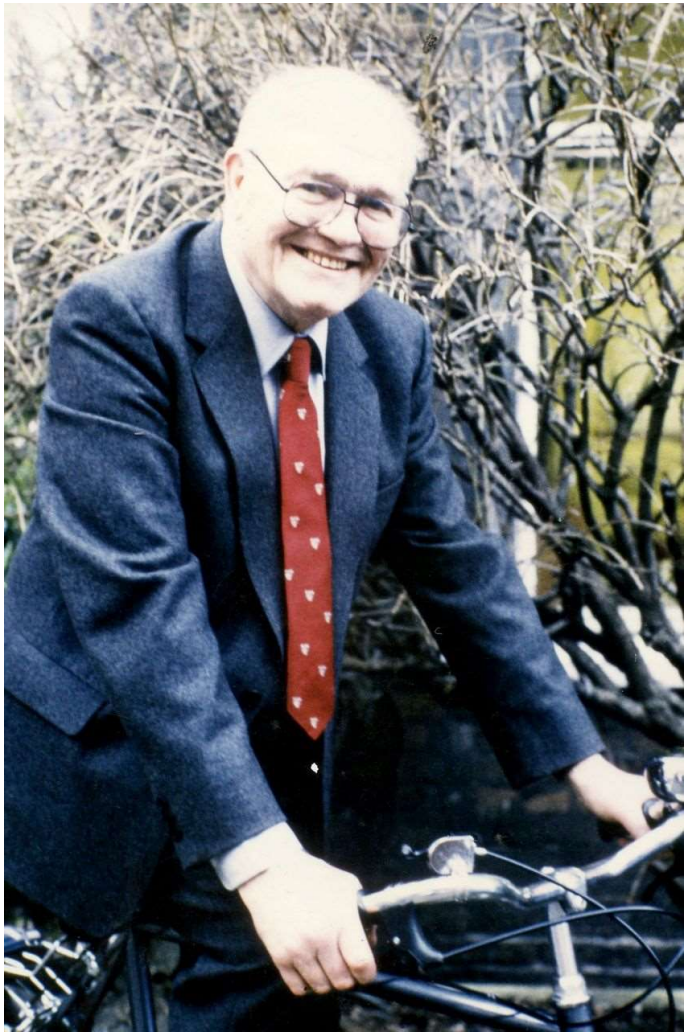
30 years of SWORD
Forging the links between research and practice to produce impact

Jennifer Hoyle

Surveillance of Work-Related and Occupational Respiratory Disease 1989

- Who and how was it started?
- Why ?
- What was it meant to achieve?

LONDON SCHOOL of HYGIENE &TROPICAL MEDICINE



Why?
Early detection of occupational hazards

"So far as we are aware, routine statistics of the type now available have never been responsible for the discovery of any new occupational disease"

"the detection of occupational hazards has often, perhaps usually, depended on astute clinical observation"

"Without prior definition of a precise question or null hypothesis, epidemiological methods are also ineffective"

From McDonald and Harrington,
J. Soc. Occup. Med. (1981) 31,93-98 *Printed in Great Britain*

Pre-SWORD 1989

1987- discussions between representatives of British Thoracic Society And Society of Occupational Medicine

Plan for voluntary reporting by members

Proposal submitted to HSE- approved funding 1989-1991

Recruitment via letter sent to members of the organisations- Monthly reports required

Protocol was extended to include – 3 monthly, 6 monthly and annual reporting

SWORD 1989

Reports (via cards) in 1989 from:

350 chest physicians (90% UK chest clinics)

361 occupational physicians

Participants:

Monthly reports of newly diagnosed cases of work-related respiratory disease

Monthly digest of newly reported cases by diagnostic category

Detailed analysis every quarter
c. Annual publications in medical literature

Excluded recreational exposures

What was the purpose?
SWORD 1989

Objectives of scheme:

(1) To monitor the frequency of work-related respiratory disease

SWORD 1989

2101 cases reported

- **Asthma (26%)**
- **Mesothelioma (16%)**
- **Pneumoconiosis (15%)**
- **Benign pleural disease (11%)**
- **Hypersensitivity pneumonitis (6%)**

Mineral dust diseases- lung cancer with pulmonary fibrosis, malignant mesothelioma and pneumoconiosis together - 34%

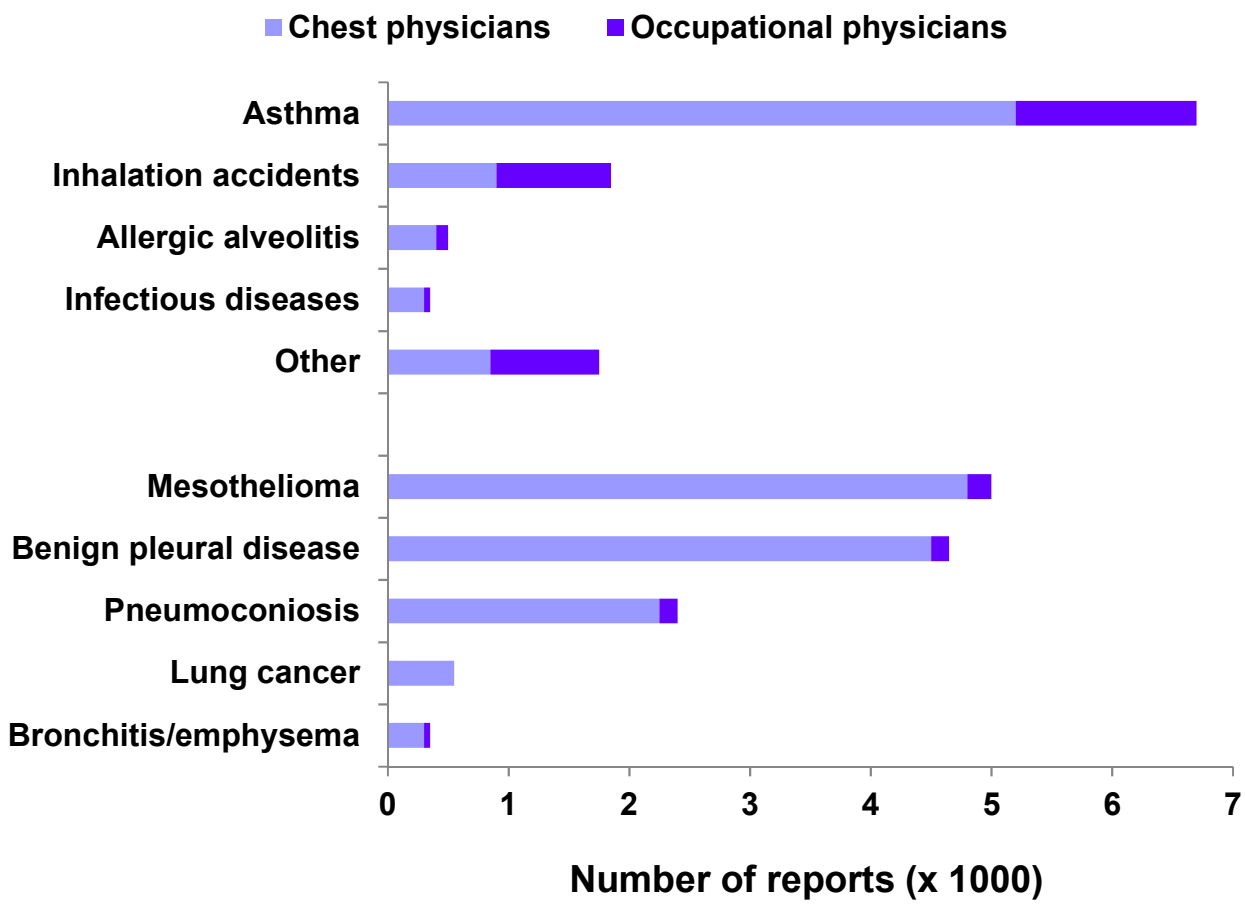
Incidence rates calculated against denominators From Labour Force Survey

Incidence of occupational asthma in high risk occupations SWORD 1989

Occupational group	Rate (million/yr)	95% CI
Coach and spray painters	639	445 – 889
Chemical processors	424	288 – 601
Bakers	409	274 – 588
Plastics making and processing	409	270 – 505
Metal making and treating	249	136 – 417
Laboratory technicians and assistants	204	133 – 299
Welders/solderers/elctronic assemblers	159	111 - 221

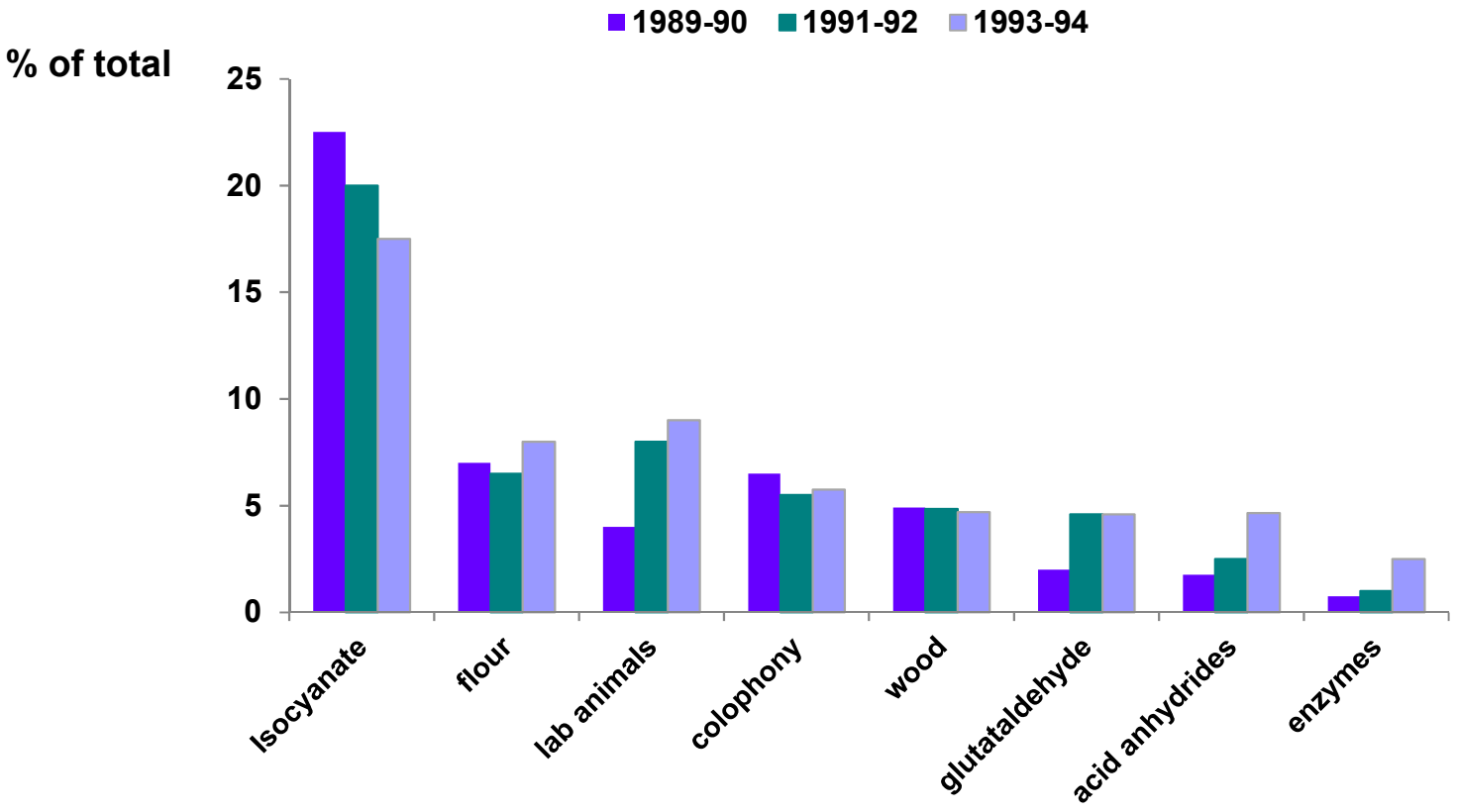
After Meredith et al, 1991

Total new cases reported to SWORD 1990-1997



Ross et al, 1999

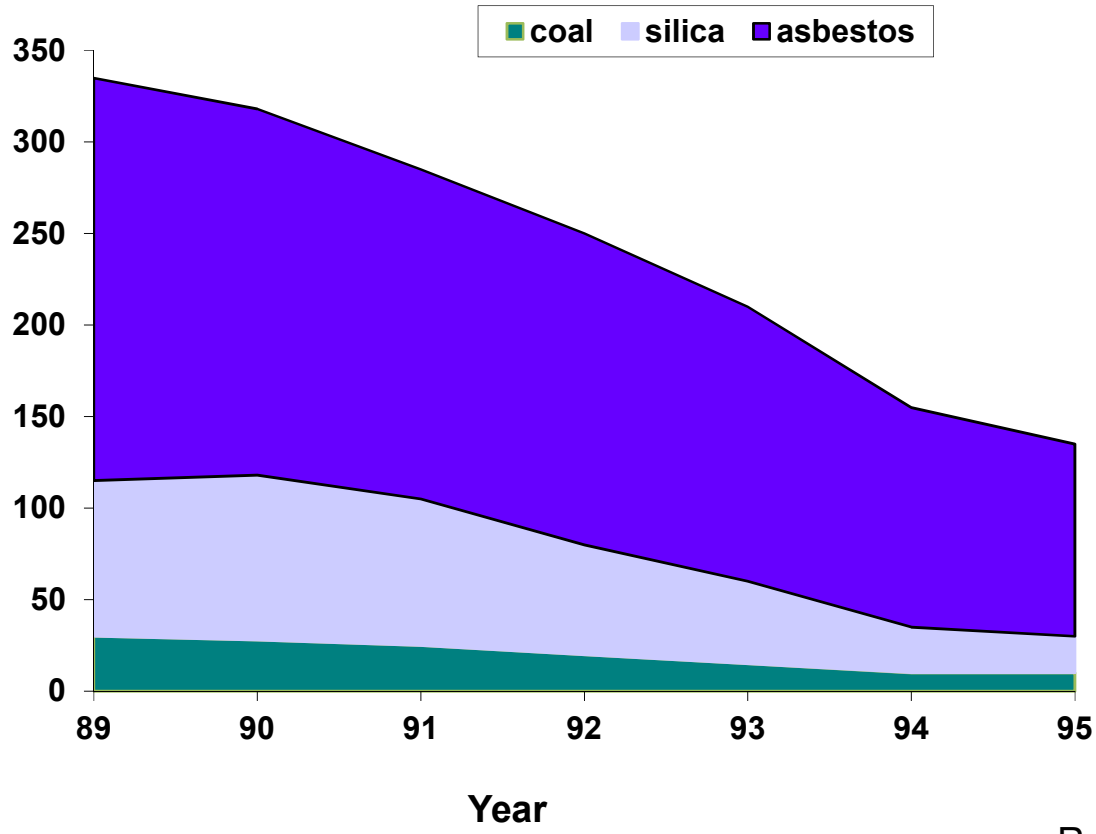
SWORD 1989-94
Trends in suspected agents for asthma



Ross et al, 1995

Pneumoconiosis in the UK
SWORD 1989-1995

No. of reports to SWORD



Ross et al, 1995

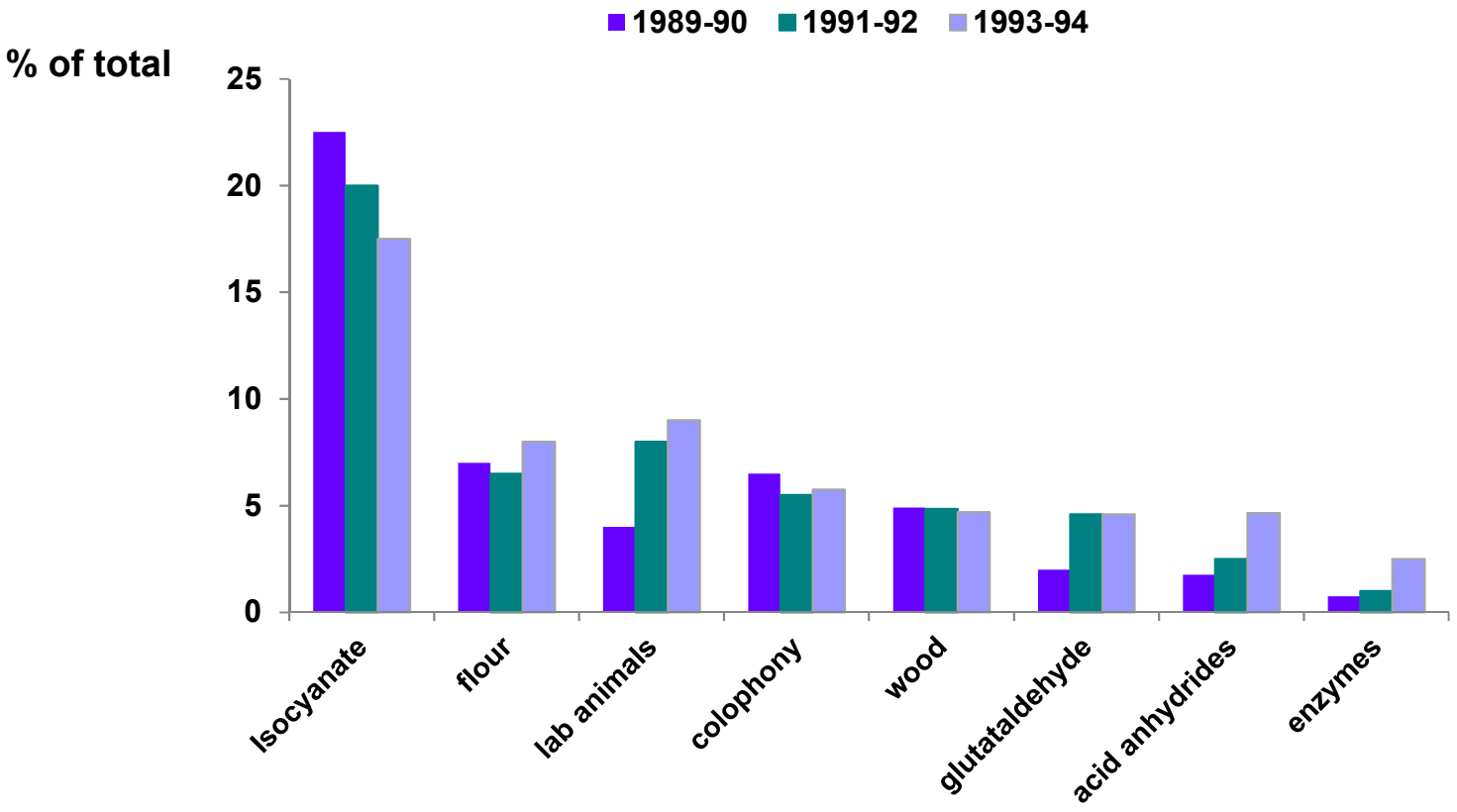
What was the purpose?
SWORD 1989

Objectives of scheme:

(1) To monitor the frequency of work-related respiratory disease

(2)To promote the early recognition and control of new problems

SWORD 1989-94
Trends in suspected agents for asthma

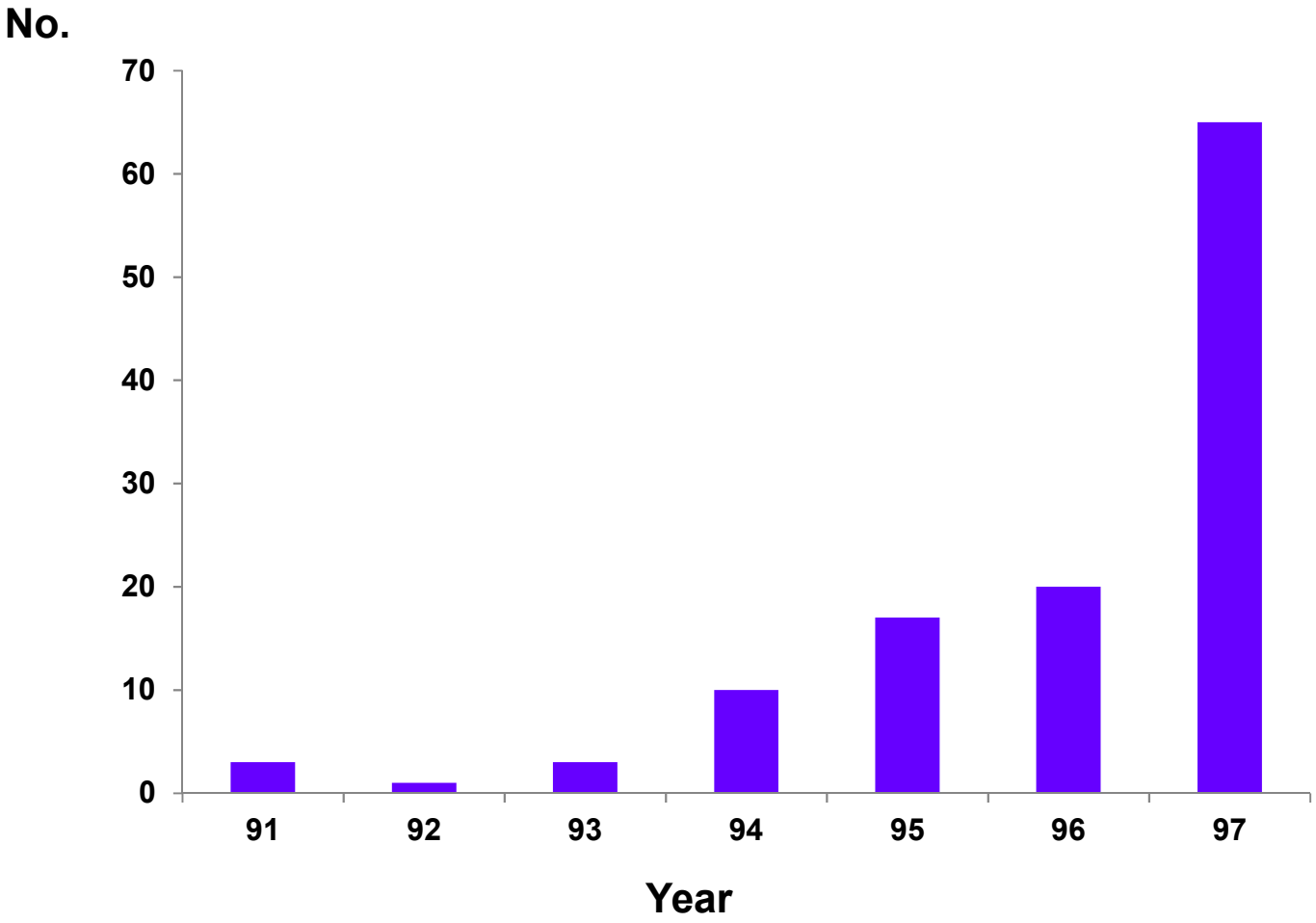


Ross et al, 1995

SWORD ‘97 report

- 64 of 1031 cases of occupational asthma resulted from exposure to latex
- Fourth most frequently incriminated asthmagen

Annual Reports to SWORD of occupational asthma attributed to latex (1991-1997)



Ross et al, 1998

Medical Devices Agency

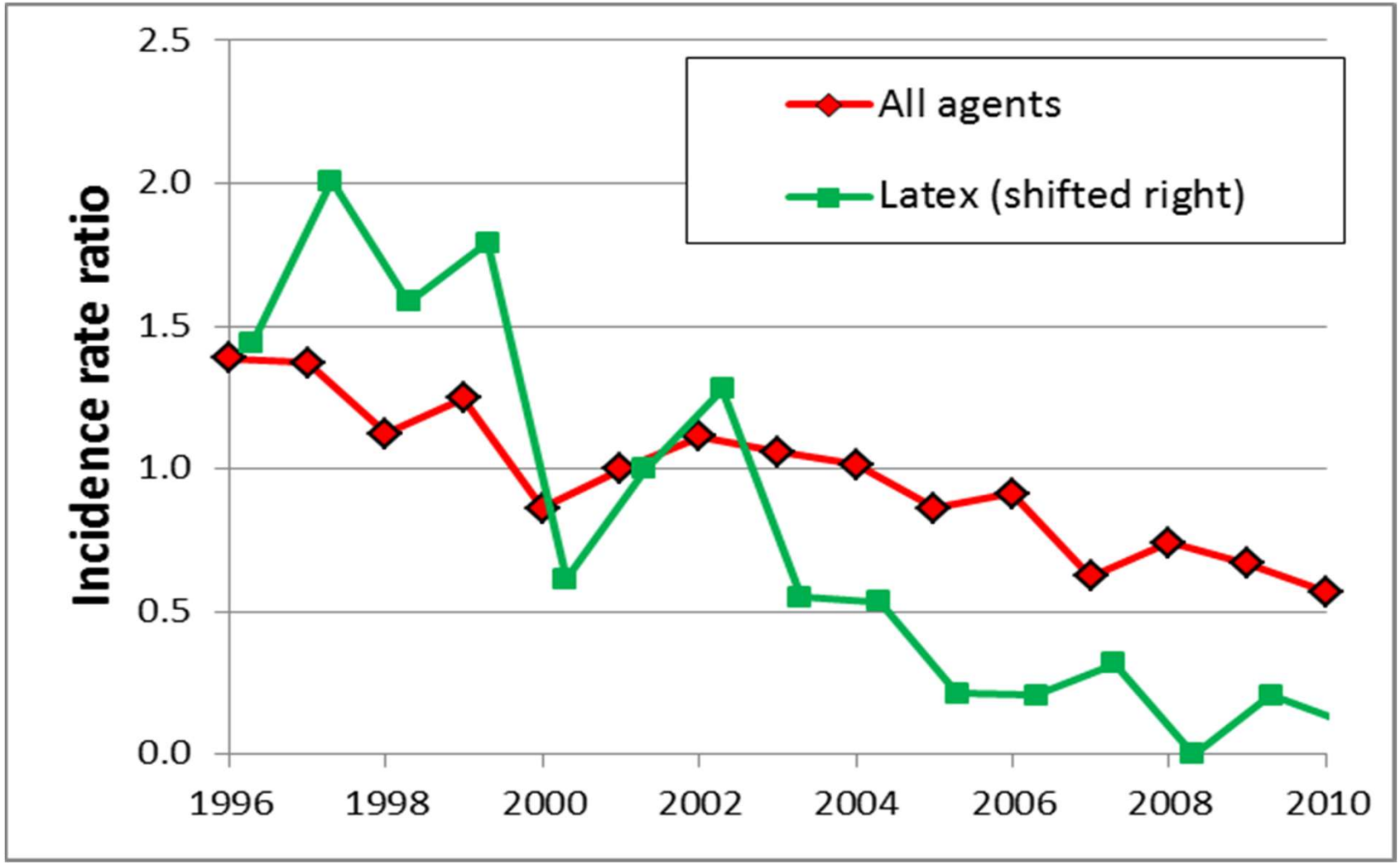
MDA Bulletin 1996, 117 million pairs of latex gloves were being supplied to the NHS annually in 1992, but few reports of latex sensitivity had been received at that time.

There is now sufficient evidence that healthcare workers are an occupational group at increased risk of latex allergy

Medical Devices Agency

- June 1998 issued mandatory advice
- aiming to increase awareness in glove users about previously published guidance on the allergic potential and risks associated with latex.
- Subsequently, in November 2002, the England and Wales Court of Appeal (Civil Division) issued a Decision associated with a claimant

Trends in asthma attributed to latex



Legislation aiming to reduce asthma attributed to latex glove use

Time1. Pre-intervention

Time2. 1998 MDA

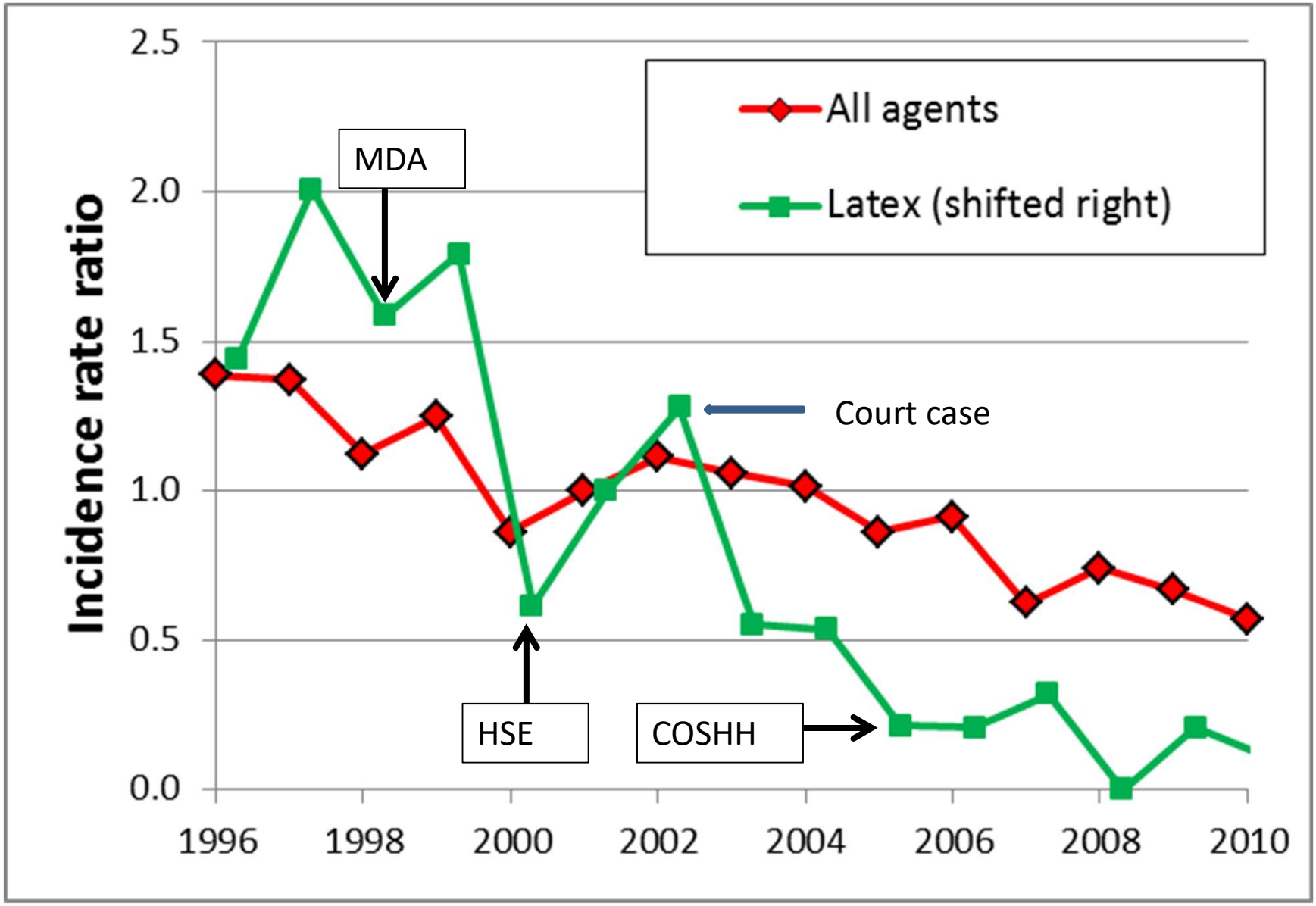
Time3. 2000 HSE guidance

Time4. 2004 COSHH amendment

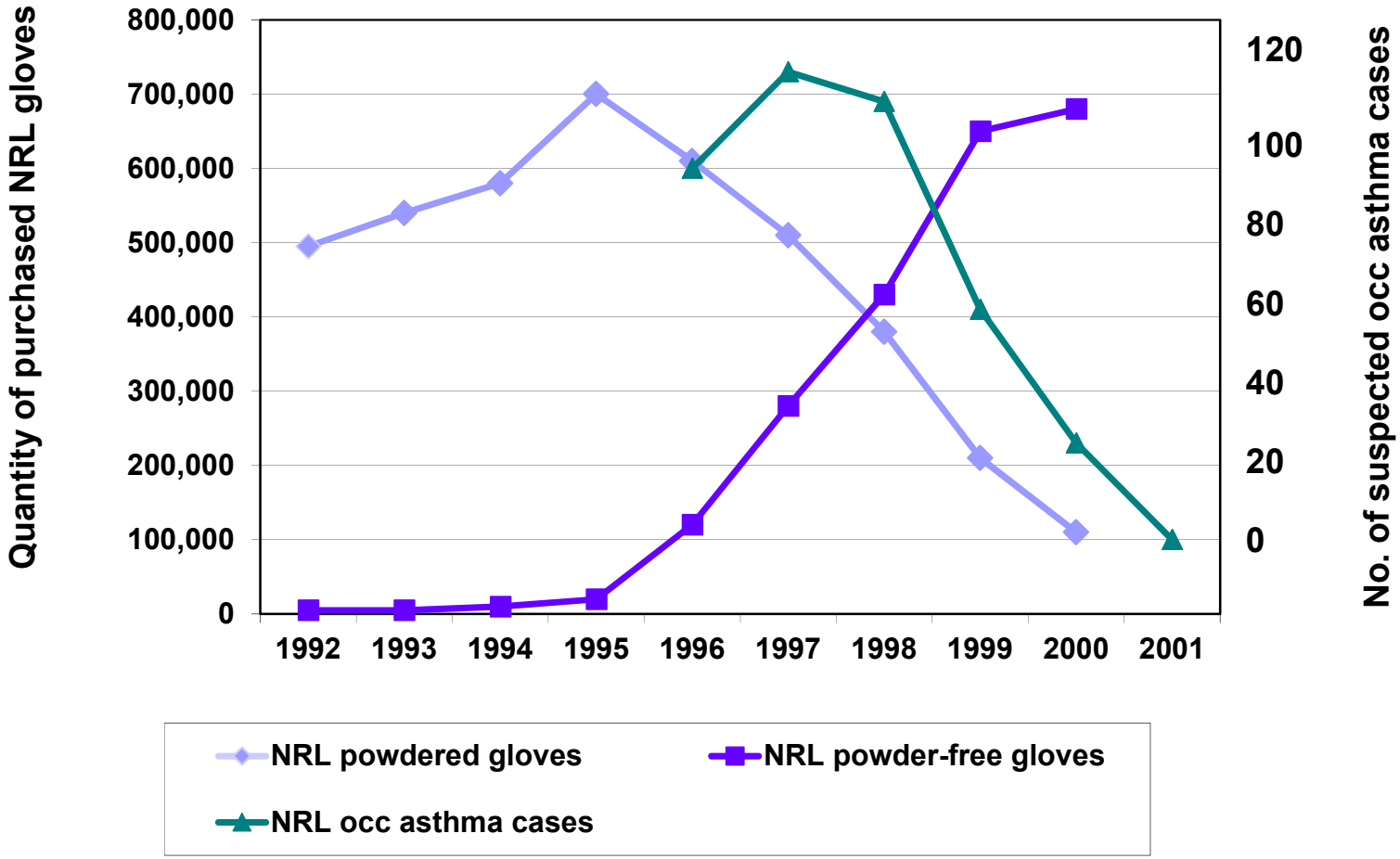
(effective 2005; ALARP but no WEL)

Occup Environ Med 2013;70:476-482 doi:10.1136/oemed-2012-101123
http://oem.bmj.com/content/70/7/476.full.pdf+html

Trends in asthma attributed to latex

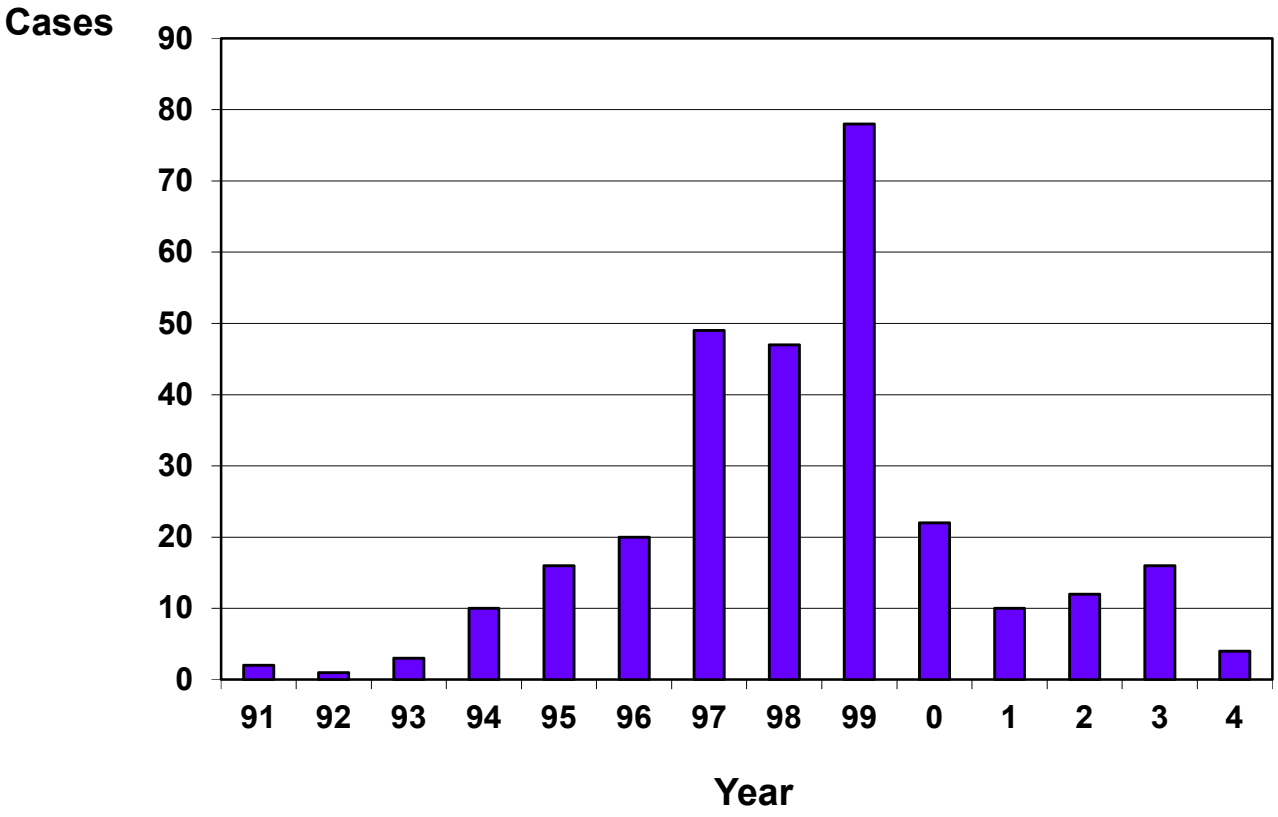


NRL glove purchase and occupational asthma in German acute care hospitals



After Allmers *et al*, 2002

Occupational asthma attributed to latex in the UK
Reports to SWORD 1991-2004



What was the purpose?
SWORD 1989

Objectives of scheme:

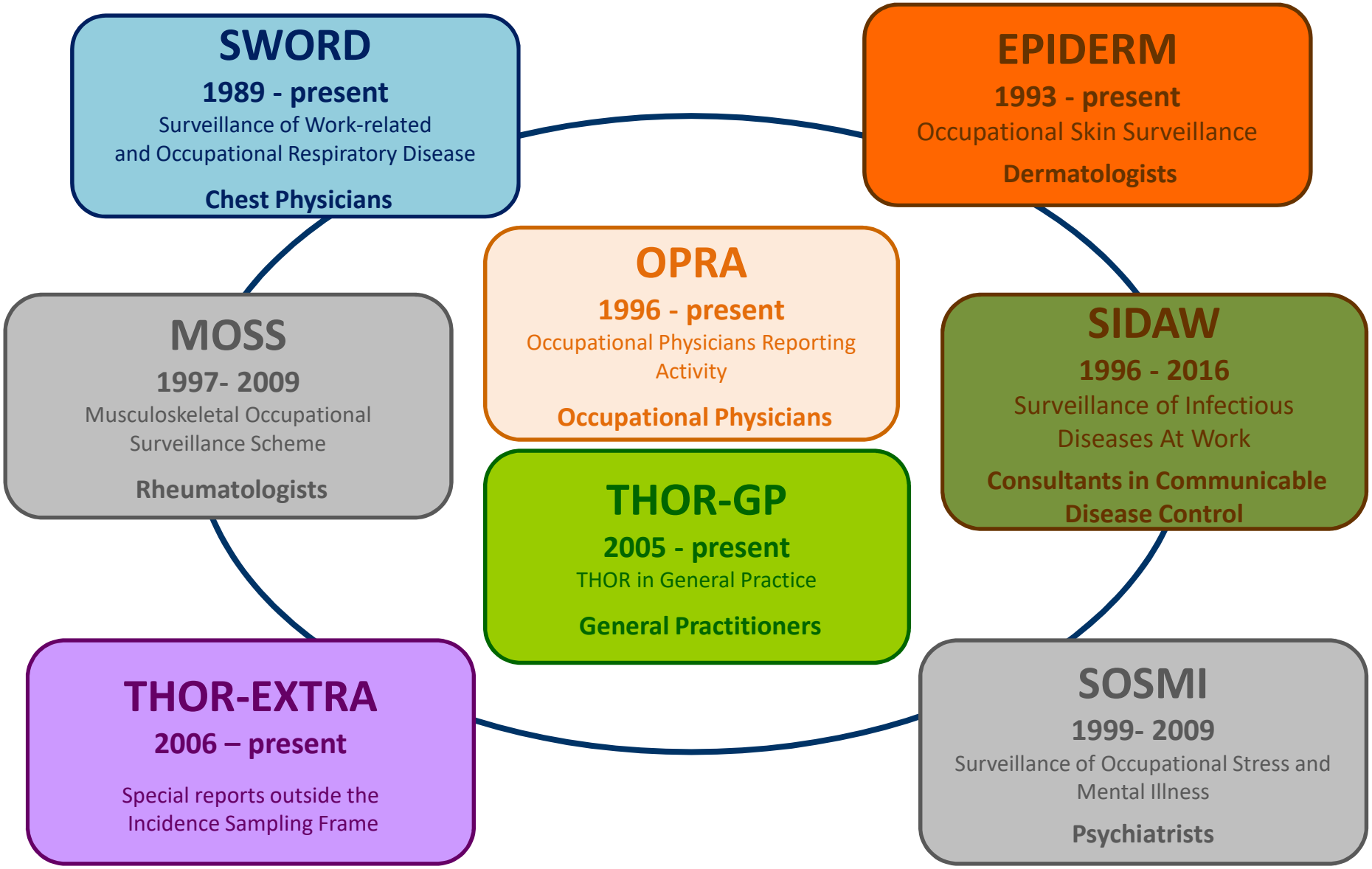
(1) To monitor the frequency of work-related respiratory disease

(2) To promote the early recognition and control of new problems

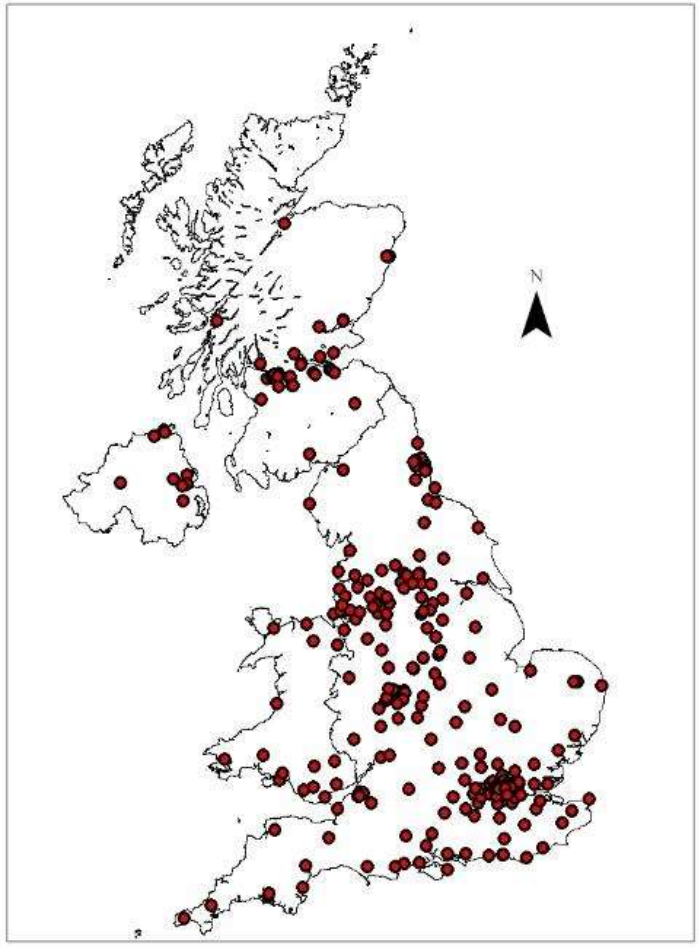
(3) To provide rapid feedback and information to participants

THOR

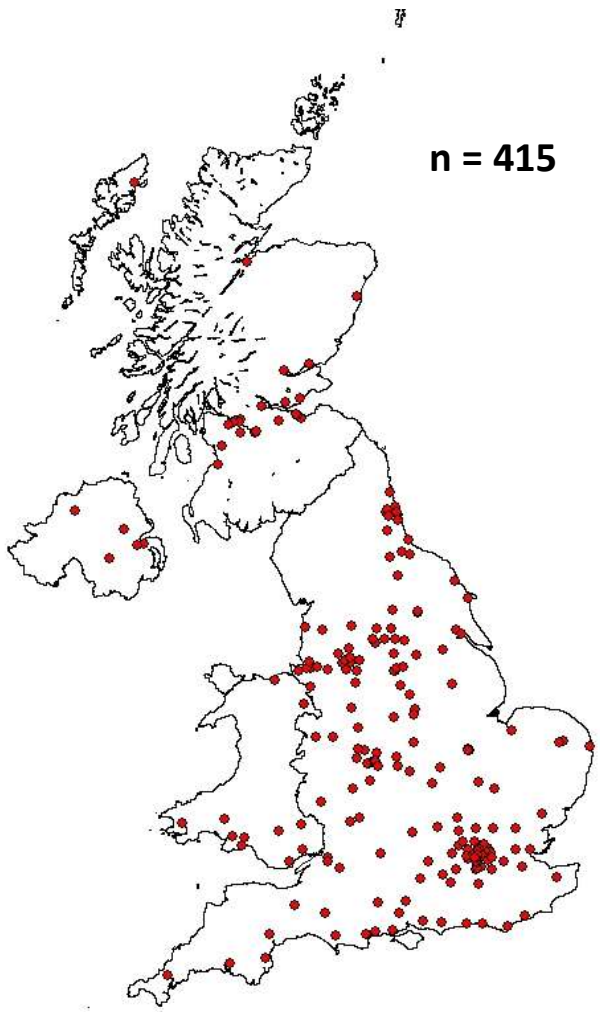
The Health & Occupation Research network



THOR- SWORD reporters



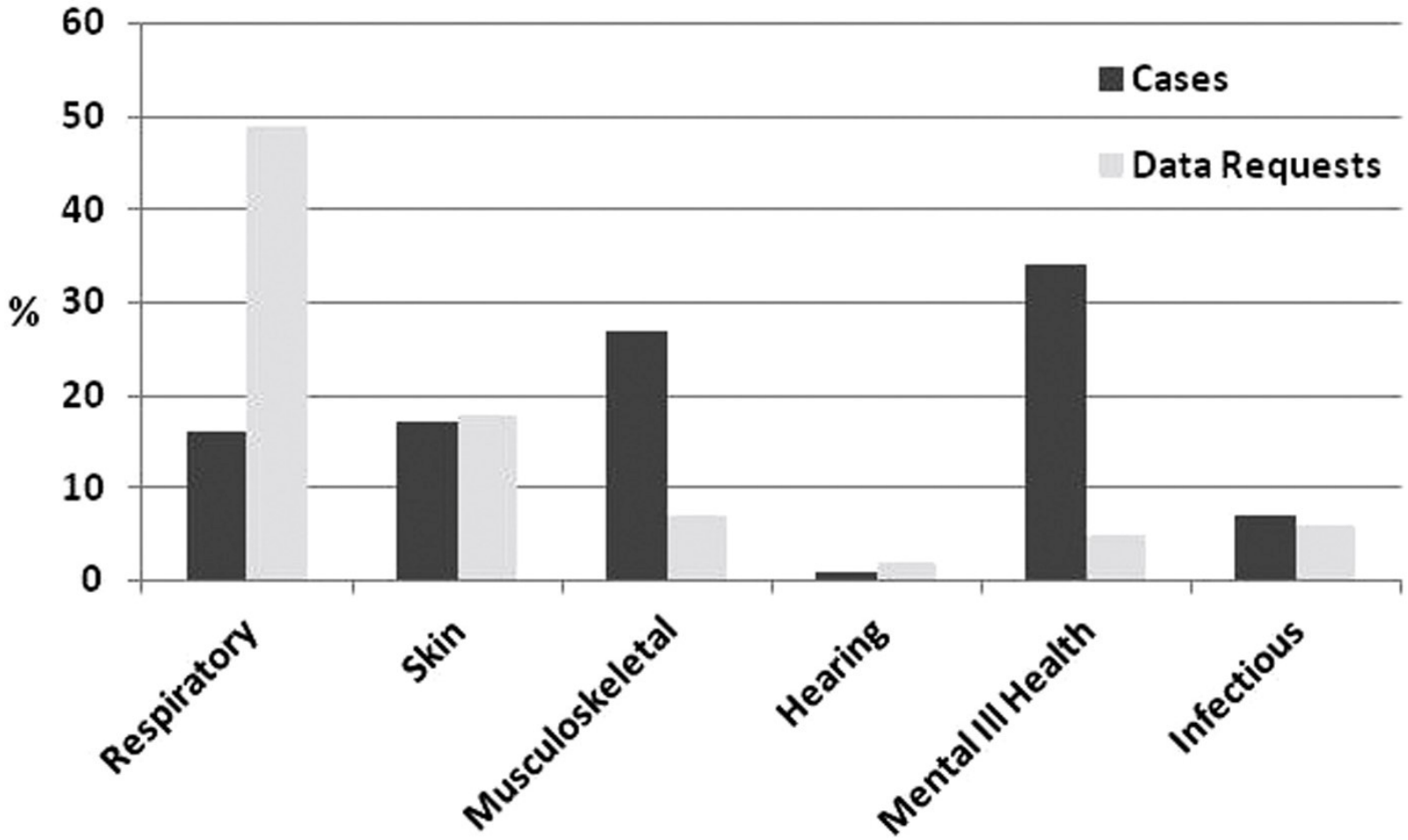
SWORD reporters – March 2017



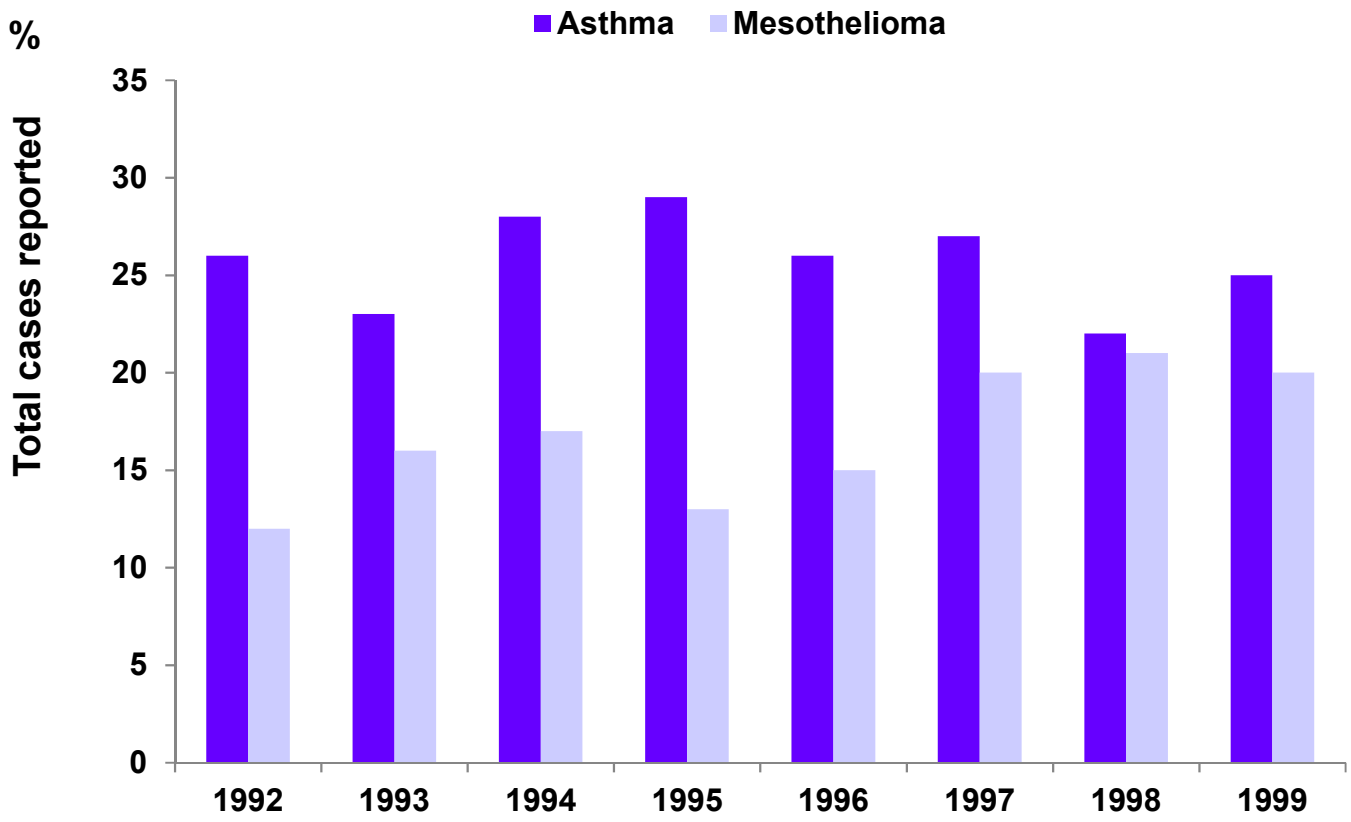
Region	No.	Region	No.
Tyne and Wear	12 (11)	South West	38 (42)
Northumberland, Cumbria, Durham and Cleveland	14 (14)	West Midlands metropolitan county	25 (26)
South Yorkshire	12 (13)	Rest of West Midlands	13 (14)
West Yorkshire	9 (10)	Greater Manchester	27 (27)
North Yorkshire & Humberside	11 (10)	Merseyside	12 (12)
East Midlands	25 (27)	Rest of North West	11 (13)
East Anglia	14 (15)	Wales	23 (24)
Inner London	49 (50)	Central Clydeside	12 (12)
Outer London	6 (7)	Rest of Scotland	25 (26)
Rest of South East	67 (67)	Northern Ireland	10 (11)

March 2016 equivalent figures shown in brackets

Data requests by specialism

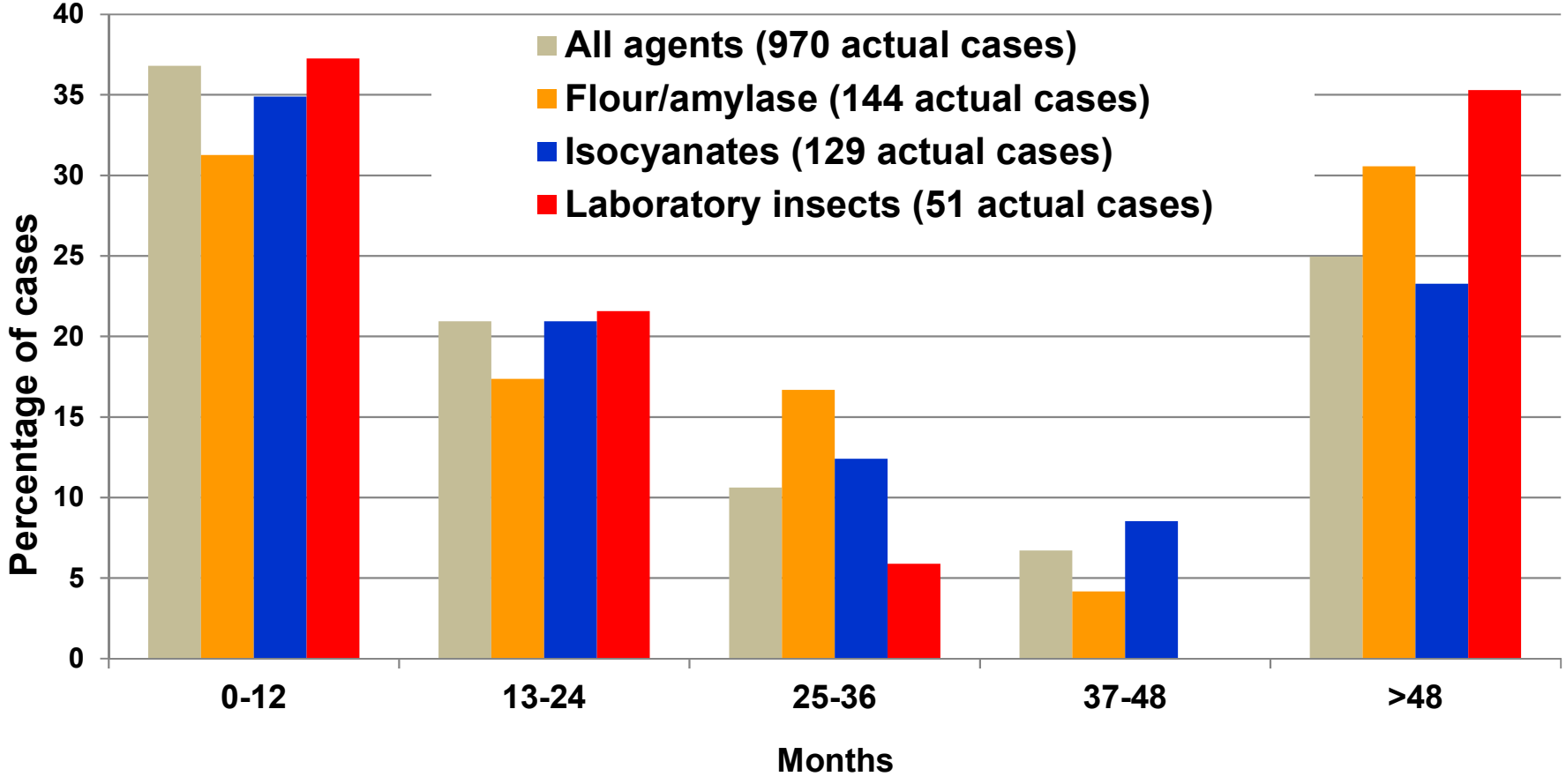


New cases of occupational asthma and mesothelioma reported to SWORD 1992-1999



Meyer et al, 2001

Proportional time lapse between month of symptom onset* and reporting month for actual cases of *asthma* reported to SWORD (2006-2016)

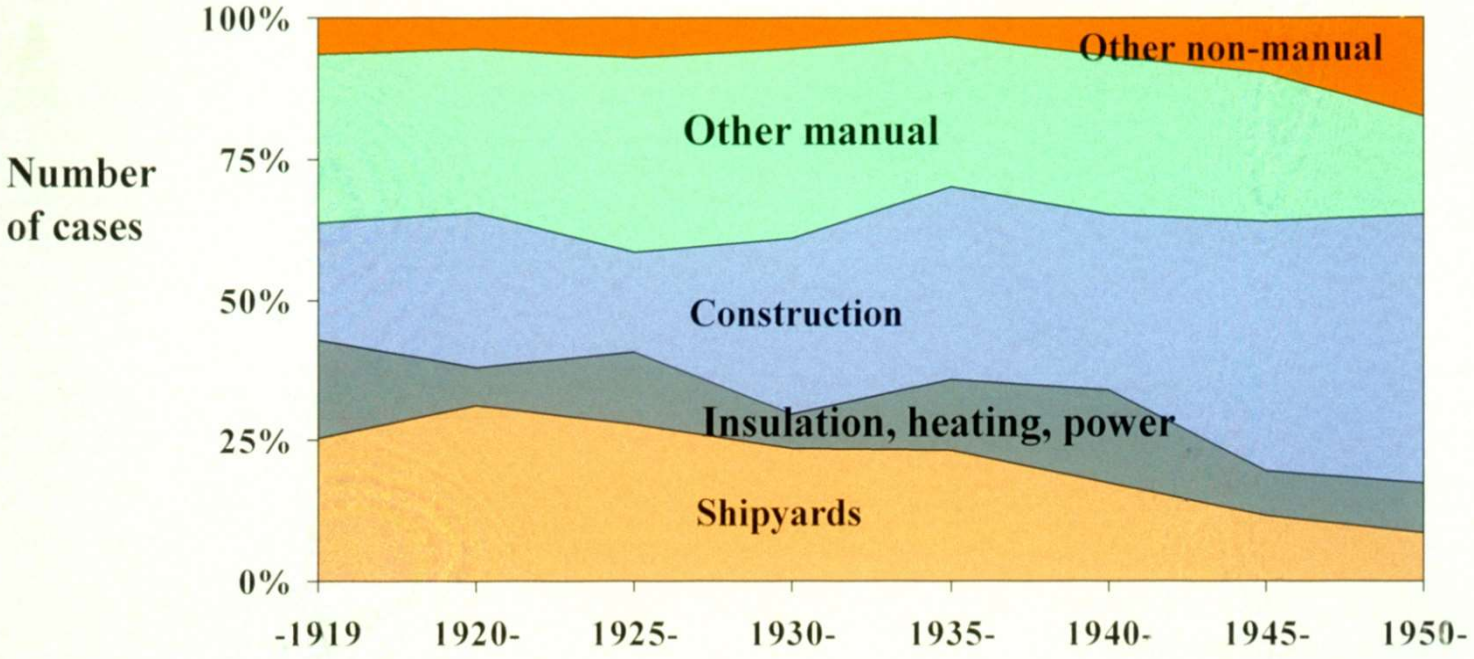


Median: All agents = 23 months Isocyanates = 24 months

Flour/amylase = 27 months Laboratory insects = 24 months

*Based on both full (month, year) and partial (year) symptom onset data

Mesothelioma: Proportional contribution of occupation by five-year birth cohort; cases reported to SWORD 1996-1999



After Meyer et al, 2001

What was the purpose?
SWORD 1989

Objectives of scheme:

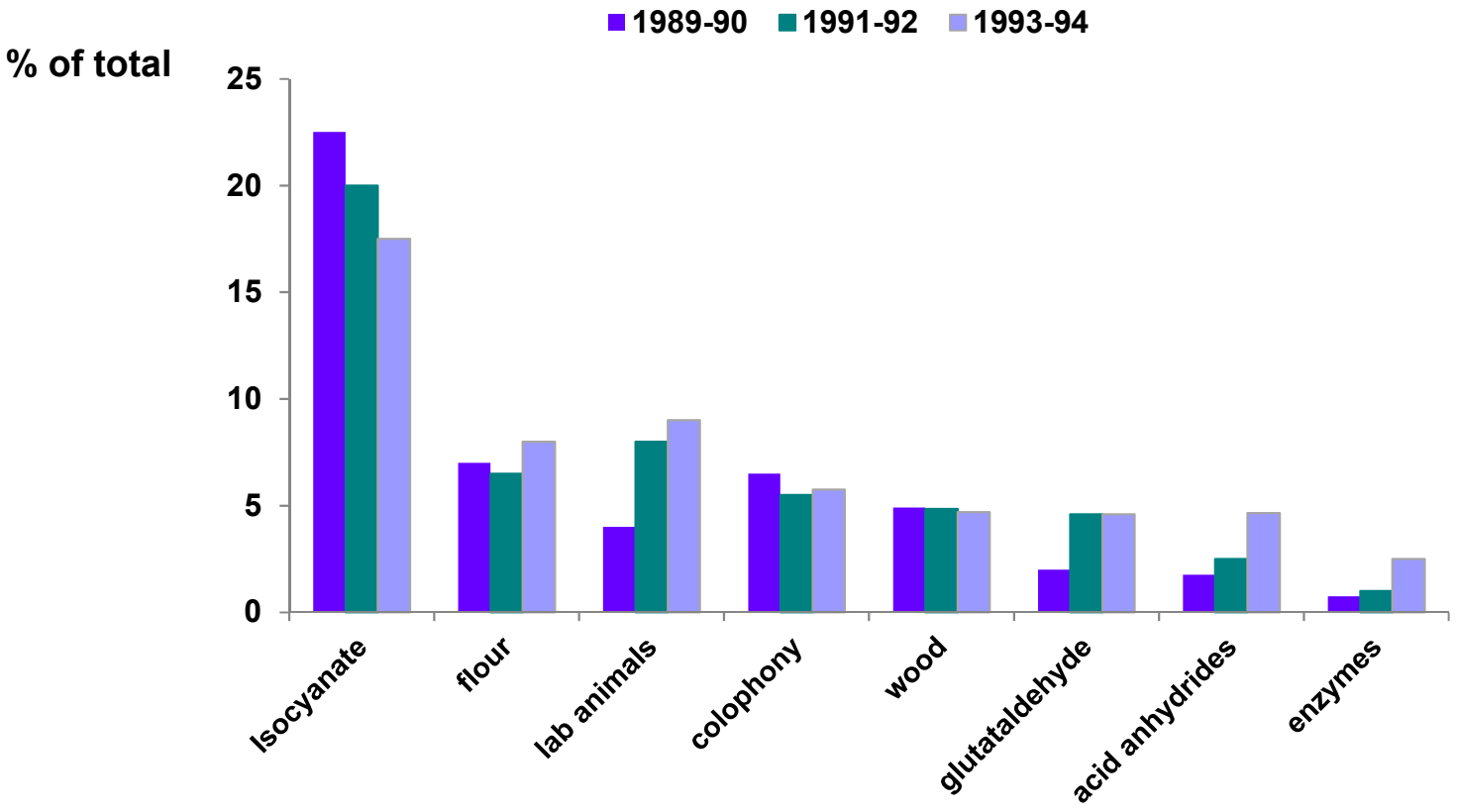
(1) To monitor the frequency of work-related respiratory disease

(2) To promote the early recognition and control of new problems

(3) To provide rapid feedback and information to participants

(4) To undertake collaborative investigations where indicated

SWORD 1989-94
Trends in suspected agents for asthma



Ross et al, 1995

ENOCH

Investigation of the principal determinants (exposure and atopy) of occupational asthma, associated allergic symptoms and of specific sensitisation

Parallel cohort studies in newly employed

laboratory animal workers

bakery workers

acid anhydride workers

Laboratory animal workers

7 year follow up (Jan 1986 - Dec 1993)

Levels of specific aero-allergen measured

6 monthly questionnaire with SPT v RUP

⟶ 4 exposure categories

Nested matched case-referent analysis within cohort

ENOCH : Cohort study of laboratory animal workers

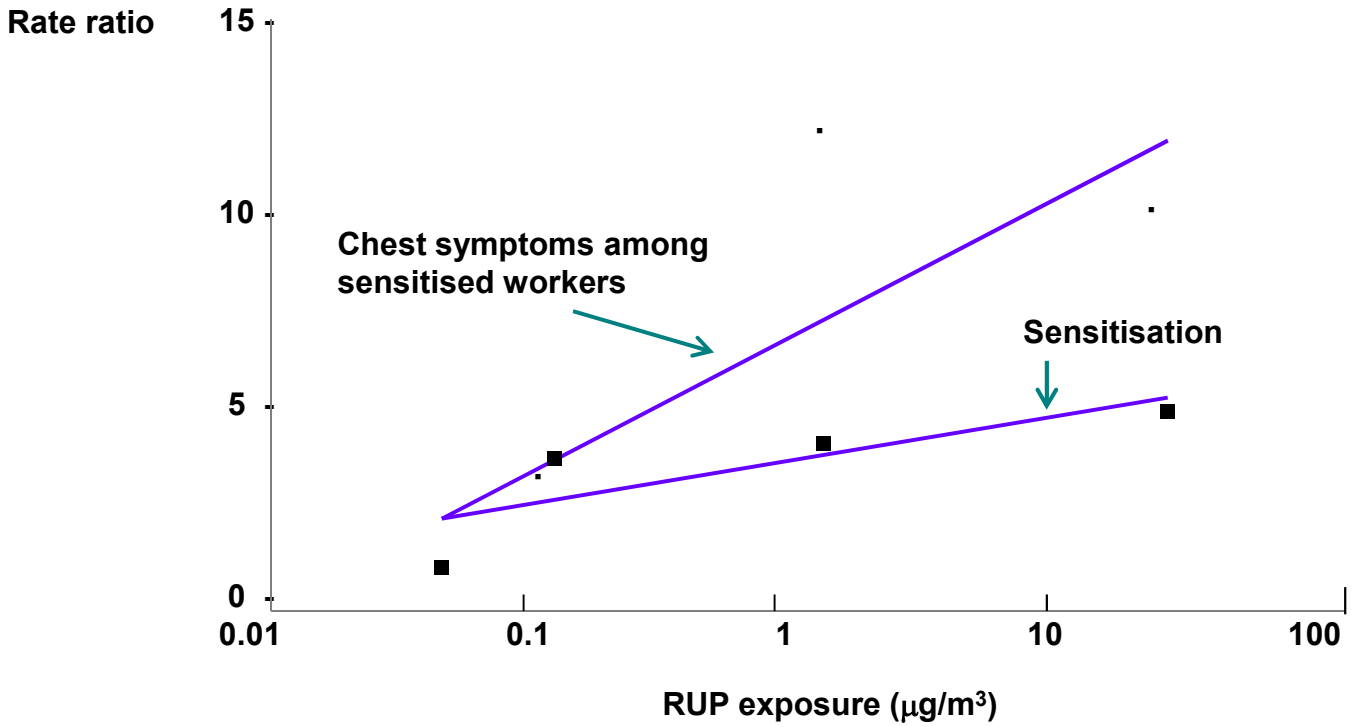
Exposure-response relationships in cases developing within 2 years of first employment

	New work-related symptoms					
Exposure category	Chest		Eye/nose		SPT v RUP	
	OR	95% CI	OR	95% CI	OR	95% CI
1 (low)	1		1		1	
2	2.4	0.2 - 38.4	3.0	0.8 - 10.9	3.0	0.3 – 29
3	5.5	0.5 – 65.1	3.7	1.1 – 12.2	6.0	0.6 - 57.1
4 (high)	4.6	0.3 – 77.4	3.2	0.9 – 11.5	5.7	0.6 - 53
Atopy	2.7	0.8 – 9.7	0.4	0.2 – 1.0	2.9	1.1 – 7.9

"This study confirmed allergen exposure as the most important determinant of laboratory animal allergy. Measures to reduce exposure may be the most effective means to reduce its incidence".

Cullinan P et al, 1999

ENOCH : Exposure-response relationships for new chest symptoms in sensitised workers and new skin prick test responses v RUP



Nieuwenhuijsen M et al, 2002

Reporting schemes + disease recognition

SWORD + occupational lung disease

Problems of attribution

We recognise the visible with strong relationships

e.g. Asbestos related diseases with specific markers

(pleural thickening/calcification)

or strong association (mesothelioma)

Occupational asthma with specific characteristics

We do not recognise the less visible

without specific markers or a strong association

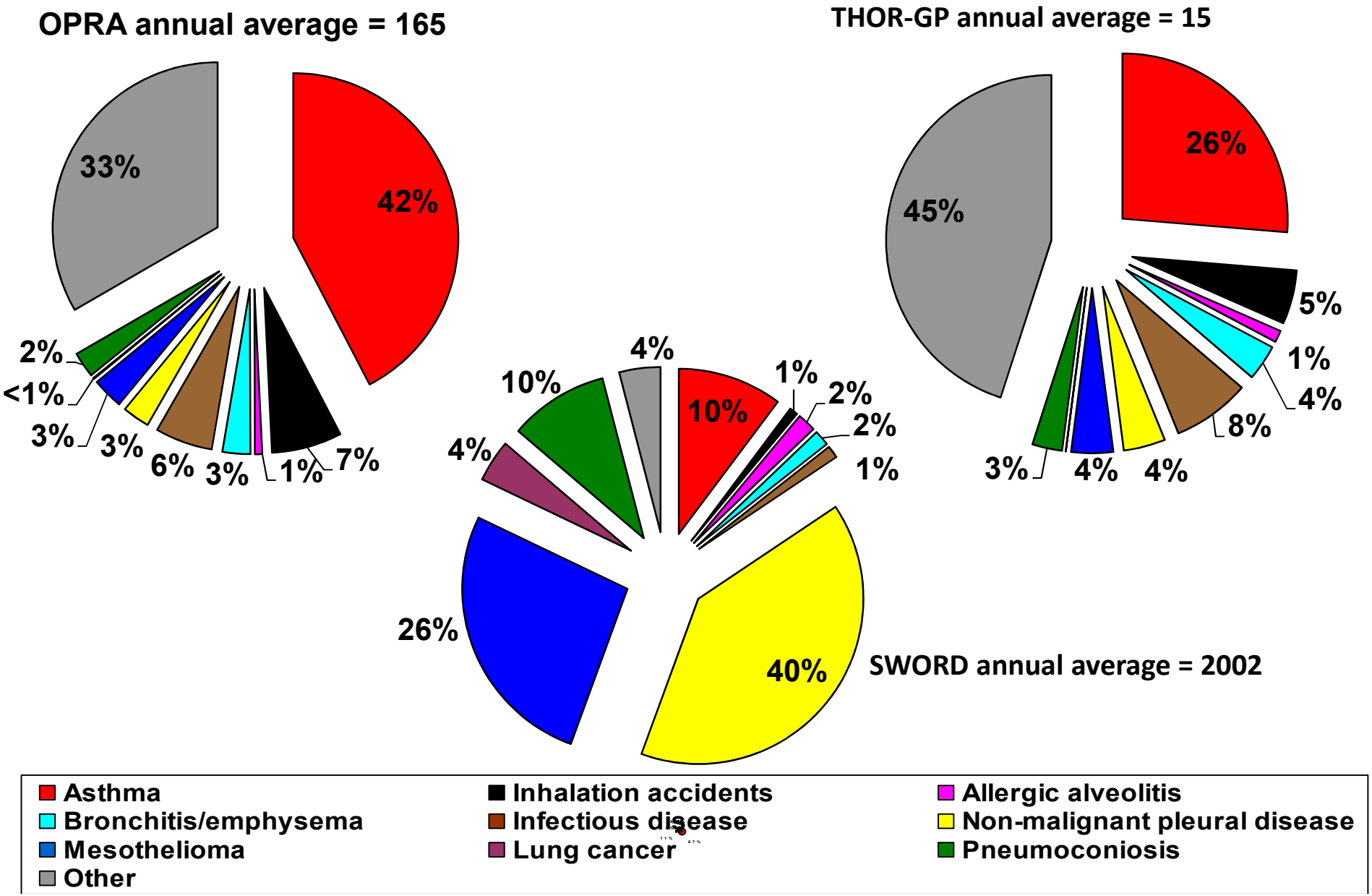
or with a strong association with another cause

e.g. cigarette smoking with:

lung cancer

chronic bronchitis and emphysema

Respiratory cases reported by diagnostic category, SWORD, OPRA and THOR-GP (2006-2016)



Why?
Early detection of occupational hazards

"So far as we are aware, routine statistics of the type now available have never been responsible for the discovery of any new occupational disease"

From McDonald and Harrington,
J. Soc. Occup. Med. (1981) 31,93-98 *Printed in Great Britain*

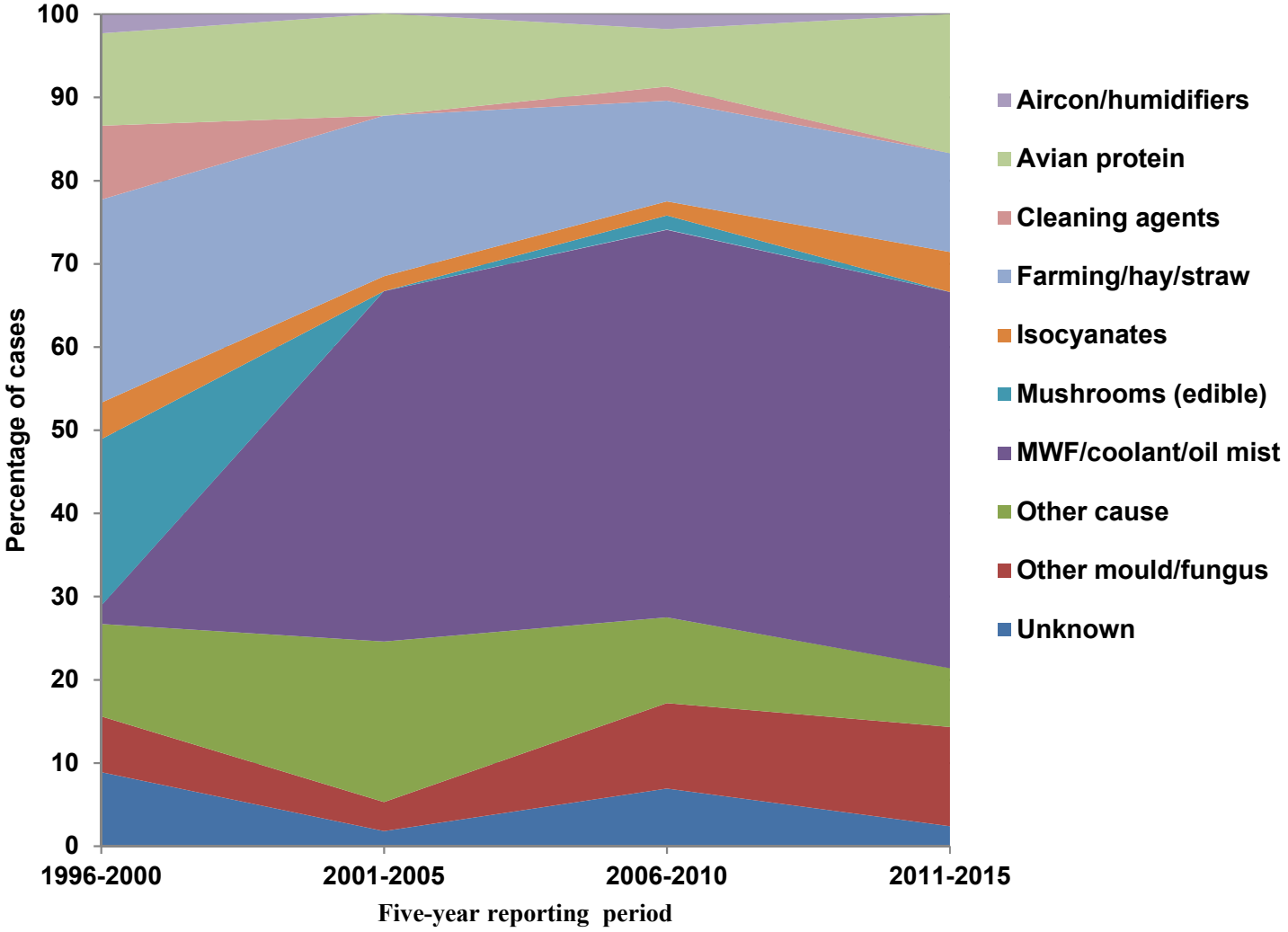
Epidemiology of occupational hypersensitivity pneumonitis; reports from the SWORD scheme in the UK from 1996 to 2015

(After Barber 2016)

- 202 cases of Occupational HP reported
- Annual incidence UK 1.4 per million workers
- More likely seen in male workers than female

Hypersensitivity pneumonitis

Reports to SWORD 1996 - 2015



After Barber et al, 2016

Cases of respiratory disease attributed to milk powder/products, coffee, diacetyl (2017)

- 8 actual cases of work-related respiratory disease attributed to milk powder/products, coffee, diacetyl reported by chest physicians to SWORD (2006-2015)
- No cases reported to OPRA or THOR-GP

Year	Diagnosis	Sex	Age	Industry	Job	Suspected agents
2006	OBSTRUCTIVE BRONCHIOLITIS	M	37	FOOD	OPERATOR	DIACETYL
2006	OTHER RESPIRATORY DISEASE NOT SPECIFIED	M	38	FOOD	PRODUCTION OPERATIVE	DIACETYL
2014	ASTHMA SENSITISATION	M	44	FOOD	MAINTENANCE ENGINEER	GREEN COFFEE
2014	OCCULAR ALLERGY	M	50	FOOD	HGV DRIVER	GREEN COFFEE BEAN
2014	RHINITIS	M	41	FOOD	ENGINEER	GREEN COFFEE BEAN OR ALTERNARIA
2015	ASTHMA IRRITATION	M	47	FOOD	PACKAGING TECHNOLOGIST	BURNT COFFEE BEANS
2015	ASTHMA IRRITATION	M	47	FOOD	PACKAGING TECHNOLOGIST	BURNT COFFEE BEANS
2015	INHALATION ACCIDENT	M	47	FOOD	MAINTENANCE TECHNICIAN	GREEN COFFEE

SWORD 1989-objectives achieved

Objectives of scheme:

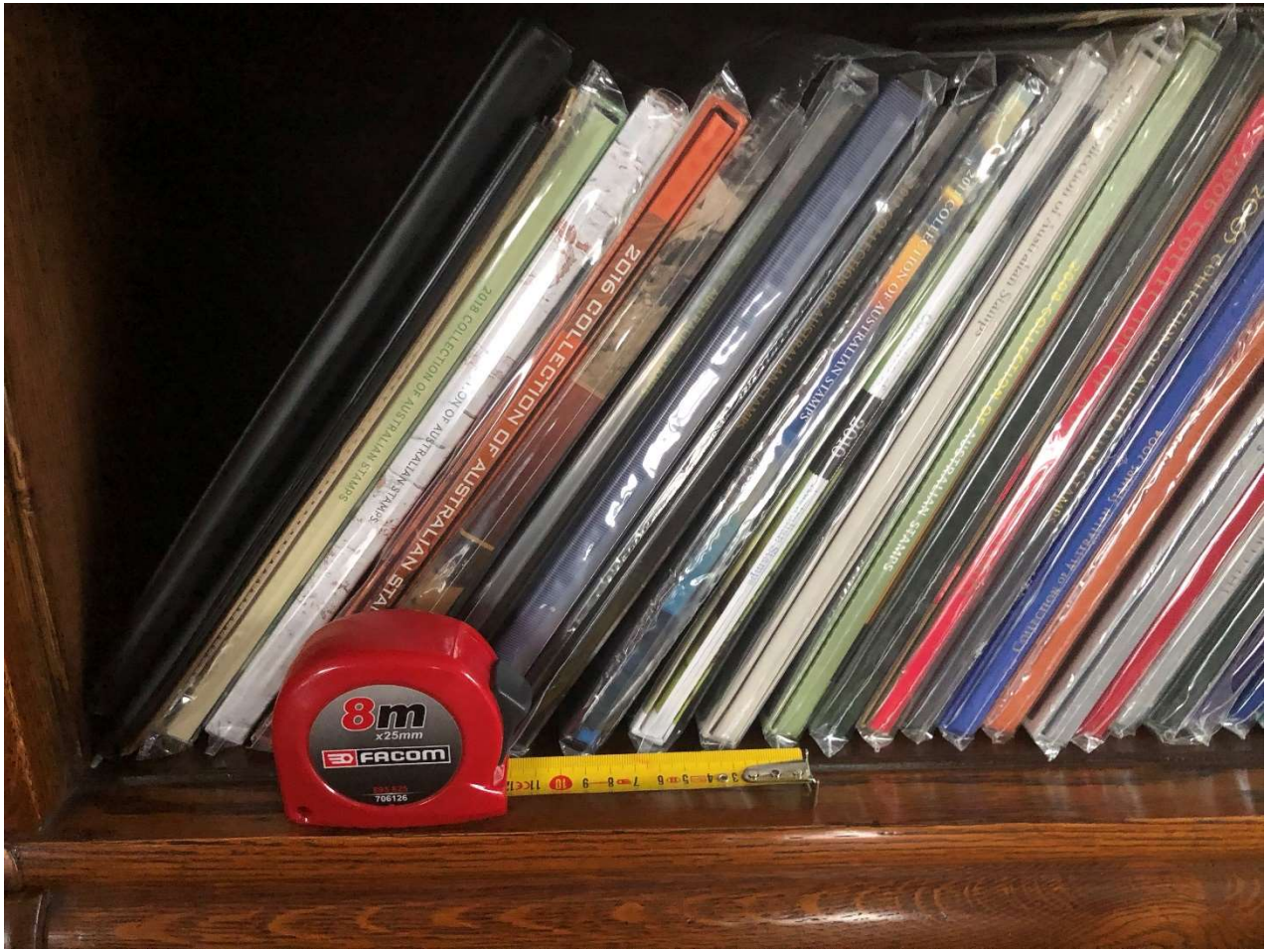
(1) To monitor the frequency of work-related respiratory disease

(2) To promote the early recognition and control of new problems

(3) To provide rapid feedback and information to participants

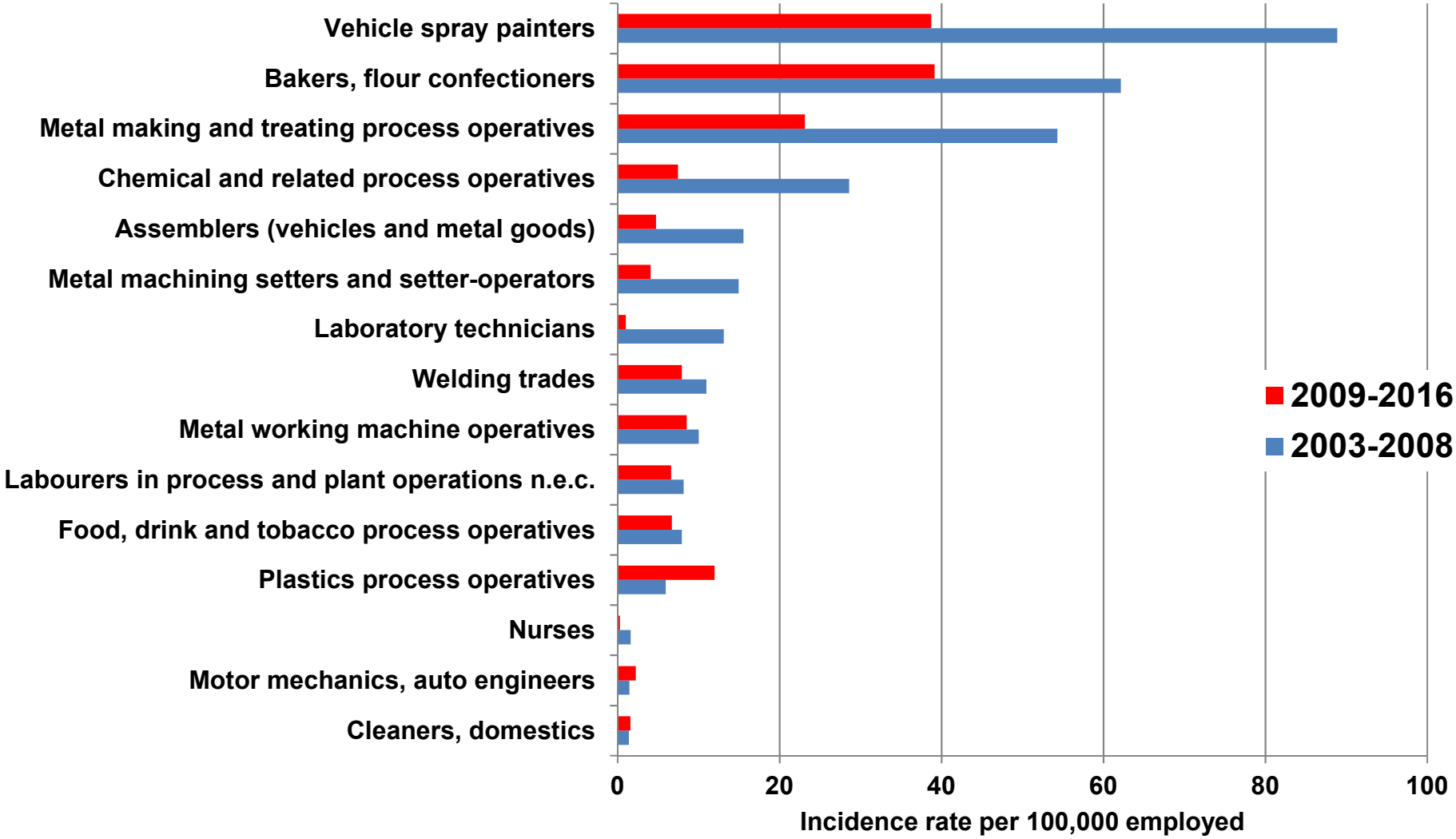
(4) To undertake collaborative investigations where indicated

Measuring Impact



- **015**
- **Article**
  - De Vocht, F., Batistatou, E., Molter, A., Kromhout, H., Schaap, K., Van Tongeren, M., ... Keevil, S. (2015). Transient health symptoms of MRI staff working with 1.5 and 3.0 Tesla scanners in the UK. *European Radiology*, [10.1007/s00330-015-3629-z]. DOI: 10.1007/s00330-015-3629-z. Publication link: b17e4845-9101-433c-a11c-5b3d79b4bc4a
  - Money, A., Carder, M., Noone, P., Bourke, J., Hayes, J., Turner, S., & Agius, R. (2015). Work-related ill-health: Republic of Ireland, Northern Ireland, Great Britain 2005-2012.*Occupational medicine (Oxford, England)*, *65*(1). DOI: 10.1093/occmed/kqu137. Publication link: cea2aa8b-303e-457b-8fe1-8eacee508dbc | PubMed:25324486
  - Povey, A. C., Gomez-Martin, A., Altakroni, B., Lozano-Paniagua, D., Margison, G. P., de Vocht, F., & Hernandez, A. F. (2015). Increased N7-methyldeoxyguanosine DNA adducts after occupational exposure to pesticides and influence of genetic polymorphisms of paraoxonase-1 and glutathione S-transferase M1 and T1. *Environmental and Molecular Mutagenesis*, *56*(5), 437-445. DOI: 10.1002/em.21929. Publication link: 05f926c8-6248-41ca-841c-60b718e040bc
  - Stocks, S. J., McNamee, R., van der Molen, H. F., Paris, C., Urban, P., Campo, G., ... Agius, R. (2015). Trends in incidence of occupational asthma, contact dermatitis, noise-induced hearing loss, carpal tunnel syndrome and upper limb musculoskeletal disorders in European countries from 2000 to 2012.*Occupational and environmental medicine*, *72*(4). DOI: 10.1136/oemed-2014-102534. Publication link: f3c10ca5-895c-4280-9e75-a567ed635be7| PubMed:25575531
  - Turner, S., Forman, S. D., McNamee, R., Wilkinson, S. M., & Agius, R. (2015). Investigating work-related neoplasia associated with solar radiation.*Occupational medicine (Oxford, England)*, *65*(1). DOI: 10.1093/occmed/kqu156. Publication link: 05e20146-bb49-4837-846a-f1e261ae94f5 | PubMed:25421392
- **Comment/debate**
  - Altakroni, B., Stocks, J., Brison, D., & Povey, A. C. (2015). Lifestyle and occupational and environmental exposure and DNA damage in human sperm. *Mutagenesis*, *29*(6), 548-549. . Publication link: 0f9e5bd8-44ad-4034-a6cf-56c09ac83844
  - Povey, A., Altakroni, B., Stocks, J., & Brison, B. (2015). Associations between DNA double strand breaks and N7-methyldeoxyguanosine in human sperm and IVF/ICSI outcomes. *Human Reproduction*, *30*(Suppl. 1), 174-174. . Publication link: 1659286f-2742-4244-9aee-7a1356450a81
  - Povey, A., Nevin, C., Altakroni, B., Murgatroyd, C., Brison, D. R., & Carroll, M. (2015). Environmental and lifestyle factors associated with sperm DNA methylation. *Human Reproduction*, *30*(Suppl. 1), 172-172. . Publication link: 1a71bae7-daaf-45a8-9050-79ab7c4f9da6
- **2014**
- **Article**
  - Carder, M., Money, A., Turner, S., & Agius, R. (2014). Workforce coverage by GB occupational physicians and disease incidence rates.*Occupational medicine (Oxford, England)*, *64*(4). DOI: 10.1093/occmed/kqu042. Publication link: d981e8ee-dbae-4c7e-b6df-0d43411b3cb3 | PubMed:24727562
  - Chatwin, J., Kennedy, A., Firth, A., Povey, A., Rogers, A., & Sanders, C. (2014). How potentially serious symptom changes are talked about and managed in COPD clinical review consultations: A micro-analysis. *Social Science and Medicine*, *113*, 120-136. DOI: 10.1016/j.socscimed.2014.04.048. Publication link: 30575a42-01dc-4415-9cc9-8d6cf65b069b
  - Cherry, N., Povey, A. C., McNamee, R., Moore, H., Baillie, H., Clyma, J. A., ... Pacey, A. A. (2014). Occupation exposures and sperm morphology: A case-referent analysis of a multi-centre study. *Occupational and Environmental Medicine*, *71*(9), 598-604. DOI: 10.1136/oemed-2013-101996. Publication link: e82e0beb-8bac-4d5b-92b6-a686d298c778 | PubMed:24847137
  - Povey, A., McNamee, R., Alhamwi, H., Stocks, S. J., Watkins, G., Burns, A., & Agius, R. (2014). Pesticide exposure and screen-positive neuropsychiatric disease in British sheep farmers.*Environmental research*, *135*, 262-270. DOI: 10.1016/j.envres.2014.09.008. Publication link: 3cb7bbbc-a77e-4092-ac17-5243b0b6f40d | PubMed:25462674
  - Supapvanich, C., Povey, A. C., & Vocht, F. D. (2014). Latex sensitization and risk factors in female nurses in Thai governmental hospitals. *International Journal of Occupational Medicine and Environmental Health*, *27*(1), 93-103. DOI: 10.2478/s13382-014-0230-7, 10.2478/s13382-014-0230-7. Publication link: 64775215-289c-4da1-b063-15356e71be81
- **2013**
- **Article**
  - Bonello, N., Sampson, J., Burn, J., Wilson, I. J., McGrown, G., Margison, G. P., ... Crosbie, P. (2013). Bayesian inference supports a location and neighbour-dependent model of DNA methylation propagation at the MGMT gene promoter in lung tumours. *Journal of Theoretical Biology*, *336*, 87-95. DOI: 10.1016/j.jtbi.2013.07.019. Publication link: 6008d0e6-5309-4ceb-8b1d-4698e697cf2b
  - Carder, M., McNamee, R., Turner, S., Hodgson, J. T., Holland, F., & Agius, R. M. (2013). Time trends in the incidence of work-related mental ill-health and musculoskeletal disorders in the UK.*Occupational and environmental medicine*, *70*(5), 317-324. DOI: 10.1136/oemed-2012-100904. Publication link: cbaa2ce3-a38b-4115-aa54-de01745bcf59 | PubMed:23343862
  - De Vocht, F., Hannam, K., & Buchan, I. (2013). Environmental risk factors for cancers of the brain and nervous system: The use of ecological data to generate hypotheses. *Occupational and Environmental Medicine*, *70*(5), 349-356. DOI: 10.1136/oemed-2012-100954. Publication link: 77dbadf3-d3b8-4a42-8e9b-dbb168692718
  - De Vocht, F., Northage, C., Money, C., Cherrie, J. W., Rajan-Sithamparanadarajah, B., Egeghy, P., ... Van Tongeren, M. (2013). The future of exposure assessment: Perspectives from the X2012 conference. *Annals of Occupational Hygiene*, *57*(3), 280-285. DOI: 10.1093/annhyg/met008. Publication link: 52fa25f4-068f-43a8-ad7f-e475d2e8e435
  - Hannam, K., McNamee, R., De Vocht, F., Baker, P., Sibley, C., & Agius, R. (2013). A comparison of population air pollution exposure estimation techniques with personal exposure estimates in a pregnant cohort.*Environmental science. Processes & impacts*, *15*(8), 1562-1572. DOI: 10.1039/c3em00112a. Publication link: fdbfcc9b-1cdb-4372-ab6c-85262ec5b5bf | PubMed:23800727
  - Iszatt, N., Nieuwenhuijsen, M. J., Bennett, J., Best, N., Povey, A. C., Pacey, A. A., ... Toledano, M. B. (2013). Chlorination by-products in tap water and semen quality in England and Wales. *Occupational and Environmental Medicine*, *70*(11), 754-760. DOI: 10.1136/oemed-2012-101339. Publication link: 83e310a5-edc1-4370-a9fa-3791f463c0bb
  - MÃ¶lter, A., Agius, R. M., de Vocht, F., Lindley, S., Gerrard, W., Lowe, L., ... Simpson, A. (2013). Long-term exposure to PM10 and NO2 in association with lung volume and airway resistance in the MAAS birth cohort.*Environmental Health Perspectives*, *121*(10), 1232-1238. DOI: 10.1289/ehp.1205961. Publication link: 23424e03-5dc3-43ac-b493-a1b82100914b | PubMed:23777813
  - Pralong, J. A., Seed, M. J., Yasri, R., Agius, R. M., Cartier, A., & Labrecque, M. (2013). A computer based asthma hazard prediction model and new molecular weight agents in occupational asthma. *Occupational and Environmental Medicine*, *70*(1), 70. DOI: 10.1136/oemed-2012-101189. Publication link: 14880468-e161-4ea9-8047-0de757a2a463
  - Senthong, P., Millington, C. L., Wilkinson, O. J., Marriott, A. S., Watson, A. J., Reamtong, O., ... Povey, A. C.(2013). The nitrosated bile acid DNA lesion O6-carboxymethylguanine is a substrate for the human DNA repair protein O6-methylguanine-DNA methyltransferase. *Nucleic acids research.*, *41*(5), 3047-3055. DOI: 10.1093/nar/gks1476. Publication link: 83b3d785-5e36-4648-9746-13abf4ffb1f7
  - Stocks, S. J., McNamee, R., Turner, S., Carder, M., & Agius, R. M. (2013). Assessing the impact of national level interventions on workplace respiratory disease in the UK: part 2--regulatory activity by the Health and Safety Executive.*Occupational and environmental medicine*, *70*(7), 483-490. DOI: 10.1136/oemed-2012-101124. Publication link: 6e7e1438-6b16-4999-afc1-15d716767839 | PubMed:23606324
  - Supapvanich, C., Povey, A. C., & de Vocht, F. (2013). Respiratory and dermal symptoms in Thai nurses using latex products. *Occupational Medicine*, *63*(6), 425-428. DOI: 10.1093/occmed/kqt068. Publication link: 8bf594c6-0595-4bae-97c5-2880a50f4176
- **Chapter**
  - Agius, R., Sim, M. R., Bonneterre, V., & Venables, K. M. (Ed.) (2013). What do surveillance schemes tell us about the epidemiology of occupational disease. In *Current Topics in Occupational Epidemiology.* (1 ed., pp. 131-141). Oxford University Press. . Publication link: 741b8510-64c7-4139-abaa-54cc79c48bf3
- **Comment/debate**
  - Oliver, K., De Vocht, F., Money, A., & Everett, M. (2013). Who runs public health? A mixed-methods study combining qualitative and network analyses. *Journal of Public Health*, *35*(3), 453-459. DOI: 10.1093/pubmed/fdt039. Publication link: ad89d333-0506-46b2-918e-dce43b3582ec | PubMed:23564840
  - Promtong, P., O'Brien, P., & Povey, A. (2013). Toxicity of Different Silver Nanoparticle Sizes on DNA Repair-Proficient and -Deficient Mouse Embryonic Fibroblasts Mediated by Intracellular Release of Silver Ions.*ENVIRONMENTAL AND MOLECULAR MUTAGENESIS*, *54*(supp 1), S33-S33. . Publication link: a410e8ba-0822-4272-81c0-9c2e310a2ad6

Asthma incidence rates (per 100,000 employed)* for most frequently reported occupations, SWORD (2003-2008, 2009-2016)



*Labour force survey data (2003-2015) used as the denominator

Impact/Benefit
A personal
reflection- 1998

SWORD- my first introduction

- Research-based on reported cases to SWORD
- Sponsored by HSE
- based at Manchester University
- Followed on from Chronic Bronchitis research

Ferrous Foundry Data from SWORD promoted a legacy of

- At least 3 research studies, MD, PhD
- Training of consultants in NHS in OLD
- Onward training in others
- Training in research
- Occupational Hygiene research and training

Who benefits from SWORD?

- Workers and employers –
- in the prevention and identification of ill health in the working population.
- The HSE and others implement the appropriate preventive strategies based, at least in part, on data.
- THOR/SWORD then monitors the trends in incidence and helps evaluate the interventions.

Benefit- to clinicians- new diseases

- Chemical **pneumonitis** caused by silicone waterproofing spray
- **Alveolitis** from spraying fabric protector (? silicone) in furniture manufacturer
- **Lipoid pneumonia** from spray mount glue in a graphic designer

Benefit to society via education

- **The HSE pocket book Bakers! – Time to clear the air** was developed in response to THOR data identifying bakers and confectioners as a high-risk group.

- THOR data influenced the **choice of trades and case studies** highlighted on the **HSE's asthma website**.

Benefit to society via policy

- **The Asthma Workplace Charter**, which was developed by Asthma UK in consultation with the HSE, uses THOR data as the basis for its list of the main occupations at risk from developing occupational asthma.

- The **House of Lords Science and Technology Committee inquiry into allergy** cited THOR as a source for its statistics (RA expert witness)

Impact

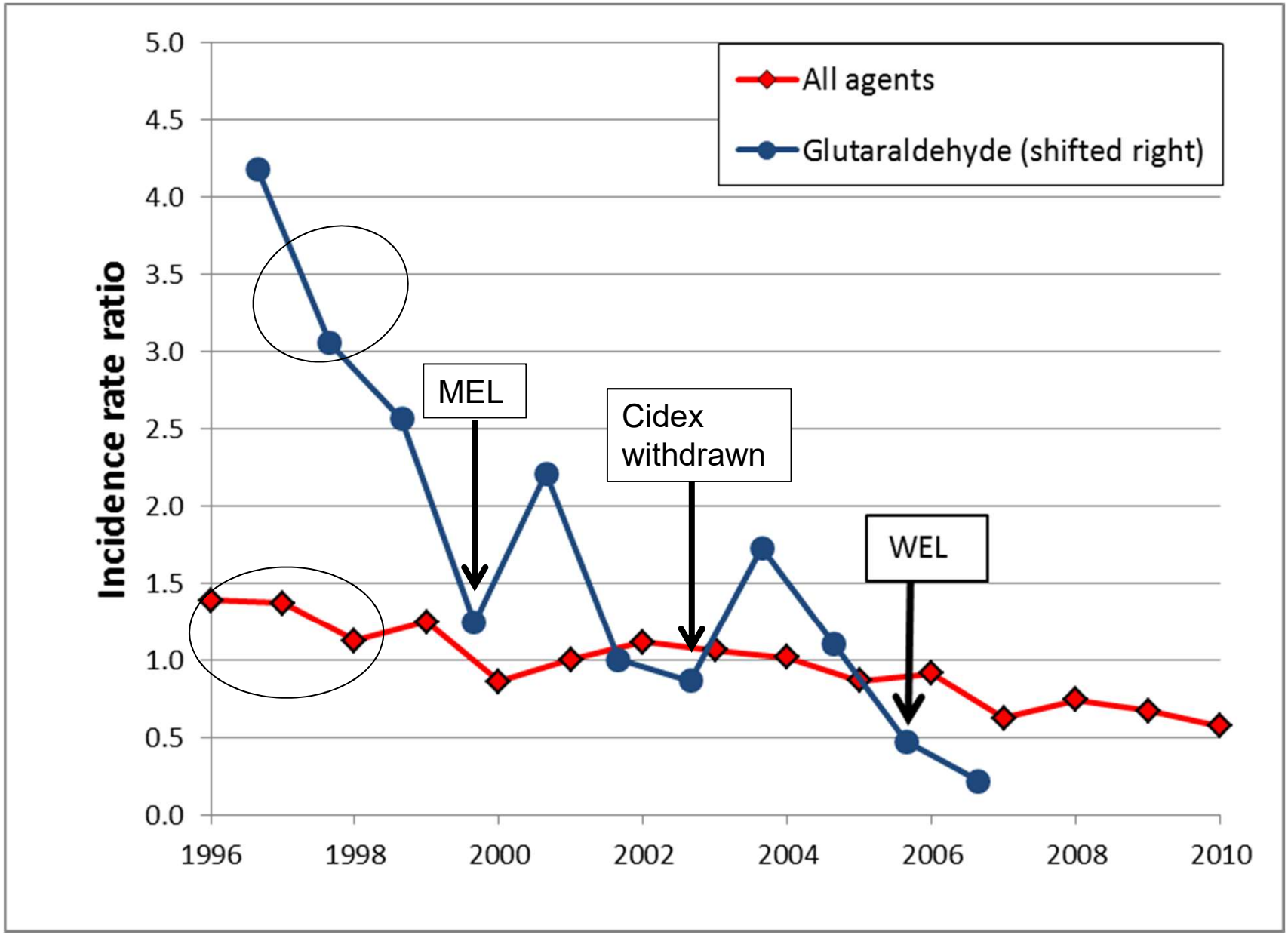
- Cultural-changes behaviour- e.g glutraldehyde

Timeline of events impacting on the use of glutaraldehyde based disinfectants in health care

- First used 1960s
- 1989 endorsed by British Society of Gastroenterologists first line disinfectant for endoscopes
- 1993 above reiterated but health risks recognised as significant
- 1999 First exposure limit introduced
- 2002 ‘Cidex’ (glutaraldehyde) withdrawn
- 2005 Exposure limit reduced further

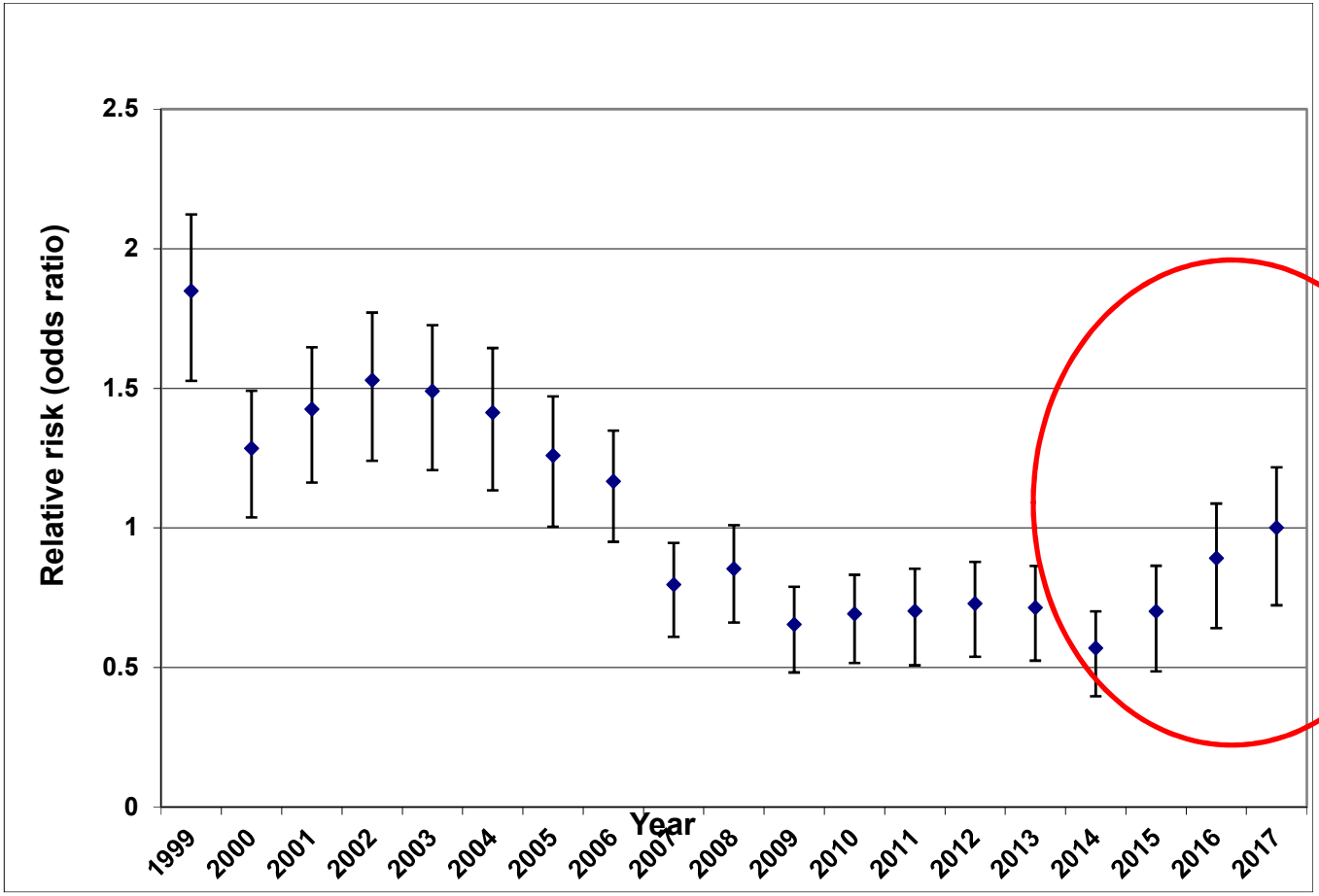
(Stocks et al 2013)

Trends in asthma attributed to glutaraldehyde

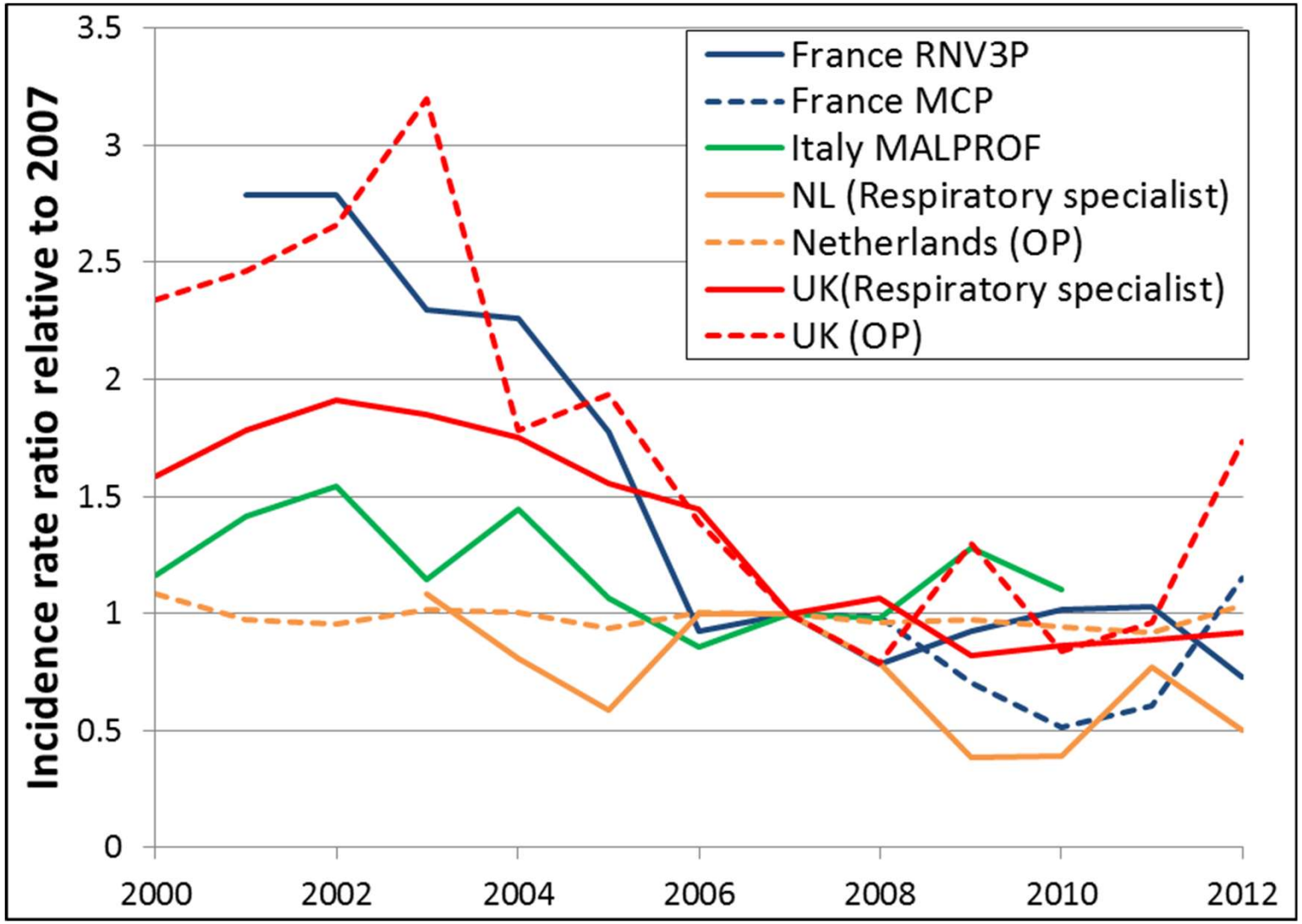


The next
30 years?

Trends in Occupational Asthma reported to SWORD



Need to investigate further – real or artifactual? Driven by certain occupations? Agents?



Estimated annual changes in incidence of physician-reported occupational asthma (Stocks et al 2015)

Interventions aiming to reduce asthma attributed to flour

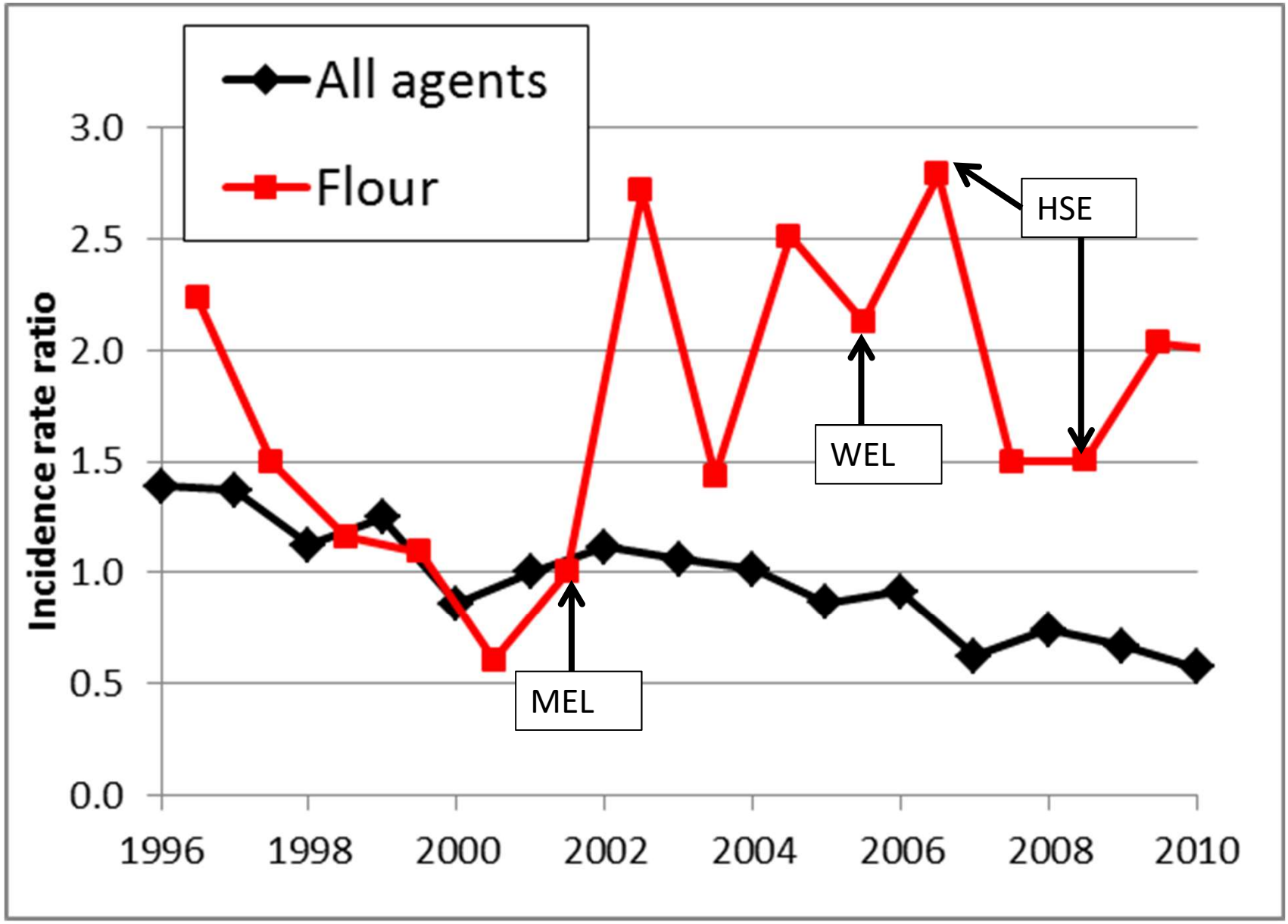
Time1. Pre-intervention

Time2. Introduction of a MEL (April 2001)

Time3. Introduction of a WEL (25 April 2005)

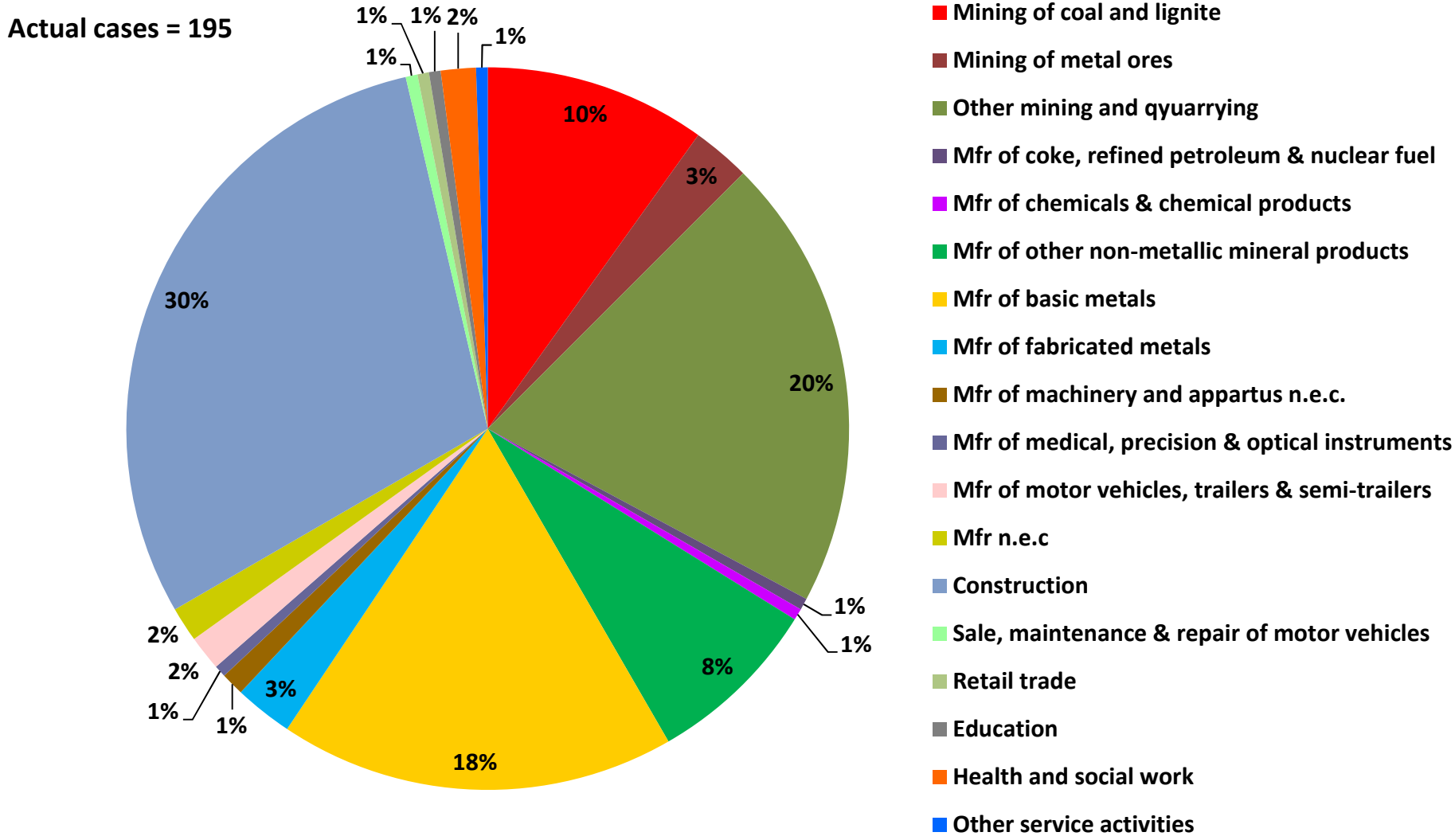
Time4. HSE inspection pack (2006 – 2008)

Trends in asthma attributed to flour

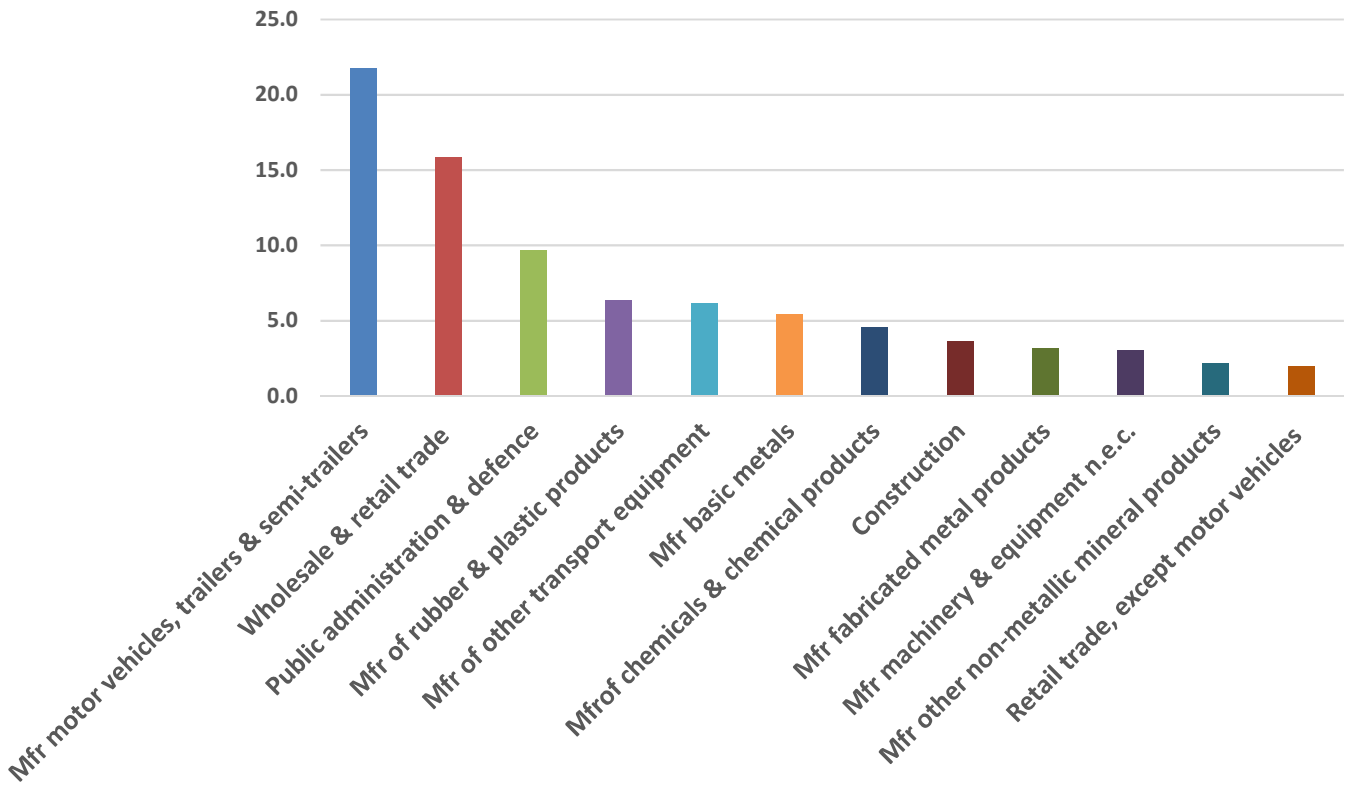


Beware the wolf in sheep's clothing?

Example…industry sectors reported with case reports of work-related respiratory disease attributed to silica, reported by chest physicians to SWORD, 1996-2016



Most frequently reported industries (%) for respiratory cases attributed to Isocyanates reported to SWORD (1996-2018)




unfinished
BUSINESS

Early identification of future risks

- Non-malignant **pleural disease** in process operator exposed to marinite (? cryptic asbestos)
- **Bronchiolitis** (? ketone peroxides) in fibre-glass laminators
- **Asthma** caused by heated triglycidyl isocyanurate (TGIC), a hardening agent used in powder paints etc

Is it value for money?

A few considerations to think about

- Impact/benefit
- Prevention of disease
- Wage loss/economy
- Cost of occupational asthma (£1.1 billion over 10 years, HSE 2006)
- Cost of lung transplantation in rarer diseases
- Etc.

What aspects are needed to maintain future performance?

- clinical reporters
- Astute observation by clinicians
- Leading to generation of hypothesis and research/intervention
- Dedicated team to collate information

Summary

- 30 successful years
- All aims objectives achieved
- ..but more work to be done

Acknowledgements

- Thank you to Prof Newman- Taylor
- The team at Manchester University esp
- Melanie Carder
- Annemarie Money
- Martie Van -tongeren