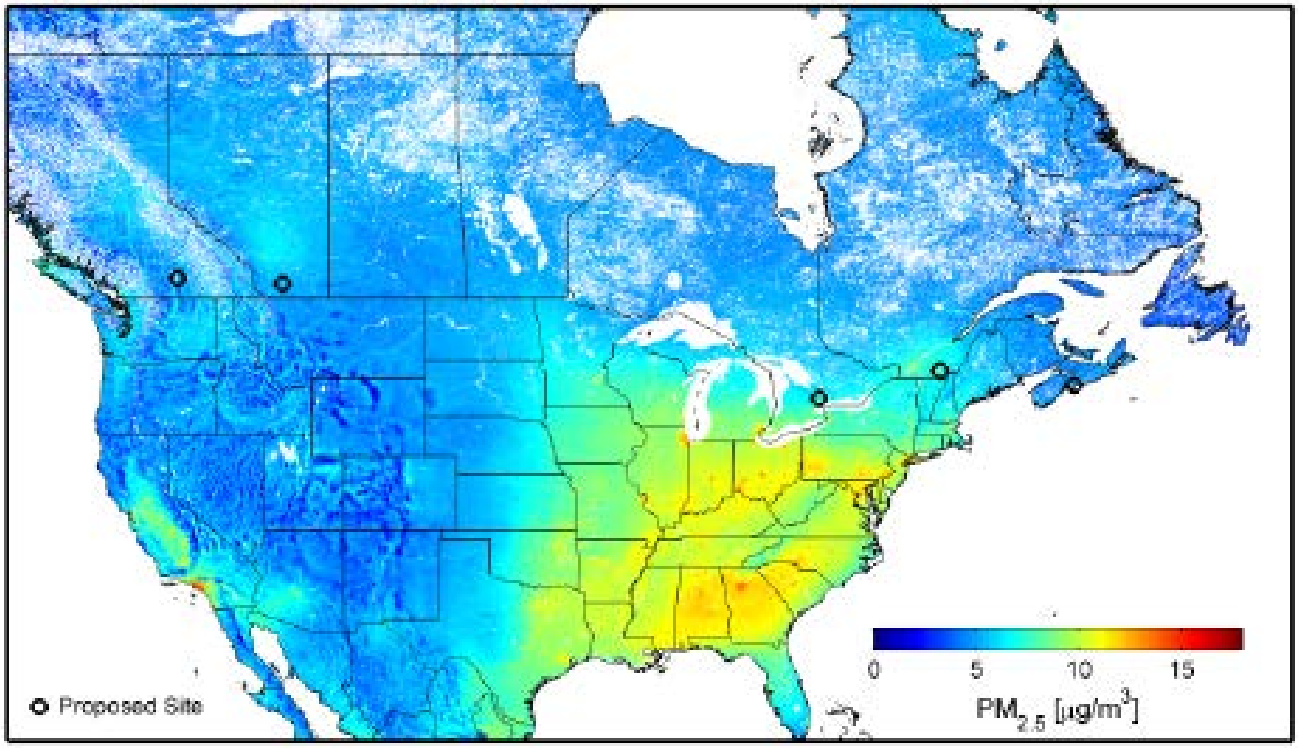
Cause-specific hospitalization

Exposure Assessment

- $PM_{2.5}$, NO_2, O_3, [PM components including BC]
- Long-term exposure estimates,1980-2014
- Hybrid models that combine satellite data, chemical transport models, land use variables, and monitoring data
- Exposure estimated at high spatial resolution (address level, 1 by 1 km grid)
- Residential mobility taken into account
- New statistical methods will be developed to correct for exposure measurement error

Exposure – Canadian study

Validation study satellite data with ground level measurements



Part of SPARTAN, http://www.spartan-network.org

Exposure – US study

- $PM_{2.5}$, NO_2, O_3, PM components
- Different exposure data sources including satellite data and ground based monitoring
- Exposure estimated at 1 by 1 km grid

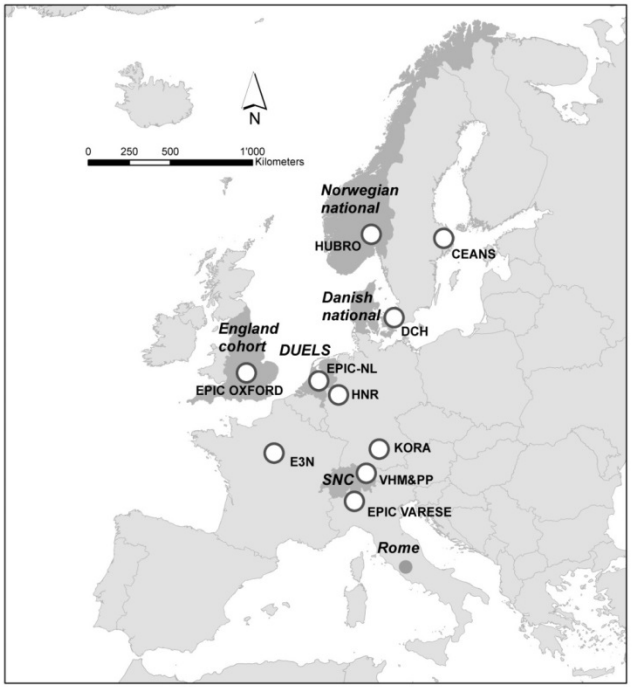
- Aerosol Optical Depth
- MODIS MAIAC Product
- Terra and Aqua Satellites (NASA)

GROUND MONITORING DATA (EPA):

- Gases, PM2.5 Mass & Species
- Land Use Variables (NGA)
- National Emission Inventories (EPA)
- Weather and Visibility (NOAA)
- Normalized Difference Vegetation Index (NASA)

Exposure – European study

- $PM_{2.5}$, NO_2, O_3, BC
- Europe-wide models as well as location-specific models
- Land use regression models that include satellite data, air pollution dispersion estimates, land use variables, traffic data and ESCAPE monitoring data
- Exposure estimated at address level



Confounding

Detailed individual-level information in ESCAPE cohorts:

Age, gender, marital status, SES, active and passive smoking, diet, BMI

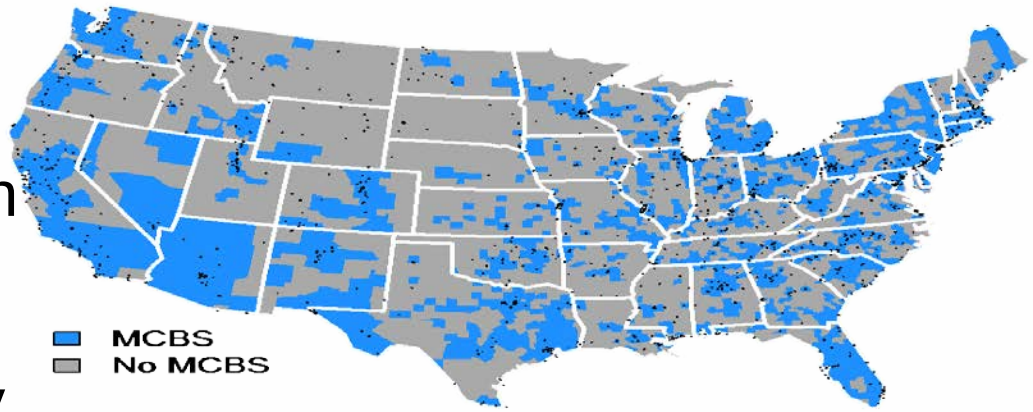
Less individual covariate information available in administrative cohorts:

Age, gender, marital status, SES

Confounding - Indirect methods

Individual co-morbidity data for diseases linked with smoking, e.g., COPD

Ancillary information from surveys, e.g., the Canadian Community Health Survey (CCHS) and the Medicare Current Beneficiary Survey (MCBS)



Statistical methods available (e.g., Shin et al. 2014, Environmental Research)

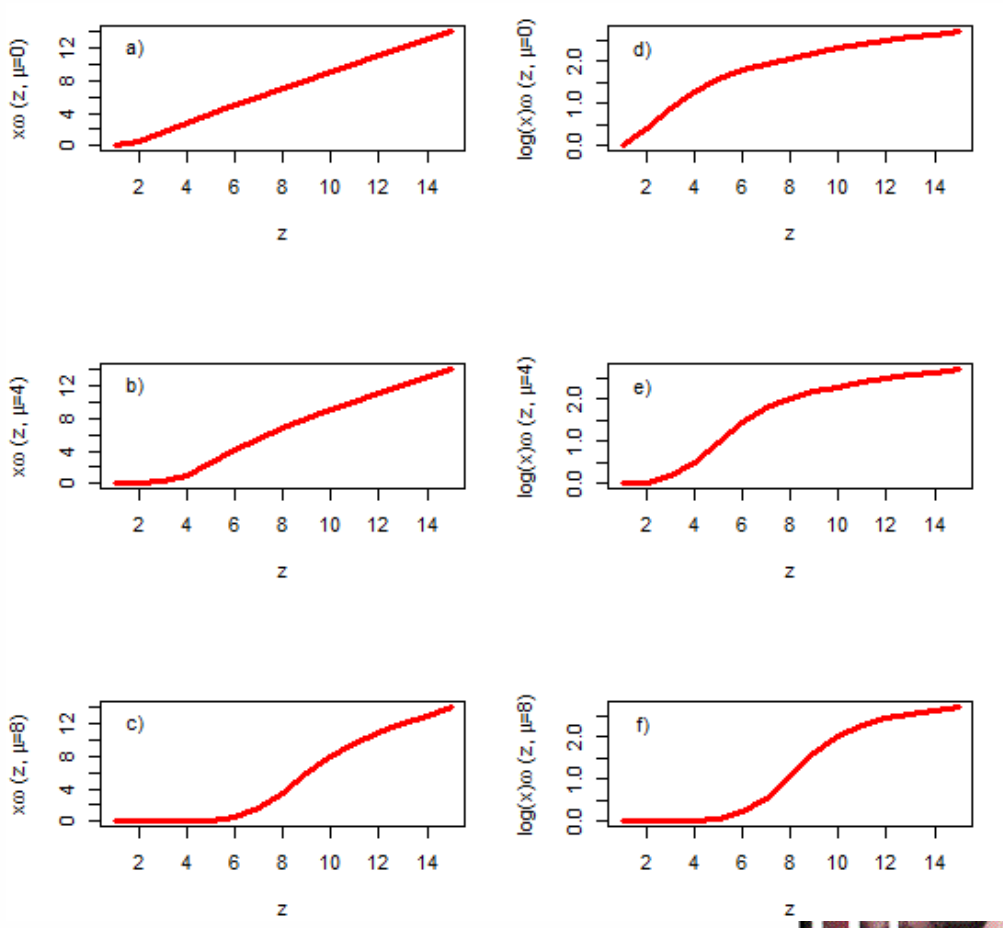
Analyses

- Cox proportional hazard models (relative and absolute risk) and causal modeling
- Single and multi-pollutant models
- Rigorous control for important confounding variables
- Possible interactions (e.g., air pollution and smoking)
- Many additional analyses (e.g., timing of exposure, additional control for traffic noise)

Characterize possible exposure-response functions

A priori ‘simple’ shapes will be explored based on biologically plausibility and suitability for risk assessment

Also fitting splines, threshold models and subgroup analyses (below specified concentrations)



Thank You