

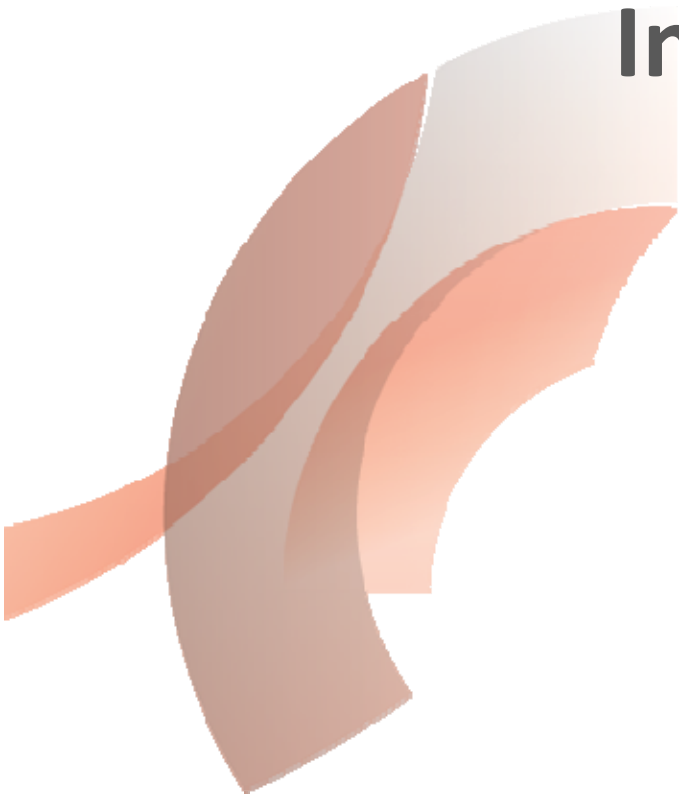


Occupational
Cancer
Research
Centre

Occupational Cancer Incidence and Prevention

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Occupational Cancer Research Centre



- Created in 2009 through partnership between:



Canadian
Cancer
Society

Société
canadienne
du cancer



- Research program focused on
 - Studies of the causes of workplace cancer
 - Surveillance of cancer and carcinogens
 - Prevention research

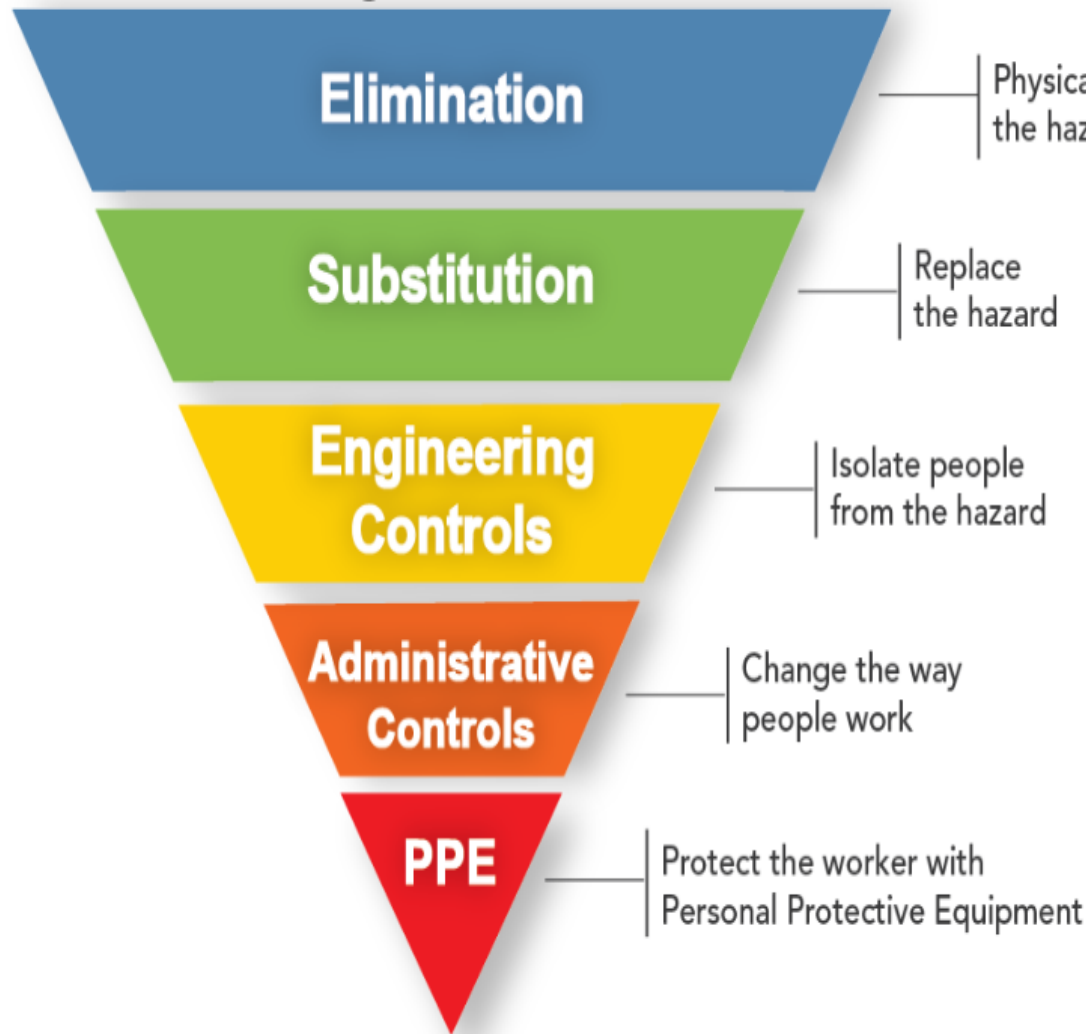


IARC Evaluation of Carcinogens



- **Group 1:** Carcinogenic in humans (117)
- **Group 2A:** Probably carcinogenic in humans (74)
- **Group 2B:** Possibly carcinogenic in humans (287)
- **Group 3:** Not classifiable, generally inadequate evidence in humans and limited or inadequate in animals (503)
- **Group 4:** Evidence of a lack of carcinogenicity in both humans & animals (1, caprolactam in 1999)

Hierarchy of Controls (from NIOSH)

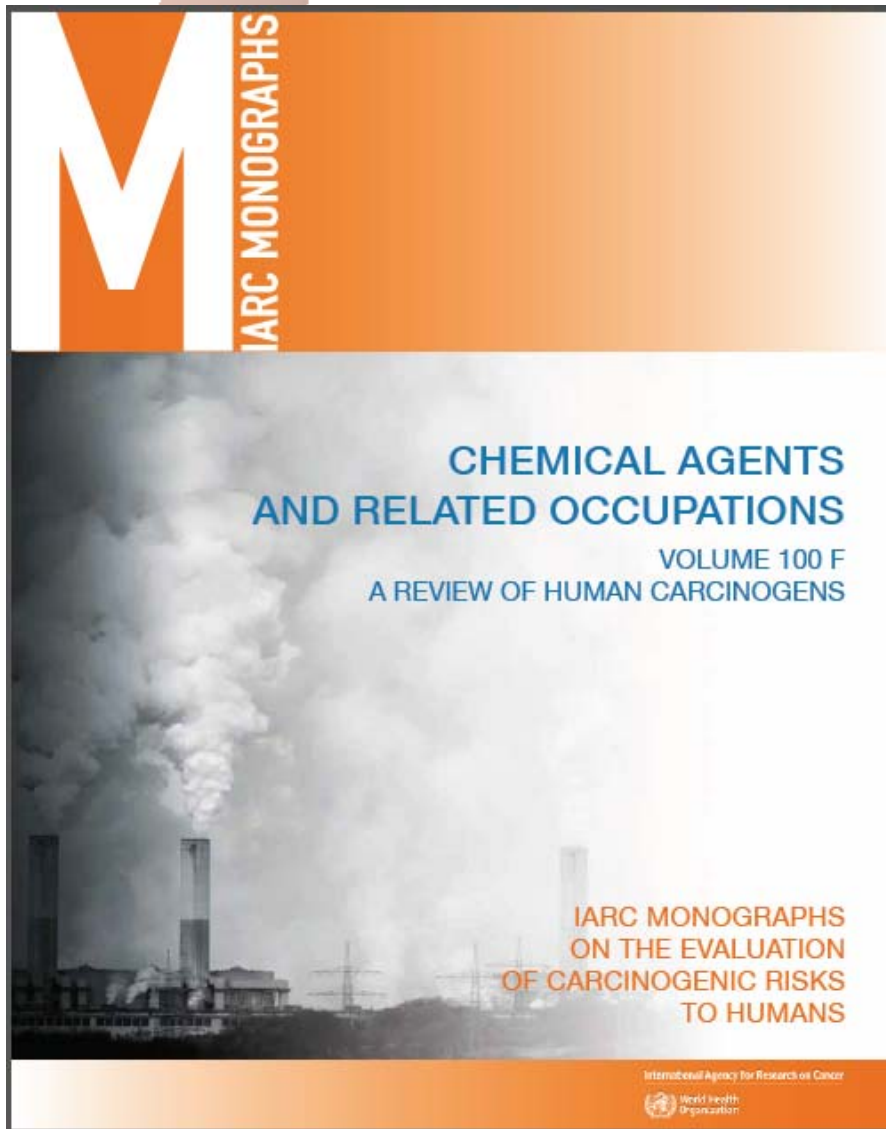


IARC's classifications contribute to prevention by:

- Stimulating regulations (OELs, labeling, toxic use reduction...)
- Stimulating voluntary actions by employers or workers
- Raising awareness

**Early Recognition
and Screening**

IARC Monograph 100 (2008-2009)



IARC re-review all known carcinogens and linked evaluations to tumour sites.

100a: Pharmaceuticals

100b: Biological agents

100c: Arsenic, metals, fibres, and dusts

100d: Radiation

100e: Personal habits and indoor combustion

100f: Chemical agents and related occupations

Recent IARC Evaluations (2012): Diesel Engine Exhaust



Classified as definite human carcinogen for lung cancer, and a possible cause of bladder cancer

11 components of diesel exhaust classified as probable or possible human carcinogens based on animal/mechanistic evidence

Gasoline Exhaust remains classified as a possible Human carcinogen



Recent IARC Evaluations: Chlorinated Solvents (2012 & 2014)



Trichloroethylene classified by IARC as definite human carcinogen for kidney cancer, limited for NHL & liver cancer

Tetrachloroethylene classified as a probably carcinogen for bladder cancer

Dichloromethane classified as a probably carcinogen for NHL & biliary cancer



Polychlorinated biphenyls and polybrominated biphenyls (Feb, 2013)

PCB's classified as a carcinogen for melanoma

Synthetic Fibres & Tubes

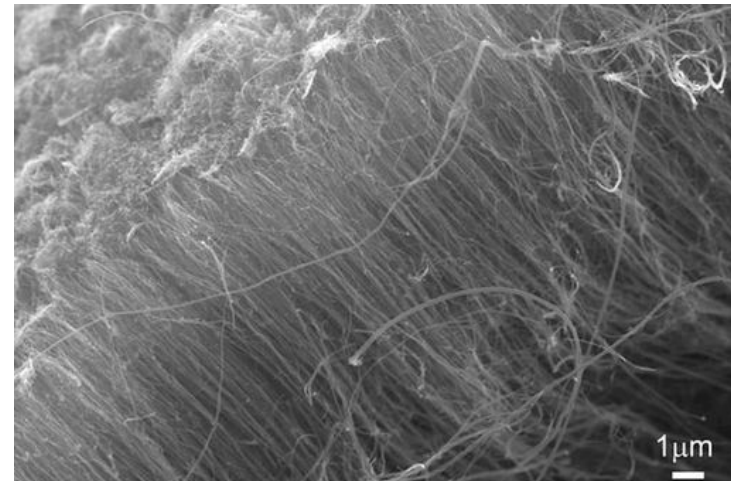


Silicon carbide (SiC) fibres produced by Acheson process classified as a lung carcinogen (other SiC fibres classified as possible)

SiC whiskers classified as 2A based on animal evidence & physical properties that resembling asbestos

Multi-walled carbon nanotubes type seven (MWCNT-7) classified as possibly carcinogenic animal evidence (mesothelioma)

Other MWCNTs and singlewalled carbon nanotubes (SWCNTs) classified inadequate





Asbestos-like Minerals (2014)



- Fluoro-edenite fibrous amphibole classified as a carcinogen based on sufficient human evidence for mesothelioma
 - Joins erionite (fibrous zeolite) as an asbestos like carcinogen
- Asbestos is a commercial term, used in regulation it leaves similar minerals unregulated
- Implications for Libby amphibole, which is composed of 85% winchite, 10% richterite, and 5% tremolite

Organophosphates Insecticides & Herbicides (2015)



Glyphosate & malathion classified as probably carcinogenic based on limited human evidence for NHL (and some other cancers) & sufficient animal evidence

Diazinon classified as probably carcinogenic based on limited human evidence for NHL and other cancers & strong mechanistic evidence

Parathion & Tetrachlorvinphos remains possible human carcinogens based on inadequate human evidence & sufficient animal evidence

Organochlorine & Chlorophenoxy Pesticides

Lindane upgraded to human carcinogen based on sufficient human (NHL) and animal evidence

DDT classified as probable carcinogen based on limited human evidence (NHL & others) & sufficient evidence in animals

2,4-D remains a possible human carcinogen based on inadequate evidence in humans and limited evidence in animals



Where do We Stand on Workplace Carcinogens* in Canada?



- Definite workplace carcinogens (Group 1)
 - 34 current chemical or physical agents
 - 8 exposure circumstances
 - 15 historical or rare agents or circumstances
- Probable workplace carcinogens (Group 2A)
 - 28 current chemical or physical agents
 - 6 exposure circumstances
 - 9 historical or rare agents or circumstances

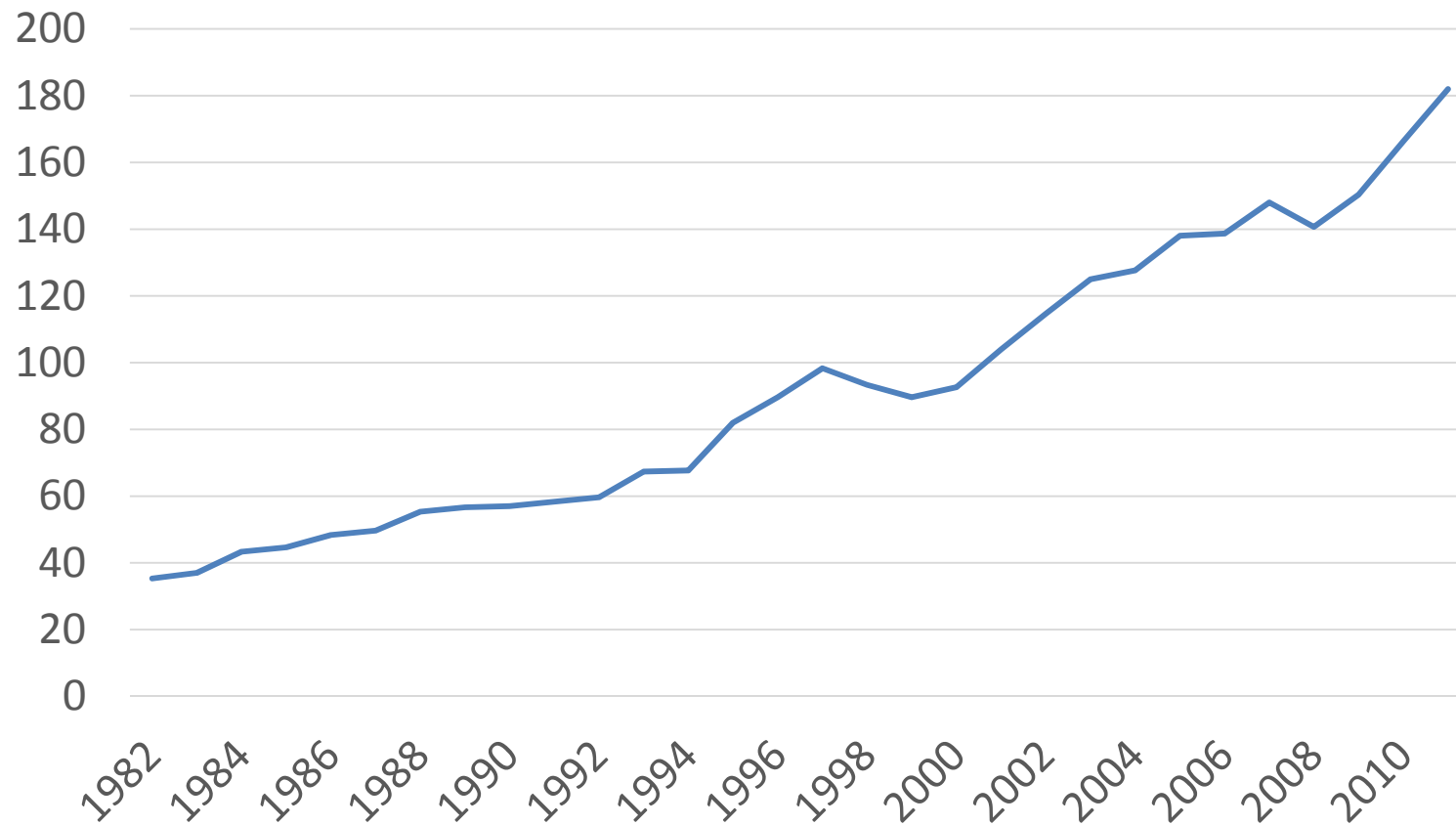
* Grouping by family (i.e. PAH, ionizing radiation...) and not including antineoplastic agents and others that are primarily non-occupational

Potentially Exposed Workers in Ontario (CAREX)



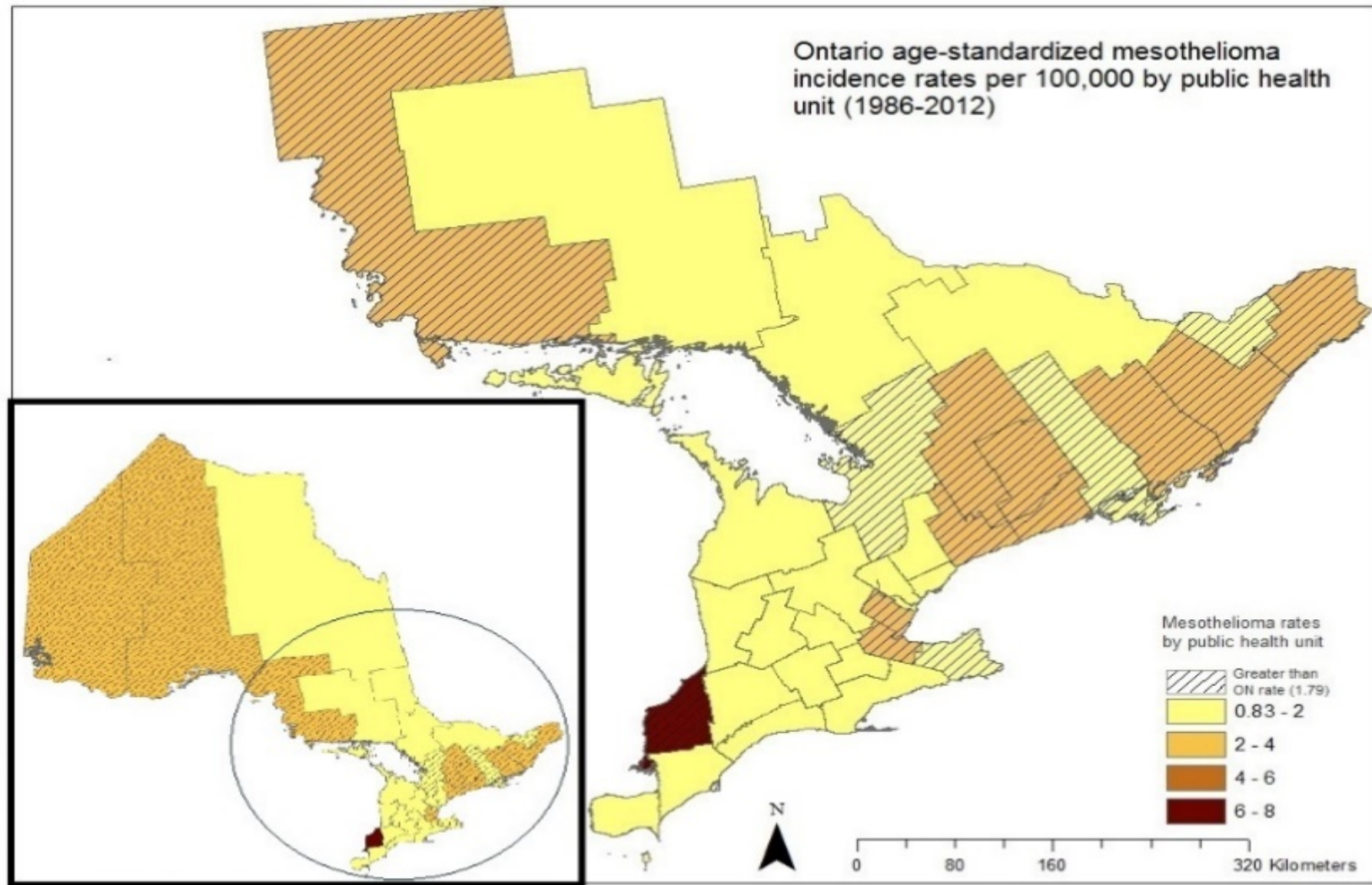
Common Workplace Carcinogen	Exposed
Solar radiation	449,000
Diesel engine exhaust	275,000
Benzene	147,000
Silica (crystalline)	143,000
Other combustion products (PAHs)	103,000
Wood dust	93,000
UV radiation (artificial sources)	73,000
Ionizing radiation	69,000
Formaldehyde	64,000
Asbestos	52,000
Chromium (VI) compounds	42,000
Antineoplastic Drugs	21,000
Nickel compounds	18,000

New cases of mesothelioma in Ontario men, 1981-2012 (3-year moving average)



Source: Ontario Cancer Registry, 2015 (Cancer Care Ontario)

Ontario age-standardized mesothelioma incidence rates per 100,000 by public health unit (1986-2012)

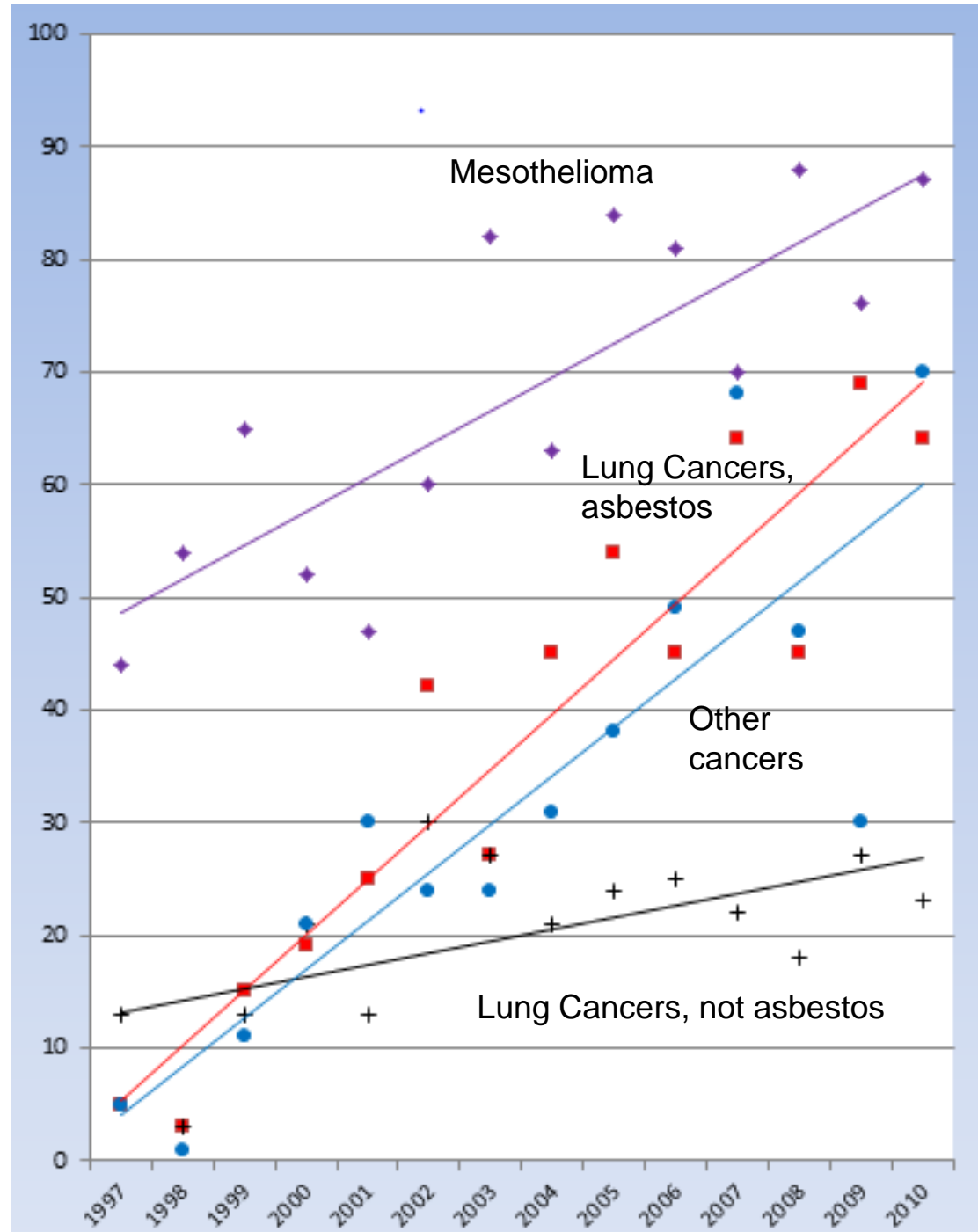


Report date: August 2015; Map date: September 2015;
 Source: Ontario Cancer Registry 2015, Cancer Care Ontario (CCO)
 Maps prepared by Occupational Cancer Research Centre, CCO
 Report prepared by Prevention and Cancer Control (Population Health and Prevention), CCO.
 Rates are per 100,000 and standardized to the age distribution of the 1991 Canadian population.
 Mesothelioma: ICD-o-3 morphology 905. Ontario excludes 18 cases with unknown residence



Trends in Compensated Fatal Cancers in Ontario

- Del Bianco A, Demers PA. The Examination of Workplace Fatalities Within Ontario and Canada. Toronto: Occupational Cancer Research Centre, 2013.
- Data from AWCBC. National Work Injury Statistics Program, extracted March 12, 2012.



Assessing Exposure to Estimate the Burden of Occupational Cancer



44 IARC
recognized
workplace
carcinogens



27
different
types of
cancer



Number of
cases and
economic
burden

- Industrial chemicals (e.g. benzene & formaldehyde)
- Metals (e.g. chromium & nickel)
- Dusts and fibres (e.g. asbestos & crystalline silica)
- Radiation (e.g. radon & solar U.V (at work))
- Combustion products (e.g. diesel engine exhausts)
- Exposure circumstances (e.g. shiftwork)

A national team grant (OCRC, CAREX, UBC, IWH, IRSST, UdeM, Imperial College (London) funded by CCSRI



Canadian
Cancer
Society

Annual Burden of Occupational Cancer Estimates: Ontario



Carcinogen	Sex	Cancers	AF%
Non-melanoma skin cancer due to solar UV radiation	Male	1249	8.3%
	Female	141	1.1%
Lung cancer due to diesel exhaust	Male	160	3.8%
	Female	8	0.2%
Lung cancer due to silica exposure	Male	191	4.5%
	Female	10	0.3%
Mesothelioma due to asbestos	Male	106	85%
	Female	12	40%
Lung cancer due to asbestos	Male	268	6.3%
	Female	30	0.8%



Towards a cancer free workplace

<http://occupationalcancer.ca>

Preliminary Default Evaluation



Cancer in Experimental Animals

Sufficient

Limited

Inadequate

Cancer
in
Humans

Sufficient

Limited

Inadequate

<i>Group 1</i>	<i>Group 1</i>	<i>Group 1</i>
<i>Group 2A</i>	Group 2B Exceptionally: Group 2A	Group 2B Exceptionally: Group 2A
Group 2B	<i>Group 3</i>	<i>Group 3</i>

Strong mechanistic evidence can move an evaluation up or down a category

Group 1 *Carcinogenic to Humans*

Group 2A *Probably Carcinogenic to Humans*

Group 2B *Possibly Carcinogenic to Humans*

Group 3 *Not classifiable as to its Carcinogenicity to Humans*

Group 4 *Probably Not Carcinogenic to Humans*