

# Health outcomes of children exposed to crocidolite at Wittenoom

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# What is Asbestos?

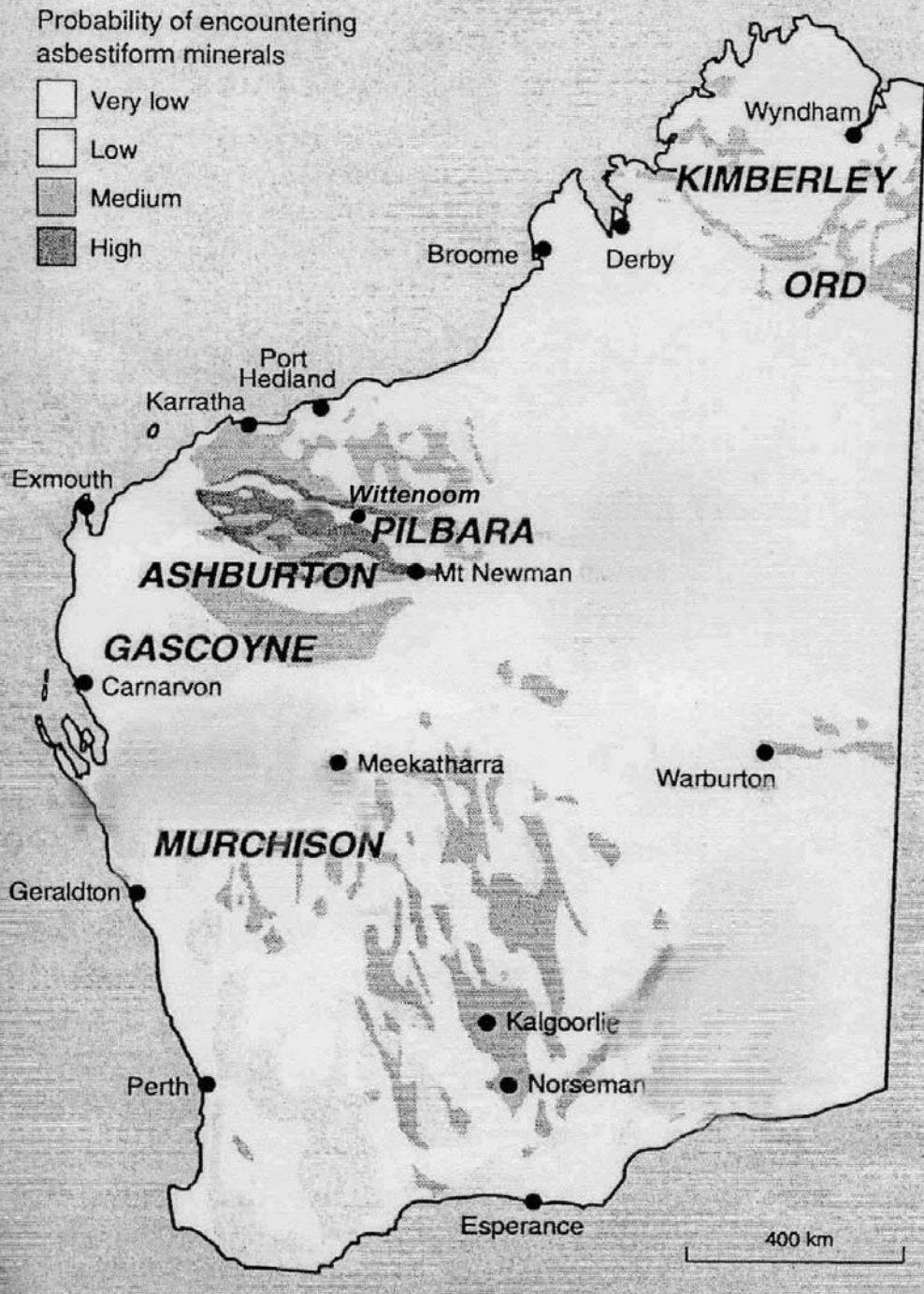
- Naturally occurring mineral that has crystallised to form long thin fibres and fibre bundles
- Two main types
  - Amphibole – crocidolite (blue asbestos)
  - Serpentine – chrysotile
- Chemical, electrical, heat resistant properties
- Asbestos mining, milling and production still occurring in developed and developing countries

# Malignant mesothelioma

- Cancer of the pleura or peritoneum
- Very rare
- Caused by asbestos, erionite, radiation
- Painful, debilitating, no treatment, no cure
- Median survival 9 months
- Universally fatal
- Risk of disease increases the longer time passes

Probability of encountering  
asbestiform minerals

-  Very low
-  Low
-  Medium
-  High



# Wittenoom

Asbestos mine and mill  
7,000 employees, 1943 –  
1966

Australian Blue Asbestos  
Company (ABA)

5,000 residents in township,  
not employed by ABA

Tailings from mine  
distributed around the  
township

Only mined crocidolite (blue  
asbestos)



# Why children?

- Occupational cohort studies of men
- Few studies able to examine risk of asbestos-related disease in children
- Anecdotally children thought to be at higher risk of disease than adults
- 43 years since Wittenoom mill and mine closed
- Wittenoom 'children' now presenting with ARD

# Mesothelioma death rate\* by age at first exposure

Age at first exposure	Residents N	Mesotheliomas N	Rate
<15 years	2491	24	47
>=15 years	2154	43	112
Unknown	123	0	
<b>Total</b>	<b>4768</b>	<b>67</b>	<b>71</b>

per 100,000 person-years



# Wittenoom Workers and Residents Cohort Studies

- **Workers Cohort** - employed by ABA 1943 – 1966
- Employment records linked to cancer/mortality registers  
n=7000
- **Residents Cohort** - residents of the town between 1943 – 1993  
public records – school, hospital, electoral roll, birth/death certificates, workers questionnaire
- Questionnaire sent to all traced residents between 1991-1993  
n=5000
- Passive follow up at state/national cancer and mortality registers
- Participation in cancer prevention program
- Regular questionnaires to cohort members (latest in 2007)
- Quantitative asbestos exposure measurements

# Quantitative Asbestos Exposure Measurements

- Duration of exposure - how long at Wittenoom
- Age of first exposure – age of arrival at Wittenoom
- Time since first exposure – number of years passed since they first came to Wittenoom (latency or lag period)
- Intensity of exposure (f/ml) – how much
- Cumulative exposure (f/ml- year) - Intensity X Duration

Armstrong 1988, Hansen 1997.

# Children at Wittenoom (aged $\leq 16$ years)

- 1,204 females
- 1,279 males
  
- 419 born there
- Median age of arrival - 3 years (IQR 1-7 years)
  
- Median duration of residence – 19 months (IQR 7-41 months)
  
- 19 worked for ABA asbestos company (3 males, 16 females)

# Follow up and analysis

- Follow up
- 1950 - WA and National deaths – end 2006
- Standardised Mortality Ratios
  - (observed deaths/expected deaths)
  - WA male and female population
- Lost to follow up censored at date last known to be alive
  - (maximum estimate)
- Mesothelioma mortality rates
  - $n/(\text{person years} * 100,000)$

# Children in 2006

- Median age 45 years (IQR 37 – 51 years)
- Median time since first exposure to asbestos 33.5 years (IQR 17.6 - 44.6)
- 228 deaths between 1950 and 2006
- 75 female, 153 male
- Median age of death 37 years (IQR 21-48 years)



# Mesothelioma

- 40 deaths from malignant mesothelioma (17% of all deaths)
- 12 females, 28 males, 39 pleural
- Median age of death 46 years (IQR 39-53 years)
- Median time since first exposure to asbestos 44 years (IQR 37- 48 years)

# Mesothelioma death rate\* by sex

Sex	Deaths N	Rate (95%CI)
Females	12	26 (15-46)
Males	28	59 (41-85)
Total	40	43 (31-58)

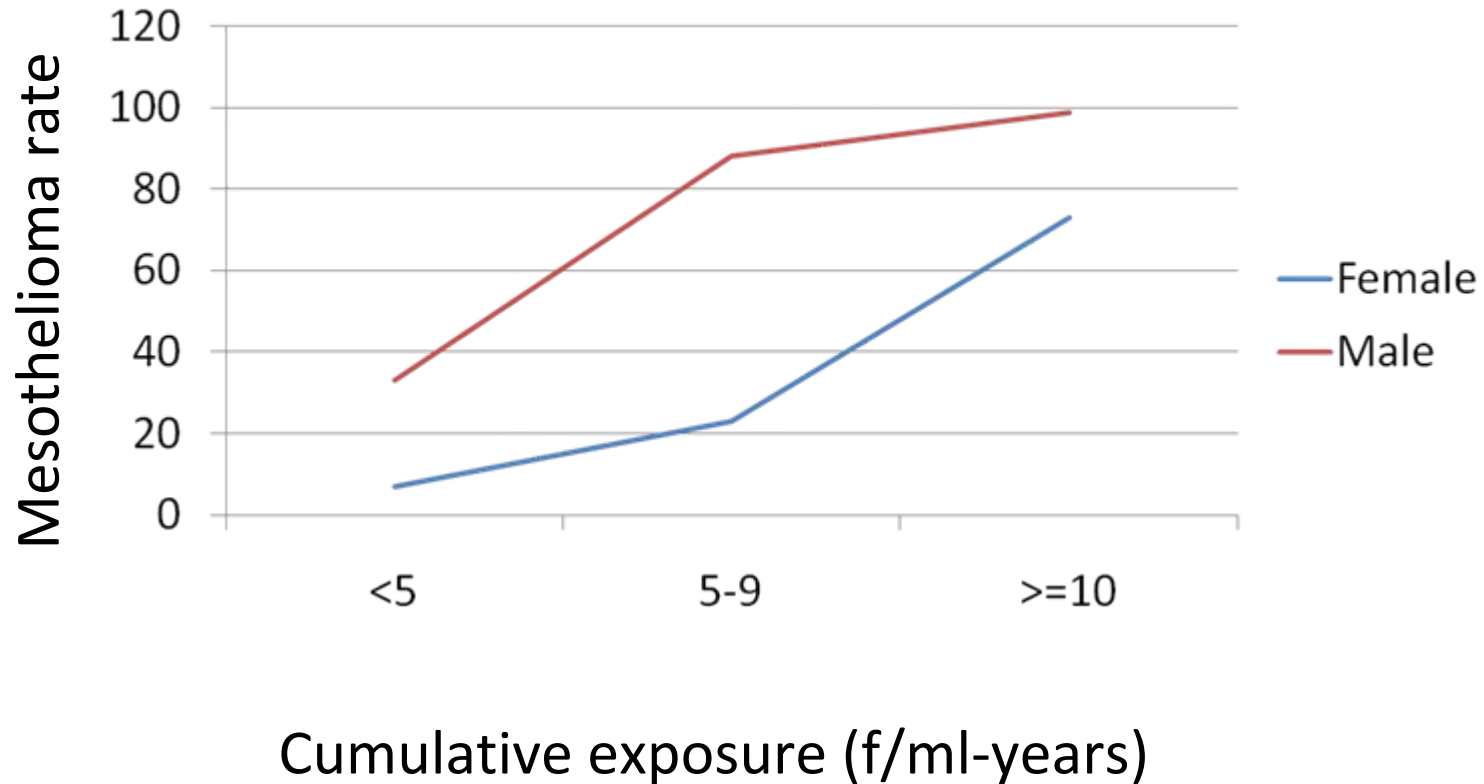
\*per 100,000 person years

Other occupational exposure?

5 (8) males with probable (possible) occupational exposure

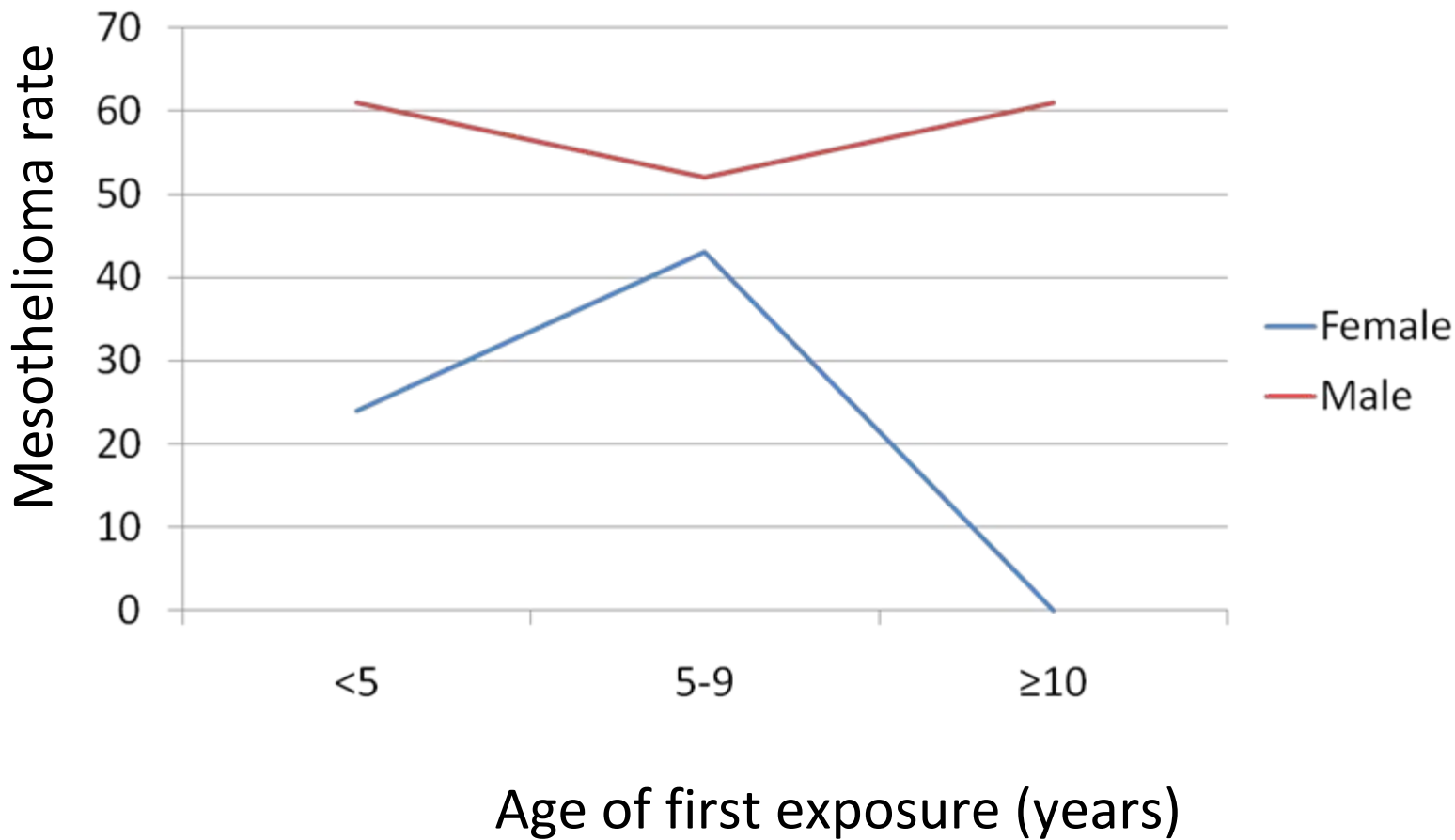
0 females

# Mesothelioma rate\* by cumulative exposure



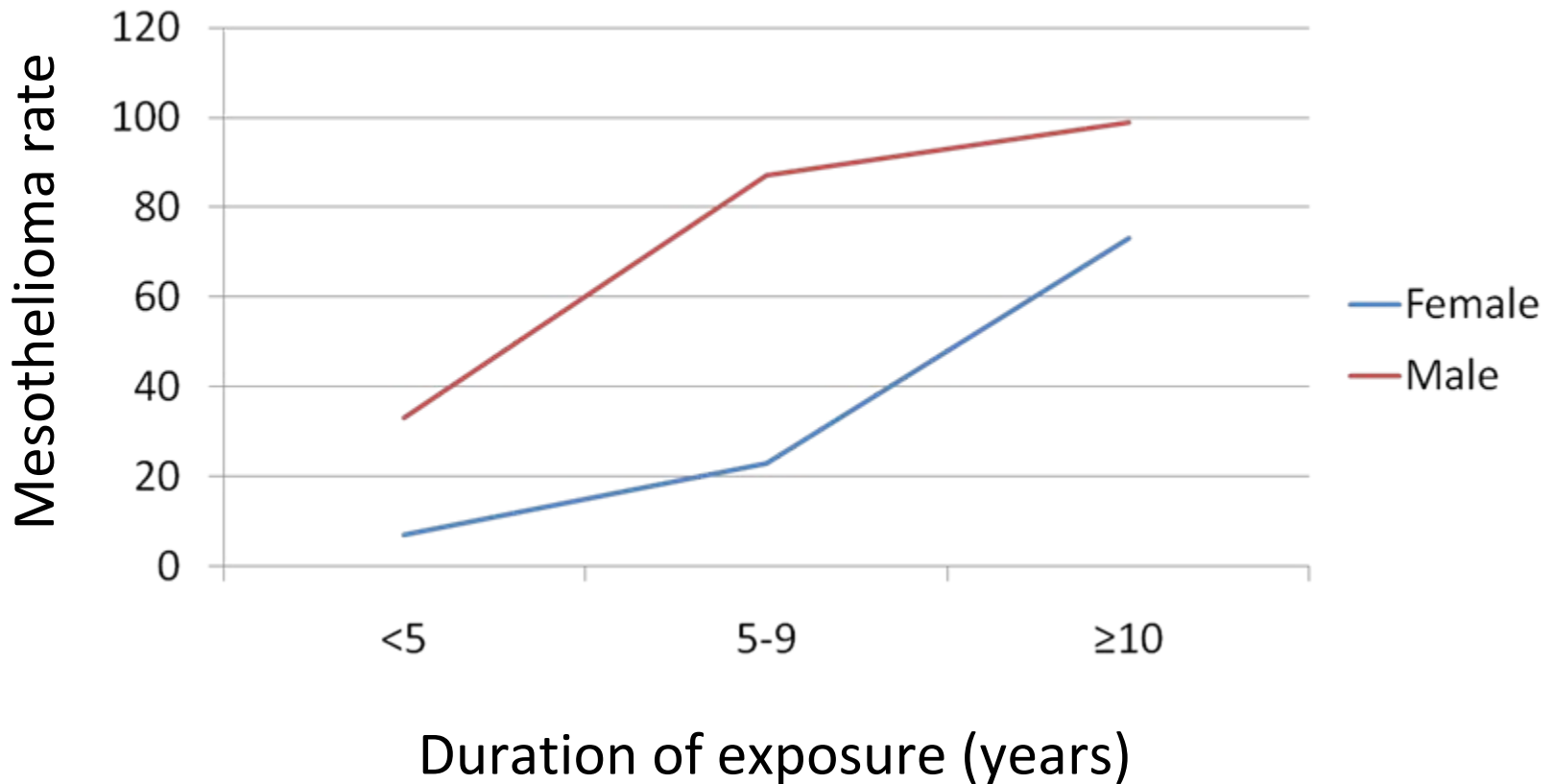
\*per 100,000 person years

# Mesothelioma rate\* by age of first exposure



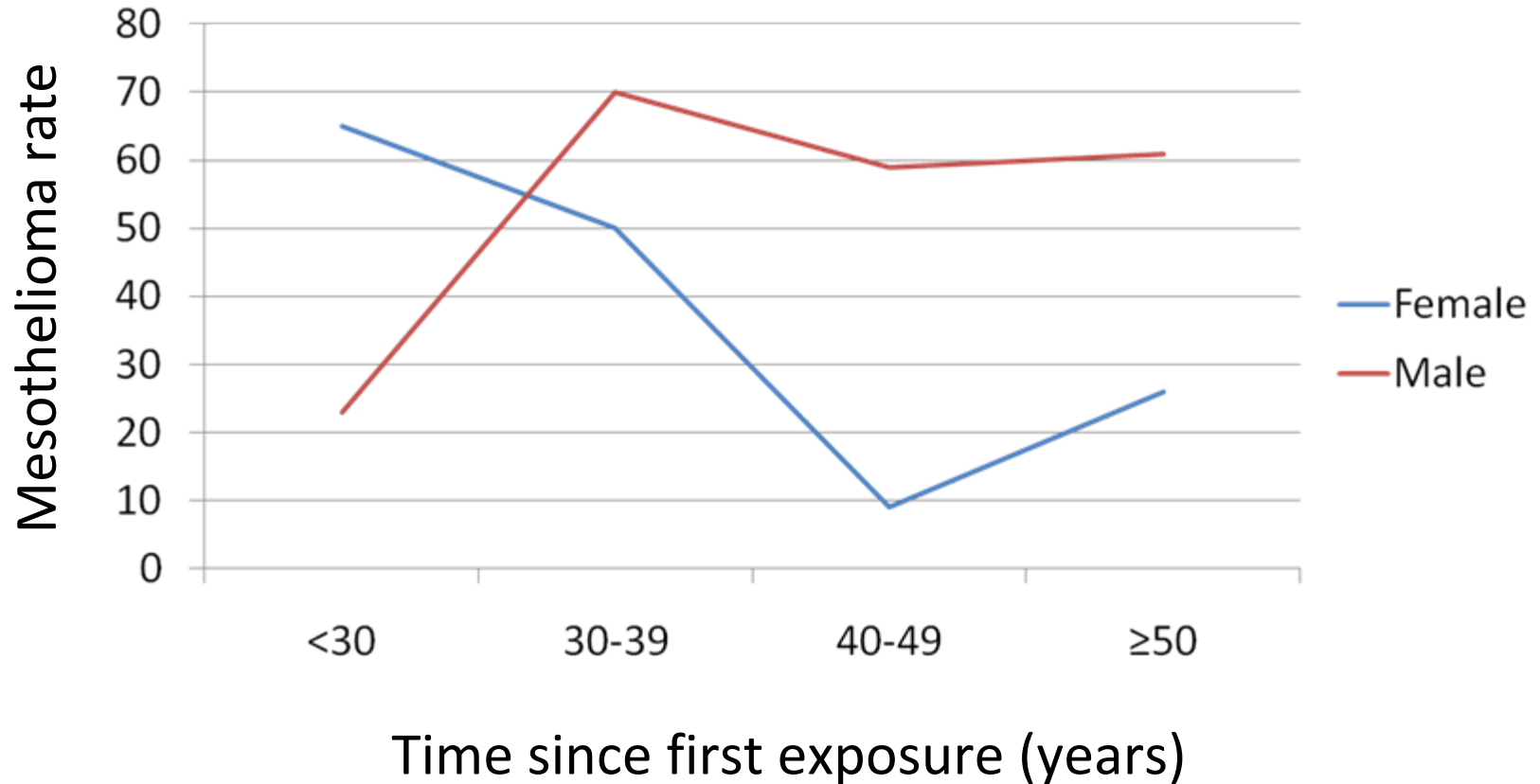
\*per 100,000 person years

# Mesothelioma rate\* by duration of exposure



\*per 100,000 person years

# Mesothelioma rate\* by time since first exposure



\*per 100,000 person years

Cause of Death	N	SMR (95%CI)
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## Females

• All Causes	66	1.62 (1.26 – 2.07)
• Neoplasms	28	2.25 (1.50 – 3.26)
• Homicide	2	3.28 (0.40 – 11.8)
• Accidents/Injuries/Poisonings		
	9	0.97 (0.44 – 1.84)
• Transport Accidents	5	1.05 (0.34 – 2.45)

Cause of Death	N	SMR (95%CI)
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## Males

• All Causes	140	1.89 (1.59 – 2.23)
• Neoplasms	41	3.70 (2.66 – 5.02)
• Suicide	13	1.69 (0.90 – 2.89)
• Accidents/Injuries/Poisonings		
	49	1.54 (1.14 – 2.04)
• Transport Accidents	24	1.52 (0.97 – 2.26)
• Non transport accidents	11	1.48 (0.74 - 2.65)
• Circulatory disease	17	2.21 (1.29 – 3.54)

# Discussion

- Cancer largest cause of death for females
- Cancer/accidents largest causes of death for males
- Mesothelioma mortality rate in children lower than that of adults (112/100,000)
- More cases of mesothelioma expected as time since first exposure increases

# Acknowledgements

- Janice Hansen
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