Contactgroep Gezondheid en Chemie & NVAB
‘s Hertogenbosch – 14.06.2012

“Klinische arbeidsgeneeskunde, van een niche tot normale zorg”

Arbeidsgerelateerde longaandoeningen en gezondheidsbewaking: van bedreiging naar een kans

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Arbeids-, Milieu- en Verzekeringsgeneeskunde

&

Pneumologie

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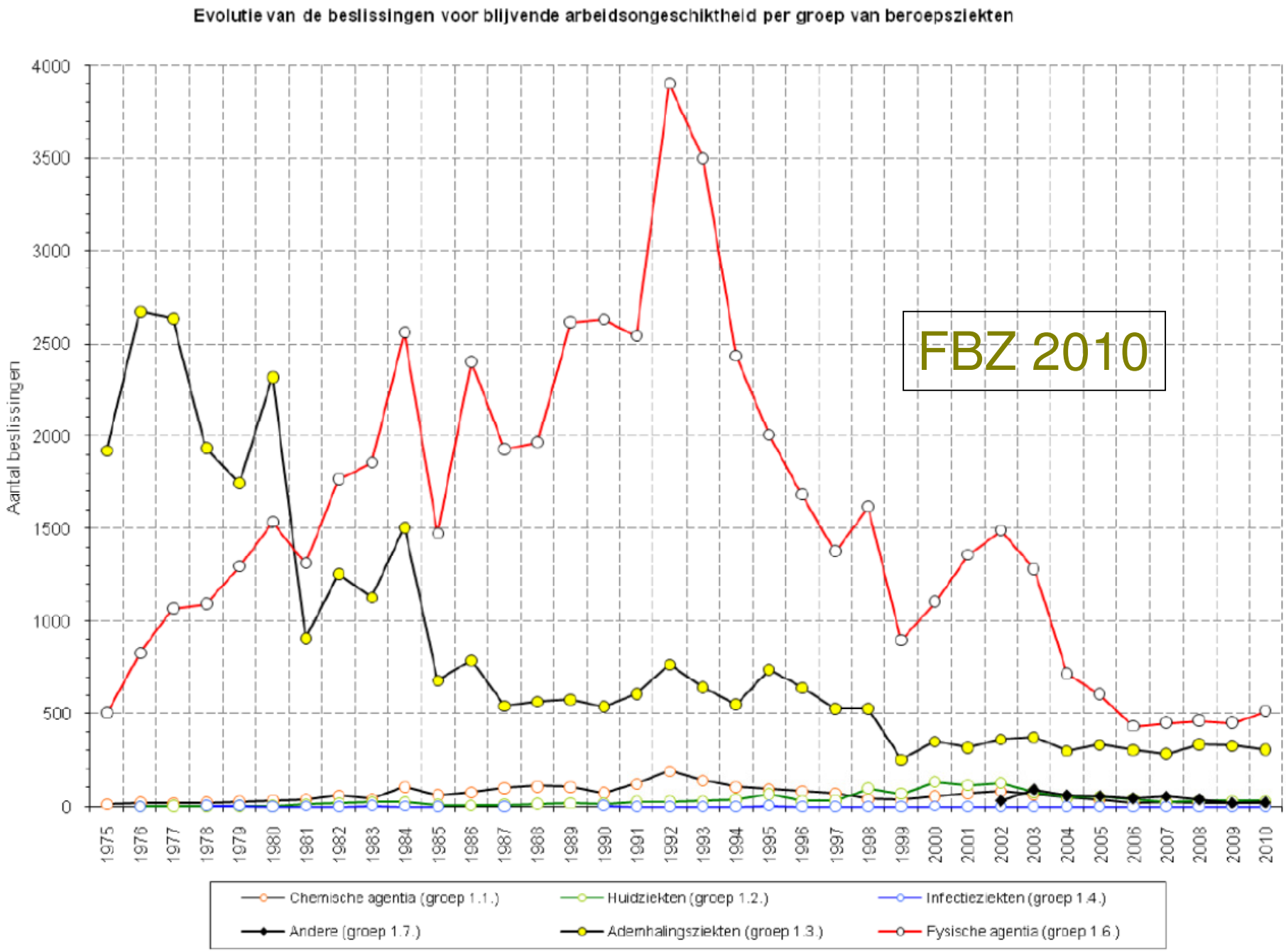
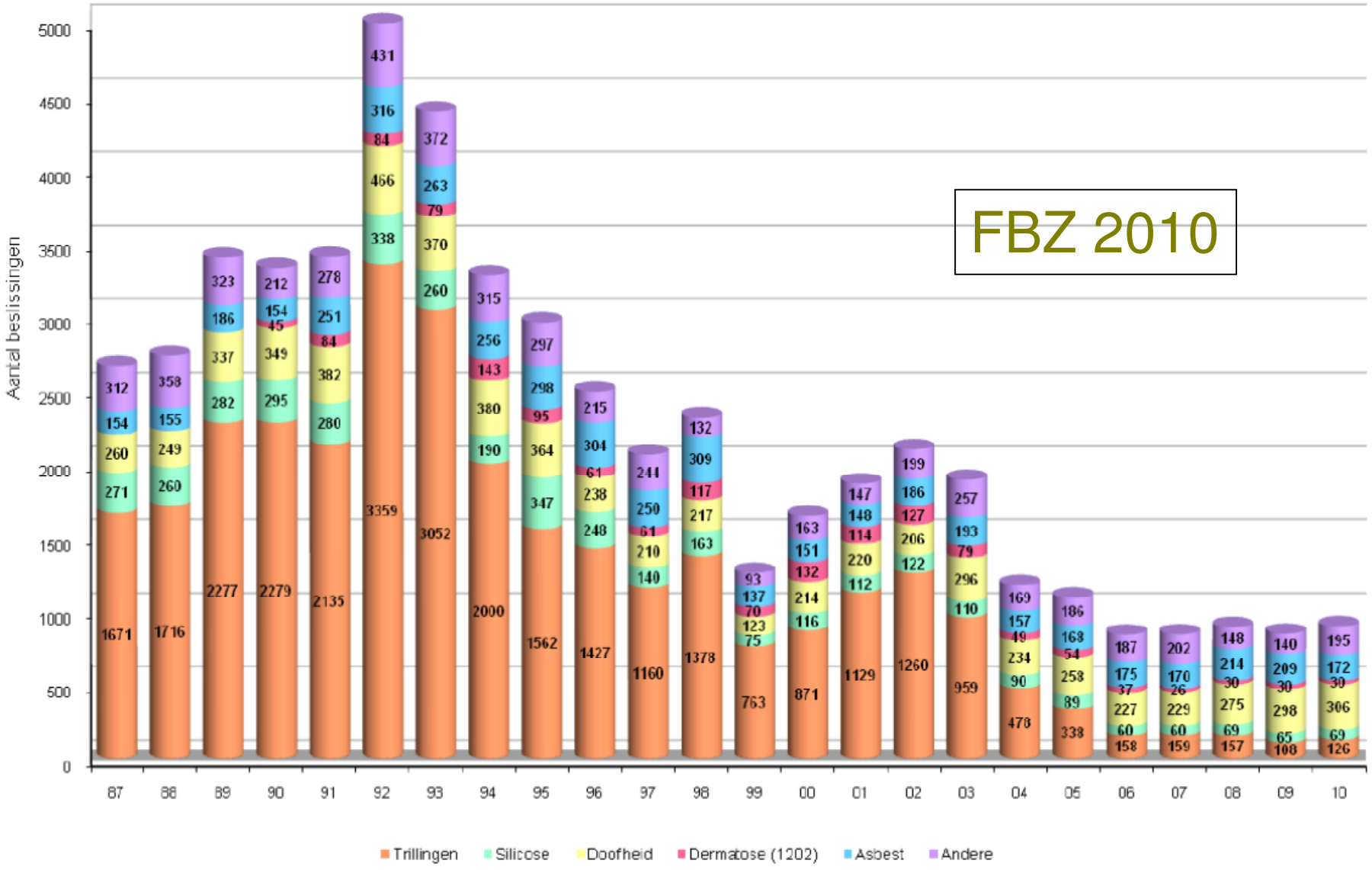
Arbeidsgerelateerde longaandoeningen

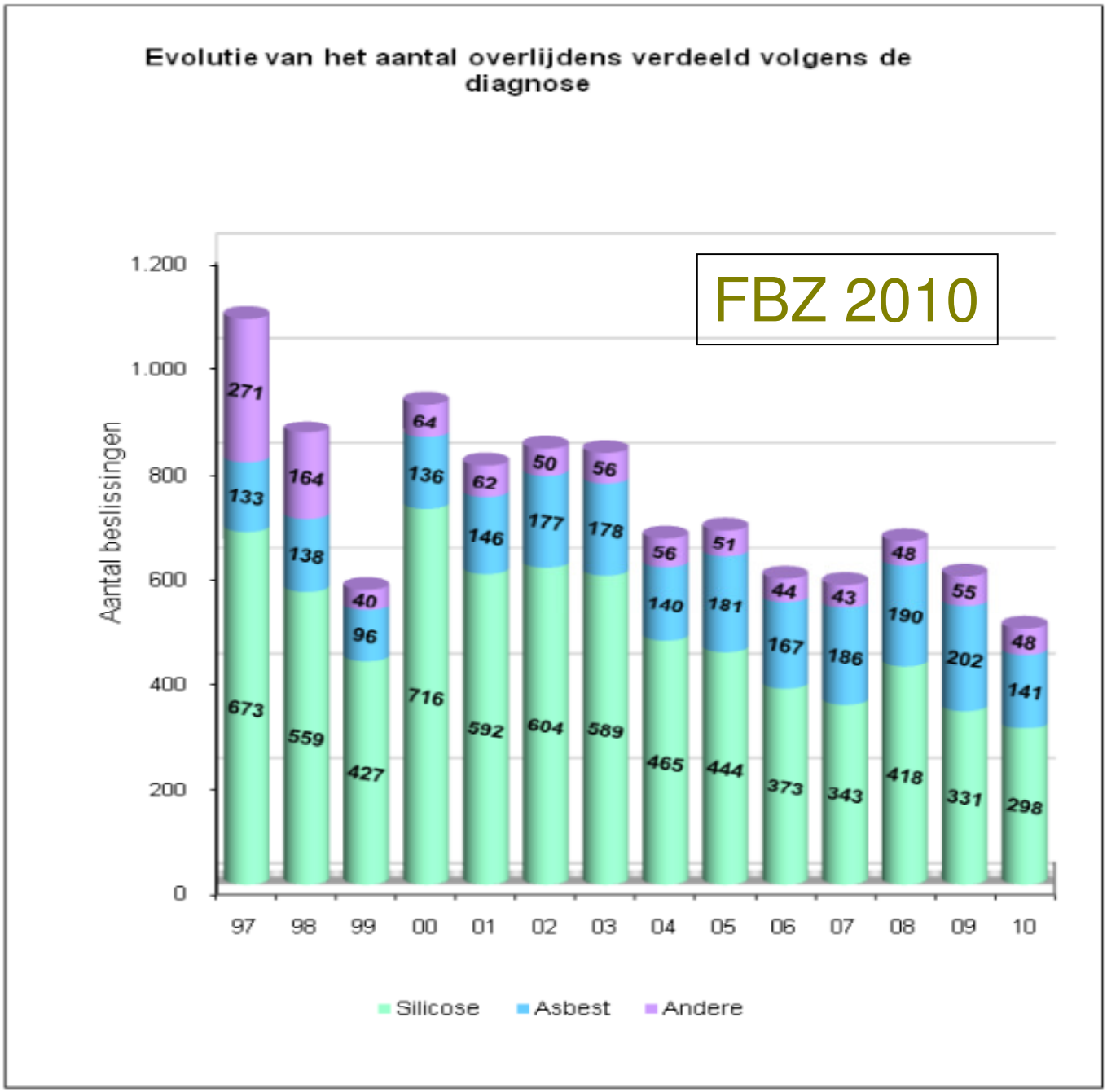
- Enkele algemene beschouwingen
  - Beroepsziekten
  - Arbeidsgerelateerde aandoeningen
  - ➢ Toegepast op astma
- Raadpleging voor Beroeps- en Milieupathologie in UZ Leuven


Evolutie van de beslissingen voor blijvende arbeidsongeschiktheid per groep van beroepsziekten
Aantal beslissingen
4000
3500
3000
2500
2000
1500
1000
500
0
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
FBZ 2010
Chemische agentia (groep 1.1.)
Huidziekten (groep 1.2.)
Infectieziekten (groep 1.4.)
Andere (groep 1.7.)
Ademhalingsziekten (groep 1.3.)
Fysische agentia (groep 1.6.)

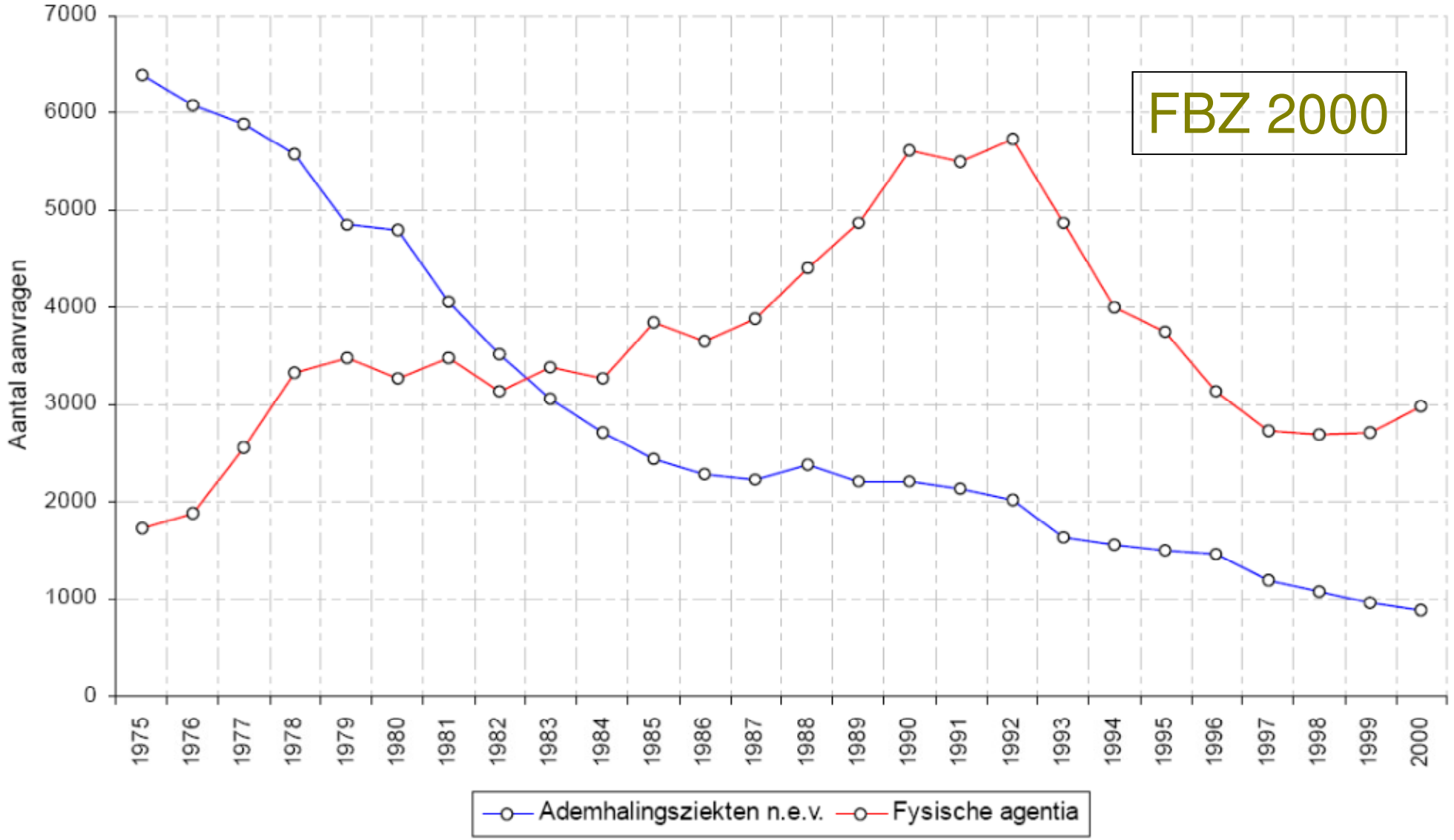
Evolutie van het aantal eerste positieve beslissingen voor blijvende arbeidsongeschiktheid
Lijstsysteem (Privé-sector)



FBZ 2010


Evolutie van het aantal overlijdens verdeeld volgens de diagnose
FBZ 2010
Aantal beslissingen
1.200
1.000
800
600
400
200
0
97 98 99 00 01 02 03 04 05 06 07 08 09 10
271 133 673
164 138 559
40 96 427
64 136 716
62 146 592
50 177 604
56 178 589
56 140 465
51 181 444
44 167 373
43 186 343
48 190 418
55 202 331
48 141 298
Silicose
Asbest
Andere

F. Evolutie van het aantal aanvragen om schadeloosstelling opgedeeld per groep van beroepsziekten (belgische lijst - Privé-sector)



Incidence of (reported) occupational diseases in NI

van der Molen *et al. OEM* 2012, 69, 519-21

- NCOD: sentinel surveillance system for “occupational diseases”
- 189/1773 occupational physicians (514,590 employees) reported 1782 cases (0-81 cases/physician, mean=12) in 2009

		n	(% total)	incidence (n/100,000 w-y)
1.	Mental diseases:	738	(41%)	143
2.	Musculoskeletal:	693	(39%)	135
3.	Hearing disease:	194	(11%)	38
4.	Infectious disease	67	(4%)	13
5.	Skin	55	(3%)	11
6.	Neurological	36	(2%)	7
7.	Respiratory	34	(2%)	7

- Construction (1127), mining/quarrying (888), water & waste processing (832), transport & storage (608)

Occupation & respiratory disease

Some respiratory diseases are caused specifically by work exposures

= occupational respiratory diseases

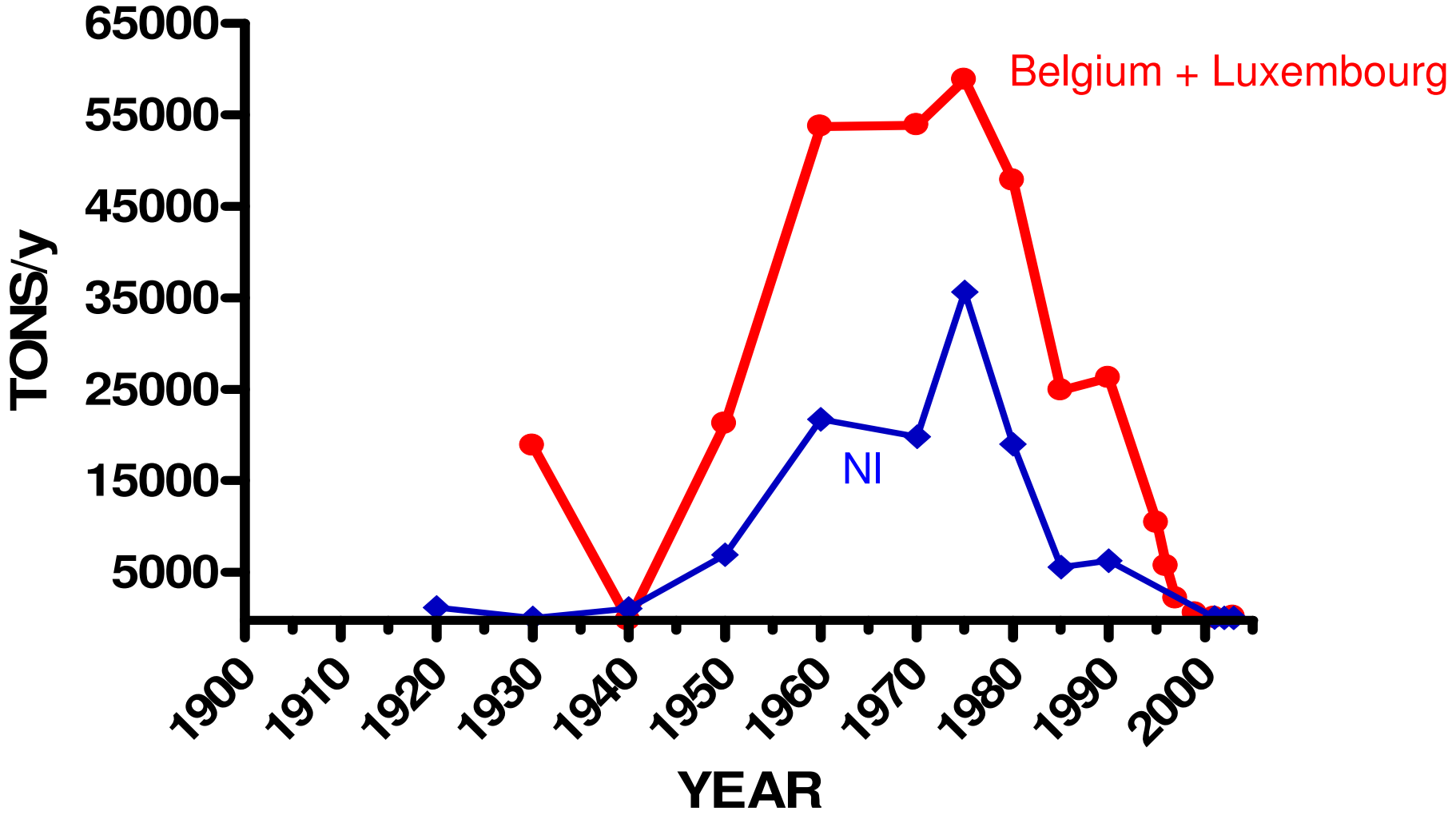
Occupational respiratory diseases

- Acute inhalation injuries
- Occupational infections
- Occupational asthma
- Chronic obstructive pulmonary disease
- Interstitial lung diseases
  - Pneumoconioses (silicosis, CWP, asbestosis, …)
  - Berylliosis, hard-metal/cobalt lung disease, other metals, …
  - Extrinsic allergic alveolitis
  - Other occupational ILD
- Bronchopulmonary cancer
- Pleural disease

“Emerging” lung diseases

1. Ardystil syndrome
2. Flock worker’s lung
3. Jeansblasting lung
4. Popcorn worker’s lung
5. Indium Tin Oxide
6. Nanomaterials (?)

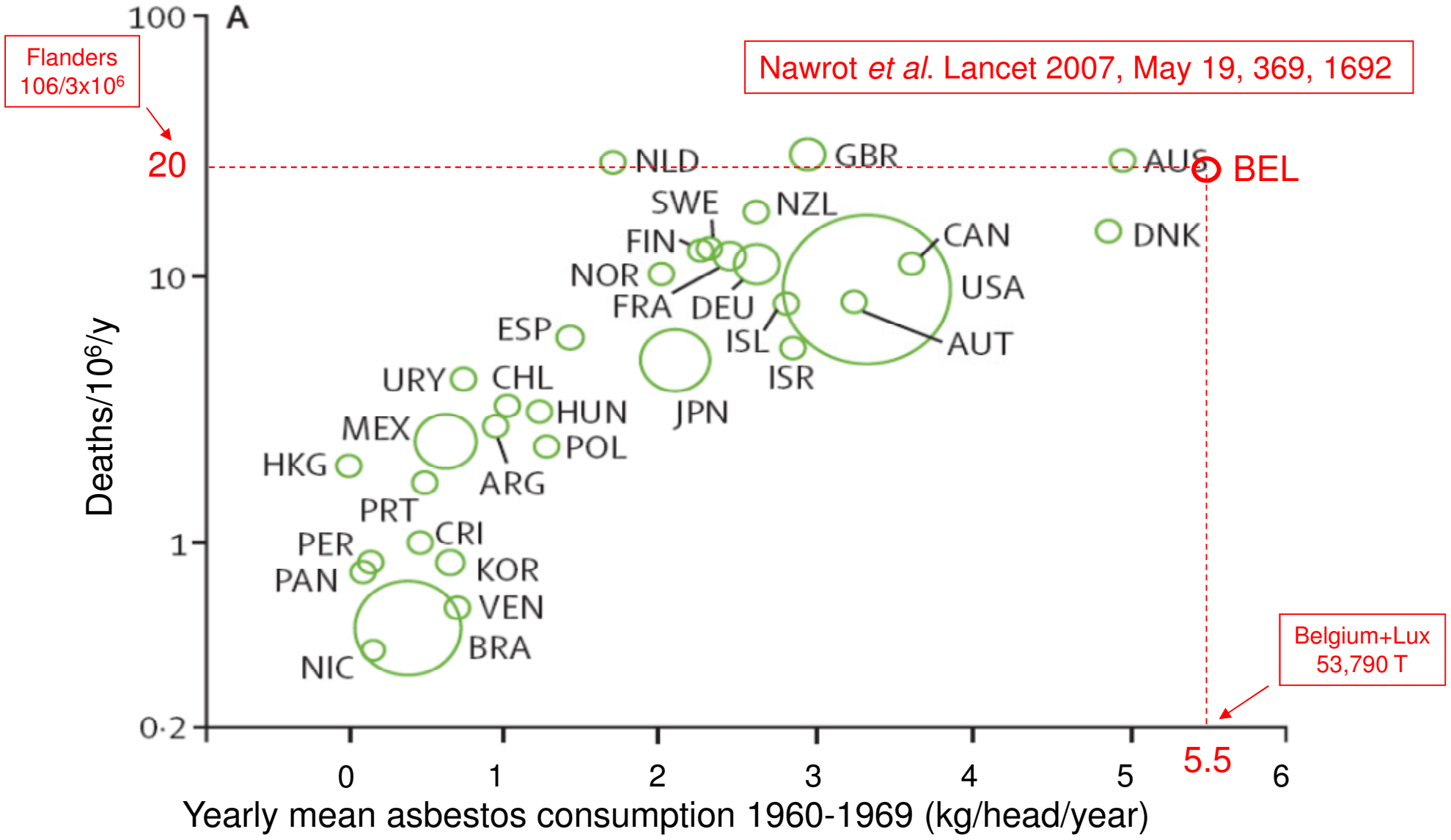
Asbestos consumption



source: Virta R.L. Worldwide asbestos supply and consumption trends from 1900 through 2003 U.S. Geological Survey. Circular 1298 http://pubs.usgs.gov/circ/2006/1298/

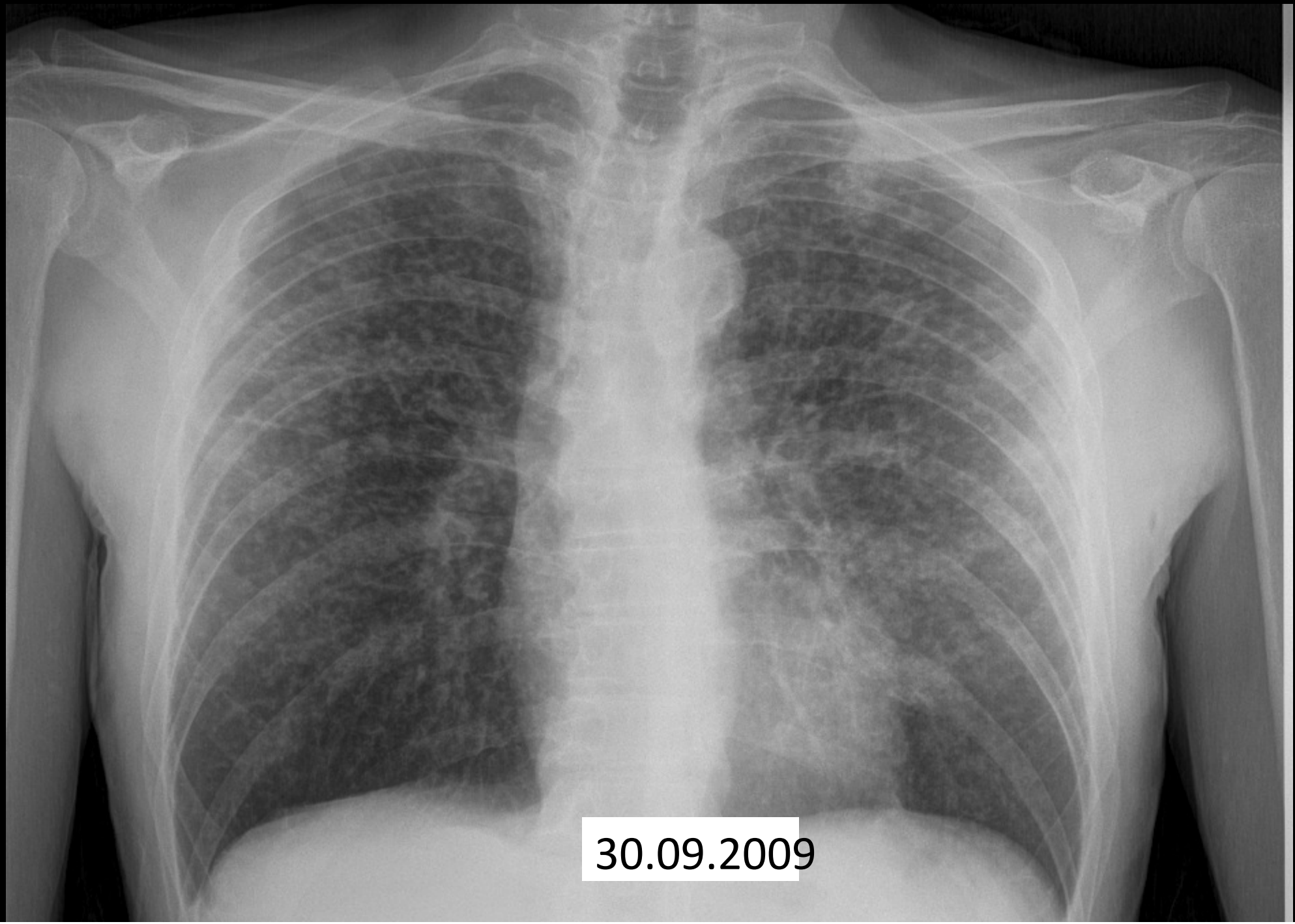
Yearly mean mesothelioma deaths 2000-2004

Lin *et al. Lancet* 2007 369, 844-9



Case

- Man, 59 y, smoker (40 PY)
- Facade renovation (incl. sandblasting) :
  - 15 y for a building firm
  - 18 y self-employed
- Progressive shortness of breath, especially on exercise
- Chest x-ray because of syncope at work


30.09.2009

“Occupational” – “Work-related”

Specific occupational diseases

Influence of work on “common” diseases

Nearly all respiratory diseases are influenced to some extent by the environment, especially the work environment

COPD and occupation

- American Thoracic Society Statement: Occupational contribution to the burden of airway disease. *Am J Respir Crit Care Med* 2003, 167, 787-797
- Literature-based estimation of population attributable risk (PAR) for asthma and COPD due to occupational exposures
  - Asthma: median PAR 15% (21 studies)
  - COPD: PAR ~15%
    - Chronic bronchitis (8 studies): median 15% [4-24%]
    - Airflow obstruction (5 studies): median 18% [12-55%]

COPD and occupation

- Blanc PD, Torén K. Occupation in chronic obstructive pulmonary disease and chronic bronchitis: an update. *Int J Tuberc Lung Dis* 2007, 11, 251-257

+ 14 studies since 2000

➢ chronic bronchitis (8 studies): median PAR 15% [0-34%]

➢ COPD (8 studies): median PAR 11% [0-37%]

+ adverse impact of COPD on working-life (work disability)

COPD and occupation

- Blanc *et al*. Occupational exposures and the risk of COPD: dusty trades revisited. *Thorax* 2009, 64, 6-12
- subjects (40-65 y) from Kaiser Permanente
    - 1202 with COPD (742 with GOLD 2-4)
    - 302 matched control subjects
- Telephone interview, then Spirometry
- Self-reported exposure to vapours, gas, dust or fumes (VGDF) + Job-Exposure Matrix (JEM) [longest held job]

➢ COPD subjects: lower educational attainment, less $, more smokers (13% NS), more « dirty » jobs

COPD and occupation

- Blanc et al. Occupational 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*

Confounding of smoking and occupation

- More smoking in dirty jobs !
- Smokers tolerate irritant exposures better («healthy smoker» + «healthy worker» effect)
- Mechanisms of injury are probably similar (oxidant injury, airway inflammation)
- Mean effects on FEV_1 are of similar magnitudes

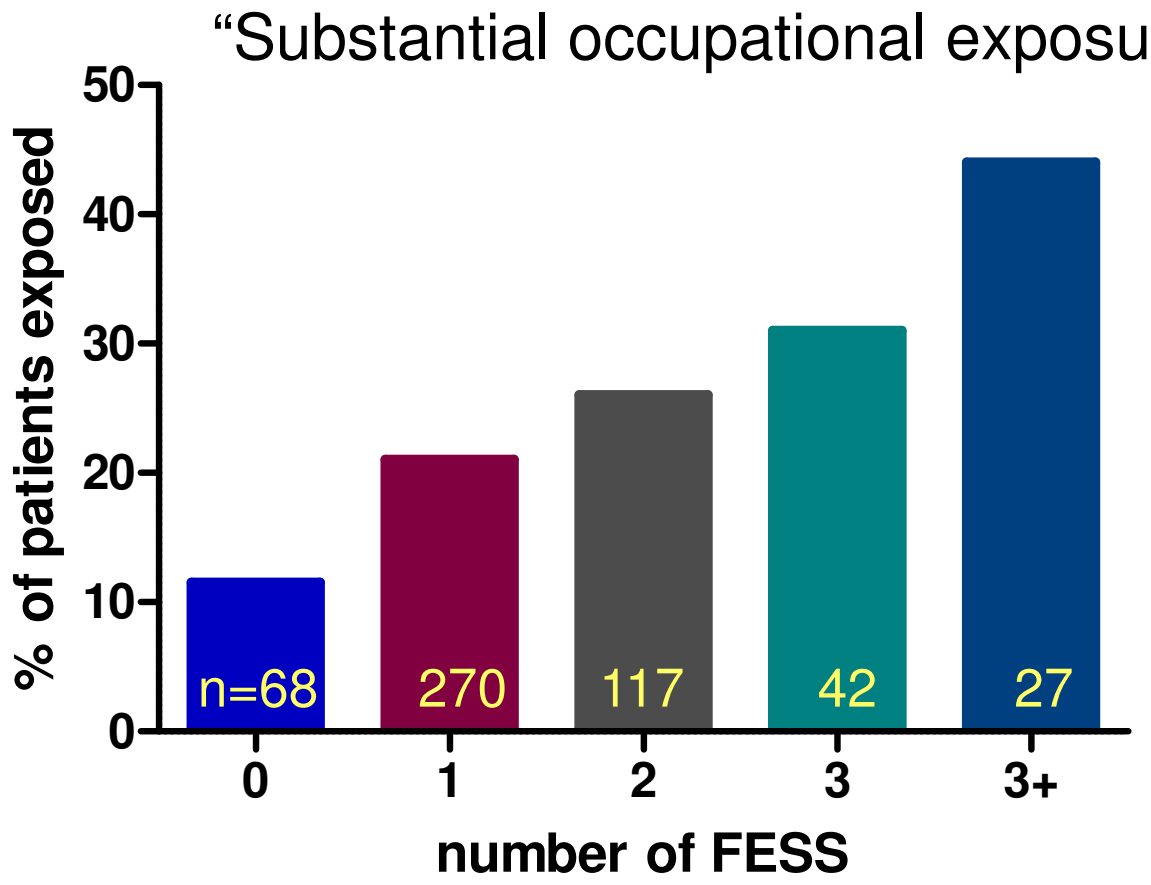
Confounding of smoking and occupation

Sterling & Weinkam. The confounding of occupation and smoking and its consequences. *Soc Sci Med*, 1990, 30, 457-67

« the category of 'smoker' in a statistical sense is an index of likelihood of 'exposure' to occupational hazards »

- Difficult to disentangle the effects of smoking and occupation from each other
- The fact that 80-90% of lung cancer is associated with smoking does not necessarily imply that only 10-20% are due to other causes

Chronic rhinosinusitis and occupation



Chi^2= 14.59 (p<0.01)

OR (>1FESS) = 1.63 (p<0.05) OR (>2FESS) = 1.97 (p<0.05)

Hox *et al.* Allergy, 2012,
doi: 10.1111/j.1398-9995.2011.02779.x

How much asthma is work-related?

- Data from workers' compensation agencies
- Data from physician-based voluntary reporting schemes
- Data from population studies

Compensation agencies

		n/10^6 workers/y
• Quebec	1989-1999	13-24
• Germany	1995	51
• Sweden	1990-1992	80 (70-90)
• Finland	1989-1995	174

Vandenplas *et al. Rev Mal Respir* 2005, 22, 421-430

Voluntary reporting schemes

		n/10^6 workers/y
• South Africa	1997-1999	17.5
• Belgium	2000-2002	23.5 (19-29)
• France ONAP	1996-1999	24 (22-25)
• Italy, Piedmont	1996-1997	24 (18-30)
• USA SENSOR		
California	1993-1996	25 (23-27)
Michigan	1995	27 (58-204)
• UK SWORD	1992-1997	38 (34-41)
• Canada		
Quebec	1992-1993	42-79
BC	1991	92

Vandenplas *et al. Rev Mal Respir* 2005, 22, 421-430

Under-recognition of occupational asthma

- Insufficient awareness among clinicians
  - Own experience (undocumented)
  - Shofer *et al*. *Chest* 2006, 130, 455-62
    - Academic medical center (USA)
    - Clinical notes of 197 adults with newly diagnosed asthma
    - Job title in 75%; rarely other details (exposures, duties, prior job, ...)

Under-recognition of occupational asthma

- Diagnosing occupational asthma is not (always) easy
  - Many pitfalls (Nemery. *Breathe* 2004, 1, 25-32)
  - Clinicians are unfamiliar with workplace exposures
- Diagnosing occupational asthma often leads to (more) administrative work

How much asthma is work-related?

[Balmes J. (chair) *et al*.] American Thoracic Society Statement. Occupational contribution to the burden of airway disease.
Am J Respir Crit Care Med 2003, 167, 787-97

Literature-based estimation of population attributable risk (PAR) for asthma «due» to occupational exposures: median 15%
(21 studies: 4% to 58%)

Asthma risk by occupation

- Karjalainen *et al*. AJRCCM 2001, 164, 565-8
  SJWEH 2002, 28, 49-57

Finland

- reimbursement of medication for asthma only if persistent asthma is confirmed by a chest physician (“Reimbursement Register”)
- match with individual employment data (Social Security Register)

Asthma risk by occupation

- Karjalainen *et al*.
  - 3 cohorts of all employed Finns (25 - 59 y) without pre-existing asthma in 1985, 1990, 1995
  - followed for incident asthma for 4 years
  - 49,575 incident cases of adult asthma in Finland
  - 1.65 (M) - 2.47 (F) / 1,000 / year
  - 2,464 cases of recognized occupational asthma

Asthma risk by occupation

- Karjalainen *et al*.
  - attributable fraction of occupation for adult-onset asthma (controls = administrative workers):
    - 29 % (men) - 17 % (women)
    - not confounded by smoking
    - known sectors (agriculture, manufacture, services) and occupations (bakers, …), but also less known jobs (cleaners, …)
    - share of recognised cases of OA << 50 %

How much asthma is work-related?

Kogevinas M. *et al*. Exposure to substances in the workplace and new-onset asthma: an international prospective population-based study (ECRHS-II). *Lancet* 2007, 370, 336-341

- ECRHS-I (1990-95), 28 centres, 13 countries, 20-44 y
- ECRHS-II (1998-2003): follow-up of 6,837 subjects without asthma or respiratory symptoms
  - New-onset asthma (symptoms or medication): n=134
  - Occupational exposures (high-risk job; job-exposure matrix; inhalation accidents)

➢ PAR due to occupation: 10-25% (250-300 cases/10^6/y)

How much asthma is work-related?

<<1%

- workers' compensation agencies
- physician-based voluntary reporting schemes
- prevalence and incidence studies in the population

25%

Mannino DM. *Occup Med* 2000, 15, 359-68

Occupational asthma
Definitions

- Occupational asthma

  Asthma that is caused (specifically) by exposure to an agent present at work
- Work-aggravated asthma

  Pre-existing asthma that is aggravated (non-specifically) by work (cold, exercise, irritants)

Occupational asthma
Definitions

- Occupational asthma
- Work-aggravated asthma

! in practice the difference may be difficult to make

! pre-existing asthma does not exclude the occurrence of occupational asthma

! work-aggravated asthma also needs appropriate individual + collective measures

Work-aggravated asthma

- Exposures at work are frequently evoked as causes of exacerbations
  - Henneberger *et al. OEM* 2006, 63, 551-7
    - 598 adult asthmatics (HMO), telephone questionnaire
    - workplace exacerbation in 23%
  - Berger *et al. JOEM* 2006, 48, 833-9
    - 301 working asthmatics (low-income minority, NY)
    - workplace exacerbation of respiratory symptoms reported by 51% (current job) - 71% (ever)

Work-aggravated asthma

Henneberger *et al*. The occupational contribution to severe exacerbation of asthma. *ERJ* 2010, 36, 743-50

- ECRHS-I &II
- 966 working adults with current asthma
- 74 (7.7%) at least 1 self-reported severe exacerbation in past year
- If high exposure to dust, gas or fumes: RR 3.1
  → PAR 14.7% among workers with asthma

American Thoracic Society Documents

An Official American Thoracic Society Statement: Work-Exacerbated Asthma

Paul K. Henneberger, Carrie A. Redlich, David B. Callahan, Philip Harber, Catherine Lemière, James Martin, Susan M. Tarlo, Olivier Vandenplas, and Kjell Torén, on behalf of the ATS Ad Hoc Committee on Work-Exacerbated Asthma

THIS OFFICIAL AMERICAN THORACIC SOCIETY (ATS) STATEMENT WAS APPROVED BY THE ATS BOARD OF DIRECTORS, MARCH 2011

Am J Respir Crit Care Med Vol 184. pp 368–378, 2011

- Work-exacerbated asthma (WEA)
- Median prevalence: 21.5% among adults with asthma
- "WEA should be considered in any patient with asthma that is getting worse or who has work-related symptoms"
- "Management of WEA should focus on reducing work exposures and optimizing standard medical management, with a change in job only if these measures are not successful"

Astma severity and occupation

- Le Moual N. *et al*. Asthma severity and exposure to occupational asthmogens. *Am J Respir Crit Care Med* 2005, 172, 440-5
  - Retrospective study of tertiary referral centres (France): 148 asthmatics
  - 8 grade score of severity (frequency of attacks, persistence of symptoms, hospitalizations)
  - Asthma more likely to be “severe” if exposure to known asthmogens (HMW & LMW sensitizers; irritants)

Risks of Exposure to Occupational Asthmogens in Atopic and Nonatopic Asthma

A Case-Control Study in Taiwan

Am J Respir Crit Care Med Vol 182. pp 1369–1376, 2010

Tsu-Nai Wang[1,2*], Meng-Chih Lin[3*], Chao-Chien Wu[3], Sum-Yee Leung[3], Ming-Shyan Huang[4], Hung-Yi Chuang[1,5], Chien-Hung Lee[1], Deng-Chyang Wu[6], Pei-Shan Ho[7], Albert Min-Shan Ko[2], Po-Ya Chang[2], and Ying-Chin Ko[2,8]

Methods: We recruited 504 hospital-based adults with current asthma, 504 community-based control subjects, and 504 hospital-based control subjects in southern Taiwan. Asthma with atopy was defined as having asthma in combination with an increase in total IgE (≥100 U/ml) or a positive Phadiatop test (≥0.35 Pharmacia arbitrary unit/L) (Pharmacia ImmunoCAP; Pharmacia, Uppsala, Sweden). Occupational exposure to asthmogens was assessed with an asthma-specific job exposure matrix.

Measurements and Main Results: We found a significant association between atopic asthma and exposure to high molecular weight asthmogens (adjusted odds ratio [AOR], 4.0; 95% confidence interval [CI], 1.8–8.9). Nonatopic asthma was significantly associated with exposure to low molecular weight asthmogens (AOR, 2.6; 95% CI, 1.6–4.3), including industrial cleaning agents and metal sensitizers. Agriculture was associated with both atopic and nonatopic asthma (AOR, 7.8; 95% CI, 2.8–21.8; and AOR, 4.1; 95% CI, 1.3–13.0,

Risks of Exposure to Occupational Asthmogens in Atopic and Nonatopic Asthma

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TABLE 3. SPECIFIC EXPOSURE GROUP FREQUENCY AND RISK ESTIMATES FOR ALL SUBJECTS WITH CURRENT ASTHMA (N = 504) AND COMMUNITY CONTROL SUBJECTS (N = 504)

				Asthma with Atopy*			
	Community Control: N = 504	Total Current Asthma: N = 504		Yes: N = 310		No: N = 194	
Specific Occupational Exposure	n	n	AOR	n	AOR	n	AOR
No or low-risk exposure	429	353	1	218	1	135	1
Any asthmogen†	75	151	2.2 (1.5–3.1)	92	2.3 (1.5–3.4)	59	2.3 (1.4–3.5)
High-MW asthmogen, any	11	28	2.7 (1.2–6.0)	24	4.0 (1.8–8.9)	4	1.0 (0.3–3.5)
Latex	5	10	2.8 (0.9–8.8)	9	3.8 (1.2–12.7)	1	0.9 (0.1–7.9)
Low-MW asthmogen, any	53	89	1.9 (1.3–2.9)	44	1.6 (0.9–2.7)	45	2.6 (1.6–4.3)
Highly reactive chemicals	28	38	1.4 (0.8–2.5)	18	1.3 (0.7–2.5)	20	1.8 (0.9–3.6)
Drugs	5	5	1.9 (0.4–8.6)	3	2.0 (0.4–11.0)	2	2.4 (0.3–19.9)
Industrial cleaning agents	7	21	2.6 (1.1–6.5)	9	2.3 (0.8–6.8)	12	3.5 (1.2–9.7)
Wood dusts	4	8	2.4 (0.6–10.3)	3	1.6 (0.2–10.8)	5	4.4 (0.9–21.5)
Metal sensitizers, fumes	11	24	2.3 (1.0–5.2)	11	1.3 (0.5–3.4)	13	4.1 (1.6–10.2)
Mixed environments, combined	25	70	3.0 (1.7–5.1)	44	2.8 (1.6–5.2)	26	3.2 (1.6–6.2)
Metal-working fluid	5	5	1.0 (0.2–4.3)	4	1.0 (0.2–5.0)	1	1.0 (0.1–10.2)
Agriculture	7	40	6.3 (2.4–16.9)	29	7.8 (2.8–21.8)	11	4.1 (1.3–13.0)
Textile production	4	9	2.1 (0.6–7.8)	5	2.5 (0.6–10.7)	4	2.1 (0.4–11.1)
Irritant peaks	9	16	2.2 (0.9–5.6)	6	1.0 (0.3–3.2)	10	4.2 (1.5–11.8)

Definition of abbreviations: AOR = adjusted odds ratio; MW = molecular weight.

AORs were calculated after adjusting for age, sex, body mass index, smoking, alcohol use, history of parental asthma, and exposure to pets, cockroaches, and indoor incense burning.

Analyses were performed for specific asthmogens when at least five patients and four control subjects were exposed.

* Asthma with atopy was defined as having asthma in combination with an increase in total IgE (≥100 U/ml) or a positive Phadiatop test result (≥0.35 PAU/L).

† These categories are not mutually exclusive. The total number for "high MW + low MW + mixed" is higher than that for "any asthmogen."

Occupational rhinitis and asthma

Malo *et al*. *Eur Respir J* 1997, 10, 1513-5

- 40 subjects (26 M, 14 F) with confirmed occupational asthma

➢ Symptoms of rhinitis in 37/40 (92%)

➢ Symptoms of conjunctivitis in 29/72% (72%)

➢ HMW agents *vs* LMW agents:

- Prevalence of rhinoconjunctivitis: HMW > LMW (NS)
- Intensity of rhinitis symptoms: HMW > LMW
- Onset: HMW: rhinitis before asthma (14/24)
  LMW: rhinitis together with asthma (9/14)

Occupational asthma

- How much asthma is occupationally related?

  1%

  - workers' compensation agencies
  - physician-based voluntary reporting schemes
  - prevalence and incidence studies in the population

  25%

Mannino DM. *Occup Med* 2000, 15, 359-68

How much asthma is work-related?

"In adults, asthma is caused (directly or indirectly) by work in approximately 15 % of cases"

- Work-aggravated asthma? some?
- Occupational allergic asthma? minority
- Irritant-induced asthma? many?

A specialised clinic for occupational and environmental medicine within a university hospital.

Introduction

- occupational physicians (in Belgium)
  - have essentially a preventative role
  - are only rarely involved in the curative sector
- physicians working in the curative sector
  - are generally unfamiliar with occupational medicine
  - have difficulties recognizing past or current occupations as a cause or determinant of disease

Introduction

- Specialized outpatient clinic (since 1988)*
- Integrated within the division of pneumology of the University Hospitals of Leuven

➢ Diagnosis of occupational or environmental health problems

- BN + 2 occupational physicians (S. Keirsbilck, E. Adams)

* + consulting for hospitalized patients
  + specific bronchial provocation testing (~ 10/y)

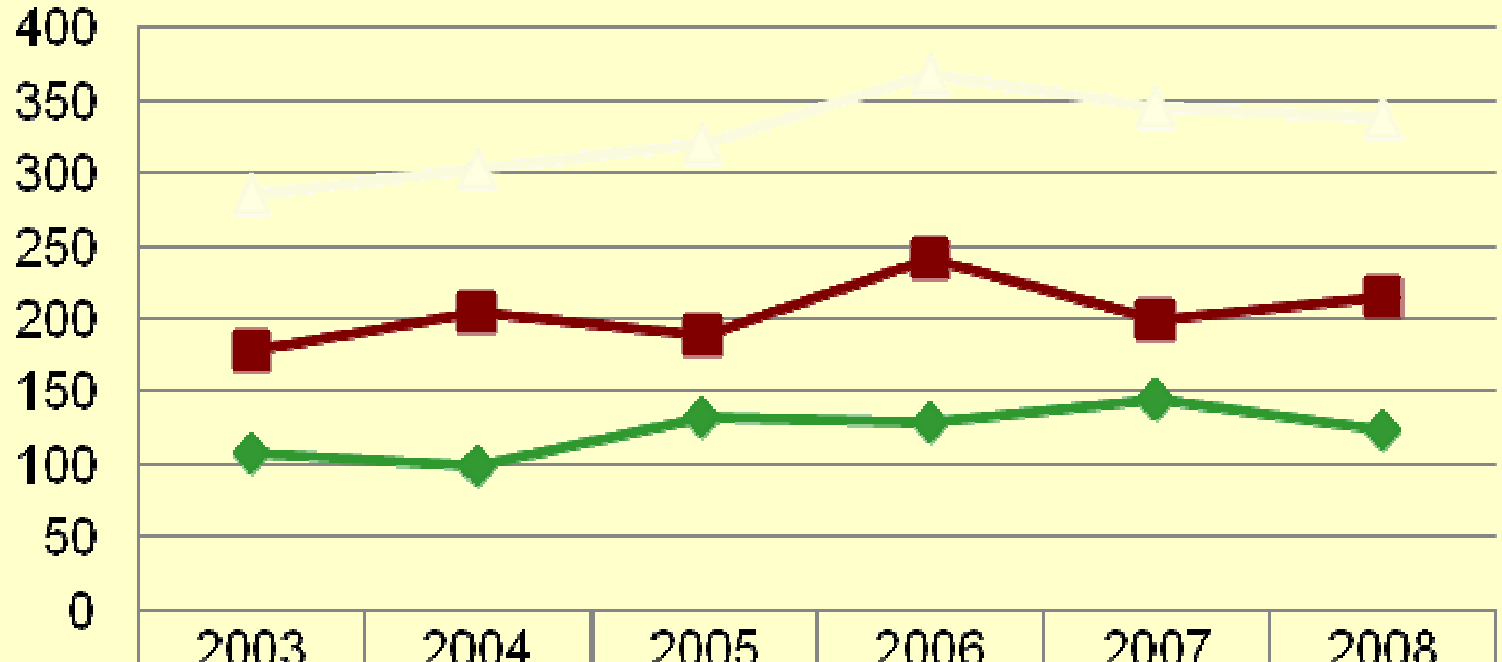
Methods

- retrospective descriptive study (file study)
- Inclusion:
  - 733 patients referred for the first time to the clinic
  - during the period 2003-2008

Methods

- Parameters:
  - socio-demographic data
  - referring physician
  - past and previous occupations
  - medical data (primary illness and co-morbidity)
  - role of occupation
  - specific causal agent(s)

OEM Clinic UZ Leuven 2003-2008

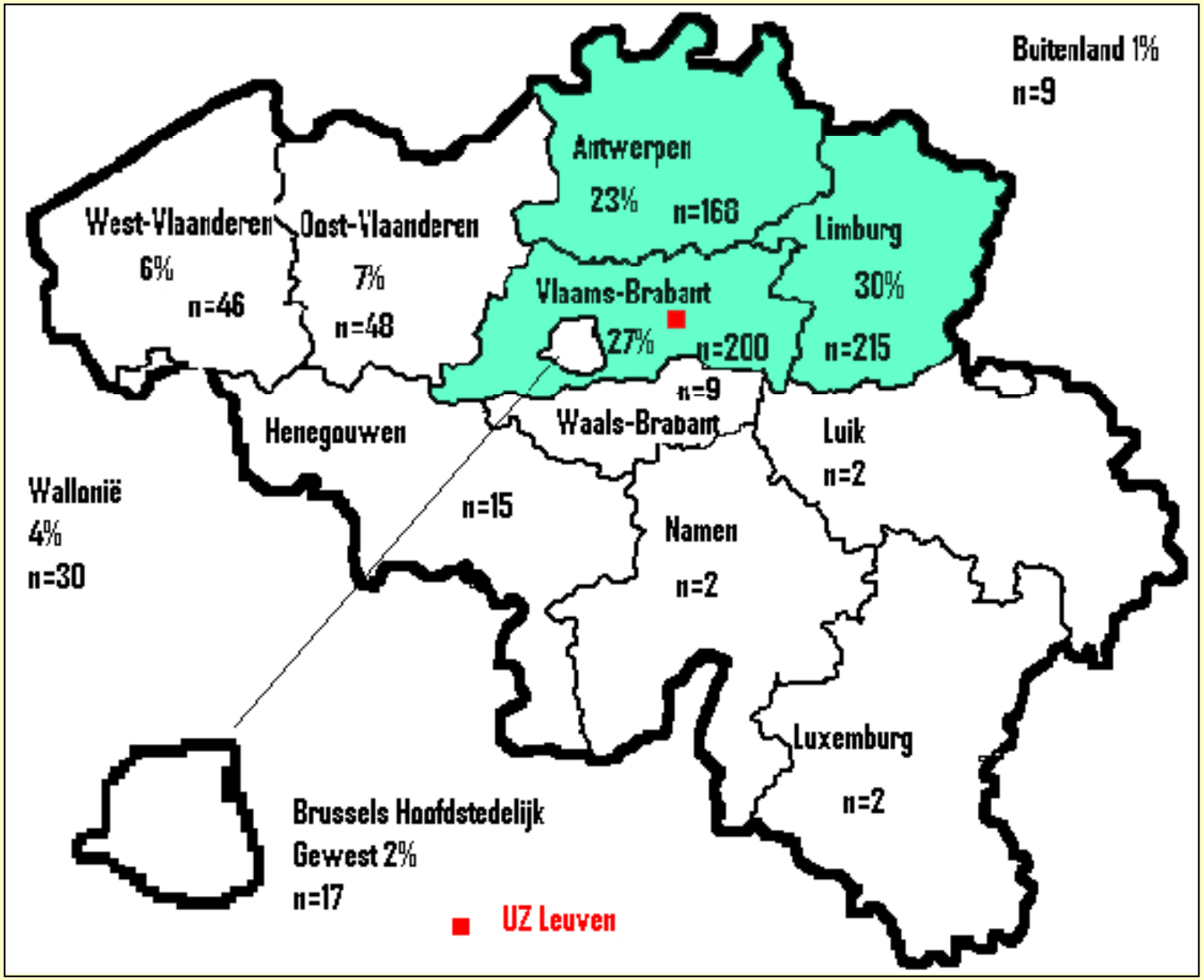


	2003	2004	2005	2006	2007	2008
new	107	98	132	128	145	123
follow-up	178	205	189	241	200	215
total	285	303	321	369	345	338

733
1228
1961

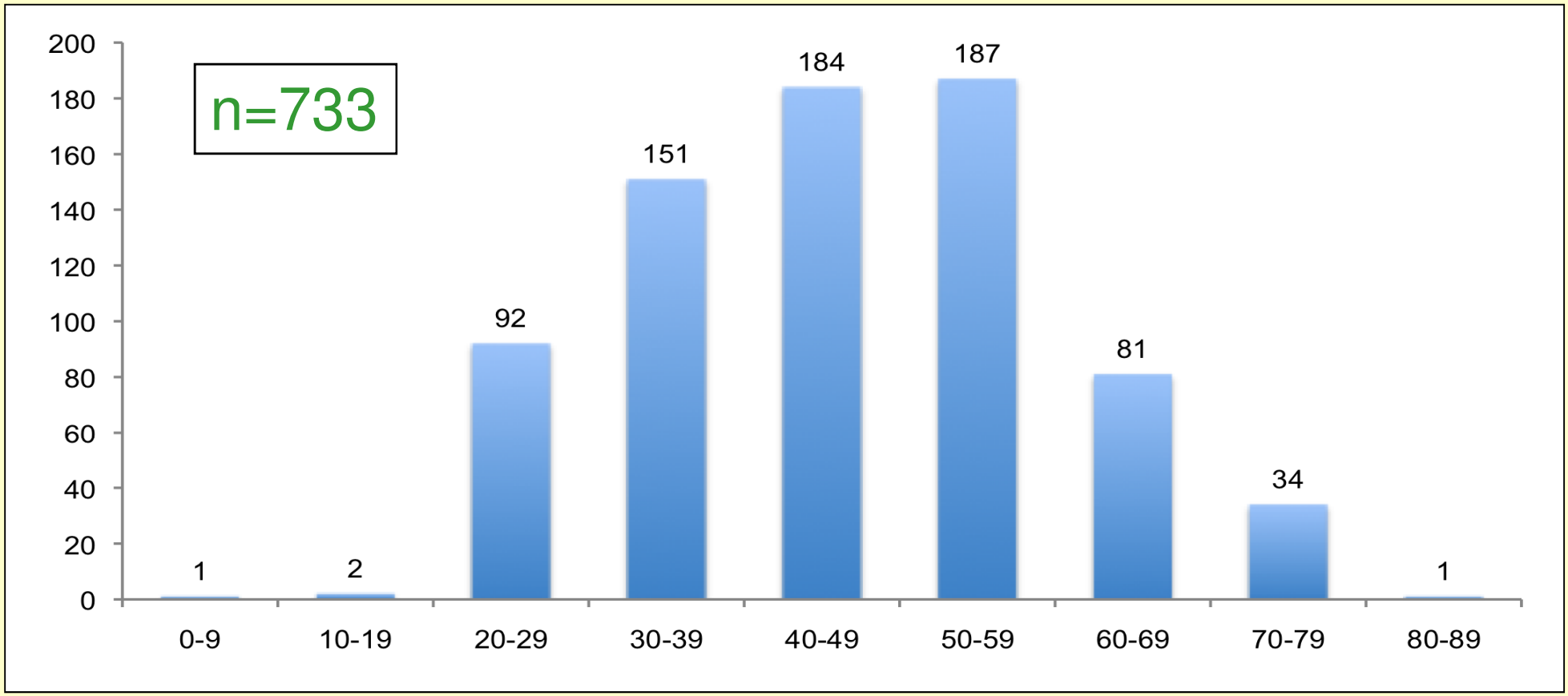
OEM Clinic UZ Leuven 2003-2008

n=733



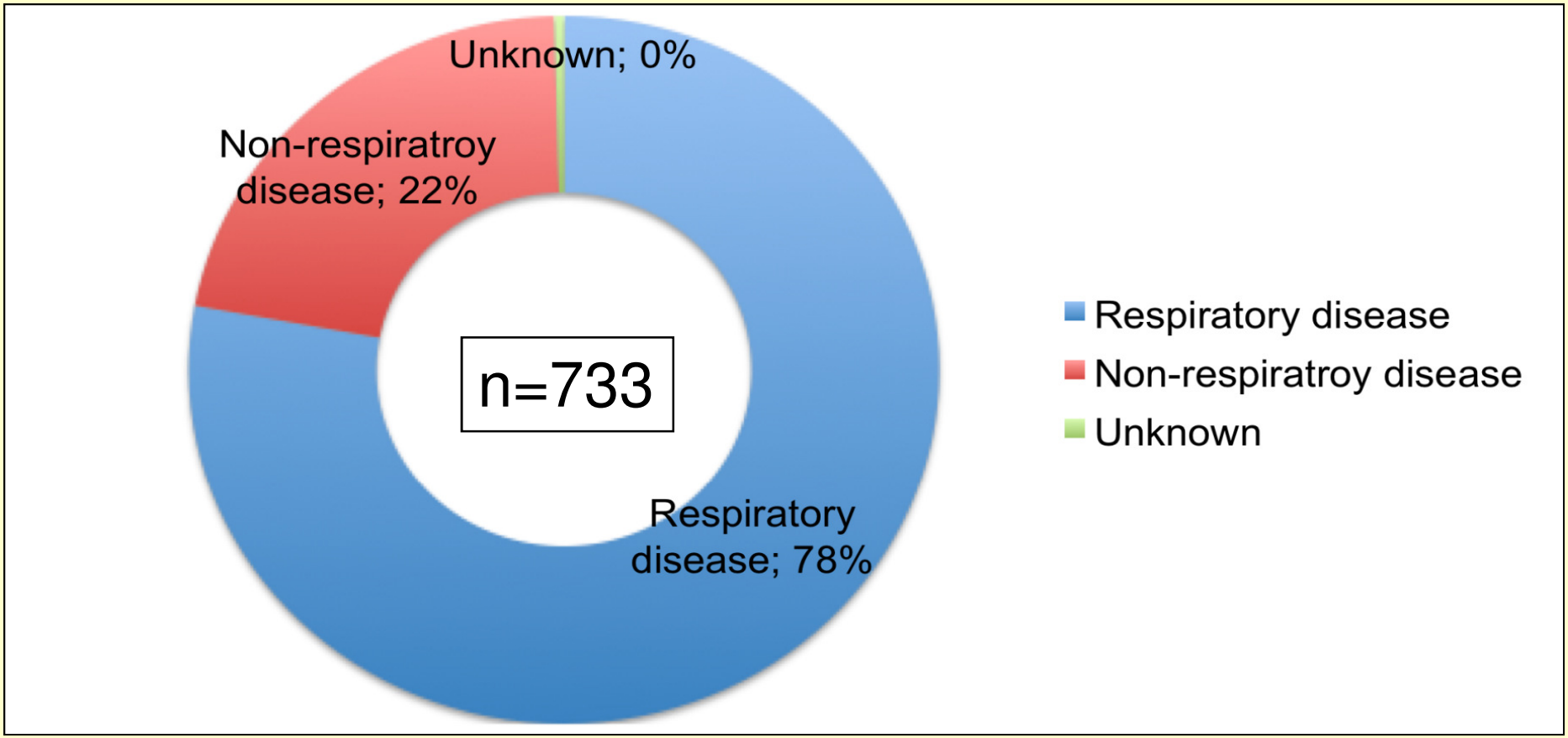
OEM Clinic UZ Leuven 2003-2008

- Mainly, but not only working-age population
  - mean age = 46 y (SD 14 y), range 2-82 y

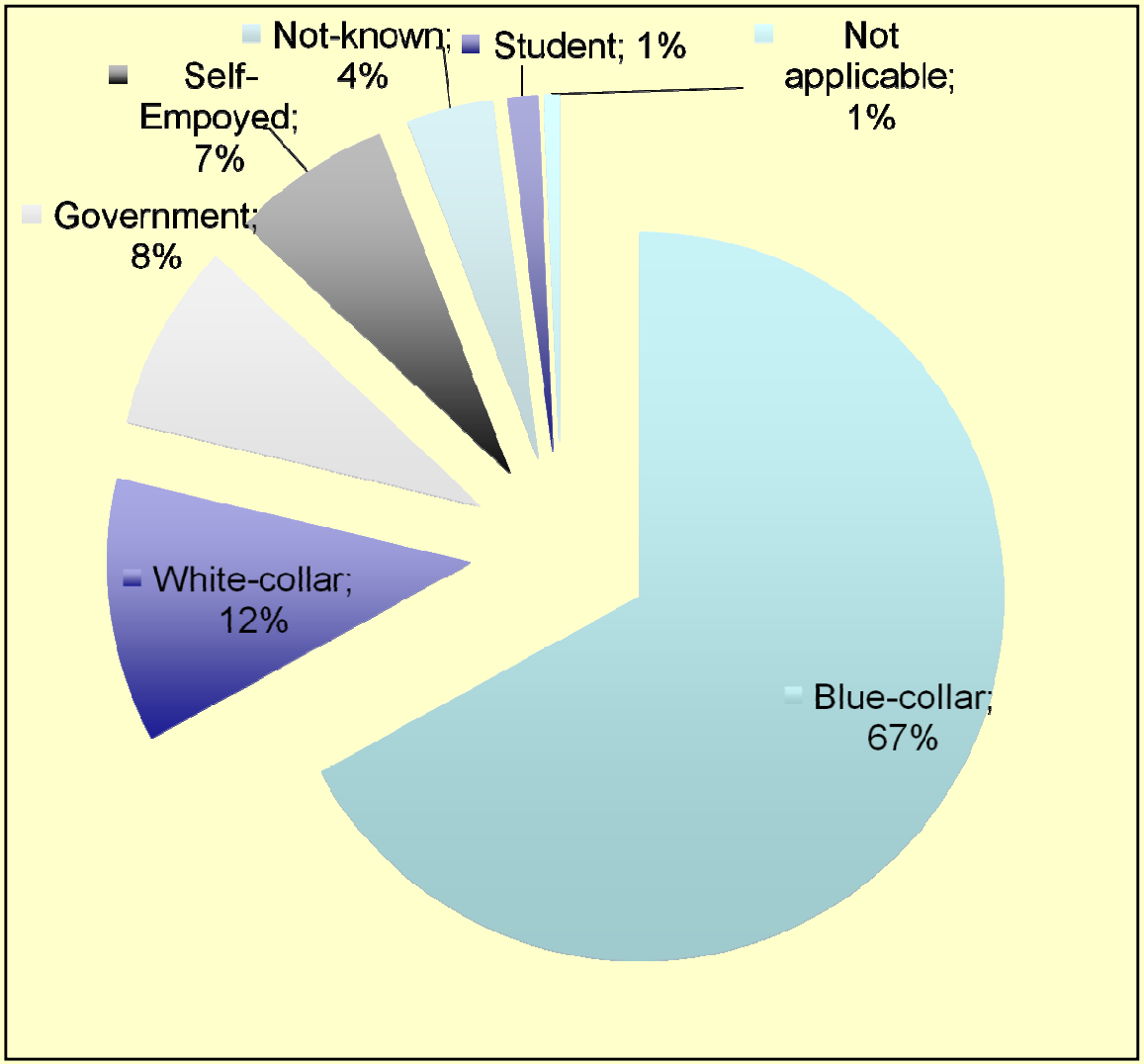


OEM Clinic UZ Leuven 2003-2008

- Pathology



OEM Clinic UZ Leuven 2003-2008



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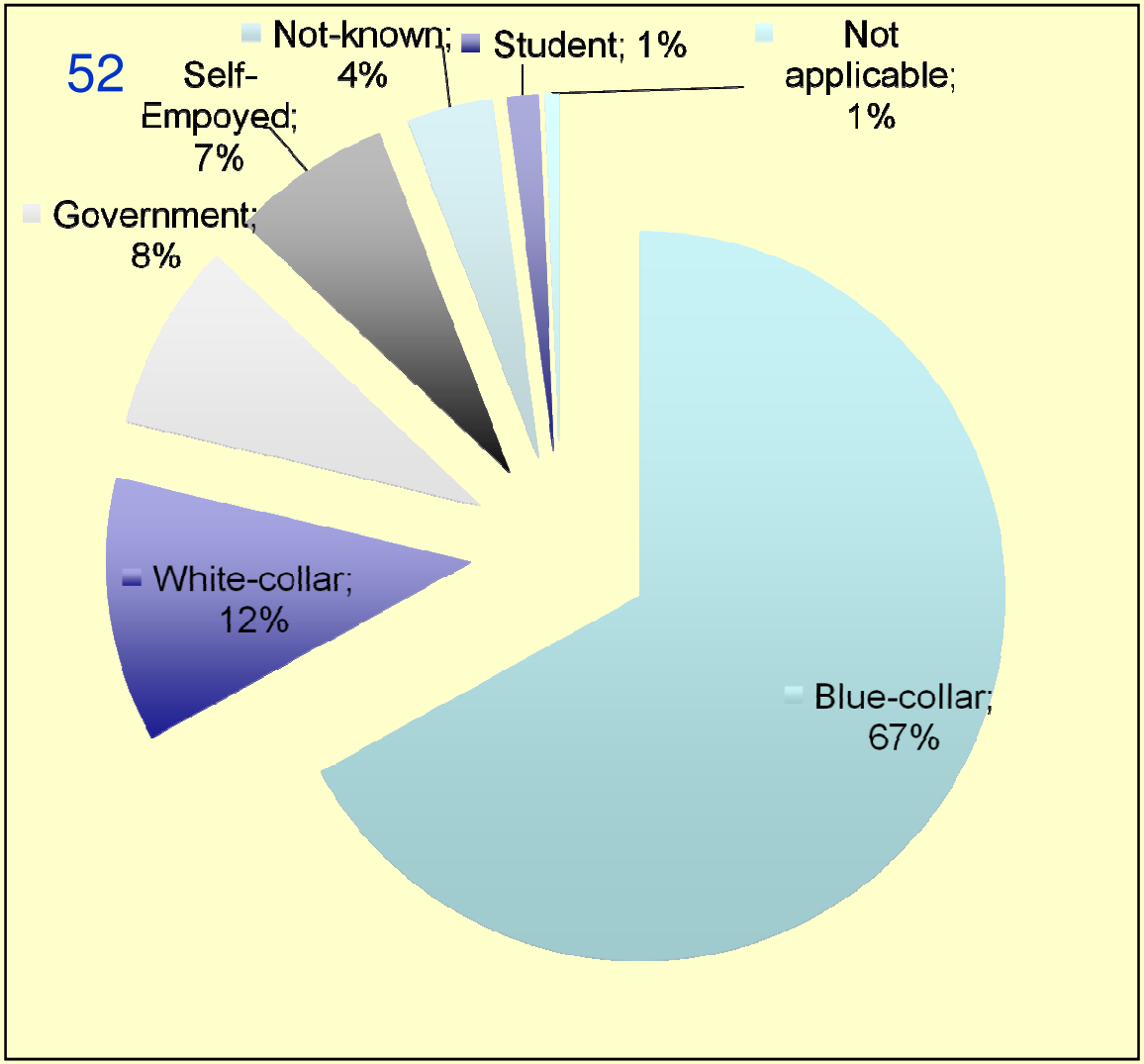
52 self-employed persons

- Agriculture 9
- Hairdresser 5
- Building worker 3
- Beautician 3
- Printer 3
- Metal worker 3
- Jeweller 3
- Carpenter 3
- Dentist 3
- Nurse 2
- Baker 2
- Artist 2
- Cook 2
- Painter 2
- Driver 2
- Other 5



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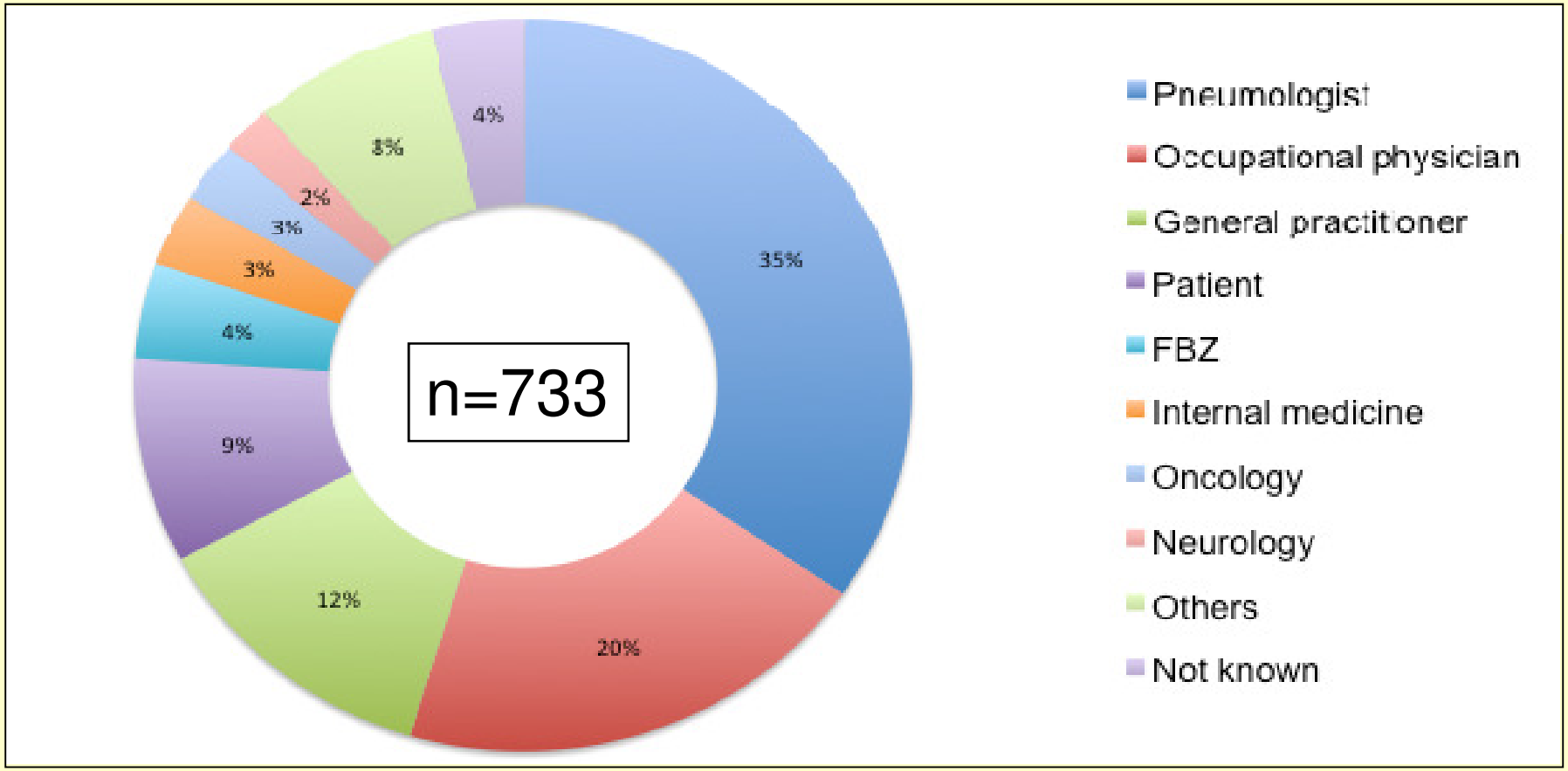
- Referring physician



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Respiratory disease (78%)	Number	Percentage
Asthma incl Reactive airways dysfunction syndrome (RADS)	246	43
Interstitial lung disease (excl asbestosis)	63	11
Asbestos related diseases	99	17
Consult MMF	34	6
Lung cancer (excl asbestos induced cancer)	12	2
Other respiratory diseases	117	20
- Upper airways	47	8
- Emphysema/COPD	20	4
- Respiratory infections	8	1
- Inhalations incidents (inhalation fever)	7	1
- Other or not specified	35	6
Total	**571**	**99**

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Non-respiratory disease (22%)	Number	Percentage
Skin	28	18
Chronic solvent encephalopathy	24	15
Chronic intoxication	31	19
Functional somatic disorders	23	14
- Multiple chemical sensitivity syndrome (MCS)	9	6
- Hyperventilation syndrome	7	4
- Chronic fatigue syndrome (CFS)	4	3
- Others	3	2
Other of not specified	53	33
Total	**159**	**100**

Respiratory disease		**36**
Asthma	1 3	
Interstitial lung disease	4	
Asbestos-related disorders	2	
Other respiraory disease (upper airways diseases, emphysema, infections, …)	1 7	
Non-respiratory work-related disease		**1 6**
Skin disease	4	
Solvent encephalopathy	3	
Chronic toxicity	3	
Psycho-somatic disorders	1	
Others	5	

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- Unique position in Belgian curative medicine
- initial focus on occupational respiratory disease ➔ other diseases
- The integration of physicians with a specific expertise in occupational medicine within tertiary hospitals contributes to a better recognition of work-related diseases.

Dank voor uw aandacht

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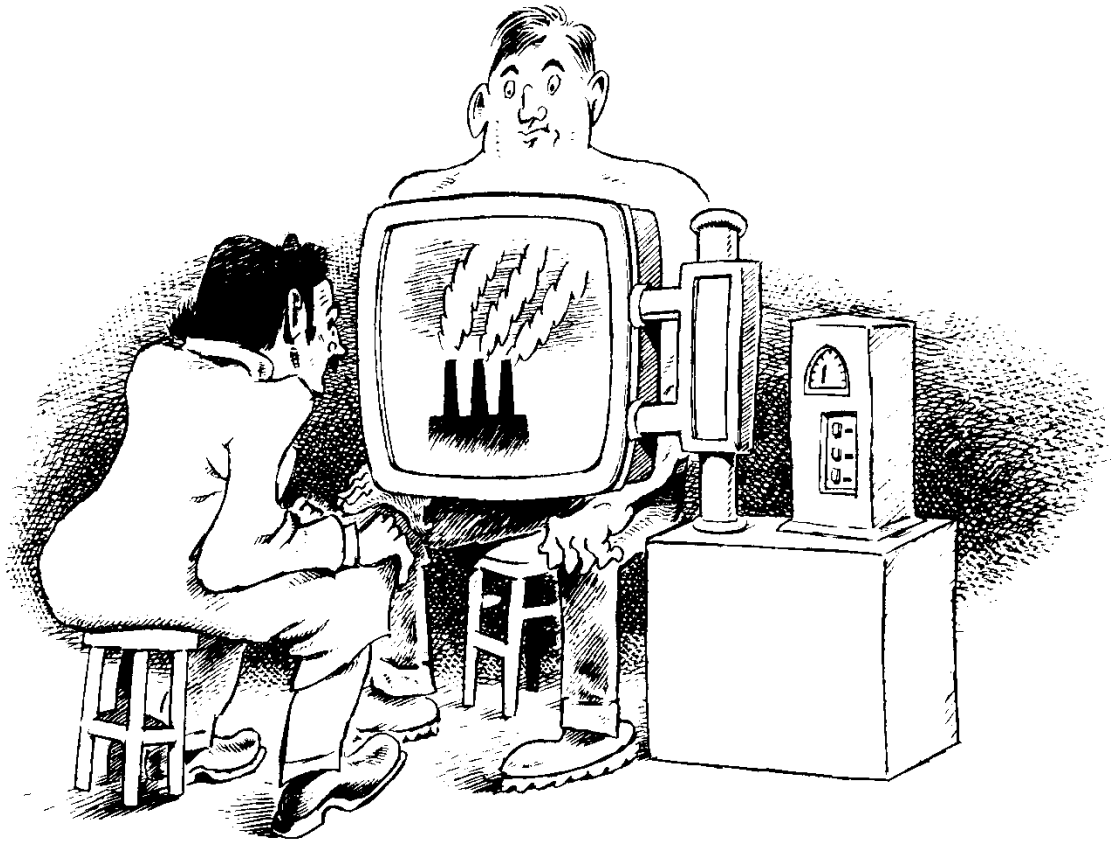
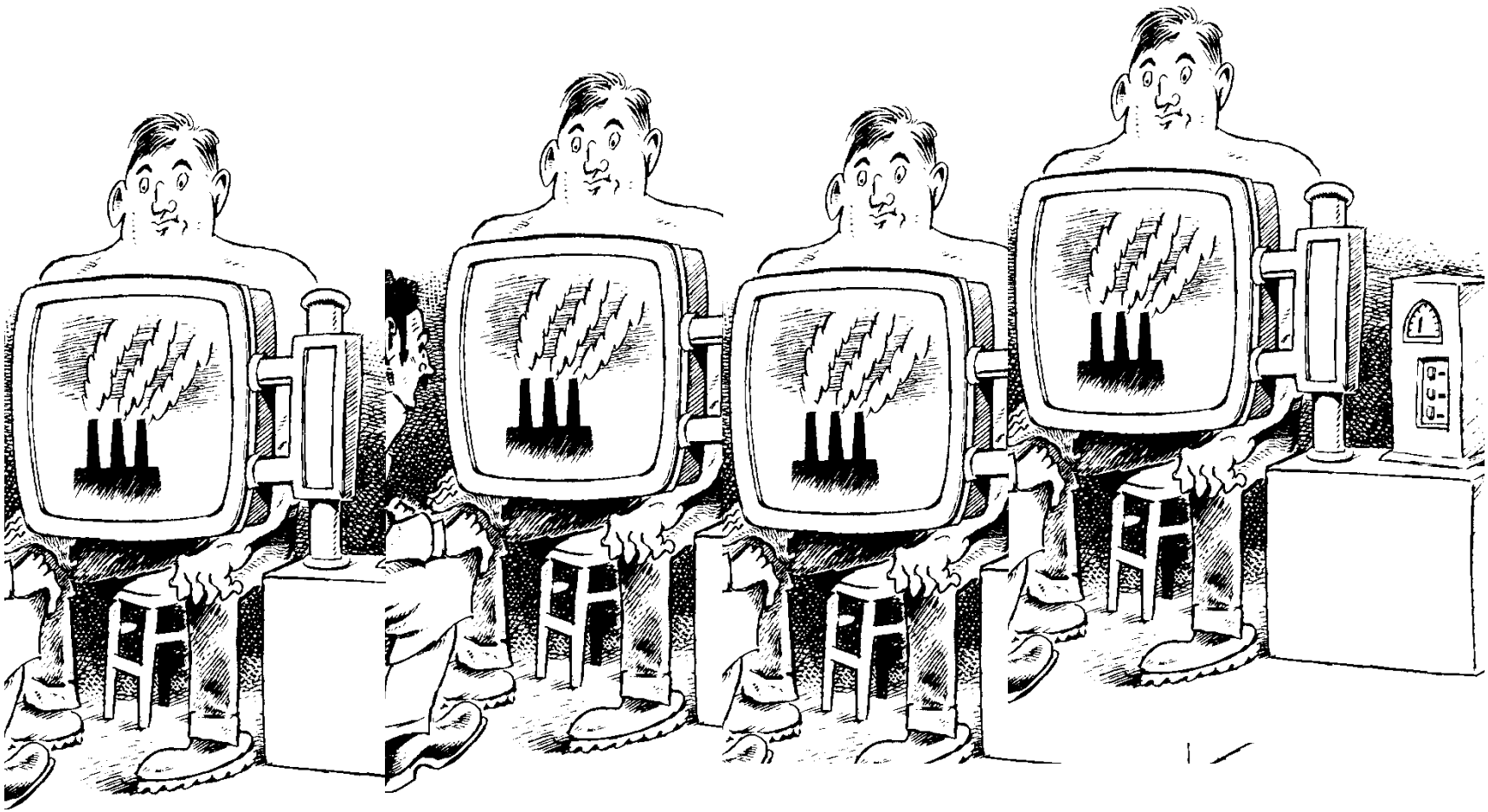


Contrary to this drawing, there is no simple test.
The suspicion and the determination of work-relatedness depend primarily on a careful occupational history

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



However, when you find one case of occupational disease, there are likely more around ...

In occupational medicine, n is nearly always >1

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

Milieu
Environment