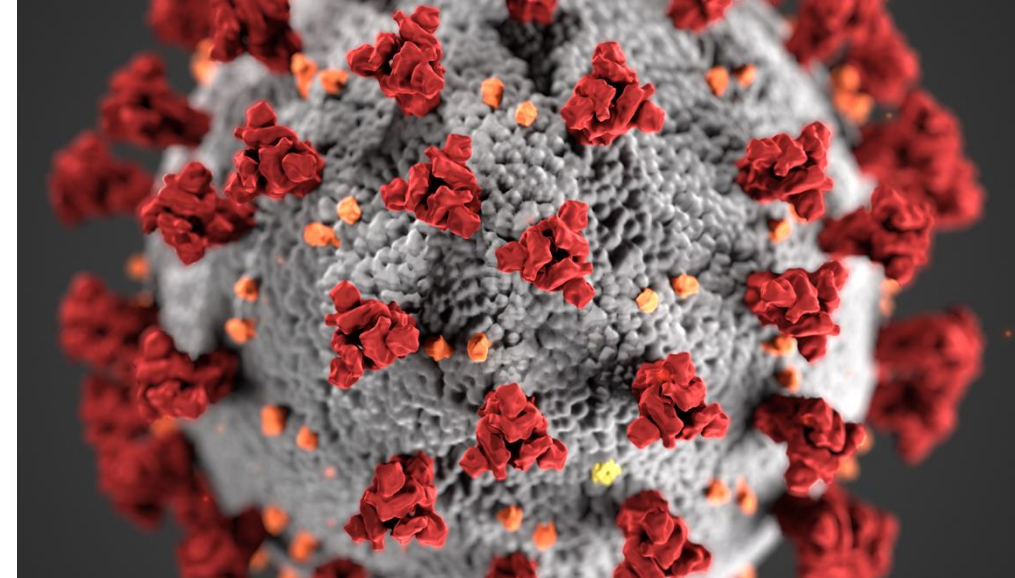


# Surveillance of Asbestos Related Disease using the Ontario Asbestos Workers Registry

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Victoria Arrandale, PhD ROH  
*Assistant Professor, Dalla Lana School of Public Health*  
*Associate Director & Affiliated Scientist, Occupational Cancer Research Centre*



# Outline

- Surveillance and Exposure Registries
- The Ontario Asbestos Workers Registry
- Results from the Linkage Study
- Conclusions and Recommendations

# Surveillance Definition

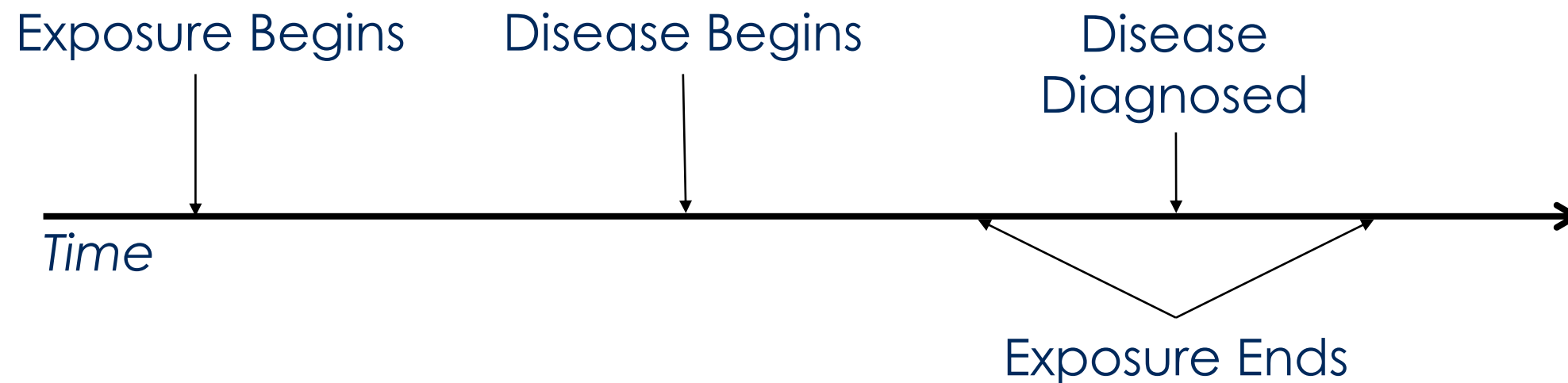
Surveillance ≈ Tracking

From Dictionary of Epidemiology (Porta, 2014):

*“**Systematic and continuous** collection, analysis, and interpretation of data, closely integrated with the **timely and coherent dissemination** of the results and assessment to those who have the right to know so that **action can be taken.**”*

# Occupational Disease Challenges

- Most occupational diseases have multiple causes, few have a single, work-related cause
- Time period between exposure and disease varies, and can be long



# Why Track Occupational Exposure and Disease?

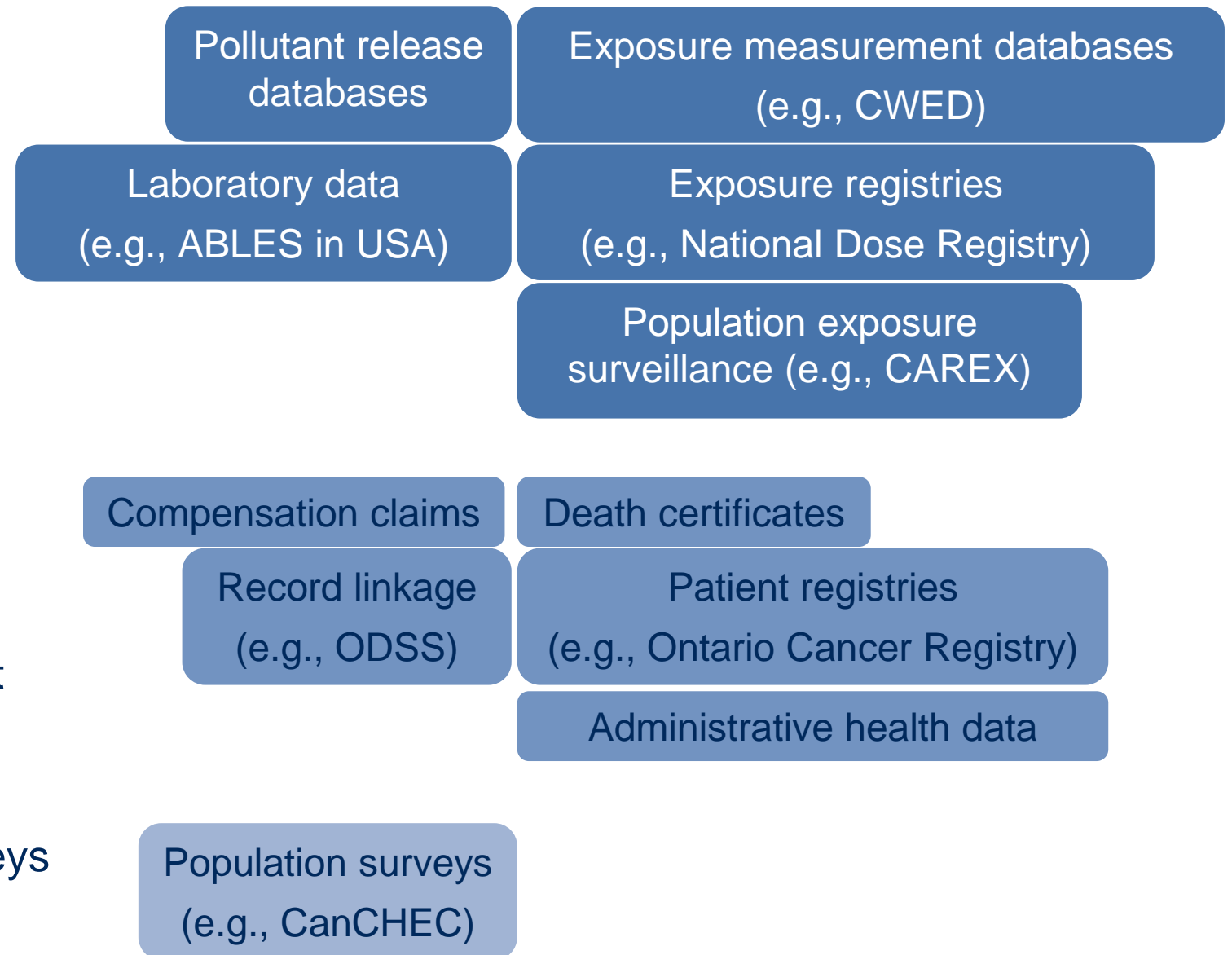
- Monitor trends (exposure or disease) in populations of workers
- Identify new hazards or new groups at risk - emerging issues
- Target prevention efforts
- Monitor impacts of prevention activities

# Surveillance Approaches

- Focus on Exposure
  - Look for and track exposure in the population (surveillance) or individuals (screening)
  - Enroll people with exposure in registries
- Focus on Disease:
  - Look for and track disease in the population (surveillance) or individuals (screening)
  - Enroll people with disease in registries
  - Identify new cases/clusters using sentinel event systems
- Study exposure and disease using population surveys

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# Goal = Prevention



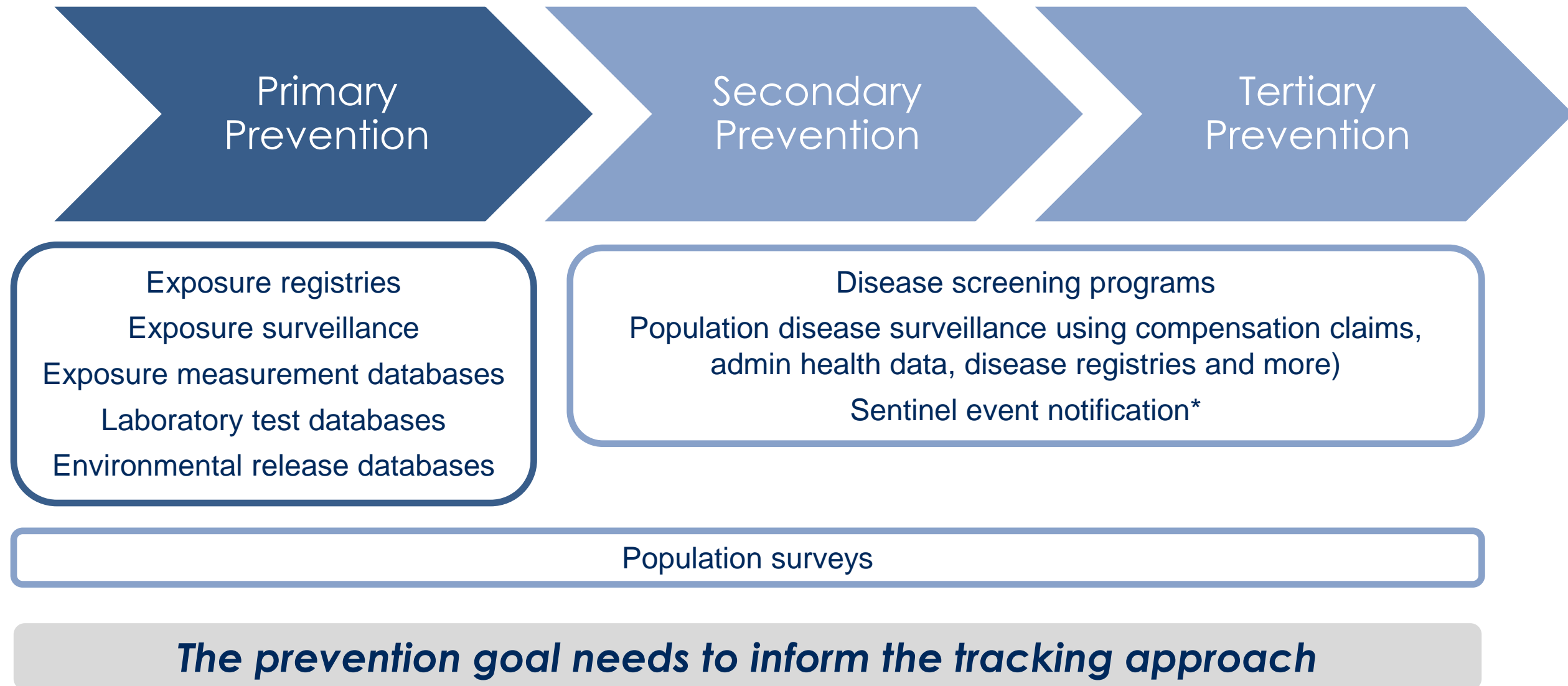
- Reducing exposure among healthy workers
- Hierarchy of controls

- Identifying early stages of disease among workers with exposure

- Ensuring appropriate treatment and compensation for workers with disease



# What is possible?



# Exposure Registries

- Systems for registering or enrolling individuals based on their exposure status
  - Generally, seek to include all exposed individuals within a specified population
  - Mandatory or voluntary

## Information contained?

- One or many agents
- Varying level of detail on exposure
- Varying level of contextual information (e.g., demographics, tasks, employment history etc.)

# Exposure Registries

## *Strengths*

- **Collect exposure information prospectively**
- **Opportunity to intervene before the onset of disease**
- Can sometimes be used as a basis for population-level surveillance
- Can support the investigation of new exposure-response relationships
- Can assist individuals in the assessment of workers' compensation claims

## *Limitations*

- Expensive
- Registry data cannot always be used for population surveillance
- Developing new registries can be challenging
  - Mandatory registry likely requires legislation
  - Cooperation between workplace parties
  - Needs worker participation
  - Privacy and ethical consideration

### *Examples of exposure registries:*

- Canadian National Dose Registry
- Ontario Asbestos Workers Registry
- Workplace Safety and Insurance Board Program for Exposure Incident Reporting (PEIR)
- WorkSafeBC Exposure Registry Program
- Baie Verte Miners' Registry (Baie Verte)
- Beryllium Associated Worker Registry
- US ATSDR Tremolite Asbestos Registry (TAR)
- Finnish ASA Registry

# Asbestos Workers Registry (AWR)

- Created in 1986, currently described in O. Reg. 278/05 (Designated substance - asbestos on construction projects and in buildings and repair operations)
  - 22. (1) The Provincial Physician, Ministry of Labour, shall establish and maintain an Asbestos Workers Register listing the name of each worker for whom an employer submits an asbestos work report under section 21. O. Reg. 278/05, s. 22 (1).*
- Mandatory exposure registry, managed by the MLTSD
- Requires employers to report workers engaged in Type II and Type III work (as work hours) with asbestos containing materials
- When a worker reaches 2,000 cumulative hours of work (approximately equal to one year's work) the worker is notified

# How is data collected?

## Asbestos Work Reports

- Paper or online

This form is required under Section 21 of the Regulation for Asbestos on Construction Projects and in Buildings and Repair Operations. Provide one copy to the employee when complete.

Employer information									
Employer operating name							Business number		
Employer legal name									
Unit number	Street number	Street name			Street type	Street direction	Postal code		
P.O. Box		City/town			Province	Telephone number	Extension	Fax number	
Employee information									
Last name						First name			
Middle name									
Home address									
Unit number	Street number	Street name			Street type	Street direction	Rural route		
P.O. Box		City/town			Province	Postal code	Date of birth (yyyy/mm/dd)		
Hours of work in asbestos type 2 or type 3 operations									
Start date (yyyy/mm/dd)						End date (yyyy/mm/dd)			
Hours of work type 2						Hours of work type 3			
Acknowledgement									
<input type="checkbox"/> I confirm that I am authorized to complete and submit this form. I hereby certify that the information provided is true and correct to the best of my knowledge.									
Last name of person completing this form						First name of person completing this form			
Position						Date (yyyy/mm/dd) 2021/03/10			
Email address									

**Notice of indirect collection of personal information**

The information on this form is being provided by your Employer to the Provincial Physician at the Ministry of Labour, Training and Skills Development to monitor your exposure to asbestos in the workplace. The personal information on this form is collected pursuant to the Occupational Health and Safety Act, O. Reg. 278/05, section 21(1)(a) Regulation for Asbestos on Construction Projects and in Buildings and Repair Operations. The collection of this information from your Employer is in compliance with section 29(1)(h) of the Freedom of Information and Protection of Privacy Act (FIPPA). Questions about the Asbestos Workers Registry may be directed to the Provincial Physician:

Ministry of Labour, Training and Skills Development  
Health Care and Occupational Medicine Unit  
505 University Ave., 19th Floor  
Toronto ON M7A 1T7

Questions about privacy matters related to the collection, use and disclosure of personal information can be directed to:

Ministry of Labour, Training and Skills Development  
Freedom of Information and Privacy Office  
400 University Ave., 10th Floor  
Toronto ON M7A 1T7

**ServiceOntario**

Next Clear Save a draft Print ? Help

This form is required under Section 21 of the Regulation for Asbestos on Construction Projects and in Buildings and Repair Operations. Provide one copy to the employee when complete.

**Employer**

**Employer information**

Employer operating name	Business number
-------------------------	-----------------

Employer legal name

Unit number	Street number	Street name	Street type	Street direction	Postal code
-------------	---------------	-------------	-------------	------------------	-------------

P.O. Box	City/town	Province	Telephone number	Extension	Fax number
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**Employee**

**Employee information**

Last name	First name
-----------	------------

Middle name

**Home address**

Unit number	Street number	Street name	Street type	Street direction	Rural route
-------------	---------------	-------------	-------------	------------------	-------------

P.O. Box	City/town	Province	Postal code	Date of birth (yyyy/mm/dd)
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**Exposure**

**Hours of work in asbestos type 2 or type 3 operations**

Start date (yyyy/mm/dd)	End date (yyyy/mm/dd)
-------------------------	-----------------------

Hours of work type 2	Hours of work type 3
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# Asbestos Work Types

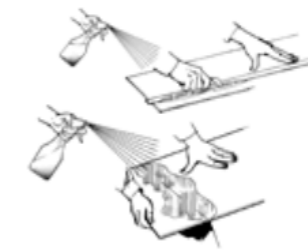
## Examples of Type 1 Operations



Hand Sawing Asbestos  
Cement Pipe



Manual Pipe Cutter



Scribing and Breaking  
Asbestos Cement

- Type 1 – lowest risk
  - <math>7.5\text{m}^2</math> of ceiling tiles without damage
  - Work with nonfriable ACM without damage (not ceiling tiles)
  - Work using wetting methods with a non powered hand held tool
  - <math>1\text{m}^2</math> of drywall with ACM joint filling compounds
- Type 2
  - “Work that may expose a worker to asbestos and that is not classified as a Type 1 or Type 3 operation, is also to be classified as a Type 2 operation”
  - See *Ontario.ca* for more examples
- Type 3 – highest risk
  - “Work with friable or non-friable ACM that has the potential to generate high concentrations of asbestos fibres in air”
  - >1m<sup>2</sup> friable asbestos
  - Spray application to friable asbestos
  - Work on ventilation system with ACM fireproofing
  - Work where asbestos products were manufactured
  - Work on kiln or furnace made of ACM
  - Work with power tool that does not have a HEPA filter

# Study Aims

*Primary objective:*

*Evaluate the risk of cancer and non-malignant respiratory disease among workers in the Asbestos Workers Registry*

*Secondary objective:*

*Assess the utility of the Asbestos Workers Registry for use in occupational disease surveillance*



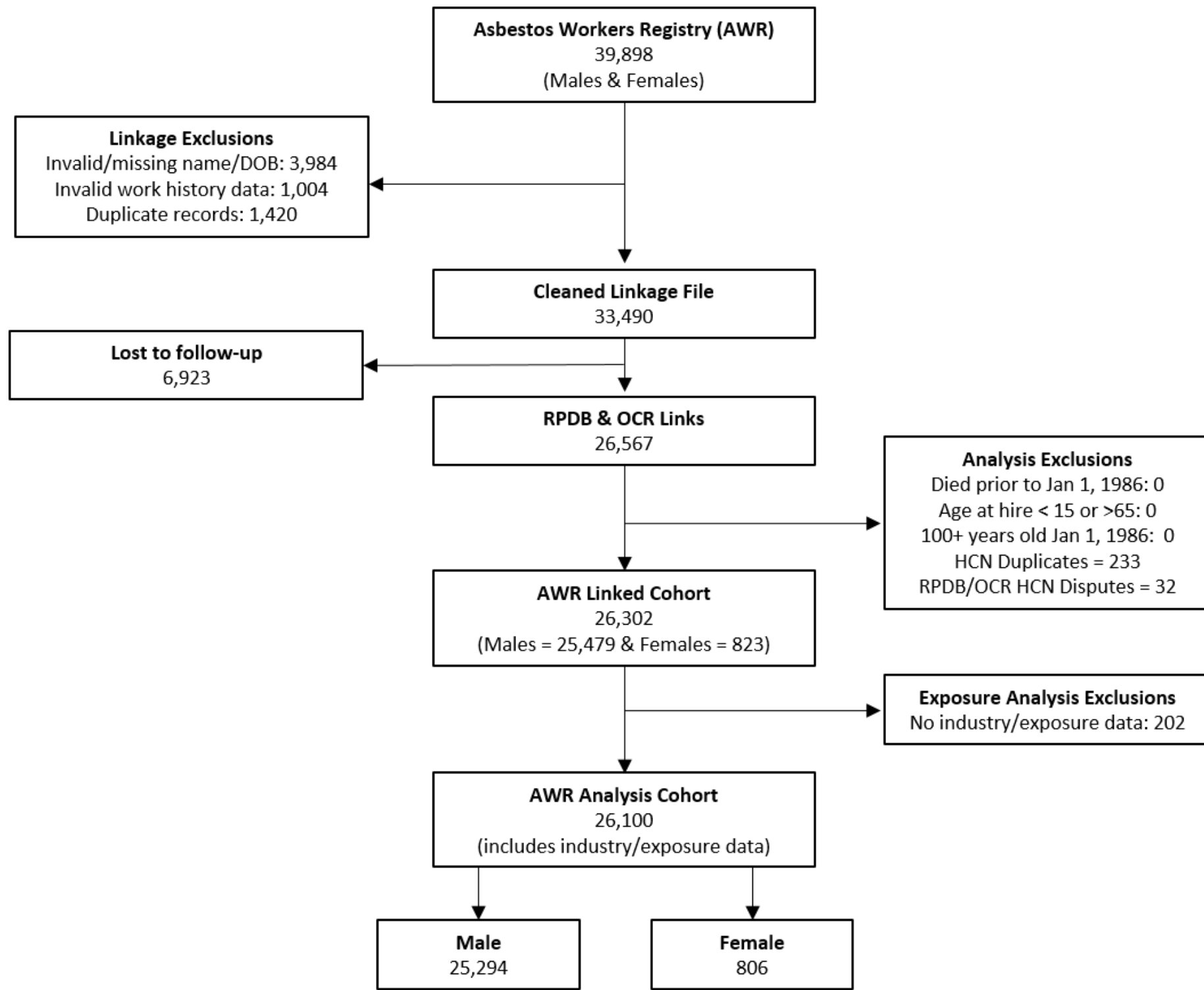
**Ministry of Labour,  
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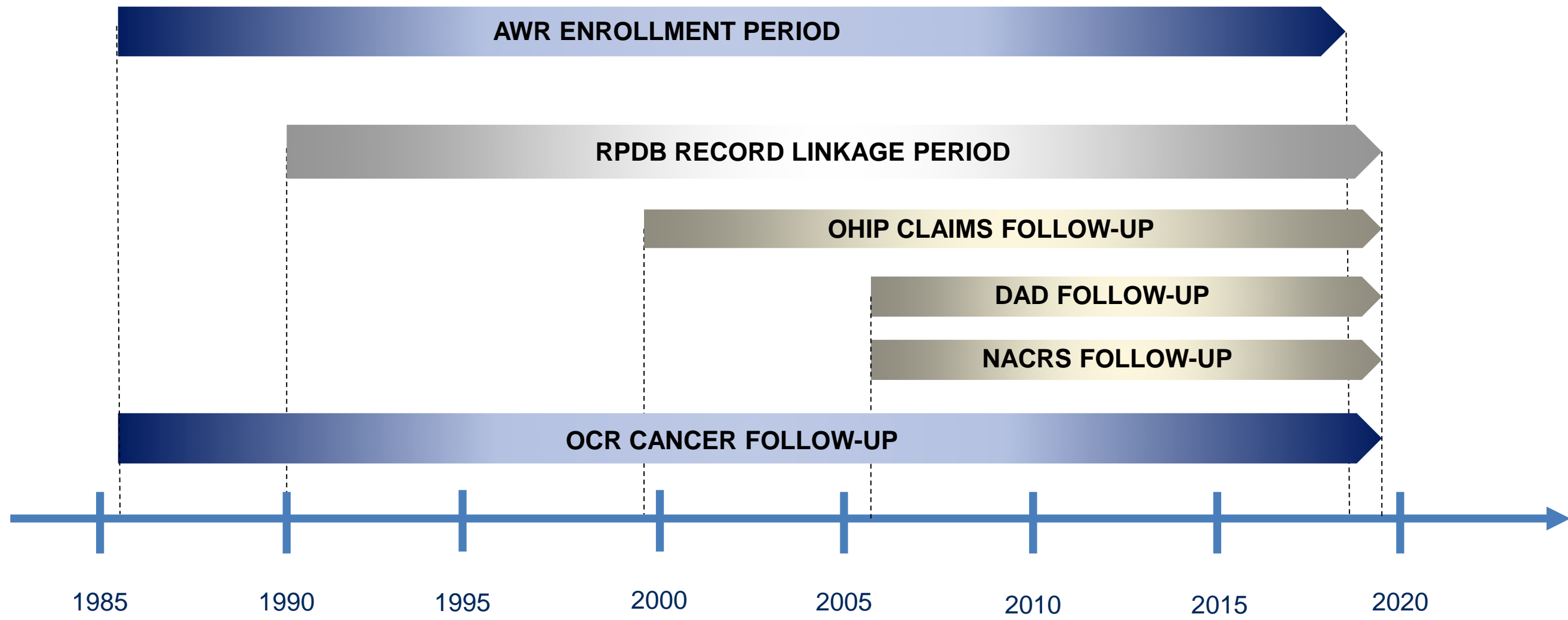
# Methods

- Data sharing agreement with MLTSD and Ontario Health (Cancer Care Ontario)
- The AWR was linked to:
  - OHIP's Registered Persons Database (RPDB)
    - Ontario Health Insurance Plan (OHIP) claims database
    - Discharge Abstract Database (DAD)
    - National Ambulatory Care Reporting System (NACRS)
  - Ontario Cancer Registry (OCR)
- Exposure was assessed two ways:
  1. Years of work history recorded in the AWR
  2. Hours of asbestos work (Type 2 + Type 3 summed)
- Health risks were compared two ways:
  - Externally to the general population of Ontario (standardized incidence ratios)
  - Internally to the lowest exposure group (Poisson regression to estimate relative risks)



**Note:** Some records met multiple exclusion criteria  
 RPDB = Registered Persons Database (Health Card Numbers)  
 OCR = Ontario Cancer Registry

# Timeline



# Case Definitions

Respiratory Diseases	DAD/NACRS (2006-2019)	OHIP (1999-2019)	Definitions
Asbestosis	J61	501	One hospitalization code or one ambulatory care visit, in any diagnosis, or two physician billing codes
Pulmonary Fibrosis	J84.1	515	One hospitalization code or one ambulatory care visit, in any diagnosis, or two physician billing codes in a year
Chronic Obstructive Pulmonary Disease (COPD)	J41-J44	491-492, 496	One hospitalization ever or three or more physician claims within 2 years
Cancers	ICD-10 Site	ICD-9 Site	OCR SEER Definitions (ICD-O-3 Histology 1986-2019)
Lung and Bronchus	C34	162	excluding 9050-9055, 9140, 9590-9992
Mesothelioma	C45	163.9	9050-9055

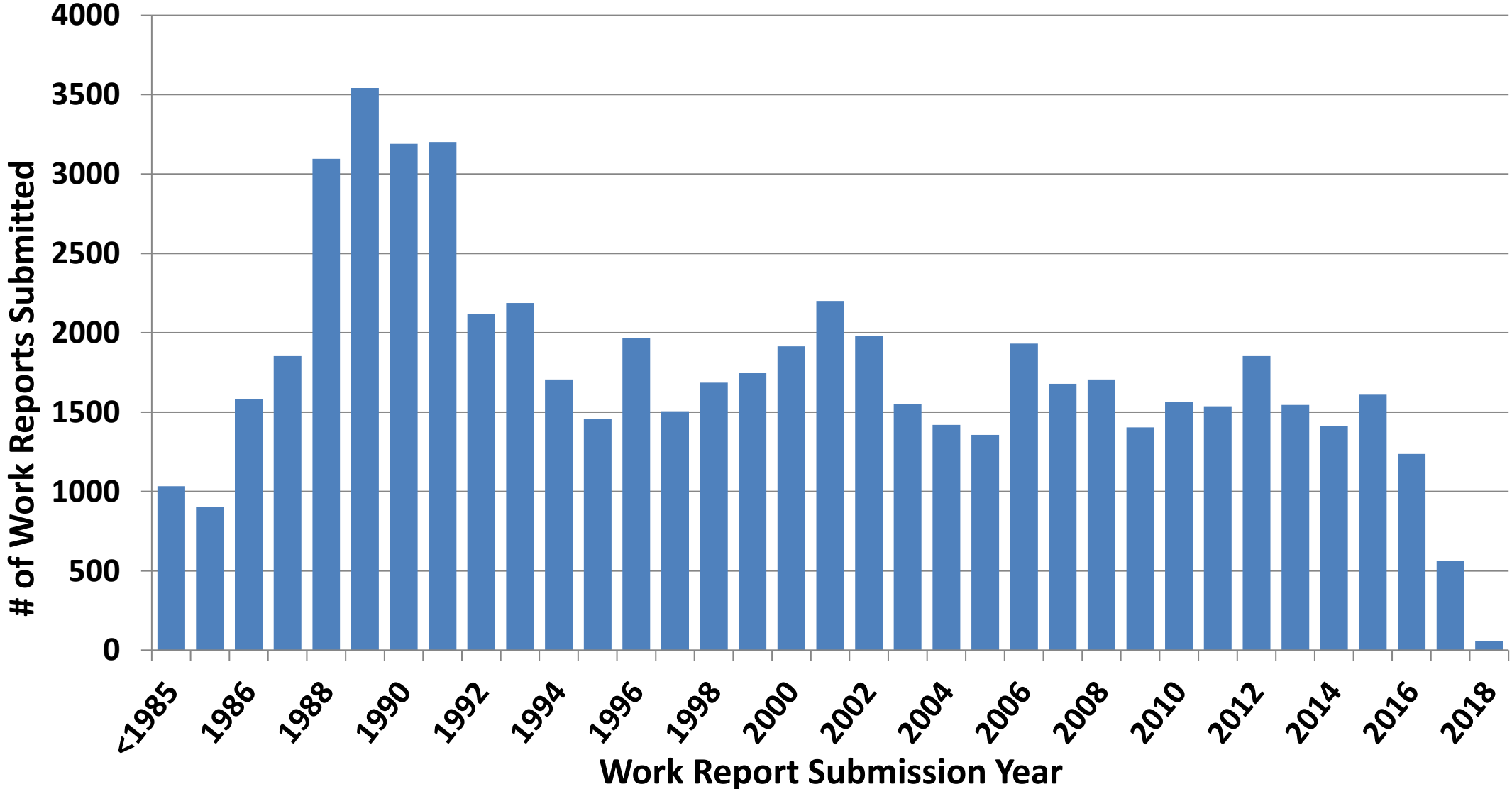
**OCR** = Ontario Cancer Registry

**SEER** = Surveillance, Epidemiology, and End Results

# Results – Cohort Description

- 26,302 (79%) people linked to the administrative health data
  - 823 (3.1%) were female
- Mean age at first employment was 35.6 years (range 15 – 79 years)
- Workers' year of first employment ranged from 1934 to 2018 (mean 1995)
- Most workers (96.3%) had 10 years or less of employment recorded in the AWR
- The biggest industry sector represented was construction (61%)
  - Manufacturing (18%), educational services (8%) & utilities (4%)
- Only 573 (2%) people were employed in waste management & remediation services, the industry where asbestos remediation companies would be expected to be categorized

# Results – ACM Work Reports Submitted Annually



*\* work period end year used as proxy for submission year*

# Men and Women

	Male Incidence (n=25,479)			Female Incidence (n=823)		
	OBS	SIR*	95% CI	OBS	SIR*	95% CI
All Cancer	3352	0.99	(0.95-1.02)	131	1.08	(0.90-1.28)
Lung Cancer	<b>560</b>	<b>1.12</b>	<b>(1.03-1.22)</b>	<b>30</b>	<b>1.66</b>	<b>(1.12-2.36)</b>
Mesothelioma	<b>102</b>	<b>6.55</b>	<b>(5.34-7.96)</b>	<b>&lt;6</b>	<b>19.3</b>	<b>(3.87-56.3)</b>
All Respiratory Disease	<b>16112</b>	<b>1.89</b>	<b>(1.86-1.91)</b>	<b>599</b>	<b>2.24</b>	<b>(2.06-2.42)</b>
COPD	<b>2214</b>	<b>2.34</b>	<b>(2.24-2.44)</b>	<b>107</b>	<b>2.62</b>	<b>(2.14-3.16)</b>
Asbestosis	<b>166</b>	<b>11.1</b>	<b>(9.46-12.9)</b>	<b>&lt;6</b>	1.21	(0.02-6.75)
Pulmonary Fibrosis	<b>197</b>	<b>13.8</b>	<b>(11.9-15.9)</b>	<b>&lt;6</b>	<b>9.15</b>	<b>(2.46-23.4)</b>

\* Standardized Incidence Ratios adjusted for 5-year age and calendar period.

# Industry Groups – External Comparisons

	Construction (n=15,933)			Manufacturing (n=4,680)		
	OBS	SIR*	95% CI	OBS	SIR*	95% CI
Lung Cancer	299	1.44	(1.28-1.61)	128	0.91	(0.76-1.07)
Mesothelioma	63	10.12	(7.78-13.0)	22	4.55	(2.85-6.89)
COPD	1310	3.09	(2.92-3.26)	505	1.78	(1.63-1.94)
Asbestosis	107	18.08	(14.8-21.9)	29	6.23	(4.17-8.95)
Pulmonary Fibrosis	102	11.61	(9.46-14.1)	53	17.5	(13.1-22.9)

\* Standardized Incidence Ratios adjusted for sex & 5-year age & calendar period.



# Industry Groups – Internal Comparisons

	Industry	Cases	RR (95% CI)
<b>Lung Cancer</b>	Other industries*	21	REF
	<b>Construction</b> ( <i>note: mesothelioma</i> )	<b>294</b>	<b>1.76 (1.13-2.74)</b>
	Educational services	88	1.00 (0.61-1.63)
	Health care and social assistance	13	1.15 (0.58-2.30)
	Manufacturing	128	1.15 (0.73-1.83)
	Utilities	30	1.13 (0.64-1.97)
	Administrative and support, waste management and remediation services	<6	1.23 (0.46-3.26)

	Industry	Cases	RR (95% CI)
<b>COPD</b>	Other industries*	105	REF
	<b>Construction</b>	<b>1284</b>	<b>1.52 (1.24-1.85)</b>
	Educational services	253	0.92 (0.73-1.16)
	Health care and social assistance	46	0.91 (0.65-1.29)
	Manufacturing	452	0.90 (0.73-1.12)
	Utilities	127	1.11 (0.86-1.44)
	<b>Administrative and support, waste management and remediation services</b>	<b>41</b>	<b>1.63 (1.14-2.34)</b>

# Major Outcomes by ACM Work Years

	< 1 years n=15,784 (62%)	1 – <10 years n=8,748 (34%)	10 – <20 years n=718 (3%)	≥ 20 years n=229 (1%)	
	Ref.	RR (95% CI)	RR (95% CI)	RR (95% CI)	Trend
Lung Cancer	1	1.03 (0.86-1.23)	0.81 (0.50-1.31)	1.50 (0.99-2.26)	P=0.20
Mesothelioma	1	2.02 (1.33-3.06)	0.99 (0.01-3.20)	2.27 (0.95-5.39)	P=0.21
COPD	1	0.94 (0.86-1.03)	0.75 (0.58-0.97)	1.18 (0.88-1.58)	P=0.76
<b>Asbestosis</b>	<b>1</b>	<b>2.18 (1.57-3.04)</b>	<b>2.44 (1.25-4.77)</b>	<b>2.51 (1.19-5.30)</b>	<b>P&lt;0.01</b>
Pulmonary Fibrosis	1	1.93 (0.98-3.79)	2.09 (1.11-3.93)	1.47 (0.77-2.80)	P=0.54

# Major Outcomes by ACM Work Hours<sup>+</sup>

	Low (<30 hours, n=9,417)	Medium (20-237 hours, n=8,115)		High (>238 hours, n=7,947)		Trend
	Ref.	RR*	95% CI	RR*	95% CI	
Lung Cancer	1.00	1.11	(0.90-1.38)	<b>1.30</b>	<b>(1.07-1.57)</b>	P=0.01
Mesothelioma	1.00	<b>1.93</b>	<b>(1.10-3.39)</b>	<b>3.13</b>	<b>(1.94-5.06)</b>	P<0.01
COPD	1.00	1.10	(0.99-1.22)	<b>1.34</b>	<b>(1.22-1.48)</b>	P<0.01
Asbestosis	1.00	0.97	(0.59-1.59)	<b>3.31</b>	<b>(2.33-4.71)</b>	P<0.01
Pulmonary Fibrosis	1.00	1.36	(0.94-1.96)	<b>1.86</b>	<b>(1.34-2.58)</b>	P<0.01

+ Based on tertiles of reported hours in the linked population.

\* Rate Ratios adjusted for sex, age & calendar period.

# Conclusions

- Significant higher risk of lung cancer, mesothelioma, asbestosis, COPD, and pulmonary fibrosis were observed compared to the general population
- Only the risk of asbestosis showed a clear significant increasing trend with employment duration (work years)
- Stronger association was found between exposure intensity (work hours) and the risk of lung cancer, mesothelioma, asbestosis, COPD, and pulmonary fibrosis
- Asbestos-related cancer & non-malignant respiratory disease continue to occur among asbestos exposed workers in Ontario
  - Results from historical exposure; impact of current exposure will be seen in future
- The AWR successfully identified a high-risk population for asbestos-related cancer & non-malignant respiratory disease

# Limitations & Strengths

- Limited asbestos exposure information
  - Though not evaluated, years and hours of work likely to be underestimated
- No information on other occupational exposures
  - Workers may be exposure to other respiratory hazards that can cause pulmonary fibrosis, COPD and lung cancer
- Mesothelioma and asbestosis results support that the AWR has captured an asbestos exposed population
- High quality health records to identify incidence rather than mortality
- Adequate power for many analyses, although limited for women and some industry sectors

# Implications

- Contemporary exposures may be associated with high risks
- Excess risks were observed well below 2000 hours threshold
  - Given under-reporting, hours may just be an indicator of risk
  - However, a lower threshold should be investigated
- With the advent of lung cancer screening the threshold for recommending medical follow-up may have additional impacts

# Recommendations

- Results demonstrate utility of the AWR for surveillance and support its continued use in Ontario
  - Could be improved with better exposure data (e.g., task information)
- Compliance with reporting requirements should be more fully evaluated (Kone et al, )
  - Linkage to enforcement and data systems
  - Routine reporting to identify firms that have gaps in reporting (or ceased reporting)
- Record linkage should be periodically updated
  - Additional linkage to compensation data would add additional insights

**Dalla Lana**  
School of Public Health

OCRC

Dr. Paul Demers  
Dr. Nathan De Bono  
Colin Berriault  
Daniel Song

MLTSD

Dr. Leon Genesove

**Thank you & Questions?**

[victoria.arrandale@utoronto.ca](mailto:victoria.arrandale@utoronto.ca)