ELAPSE

Effects of Low Level Air Pollution A Study in Europe

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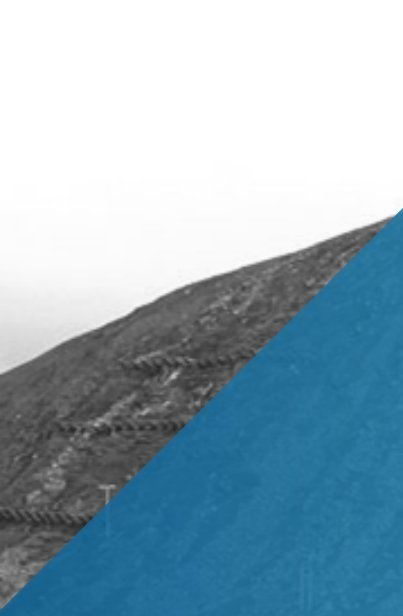
ON BEHALF OF THE ELAPSE PROJECT TEAM



Background

Associations between air pollution and health have been observed at **low concentrations**

Objectives

Investigate **associations** between long-term exposure to **$PM_{2.5}$, NO_2, O_3, BC** and:

- Natural and cause-specific mortality
- Incidence of lung cancer and cardiovascular events

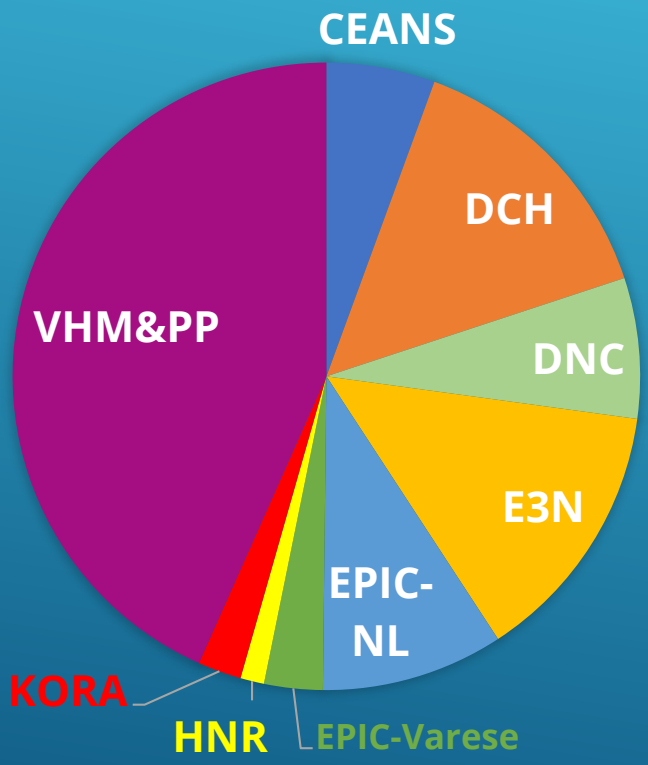
$PM_{2.5}$ = particulate matter < 2.5 μm in aerodynamic diameter
O_3 = ozone
NO_2 = nitrogen dioxide
BC = black carbon

Methods

- Pooling eight ESCAPE cohorts and Danish Nurse Cohort (N = 392,826)
- Large administrative cohorts from seven countries in Europe (N = 27,910,693)

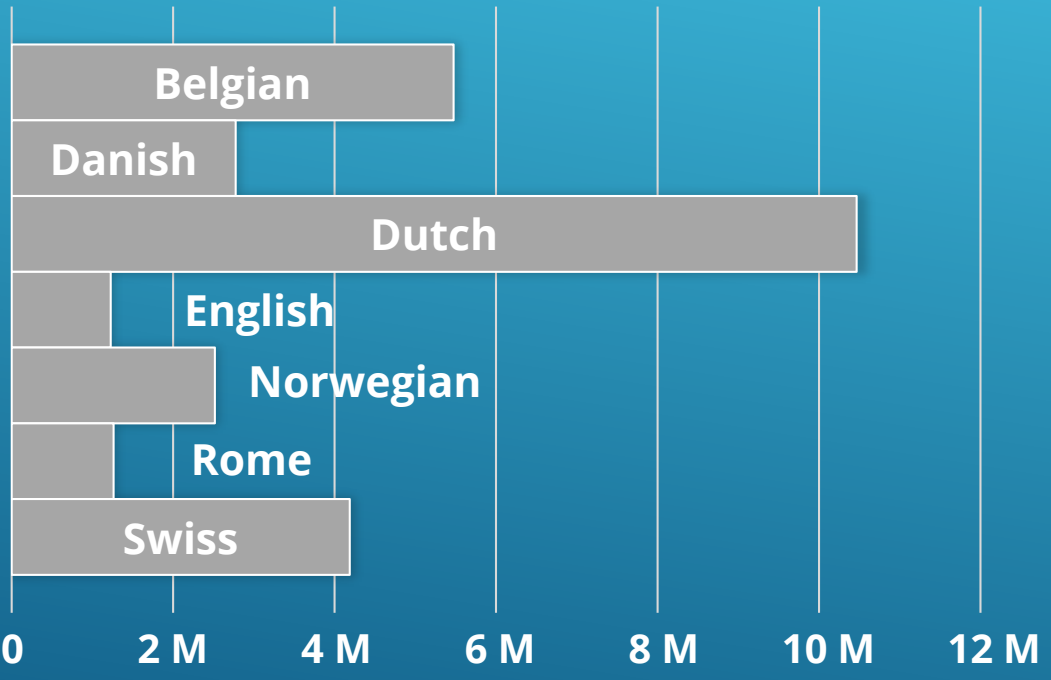
- Common codebook harmonizing individual- and area-level variables between cohorts
- Central exposure assessment of $PM_{2.5}$, NO_2, O_3 and BC at 100x100 m resolution

Pooled cohort



- **N = 392,826**
- Extensive covariate information

Administrative cohorts

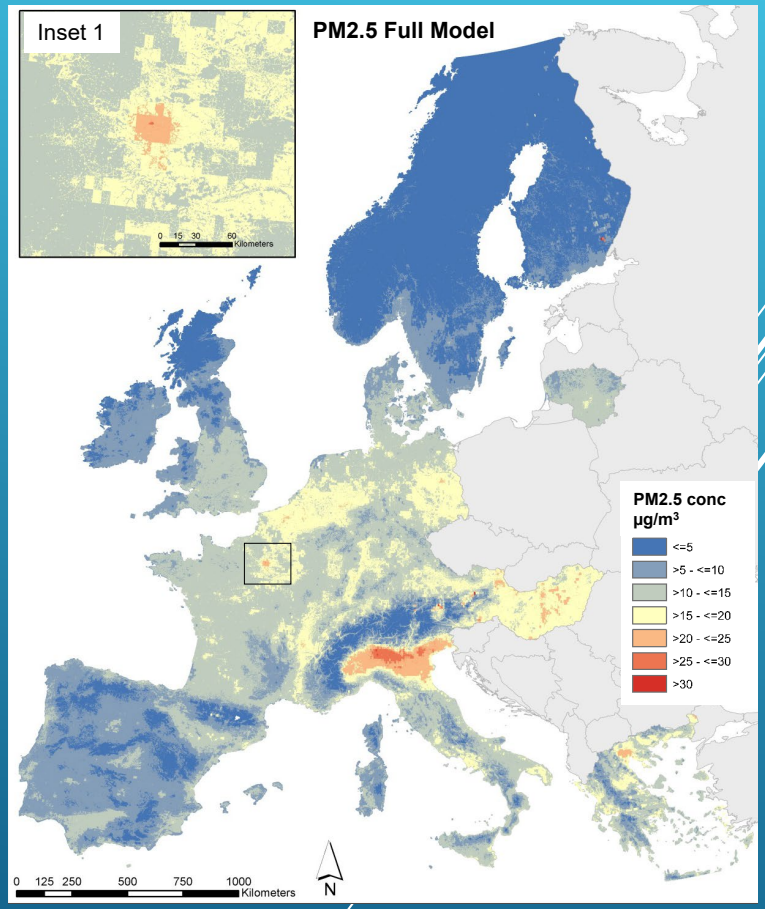


- **N = 27,910,693**
- Limited covariate info (except English)
- Analyzed individually -> Meta-analysis

Central exposure assessment

Europe-wide **hybrid** land use regression models (100x100 m)

Land use and road data, with **satellite** observations and **dispersion model** estimates as additional predictors



Local exposure models

Existing LUR and/or dispersion models

LUR = land use regression

Methods

- Cox proportional hazard models to investigate associations between air pollution and health
- Splines and other methods to assess shape of the concentration-response relationships
- Subset and threshold analysis
- Random-effects meta-analysis of cohort-specific effect estimates

POOLED COHORT RESULTS

Descriptives | Pooled cohorts

	Population		
	N	**Cases**	**Person-Years**
All	392,826	54,273	7,518,024
Main model	325,367	47,117	6,339,553

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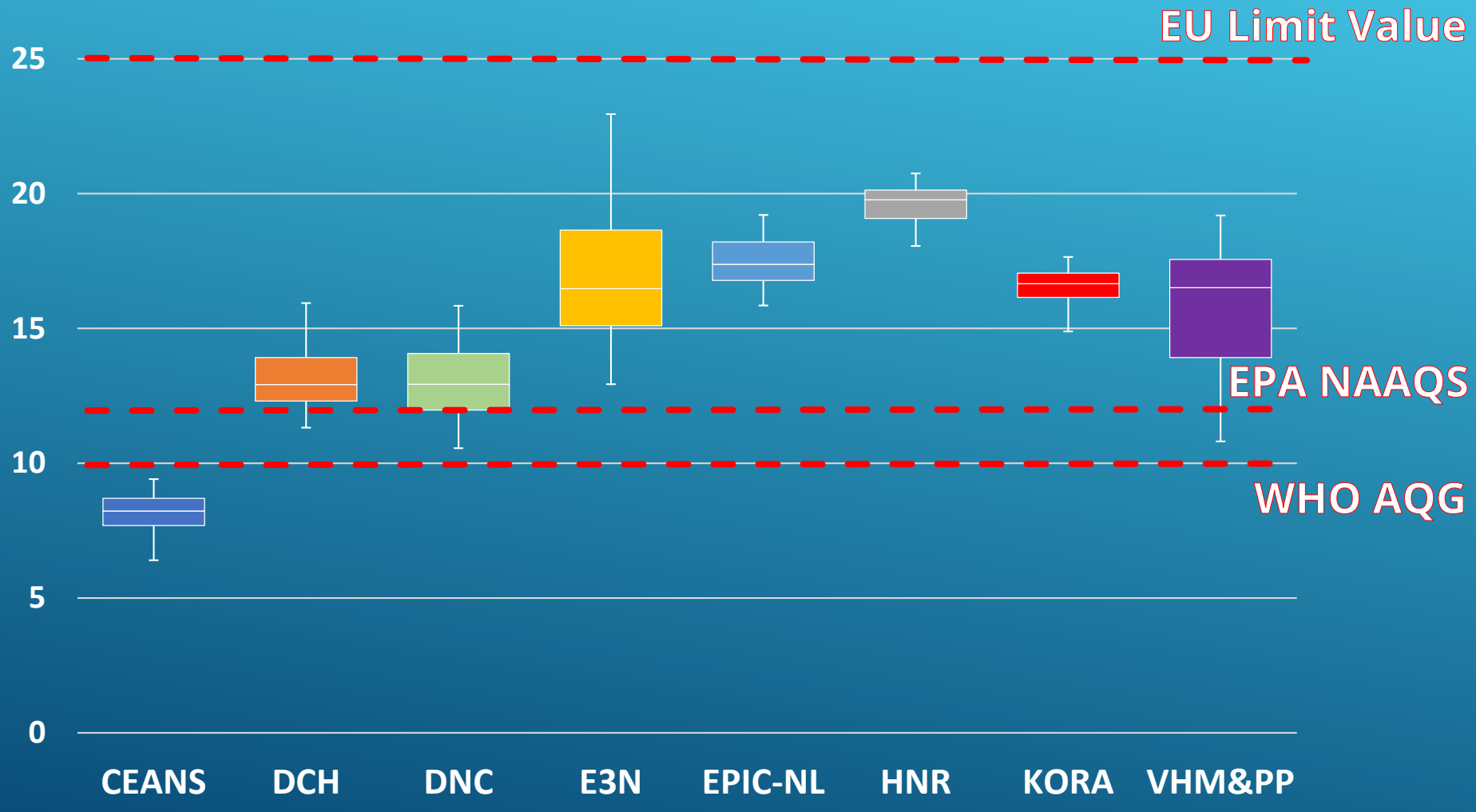
$PM_{2.5}$ ($\mu g/m^3$)



$PM_{2.5}$ = fine particulate matter; EU = European Union; EPA NAAQS = US EPA National Ambient Air Quality Standard; WHO AQC = World Health Organization Air Quality Guideline

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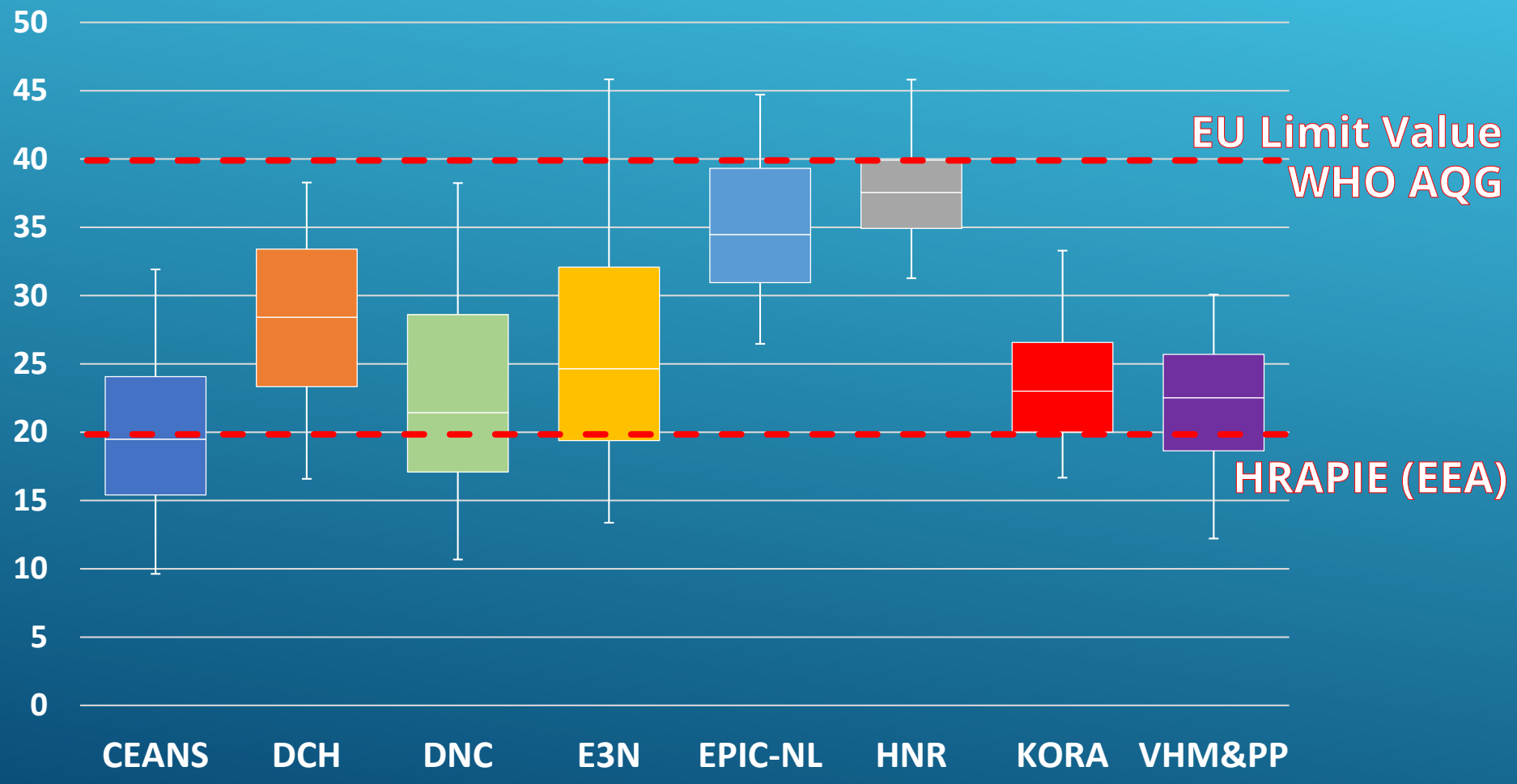
NO_2 ($\mu g/m^3$)



NO_2 = nitrogen dioxide; HRAPIE = Health risks of air pollution in Europe; EEA = European Environmental Agency

ADMINISTRATIVE COHORTS

RESULTS

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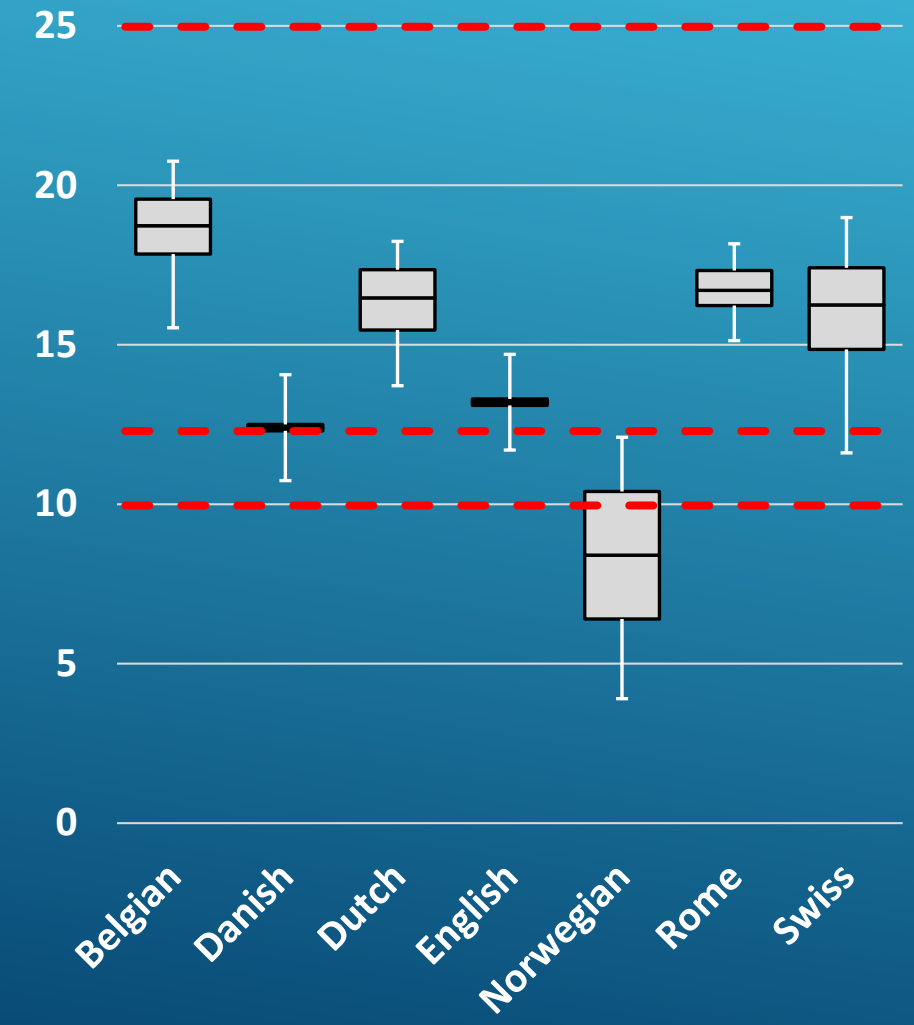
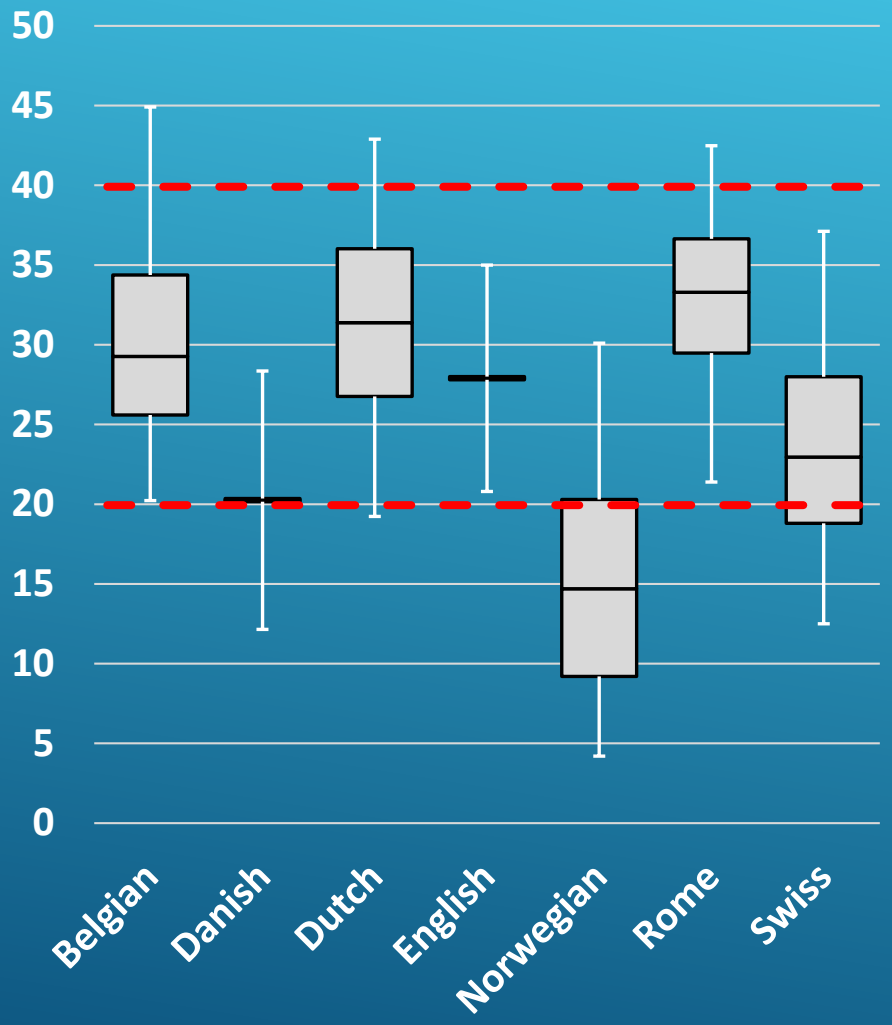
$PM_{2.5}$



NO_2



NO_2 = nitrogen dioxide
$PM_{2.5}$ = fine particulate matter

Correlations

Very positive between BC and NO_2, strongly negative between O_3 and all others

	NO_2	BC	O_3
$PM_{2.5}$	.51 - .76	.50 - .70	-.41 - -.68
NO_2		.86 - .93	-.67 - -.80
BC			-.64 - -.82

O_3 = ozone
NO_2 = nitrogen dioxide
BC = black carbon
$PM_{2.5}$ = fine particulate matter

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Descriptives | Administrative cohorts

	Population		
	N	**Cases**	**Person-Years**
COMBINED	**24,166,141**	**2,733,245**	**213,719,849**
Belgian	*5,474 K*	*707 K*	*54,575 K*
Danish	*2,773 K*	*524 K*	*40,063 K*
Dutch	*10,465 K*	*604 K*	*50,436 K*
Rome	*1,263 K*	*235 K*	*15,300 K*
Swiss	*4,188 K*	*661 K*	*53,344 K*

SUMMARY

Strengths

- Multiple cohorts pooled with individual level covariates
- Large administrative databases
  - Surveys with individual level covariates
- Central Europe-wide exposure assessment
  - In addition, local exposure models
- Common analysis scripts

Limitations

- Most subjects at > 10 μg/m^3 $PM_{2.5}$ (but still sufficient power in some administrative databases)
- Missing lifestyle data in large administrative cohorts

Conclusions (so far…)

- Long-term exposure to $PM_{2.5}$, NO_2, BC was positively **associated with morbidity and mortality** in pooled cohort and in five large administrative database cohorts
- Associations **remaining at low levels**

$PM_{2.5}$ = fine particulate matter
NO_2 = nitrogen dioxide
BC = black carbon

THANK YOU

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