National Institute for Public Health
and the Environment
Ministry of Health, Welfare and Sport

The role of air pollution in the COVID-19 pandemic

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Contents air pollution and COVID

1. Air pollution
2. Hypothesis
3. Research
4. How to proceed

Air pollution and COVID – the story

- Both air pollution and SARS-CoV-2 have an impact on the respiratory system and mortality

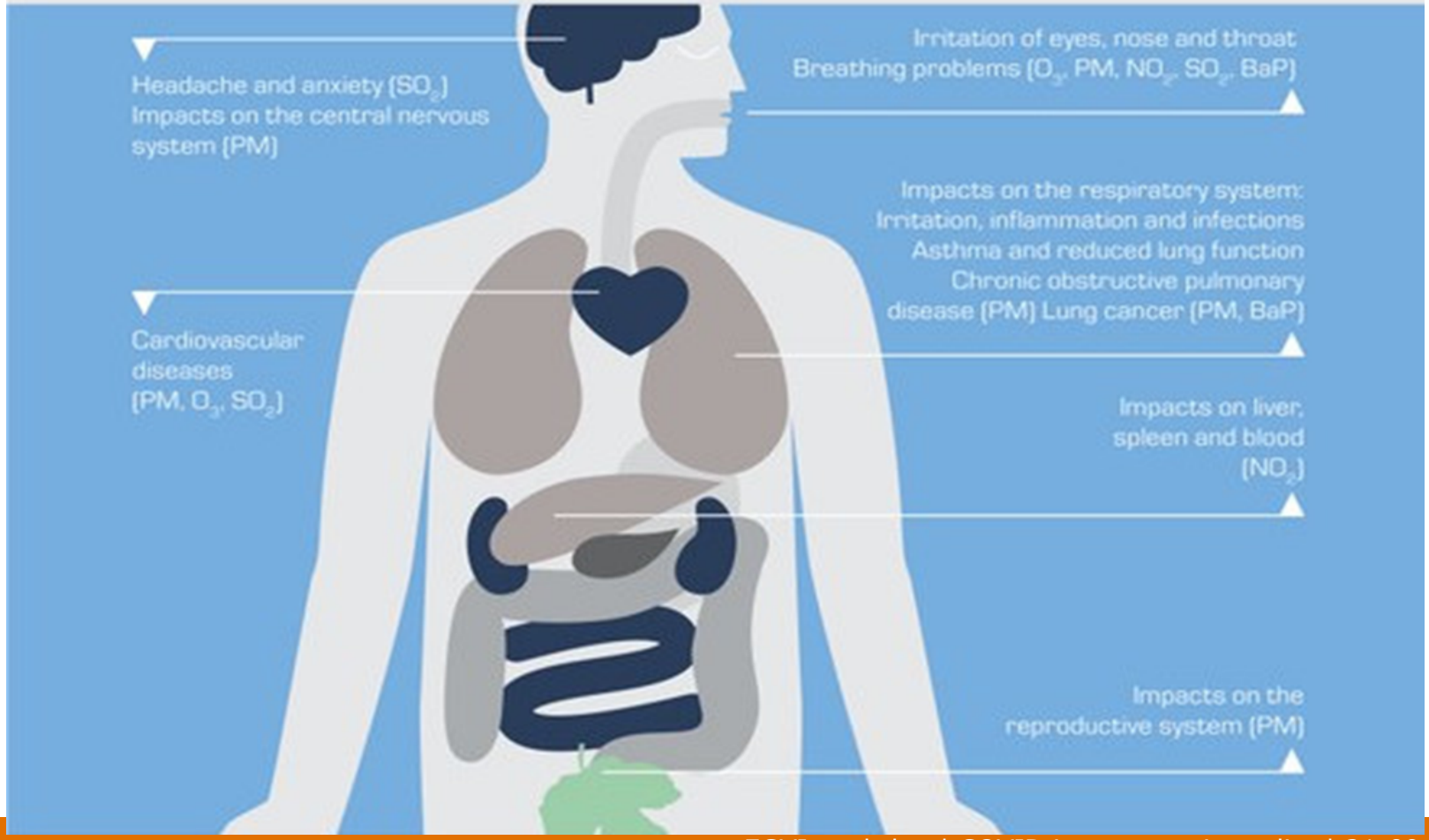
- …. and since some regions of the world have higher SARS-CoV-2 infection rates with higher mortality

- …. and these regions seem to have high concentration of air pollutants the story that came up was that COVID and air pollution should be related

European Environment Agency

Health impacts of air pollution

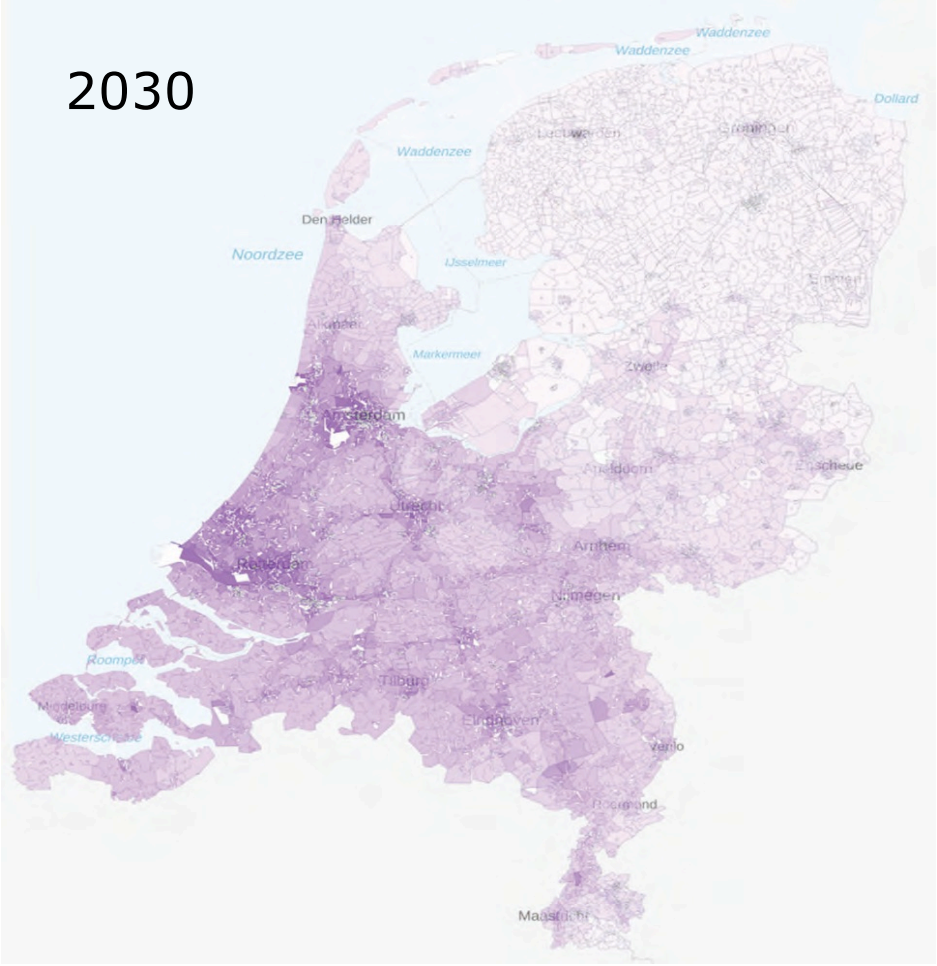
Air pollutants can have a serious impact on human health. Children and the elderly are especially vulnerable.



Loss of life expectancy

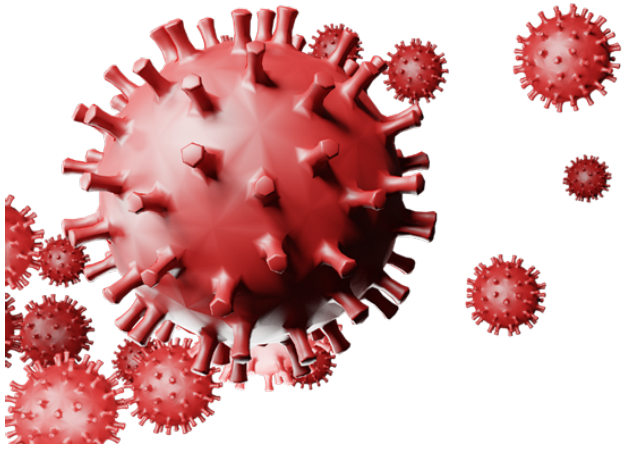
2016

2030

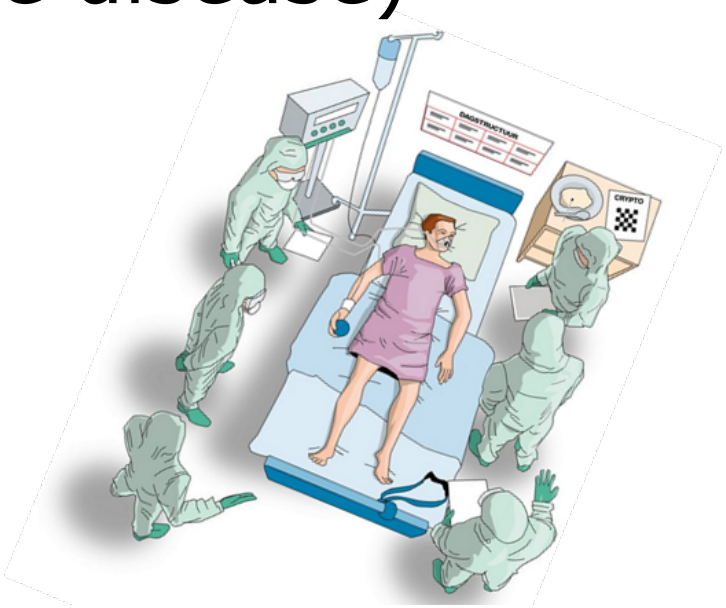


Two hypothesis

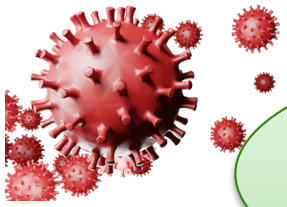
- Air pollution increases the risk of infection with the SARS-CoV-2 virus (accelerate spread)



- Air pollution causes a more serious course of COVID-19 (the disease)



Hypothesis 1 - Air pollution increased infection risk



High air pollution concentrations

Impact on respiratory system

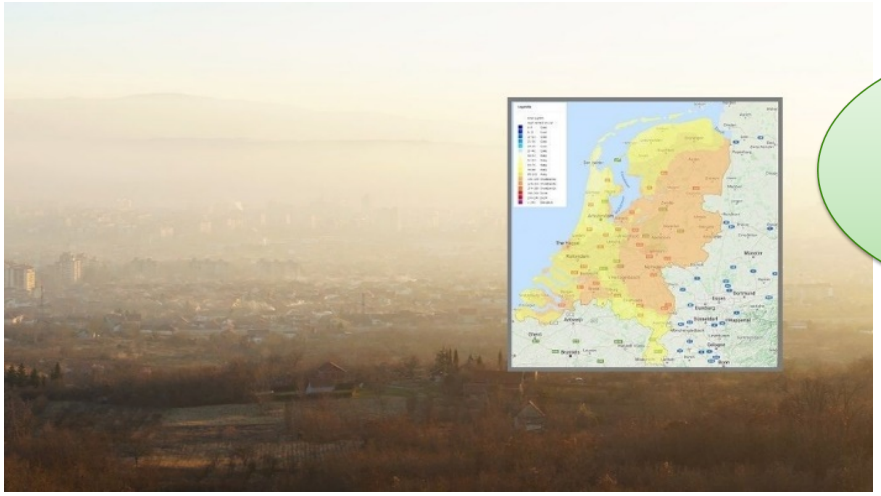
– **inflammation and infection**
- Asthma and reduced lungfunction
- COPD
- Lungcancer

– Increased susceptibility by increasing comorbid conditions associated with higher mortality in patients infected with COVID-19

– Increased rate of COVID-19 transmission by facilitating virus survival and transport over larger distances

Hypothesis 1 - Air pollution increased infection risk

- short-term exposure ('smog' episodes)



- long-term exposure

High air pollution concentrations

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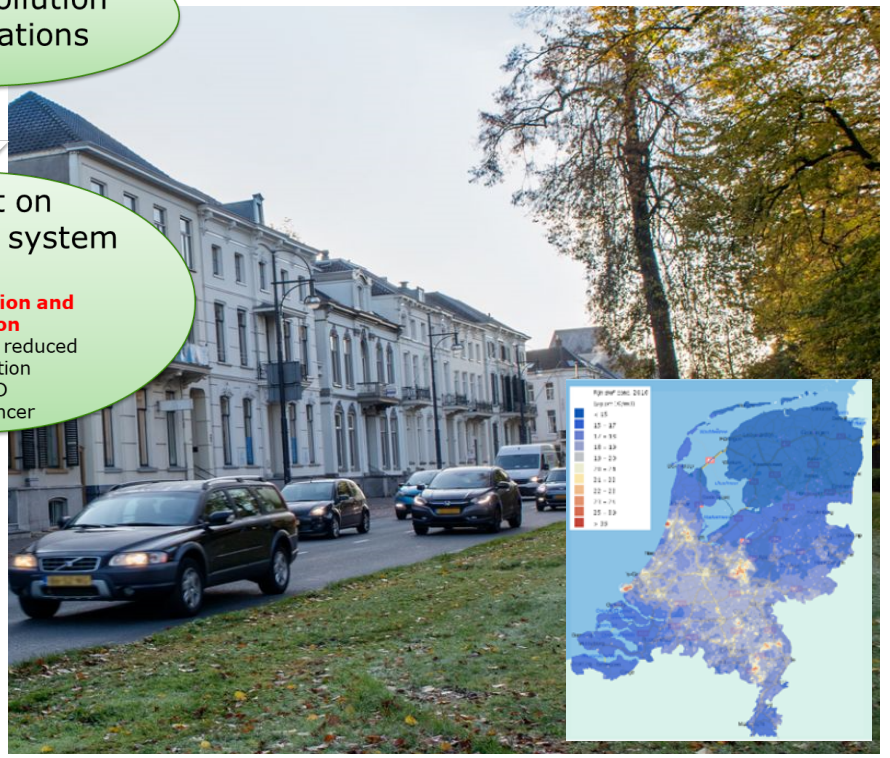
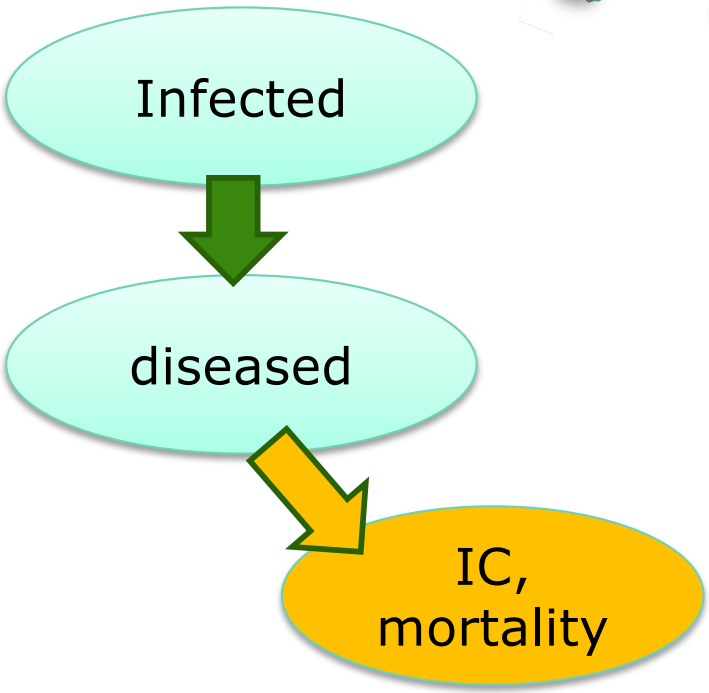


ISPAM - Innovative Sampling for Particulate Aerosols for Microorganisms

Hypothesis 2 – more severe disease course



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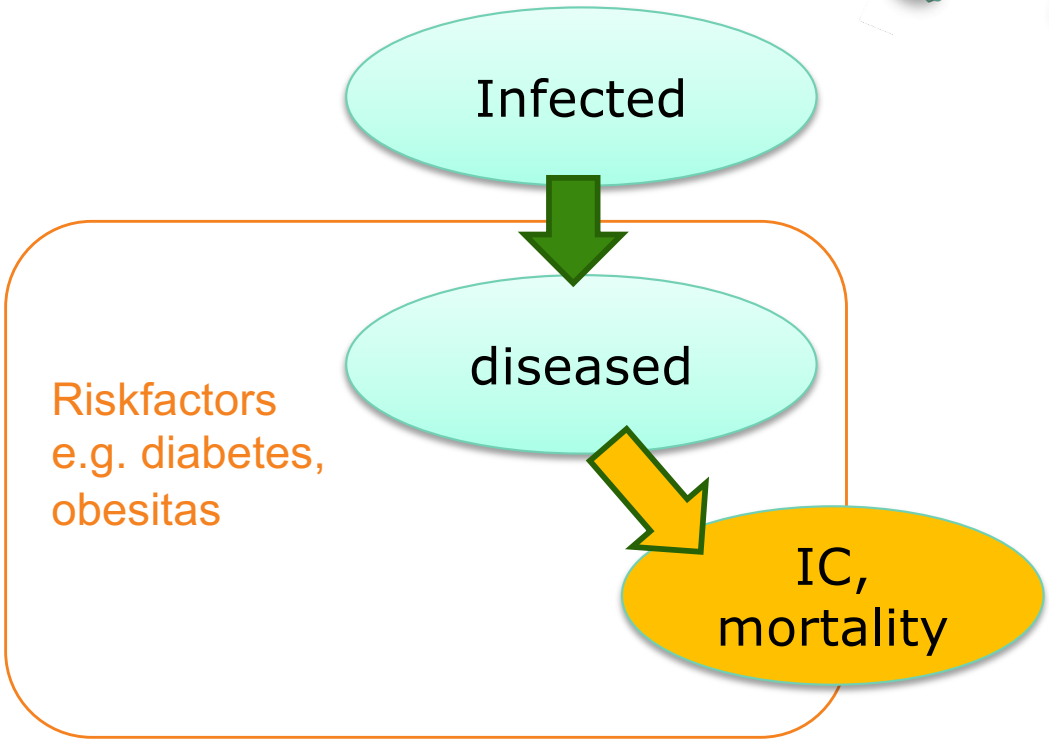

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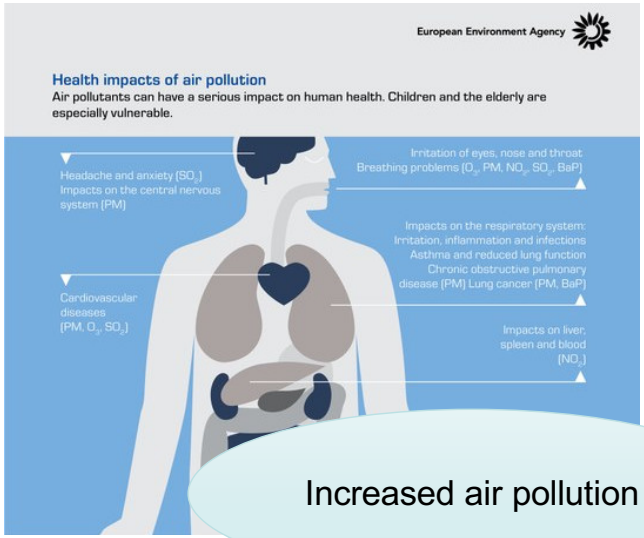


Increased air pollution

Increased cardiovascular disease

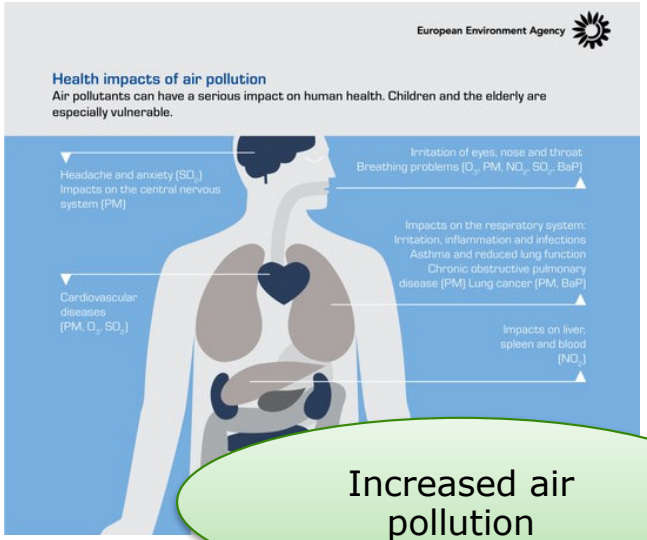
Infected

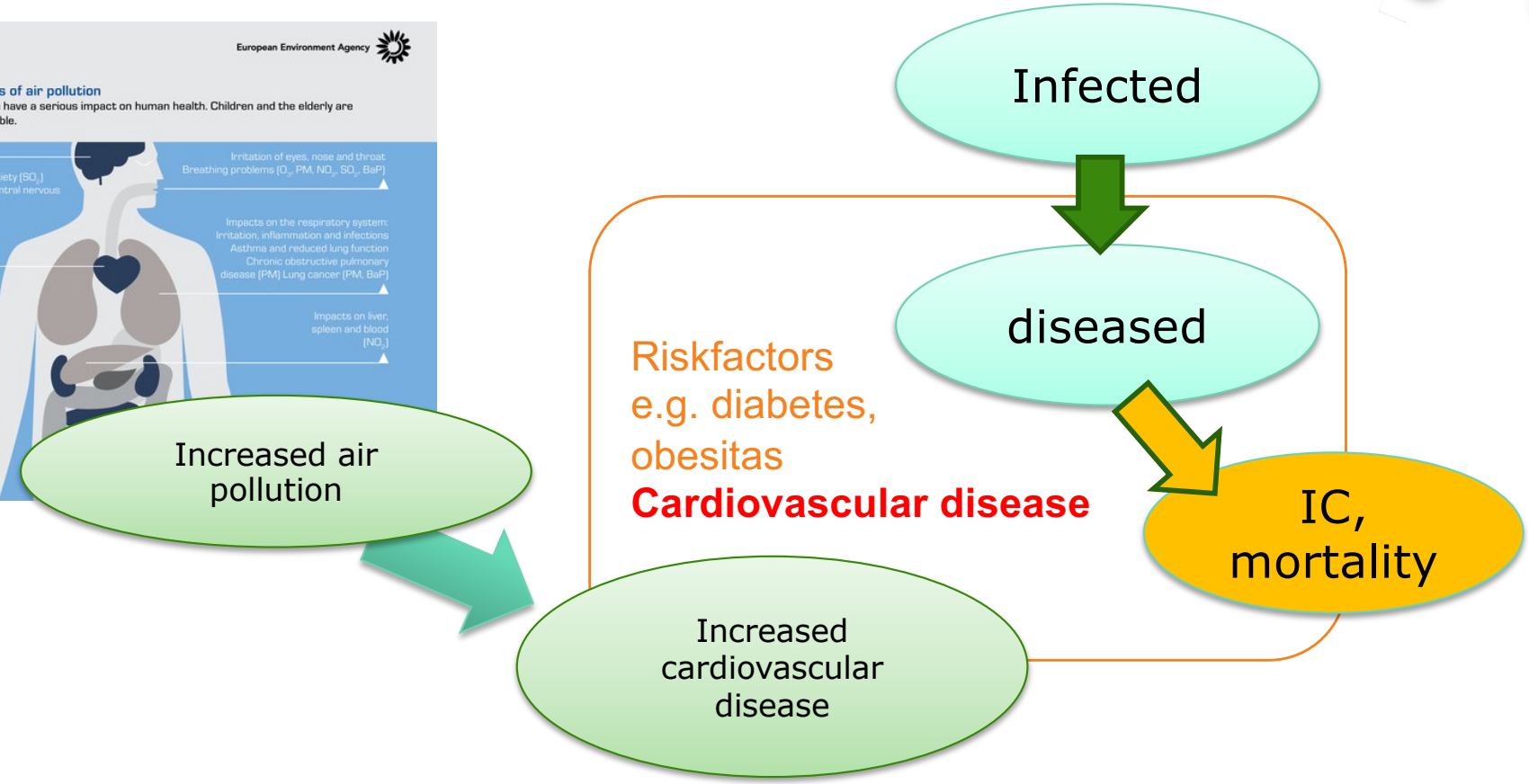
diseased

IC, mortality

Riskfactors e.g. diabetes, obesitas

Hypothesis 2 – more severe disease course





Both plausible hypothesis

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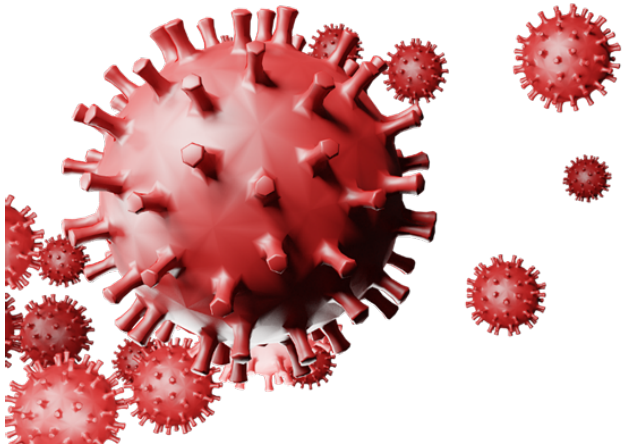
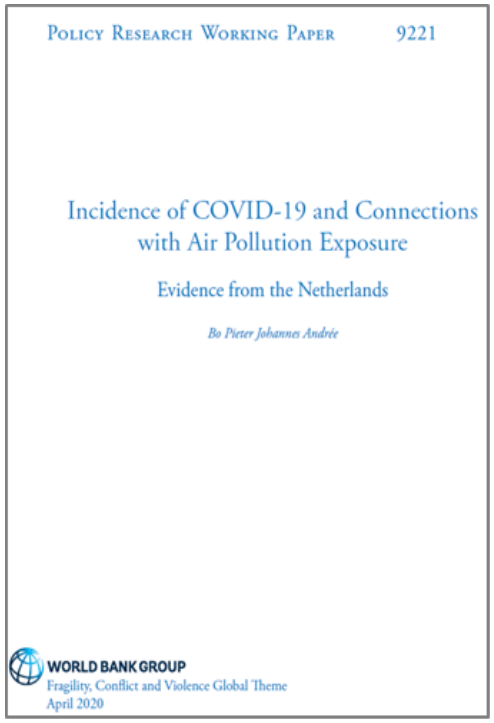


- Air pollution causes a more serious course of COVID-19 (the disease)

Research air pollution and COVID-19



- Many pre-prints nonpeer reviewed (no quality check)

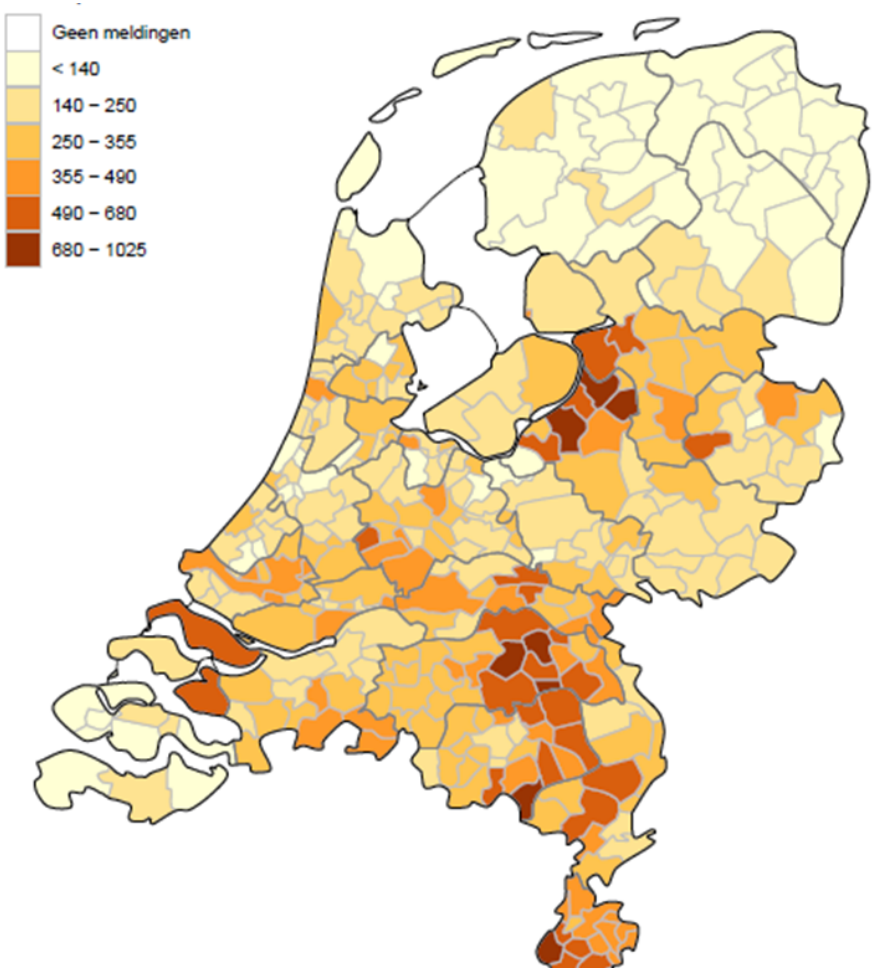
+ treatment patients	- discussion between scientists
+ acute crisis management	- papers adapted or withdrawn
	- uncertainty and lack of clarity

Research on air pollution and COVID complex

- Good research takes time
- Availability reliable and complete data also for situation related to the pandemic
  - New disease: which state of the pandemic, what measures are taken?
  - Infectious disease: transmission characteristics
  - Characteristics population and environment
  - Distance, age, behavior, activities etc.
- Important to unravel all these factors
  - Pitfalls e.g. in the Netherlands effect from Carnival or winter sports?

Spatial coherence

- Characteristics and circumstances of the pandemic also contains a spatial component
- These spatial variation might be related to air pollution



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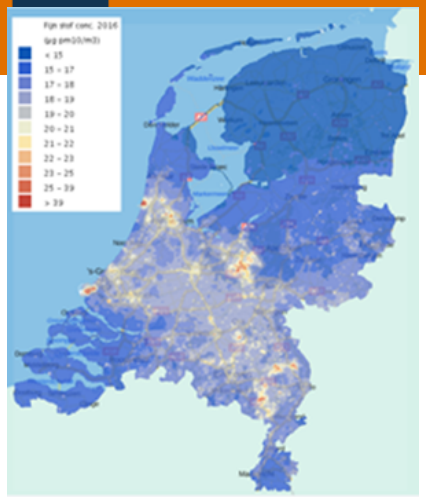

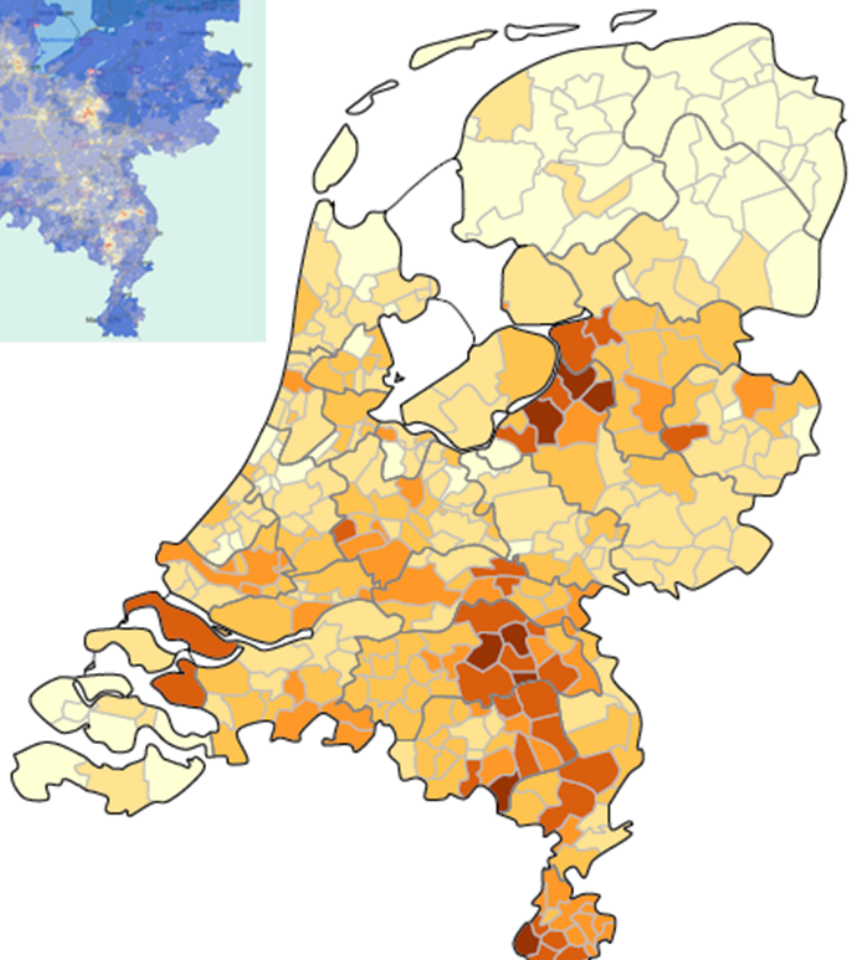

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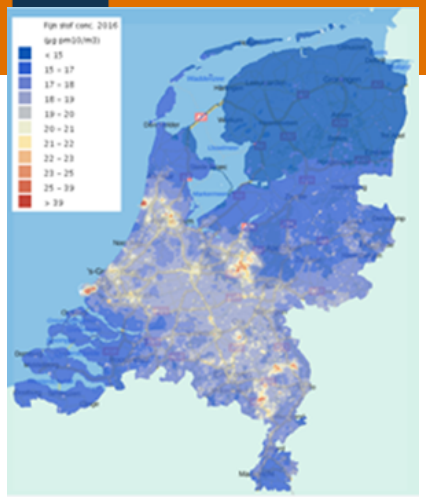

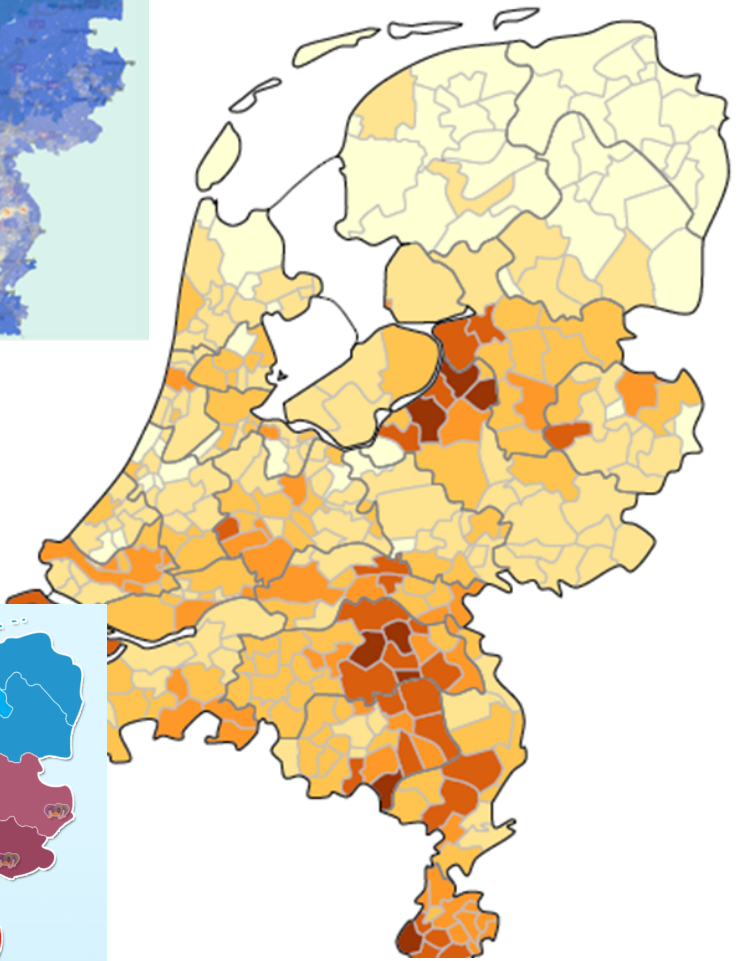

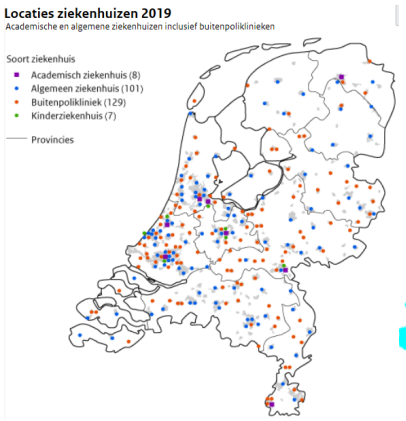

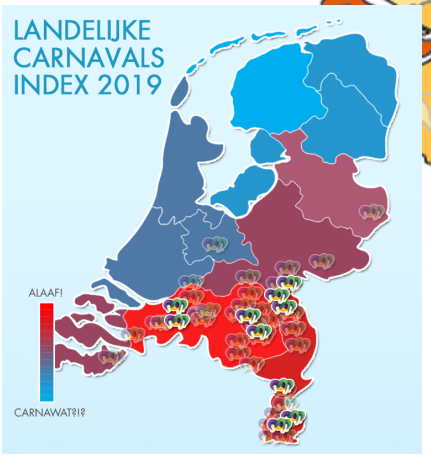

Challenges assessing effects of air pollution

Commentary

A Section 508–conformant HTML version of this article
is available at https://doi.org/10.1289/EHP7411.

Methodological Considerations for Epidemiological Studies of Air Pollution and the SARS and COVID-19 Coronavirus Outbreaks

Paul J. Villeneuve[1,2] and Mark S. Goldberg[2,3,4,5]

[1]School of Mathematics and Statistics, Carleton University, Ottawa, Canada
[2]Department of Epidemiology, Biostatistics, and Occupational Health, McGill University, Montreal, Canada
[3]Department of Medicine, McGill University, Montreal, Canada
[4]Gerald Bronfman Department of Oncology, McGill University, Montreal, Canada
[5]Centre for Outcomes Research and Evaluation, Research Institute of the McGill University Hospital Centre, Montreal, Canada

- Address critical features that should be considered:
  - Specification of the target population
  - Incidence and mortality of SARS and COVID-19
  - Timing on the pandemic curve
  - Physical distancing and other public health interventions
  - Spatiotemporal assignment of air pollution
  - Clustering of cases and deaths
  - Other determinants of COVID-19 mortality

Summary

Commentary

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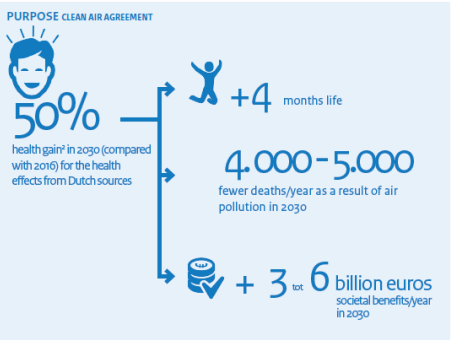
- Plausible that both daily increases and chronic exposures to outdoor air pollution adversely impact prognoses among those with SARS or COVID-19

- However, all studies had significant weaknesses that preclude them from providing insight about a causal association

How to proceed

- Although the hypothesis are plausible they require further research with advanced study designs
- Less air pollution is always better for health
- Consider impact COVID has on our transport and mobility in relation to air pollution now and in the future



Clean air for everyone!

Clean air is of vital importance. For everyone. Even though air has become much cleaner in recent decades, air pollution remains a major health risk in our country. In the Netherlands we live on average nine months shorter due to air pollution. And in one in five children with asthma, the disease is related to air pollution.
In short, there is work to be done. Our air can and must be cleaner. That is why, at the beginning of 2020, the Cabinet will sign the Clean Air Agreement with provinces and municipalities.

"Breathing clean air is a right for everyone"

The aim of the agreement is to permanently improve air quality in the Netherlands. With our approach to national

Thank you for your attention