Occupational Cancer Research Centre

# Preventing Occupational Disease: Moving the Agenda Forward

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Nachemson Memorial Lecture

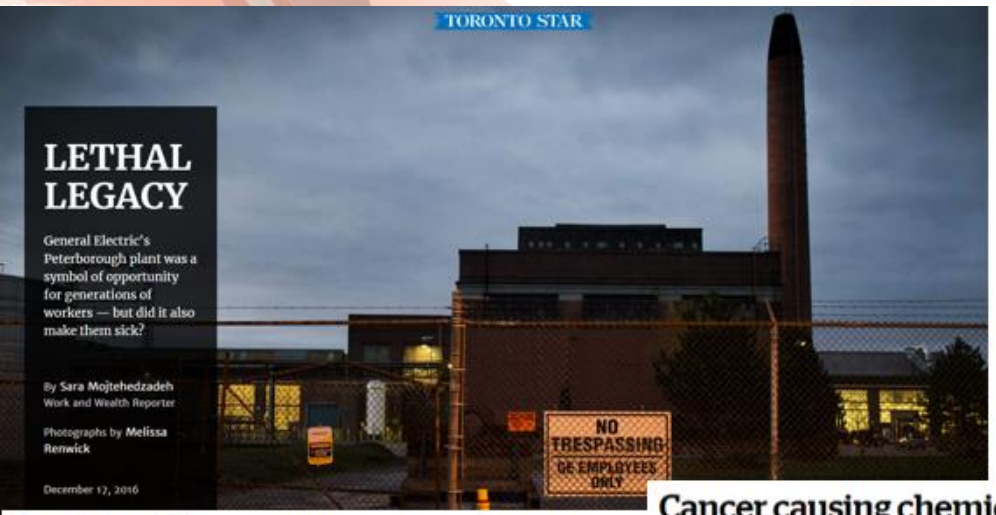
# *No conflicts of interest to report.*

*The work presented here has been made possible through funding from the OCRC's core funders, listed below. Ontario's WSIB played a significant role in establishing the Centre, as did the United Steel Workers.*

Ontario
Ministry of Labour
Ministère du Travail

Canadian Cancer Society
Société canadienne du cancer

Ontario
Cancer Care Ontario
Action Cancer Ontario




# Government plans to review handling of workplace cancers in wake of GE Peterborough case

NEWS Apr 13, 2018 by Joelle Kovach Examiner Staff Writer

# Canada set to announce a new ban on asbestos

By Staff The Canadian Press

Comments | Facebook 236 | Twitter | Email | Print | ...

# Cancer causing chemicals prompt province-wide testing of nail salons

Katie Nicholson · CBC News · Posted: Feb 11, 2016 6:00 AM ET | Last Updated: February 12, 2016

# 'Miners are dying': WSIB to examine McIntyre Powder exposure in new study

Researchers from the Occupational Cancer Research Centre will study mining for the board

Olivia Stefanovich · CBC News · Posted: Aug 17, 2017 12:49 PM ET | Last Updated: August 18

# 'Troubling allegations' prompt Health Canada review of studies used to approve popular weed-killer

Maker of Roundup denies any hidden influence on studies used in approval proces

HEALTH August 10, 2018 6:48 pm Updated: August 11, 2018 10:19 pm

# Monsanto ordered to pay $289M after man said its Roundup weed-killers caused his cancer


THE GLOBE AND MAIL* CANADA

# Workplace carcinogens lead to thousands of cancer cases in Ontario each year: study

THE GLOBE AND MAIL* CANADA

# Asbestos-related cancer costs Canadians billions

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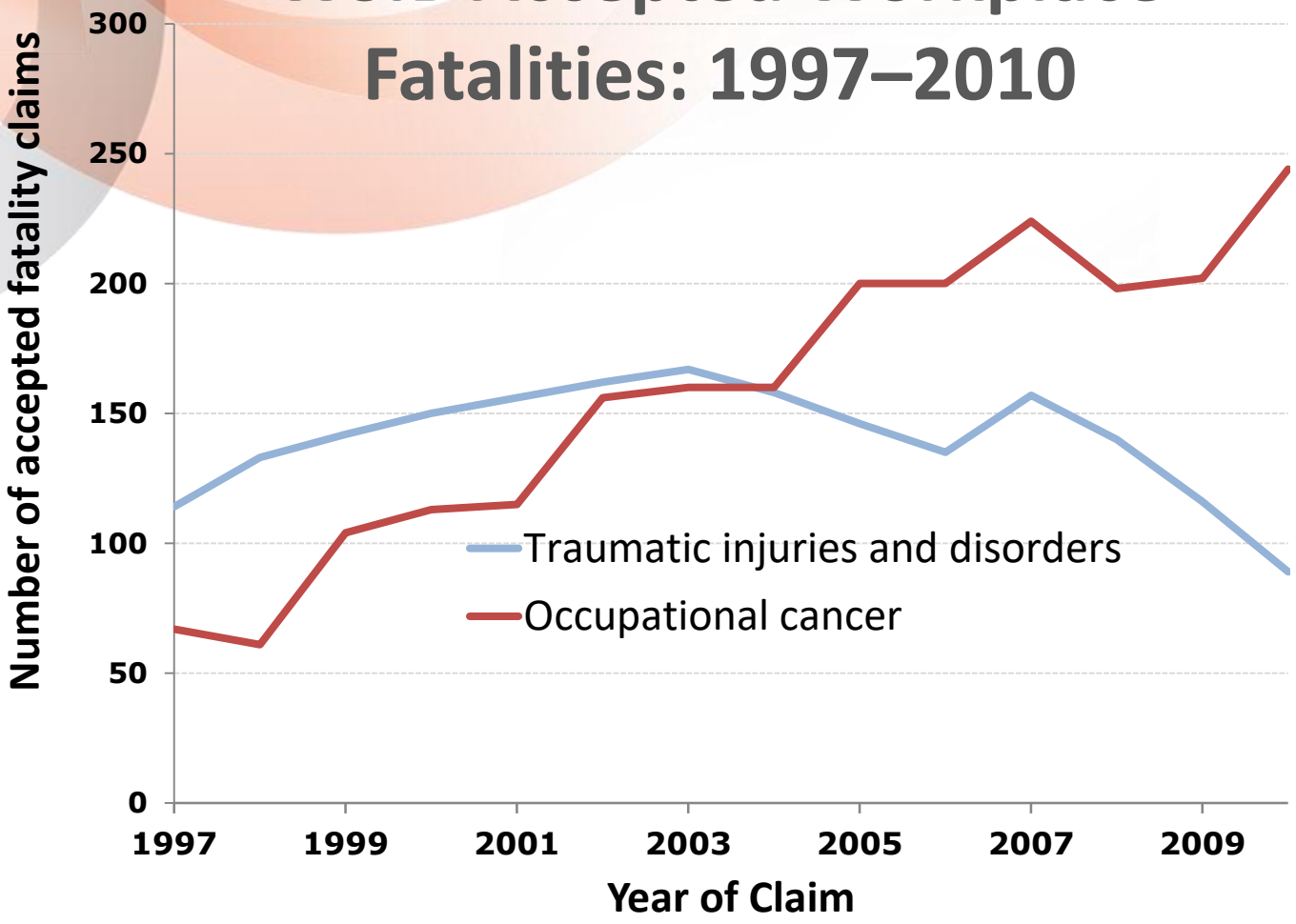
# Health Canada rejects claim that new radon gas standards put Canadians at risk

Canadian Home Builders' Association warns of 'severe and immediate health

# WSIB Accepted Workplace Fatalities: 1997–2010




Del Bianco & Demers. Trends in compensation for deaths from occupational cancer: a descriptive study. *Can Med Assoc J Open* 2013;1:E91-E96.
Data Source: Association of Workers' Compensation Boards of Canada (AWCBC) National Work Injury, Disease and Fatality Statistics 1997–2010.

# Ontario's Occupational Disease Action Plan (ODAP)

- In June 2016 an ODAP Working Group was created including representatives from all OHS System partners as well as Public Health Ontario & The Lung Association
- The goal of ODAP is to align the OHS System's efforts on OD prevention, specifically prevention of hazardous exposures & reduction of OD burden in Ontario workplaces

# ODAP Implementation Priorities

- A ranking process was undertaken to prioritize areas of focus based on:
  - Prevalence or need for prevention
  - Significance or potential for impact
  - Opportunity to leverage other prevention activities in the province
- In 2017 ODAP Implementation Team created, with five working groups:
  1. Noise
  2. Allergens and irritants
  3. Diesel engine exhaust
  4. Intelligence and decision support
  5. Electronic medical record

***Table 1.*** Exposures ranked by the ODAP Working Group

| Exposures Considered | Rank |
|---|---|
| Noise | 1 |
| Allergens/Irritants | 2 |
| Diesel Engine Exhaust | 3 |
| Asbestos | 4 |
| Silica | 5 |
| Solar | 6 |
| Organic Solvents | 7 |
| Heat | 8 |
| Shift Work | 9 |
| Nanotechnology | 10 |
| Radiation | 11 |
| Radon | 12 |

# ODAP Implementation Team Priorities

- Noise
  - Estimated 350-400,000 exposed, based on BC data
  - Approximately 5-8,000 hearing loss claims, most disease unrecognized
- Allergens and Irritants
  - Prevalence of exposure difficult to estimate
  - Approximately 1,000 dermatitis and fewer respiratory claims, most disease unrecognized
- Diesel Engine Exhaust
  - Approximately 300,000 exposed (CAREX Canada)
  - Estimated 170 lung cancers, 45 bladder suspected cancers, unknown number of cardiovascular and respiratory disease

# Challenges in the Recognition of Occupational Disease

- Clinical and pathological expression of diseases do not generally differ by cause
- Chronic disease can be diagnosed long after exposure, so a full work history is needed
- Dose is a strong predictor of the likelihood of disease, but almost always unknown
- Most diseases have multiple causes
- Individuals differ in susceptibility

# Other ODAPIT Working Groups

## Intelligence and Decision Support

- Inventoried existing data resources and activities relevant to occupational exposure and disease surveillance in Ontario
- Supported the successful application for the Occupational Disease Surveillance Program, jointly funded by the Ministry of Labour and Ministry of Health and Long-Term Care
- Currently undertaking an analysis of detailed WSIB data for OD claims and exploring the use of laboratory test data for exposure surveillance

## Electronic Medical Record (EMR)

- Engaged with OntarioMD, the organization responsible for EMR implementation in Ontario
- Undertaking studies to assess the feasibility of, and barriers/facilitators to, completing an occupational history in the clinical setting


This report is available online at
http://www.occupationalcancer.ca/2017/news-occupational-burden-ontario-report

Towards a cancer-free workplace

# Occupational Cancer in Ontario: 2011

| Carcinogen | Annual Cancers | Current Exposure* |
|---|---|---|
| Solar UV at Work | 1400 non-melanoma skin | 449,000 |
| Asbestos | 630 lung, 140 mesothelioma, 15 larynx, <5 ovarian, (? digestive) | 52,000 |
| Diesel Exhaust | 170 lung, (45 bladder) | 301,000 |
| Crystalline Silica | 200 lung | 142,000 |
| Welding Fumes | 100 lung | 169,000 |
| Nickel | 80 lung | 48,000 |
| Chromium VI | 25 lung | 39,000 |
| ETS at work | 50 lung, 10 pharynx, 5 larynx** | 125,000 |
| Radon | 60 lung | 34,000 |
| Arsenic | 20 lung | 8,000 |
| Benzene | 10 leukemia, <5 multiple myeloma | 147,000 |
| PAH's | (60 lung, 15 skin, 30 bladder) | 134,000 |
| Shiftwork | (180-460 breast) | 833,000 |

* CAREX Canada ** Among never smokers (probable associations)


DANGER
ASBESTOS
CANCER AND LUNG DISEASE HAZARD
AUTHORIZED PERSONNEL ONLY

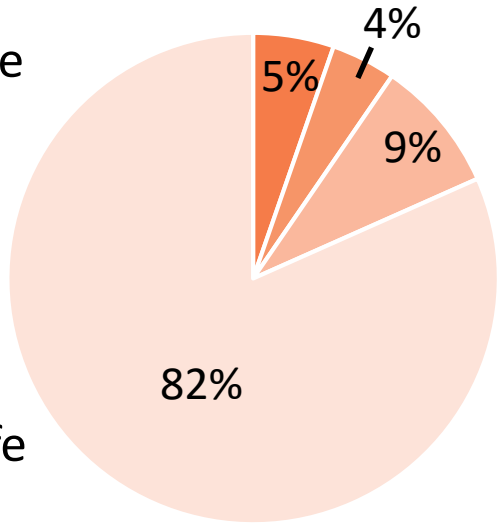
# The Impact of Asbestos in Canada

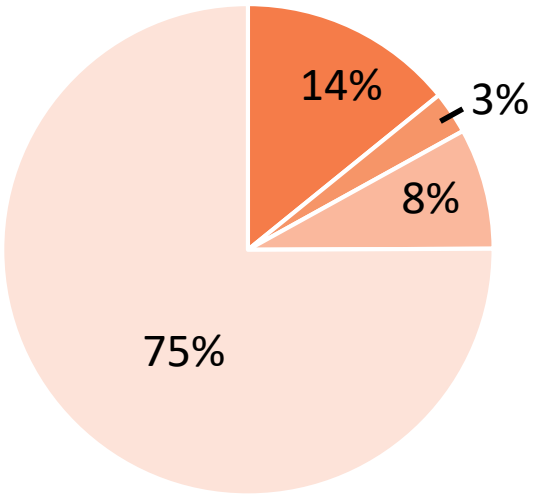
- **Mesothelioma:** over 500 new cases diagnosed in Canada each year (and the numbers are still rising)
- **Lung cancer:** estimates of approximately 1,900 new cases each year
  - Economic costs of mesothelioma and lung cancer alone: $2.35 billion annually
- **Other cancers:** smaller numbers of larynx, ovary, stomach and colorectal
- **Silicosis:** 80 deaths per year, but likely 1000's with some level of lung scarring

# Asbestos: Economic Burden

| | Lung Cancer | Mesothelioma |
|---|---|---|
| Average cost per case | $980K | $1.1 M |
| Total Cost | $1.9 billion | $480 million |

- Healthcare & administrative
- Caregiving & out-of-pocket
- Output & productivity
- Health-related quality of life




Tompa et al. The economic burden of lung cancer and mesothelioma due to occupational and para-occupational asbestos exposure. Occup Environ Med 2017;74:816-22.

# Compensation Rate by Gender

**Compensation Rate (CR)** = **Average Fatal Claims 2011-2014** / **Estimated Fatal Cancers in 2011**

**1557**
**lung cancers**
CR = 5%

**1424**
CR = 6%

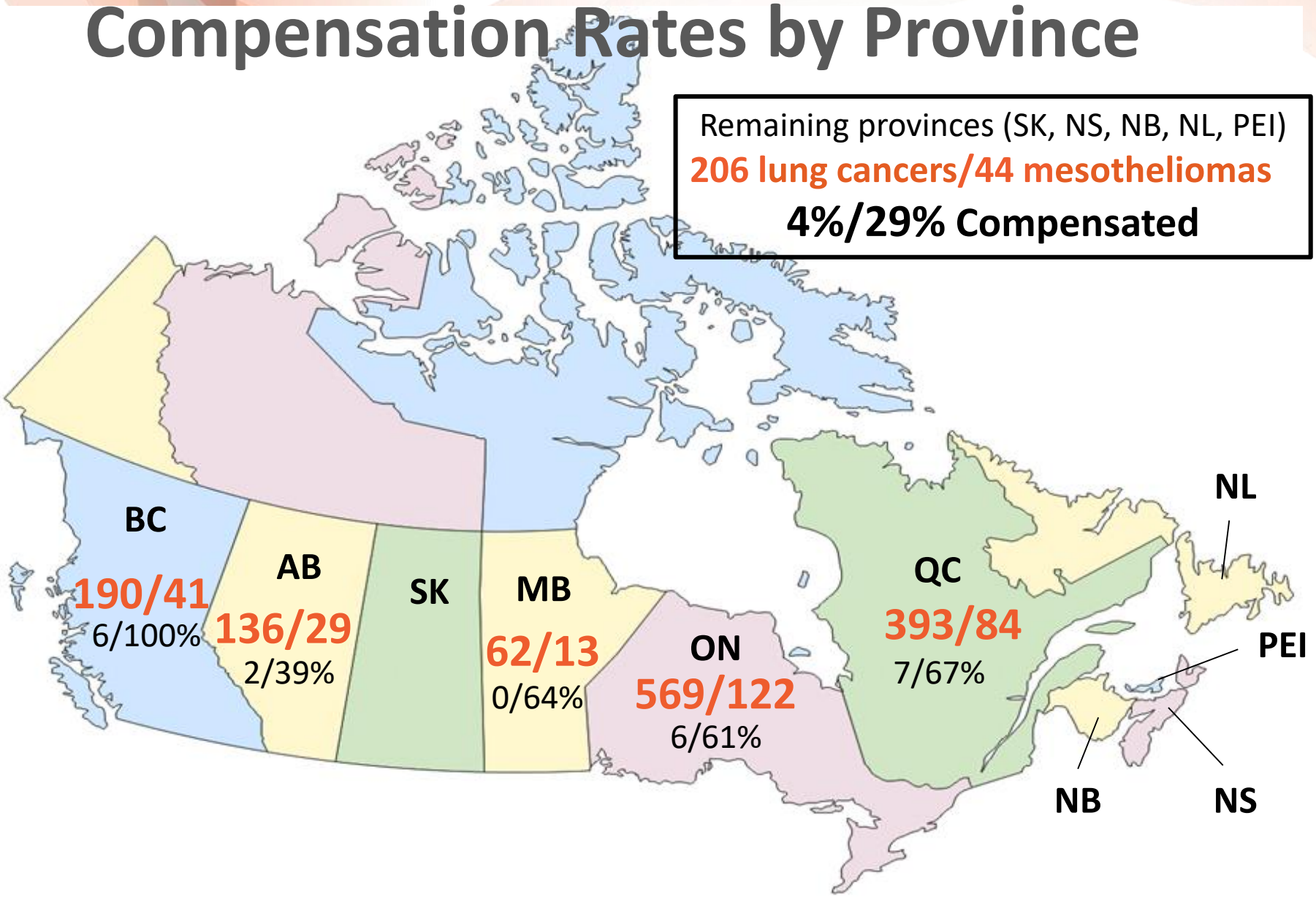
**133**
CR = 2%

**334**
**mesotheliomas**
CR = 61%

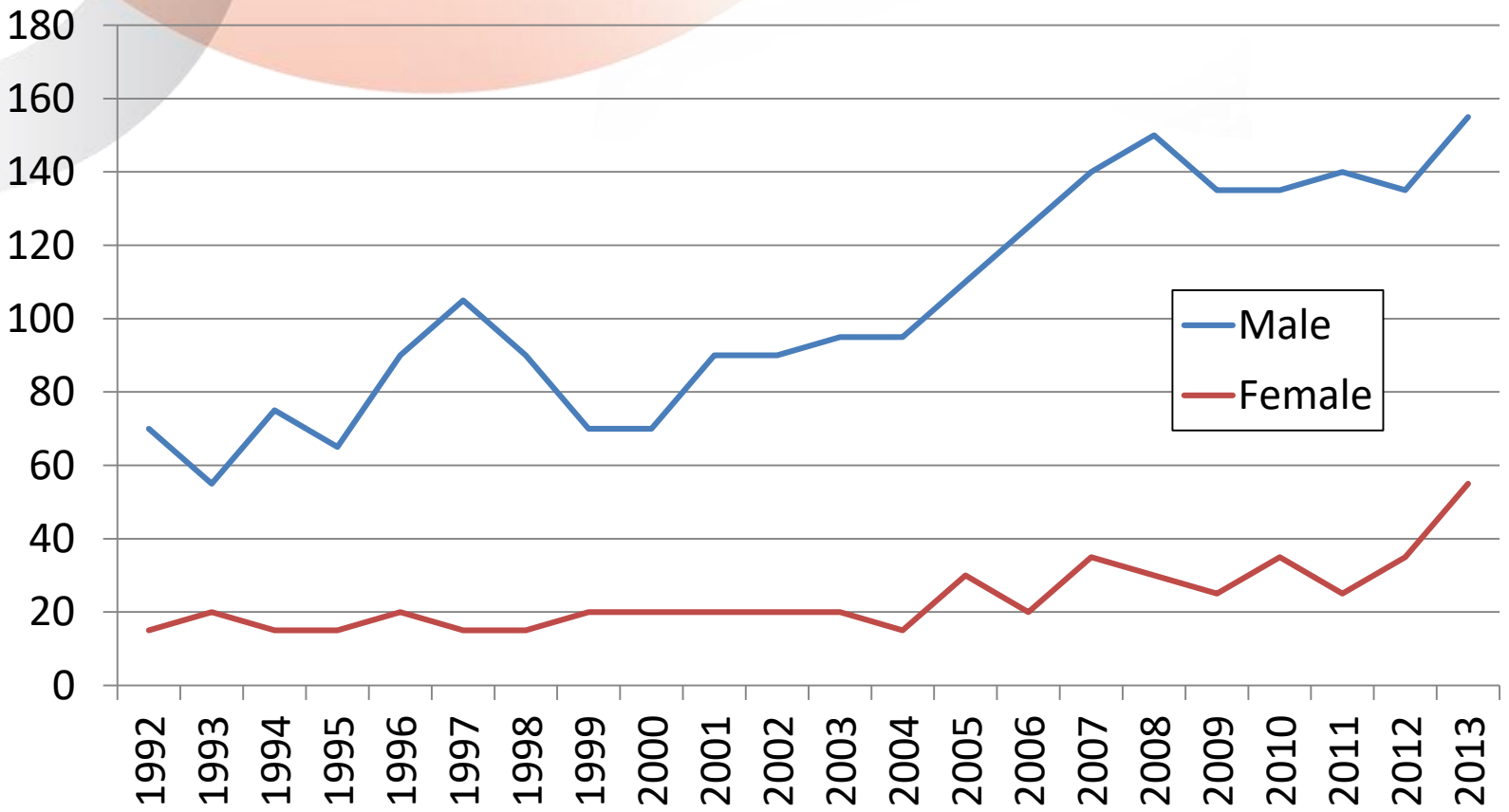
**305**
CR = 64%

**29**
CR = 32%

# Compensation Rates by Province

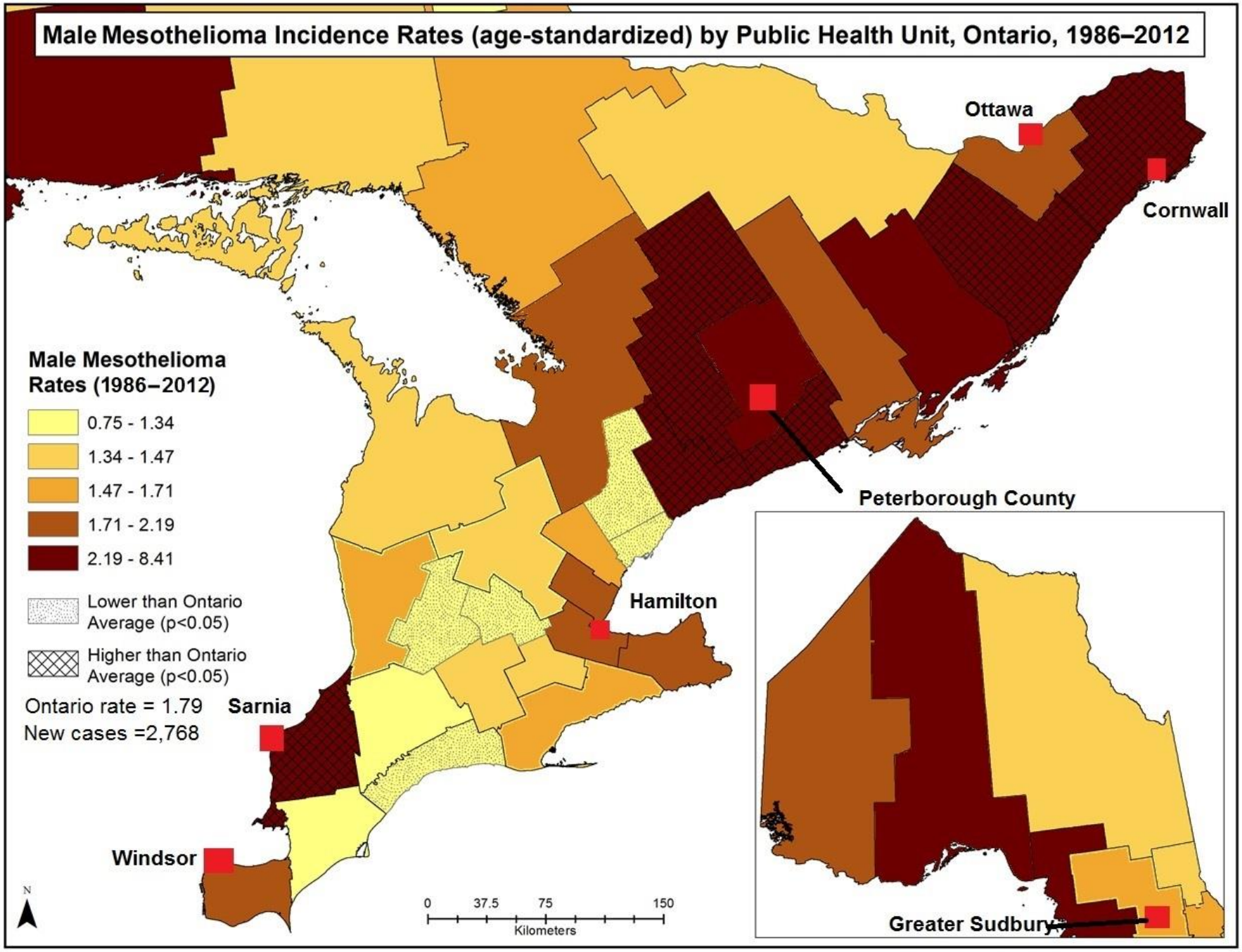


# Incident Cases of Mesothelioma* Ontario, 1991-2013




Data Source: Ontario Cancer Registry, 2014 (Cancer Care Ontario)

*Mesothelioma: ICD-O-3 morphology 905.


Male Mesothelioma Incidence Rates (age-standardized) by Public Health Unit, Ontario, 1986–2012
Ottawa
Cornwall
Peterborough County
Hamilton
Sarnia
Windsor
Greater Sudbury
Male Mesothelioma Rates (1986–2012)
0.75 - 1.34
1.34 - 1.47
1.47 - 1.71
1.71 - 2.19
2.19 - 8.41
Lower than Ontario Average (p<0.05)
Higher than Ontario Average (p<0.05)
Ontario rate = 1.79
New cases =2,768
N
0 37.5 75 150
Kilometers

# Occupational Disease Surveillance System

- Pilot work funded by WSIB, MOL and PHAC
- Created February 2017 through a meeting of MOHLTC & MOL with CCO and others to establish a collaboration on occupational disease prevention
- Linkage of 2.2 million time loss claimants (1983-2014) to:
  - Ontario Cancer Registry
  - Physician visits (OHIP)
  - Ambulatory care visits (NACRS)
  - Hospital visits (DAD)

Ontario Ministry of Labour / Ministère du Travail

Public Health Agency of Canada / Agence de la santé publique du Canada

Ontario Ministry of HEALTH AND LONG-TERM CARE

# Mesothelioma & Asbestosis: Occupational Disease Surveillance System

| Group | Mesothelioma | Asbestosis |
|---|---|---|
| Construction trades | 2.6 (2.2-3.0) | 3.2 (2.7-3.7) |
| Construction electricians & repair | 2.5 (1.7-3.6) | 3.1 (2.2-4.3) |
| Foremen | 4.8 (2.8-8.1) | 3.6 (2.1-5.9) |
| Carpenters | 2.2 (1.5-3.1) | 1.7 (1.2-2.5) |
| Plasterers | 2.9 (1.4-6.2) | 5.3 (3.1-9.0) |
| Insulators | 25.2 (14.9-42.8) | 27.8 (16.4-47.1) |
| Pipe fitting and plumbing | 7.3 (5.6-9.6) | 8.5 (6.7-10.7) |
| Machining and related | 1.2 (1.0-1.5) | 1.1 (0.9-1.4) |
| Boilermakers | 5.0 (2.4-10.5) | 11.0 (7.0-17.4) |
| Other occupations | | |
| Industrial, farm & construction machinery mechanics & repairmen | 2.4 (1.7-3.2) | 1.7 (1.2-2.4) |
| Stationary engine & utilities equipment operating and related | 3.9 (2.2-6.7) | 1.4 (0.7-3.0) |
| Education and Related Services | 2.1 (1.5-2.8) | 1.6 (1.2-2.1) |

# Asthma: ODSS Results

- **100's** of suspected or causative agents

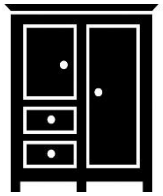




**PAINTING/DECORATING, EXCEPT CONSTRUCTION**
**HR 1.67 (95% CI 1.23-2.28)**

**BAKING/CONFECTIONARY MAKING**
**HR 1.60 (95% CI 1.22-2.09)**

**DIAGNOSTIC/THERAPEUTIC SERVICE INDUSTRY**
**HR 1.41 (95% CI 1.03-1.94)**



**CABINET/WOOD FURNITURE MAKERS**
HR 1.33 (95% CI 0.96-1.83)

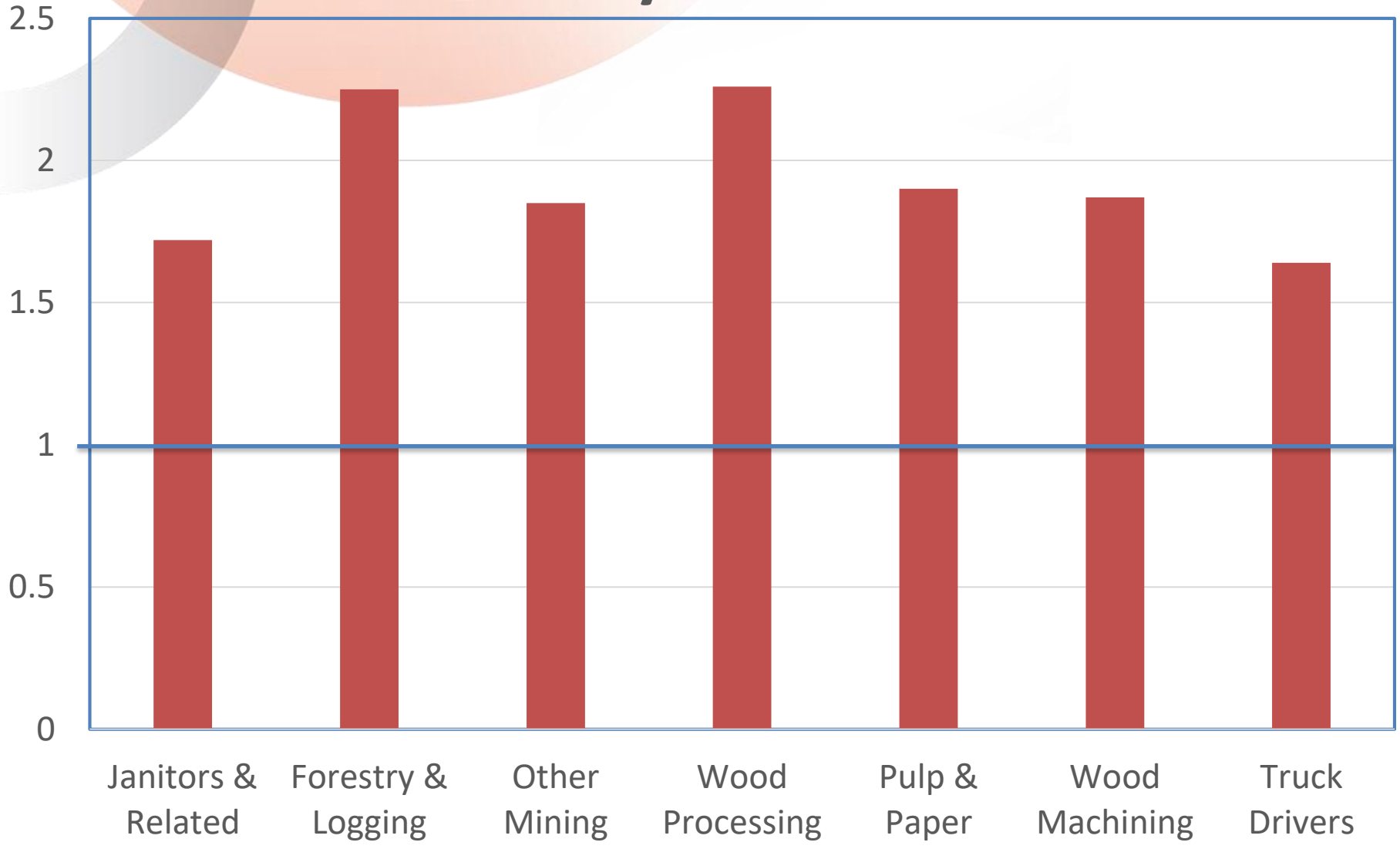
Logar-Henderson et al. Adult Asthma Among Workers in Ontario: Results from the Occupational Disease Surveillance System. Annals of the American Thoracic Society (conditionally accepted).

# Lung Cancer & Diesel Engine Exhaust

| Group | HR (95% CI) |
|---|---|
| Construction trades | 1.1 (1.1-1.2) |
| Excavating, paving & grading & related | 1.8 (1.7-2.0) |
| Excavating, grading & related | 2.1 (1.8-2.4) |
| Paving, surfacing & related | 1.8 (1.1-2.8) |
| Labouring and other elemental work | 1.7 (1.4-2.1) |
| Other related occupations, n.e.c. | 1.9 (1.6-2.2) |
| Transport Equipment Operating Occupations | 1.5 (1.4-1.5) |
| Other Motor Transport Operating | 1.4 (1.3-1.5) |
| Truck Drivers | 1.5 (1.5-1.6) |
| Railway Transport Operating Occupations | 1.5 (1.2-1.8) |
| Water Transport Operating Occupations | 1.1 (0.8-1.5) |
| Other Related Occupations | 1.6 (1.4-1.8) |
| Other crafts & equipment operating | 1.1 (1.1-1.2) |
| Stationary Engine and Related | 1.6 (1.4-1.8) |

Jung et al. Examining lung cancer risks across different industries and occupations in Ontario, Canada: the establishment of the Occupational Disease Surveillance System. Occ Environ Med 2018;75:545-52.

# Raynaud's Syndrome: Based on Ambulatory Care Visits



# Use of Hazard/Exposure Surveillance

- To really prevent disease we need to identify exposure!
- Monitor trends in exposure
- Identify populations or geographic areas most affected
- Set priorities for policy or prevention-related activities (e.g. regulation, education, …)
- Provide data necessary for risk assessment, disease surveillance, research

CAREX CANADA

# A National Occupational & Environmental Exposure Surveillance Project

**Based at:**

1. Faculty of Health Sciences,
   Simon Fraser University, Vancouver
2. School of Population and Public Health,
   University of British Columbia , Vancouver
3. Alberta Health Services, Calgary
4. Occupational Cancer Research Centre, Toronto

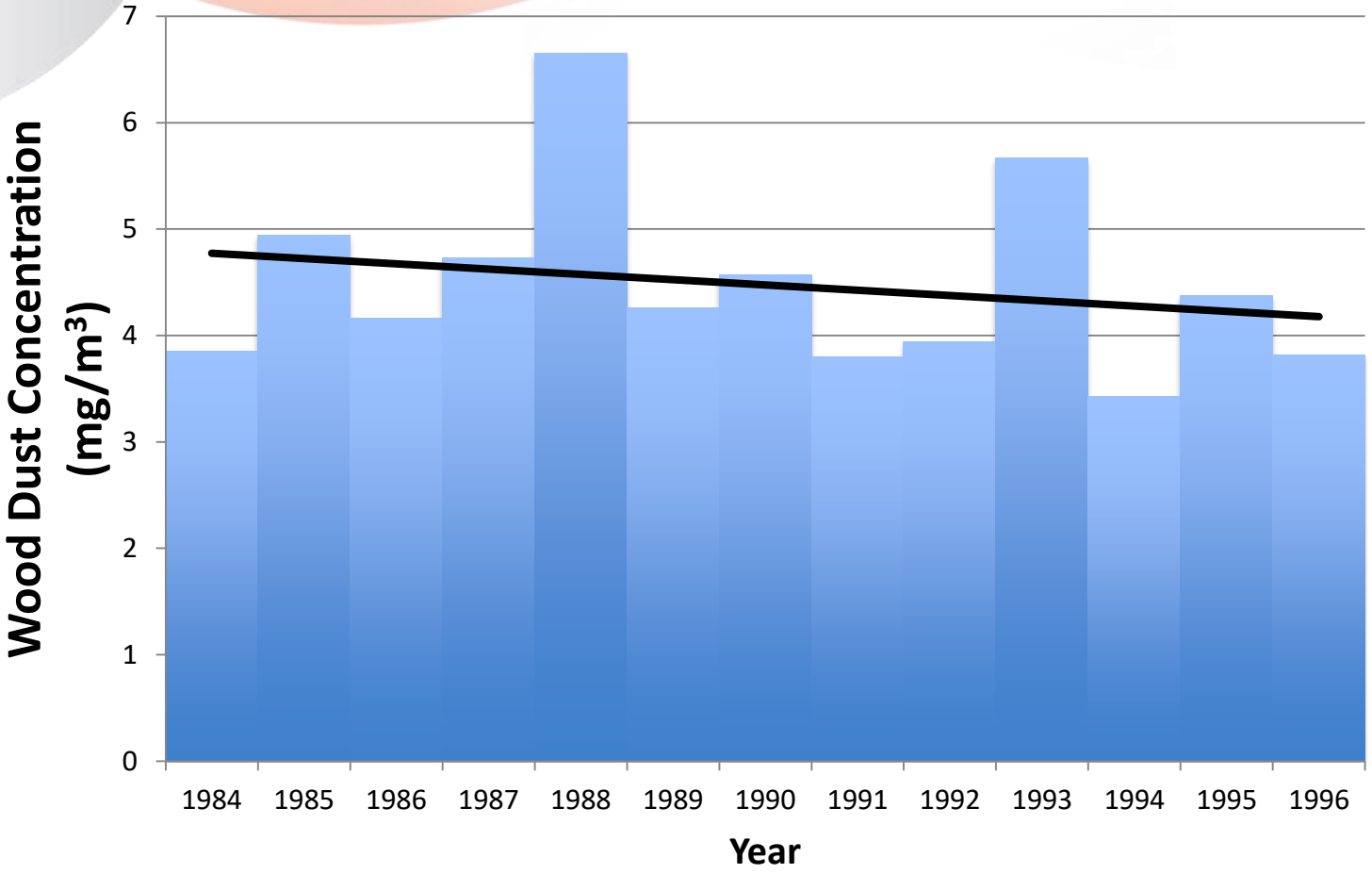
CANADIAN PARTNERSHIP AGAINST CANCER
PARTENARIAT CANADIEN CONTRE LE CANCER

# Workplace Data Collected by Provincial Agencies

| | Ontario (81-96) | BC (81-04) | Quebec (01-05) |
|---|---|---|---|
| Wood dust | 3,848 | 7,194 | 4,588 |
| Formaldehyde | 7,936 | 2,788 | 4,629 |
| Lead | 7,806 | 3,060* | 3,459 |
| Silica | 4,666 | 1,640 | 3,373 |
| Perchloroethylene | 2,764 | 2,148 | 882 |
| Benzene | 1,441 | 658 | 1,240 |
| Cadmium | 1,358 | 851 | 662 |
| Asbestos | 1,787 | 4,718 | 1,385 |
| Beryllium | 292 | 128 | 17,864 |

* plus 5,200 blood-lead & 17,400 urine-lead biological measurements

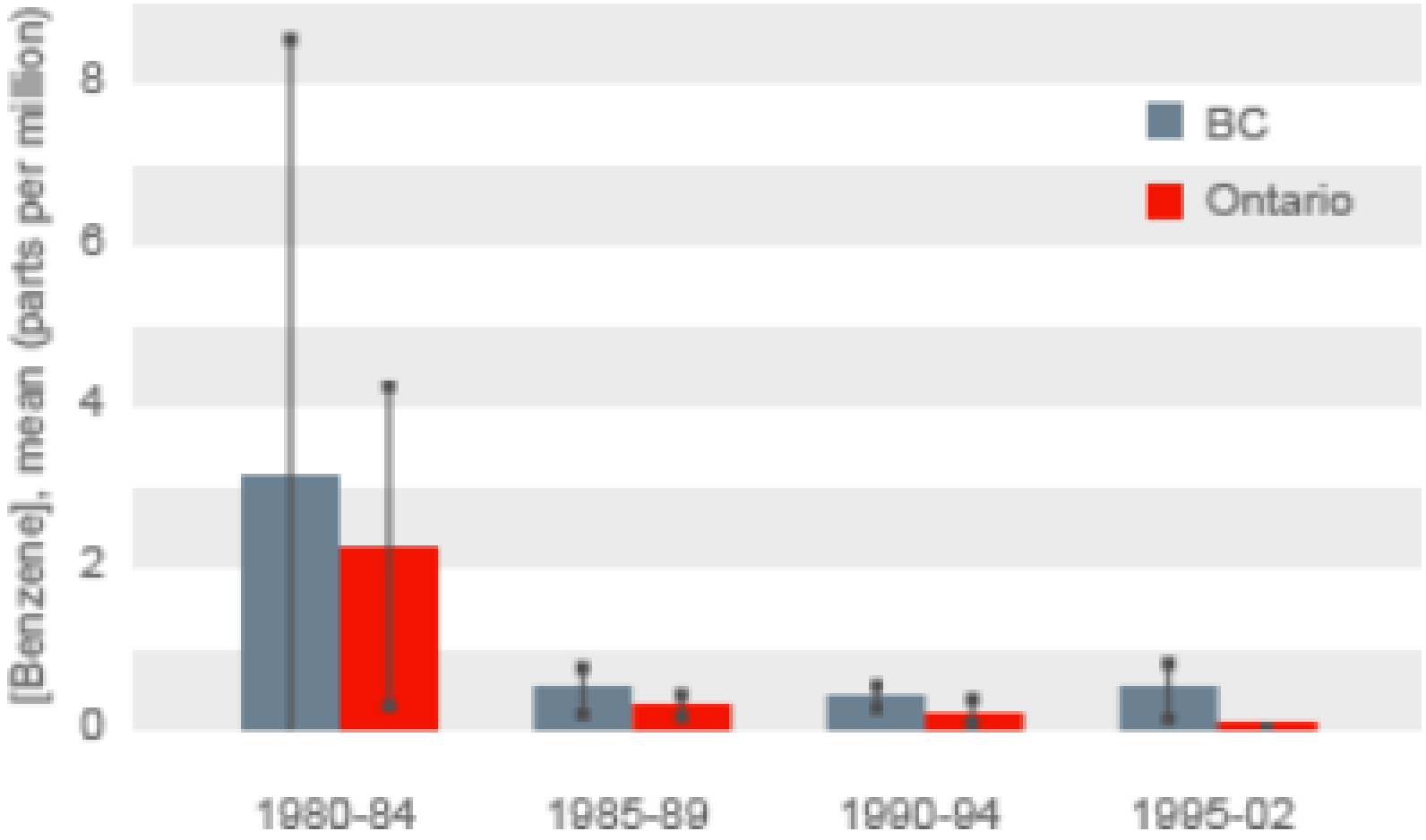
# Mean Wood Dust Concentration by Year: Ontario MESU Database




* Data limited to measurements ≤ 50 mg/m$^3$

# Results from the Canadian Workplace Exposure Database

## Changes in Benzene Exposure Levels Over Time



# Exposure Registries

- National Dose Registry (Health Canada)
  - Created in 1951, ~500,000 radiation-exposed workers
- Ontario Asbestos Worker Registry (ON MOL)
  - Created in 1986, ~25,000 asbestos-exposed workers
- Beryllium Associated Worker Registry (US DOE)
  - Created in 1999, ~25,000 beryllium-exposed workers
- Finnish ASA Registry (FIOH)
  - Created in 1979, ~25,000 workers exposed to 162 known and suspected carcinogens

Arrandale et al. Designing Exposure Registries for Improved Tracking of Occupational Exposure and Disease. Can J Public Health 2016;107(1):e119-25.

# Toxics Reduction Program

Learn about the Toxics Reduction Program, which encourages facilities to reduce toxic substances, outlines their legal reporting and planning requirements, and gives Ontarians information about these substances.

## On this page



## Related

Toxic Substances

A Guide for Regulated Facilities

Toolkit for Toxic Substance Accounting

Reference Tool for Assessing Safer Chemical Alternatives

Toxics reduction reporting

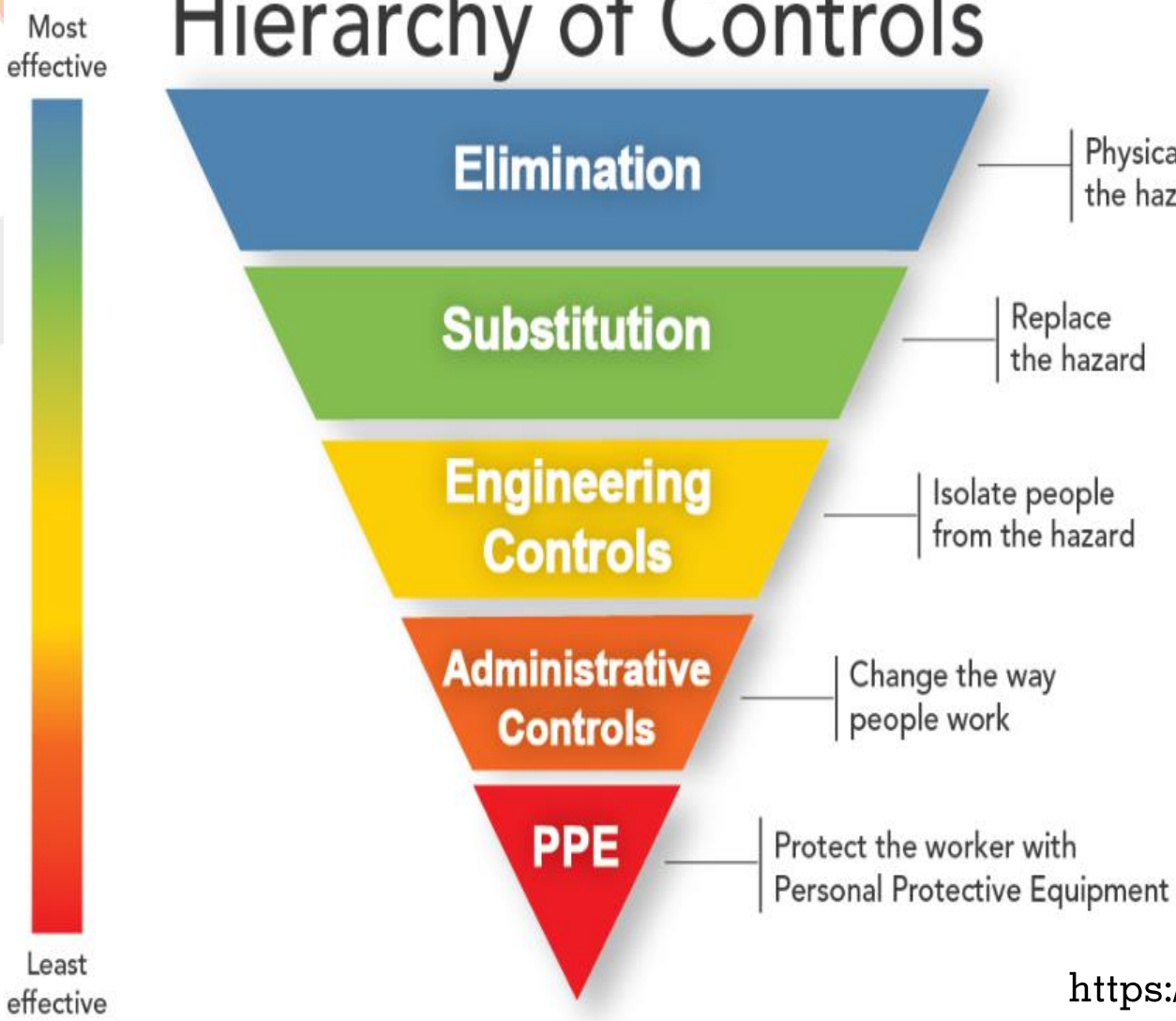
Interactive Map: Toxics reduction

# Use of carcinogens by industrial sector: 2011-2015

| Sectors using most carcinogens | Workers | Tonnes: 2011-2015 | Top 3 carcinogens |
|---|---|---|---|
| Chemical Manufacturing | 12,839 | 10,468,540 | Benzene; Vinyl chloride; 1,3-Butadiene |
| Primary Metal Manufacturing | 132,759 | 4,759,040 | Nickel; Benzene; Lead |
| Petroleum and Coal Products Manufacturing | 14,891 | 1,977,480 | Benzene; 1,3-Butadiene; Nickel |
| Mining (except Oil and Gas) | 28,102 | 648,900 | Nickel; Lead; Arsenic |
| Transportation Equipment Manufacturing | 42,276 | 205,020 | Nickel; Hexavalent chromium; Lead |
| Paper Manufacturing | 18,307 | 28,530 | Formaldehyde; Lead; Arsenic |
| Fabricated Metal Product Manufacturing | 10,728 | 25,140 | Nickel; Hexavalent chromium; Lead |
| Wood Product Manufacturing | 4,102 | 9,770 | Formaldehyde; Arsenic; Benzene |
| Machinery Manufacturing | 1,523 | 7,650 | Nickel; Lead |

Slavik et al. Industry and geographic patterns of use and emission of carcinogens in Ontario, Canada, 2011-2015. Can J Public Health, 2018.

# Hierarchy of Controls




**Early Recognition and Screening**

https://www.cdc.gov/niosh/topics/hierarchy/default.html

- Promising strategies for primary prevention of four occupational diseases: noise-induced hearing loss, dermatitis, asthma, cancer (asbestos, diesel exhaust, silica, shiftwork)
  - A scoping review with key informant interviews

Review team: Barbara Neis & Stephen Bornstein (MUN), Anya Keefe, Hugh Davies (UBC), Linn Holness (UofT), Paul Demers (OCRC), Zhiwei Gao (MUN), Susan Stock (INSPQ), Mieke Koehoorn (UBC), Allen Kraut (UMB), Victoria Arrandale (OCRC), Colin Murray (WorkSafeBC), Mary Shortall & Bill Hynd (NFLDFL), Alec Farquhar (OWA, retired)

# Control Strategies

- Legislation & regulation: including occupational exposure limits and inspections
- Surveillance & screening: monitoring exposure or disease at the workplace
- Control measures: across the full range of the hierarchy of controls
- Education & training
- Multifaceted approaches

BCCSA
BC Construction Safety Alliance

BCCSA SILICA CONTROL TOOL

- Assessment of the risk from exposure
- Identification of the expected exposure
- Suggestions for appropriate controls
- Identification of expected exposure with the controls
- Any PPE that may be required
- Linked to regulatory requirements, produces an Exposure Control Plan

**New to the BCCSA Silica Control Tool?**

Receive step-by-step guidance to prepare your ECP

more info

SafetyNet
Centre for Occupational Health & Safety Research

# An example of multi-faceted primary prevention

- Québec integrates occupational health services into the broader public health framework
- The *OHS Act* mandates doctors in the public health system to carry out occupational disease prevention
- Local teams carry out risk identification and assessment, provide information and training sessions, perform occupational disease screening activities and worker health surveillance

WorkSafeBC

MEMORIAL UNIVERSITY

SafetyNet
Centre for Occupational Health & Safety Research

# Conclusions

- Legislation & regulation: effective in certain contexts, require strong enforcement, need to be up-to-date
- Surveillance & screening: multiple roles, effective
- Control measures: effective across the hierarchy of controls, but too much relying on PPE
- Education & training: effective but influenced by context & manner of delivery
- Multi-faceted approaches: effective for all
- Few studies evaluated the effectiveness of interventions

Institute for Work & Health | Research Excellence Advancing Employee Health

## Break-Even Analysis (WET Method)




| Parameter | Value | Parameter | Value |
|---|---|---|---|
| Silica exposed worker in 2030 | 99,705 | Silica elimination effectiveness (Baseline) | 100% |
| Percentage of exposed workers that use WET | 62% | Silica elimination effectiveness (Medium) | 80% |
| Current compliance level | 44% | Silica elimination effectiveness (Low) | 60% |

# Conclusions

- Preventing occupational disease has become a priority not only in Ontario, but across Canada
- We have made good progress in occupational disease surveillance, although recognition remains very poor
- We have much further to go with hazard/exposure surveillance
- There are effective control strategies, though more evaluation is needed

# Moving the Agenda Forward

- Occupational disease prevention needs to remain a priority
- More data is needed to drive prevention, especially in the area of hazard/exposure surveillance
- We need more prevention research to identify the most effective ways to reduce exposure
  - We need more studies with a strong evaluation component












# Thank You!

http://occupationalcancer.ca

**Thanks to the many OCRC staff and students and our scientific collaborators from across the country who contributed to the research presented here!**