Finnish Institute of Occupational Health

Burden of work-related cancer in Finland and two exposure information systems (CAREX and FINJEM) including estimates on occupational exposure to carcinogens

Timo Kauppinen

Estimates of work-related cancer in Finland

- **3 %** of incident cancers (Aitio and Kauppinen 1992)
  - men 5%, women 0.5%
  - lung cancer (300 cases), mesothelioma (100), bladder, leukemia, skin, nose, etc (<100)
  - 150-200 from past exposure to asbestos
  - based on attributable fraction (AF) estimates of Doll&Peto (1981)
- **0.6 %** of incident cancers (158 cases) notified to Finnish Register of Occupational diseases (Oksa et al 2011)
  - 152 due to asbestos, 6 due to other exposures
  - underreporting, particularly of non-asbestos cancers
- **8 %** of cancer mortality (Nurminen and Karjalainen 2001)
  - based on FINJEM exposure estimates and risk estimates of selected epidemiological studies
  - some risks not confirmed, application of exposure data debatable
- Future burden from current exposure less (Priha et al 2010)
  - silica 17 cases/y, diesel exhaust 9, welding 8, asbestos 1, benzene <1, formaldehyde <1, chromiumVI <1, nickel <1, wood dust <1

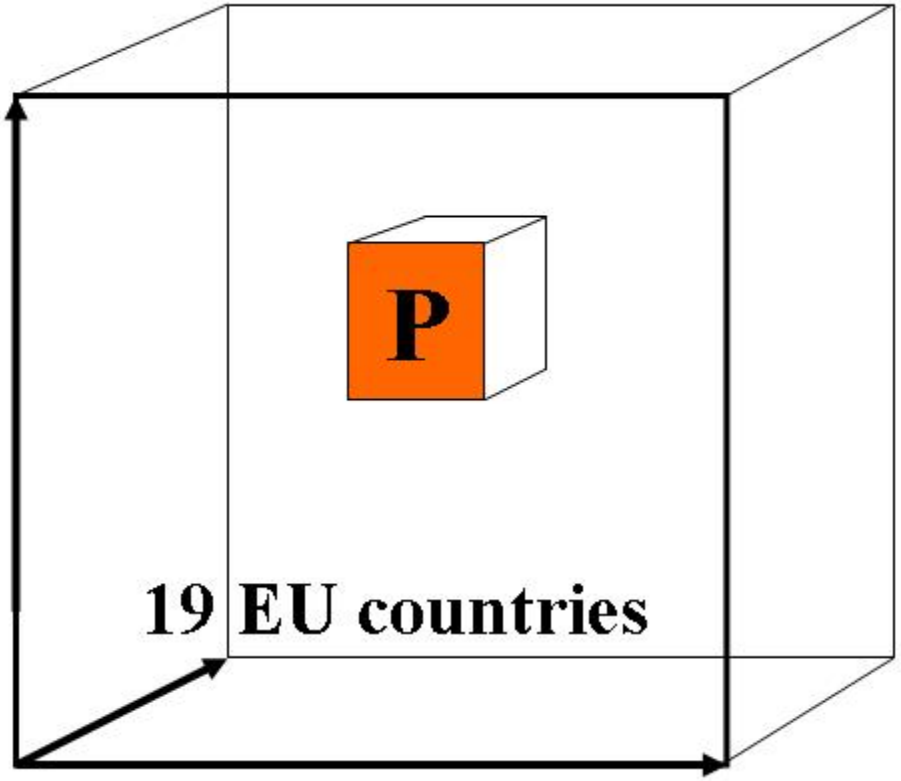
International Information System on Occupational Exposure to Carcinogens (CAREX)

- **EU / IARC** research project in the mid 90s
- **numbers of workers exposed** carcinogens by country and industry in 15 'old' member states of EU in 1990-93
- **carcinogen** = IARC group 1, 2A and selected 2B (ie. carcinogenic, probably carcinogenic and possibly carcinogenic to humans)
- only numbers of exposed estimated based on Finnish, US or own data on prevalence of exposure (**'default' method, mainly**)
- **documentation** and summarised exposure measurements are in a database but the levels of exposure were not estimated due to lack of resources

Occupational exposure to carcinogens in the European Union (CAREX)

- Timo Kauppinen, Jouni Toikkanen, Anja Savela, Finland
- David Pedersen, Randy Young, USA
- Wolfgang Ahrens, Germany
- Paolo Boffetta, Dario Mirabelli, Italy, IARC
- Johnni Hansen, Denmark
- Hans Kromhout, the Netherlands
- Jeronimo Blasco, Victoria de la Orden-Rivera, Spain
- Brian Pannett, UK
- Nils Plato, Sweden
- Raymond Vincent, France
- Manolis Kogevinas, Greece

CAREX



139 carcino-gens (IARC)

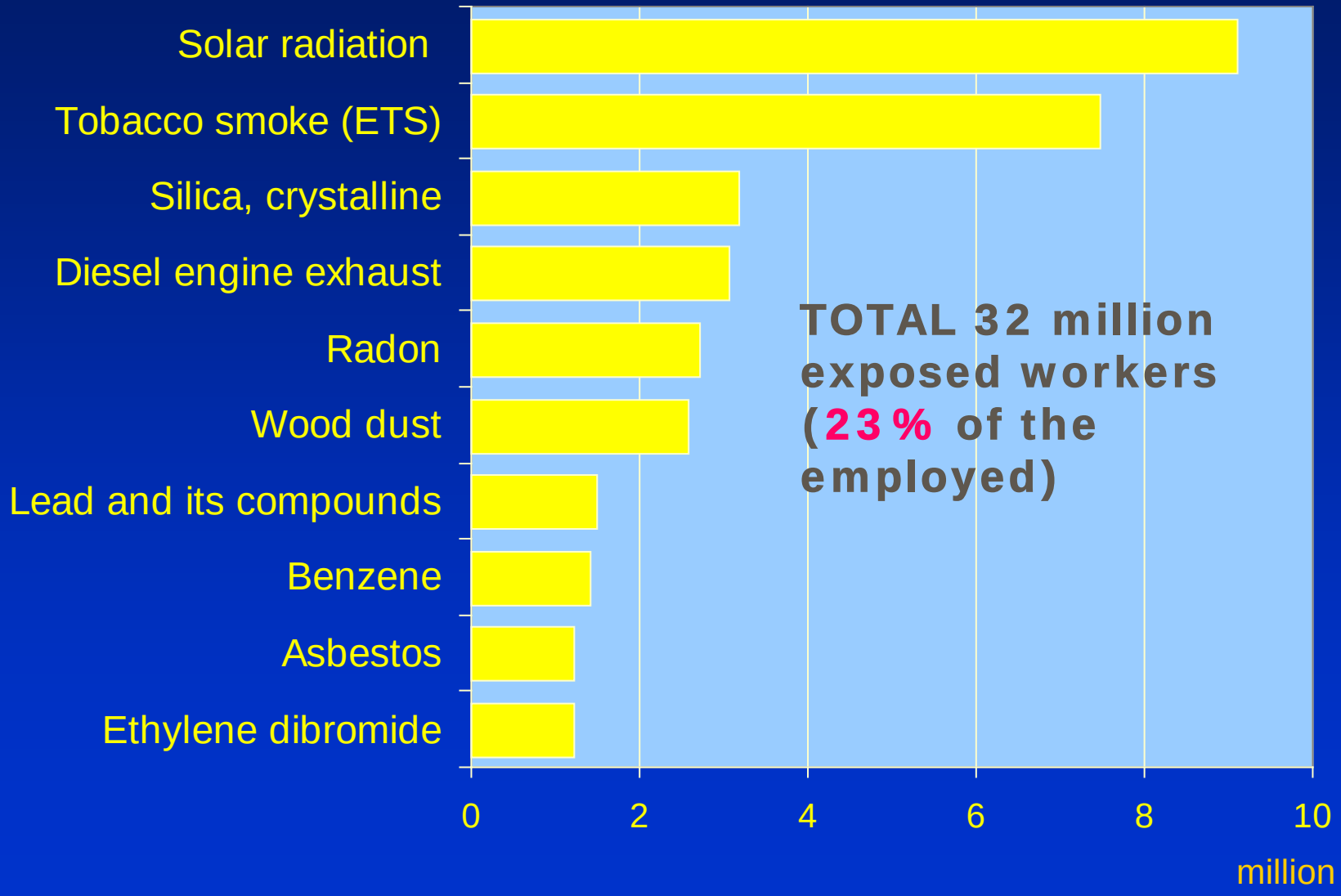
(1,2A,2B mainly)

19 EU countries

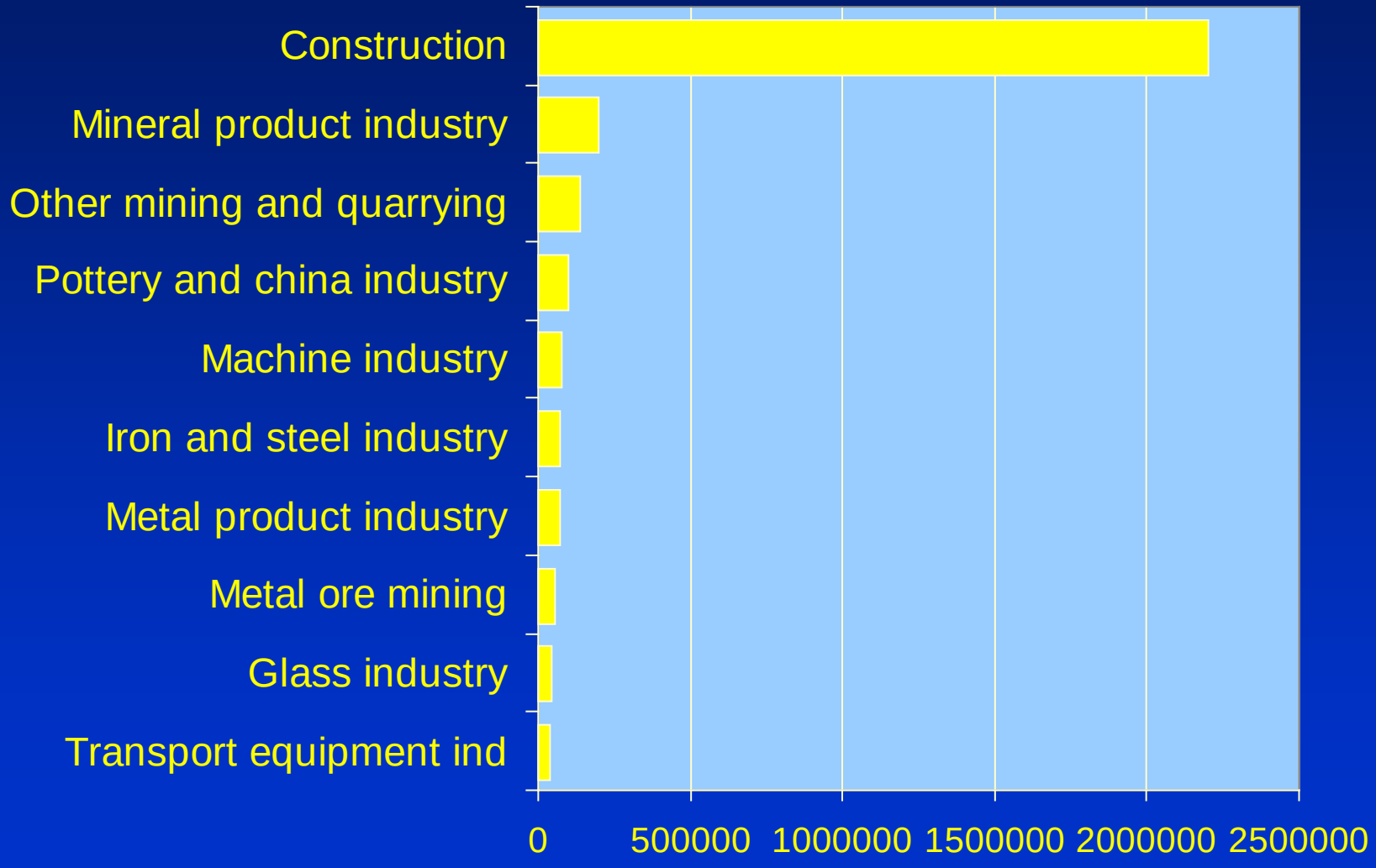
P, preva-lence of exposure (%) in 1990-93

55 industries (UN ISIC Rev. 2)

Carex - Most common occupational exposures to IARC agents in EU 15 (1990-93)



Carex - Occupational exposure to crystalline silica by industry in EU 15 (1990-93)



Strengths and weaknesses of CAREX

- New information on the extent of exposure (overview of national situation)
- Systematic approach: similar definitions and procedures in all countries
- Consistency and comparability of the results
- Wide coverage: all industries, agent list expandable
- Easy to use: PC-version, wide selection of tables and figures (reports)
- Data not confidential and freely to be distributed (Internet etc)

- Lack of estimates on level of exposure: does not identify worker groups at high risk (prevention!)
- Lack of estimates by gender (men/women), time (trends) and region (local prevention)
- Covered only carcinogens
- Estimates partially unreliable: no company surveys made to validate the results, no confidence limits (high/low estimates)
- Construction requires competence and resources (although less than an official exposure or measurement register)

Successors of CAREX

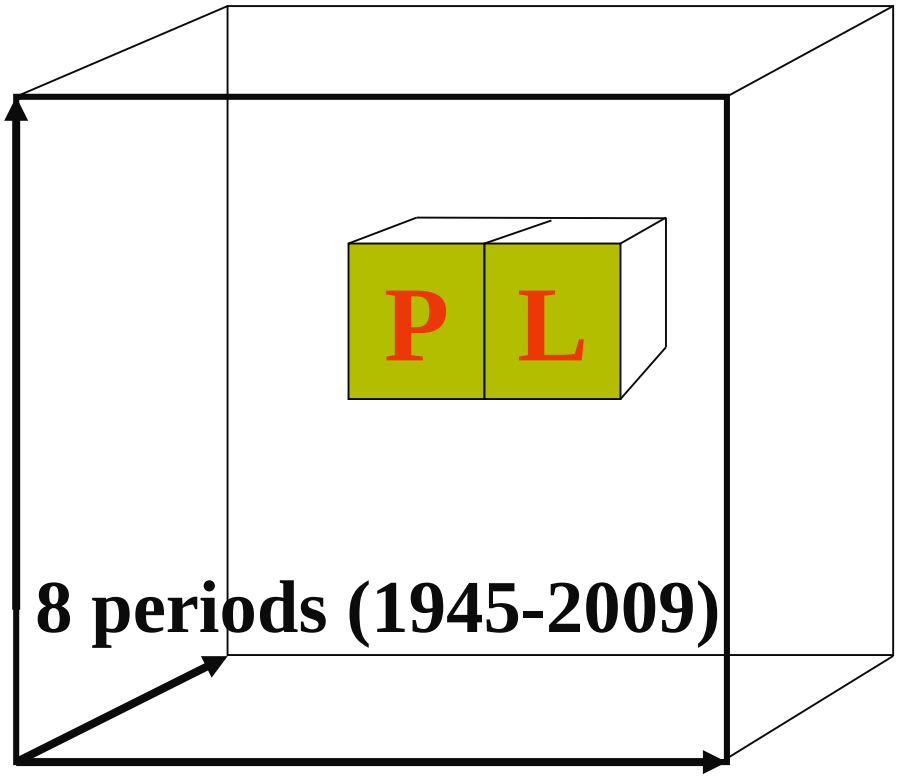
- Extension to 4 East European countries (**FIBELLC**-project), the same procedure, **no improvements**
- Update until 2000 and **regional** application with estimates on **exposure levels** in Finland (**CAREX Finland**); Italian CAREX updated 2005, Spanish CAREX under update **(time trends)**
- Integration with **company survey** (reliability!), country questionnaire and exposure data of wood dust in EU-25 (**WOODEX**), **high risk groups** documented
- Costa Rican **TICAREX** includes **non-carcinogens** (pesticides), **gender** and **low / high estimates.** Extented to Panama and Nicaragua
- **CAREX Canada**: exposure **levels, regional environmental exposures, web-data**

Examples of CAREX use

- The estimation of global burden of disease due to occupational carcinogens by **WHO** (Driscoll et al 2005)
- The estimation of burden of occupational cancer in **Britain** (a series of papers by Rushton et al. in British Journal of Cancer in 2012)
- The estimation of consequences of exposure to 25 carcinogens in **EU** (SHEcan project, unpublished?)
- CAREX Finland: municipality-specific exposure estimates (prevalence and level) for a prevention campaign of regional labor safety inspection offices in **Finland**
- Priority setting for prevention of occupational cancer?

FINJEM

84 exposures: (chem, phys, ergo, psycho, lifestyle)

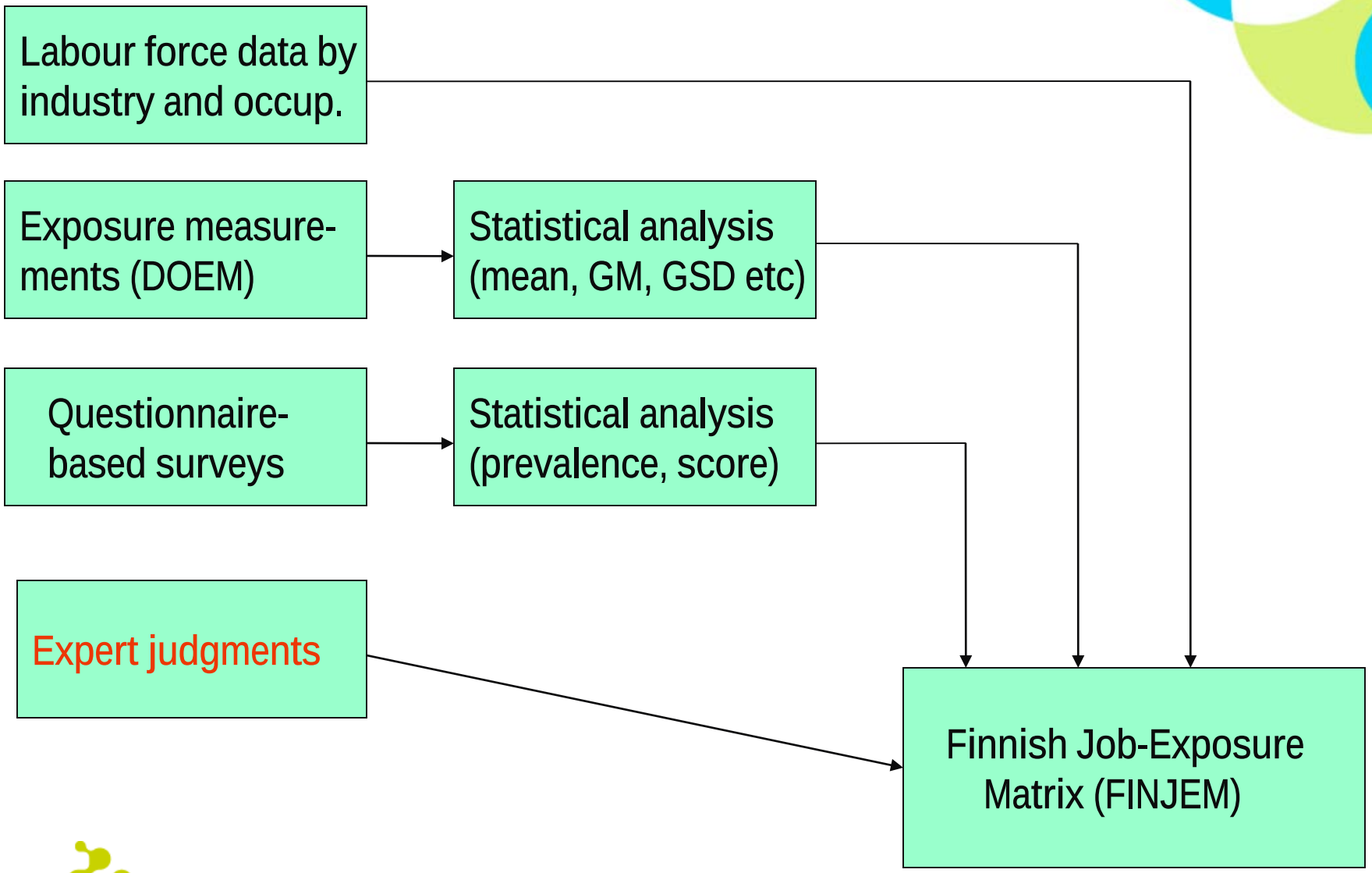


P, prevalence of exposure (%)

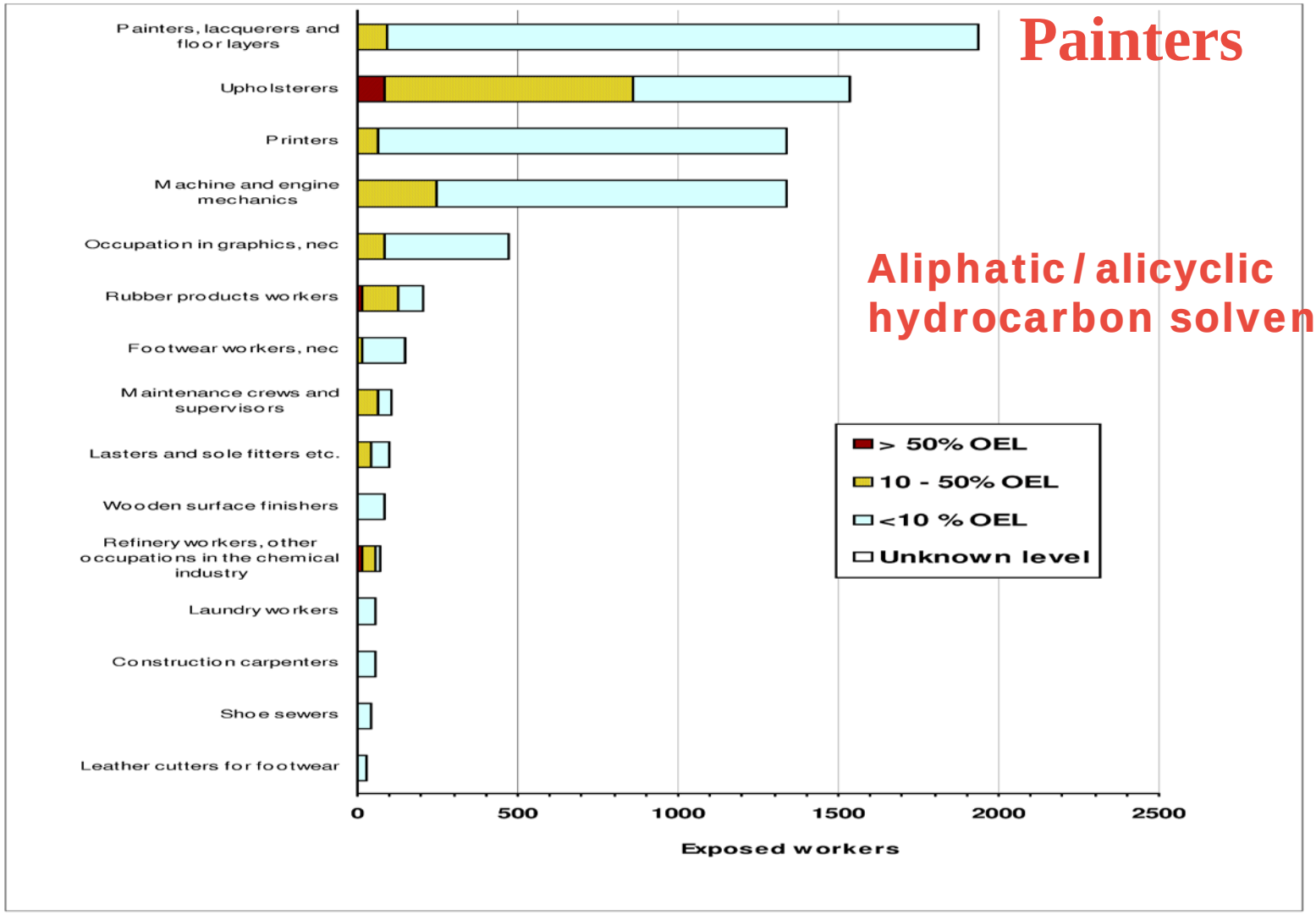
L, level of exposure (ppm, etc.)

311 occupations (Finnish classification)

FINJEM: Sources of information

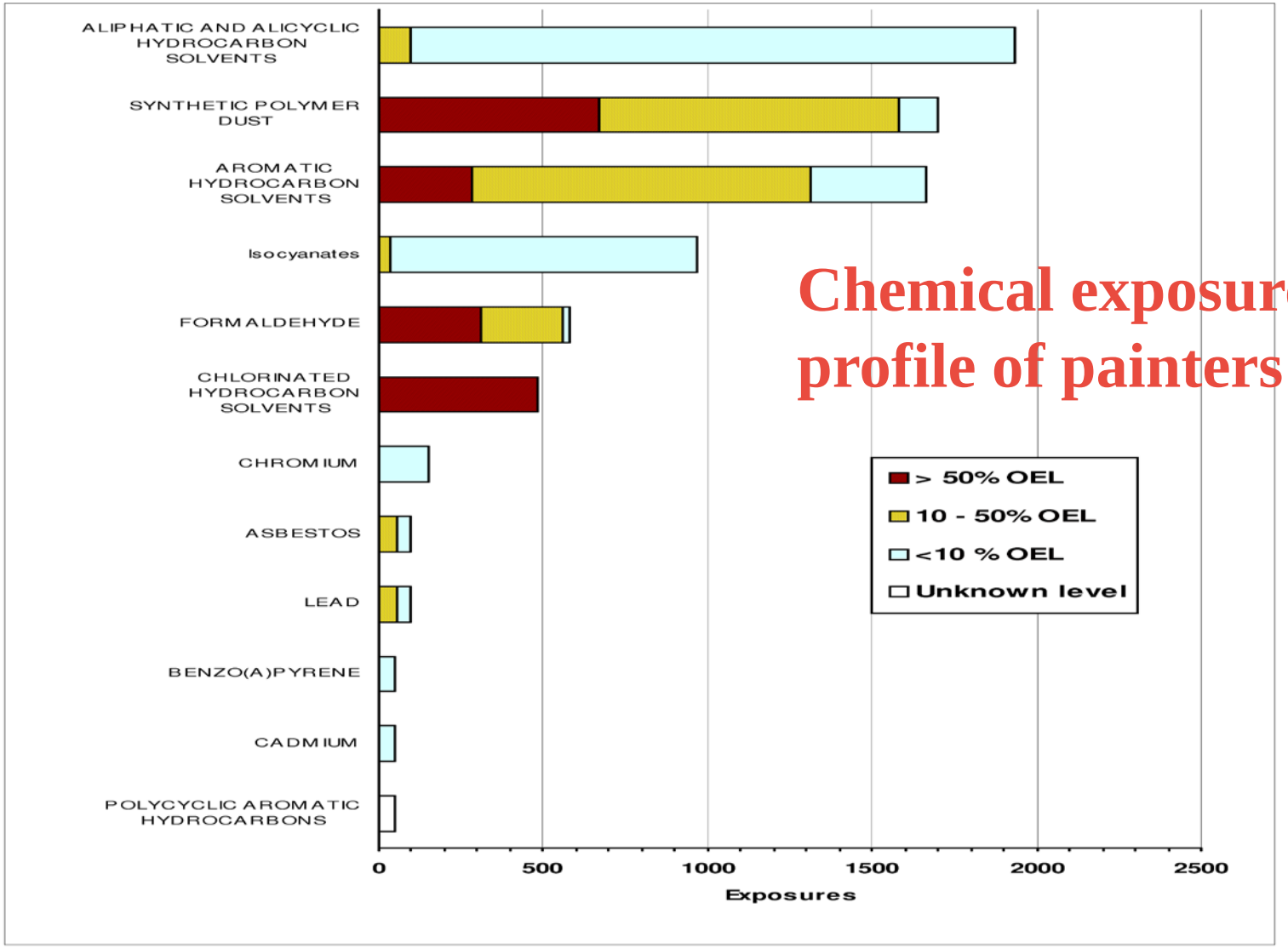


Exposure profiles for agents



Exposure profiles for occupations

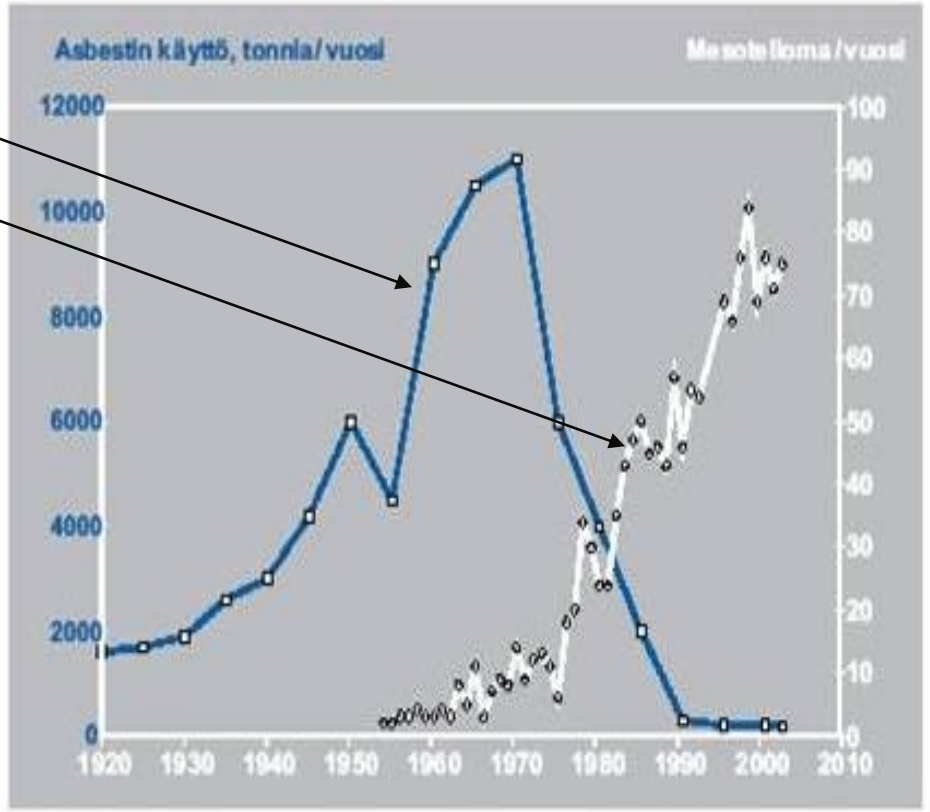
680 *Painters, lacquerers and floor layers*



Chemical exposure profile of painters

Past, present and future exposure and burden of disease (number of attributable cases)

- **asbestos** consumption and **mesothelioma** cases in Finland
- exposure predicts burden after a latency period
- the relationship between past and present exposure can be used to estimate future attributable cases

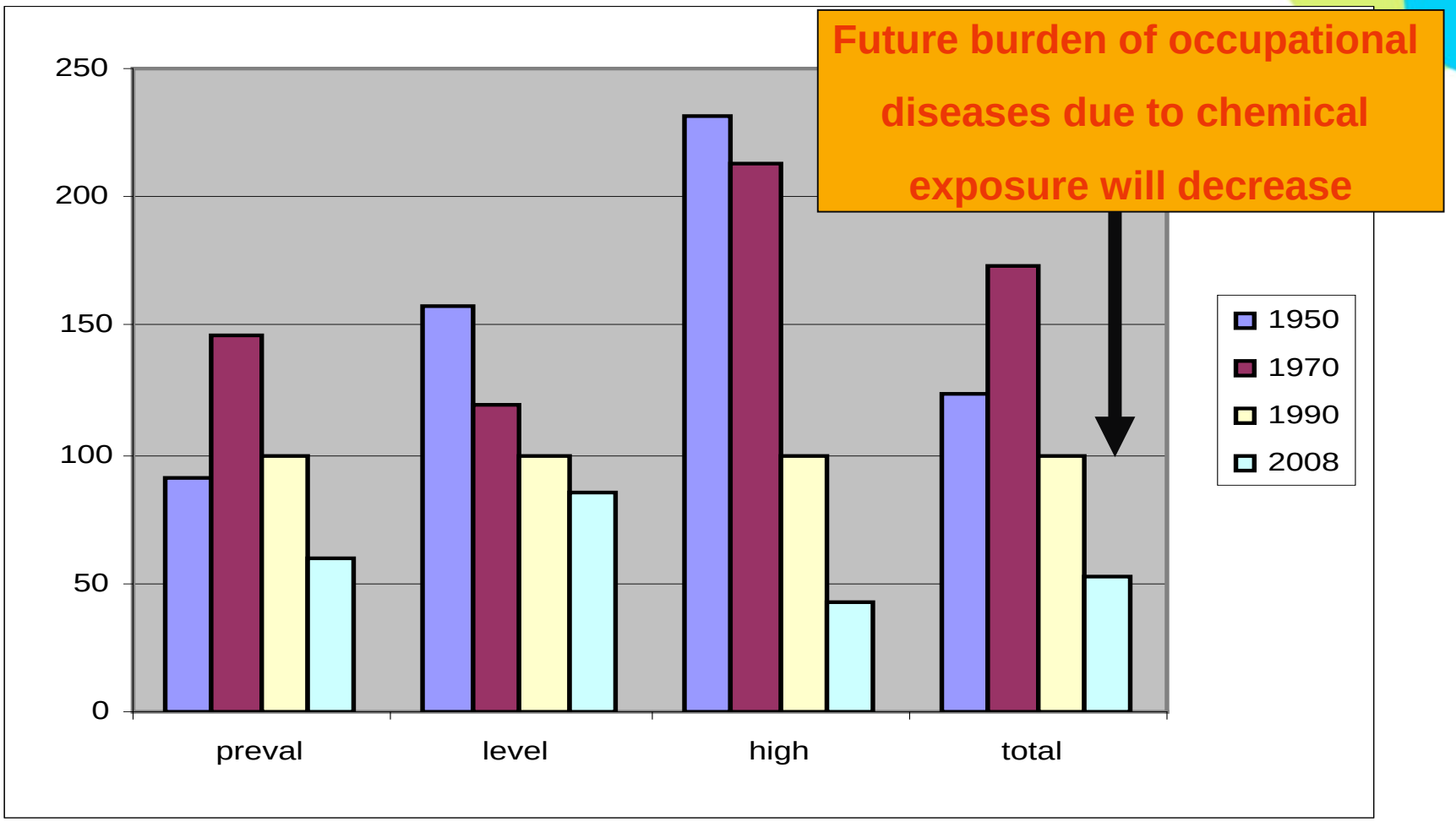


Kuva 50. Asbestin käyttö ja mesotelioomatapaukset vuosina 1918–2002 (Työterveyslaitos, Syöpärekisteri)

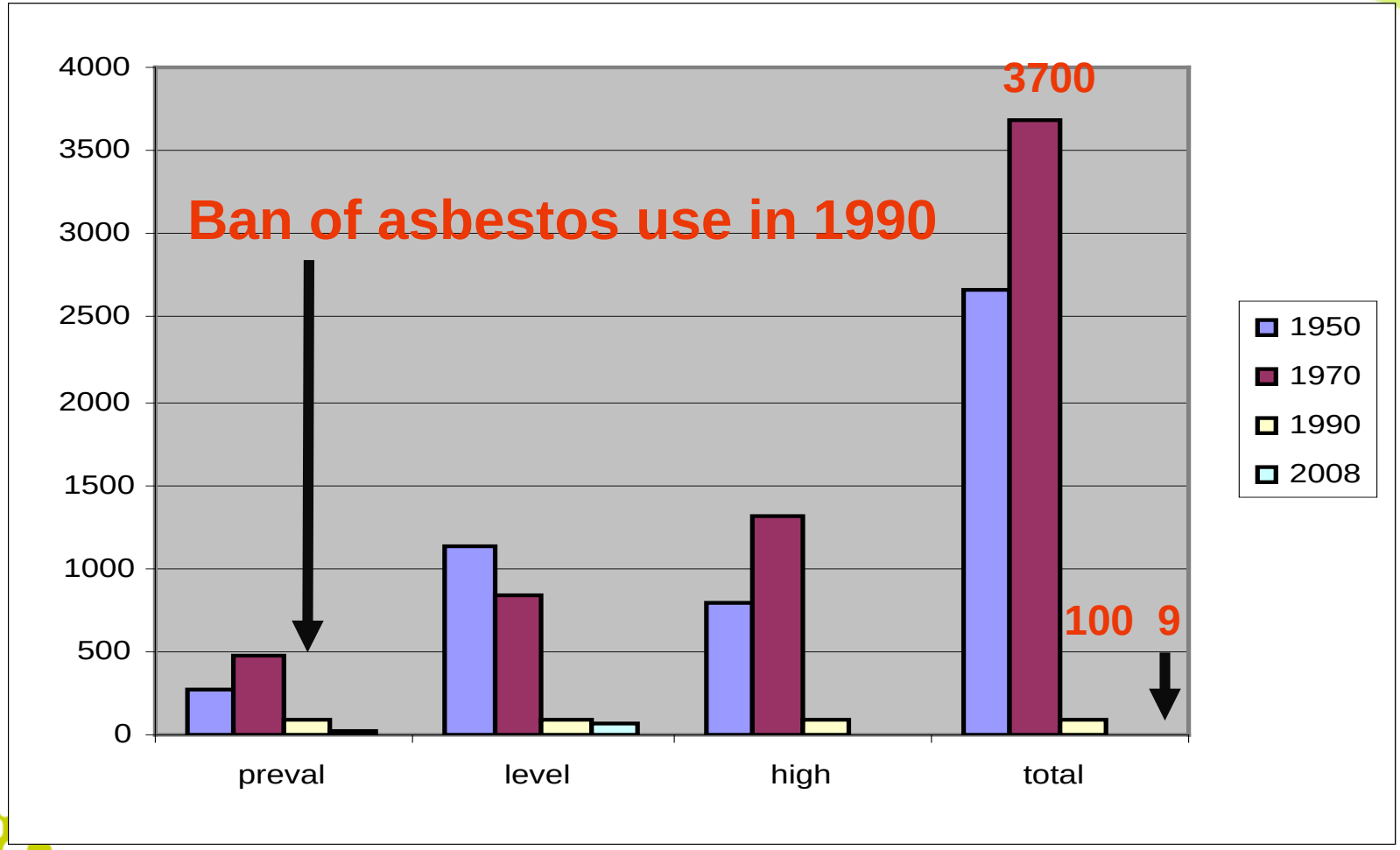
FINJEM-based trend estimates for 41 chemical agents

- **P** = prevalence of exposure
  - as % of the employed in Finland (and number of exposed workers **N**exp)
- **L** = average level of exposure among the exposed
  - as agent-specific units (eg, ppm, mg/m3), weighed by the number of exposed workers
- **Phigh** = prevalence of high exposure
  - to >50% of occupational exposure limit, as % of the employed in Finland, log-normality of L within the exposed in an occupation was assumed
- **NOIE** = national occupational inhalation exposure
  - 'total' exposure in Finland, as Nexp * L
- The reference year was **1990 (=100)**

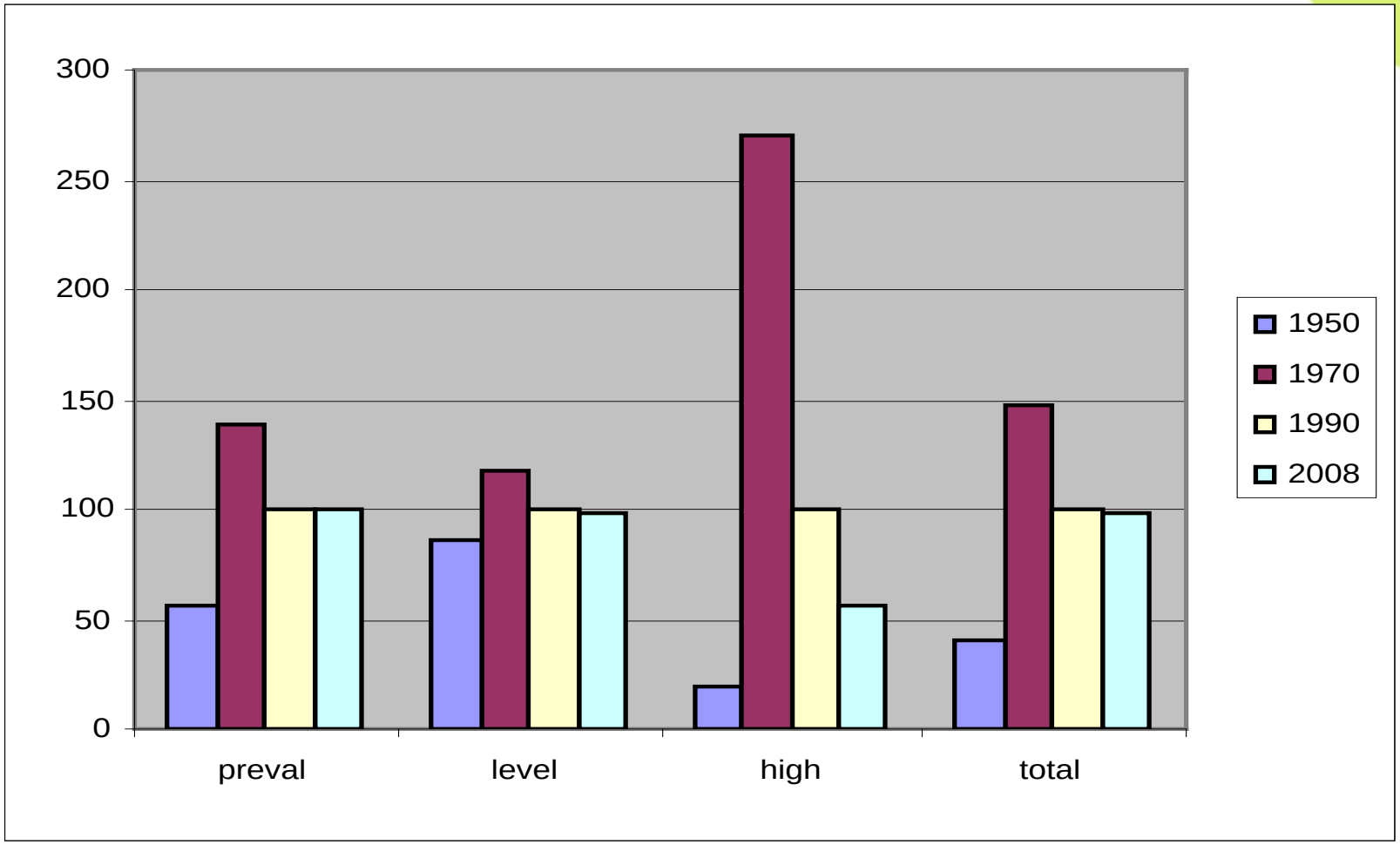
41 chemical agents, median



Asbestos



Diesel exhaust



How to improve CAREX?

- incorporation of **levels of exposure** would enable more accurate burden assessments and identification of high risk industries and worker groups
- extension to important **non-carcinogens**?
- time dimension and **trends**?
- better use of exposure **measurement data** in estimations?
- extension to **all EU countries**, and non-European countries?
- **gender**-specific estimates?
- **occupation**-specific estimates?
- estimates of **uncertainty**?
- default-approach complemented by **crowd-sourcing**?
- better free **availability** through the Internet
- **Collaboration** with safety/health authorities, IARC, unions, research institutions, forerunner companies, NGOs etc?
- step-wise development towards global CHEMEX?
- a good plan and financing needed