Advancing clean air and air pollution research in Europe

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HEI Annual Conference
Boston
April 30, 2023
The European Union
A Regional Air Quality Snapshot

FIGURE 1: Population-weighted annual average PM$_{2.5}$ exposures in 2019
HEI’s role in advancing clean air in Europe

1. Funding policy-relevant research
2. Supporting capacity building
3. Communicating science to policy makers
1. HEI Research Program targeted at low concentration levels

1. Down to what levels can we observe long-term health effects?

2. What does the exposure-response function look like at the low end of exposure?
Methods

• **Part 1**: Pooling eight European cohorts (mostly from prior ESCAPE study) with extensive individual-level data (N = 393,000; 7.5 Mill person years)

• **Part 2**: Seven separate large administrative cohorts from seven countries in Europe (N = 28 Mill)
Europe-wide **hybrid** land use regression models (100x100 m)

**Year 2010** pollutant concentrations from Airbase and ESCAPE

Land use and road data, **satellite** observations and **dispersion** model

De Hoogh et al., Env Res 2016, Env Int 2018
Natural mortality
Pooled Cohort – PM2.5 and NO2

Results - highlights
• Effects down to lowest observed levels
• No threshold
• Effect sizes higher than previously estimated
• Effect sizes higher at lower end of exposure

Strak et al., BMJ 2021
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


Includes a Commentary by the Institute’s Low-Exposure Epidemiology Studies Review Panel

 ISSN 2041-5355 (print)
 ISSN 2689-601X (online)

Elapsee

Health Effects at Low Air Pollution Levels Informing Europe’s Air Quality Policies

October 12, 2021 CEST

October 12 from 3 to 5 PM CEST | 9 to 11 AM ET

Watch the webinar

A new Health Effects Institute Research Report by Bert Brunekreef at University of Utrecht, and other leading scholars and experts, details the importance of exposures to low concentrations of ambient air pollution and several health outcomes among the European Union. The report is based on a large study population of about 28 million participants across Europe. The study was funded by the European Commission and compares exposures to low levels of air pollution in very large populations across the United States, Canada, and Europe.

This webinar presented results from the European study, discuss their strengths and weaknesses, and how they can inform future policies. The new results will inform the revision of the European Air Quality Directive, which is slated for 2022.

Record high of almost 900 registrations!

https://www.healtheffects.org/publications
2. Capacity - HEI Program on SE Europe

Virtual Workshop on Air Pollution and Health in Southeast Europe

June 8, 2021 to June 9, 2021 CEST

As fine particulate matter (PM<sub>2.5</sub>) levels in Southeast Europe have remained higher than in those of Western Europe for decades, public and governmental interest in the topic increases, and the demand for data and evidence on air pollution levels and trends as well as health effects is growing. In an effort to focus the discussions related to air quality and health, the Health Effects Institute (HEI), the International Society for Environmental Epidemiology (ISEE), the European Respiratory Society (ERS), the Medical University of Plovdiv, Bulgaria, and environmental health institutions in Serbia jointly hosted a virtual workshop on June 8–9, 2021 (9–14 PM CET) to review the status of current evidence on the health effects of air pollution in the Southeast European region and its interlinkage to current policy debate and actions. The workshop is part of the larger HEI project in Southeast Europe funded by the Clean Air Fund.

Read the workshop summary and key results.

Session recordings are now available:

Workshop on Air Quality and Health in Bulgaria

June 14, 2022
In-person & online
3. Communication to policy makers in the EU

Revision of the EU Ambient Air Quality Directive (AAQD)
EU Clean Air Policy Milestones 2020 to 2023

- Fitness Check (published in Nov 2019)
- Council Conclusions
- NEC Implementation Report (Commission Communication)

**I / 2020**
- EEA Air Quality Report 2020
- Inception Impact Assessment (revising the Air Quality Directive)
- Second Clean Air Outlook (Commission Report)

**II / 2020**
- Expert consultation (on monitoring, modelling, plans)
- WHO Guidelines publication (postponed to II/2021)
- Zero Pollution Action Plan

**I / 2021**
- EEA Air Quality Briefings 2021
- WHO Guidelines publication (22 September 2021)

**II / 2021**
- Targeted consultation
- Impact Assessment (air quality – revision of EU rules)

**I / 2022**
- EEA Air Quality Briefings 2022
- Public consultation (air quality – revision of EU rules)
- Adoption: legislative proposal (air quality – revision of EU rules)
- Review Gothenburg Protocol (Air Convention)

**II / 2022**
- Third Clean Air Outlook (Commission Report)

**I / 2023**
- EEA Air Quality Briefings 2023

**II / 2023**
- Submission of Second National Air Pollution Control Programmes begins
- 4th EU Clean Air Forum (location to be determined)

- EU Parliament forms position
- Council discussions of legislative proposal (air quality - revision of EU rules)
Joint Conference in Brussels in 2020

Main points

• Substantial BoD and economic impact in EU
• No observable threshold
• Abatement measures work
• Current EU regulations not in line with scientific evidence

Air pollution and Health: Recent Advances to Inform the European Green Deal

January 21-22, 2020
Square Brussels Convention Centre, Coudenberg 3, 1000 Brussels, Belgium

ERJ 2020

Air pollution and health: recent advances in air pollution epidemiology to inform the European Green Deal: a joint workshop report of ERS, WHO, ISEE and HEI

Barbara Hoffmann¹, Nathalie Roebeke², Sophie Gumy³, Francesco Forastiere³, Bert Bruneckert⁴, Dorota Jarosinska⁵, Katherine D. Walker⁶, Annemoon M. van Erp⁷, Robert O’Keefe⁸, Dan Greenbaum⁹, Martin Williams⁵,¹, Michal Krzyzanowski¹⁰, Frank J. Kelly¹, Michael Brauer¹⁰, Hans Bruyninckx¹ and Hanna Boegaard¹⁰
Impact assessment – burden of disease

Relative Risk 1.080

Study to support the impact assessment for a revision of the EU Ambient Air Quality Directives

PM$_{2.5}$ WHO, cut-off 5 μg/m$^3$

Premature mortality for 2030, base

NO$_2$ WHO, cut-off 10 μg/m$^3$

Total mortality and PM$_{2.5}$

<table>
<thead>
<tr>
<th>Cohort</th>
<th>Weights</th>
<th>HR [95% CI]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belgian 2001 Census</td>
<td>•</td>
<td>13.047% 1.100 [1.073, 1.128]</td>
</tr>
<tr>
<td>Danish cohort</td>
<td>•</td>
<td>12.437% 1.200 [1.100, 1.302]</td>
</tr>
<tr>
<td>DUELS</td>
<td>•</td>
<td>12.237% 1.030 [0.984, 1.078]</td>
</tr>
<tr>
<td>NORCOHORT</td>
<td>•</td>
<td>13.207% 1.113 [1.029, 1.134]</td>
</tr>
<tr>
<td>Rome Longitudinal study</td>
<td>•</td>
<td>11.413% 1.234 [1.161, 1.312]</td>
</tr>
<tr>
<td>Swiss National Cohort</td>
<td>•</td>
<td>13.061% 1.030 [1.006, 1.055]</td>
</tr>
<tr>
<td>English CPRD</td>
<td>•</td>
<td>12.308% 1.046 [1.001, 1.094]</td>
</tr>
<tr>
<td>ELAPSE posed cohort</td>
<td>•</td>
<td>12.269% 1.177 [1.126, 1.231]</td>
</tr>
<tr>
<td>RE Model</td>
<td>•</td>
<td>100.000% 1.118 [1.060, 1.179]</td>
</tr>
</tbody>
</table>

Hazard ratio per 16 μg/m$^3$
Impact assessment – burden of disease

Relative Risk

1.080

1.118

1.020

1.045

RR=1.118
### Proposed Ambient Air Quality Directive – some highlights

<table>
<thead>
<tr>
<th>Pollutants*</th>
<th>2021 WHO Guidelines</th>
<th>EU Current Limit values</th>
<th>EU new proposed Limit values</th>
</tr>
</thead>
<tbody>
<tr>
<td>PM$_{2.5}$ (year)</td>
<td>5 µg/m$^3$</td>
<td>25 µg/m$^3$</td>
<td>10 µg/m$^3$</td>
</tr>
<tr>
<td>NO$_2$ (year)</td>
<td>10 µg/m$^3$</td>
<td>40 µg/m$^3$</td>
<td>20 µg/m$^3$</td>
</tr>
<tr>
<td>O$_3$ (long-term)</td>
<td>60 µg/m$^3$ (peak season)</td>
<td>-</td>
<td>100 µg/m$^3$ (annual, long-term objective)</td>
</tr>
</tbody>
</table>

- Average exposure reduction obligation for annual PM$_{2.5}$ and NO$_2$ (25% every 10 years)
- Regular review
- Monitoring, supersites (including UFP, BC, ammonia, oxidative potential, PM composition)
- Deduction of PM from natural sources
- Access to justice and compensation of damage
Joint Conference in Brussels – May 24, 2023

Briefing for EU MEPs

https://www.healtheffects.org/meeting/brussels-meeting-air-pollution-and-health-taking-stock-proposed-revision-ambient-air-quality
Where are we now in Europe?

1966

1994

2023

Thank you

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