

The occupational cancer burden: Australia and beyond

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The more things change, the more they stay the same

- The past.....Asbestos
- The present.....Asbestos
- The future.....Asbestos



What do we know?

- Carcinogenic agents (exposures)
.....mostly
- Cancer types associated with carcinogens
- How to avoid exposure



What causes cancer?

- International Agency for Research on Cancer (IARC)
- Group 1: **Definitely** causes cancer in humans
- Group 2A: **Probably** causes cancer in humans
- Group 2B: **Possibly** causes cancer in humans
- Group 3: **Not enough evidence** to decide
- Group 4: **Does not** cause cancer in humans



What don't we know?

- Who is exposed?
- What are they exposed to?
- How many cases occur that are related to occupational exposures?



Estimating the burden



Why is it so hard??

- Most occupational cancers can be caused by non-occupational causes
- Usually no way to determine the cause in an individual case
- Long latency obscures the connection to exposure

Usually use attributable fraction approach



Occupational cancer estimates made easy

Determine the proportion of cases resulting from exposure to the risk factor

Find the total number of cases

Multiply the proportion by the number of cases

= cases due to the risk factor!



Attributable fraction

Based on:

- exposure prevalence
- relative risk

$$AF = \frac{\sum P_i * R R_i - 1}{\sum P_i * R R_i}$$



Producing the estimates

- List of occupational carcinogens
- Estimate of the relative risk for each carcinogen
- Proportion of people exposed
- Number of cancers



The international burden



Estimates of occupational cancer - selected countries

United States

- 1981: 4% (Doll and Peto)
- 1987: 6% to 10% (Leigh et al)
- 2003: 2% to 5% (Steenland et al)

Finland

- 2001: 14% (male) (Nurminen and Karjalainen)
- 2001: 2% (female) (Nurminen and Karjalainen)

New Zealand

- 2005: 5% to 9% (male) (t'Mannetje et al)
- 2005: 0.5% to 2% (female) (t'Mannetje et al)



Global estimates of occupational cancer

2000: 456,000 (Takala)

2004: 610,000 (Hamalainen et al)

2005: 152,000 (Driscoll et al)

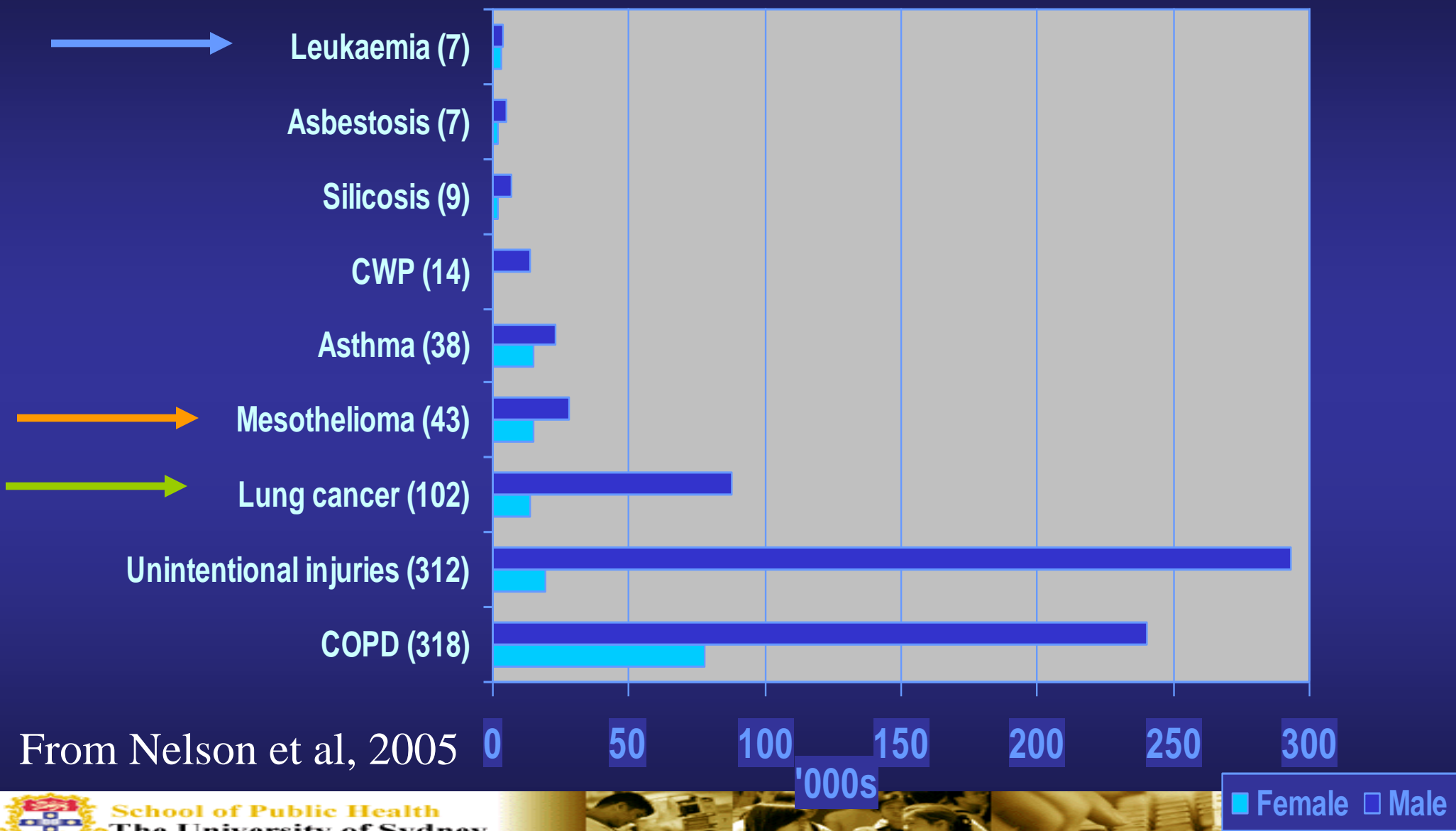


Mesothelioma estimates

- 43,000 Driscoll et al, 2005
- 14,200 – 25,000 Park et al, 2011



The burden internationally (deaths)



The UK Cancer Burden study

- Number of cancers due to occupation in Great Britain
- Broken down by:
 - Cancer type
 - Carcinogens
 - Industry sectors
- Lesley Rushton, Sally Hutchings



Meticulous, complicated methods



Meticulous, complicated methods (Aust)

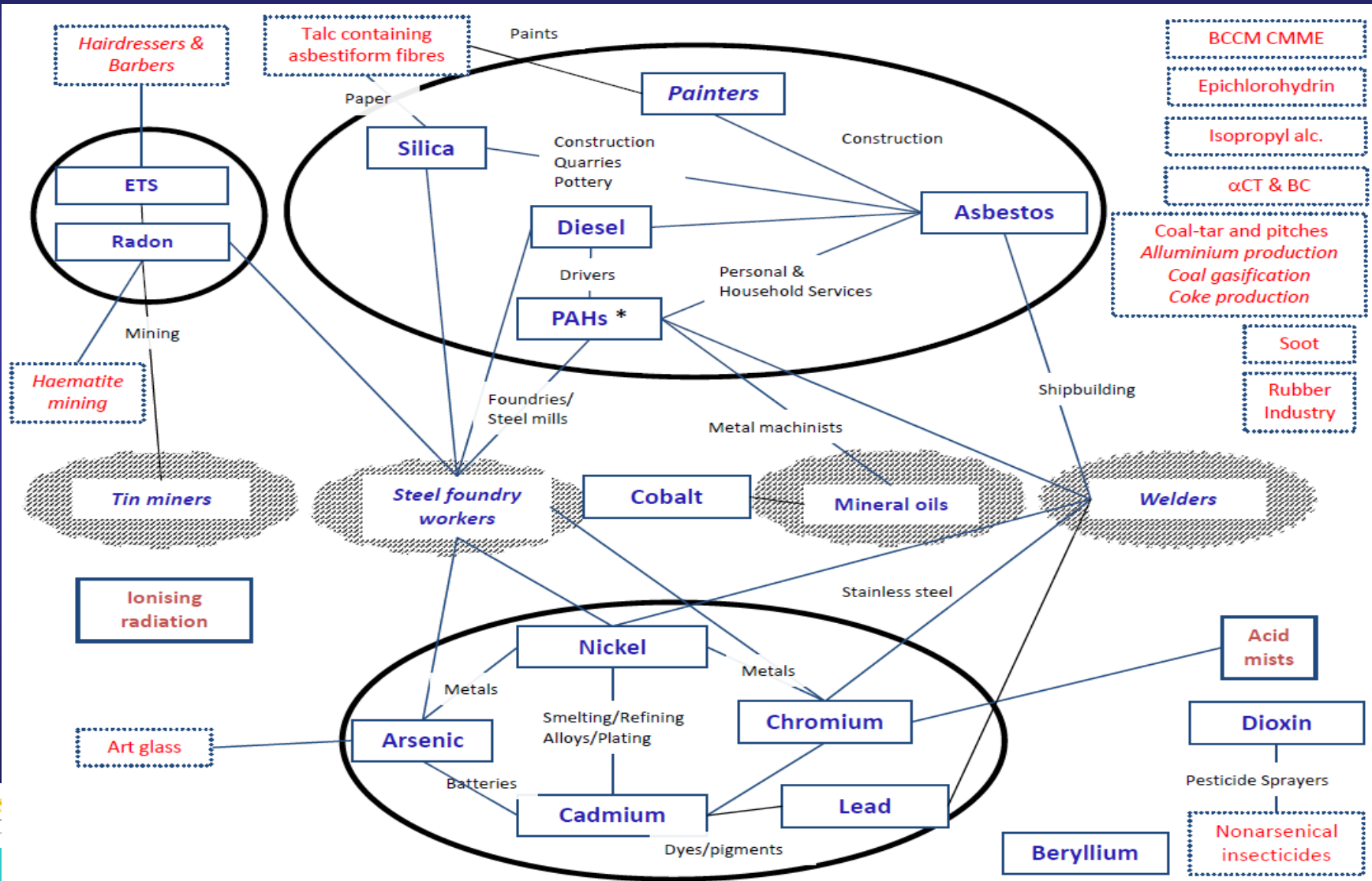
Occupational exposure



Cancer



Meticulous, complicated methods (UK)



Most common types of cancer caused by work

Cancer type	No. of work-related cancers, UK 2004
Lung	5,447
Non-melanoma skin	2,928
Breast	1,969
Mesothelioma	1,937
Bladder	550
Total	13,679

From Rushton et al, 2010



Most common carcinogens at work

Carcinogen	No. of work-related cancers, UK 2004
Asbestos	4,216
Shiftwork	1,957
Mineral oils	1,730
Solar radiation	1,541
Silica	907
Total	13,679

From Rushton et al, 2010



Industries with the highest number of work-related cancers

Industry	No. of work-related cancers, UK 2004
Construction	4,816
Shiftwork	1,957
Metal workers	1,250
Personal and household services	804
Roofers, road construction	541
Total	13,679

From Rushton et al, 2010



Future predictions of cancers



Why should estimates change over time?

- Different exposure types
- Different exposure intensities
- Different exposure circumstances
- Different cancer profiles



Testing reduction of exposure standard and changes in compliance Forecast lung cancers for 2060 for Respirable Crystalline Silica

	2010		
	Attributable Fraction	Attributable registrations	Avoided registrations
	3.3	803	
	2060		
Base-line: exposure limit 0.1mg/m ³ , compliance 33%	1.08	794	
Exposure limit 0.05mg/m ³ , compliance 33%	0.80	592	202
Exposure limit 0.025mg/m ³ , compliance 33%	0.56	409	385
Exposure limit 0.1mg/m ³ , compliance 90%	0.14	102	693
Exposure limit 0.05mg/m ³ , compliance 90%	0.07	49	745
Exposure limit 0.025mg/m ³ , compliance 90%	0.03	21	773

Based on Rushton et al, 2012

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The burden in Australia



Estimates of occupational cancer - Australia

- 1991 Winder and Lewis
- 1996 Kerr et al
- 1999 Mathers et al

2% to 4% (All based on Doll and Peto)

2001 – 2003 403 accepted compensation claims for cancer



Occupational cancer in Australia

- 5000 cancers each year
 - 11% of incident cancers in males
 - 2% of incident cancers in females
- PLUS about 34 000 Non-melanoma skin cancer (NMSC)
 - 13% of NMSCs in males
 - 4% of NMSCs in females

Fritschi and Driscoll, 2006



Numbers - males

Cancer	Attributable fraction	Number of cases
Bronchus and lung	29%	1,530
Prostate	6%	630
Mesothelioma	90%	352
Bladder	14%	304
Colon	6%	265
Leukaemia	18%	264
Non-Hodgkin's lymphoma	13%	252
Melanoma	4%	192
Stomach	10%	131
Pancreas	13%	122



Numbers – females

Cancer	Attributable fraction	Number of cases
Breast	2%	192
Bronchus and lung	5%	147
Non-Hodgkin's lymphoma	3%	49
Cervix	6%	44
Stomach	5%	38
Pancreas	3%	31



Workers exposed to carcinogens

- 1.5 Million (23%)
- 60% to 90%
 - Forestry and logging
 - Furniture and fixture manufacturing
 - Other mining
 - Petroleum and coal products manufacture
 - Other non-metallic mineral products manufacture
 - Pottery, china and earthenware manufacture
 - Fishing
 - Wood and wood products manufacture
 - Air transport



Where are we heading?



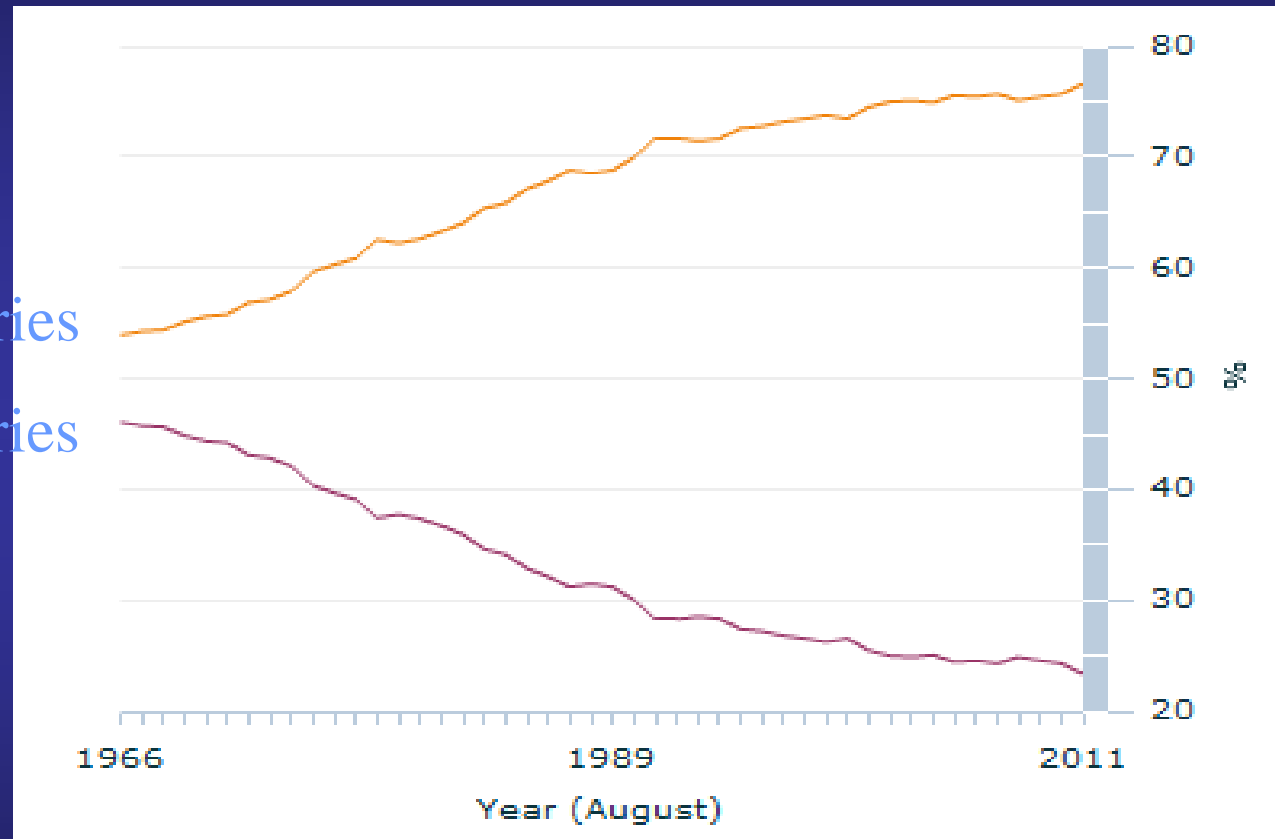
What's changing?

- Changing industry distribution
- Changing occupation distribution
- Changing demographics – more women, more older persons
- Better control of many 'traditional' exposures
- Activity replaced by inactivity
- Public better educated...?



Changing workplace - industry

Service industries
Production industries

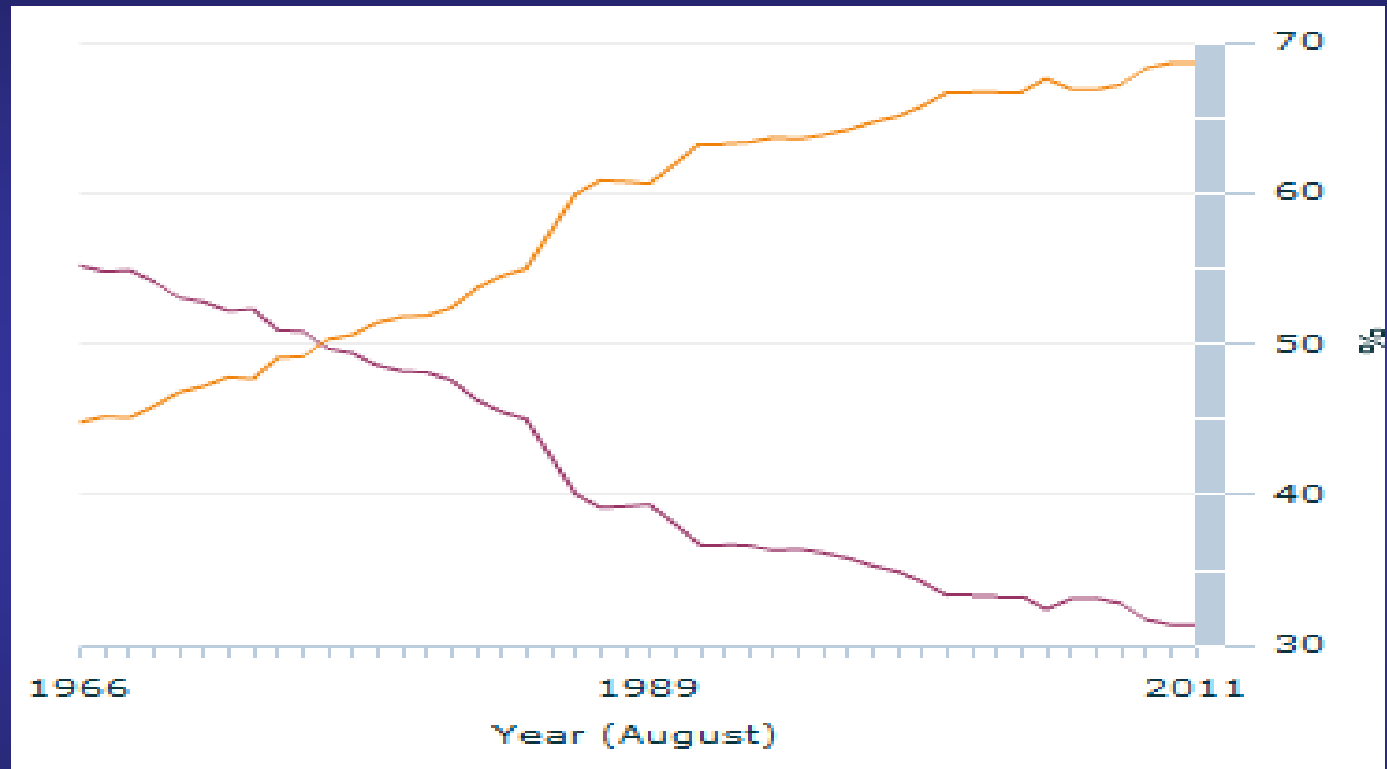


Proportion of all employed people in the production and service industries – 1966-2011 – from the ABS



Changing workplace - occupation

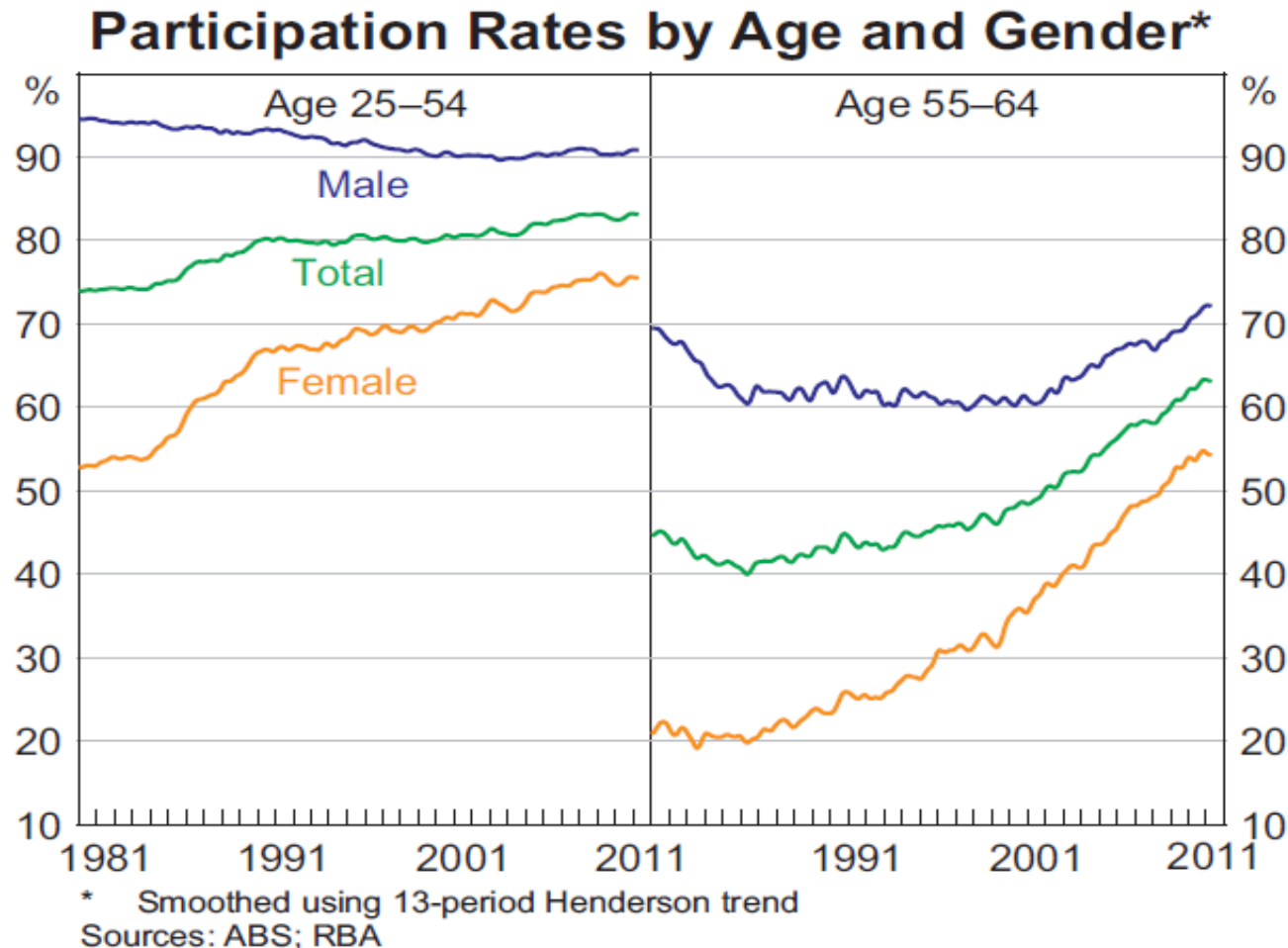
Blue collar
White collar



Proportion of all employed people in blue and white collar occupations – 1966-2011 – from the ABS



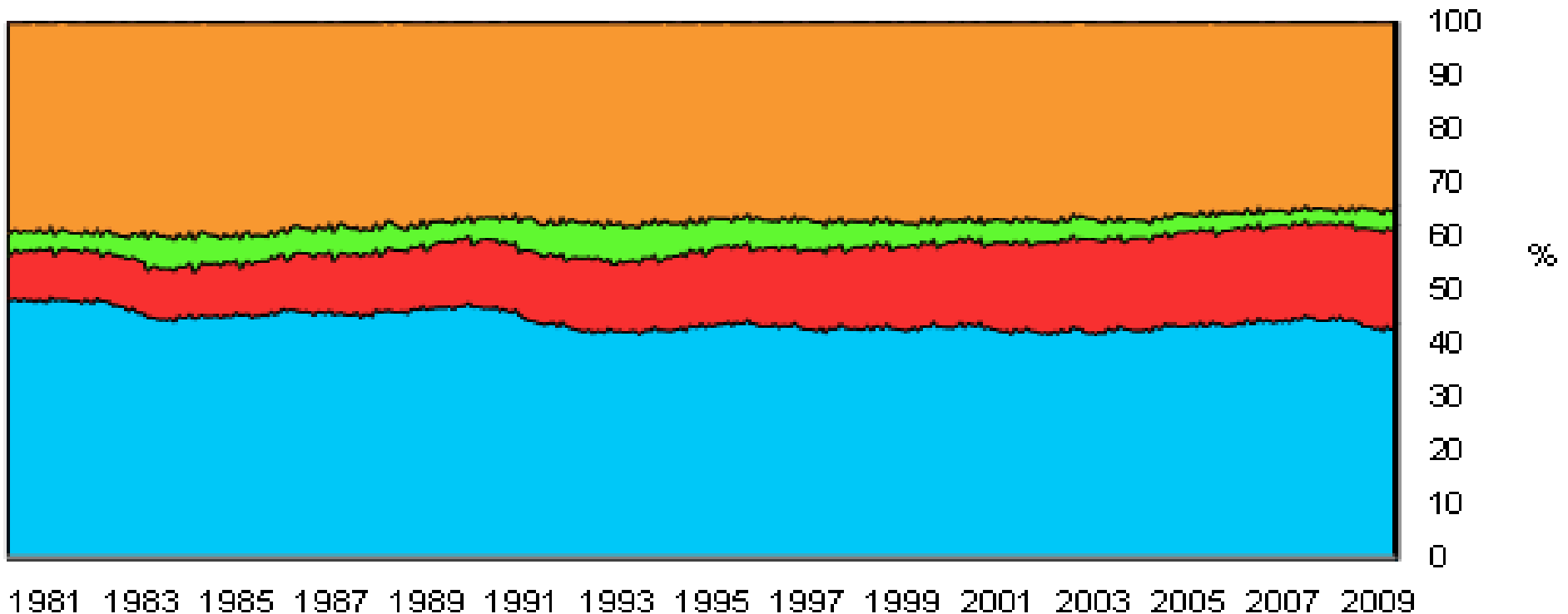
Changing workplace – gender



From Trends in Labour Supply, Connolly et al.

Changing workplace – part time

■ Employed full time ■ Employed part time ■ Unemployed ■ Not in the labour force



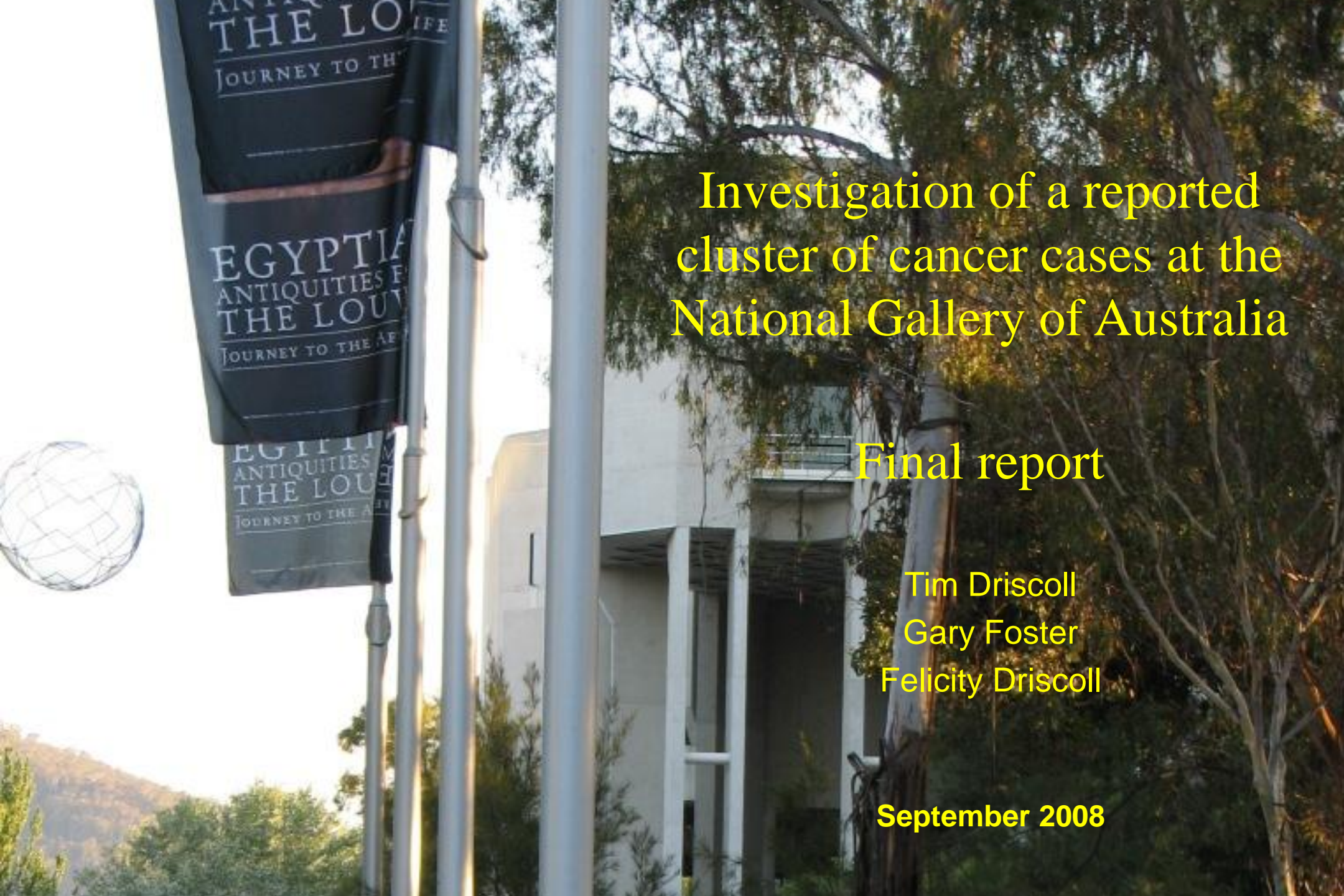
Source: ABS



Exposure changes over time

- Literature review on changes in inhalation exposure in occupational circumstances.
- In the majority of instances, there were significant reductions in exposure, with percentage yearly declines up to 32%.
- Factors commonly cited as being responsible
 - introduction of new standards
 - response to regulatory requirements
 - changes in production methods.
 - Creely et al, 2007



The background image shows the National Gallery of Australia building, a modern white structure with large glass windows, partially obscured by lush green trees. In the foreground, there are several tall, silver flagpoles. One flag is prominently displayed, featuring the text 'EGYPTIAN ANTIQUITIES FROM THE LOUVRE' and 'JOURNEY TO THE ANCIENNE ÉGYPTE'. To the left, a spherical wireframe sculpture is visible against the sky.

Investigation of a reported cluster of cancer cases at the National Gallery of Australia

Final report

Tim Driscoll

Gary Foster

Felicity Driscoll

September 2008

CFA buries cancer time bomb

Ruth Lamperd | Herald Sun | December 06, 2011 12:00AM

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Former CFA Chief Officer Brian Potter with wife Diane at the memorial for killed fire fighters. Herald Sun

« 1 of 2 »

UPDATE: MORE people claiming to be victims of the CFA Fiskville chemical exposure revelation have come forward today.

Former CFA families have contacted the Herald Sun with stories of relatives that died in their 50s



m – May 2012

Where have cancer cluster concerns arise?

- National Gallery
several types
- University NSW
breast
- Jilalan Rail Yard
several types
- Sydney Airport
breast
- School
several types
- University
vague
- Government office
breast
- Private business
breast
- Industrial site
myeloma



What to do about clusters

Concerns about cancer clusters are unlikely to disappear

Therefore, it is important to:

- Educate the public and people likely to have to respond;
- Respond quickly and appropriately.



Where should we be heading?



Driscoll-Fritschi-Slevin-Vallance guide to cancer control



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- A strategic approach
- Encourage industry to decrease exposures
- Regulate appropriately
- Use data to guide decisions and actions
- Make sensible decisions when faced with uncertainty



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- Asbestos
- Educate
- Inform
- Prioritise



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- A strategic approach.....Peta Miller
- Encourage industry to decrease exposures.....Lucy Servidio
- Regulate appropriately.....Michael Borowick
- Use data to guide decisions and actions
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- Change with the times.....David Dunstan
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Using data to guide to decisions and actions and to prioritise

- Who is exposed?
- What are they exposed to?
- What level are they exposed to?
- Where do they work?
- How common is the cancer produced by the exposure?
- What can we do?
- What should the priorities be?



Where should we be heading?

- Decreasing exposure at source
- Improved characterisation of exposure
- Better availability of exposure measures
- Designing out problems
- Better practical support of small businesses and self-employed
- Better education of the public
- Better enforcement where necessary



Change what you can change



Change what you can change

- Stop smoking
- Exercise regularly
- Eat plenty of vegetables and fruit
- Maintain appropriate weight
- Restrict sun exposure
- Restrict alcohol use

after Slevin



Conclusions - 1

- The number of occupational cancer cases will always be uncertain
- A significant proportion of the Australian workforce is meaningfully exposed to carcinogens
- The burden of occupational cancer is probably decreasing
- Occupational cancer is still a big enough problem in Australia (and elsewhere) to be taken seriously



Conclusions - 2

- Get some/more/better data on exposure
- Control this exposure!
- Predict future burden under different scenarios and act on this information
- Prioritise sensibly
- Change what you can change

