ERS

AIPO ASSOCIAZIONE ITALIANA PNEUMOLOGI OSPEDALIERI

FIBROSING INTERSTITIAL LUNG DISEASES OF IDIOPATHIC AND EXOGENOUS ORIGIN. PHENOTYPE APPROACH.

Conference, Postgradual and Scientific Course

PRAGUE

CZECH REPUBLIC

JUNE 19TH – 21ST 2014

RTEMIS

AGUE 8

Potential role of exogenous particles, gasses and fumes in pathogenesis of „idiopathic“ interstitial lung diseases. Does air pollution contribute to epidemiology of idiopathic ILDs?

Fibrosing interstitial lung diseases of idiopathic and exogenous origin.
Prague – 19.06.2014

Does air pollution contribute to the epidemiology of idiopathic ILDs?

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Does air pollution contribute to the epidemiology of idiopathic ILDs?

I don’t know

Does air pollution contribute to the epidemiology of idiopathic ILDs?

Probably, nobody else really knows either

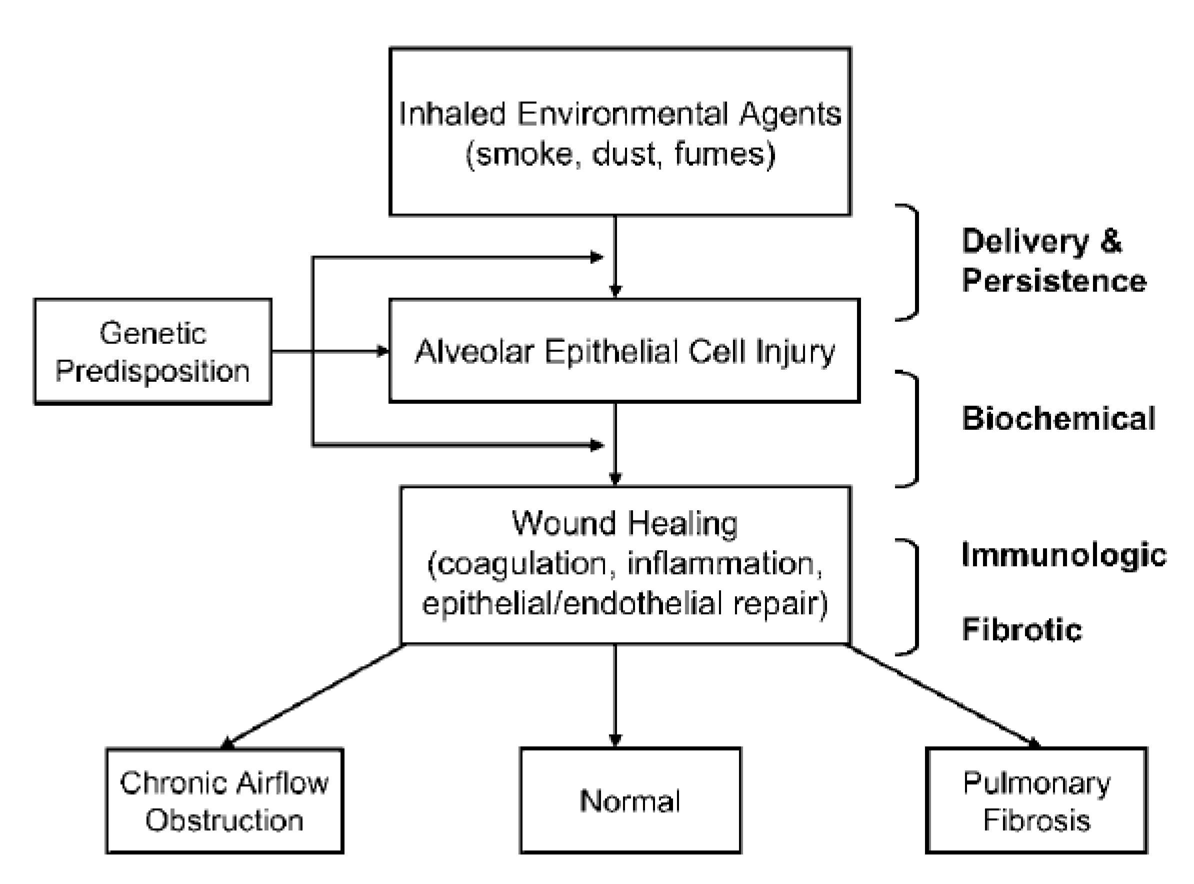
Does air pollution contribute to the epidemiology of idiopathic ILDs?

Plausible

Is Idiopathic Pulmonary Fibrosis an Environmental Disease?

Proc Am Thorac Soc Vol 3. pp 293–298, 2006

Varsha S. Taskar and David B. Coultas



Does air pollution contribute to the epidemiology of idiopathic ILDs?

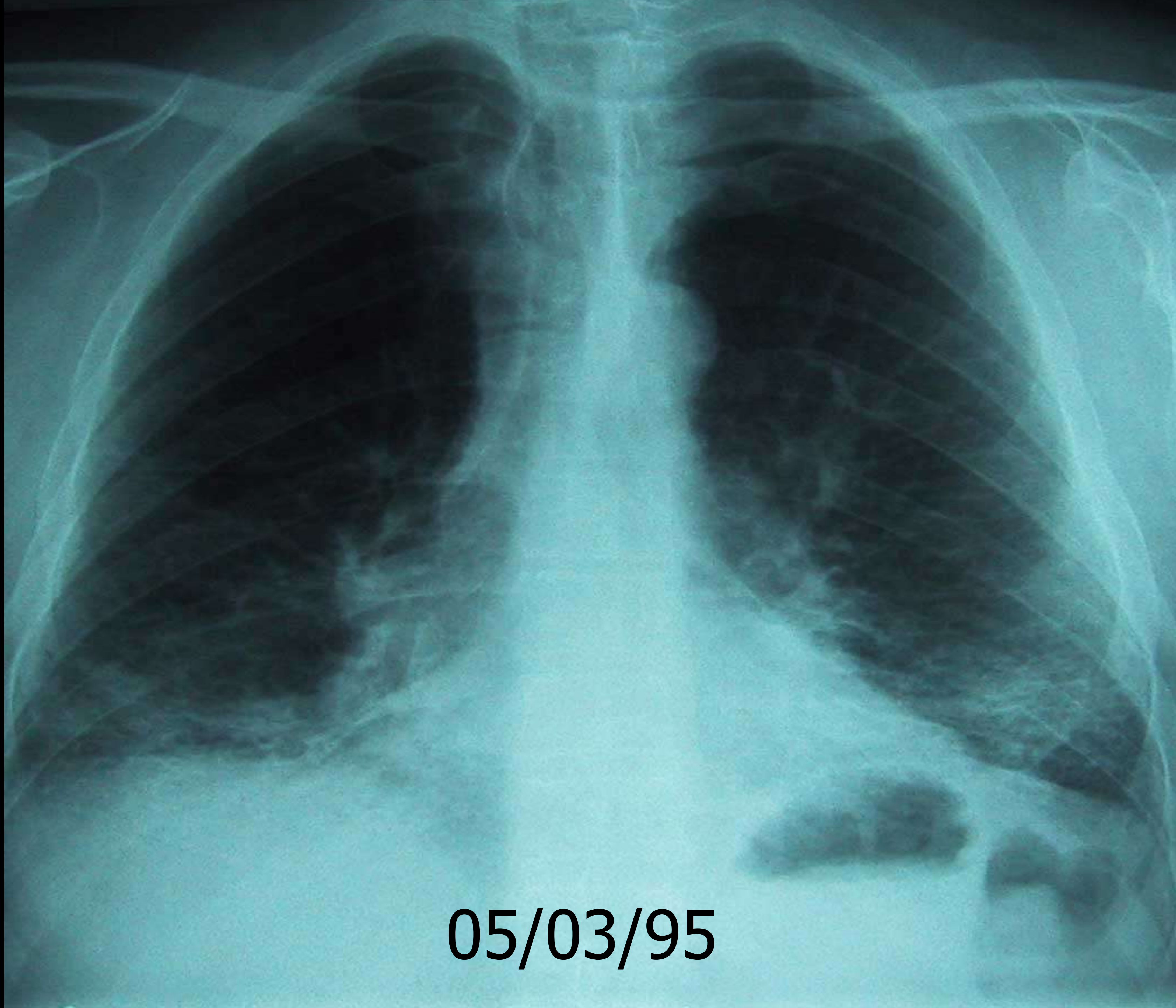
<u>Outline</u>

- “Idiopathic” ?
- “Air pollution”
- Health effects of outdoor air pollution
  - Triggering (lung) disease
  - Causing/contributing to (lung) disease

“idiopathic”

Case

- Male, smoker (1.5 p/d)
- 1995: idiopathic pulmonary fibrosis
- Occupation:
  - 1973-1987: various jobs in a car assembly plant (Al, Fe, Cu, some asbestos, mineral oil, solvents, ...)
  - 1987-1995: union representative
- 2001: Double Lung Transplantation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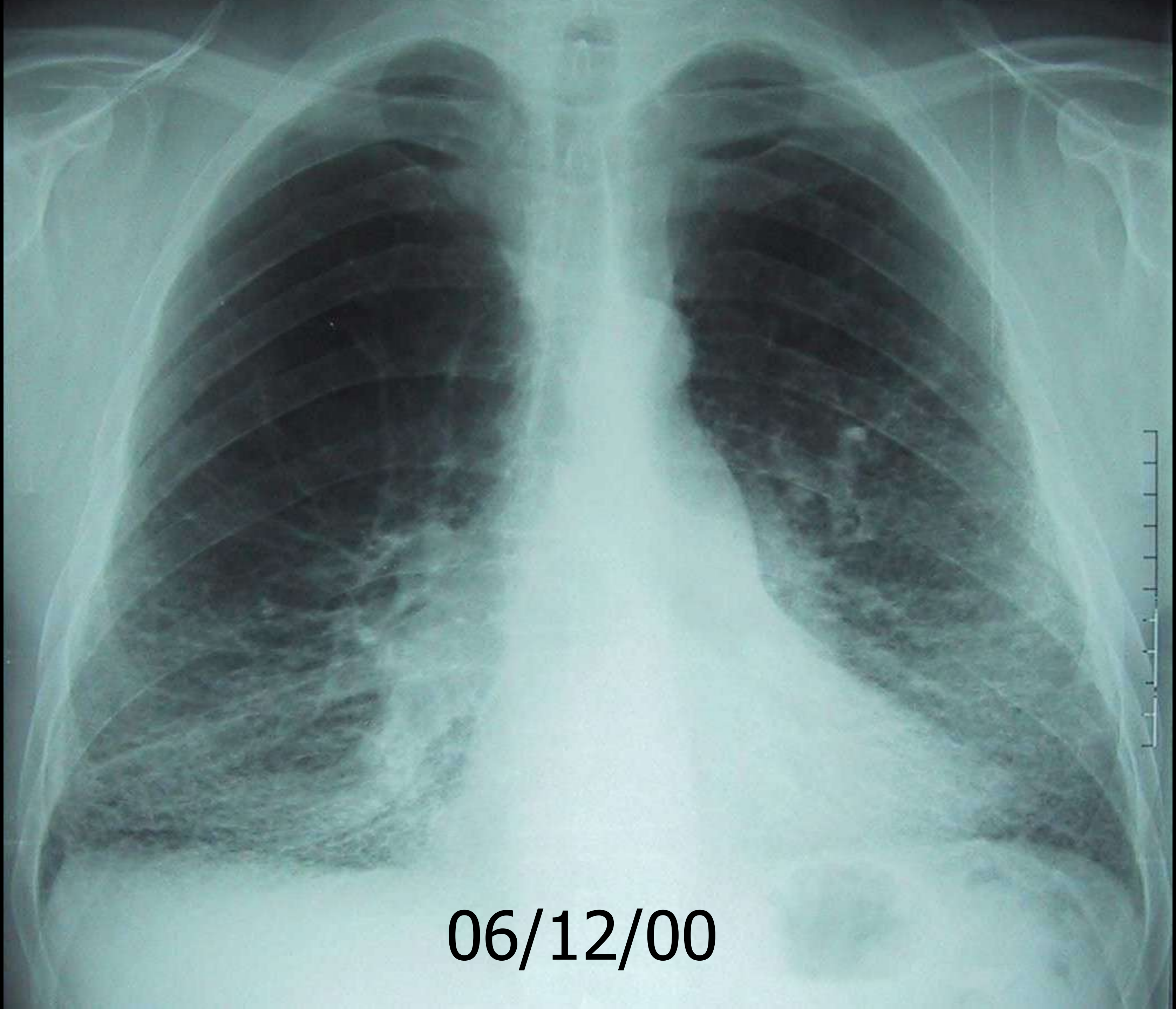

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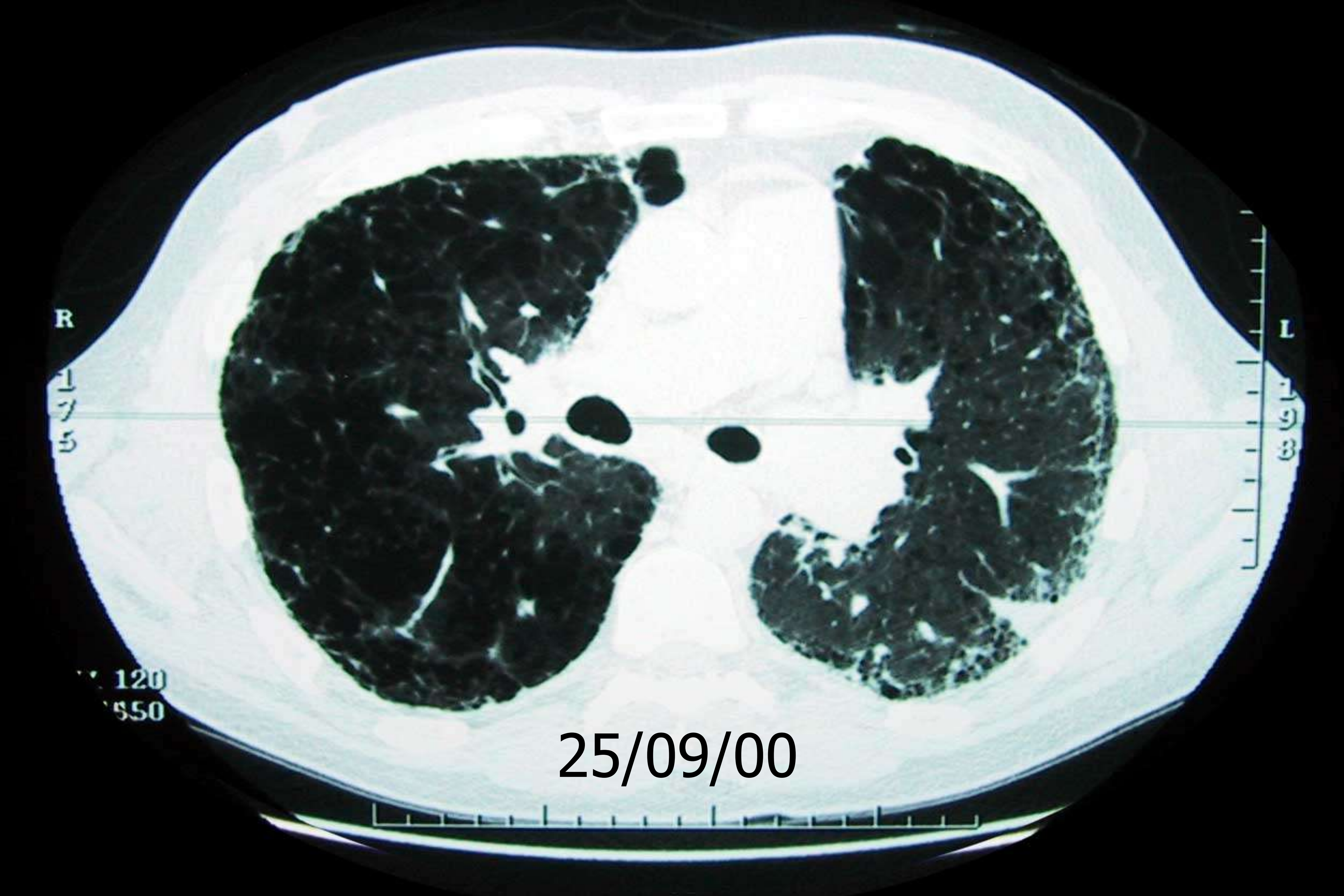
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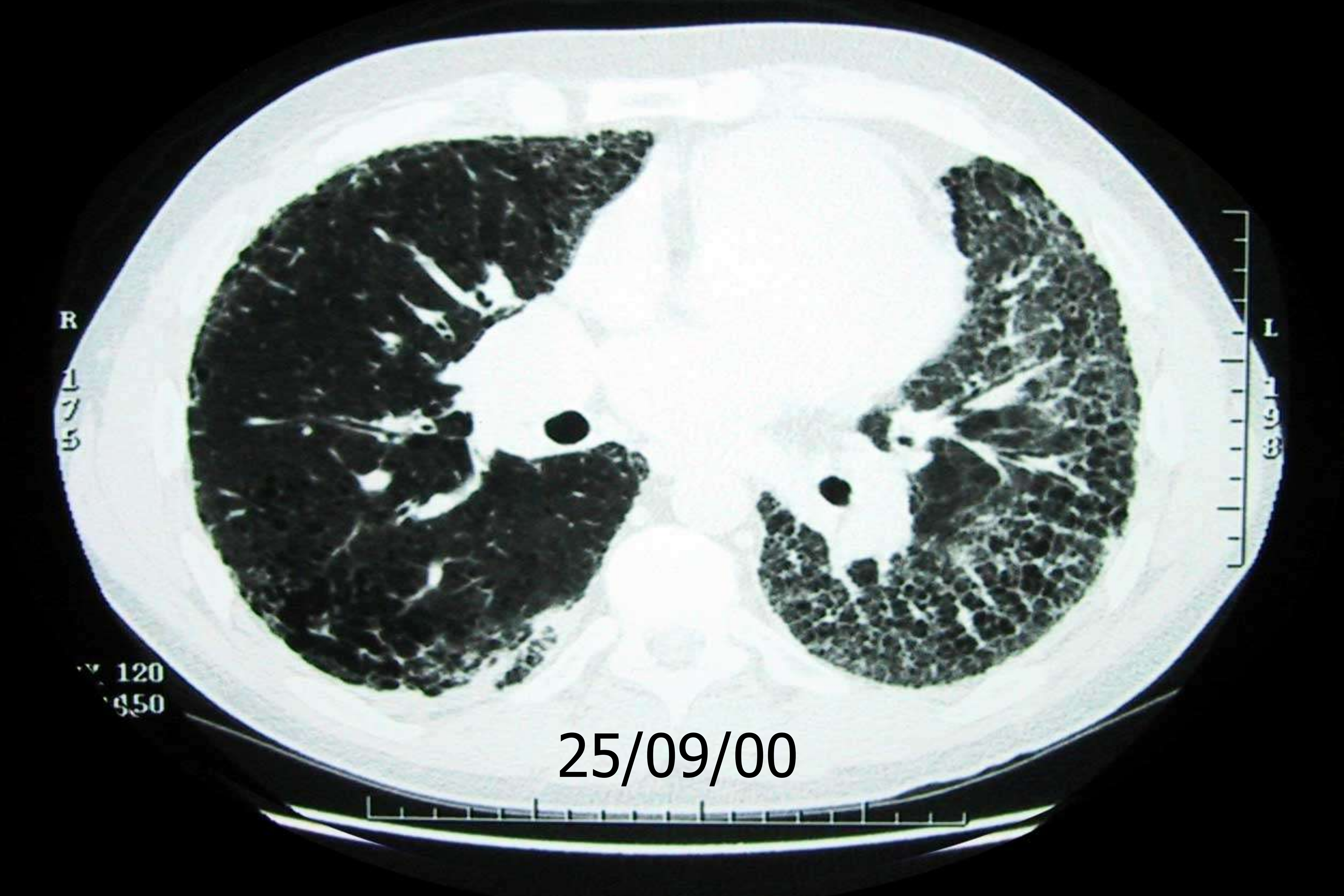
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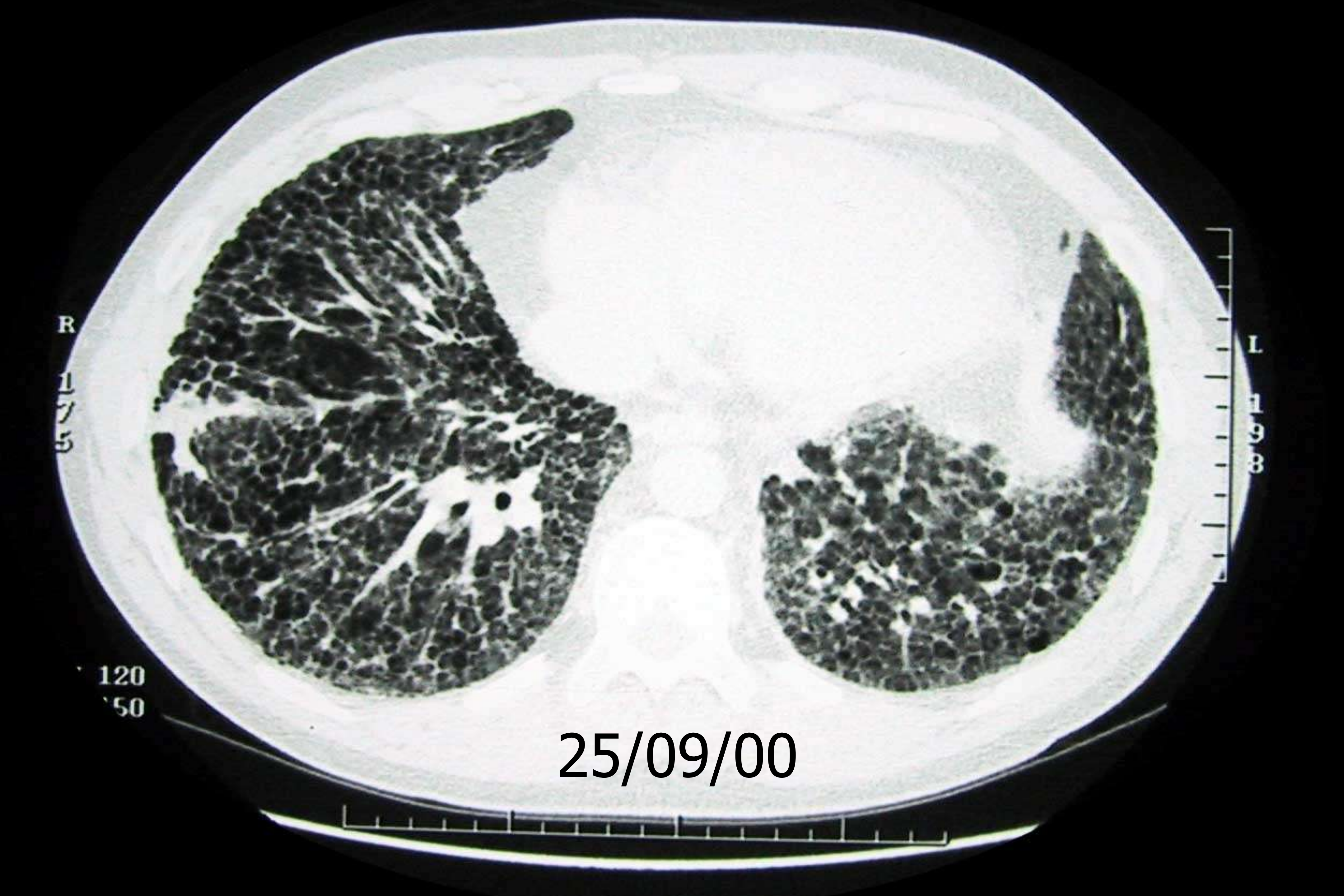
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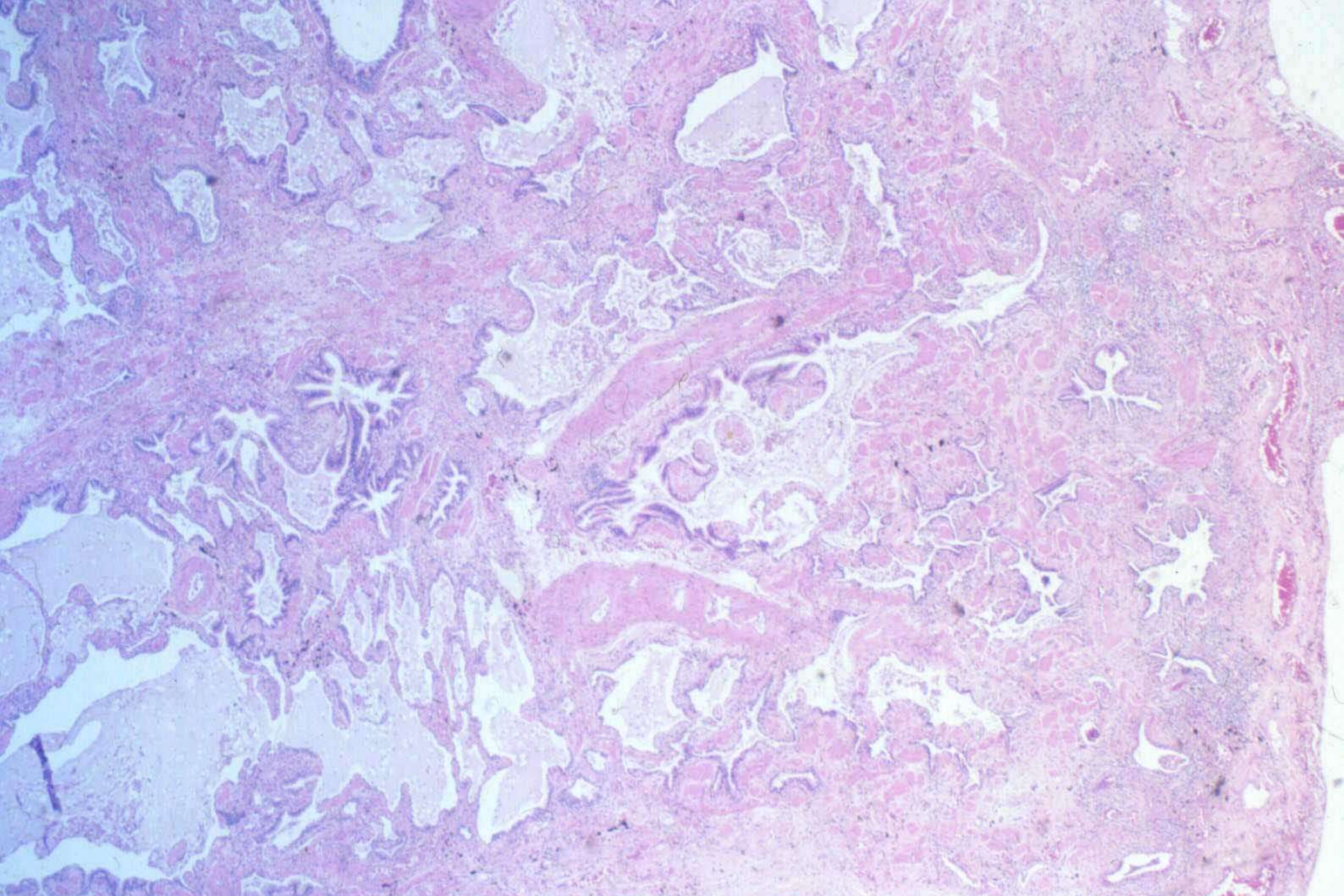
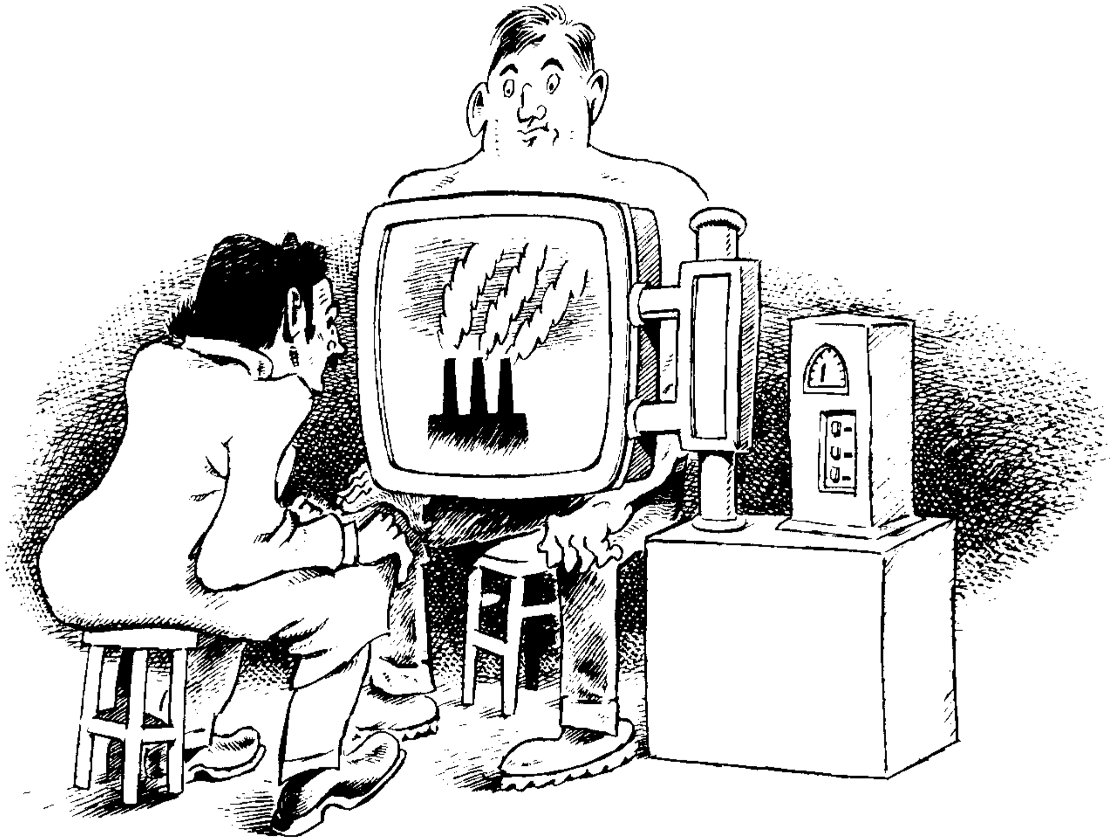


Terminal interstitial fibrosis,
numerous asbestos bodies,
compatible with asbestosis

New occupational history:
1973-1983: substantial dust exposure when working on presses (replacing friction material + use of compressed air)

Most probably asbestosis



Contrary to this drawing, there is no simple test.
The suspicion and the determination of work-relatedness depend primarily on a careful occupational history

From LEVY BS, WEGMAN DH. Occupational health (3d ed), p.60

Take Home Message

Clinicians, radiologists, pathologists,

Use « idiopathic » or « cryptogenic » with care (diagnosis of exclusion)

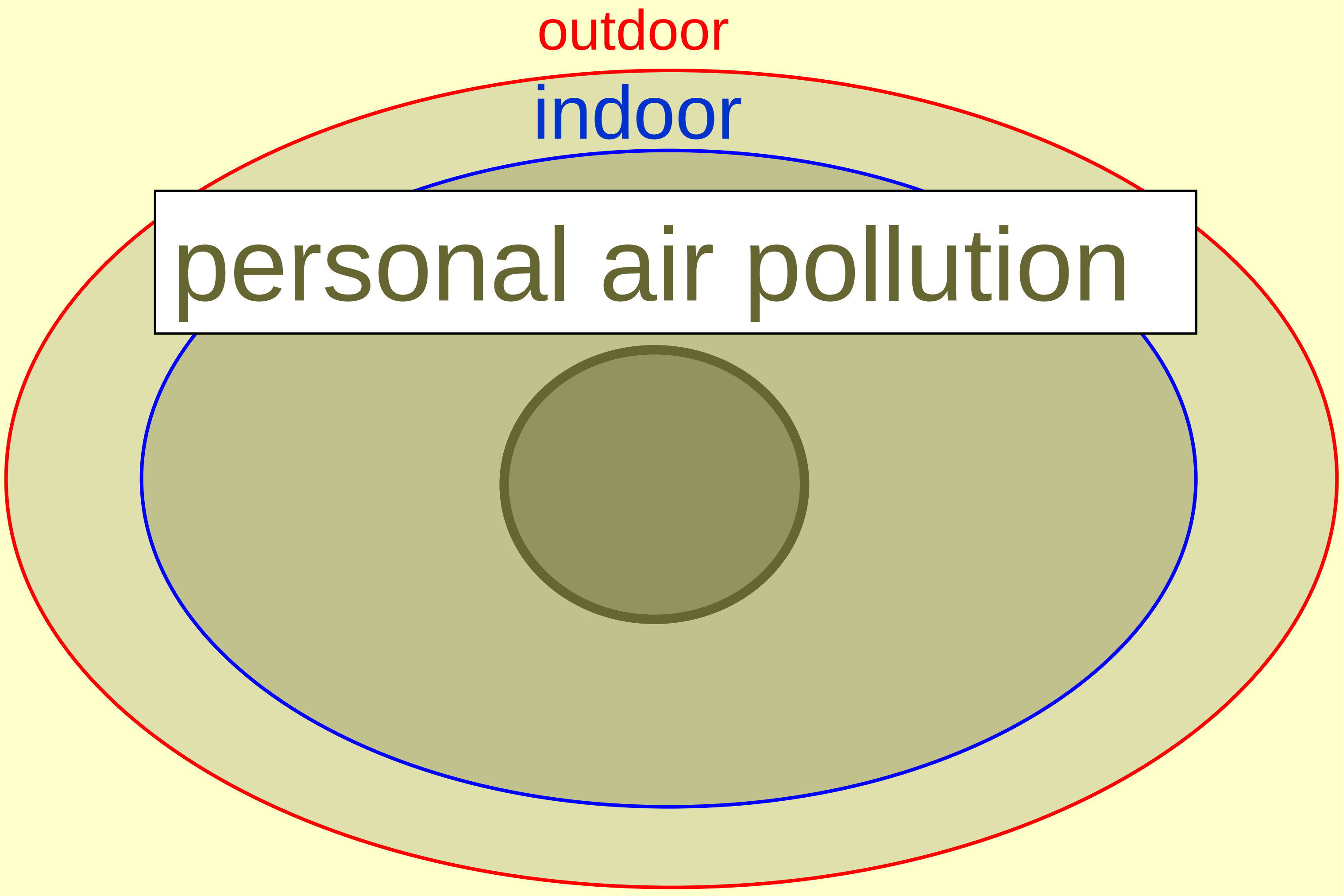
Keep searching for possible environmental causes of lung disease

Ask advice from experts

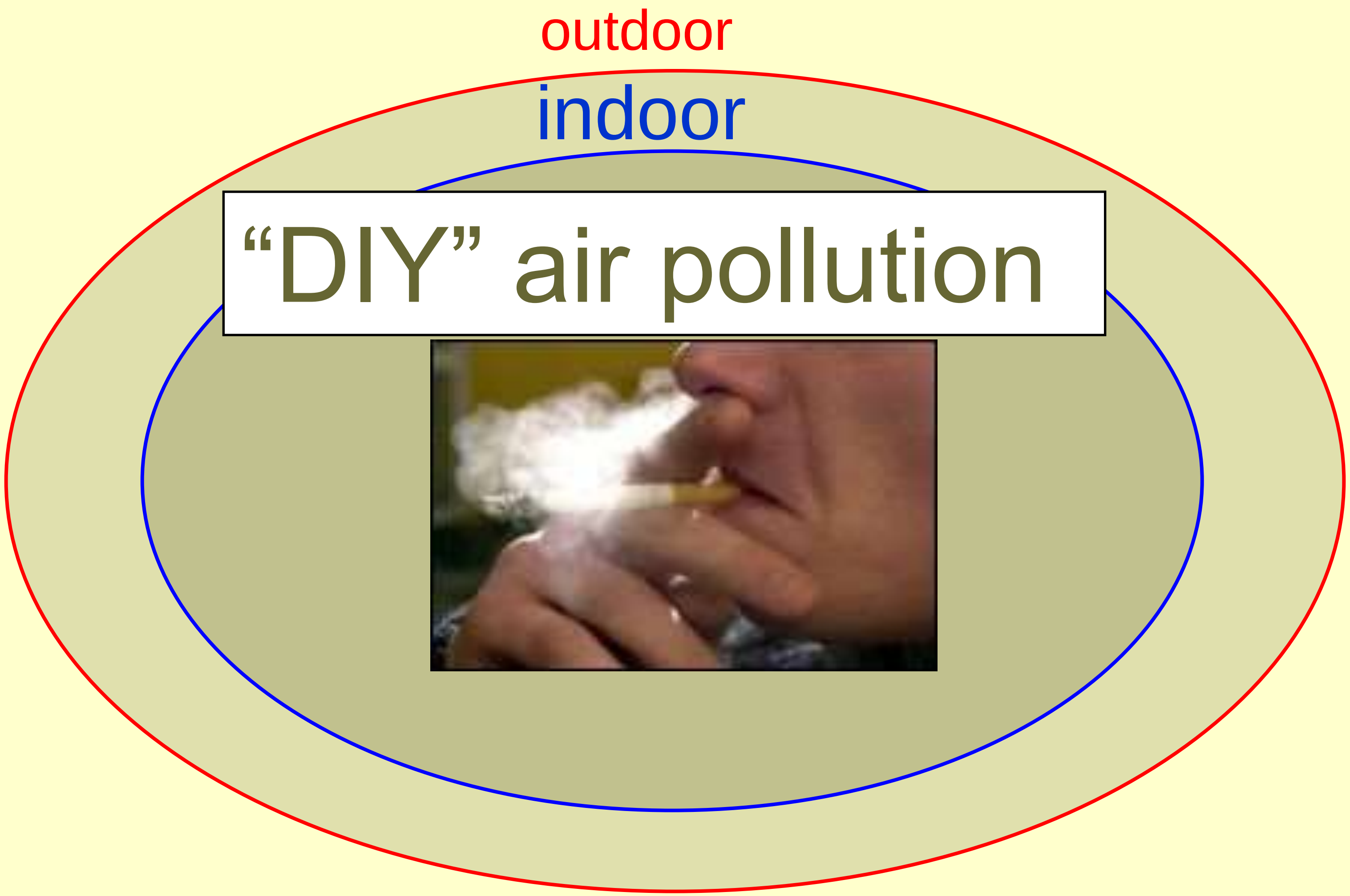
Old and new causes of disease may occur even in modern industry

“Air pollution”

Air pollution



Air pollution



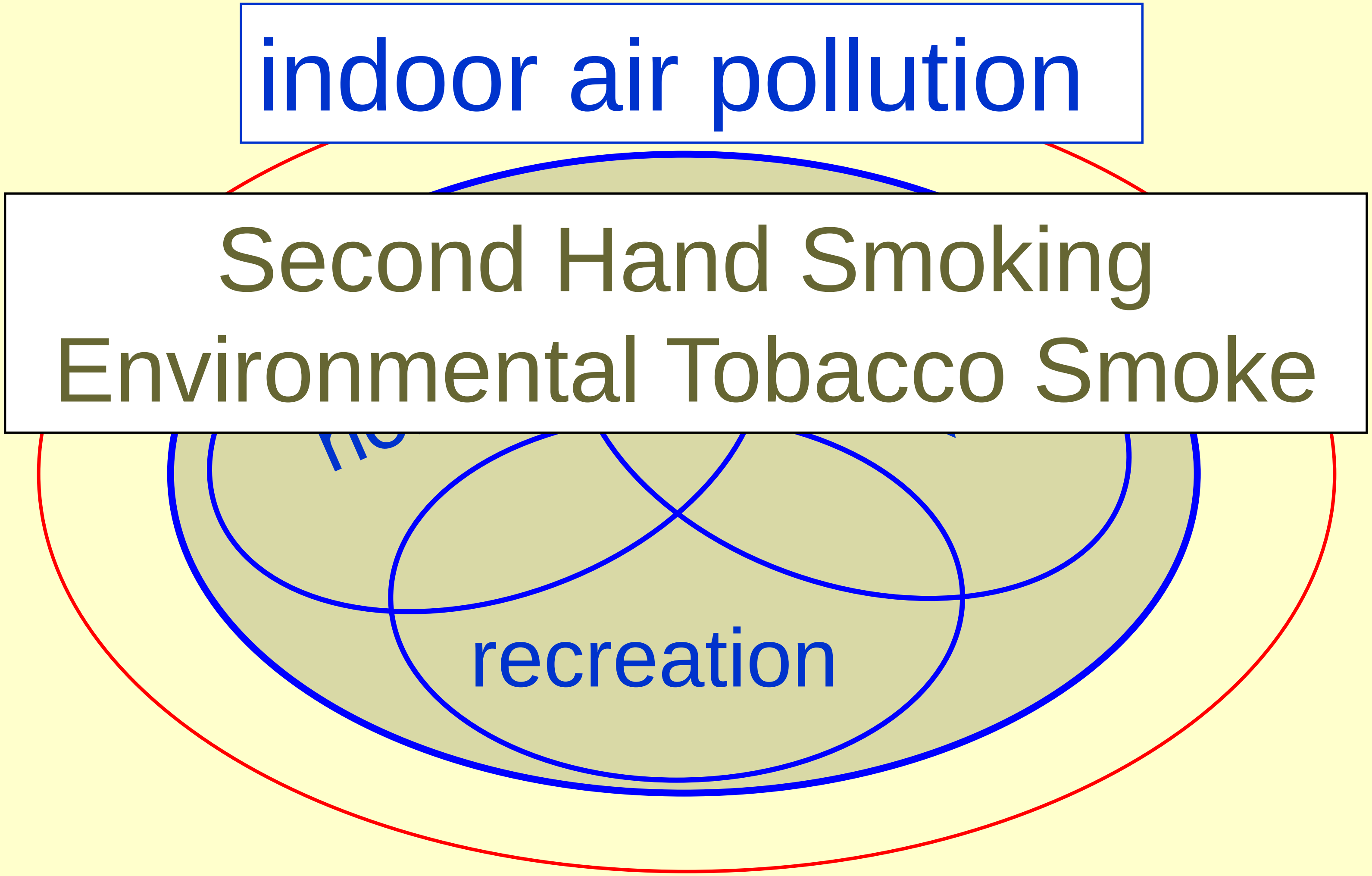
Air pollution

outdoor

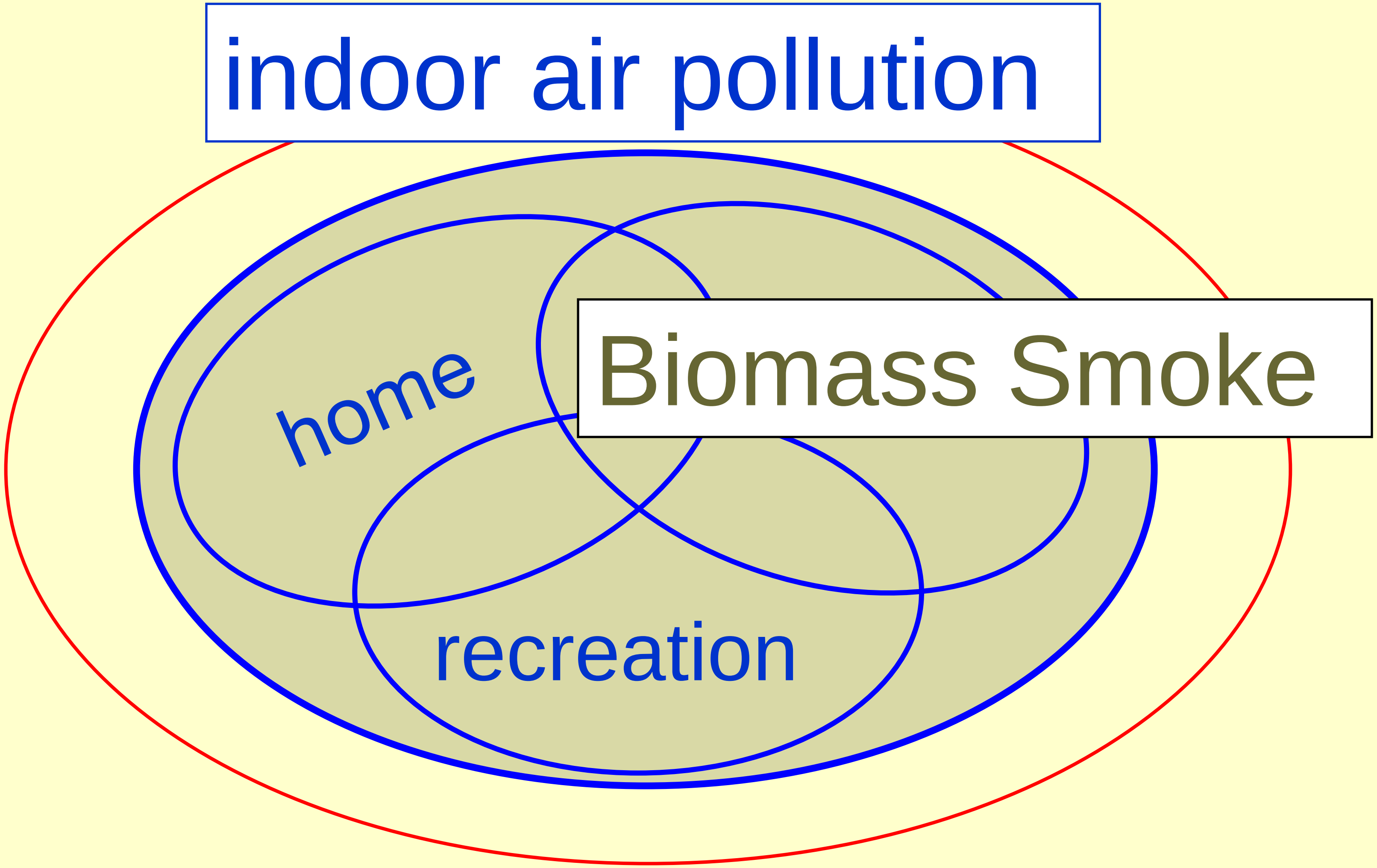
indoor

“DIY” air pollution

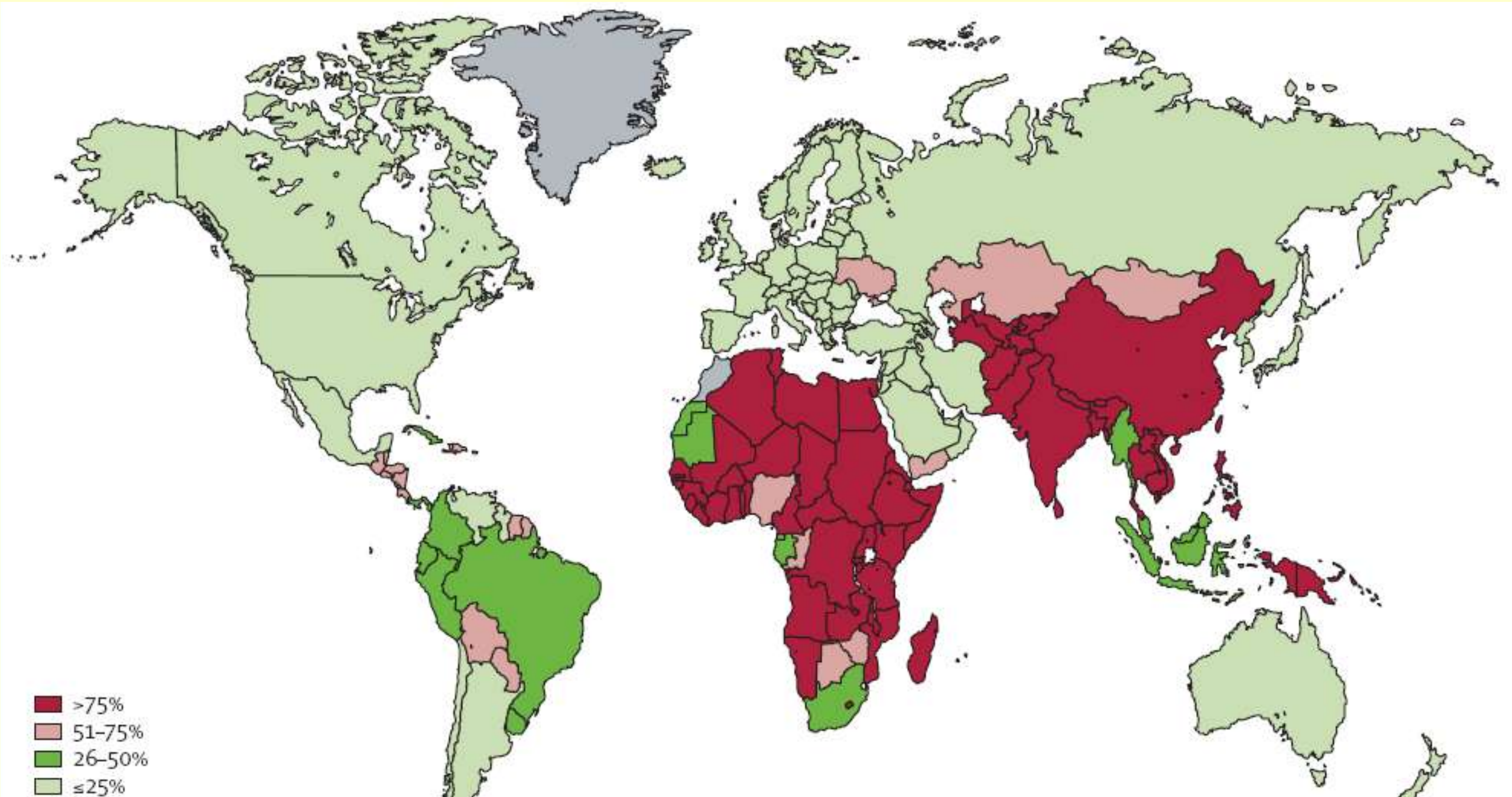
Air pollution



Air pollution

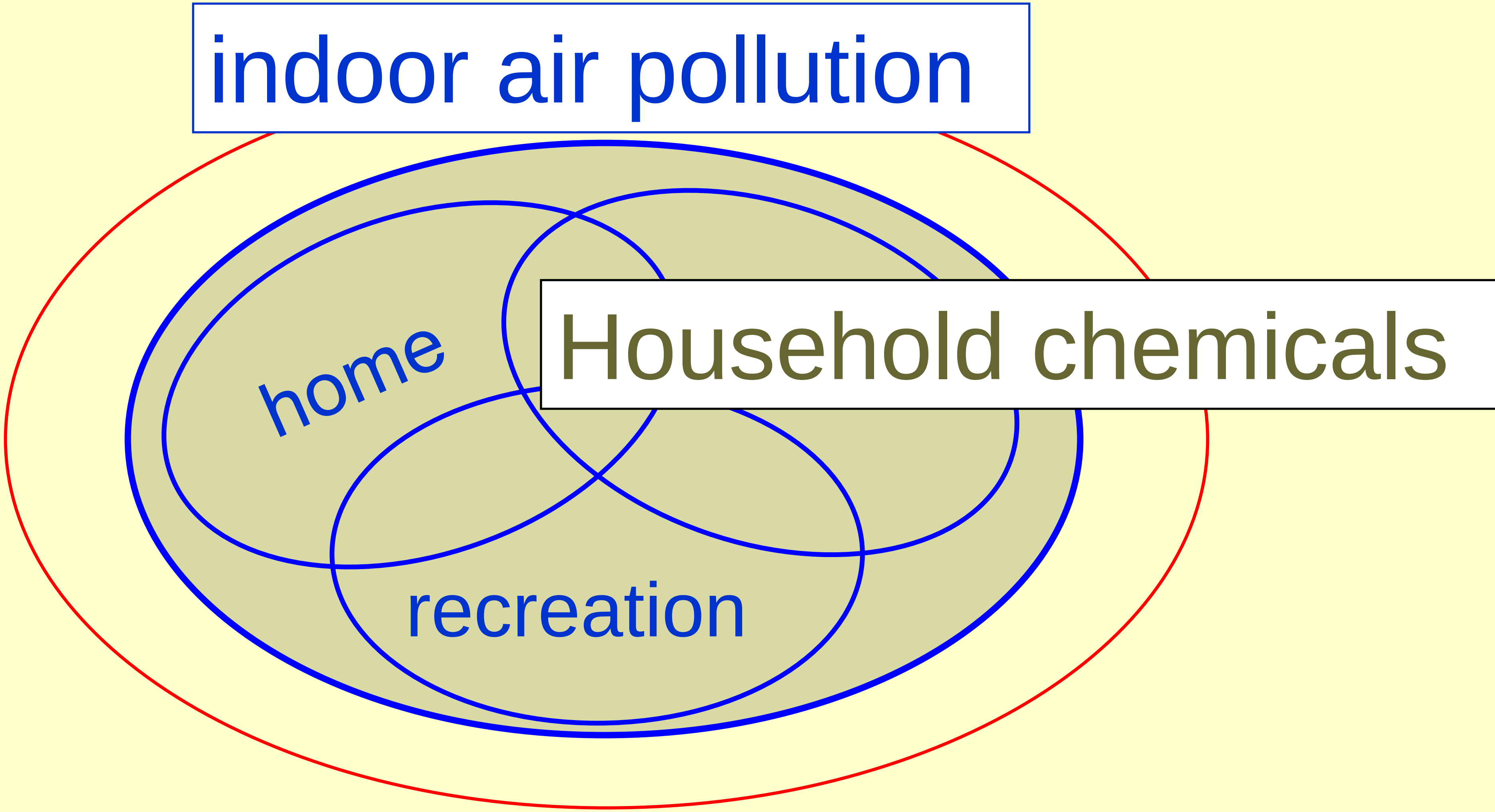


Biomass fuel for cooking



Data from WHO in *Lancet* 2009, 374, 733-43

Air pollution




AJAX
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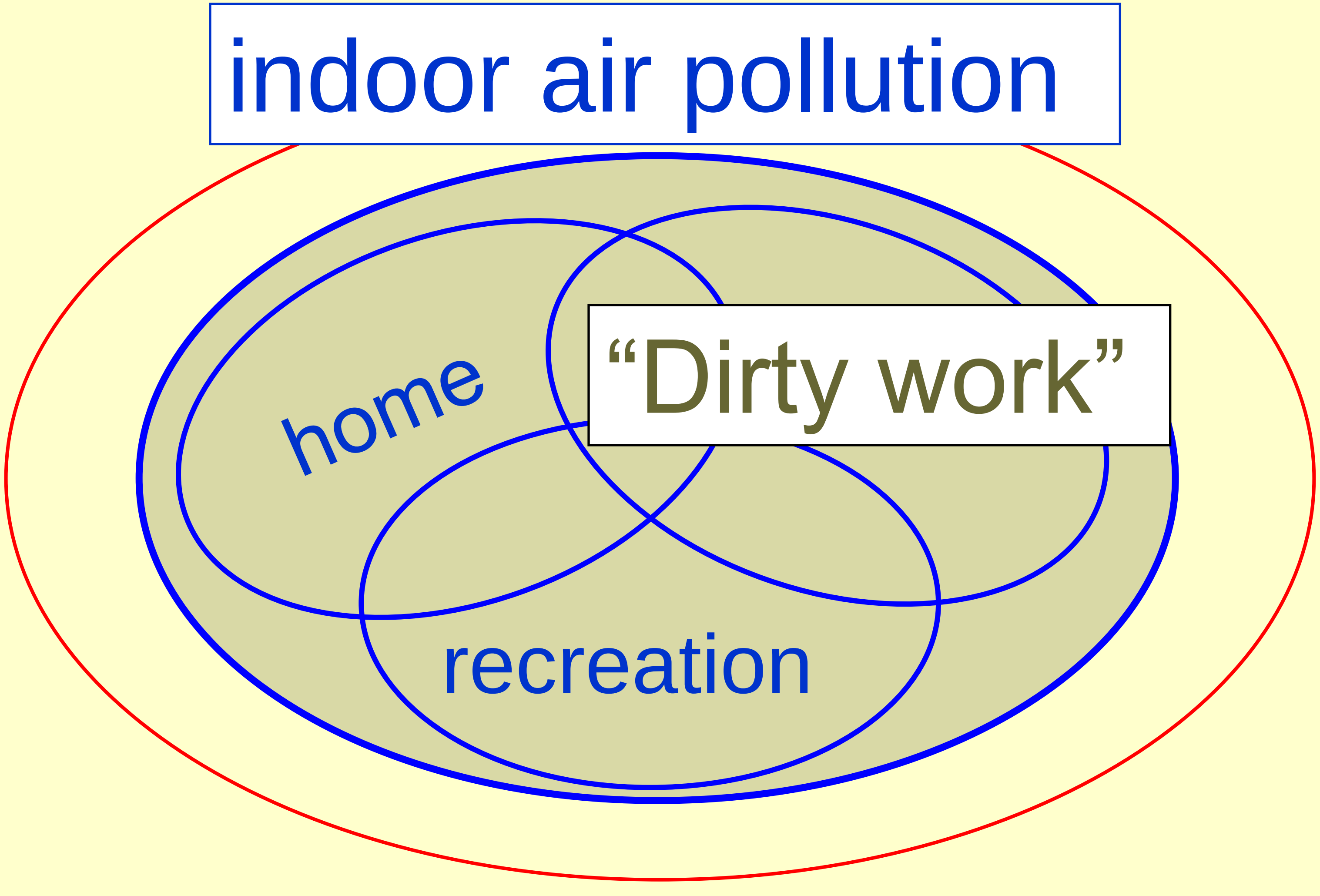
Air pollution



COPD and occupation

- Blanc et al. Occupation exposures and the risk of COPD: dusty trades revisited. *Thorax* 2009, 64, 6-12

➢ VGDF exposure: adj. OR 2.11 [1.59-2.82] → PAF 31%

➢ JEM high exposure: adj. OR 2.27 [1.46-3.52] → PAF 13%

➢ Joint influence of smoking and VGDF:

	adj. OR COPD	*GOLD 2+*
• Never S / no VGDF	1.0	*1.0*
• Never S / VGDF	1.98 [1.26-3.09]	*1.69*
• Ever S / no VGDF	6.71 [4.58-9.82]	*8.31*
• Ever S / VGDF	14.1 [9.33-21.2]	*18.7*

Is Idiopathic Pulmonary Fibrosis an Environmental Disease?

Proc Am Thorac Soc Vol 3. pp 293–298, 2006

Varsha S. Taskar and David B. Coultas

TABLE 1. CASE-CONTROL STUDIES OF OCCUPATIONAL AND ENVIRONMENTAL RISK FACTORS FOR IDIOPATHIC PULMONARY FIBROSIS

	United Kingdom		United States		Japan	
Exposure	England/Wales Scott and Colleagues, 1990 (45) (40/106)*	Trent Region Hubbard and Colleagues, 1996 (46) (218/569)*	Mullen and Colleagues, 1998 (50) (17/94)*	Baumgartner and Colleagues, 2000 (48) (248/491)*	Iwai and Colleagues, 1994 (43) (86/172)*	Miyake and Colleagues, 2005 (51) (102/59)*
Agriculture/Farming				1.60 (1.0–2.5)	3.01 (1.29–7.43)	
Livestock	10.89 (1.24–96.0)			2.70 (1.30–5.50)		
Wood dust	2.94 (0.87–9.9)	1.71 (1.01–2.92)	3.3 (0.42–25.8)	1.60 (0.80–3.30)		6.71 (0.37–123.59)
Textile dust	0.9 (0.24–3.44)	1.80 (1.10–2.96)		1.90 (0.80–4.40)		
Mold			16.0 (1.62–158)			0.98 (0.48–2.01)
Metal dust	10.97 (2.34–52.4)	1.68 (1.07–2.65)		2.00 (1.00–4.00)	1.34 (1.14–1.59)	9.55 (1.68–181.12)
Stone/sand/silica	1.59 (0.52–4.79)	1.76 (1.01–3.07)	11.0 (1.05–115)	3.90 (1.20–12.70)		
Wood fires	12.55 (1.40–114.0)			0.80 (0.40–1.60)		
Smoking	1.11 (0.13–1.40)	1.57 (1.01–2.43)		1.60 (1.10–2.40)	2.94 (1.37–6.3)	3.23 (1.01–10.84)

Values are shown as odds ratios (95% confidence intervals).

* Numbers in parentheses represent number of cases/number of controls.

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TABLE 2. META-ANALYSIS OF RISK FOR IDIOPATHIC PULMONARY FIBROSIS ASSOCIATED WITH ENVIRONMENTAL AND OCCUPATIONAL EXPOSURES

Exposure	No. Studies (*Reference*)	Cases Exposed/ Not Exposed, n (%)	Controls Exposed/ Not Exposed, n (%)	Summary Estimates*	Population-Attributable Risk Percentage
Agriculture/farming	2 (43, 48)	86/334 (25.7)	115/663 (17.3)	1.65 (1.20–2.26)	20.8
Livestock	2 (45, 48)	30/288 (10.4)	30/597 (5.0)	2.17 (1.28–3.68)	4.1
Wood dust	5 (45, 46, 48, 50, 51)	58/625 (9.3)	67/1319 (4.9)	1.94 (1.34–2.81)	5.0
Metal dust	5 (43, 45, 46, 48, 51)	82/694 (11.8)	75/1397 (5.4)	2.44 (1.74–3.40)	3.4
Stone/sand/silica	4 (45, 48, 50, 51)	28/407 (6.9)	26/750 (3.5)	1.97 (1.09–3.55)	3.5
Smoking	5 (43, 45, 46, 48, 51)	460/694 (66.3)	784/1,397 (56.1)	1.58 (1.27–1.97)	49.1

* Values are shown as odds ratios (95% confidence intervals).

IPF

Gustafson *et al.* Occupational exposure and severe pulmonary fibrosis. *Respir Med* 2007, 101, 2207-12

- 181 cases [Swedish O_2 Register] *vs* 757 controls
- postal questionnaire

Table 4 Logistic regression models for the pulmonary fibrosis sample giving odds ratios (and 95% confidence intervals) adjusted for sex, smoking, year of birth and year of diagnosis.

Predictor	PF		
	All ($n = 181$)	Women	Men
Inorganic dust	1.1 (0.70–1.68)	0.55 (0.12–2.53)	1.1 (0.70–1.83)
Organic dust	1.5 (1.00–2.15)	1.2 (0.60–2.22)	1.7 (1.06–2.8)
Metal dust	0.98 (0.61–1.58)	0.82 (0.17–3.82)	0.97 (0.58–1.63)
Wood dust	1.9 (1.12–3.15)	0.50 (0.06–4.11)	2.1 (1.22–3.75)

PF: pulmonary fibrosis.

Lung cancer

Veglia *et al.* Occupational exposures, environmental tobacco smoke, and lung cancer. *Epidemiology* 2007, 18, 769-775

- EPIC (multicenter European prospective cohort, n=~217,055, 6 y follow-up, 809 incident lung ca.)

➢ Hazard ratios and PAR% (M – F) for occupational exposure (Job Exposure Matrix) to

• "at risk" job	1.42 [1.2 – 1.7]	16% – 12%
• Asbestos	1.53 [1.2 – 1.9]	8% – 0.8%
• Metals	1.60 [1.1 – 1.8]	9% – 1.4%
• PAH	1.42 [1.1 – 1.8]	6% – 0.2%
• ETS	1.59 [1.2 – 2.1]	0.6% – 5.6%

Air pollution

outdoor air pollution

Ambient Air Pollution

Gaseous pollutants

- SO_2
- O_3, NO_2, ...

Suspended "particulate matter" (PM)

- PM_{10}, $PM_{2.5}$, UFP

Eur Respir J 2012; 39: 525–528
DOI: 10.1183/09031936.00001112

Eur Respir J 2012, 39, 525-528

EDITORIAL

Ten principles for clean air

B. Brunekreef[*,#], I. Annesi-Maesano[¶,+], J.G. Ayres[§], F. Forastiere[ƒ], B. Forsberg[**], N. Künzli[##,¶¶], J. Pekkanen[++,§§] and T. Sigsgaard[ƒƒ]

1) Citizens are entitled to clean air, just like clean water and safe food.

2) Outdoor air pollution is one of the biggest environmental health threats in Europe today, leading to significant reductions of life expectancy and productivity.

3) Fine particles and ozone are the most serious pollutants. There is an urgent need to reduce their concentrations significantly.

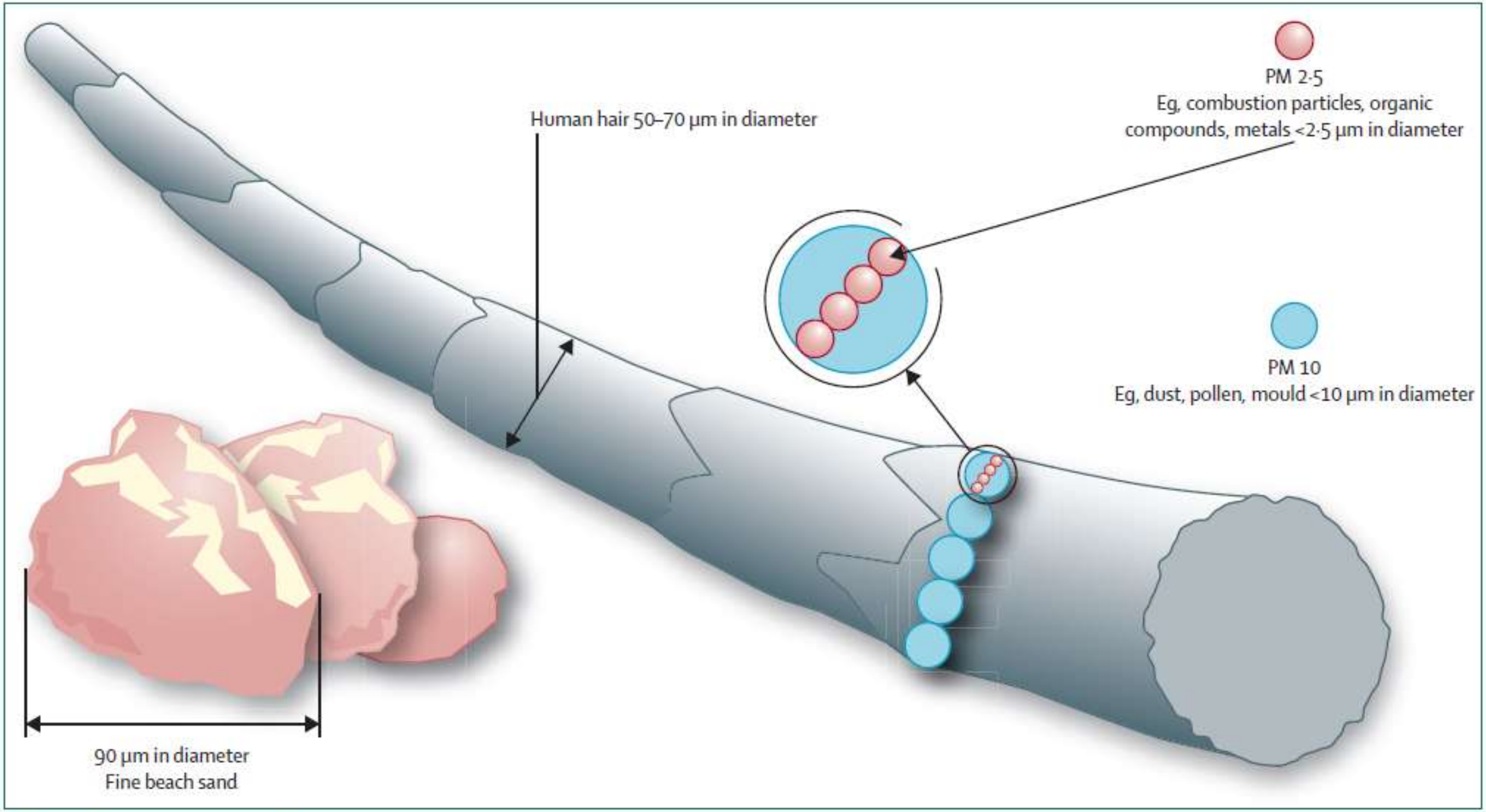


Figure 3: **Particulate matter size**

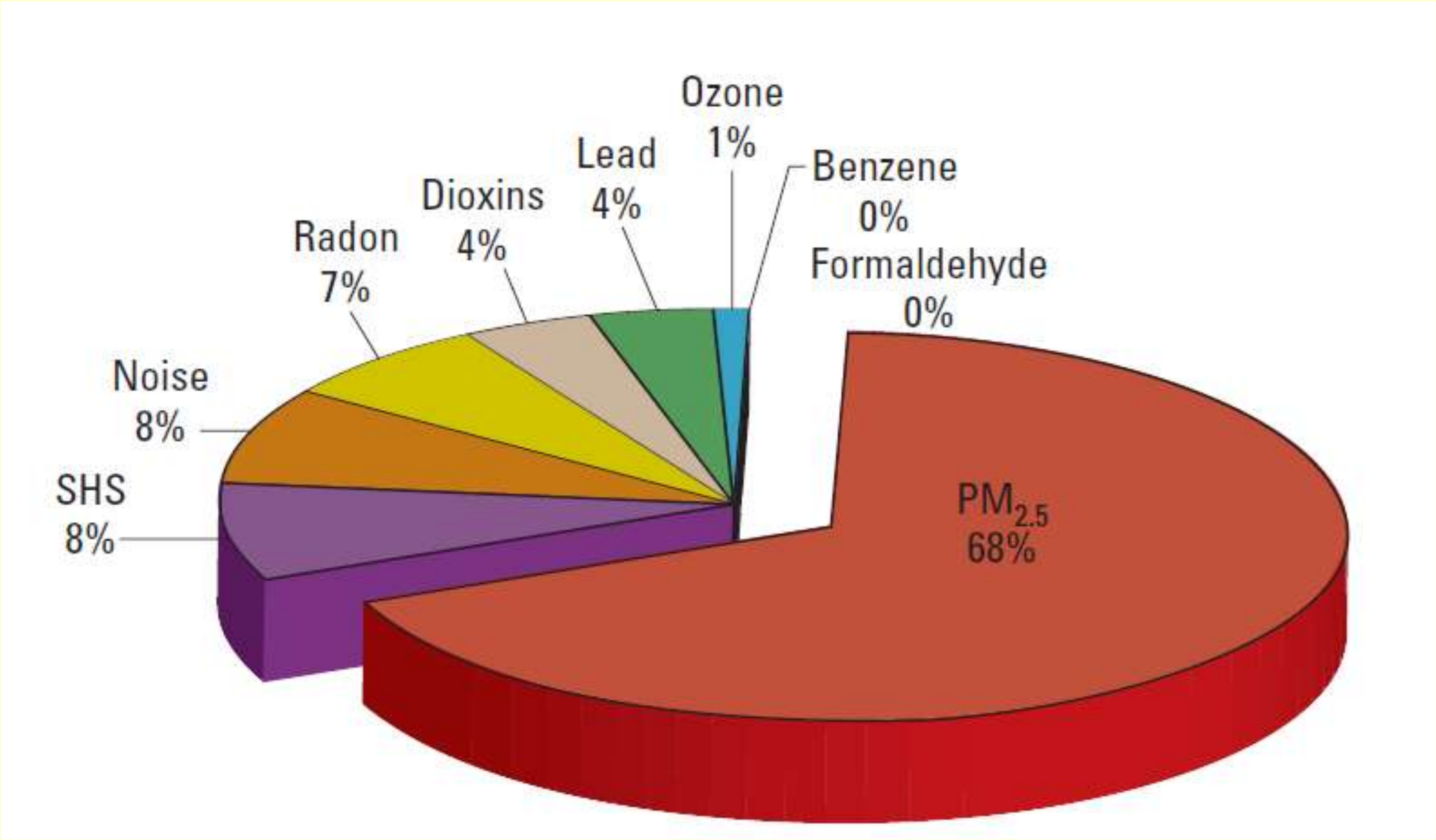
Image modified with permission from the US Environmental Protection Agency. PM=particulate matter.

Guarnieri & Balmes. *Lancet* 2014, 383, 1581-92

Environmental Burden of Disease in Europe: Assessing Nine Risk Factors in Six Countries (BE, FIN, FR, DE, IT, NL)

Otto Hänninen,[1] Anne B. Knol,[2] Matti Jantunen,[1] Tek-Ang Lim,[3] André Conrad,[4] Marianne Rappolder,[4] Paolo Carrer,[5] Anna-Clara Fanetti,[5] Rokho Kim,[6] Jurgen Buekers,[7] Rudi Torfs,[7] Ivano Iavarone,[8] Thomas Classen,[9] Claudia Hornberg,[9] Odile C.L. Mekel,[10] and the EBoDE Working Group

Environ Health Perspect 2014, 122, 439-446



Short term effects of pollutant particles (“peaks”)

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European Environment Agency

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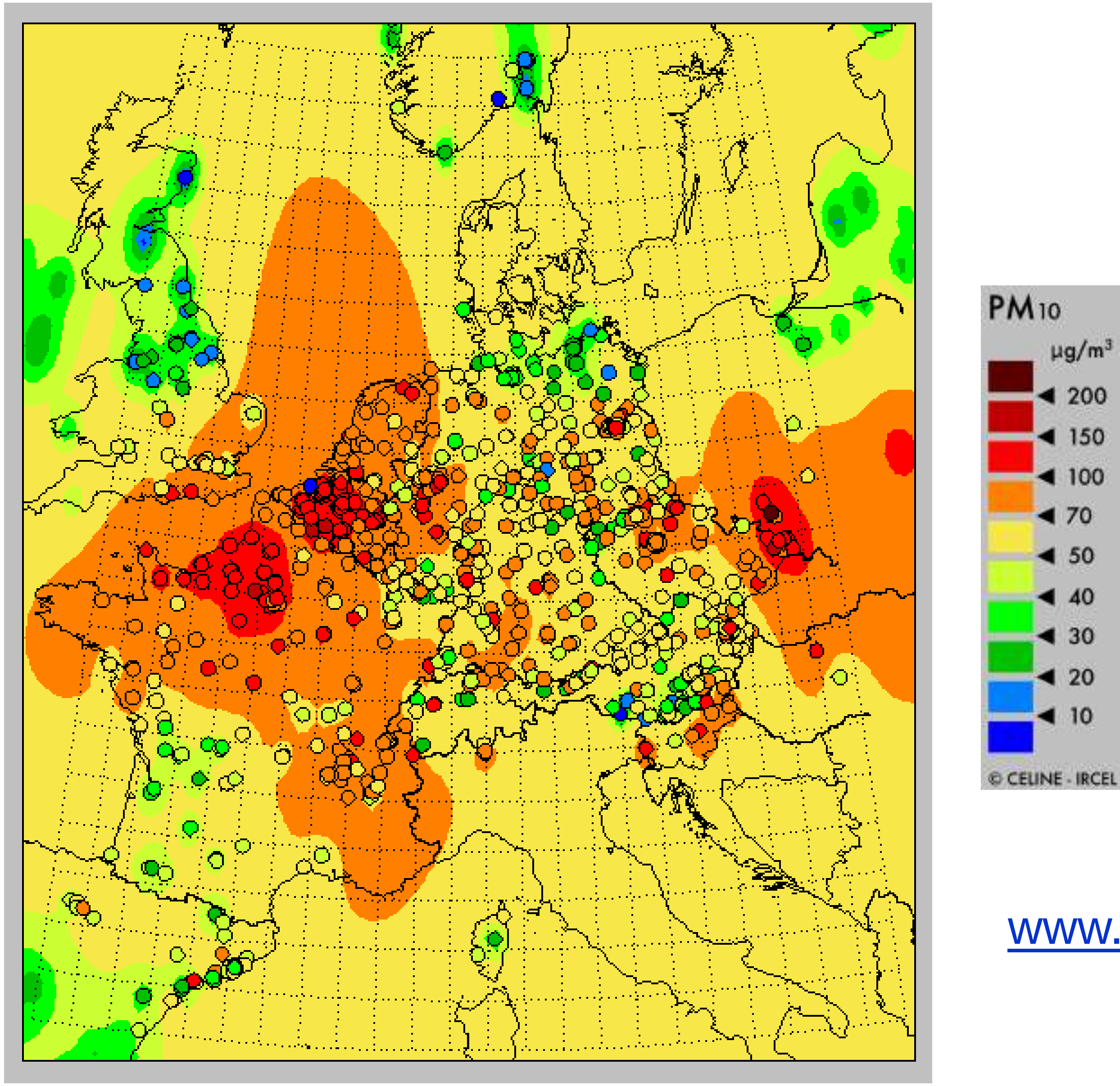
Very high air pollution levels across Western Europe

Highlight Published 14 Mar 2014 Last modified 15 Mar 2014, 12:50 PM

High pollutant levels currently experienced in parts of France, Belgium and Germany are leading some areas to take urgent action to lower air pollution – for example, public transport is free in Paris over the weekend as an incentive for people to avoid car use.

Gemeten fijnstofconcentraties (PM10) in Europa

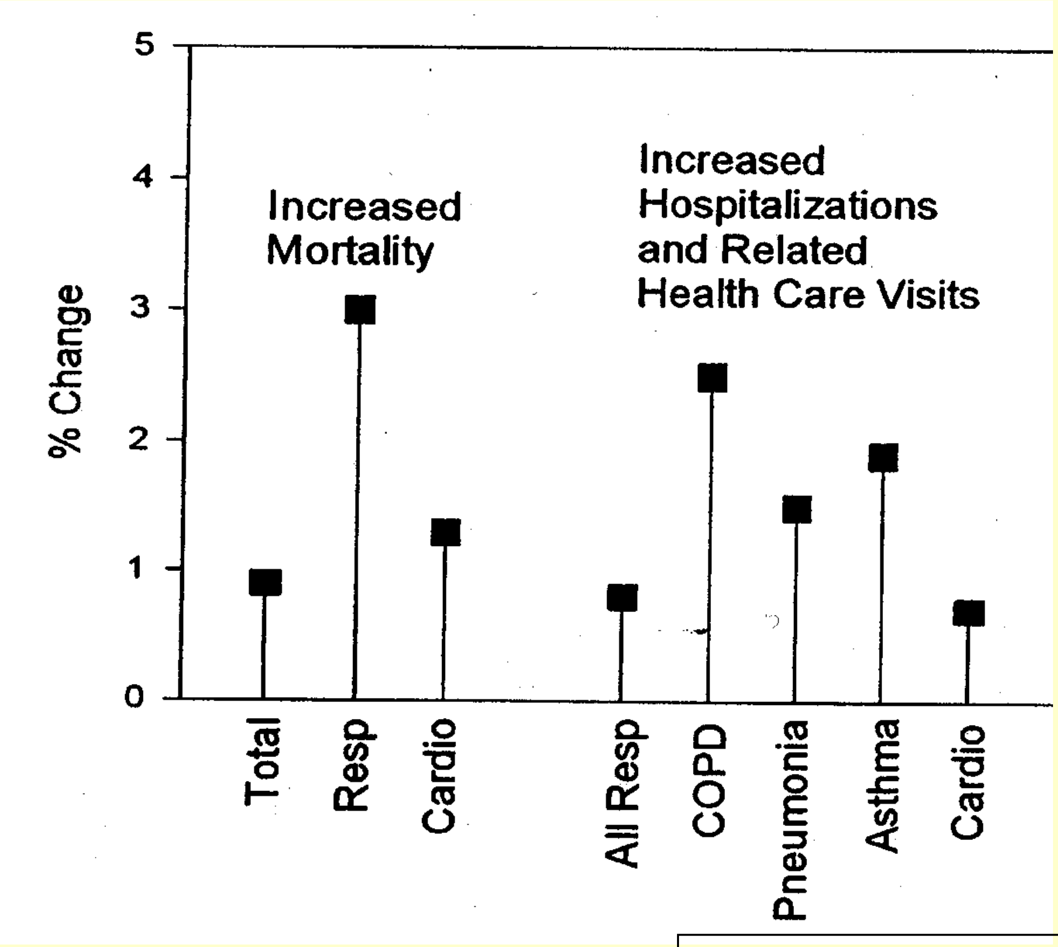
Datum : woensdag 14 maart 2014 om 20 uur (universal time)



www.irceline.be

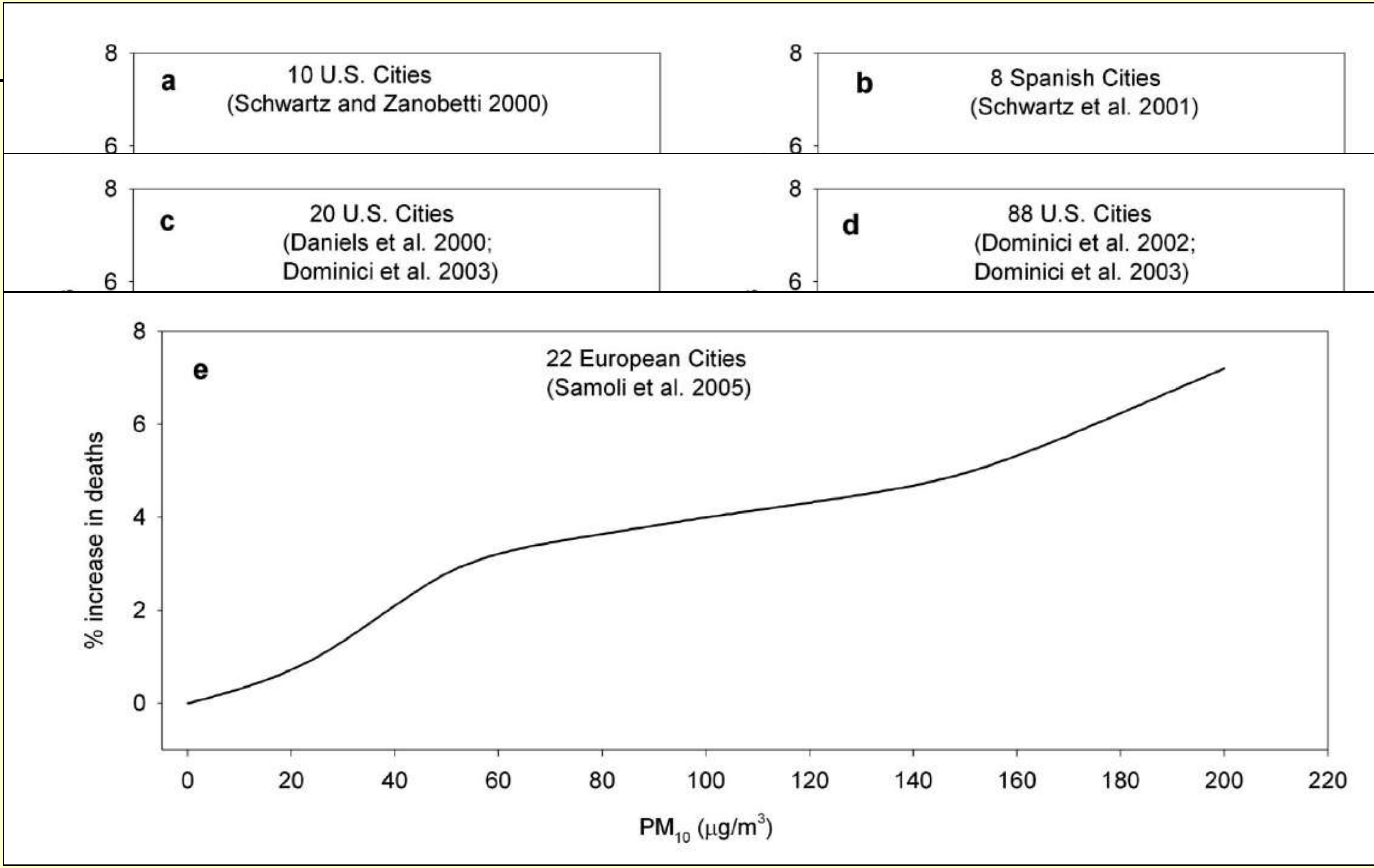
PM_{10} & mortality/morbidity (short term)

Stylized summary: % change per 10 μg/m^3 change in PM_{10}

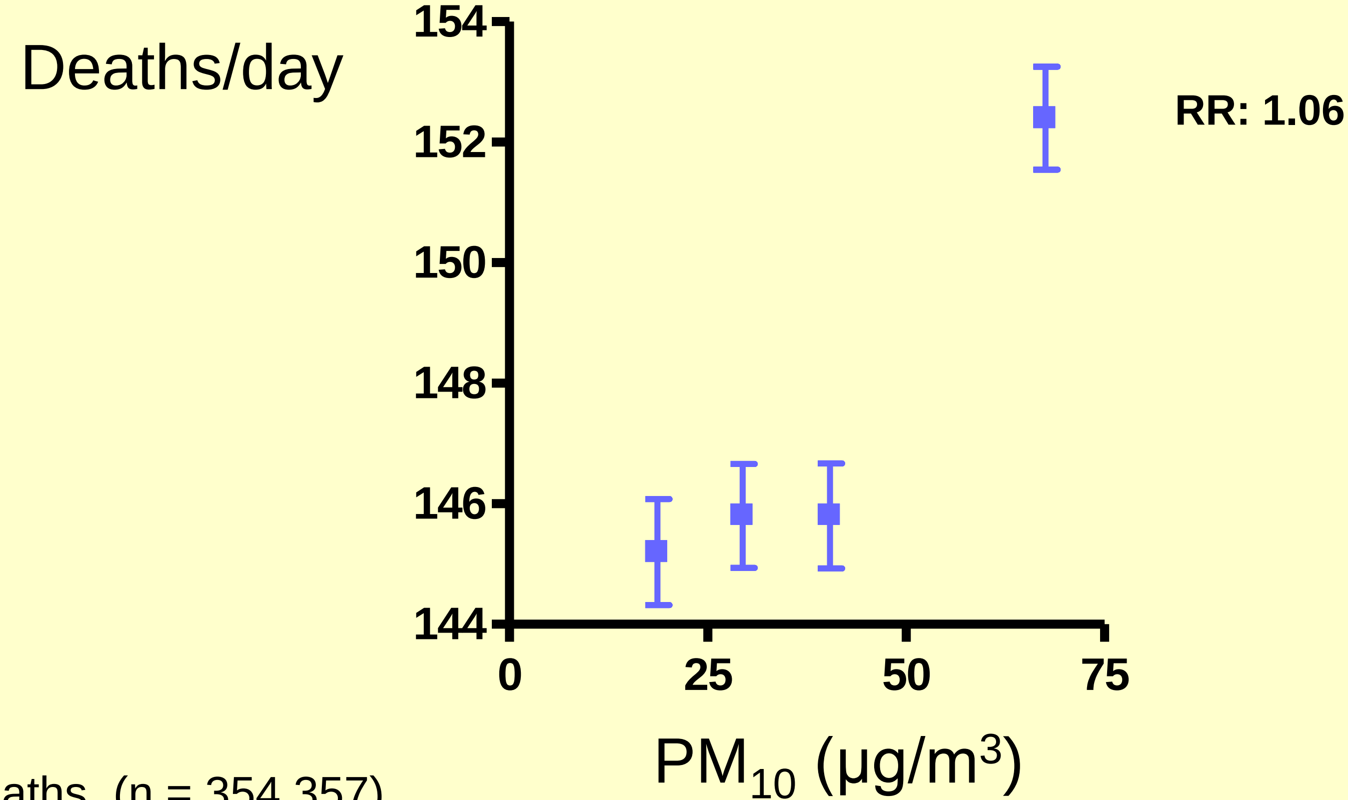


Pope, Ch.31 *in* Holgate *et al*. 1999

Pope & Dockery. *J Air Waste Manage Assoc* 2006, 56, 709-742



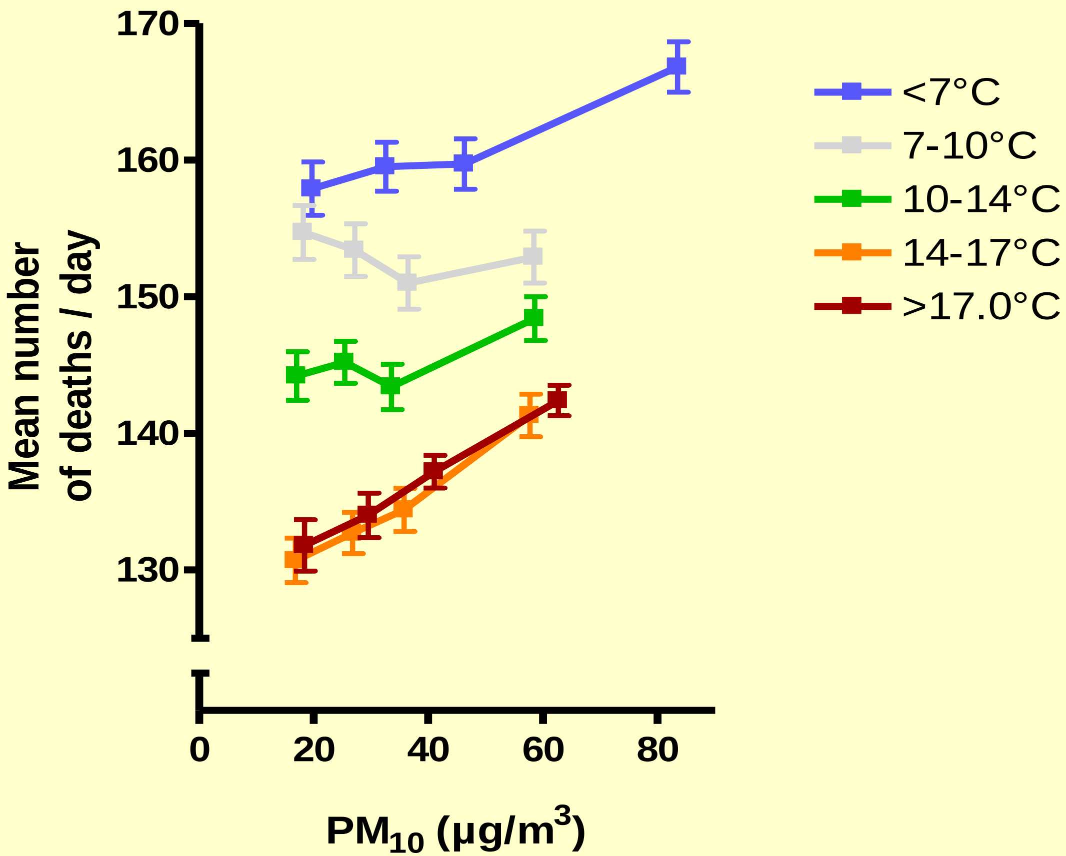
Daily mortality *vs* quartiles of PM_{10} Flanders, 1997-2003



non-traumatic deaths (n = 354 357)

Nawrot *et al*. J Epidemiol Comm Health 2007, 61, 146-9

Mean daily mortality by temperature specific quartiles of PM_{10}



Non-traumatic deaths (n = 354 357)

Nawrot *et al*. J Epidemiol Comm Health 2007, 61, 146-9

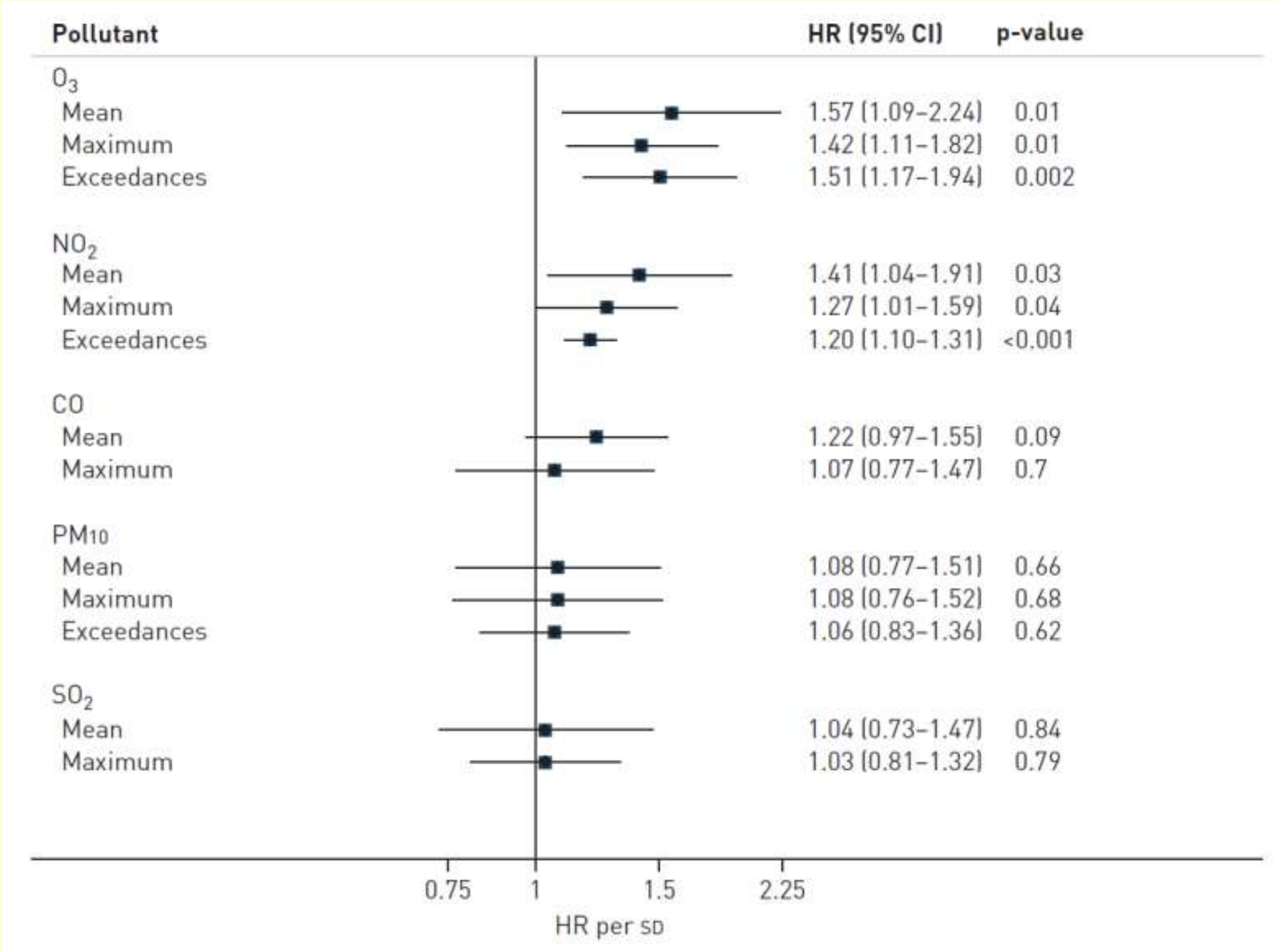
Acute exacerbation of idiopathic pulmonary fibrosis associated with air pollution exposure

Kerri A. Johannson[1,2,3], Eric Vittinghoff[4], Kiyoung Lee[5], John R. Balmes[1,2], Wonjun Ji[6], Gilaad G. Kaplan[3], Dong Soon Kim[6] and Harold R. Collard[1]

Eur Respir J 2014; 43: 1124–1131 | DOI: 10.1183/09031936.00122213

- South Korea, 436 IPF patients, 2001-2010 (1699 p-y)
- 89 exacerbations in 75 patients (= 5.2/100 p-y)
  - 49% admitted to ICU
  - Decreased survival (37% † at 1 mo; 67% † at 6 mo)
- Outdoor air pollution at residence during 6 weeks before exacerbation date?
  - monitoring stations (PM_{10}, SO_2, NO_2, O_3, CO) at mean 7.2 km

Johannson *et al*. *ERJ* 2014, 43, 1124-31



Impact of Air Pollution on Cystic Fibrosis Pulmonary Exacerbations

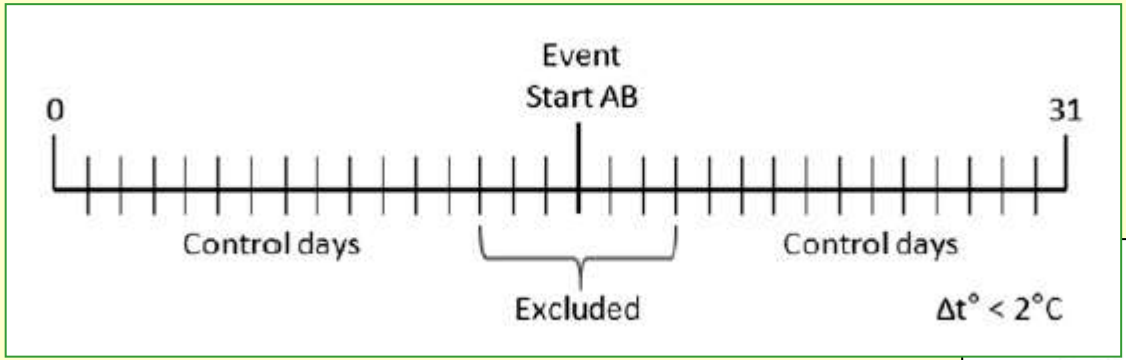
A Case-Crossover Analysis

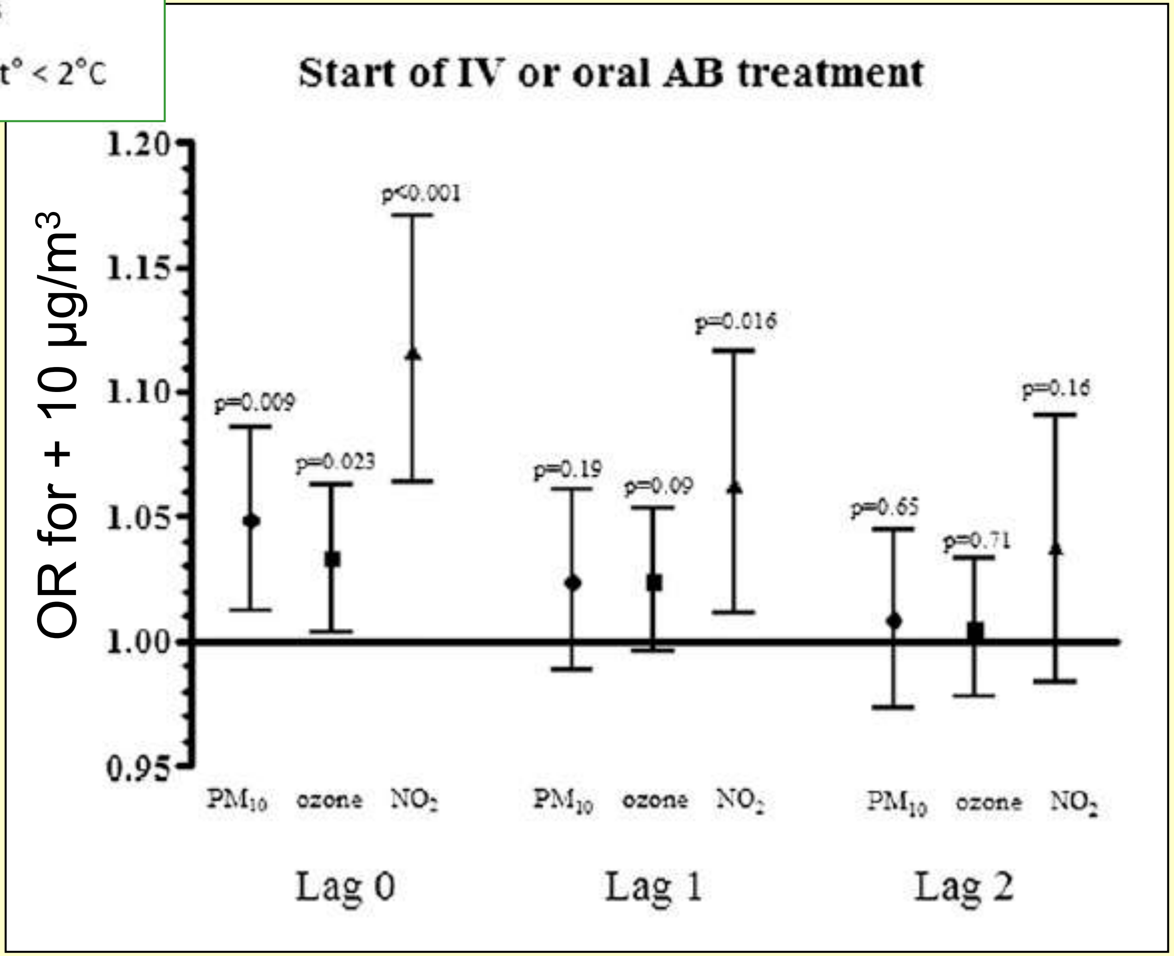
CHEST 2013; 143(4):946–954

Pieter C. Goeminne, MD; Michał Kiciński, MSc; François Vermeulen, MD; Frans Fierens, MSc, Kris De Boeck, MD, PhD; Benoit Nemery, MD, PhD; Tim S. Nawrot, PhD; and Lieven J. Dupont, MD, PhD

- Leuven, 215 CF patients, 1998-2010
- 2,204 exacerbations = R/ iv or oral AB
- Outdoor air pollution (PM_{10}, NO_2, O_3) on day of start of AB administration compared to other days of month
- Case-crossover analysis

Goeminne *et al*. *Chest* 2013, 143, 946-54





Long term effects of pollutant particles (chronic exposure)

http://www.eea.europa.eu/themes/air/air-quality/map/airbase/airbase

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Validated monitoring data and air quality maps

The air quality database 'Airbase' contains validated information for more than 30 participating countries throughout Europe.

Every year countries report air quality measurement data for a set of pollutants at a representative selection of stations. Reporting follows the requirements of the Council Decision 97/101/EC, a reciprocal Exchange of Information (EoI) on ambient air quality.

Airbase contains a large amount of data including calculated statistics on Europe's air quality over the last decade. You can browse it in different ways:

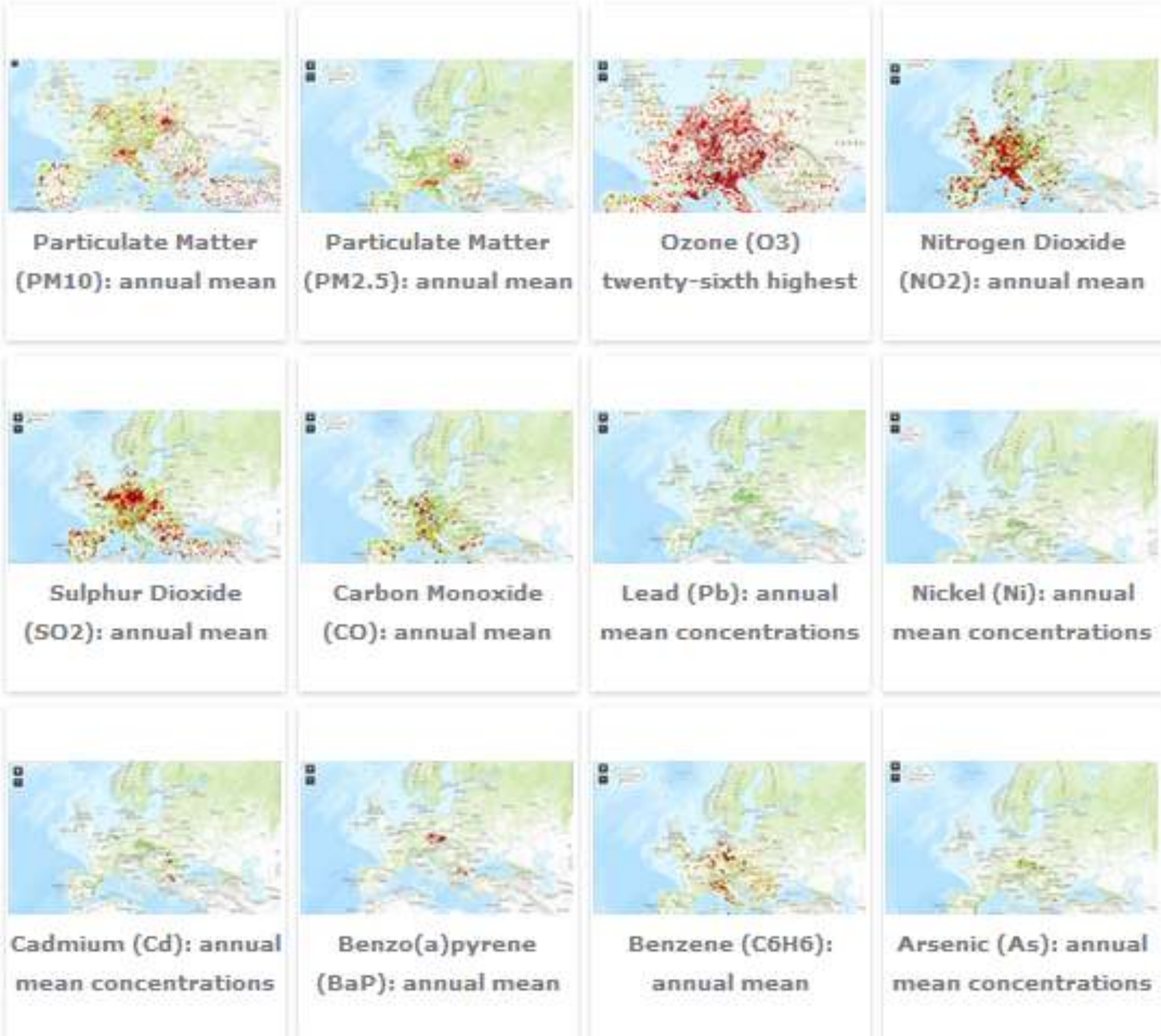
Interactive maps

- Map air quality statistics at reporting stations. Every year countries report air quality measurement data for a set of pollutants at a representative selection of stations.

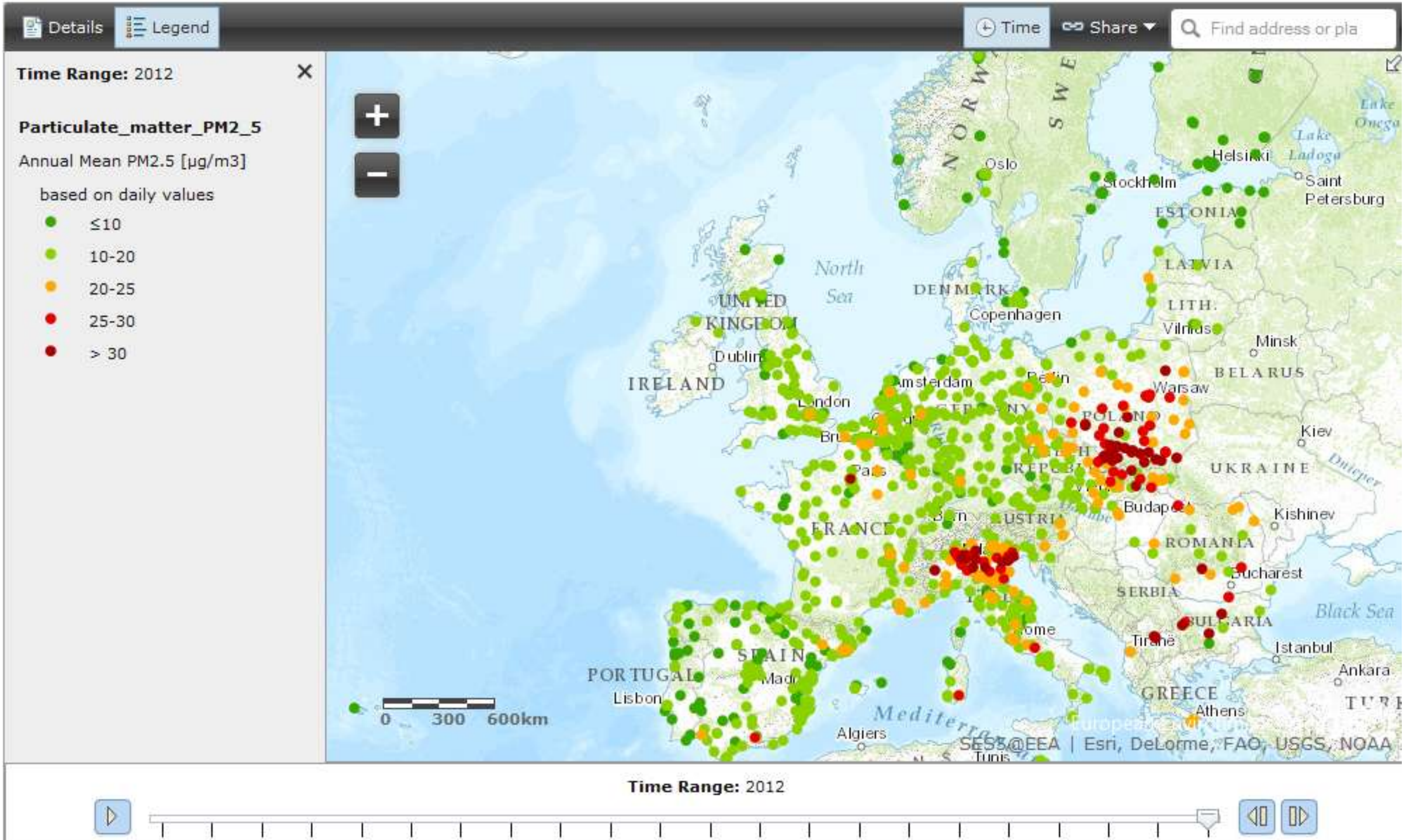
Air quality levels in Europe

- Interactive maps and data
  - About the air quality website
  - Unvalidated real-time air quality map
  - How to read unvalidated air quality map
  - Validated air quality maps and data
    - Validated monitoring data and air quality maps
    - Air quality statistics at reporting stations
    - Air Quality interpolated maps
- Ozone summer

http://www.eea.europa.eu/themes/air/air-quality/map/airbase/airbase



http://www.eea.europa.eu/themes/air/interactive/pm2_5



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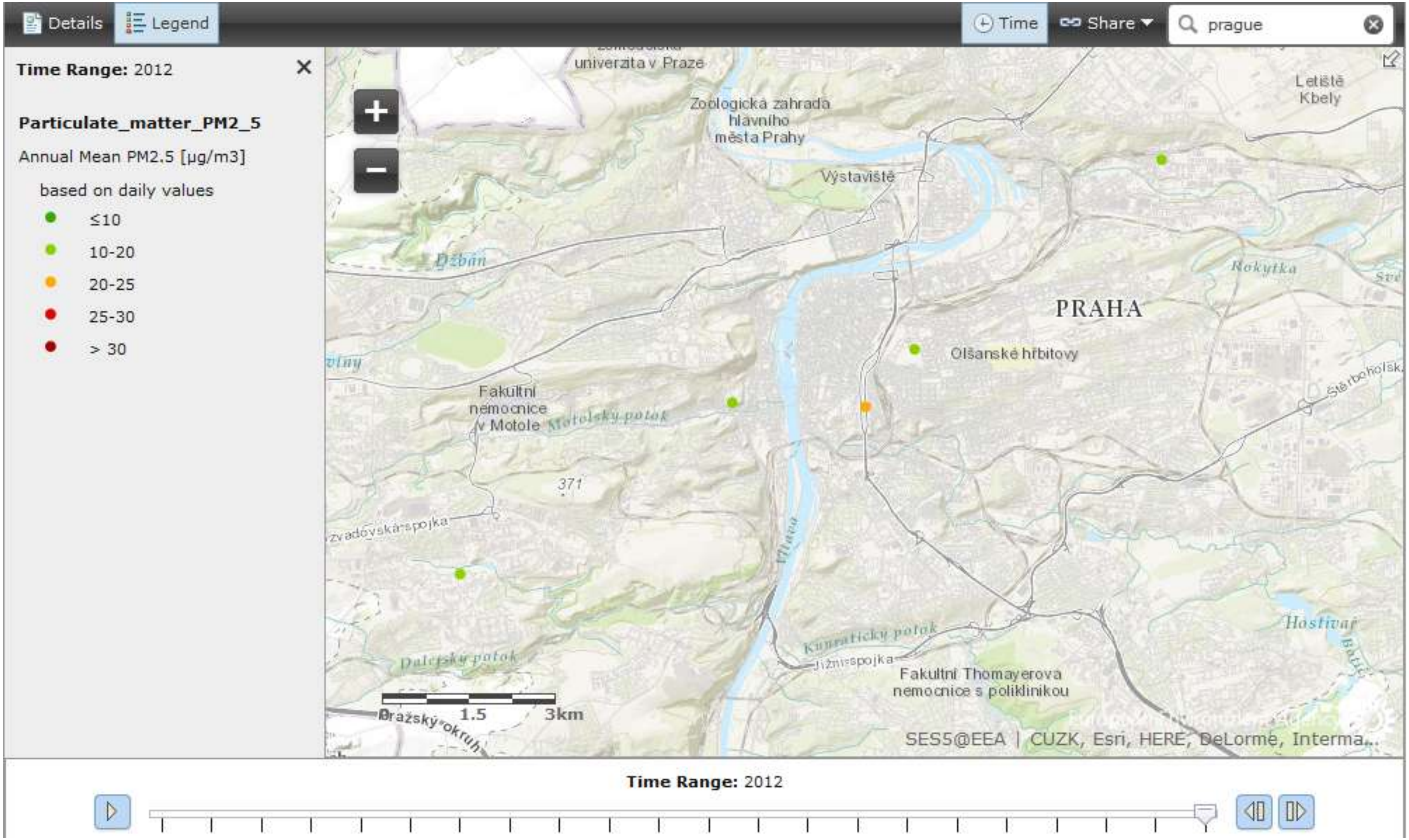

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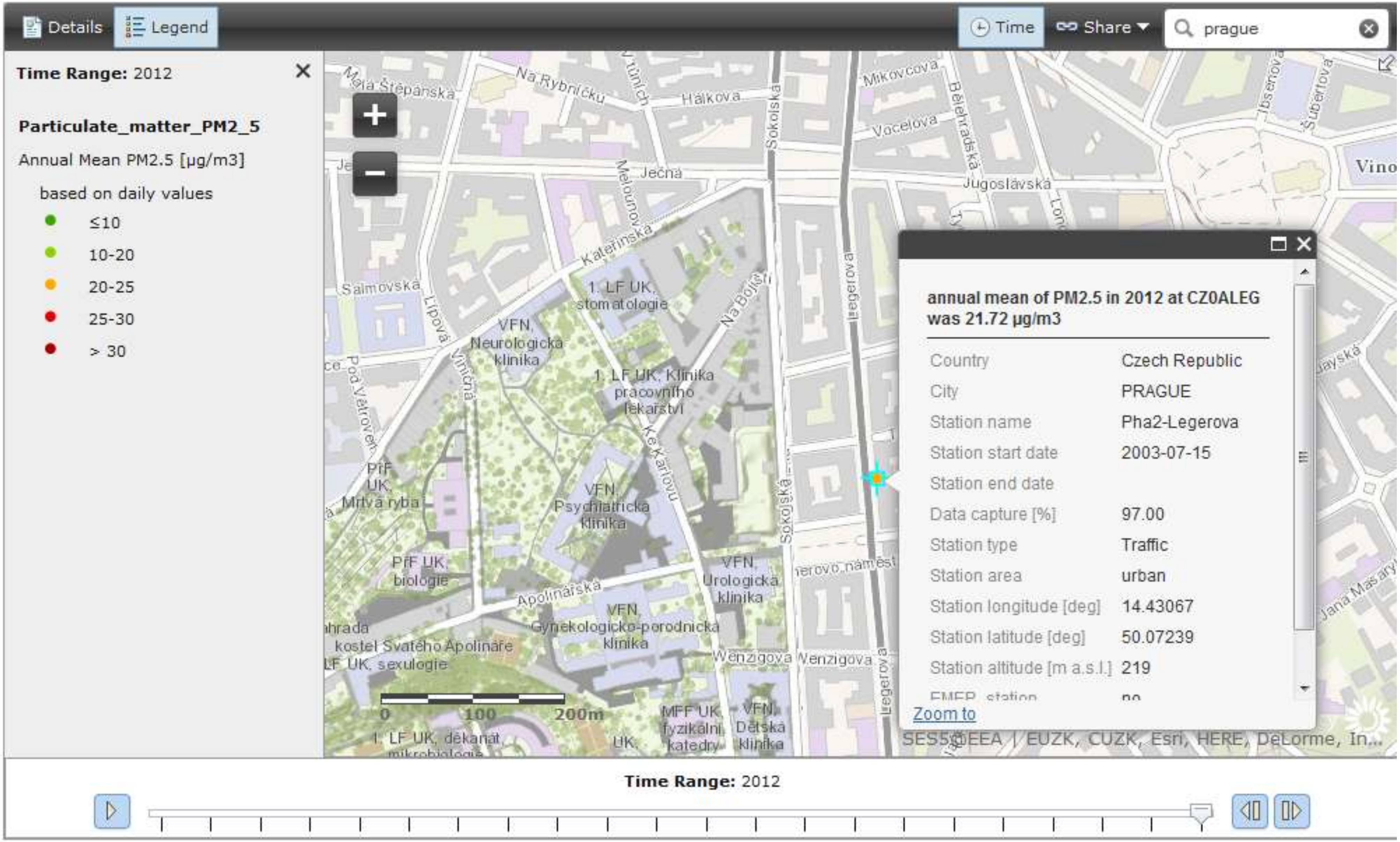
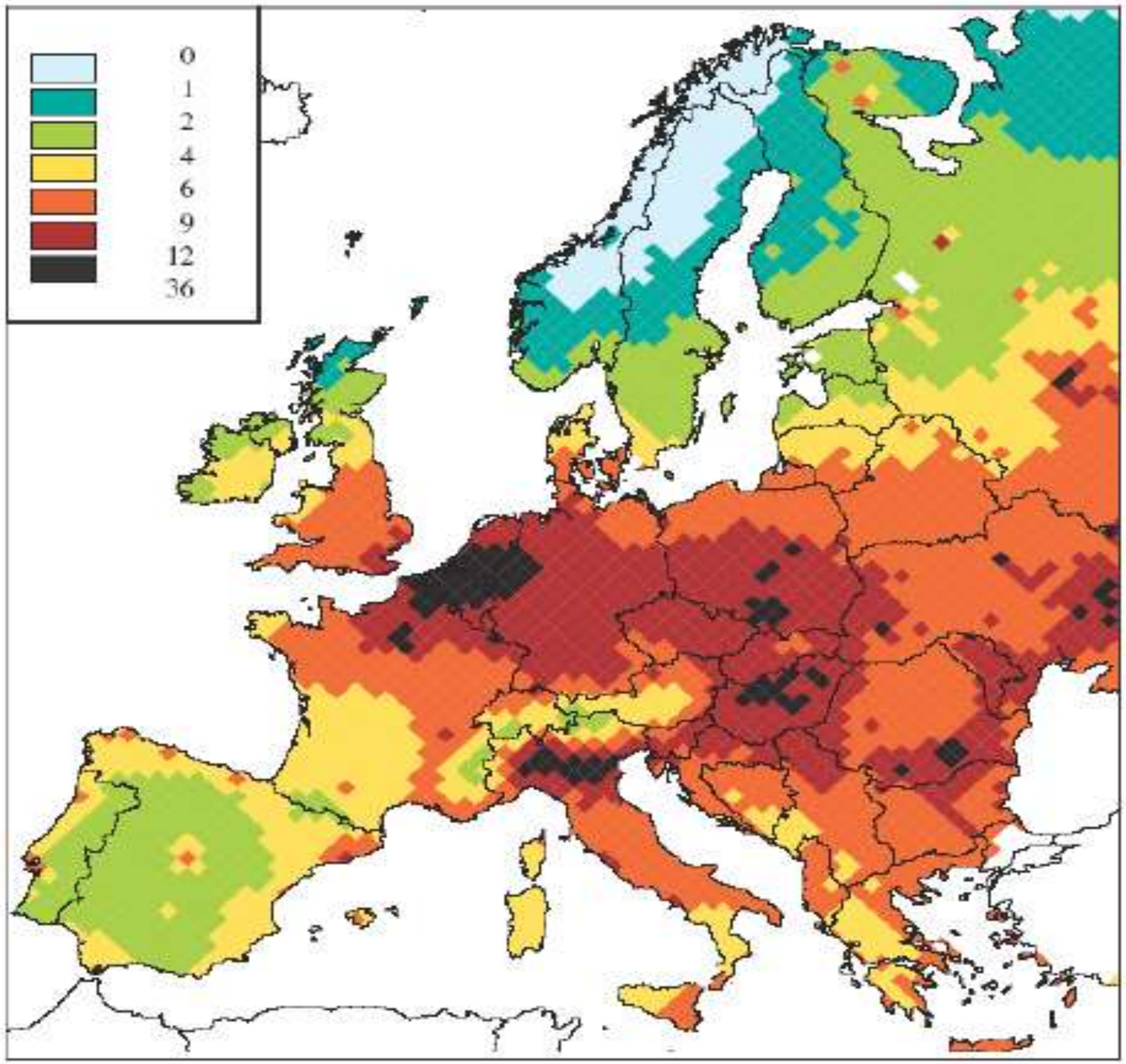


Estimated loss of life expectancy (months) attributable to $PM_{2.5}$ (2000)



http://europa.eu.int/comm/environment/air/cafe/activities/pdf/cafe_scenario_report_2.pdf

Table 3.17: Losses in statistical life expectancy attributable to the exposure to anthropogenic PM2.5 for the year 2000, the emission ceilings for 2010, the current legislation baseline in 2020 and the optimized scenarios for the three environmental ambition levels (in months)

	2000	*2010* National emission ceilings	*2020* Baseline, Current legislation	*Optimized scenarios for 2020* Case "A"	Case "B"	Case "C"	*2020* Maximum technically feasible reductions
Austria	7.2	5.7	5.4	4.4	4.2	4.0	3.8
Belgium	13.2	9.5	8.9	7.3	7.0	6.7	6.5
Cyprus	4.8	4.3	4.2	4.1	4.1	4.1	4.0
Czech Rep.	8.8	6.5	5.8	4.4	4.1	4.0	3.8
Denmark	5.9	4.7	4.5	3.8	3.6	3.4	3.2
Estonia	3.8	3.2	3.0	2.7	2.6	2.6	2.4
Finland	2.6	2.3	2.2	2.1	2.1	2.1	1.9
France	8.0	6.0	5.5	4.5	4.2	4.1	3.8
Germany	9.2	6.8	6.5	5.1	4.7	4.6	4.4
Greece	6.7	5.5	5.2	4.9	4.8	4.7	4.6
Hungary	10.6	8.3	7.6	5.6	5.3	5.2	4.9
Ireland	4.0	2.9	2.6	2.1	2.0	1.9	1.8
Italy	9.0	6.1	5.3	4.3	4.1	4.0	3.9
Latvia	4.5	4.0	3.8	3.4	3.3	3.2	3.0
Lithuania	6.1	5.4	5.0	4.4	4.3	4.1	3.9
Luxembourg	9.6	7.0	6.8	5.1	4.7	4.4	4.2
Malta	5.6	4.3	4.1	3.8	3.8	3.7	3.6
Netherlands	11.8	8.6	8.3	6.6	6.1	5.9	5.7
Poland	9.6	7.5	6.5	5.2	5.0	4.9	4.7
Portugal	5.1	3.2	3.2	2.8	2.5	2.4	2.2
Slovakia	9.1	7.2	6.4	4.8	4.6	4.4	4.2
Slovenia	8.2	6.5	6.0	4.8	4.6	4.4	4.1
Spain	5.2	3.5	3.2	2.8	2.7	2.6	2.5
Sweden	3.5	2.9	2.7	2.4	2.4	2.2	2.0
UK	6.9	5.0	4.6	3.5	3.2	3.1	3.0
EU-25	8.1	5.9	5.5	4.4	4.1	4.0	3.8

http://europa.eu.int/comm/environment/air/cafe/activities/pdf/cafe_scenario_report_6.pdf

Effects of long-term exposure to air pollution on natural-cause mortality: an analysis of 22 European cohorts within the multicentre ESCAPE project

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Summary

Background Few studies on long-term exposure to air pollution and mortality have been reported from Europe. Within the multicentre European Study of Cohorts for Air Pollution Effects (ESCAPE), we aimed to investigate the association between natural-cause mortality and long-term exposure to several air pollutants.

Lancet 2014; 383: 785–95

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http://dx.doi.org/10.1016/

Findings The total study population consisted of 367 251 participants who contributed 5 118 039 person-years at risk (average follow-up 13·9 years), of whom 29 076 died from a natural cause during follow-up. A significantly increased hazard ratio (HR) for $PM_{2.5}$ of 1·07 (95% CI 1·02–1·13) per 5 μg/m³ was recorded. No heterogeneity was noted between individual cohort effect estimates (I^2 p value=0·95). HRs for $PM_{2.5}$ remained significantly raised even when we included only participants exposed to pollutant concentrations lower than the European annual mean limit value of 25 μg/m³ (HR 1·06, 95% CI 1·00–1·12) or below 20 μg/m³ (1·07, 1·01–1·13).

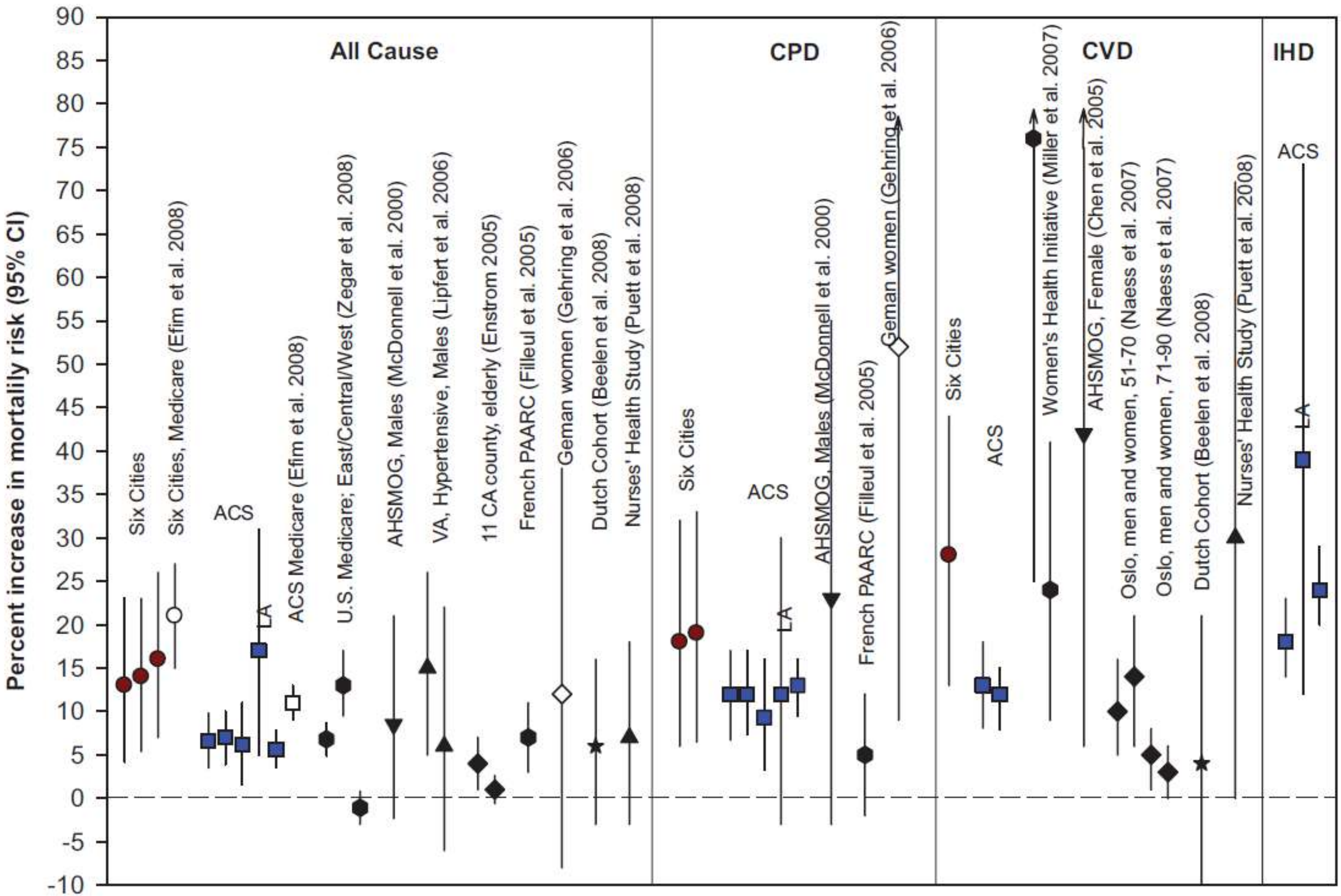


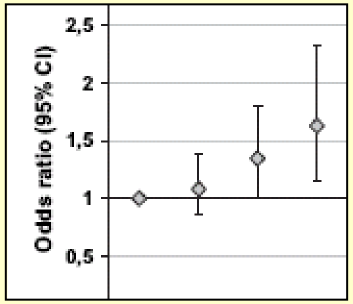
Figure 1. Risk estimates provided by several cohort studies per increment of 10 $\mu g/m^3$ in $PM_{2.5}$ or PM_{10}. CPD indicates cardiopulmonary disease; IHD, ischemic heart disease.

Brooks *et al. Circulation* 2010,121, 2331-78

Pollution (long term) and CV morbidity

Hoffman *et al.* Residential exposure to traffic is associated with coronary atherosclerosis. *Circulation* 2007, 116, 489-96

- Prospective cohort study, Essen/Mülheim/Bochum (Ruhr area, DE)
  - 2000-2003 : 4494 persons, 45-74 y
  - Coronary artery calcification (CAC) by electron-beam CT
- Exposure
  - Annual average $PM_{2.5}$ for 2002 per 5x5 km grid (EURAD dispersion model)
  - Distance of residence to major roads (10,000-130,000 vehicles/d)
- OR for CAC > 75th percentile (adj. for city, area, age, sex, education, smoking, ETS, physical inactivity, waist-to-hip ratio, diabetes, blood pressure, lipids)
  - > 200 m from major road (n=3821): 1 (reference)
  - 101-200 m (n=322): 1.08 (0.85-1.39)
  - 51-100 m (n=214): 1.34 (1.00-1.79)
  - < 50 m (n=137): 1.63 (1.14-2.33)

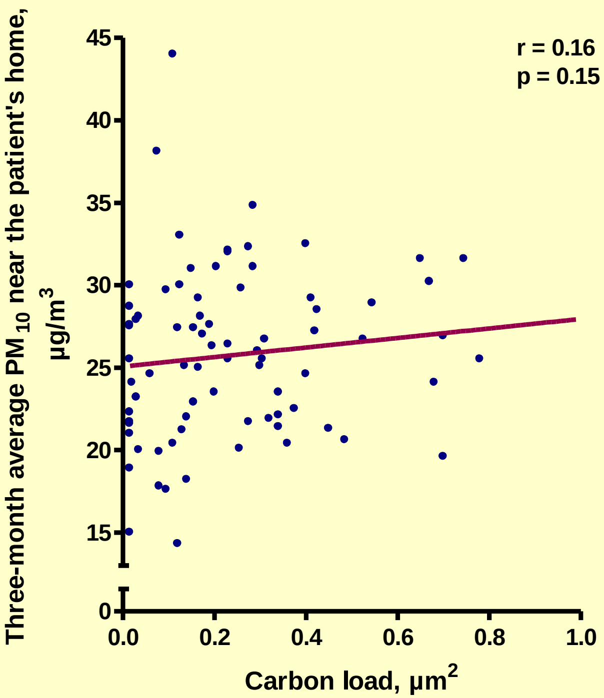


Jacobs *et al.* Exposure to air pollution and prothrombotic changes in persons with diabetes. *Environ Health Persp* 2010,118, 191-6

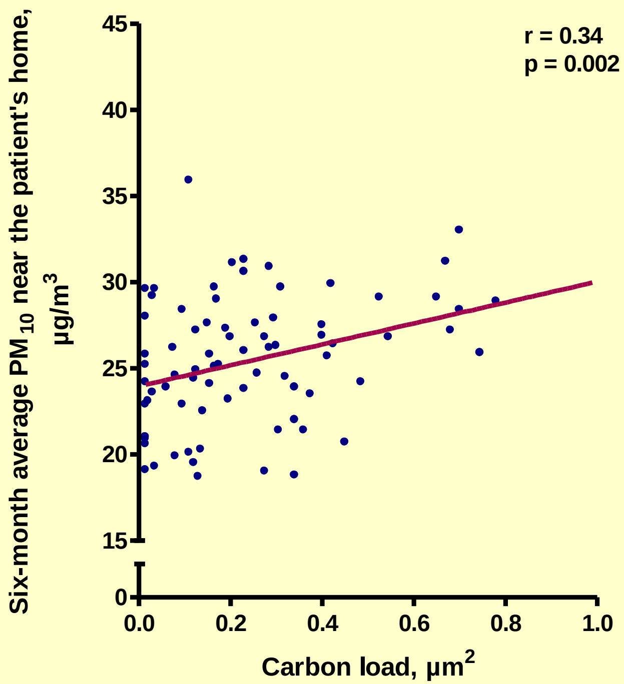
Jacobs *et al.* Traffic air polution and oxidized LDL. *PLoS One* 2011, 19;6(1):e16200

Carbon load in sputum macrophages and chronic exposure to ambient PM

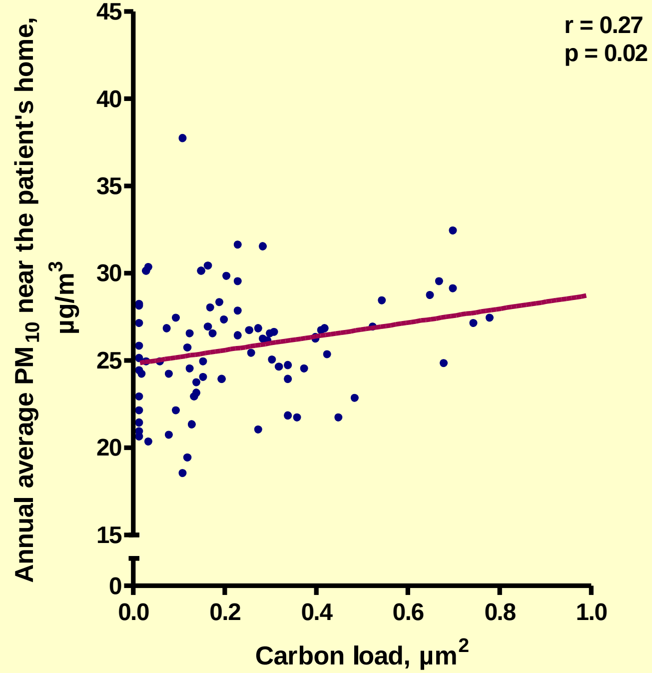
Three-month average PM_{10}

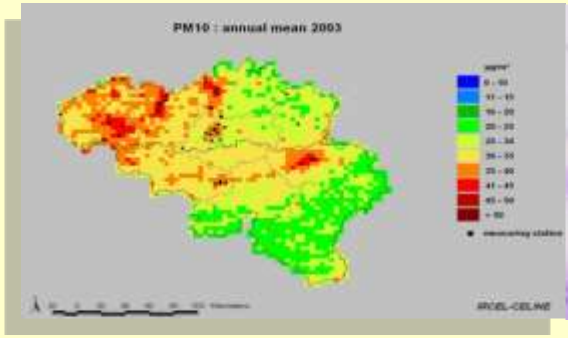


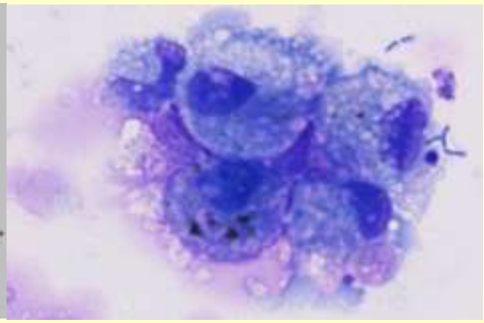
Six-month average PM_{10}



Annual average PM_{10}

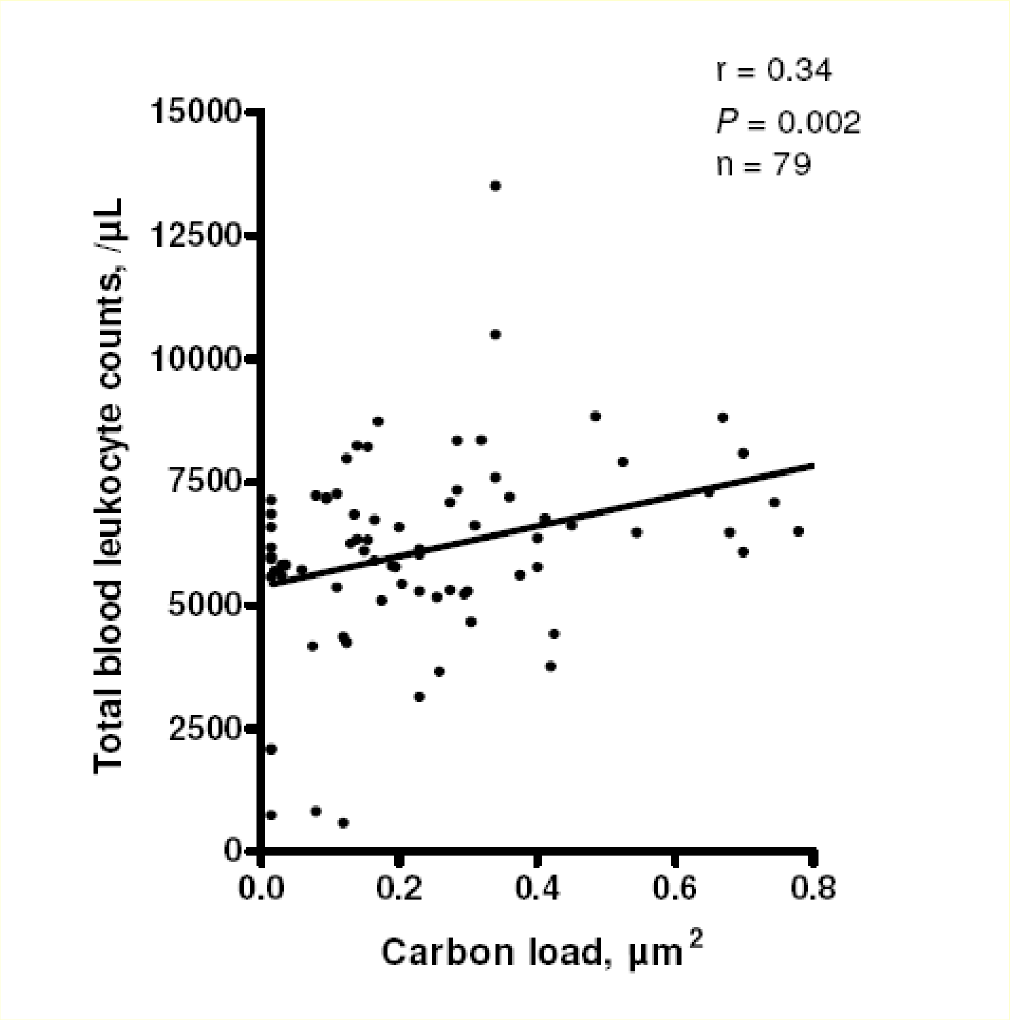






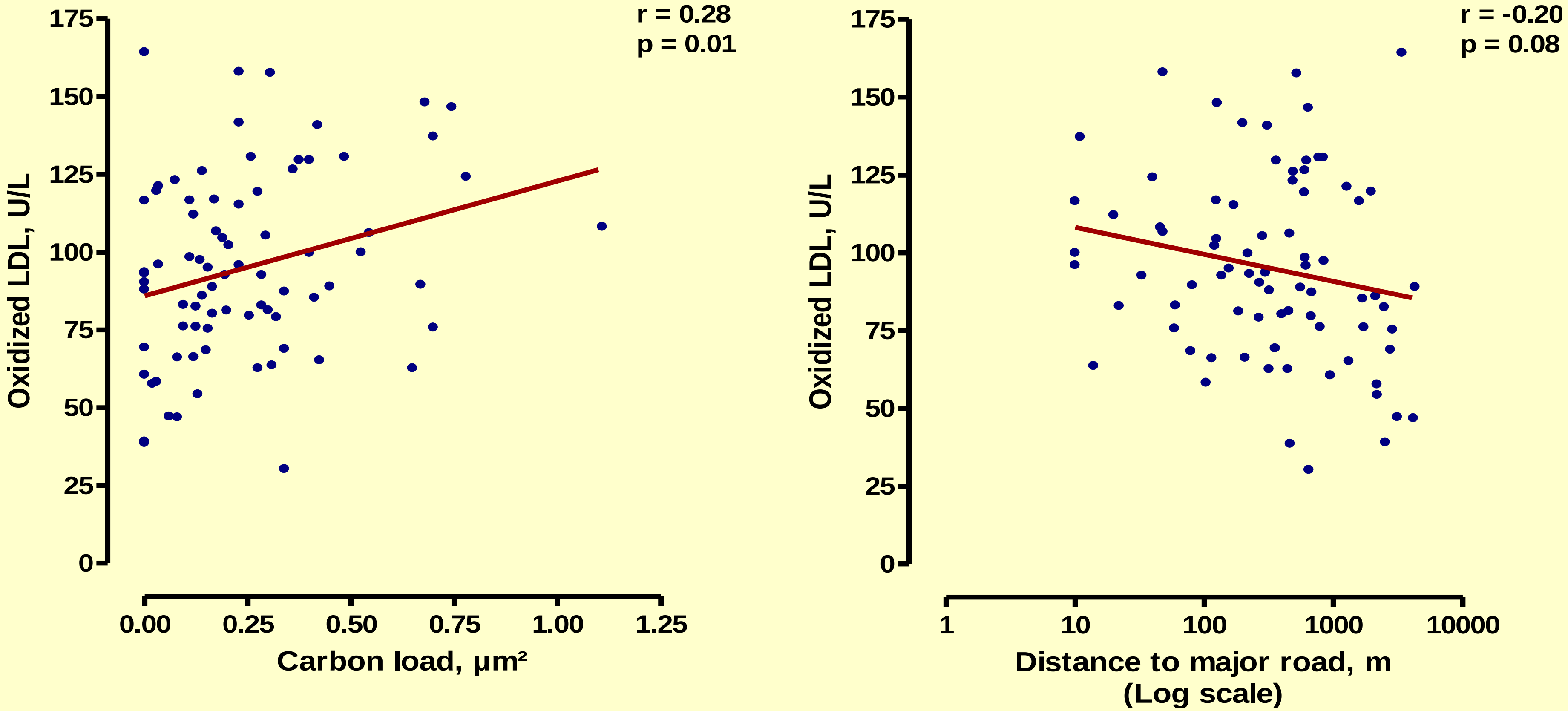
Spearman Rank correlation

Blood leukocyte count



Jacobs L *et al. Environ Health Persp* 2010,118, 191-6

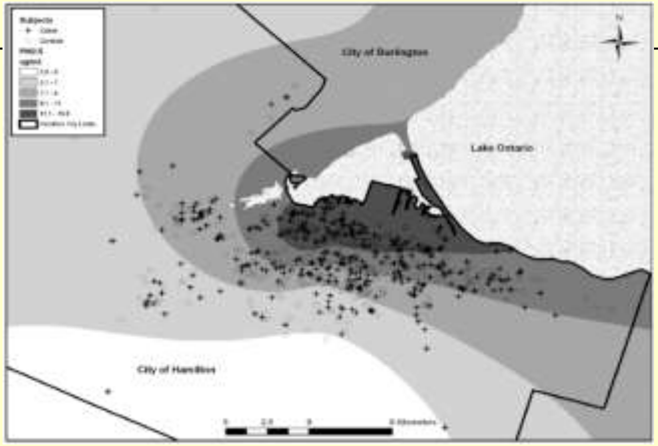
Oxidized LDL



Jacobs L *et a.* *PLoS One* 2011, e16200

Air pollution and pneumonia

Neupane *et al.* Long-term exposure to ambient air pollution and risk of hospitalization with community-acquired pneumonia in older adults. *AJRCCM* 2010, 181, 47-53



- Hamilton, Ontario
- Case-control study, 2003 – 2005

  345 patients (> 65 y) hospitalized for CAP

  494 controls from community
- Estimated annual exposure to $PM_{2.5}$, NO_2, at residence
- adjusted OR for hospitalization for CAP [↑ from 5th to 95th percentile]:
  - $PM_{2.5}$ [9.3 → 12.4 µg/m^3] 2.26 (1.20-4.24)
  - NO_2 [16.1 → 23.3 µg/m^3] 2.30 (1.25-4.21)
  - SO_2 [4.6 → 7.2 µg/m^3] 0.97 (0.59-1.61)

Air pollution and COPD

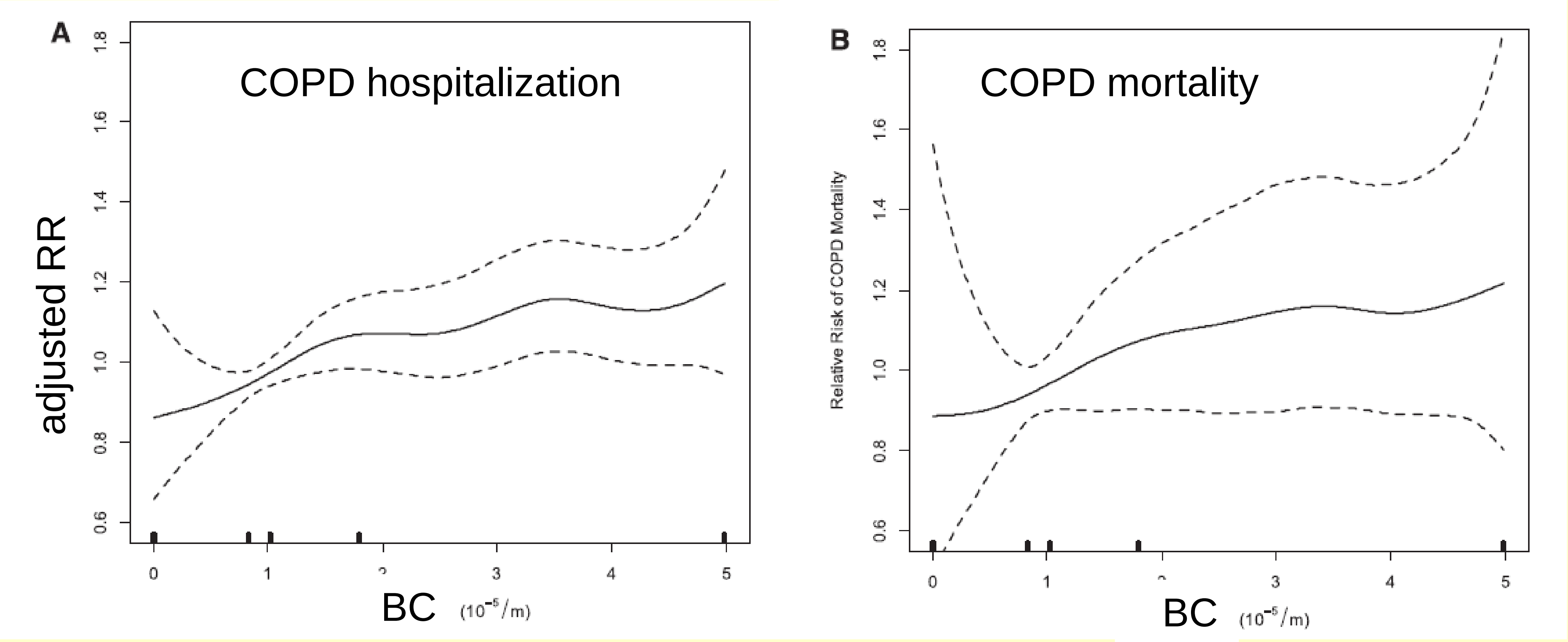
Gan WQ *et al.* Associations of ambient air pollution with chronic obstructive pulmonary disease hospitalization and mortality. *AJRCCM* 2013, 187, 721-7

- Metropolitan Vancouver, 467,994 residents, 45-85 y, without COPD at baseline
  - Estimated 5 y exposure (1994-1998) to traffic-related pollutants [BC, $PM_{2.5}$, NO_2, NO] and woodsmoke
  - 4 y follow-up (1999-2002): COPD hospitalization (n=2,299) or mortality (n=541)

➢ no significant association with $PM_{2.5}$ (0-10.2 µg/m^3) or NO_2, NO, but positive associations with BC (+6% for IQR) and woodsmoke (hospitalizations)

Air pollution and COPD

Gan WQ *et al.* Associations of ambient air pollution with chronic obstructive pulmonary disease hospitalization and mortality. *AJRCCM* 2013, 187, 721-7



Air pollution and lung cancer

Turner *et al.* Long-term ambient fine particulate matter air pollution and lung cancer in a large cohort of never-smokers. *AJRCCM* 2011, 184, 1374-81

- ACS, 1982-2008, 188,699 life-long never-smokers
- 1,100 lung cancer deaths
- Estimated exposure to $PM_{2.5}$ at residence (metropolitan stat. area)
- Adjustments for personal variables (incl. passive smoking) + ecologic variables (residential radon, SES)
- For $PM_{2.5}$ + 10 $\mu g/m^3 \rightarrow$ HR +15-27% lung cancer mortality

Effects of residential proximity to traffic in lung transplant patients

(Nawrot *et al.*, *Thorax* 2011, 66, 748-54)

Thorax Online First, published on March 23, 2011 as 10.1136/thx.2010.155192

PRESS RELEASE

The impact of traffic air pollution on bronchiolitis obliterans syndrome and mortality after lung transplantation

Tim S Nawrot,[1,2] Robin Vos,[3,4] Lotte Jacobs,[2] Stijn E Verleden,[3,4] Shana Wauters,[4] Veerle Mertens,[4] Christophe Dooms,[3] Peter H Hoet,[2] Dirk E Van Raemdonck,[4,5] Christel Faes,[6] Lieven J Dupont,[3,4] Benoit Nemery,[2] Geert M Verleden,[3,4] Bart M Vanaudenaerde[3,4]

BOS and mortality after lung transplantation and residential proximity to traffic

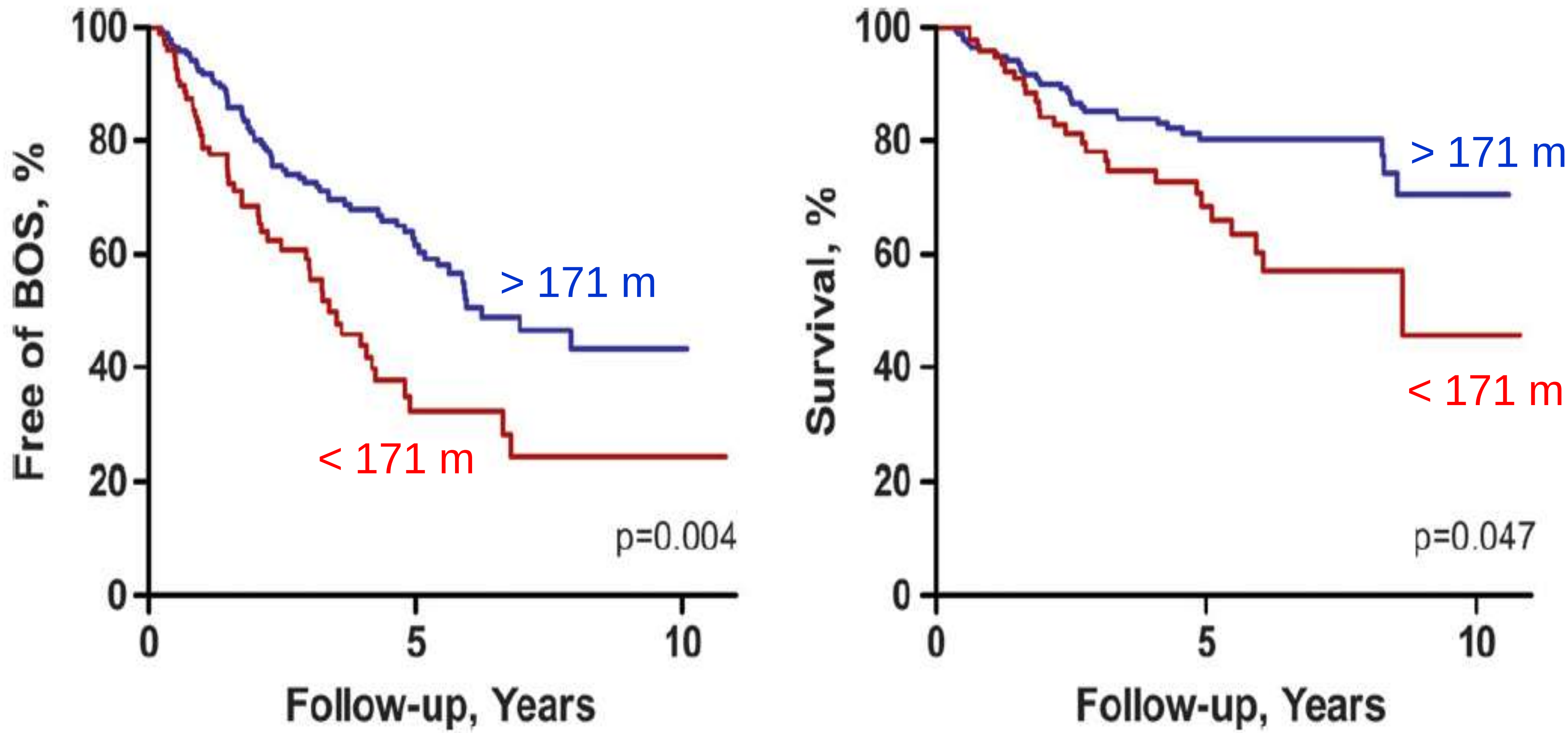
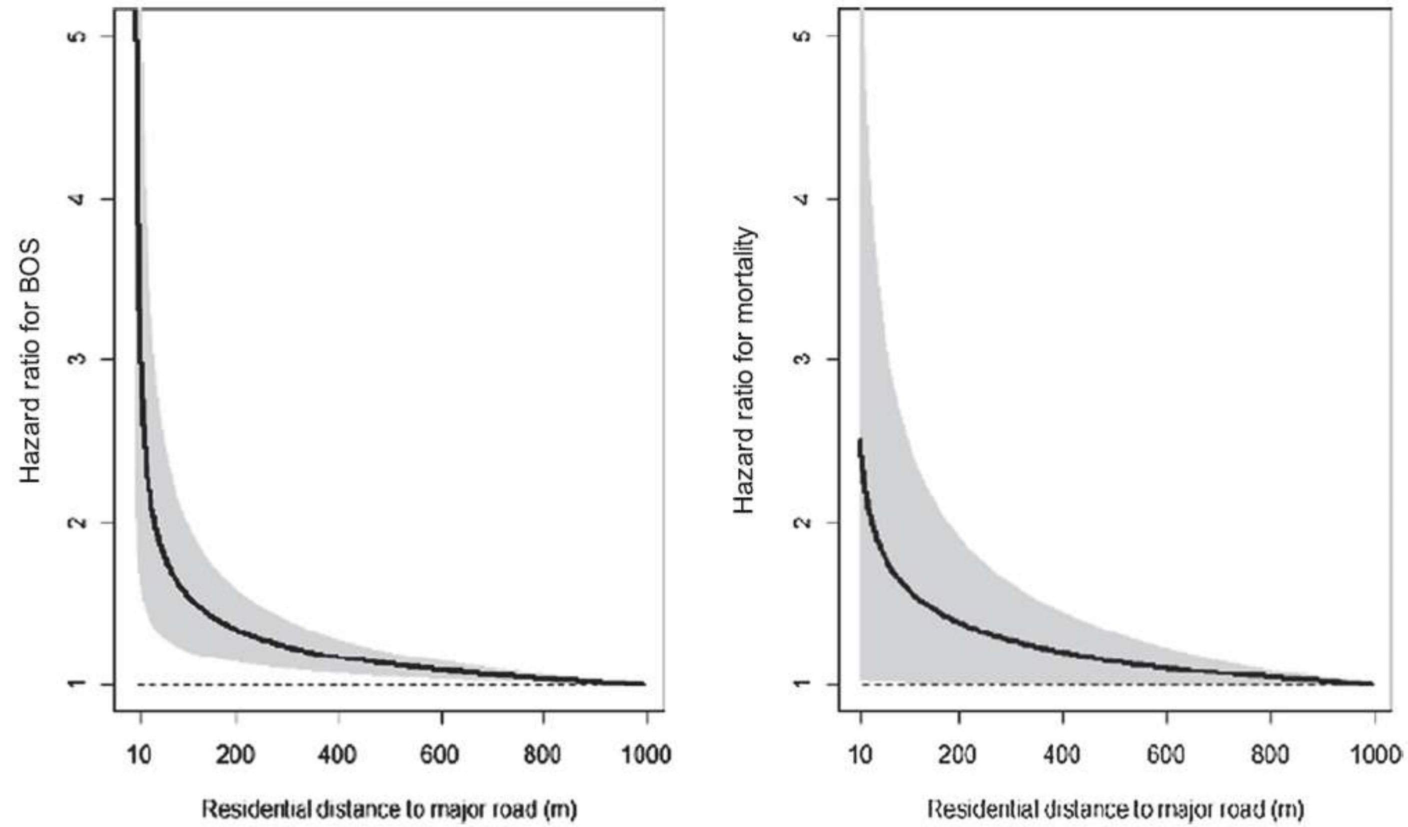


Figure 1 Unadjusted Cox regression in patients after lung transplantation classified according to whether they lived within 171 m of a major road (n=96, lowest tertile, red line) or more than 171 m from a major road (n=192, blue line). BOS, bronchiolitis obliterans syndrome.

Nawrot TS, Vos R, Jacobs L, *et al*. *Thorax* (2011). doi:10.1136/thx.2010.155192



Distance to major road, m	Hazard ratio (95% CI) for BOS	Attributable fraction
1000	1.00	-
800	1.04 (1.02-1.06)	3.8%
600	1.09 (1.04-1.14)	8.2%
400	1.17 (1.04-1.28)	14.7%
200	1.34 (1.14-1.58)	25.4%
150	1.43 (1.17-1.74)	30.0%
100	1.57 (1.22-2.02)	36.3%
50	1.88 (1.32-2.66)	46.7%

Distance to major road, m	Hazard ratio (95% CI) for mortality	Attributable fraction
1000	1.00	-
800	1.05 (1.00-1.09)	4.8%
600	1.11 (1.00-1.23)	9.8%
400	1.20 (1.00-1.45)	16.9%
200	1.39 (1.01-1.90)	27.8%
150	1.47 (1.01-2.14)	31.9%
100	1.60 (1.02-2.52)	37.2%
50	1.83 (1.02-3.30)	45.4%

Figure 2 Adjusted hazard ratio (with 95% CI, the grey area) for the incidence of bronchiolitis obliterans syndrome (BOS) and mortality in patients after lung transplantation, with 1000 m as reference. Hazard ratios were adjusted for sex, age, type of transplantation (single or double lung transplantation), infection with cytomegalovirus (CMV) and non-CMV infections, acute rejections, a factor reflecting time trend and social economic status. A corresponding table is given with HRs (95% CI) and the attributable

Nawrot TS, Vos R, Jacobs L, *et al*. *Thorax* (2011). doi:10.1136/thx.2010.155192

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Eur Respir J 2012, 39, 525-528

EDITORIAL

Ten principles for clean air

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1) Citizens are entitled to clean air, just like clean water and safe food.

2) Outdoor air pollution is one of the biggest environmental health threats in Europe today, leading to significant reductions of life expectancy and productivity.

3) Fine particles and ozone are the most serious pollutants. There is an urgent need to reduce their concentrations significantly.

Thank you for your attention

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