OCCUPATIONAL CANCER
A leading cause of work-related mortality

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Outline

- Burden of occupational cancer
- Evolution of occupational carcinogen recognition
- Major occupational carcinogens
- Occupational carcinogen exposure assessment
- Challenges in occupational cancer epidemiology
- Take home messages
- References

What we know about occupational cancer (ILO)

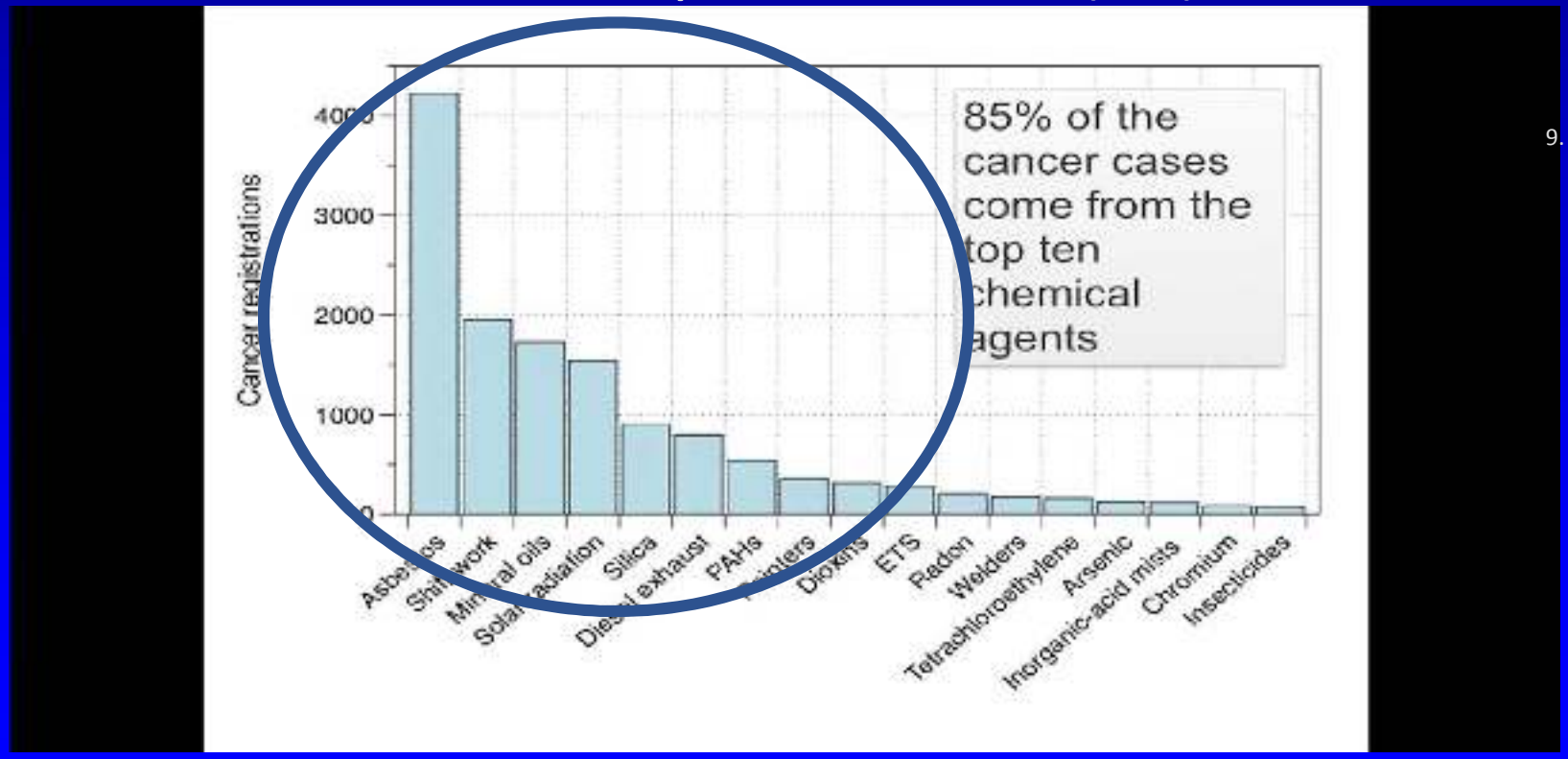
- 660 000 deaths per year (2 x occupational accidents)
- EU 102 500 deaths (20 x occupational accidents)
- Biggest killer at work in HIC countries including EU and Japan
- 5.3- 8.4 % all cancer caused by occupational exposures

What we know about occupational cancer (ILO)

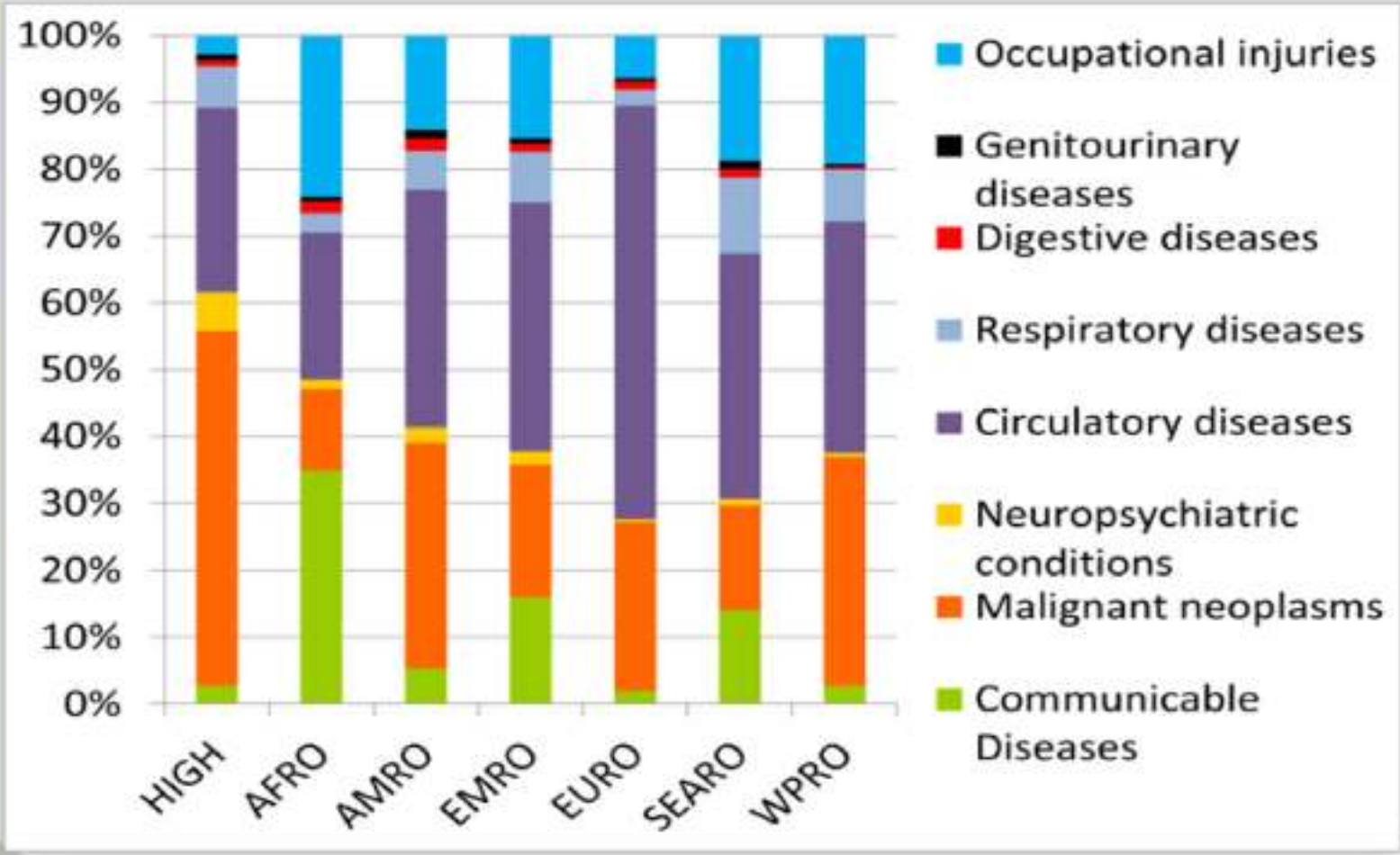
- Lung cancer accounts for 54-75% of all occupational cancer
- 17-29% of lung cancer deaths due to occupational cancer
- 55-85% of occupational exposure related to asbestos exposure
- 10 carcinogens account for 85% of occupational deaths

Burden of Occupational Cancer

- 10 most important occupational carcinogens count for around 85% of all occupational cases (UK).



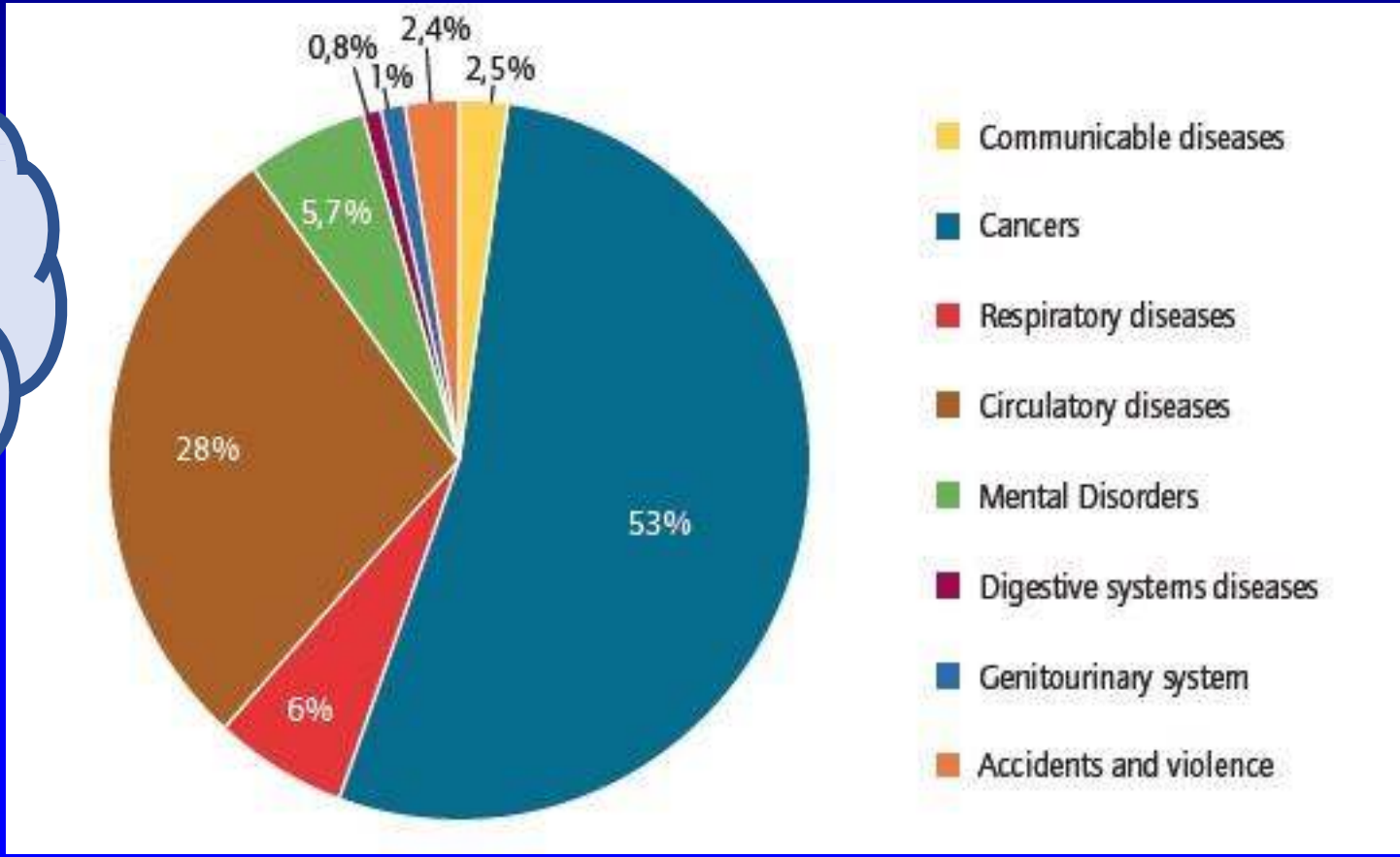
Industrialised countries had a higher burden from cancers, at 53% and a much smaller attribution from accidents and infectious conditions each at 3%.



Burden of Occupational Cancer in HIC

Work-related annual deaths in the EU28 and other developed countries

High Income Countries reflect a higher burden from cancer



Industrialized countries

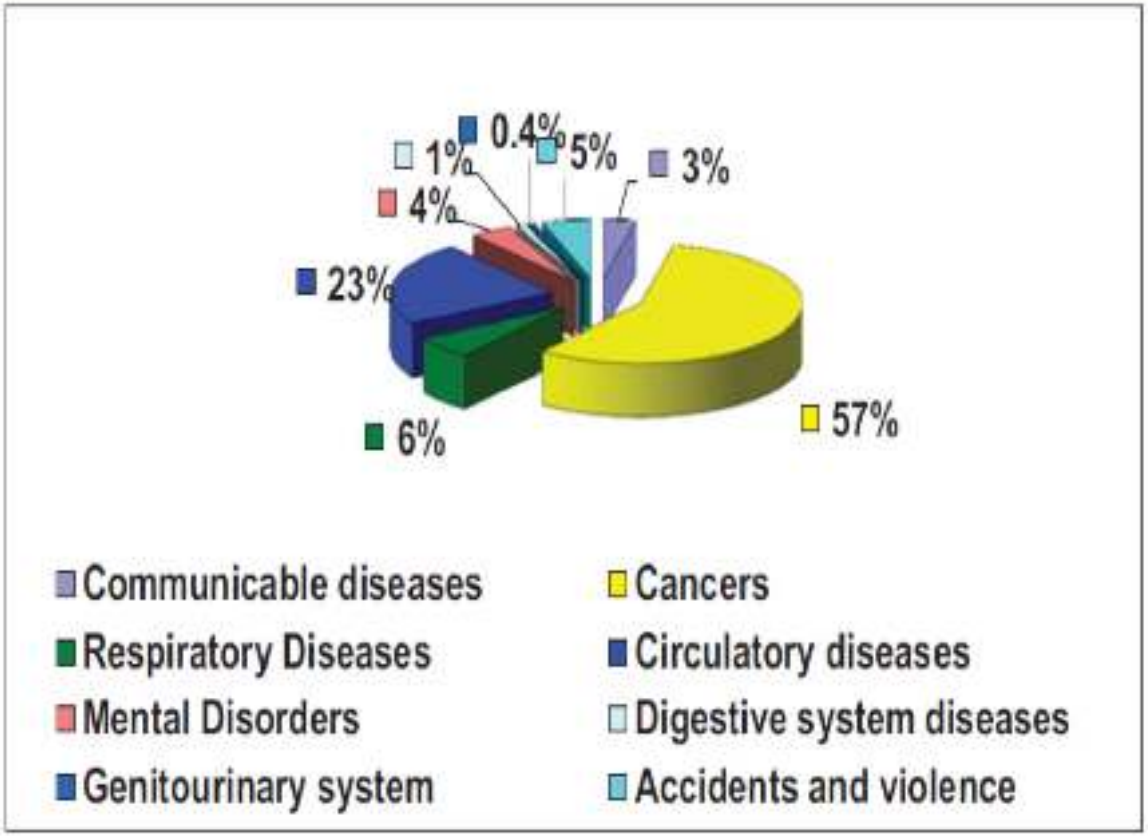


FIGURE 3. **Work-related annual deaths - EU and the pattern in other industrialized countries** (Sources: Hämäläinen P, Takala J, Saarela KL; TUT, ILO, EU-OSHA).

Work-related deaths globally

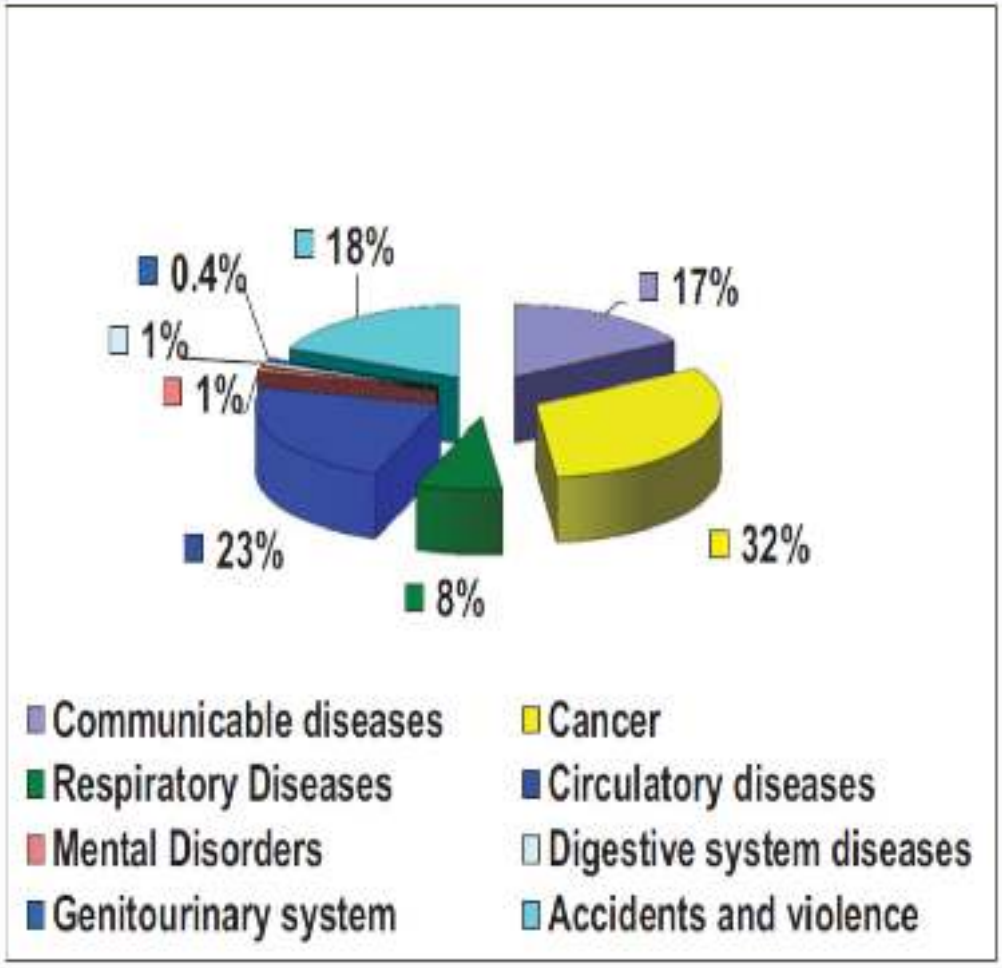


FIGURE 2. Work-related annual deaths - World (Sources: Hämäläinen P, Takala J, Saarela KL; TUT, ILO, EU-OSHA, 2008).

The proportion of cancer mortality attributed to occupational exposure varies with the type of cancer

Type of Cancer	Related to Occupational Exposure Estimated % (USA)
Mesothelioma	85 - 90% (men); 23 - 90% (women)
Sinonasal and nasopharyngeal	31 - 43% (men)
Laryngeal	1 - 20% (men)
Bladder	3 - 19%
Lung	6.3 - 13%
Skin Cancer (non-melanoma)	1.5 - 6% (men)
Leukemia	0.8 - 2.8%
Kidney	0 - 2.3%
Liver	0.4 - 1.1 (vinyl chloride only; men)

Dying for work: the magnitude of US mortality from selected causes of death associated with occupation. K. Steenland, et al. American Journal of Occupational Medicine. Vol. 43 (2003). p. 461-482

Table 6: Occupational diseases reported to the Compensation Fund for the non-mining sector in South Africa, 2001-2006

Occupational disease reported	2001	2002	2003	2004	2005	2006
Noise-induced hearing loss (NIHL)	1 465	1 952	2 549	2 724	1 823	1 276
Post traumatic stress syndrome (PTSD)	970	1 624	1 325	1 297	839	816
Tuberculosis of the lungs (in health care workers)	211	500	384	384	323	293
Dermatitis	217	203	203	227	203	156
Pneumoconiosis	193	182	302	189	109	134
Occupational asthma	104	168	214	165	103	74
Repetitive strain injuries		40	24	82	71	71
Mesothelioma	201	20	17	28	16	12
Irritant induced asthma				7	16	2
Lung cancers				4	1	1
Chronic obstructive airways disease (COAD)				17	13	25
Disease caused by chemical agents				69	15	19
Disease caused by physical agents, excluding noise				5	13	
Disease caused by biological agents, excluding TB				75	228	185
Others				85	49	44
Total	3 361	4 689	5 018	5 358	3 822	3 108

ILO evolution of occupational carcinogen recognition

Table 1 Occupational disease list of the ILO during the industrial poisoning era

ILO legislation	R03, R04 (1919)	C18 (1925)	C42 (1934)
Chemical	1) Lead	2) Mercury	3) Phosphorous, 4) arsenic, 5) Benzene or its homologues, their nitro- and amino-derivatives, 6) halogen derivatives of hydrocarbons of the aliphatic series
Physical			1) Radium and other radioactive substances, 2) X-rays
Biological	1) Anthrax	No change	No change
Pulmonary			1) Silicosis with or without pulmonary tuberculosis, provided that silicosis is an essential factor in causing the resultant incapacity or death
Cancer			1) Primary epitheliomatous cancer of the skin

ILO: International Labour Organization, R03: ILO recommendation No.3, R04: ILO recommendation No. 4, C18: ILO convention No. 18, C42: ILO convention No. 42

Table 2 New items on the occupational disease list in Convention No. 121

ILO legislation		C121 (1964, revised 1980)
Chemical	'64	6) Beryllium, 7) Chromium, 8) Manganese, 9) Carbon disulfide
	'80	10) Toxic halogen derivatives of aliphatic or aromatic hydrocarbon, 11) Cadmium, 12) Arsenic, 13) Fluorine, 14) Nitroglycerin or other nitric acid esters, 15) Alcohols, glycols or ketones, 16) Asphyxiants: carbon monoxide, hydrogen cyanide, or its toxic derivatives, hydrogen sulfide
Physical	'64	1) Ionizing radiation
	'80	2) Hearing impairment caused by noise, 3) diseases caused by vibration, 4) diseases caused by work in compressed air
Biological	'80	1) Infectious or parasitic diseases contracted in an occupation where there is a particular risk of contamination (health or laboratory work, veterinary work, animal handling work, other work with contamination risk)
Pulmonary	'80	1) Pneumoconiosis caused by sclerogenic mineral dust (silicosis, anthracosilicosis, asbestosis) and silicotuberculosis, provided that silicosis is an essential factor in causing the resultant incapacity or death, 2) Bronchopulmonary diseases caused by hard-metal, 3) Bronchopulmonary diseases caused by cotton dust (byssinosis), or flax, hemp, or sisal dust, 4) Occupational asthma, 5) Extrinsic allergic alveolitis and its sequelae caused by the inhalation of organic dusts, as prescribed by national legislation
Skin	'80	1) Skin diseases caused by physical, chemical, or biological agents
Cancer	'80	2) Lung cancer or mesotheliomas caused by asbestos

ILO: International Labour Organization, *C121*: ILO convention No. 121.

Table 3 New items on the occupational disease list of Recommendation No. 194

ILO legislation		R194 (2002, revised 2010)
Cancer	'02	1) Asbestos, 2) Benzidine and its salts, 3) BCME, 4) Chromium VI, 5) Coal tars, coal tar pitches, 6) Beta-naphtylamine, 7) vinyl chloride, 8) Benzene, 9) Toxic nitro and amino derivatives of benzene or its homologue, 10) Ionizing radiation, 11) Tar, pitch, bitumen, mineral oil, anthracene, or compounds, 12) Coke oven emissions, 13) Nickel, 14) Wood dust, 15) Other carcinogens
	'10	16) Arsenic, 17) Beryllium, 18) Cadmium, 19) Erionite, 20) Ethylene oxide, 21) Hepatitis B virus and C virus

Table 4 Unaccepted proposals during the tripartite meeting in 2005 and 2009

		R194 (2002, revised 2010)
Cancer	ILO	Add "cancer caused by formaldehyde" and "cancer caused by silica"
	Government	Delete "dust from wood"
	Employer	1. Insert specific cancer name for every carcinogen
		2. Delete "cancer caused by any other agents not mentioned"
	Worker	Add "Silica, crystalline in the form of quartz or cristobalite"

Table 6 Examples of occupational disease from each country that are not included in the ILO's List of Occupational Diseases R194

Categories	Items (countries)
Chemical agents	Phenol derivatives (Austria, Belgium, China, Costa Rica, El Salvador, Finland, Romania, Swiss, Turkey, France)
Carcinogenic agents	Aflatoxins (Denmark, Finland), Aliphatic aromatic and alicyclic hydrocarbons (Finland), lead (Denmark), trichloroethylene (Denmark), benzidine dye (France), ortho-toluidine (France), anticancer drugs (Finland), Aluminum production process (Denmark), 4-nitrodiphenyls (Canada, Japan), trichloroethylene (Denmark), tetrachloroethylene (Denmark), 2,3,7,8,-TCDD (Denmark), silica (German, United Kingdom, Romania, Taiwan), formaldehyde (Denmark, Malaysia, Taiwan), lead (Denmark, Saudi Arabia), leather (Ireland, Italy, Saudi Arabia, United Kingdom), iron mining with radon exposure (Denmark)

Schedule 3 of COIDA

3. OCCUPATIONAL CANCER

3.1. Cancer caused by the following agents

3.1.1 Asbestos
3.1.2 Benzidine and its salts
3.1.3 Bis chloromethyl ether (BCME)
3.1.4 Chromium and chromium compounds
3.1.5 Coal tars, coal tar pitches or soots
3.1.6 Beta-naphthylamine
3.1.7 Vinyl chloride
3.1.8 Benzene or its toxic homologues
3.1.9 Toxic nitro- and amino-derivatives of benzene or its homologues

Schedule 3 of COIDA

3.1.10 Ionizing radiations

3.1.11 Tar, pitch, bitumen, mineral oil, anthracene, or the compounds, products or residues of these substances

3.1.12 Coke oven emissions

3.1.13 Compounds of nickel

3.1.14 Wood dust

3.1.15 Crystalline silica

3.1.16 Mycotoxins

3.1.17 Arsenic

IARC: International Agency for Research on Cancer

- Specialized cancer agency within the World Health Organization
- Funding from participating countries and other funding sources/grants
- Situated in Lyon, France
- The IARC Monographs
  - Began in 1971 and over 900 agents reviewed

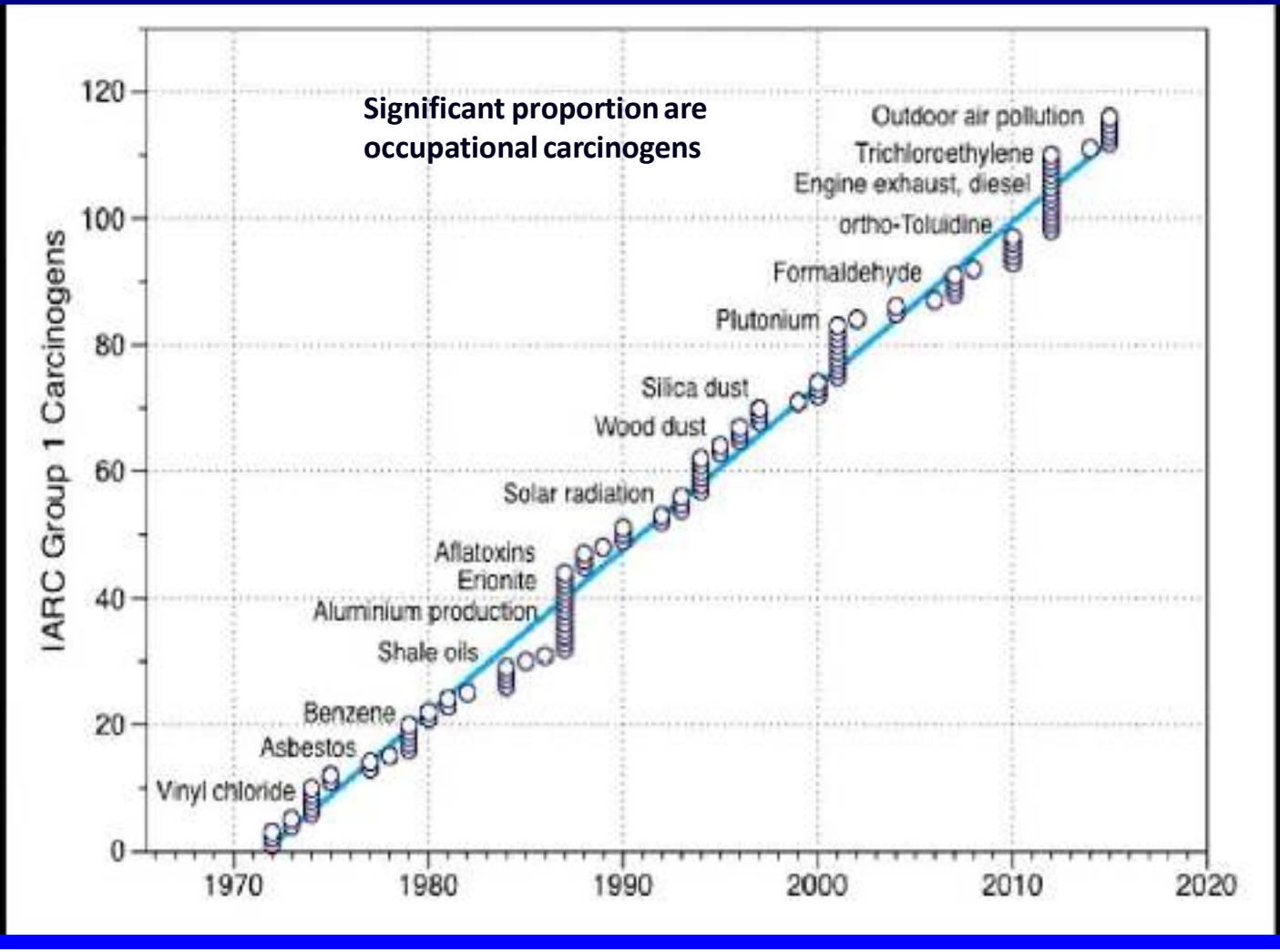
IARC

IARC Monographs on the Evaluation of Carcinogenic Risks to Humans programme

- Each evaluation is done by a working group
- Scientists are divided into 4 subgroups who review the literature
  1. Exposure data
  2. Studies of cancer in humans (epidemiology)
  3. Studies of cancer in experimental animals
  4. Mechanisms and other relevant data

- Decision on carcinogenicity is made during a plenary meeting held in France

IARC


Significant proportion are occupational carcinogens
IARC Group 1 Carcinogens
120
100
80
60
40
20
0
1970
1980
1990
2000
2010
2020
Outdoor air pollution
Trichloroethylene
Engine exhaust, diesel
ortho-Toluidine
Formaldehyde
Plutonium
Silica dust
Wood dust
Solar radiation
Aflatoxins
Erionite
Aluminium production
Shale oils
Benzene
Asbestos
Vinyl chloride

Occupational carcinogens as classified by IARC

Human carcinogen	As percentage of IARC Carcinogens	Upgraded / emerging carcinogens
Sufficient	31%	Butadiene and Formaldehyde
Probable	42%	Cobalt and lead compounds; Shift work
Possible	42%	Carbon black , Titanium dioxide and talc
Occupational carcinogens now comprise about 50% of carcinogens in IARC		
Blair et al, *Environmental Health* 2011, 10 (Suppl 1): S9		

Major occupational exposures and associated cancers

Exposure	Cancer site
Asbestos	Mesothelioma Ca lungs, larynx and GIT
Chromium	Nasal cavities and lung
Arsenic	Liver, lungs and skin
Mustard gas	Pharynx, larynx and lung
Ionizing radiation	Leukaemia, liver, lung, bone, breast, thyroid
Coking plants	Lung, skin and bladder
Soots	Oesophagus, lung and skin

Surveillance of Occupational Exposures to Carcinogens

CAREX Canada: example of use of IARC info in exposure surveillance

- Canadian national carcinogen surveillance programme
- Builds on the European CAREX project
- CAREX = CARcinogen Exposure

- Aims to estimate carcinogen exposure in Canadian workplaces
  - Identify what carcinogens people are exposed to
  - Locate where people are exposed
  - Calculate how many people are exposed
  - Estimate how much of a carcinogen people are exposed to (where data exist to calculate levels)

CAREX Canada

Click on the link or copy and paste it into your browser to watch the following video demonstrating the CAREX Canada online exposure estimates tool:

https://youtu.be/juYLEBdtqig

Figure 1 Generalised methodology used to generate estimates of occupational exposure to known and suspected carcinogens.

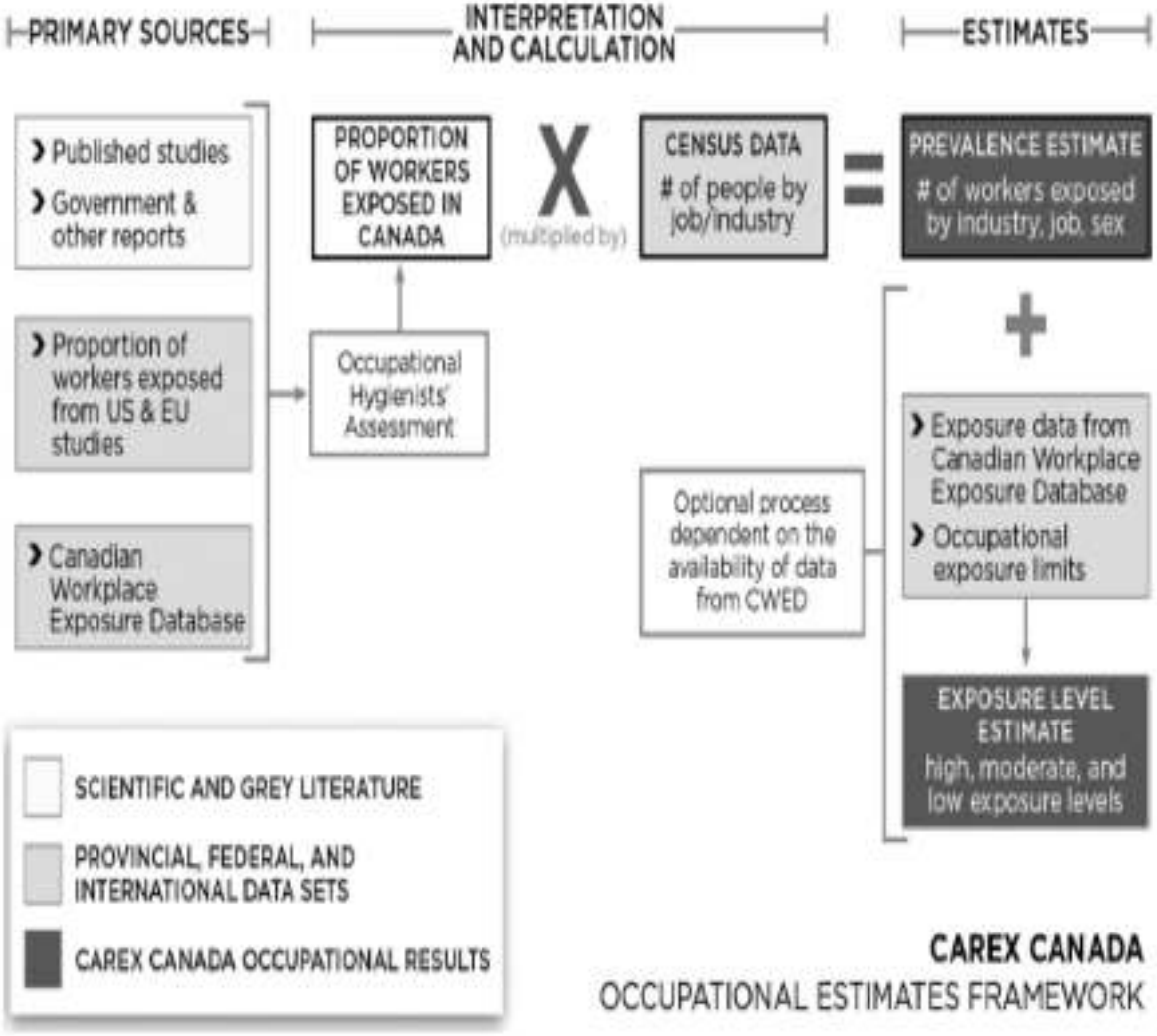


Table 1 Workplace exposure to known and suspected carcinogens, Canada, 2006

IARC group	Agent	Data quality	n Exposed at work	% Of total workforce	Exposure levels available
Carcinogenic agents (IARC 1)	Solar radiation	Moderate	1 476 000	8.8	Yes
	Diesel engine exhaust	Low	781 000	4.6	No
	Silica (crystalline)	High	382 000	2.3	Yes
	Benzene	High	374 000	2.2	Yes
	Wood dust	High	338 000	2.0	Yes
	Asbestos	Low	151 000	0.90	No
	Formaldehyde	High	151 000	0.90	Yes
	Ultraviolet radiation (artificial sources)	Moderate	141 000	0.83	Yes
	Chromium (hexavalent)	High	104 000	0.61	Yes
	Ionising radiation	Moderate-high	37 000–78 000	0.22–0.46	Yes
	Cadmium	High	31 000	0.18	Yes
	Arsenic	Moderate	25 000	0.15	No
	Trichloroethylene	Moderate	9800	0.06	Yes
	Polychlorinated biphenyls	Low	8200	0.05	No
	Coal tar and coal tar pitches	Low	7600	0.05	No
	Beryllium	Low	3900	0.02	No
	1,3-Butadiene	Low	3900	0.02	No
	Ethylene oxide	Moderate	2400	0.01	Yes
Probable carcinogenic agents (IARC 2A)	Shift work with potential for circadian disruption	High	1 900 000	11.6	Yes
	Tetrachloroethylene	High	15 000	0.09	Yes
	Acrylamide	Low	9300	0.05	No
	Epichlorohydrin	Low	6600	0.04	No
	Creosotes	Low	4800	0.03	No

Challenges in occupational cancer epidemiology

- Most studies performed on men in industrialized / high income countries
- Occupational cancer in women???
- Lack of robust quantitative exposure data and reliance on job titles as proxy for exposure (underestimate exposure) e.g.

Smoking	RR for lung cancer
1-4 cigarettes / day	5.6
35-40 cigarettes / day	50.7
Smokers vs non-smokers	12

Challenges in occupational cancer epidemiology

- Neglect of dose-response relationship and impact on risk of occupational cancer with potential for underestimating the risk estimates
- Impact of cancer prevention efforts difficult because of long latency e.g reduction in lung cancer after smoking only visible after 5 yrs with a 50% reduction achieved after 15 years
- Recognition and compensation for environmental cancer remains unaddressed

Challenges in occupational cancer epidemiology

- One carcinogen may manifest as different types of cancer
- Lack of good cancer registry data to use in epidemiological studies to evaluate occupational contribution

Challenges in occupational cancer epidemiology

- Decline in identification of new carcinogens
- 1964 – 1982 [increasing from 9 – 92 (1000%)]
- 1982-2003 [increasing from 92 -137 (50%)]
- Increase in number of chemicals in workplace and emerging occupational hazards
- Decreased scientific effort?

Occupation and cancer-follow-up of 15 million people in 5 Nordic countries

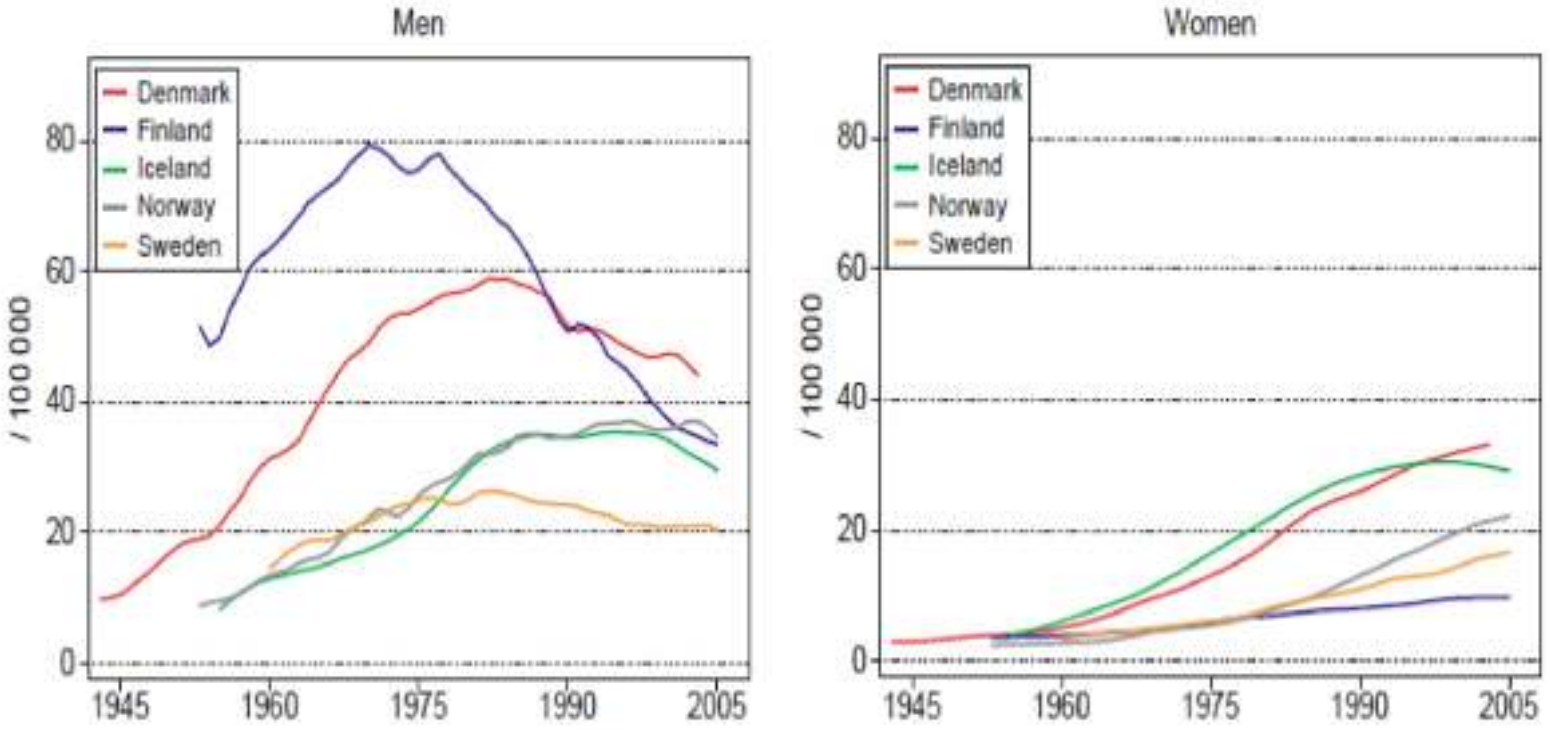


Figure 27. Age standardised (World) incidence rates for lung cancer 1943–2005, by country and gender. Modified from NORDCAN [49].

Table 34. Observed number of lung cancer among men in the Nordic countries and standardised incidence ratios 1961–2005, by country and occupational category.

		Denmark		Finland		Iceland		Norway		Sweden		Total		
No	Occupational category	Obs	SIR	Obs	SIR	Obs	SIR	Obs	SIR	Obs	SIR	Obs	SIR	95% CI
1	Technical workers, etc	3019	0.91	1503	0.58	9	0.41	855	0.61	5154	0.93	10540	0.82	0.80—0.83
2	Laboratory assistants	70	1.04	55	0.89	3	0.71	51	0.75	17	0.70	196	0.87	0.75—1.00
3	Physicians	144	0.53	45	0.30	6	0.67	82	0.46	178	0.73	455	0.53	0.49—0.58
4	Dentists	36	0.46	9	0.27	[2.08]	0.00	55	0.68	59	0.47	159	0.50	0.43—0.58
5	Nurses	[3.48]	0.00	1	0.20	1	23.30	4	0.56	4	0.43	10	0.40	0.19—0.73
6	Assistant nurses	61	0.78	1	0.25	[0.97]	0.00	24	0.76	84	1.01	170	0.86	0.74—1.00
7	"Other health workers"	210	0.87	93	0.59	1	0.41	62	0.90	199	0.95	565	0.83	0.76—0.90
8	Teachers	769	0.54	371	0.33	17	0.52	428	0.43	834	0.59	2419	0.49	0.47—0.51
9	Religious workers etc	377	0.61	296	0.51	22	1.03	253	0.50	783	0.75	1731	0.62	0.60—0.65
10	Artistic workers	160	0.82	142	0.65	8	1.36	146	0.95	391	1.16	847	0.93	0.87—1.00
11	Journalists	85	0.94	76	0.69	6	1.80	59	0.89	169	1.08	395	0.93	0.84—1.02
12	Administrators	3415	0.90	1000	0.56	49	0.86	1523	0.84	1992	0.92	7979	0.83	0.81—0.85
13	Clerical workers	1412	0.85	936	0.75	64	1.00	1177	0.84	2432	1.04	6021	0.90	0.88—0.92
14	Sales agents	855	0.98	1365	0.80	44	1.35	1604	1.01	3796	1.12	7664	1.01	0.99—1.03
15	Shop workers	3803	0.98	518	0.78	30	0.90	598	0.95	1204	1.10	6143	0.98	0.95—1.00
16	Farmers	3465	0.47	7611	0.77	49	0.52	1995	0.46	2417	0.40	15537	0.56	0.55—0.57
17	Gardeners	808	0.77	1056	0.84	4	1.36	637	0.57	1361	0.61	3866	0.68	0.66—0.71
18	Fishermen	461	1.29	127	1.02	78	1.52	1654	1.17	227	0.96	2547	1.16	1.12—1.21
19	Forestry workers	139	0.88	2074	1.41	[0.47]	0.00	486	0.60	878	0.54	3577	0.88	0.85—0.91
20	Miners and quarry workers	48	0.97	450	1.93	1	1.18	325	1.40	621	1.57	1445	1.58	1.50—1.67
21	Seamen	547	1.43	353	1.19	23	1.57	2036	1.74	624	1.82	3583	1.62	1.57—1.68
22	Transport workers	896	1.07	739	0.78	37	1.22	601	0.97	1201	1.03	3464	0.96	0.93—1.00
23	Drivers	3762	1.37	2897	1.05	46	1.07	2415	1.44	3762	1.34	12882	1.28	1.26—1.31
24	Postal workers	536	1.05	312	0.72	4	0.70	278	0.88	653	1.06	1783	0.95	0.90—0.99
25	Textile workers	527	1.07	291	0.95	6	0.62	309	0.87	721	1.02	1854	0.99	0.94—1.04
26	Shoe and leather workers	133	1.08	148	1.07	5	2.34	159	1.07	297	1.04	742	1.06	0.99—1.14
27	Smelting workers	1488	1.38	586	1.28	16	1.18	715	1.50	1422	1.27	4227	1.34	1.30—1.38
28	Mechanics	3595	1.24	2979	1.10	43	1.07	3123	1.34	6463	1.27	16203	1.24	1.22—1.26
29	Plumbers	399	1.55	591	1.31	8	1.20	420	1.55	807	1.37	2225	1.42	1.36—1.48
30	Welders			443	1.17	2	0.83	444	1.44	909	1.38	1798	1.33	1.27—1.40
31	Electrical workers	777	1.15	1055	0.96	26	1.09	1072	1.04	1780	1.03	4710	1.03	1.00—1.06
32	Wood workers	2085	1.05	3801	1.16	17	0.71	2370	0.88	2668	0.77	10941	0.96	0.94—0.97
33	Painters	858	1.30	792	1.21	8	0.81	593	1.32	1167	1.17	3418	1.23	1.19—1.28
34	"Other construction workers"	3075	1.19	3402	1.59	45	0.96	741	1.40	2217	1.18	9480	1.32	1.29—1.35
35	Bricklayers	899	1.24	477	1.40	—	—	344	1.28	513	1.13	2233	1.25	1.20—1.30
36	Painters	545	1.20	236	0.91	9	1.16	325	1.21	711	1.33	1826	1.20	1.14—1.26
37	Chemical process workers	534	1.21	522	1.11	6	1.34	786	1.32	857	1.02	2705	1.15	1.11—1.19
38	Food workers	1700	1.22	342	1.00	45	1.18	861	1.26	1000	1.18	3948	1.19	1.16—1.23
39	Beverage workers	275	1.54	19	0.78	2	3.31	7	0.98	65	1.33	368	1.42	1.28—1.57
40	Tobacco workers	51	1.76	8	2.07	[0.05]	0.00	18	1.74	7	1.87	84	1.79	1.43—2.21
41	Glass makers etc	1007	1.21	537	1.08	7	1.06	470	1.42	1034	1.12	3055	1.18	1.14—1.22
42	Packers	883	1.18	1390	1.28	21	0.96	1449	1.42	2170	1.29	5913	1.30	1.26—1.33
43	Engine operators	815	1.11	1501	1.13	25	0.89	828	1.43	1679	1.22	4848	1.20	1.17—1.23
44	Public safety workers	686	1.02	688	0.85	16	0.78	476	1.09	787	1.00	2653	0.97	0.93—1.01
45	Cooks and stewards	89	1.64	41	0.99	17	1.81	292	1.51	240	1.74	679	1.56	1.44—1.68
46	Domestic assistants	1	1.74	[3.29]	0.00	[0.03]	0.00	3	1.93	6	0.64	10	0.68	0.32—1.24
47	Waiters	348	2.03	40	1.04	1	1.04	145	1.73	169	3.32	603	1.90	1.75—2.05
48	Building caretakers	978	1.30	738	1.01	10	1.05	317	1.45	752	1.18	2795	1.19	1.15—1.24
49	Chimney sweeps	30	1.58	62	1.14	—	—	41	1.77	79	1.71	212	1.49	1.30—1.70
50	Hairdressers	241	1.14	12	0.79	2	1.48	87	1.33	218	1.32	560	1.22	1.12—1.33
51	Launderers	121	1.18	15	1.04	[0.92]	0.00	59	1.50	158	1.33	353	1.28	1.15—1.42
52	Military personnel	292	0.87	137	0.63	—	—	372	0.97	494	1.06	1295	0.92	0.88—0.98
53	"Other workers"	2981	1.29	1121	1.29	97	1.15	2128	1.12	2186	1.07	8513	1.18	1.16—1.21
54	Economically inactive	3010	1.19	8195	1.47	70	1.19	1032	1.15	3761	1.23	16068	1.33	1.31—1.35
1–54	All categories	53401	1.00	52189	1.00	996	1.00	37334	1.00	64377	1.00	208297	1.00	Ref.

Obs = observed number of cases; SIR = standardised incidence ratio; 95% CI = 95% confidence interval.

Mesothelioma and ARD-related cancer 1979-2012

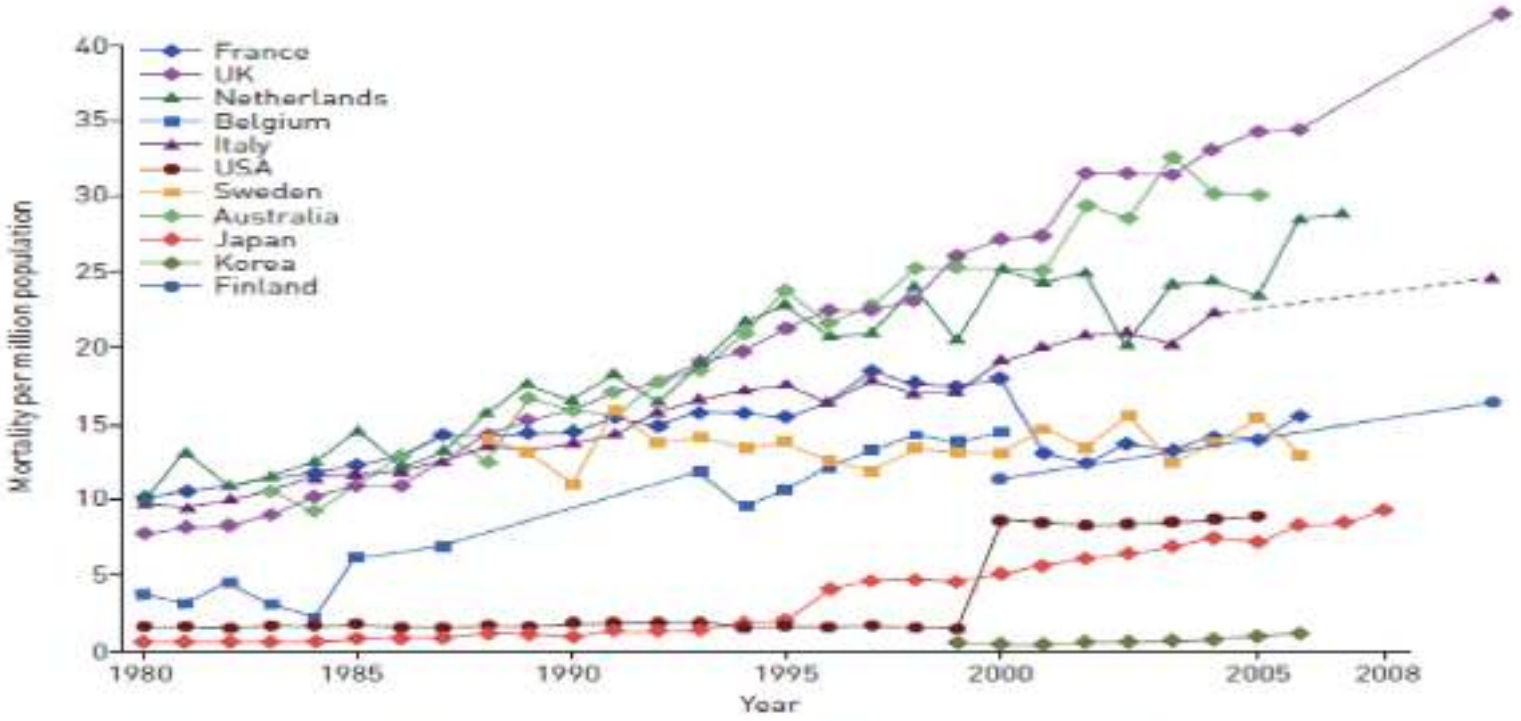


FIGURE 2 Mesothelioma and related asbestos-related lung cancer mortality by country, 1979–2012. Reproduced and modified from [11] with permission.

registrations, corresponding to about 3500 cases per year, are attributed to past exposure to asbestos and silica in this sector, mostly causing lung cancer and mesothelioma [23].

Percentage of workers exposed to respiratory carcinogens in Europe

TABLE 1 Percentage of workers exposed to eight respiratory carcinogens in different industrial sectors in Europe

	Agriculture	Mining	Manufacturing	Electrical	Construction	Trade	Transport	Finance	Services
Silica	3.72	2.30	2.33	1.41	**18.9**	0.02	0.48	0.00	0.06
Cadmium	0.00	0.00	0.49	0.29	0.29	0.00	0.00	0.00	0.05
Nickel	0.00	2.21	1.68	0.35	0.05	0.00	0.07	0.00	0.04
Arsenic	0.05	0.07	0.40	0.14	0.13	0.00	0.00	0.00	0.01
Chromium	0.00	0.04	2.08	0.41	0.24	0.02	0.37	0.00	0.23
Diesel fumes	0.65	**22.0**	1.11	3.36	5.82	0.49	**13.4**	0.00	0.91
Beryllium	0.00	0.05	0.21	0.07	0.00	0.00	0.01	0.00	0.00
Asbestos	1.25	**10.2**	0.59	1.70	5.20	0.29	0.68	0.02	0.28

Percentages above 10% are shown in bold. Reproduced and modified from [15] with permission.

Success stories

- Scrotal cancer in England and Wales declined from personal hygiene intervention
- Nasal cancer in furniture workers employed after 1940 decreased with improvements in dust control
- Stabilization in pleural mesothelioma rates in Sweden in 1990's following legal controls to restrict exposure passed in 1970's

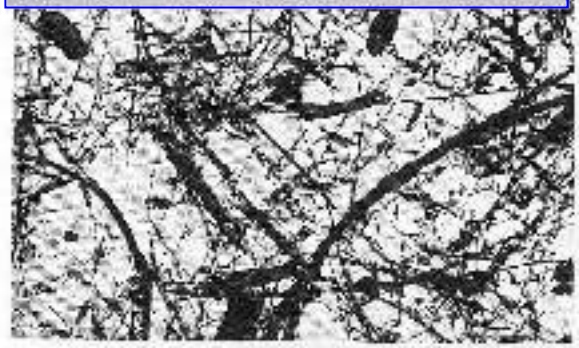
ASBESTOS AND CANCER

- Malignant mesothelioma
- Carcinoma of lung
- Carcinoma of larynx
- Carcinoma of ovaries

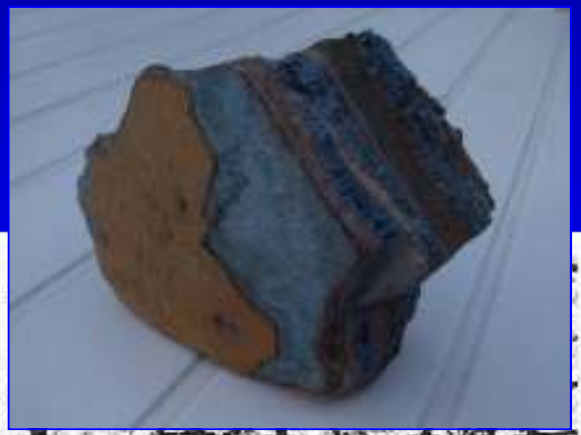
Asbestos

- Compound mineral containing various elements – “silicate”
- “White”, “blue”, “brown” asbestos – all previously mined in RSA

Chrysotile (White)



Crocidolite (Blue)



Amosite (Brown)

Epidemiology of mesothelioma in South Africa

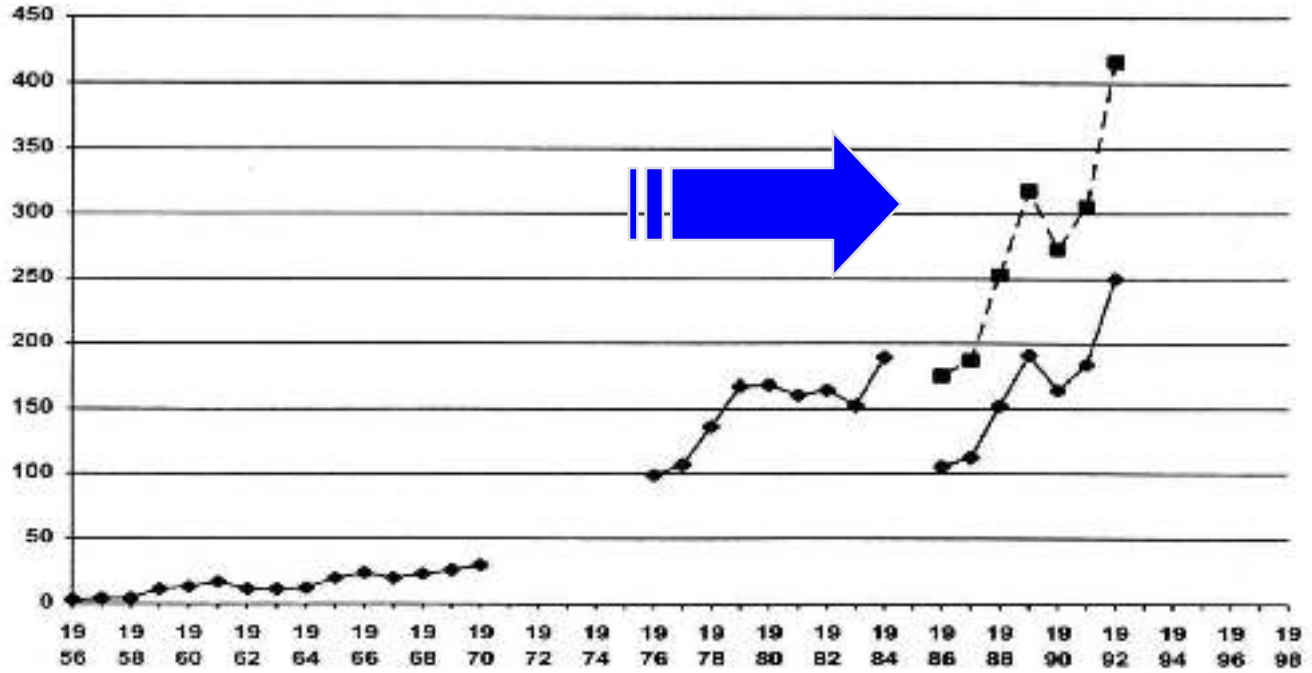


Figure 1 : Annual numbers of cases of mesothelioma occuring in South Africa 1955 - 1992.

Data sources : 1955 - 70 : Webster ( ); 1976 - 86 : Zwi et al ( ); 1986 - 92 (NCR); hatched line 1986 - 92 is an extrapolation of NCR data (see text).

The story of mesothelioma in South Africa (www.asbestos.com)

- Early 1900 link between asbestos exposure and high rates of lung disease
- In 1960 Christopher Wagner, a South African pathologist, discovered a definitive link between the exposure and cancer .
- “Diffuse Pleural Mesothelioma and Asbestos Exposure in the North Western Cape Province,” became the most quoted paper in occupational medicine and triggered a wave of research on asbestos related disease.

The story of mesothelioma in South Africa

- 1956 autopsy performed on a South African man who worked at a gold mine. Doctors struggled to explain why patients living and working west of South Africa's Kimberley area did not respond to TB treatment as well as those living elsewhere.
- Wagner's autopsy revealed a tumor in the patient's right chest and a collapsed lung. He gained further evidence for his study from Dr. C.A. Sleggs, the chief medical officer of Kimberley TB Hospital.

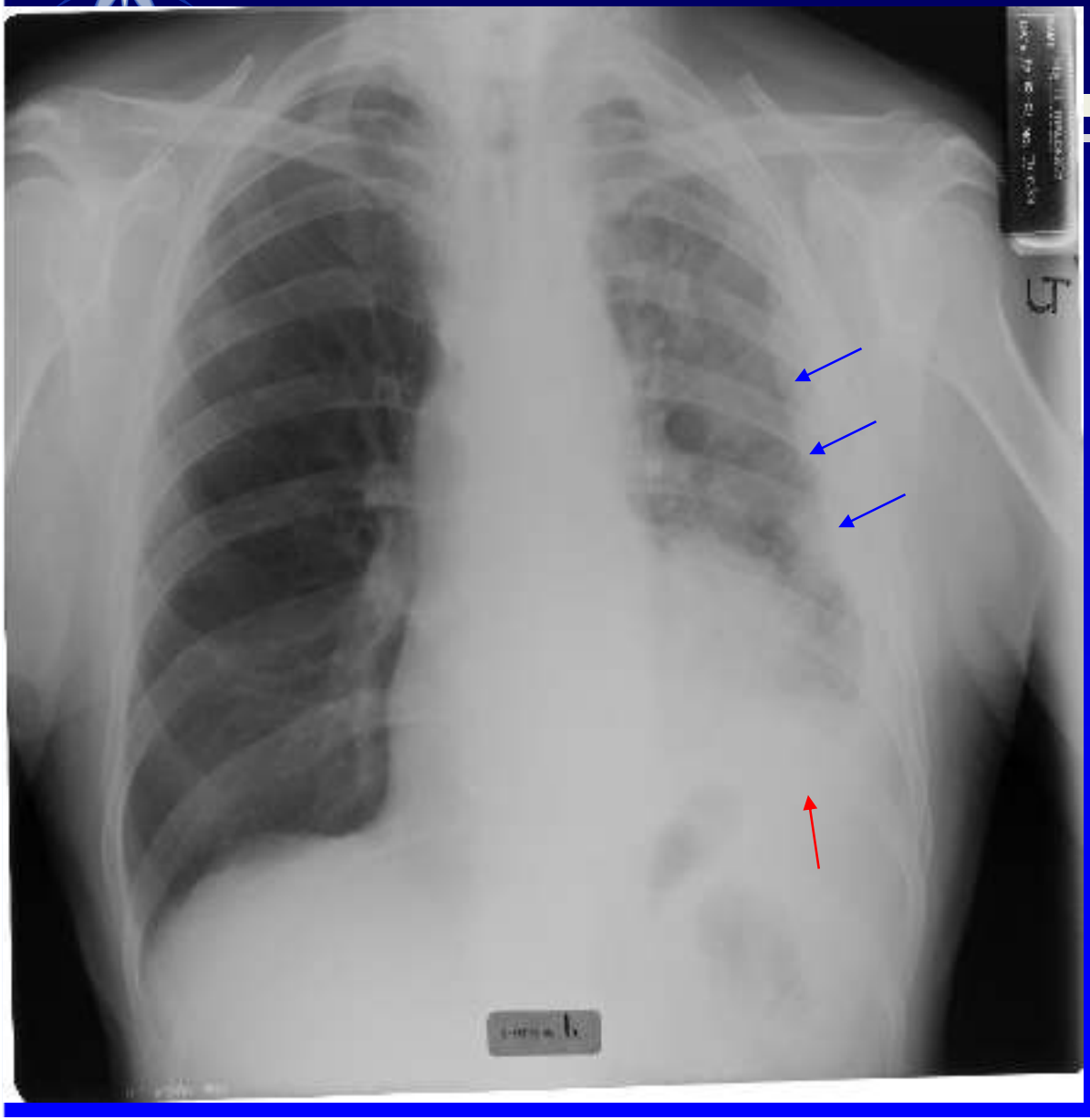
The story of mesothelioma in South Africa

- After collecting imaging scans from 14 patients who lived near an asbestos mine, Sleggs performed biopsies and confirmed the presence of mesothelioma. Shortly after, Wagner reported the link between the exposure and mesothelioma.
- Senior officers of the Department of Health demanded industry review of future research papers. Despite evidence of serious risks to workers, the industry ramped up the output of crocidolite asbestos from 60,389 tons in 1960 to 155,477 tons in 1974.

The story of mesothelioma in South Africa

- SA reports over 200 cases of mesothelioma per year
- 30% environmental and 70% of these affecting women and children
- Long latency. Asbestos banned in 2008 with last mine closing in 2001.
- Estimated that 2700 fatalities due to mesothelioma
- Law makes no provision for post employment surveillance
- Peak of epidemic still to come??

Malignant mesothelioma of pleura



- “Bunch of grapes” pleural mass on the left side (chest pain)

- accompanying pleural effusion (red arrow)

- local spread (no metastases)

  - diagnosis (histology and special stains)

- -very poor prognosis

Take home messages

- Occupational cancer exists and are linked to certain exposures with 85% of such cancer deaths caused by only 10 hazardous exposures
- Need for cancer registries to incorporate data on occupational exposure
- Countries need to develop a risk exposure profile linking exposures / occupations with cancer risk (Carex tool)
- Occupational history important: consider latency period and the lack of post employment surveillance;
- Surveillance of high risk populations to be mandatory
- Measures to reduce exposure and review of OEL's ;
- Risk control management e.g hierarchy of control
- Right to Compensation and needs to be reported in terms of existing legislation (COIDA and ODMWA)

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- Dr Blanche Andrews (Sanlam)