



THE EPIDEMIOLOGY OF OCCUPATIONAL CANCER IN NEW ZEALAND

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WHAT CAUSES CANCER? NOT EVERYTHING!

Chemicals used in commerce	75,000+
Agents evaluated for carcinogenicity in humans	
IARC Monographs	970
• Group 1 <u>proven</u> human carcinogens	113
• Group 2A <u>probable</u> human carcinogens	66
• Group 2B <u>possible</u> human carcinogens	285
US NTP <i>Report on Carcinogens</i>	285
• Known to be carcinogens	54
• reasonably anticipated to be a carcinogen	179

<http://monographs.iarc.fr/ENG/Classification/index.php>

<http://www.niehs.nih.gov/about/od/ontp/roc.cfm>

ESTIMATED OCCUPATIONAL CANCER BURDEN



't Mannelje A, Pearce N.
Scand J Work Environ Health 2005;31:266-76.

- An estimated at 692 to 980 deaths in New Zealand p.a. due to work-related disease
- Between 35 and 40% of these deaths due to occupational cancer, i.e.:
 - **237 to 425 deaths p.a.**
- 2%-5% of total cancer incidence in people age 30 or older is estimated to be work related
 - **Males 3%-8%**
 - **Females 0.5%-1.5%**

OCCUPATIONAL CANCER EPIDEMIOLOGY

The systematic study of the distribution and causes of cancers that are related to the workplace environment.

Observational rather than an experimental science.

Study designs:

- Surveillance schemes
- Analyses of Routinely Collected Data
- Cohort studies
- Case-Control Studies

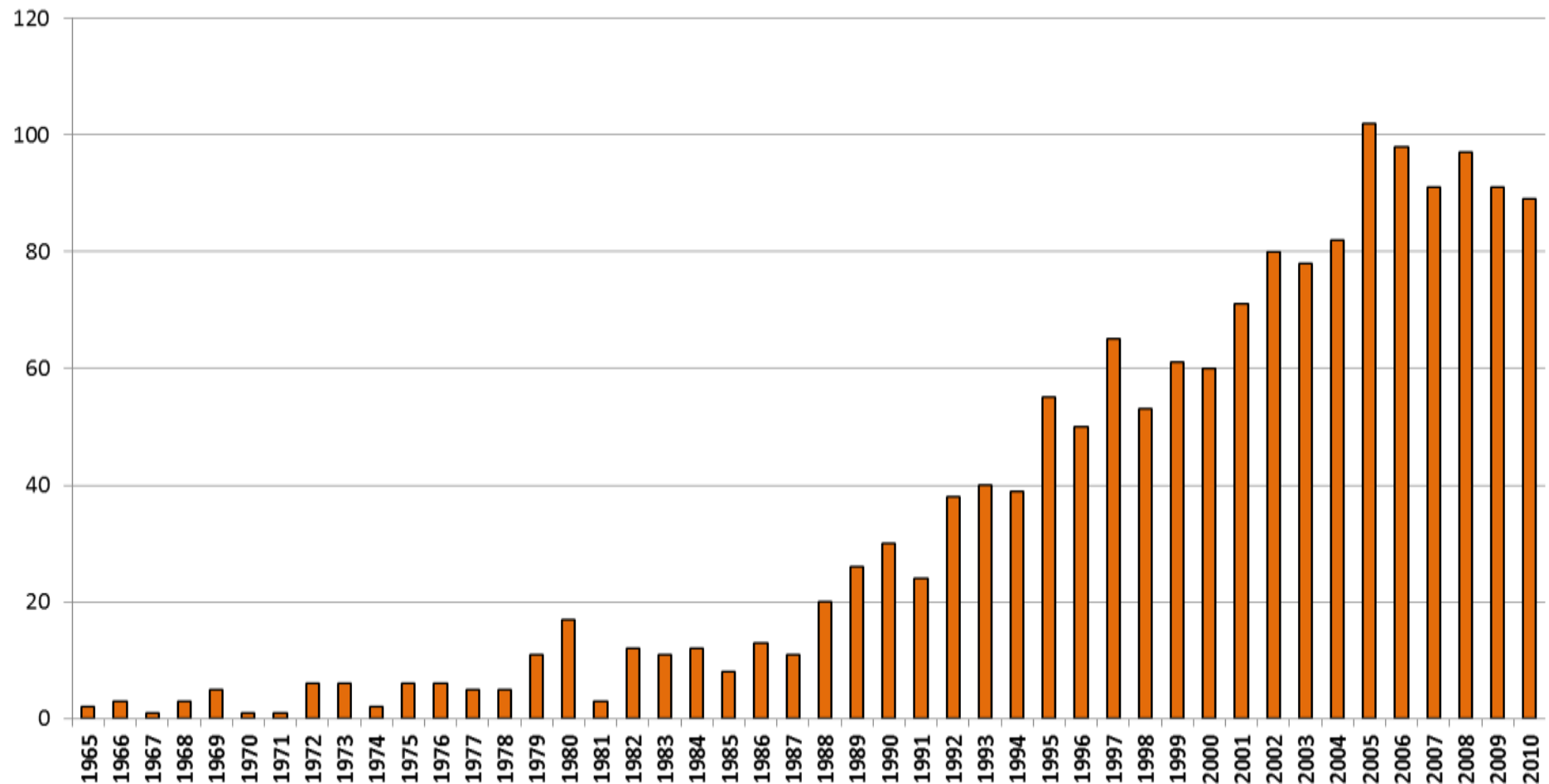


REPORTING OF OCCUPATIONAL CANCER

- In 2001-2002, 4 cases of occupational cancer received compensation from ACC
- DoL Notifiable Occupational Disease System data for 1992-1997
 - 11 cancer cases in total
 - 2.2 per year
 - not including asbestos cancers
 - Mesothelioma 94 cases
 - Lung cancer 49 cases



NUMBER OF CASES OF MESOTHELIOMA IN NEW ZEALAND 1965 TO 2010



STUDIES USING ROUTINELY COLLECTED DATA

1. **Cooke et al.** Socio-economic status, indoor and outdoor work, and **malignant melanoma**. *Int J Cancer* 1984;34:57-62.
2. **Kawachi et al.** Deaths from **lung cancer** and ischaemic heart disease due to passive smoking in New Zealand. *N Z Med J* 1989;102:337-340.
3. **Preston-Martin et al.** Descriptive epidemiology of primary **cancer of the brain**, cranial nerves, and cranial meninges in New Zealand 1948-1988. *Cancer Causes Control* 1993;4:529-538.
4. **Fraser G & Pearce N.** Occupational physical activity and risk of **cancer of the colon and rectum** in New Zealand males. *Cancer Causes Control* 1993;4:45-50.
5. **Firth et al.** Male **cancer mortality** by occupation 1973-86. *N Z Med J* 1993;106:328-330.
6. **Firth et al.** Male **cancer incidence** by occupation: New Zealand 1972-1984. *Int J Epidemiol* 1996;25:14-21.
7. **Kjellstrom T & Smartt P.** Increased **mesothelioma** incidence in New Zealand: the asbestos-cancer epidemic has started. *N Z Med J* 2000;113:485-490.
8. **Firth et al.** **Cancer mortality** by occupation among New Zealand women: 1988-1997. *N Z Med J* 2007;120:U2833.
9. **'t Mannelje et al.** Farming, growing up on a farm, and **haematological cancer** mortality. *Occup Environ Med* 2012;69:126-132.

NEW ZEALAND COHORT STUDIES

1. **Kogevinas** et al. Cancer mortality in workers exposed to phenoxy herbicides, chlorophenols, and dioxins. *Am J Epidemiol* 1997; 145: 1061-1075.
2. **Firth** et al. Historical cohort study of a New Zealand foundry and heavy engineering plant. *Occup Environ Med* 1999; 56: 134-138.
3. **Bates** et al. Is testicular cancer an occupational disease of fire fighters? *Am J Ind Med* 2001; 40: 263-270.
4. **McLean** et al. Mortality and cancer incidence in New Zealand pulp and paper mill workers. *N Z Med J* 2002; 115: 186-90.
5. **McLean** et al. Mortality and cancer incidence in New Zealand meat workers. *Occup Environ Med* 2004;61: 541-7.
6. **'t Mannetje** et al. Mortality in New Zealand workers exposed to phenoxy herbicides and dioxins. *Occup Environ Med* 2005; 62: 34-40.
7. **McLean** et al. Cancer mortality in workers exposed to organochlorine compounds in the pulp and paper industry: an international collaborative study. *Environ Health Perspect* 2006: 114: 1007-1012.
8. **McLean** et al. Mortality and cancer incidence in a New Zealand sawmill workers cohort. *Australasian Epidemiologist* 2007, (Abstract).
9. **McBride** et al. Mortality in workers exposed to 2,3,7,8-Tetrachlorodibenzo-p-dioxin at a Trichlorophenol plant in New Zealand. *J Occup Environ Med* 2009;51:1049-1056.
10. **McBride** et al. Mortality in employees at a New Zealand agrochemical manufacturing site. *Occup Med* 2009;59:255-263.

WOOD DUST

Wood dust is a Group 1 carcinogen. Significant excess risk of **lung** and **nasopharyngeal** cancer observed in wood dust exposed occupations in 2 NZ studies.



Cancer type:	OR	95% CI
Nasopharyngeal cancer		
Forestry/Logging	6.0	1.0-28.4
Lung cancer		
Sawmill workers	1.8	1.2-2.5
Sawmill, Wood Panel and Related Wood-Processing Plant Operators	4.6	1.1 - 20.3
Log sawmilling and timber dressing industry	2.9	1.2-7.0
Carpenter	1.3	1.1-1.5
Builder's labourer	3.2	1.4-7.1

WOOD DUST

For **lung** cancer we have observed relationships with both level and duration of exposure.



NZJEM – wood dust exposed occupations	Cases/Controls	OR	95% CI
Never exposed	142/266	1	-
High exposure *	42/66	1.46	0.82 – 2.60

* >50% exposed to levels in excess of $\geq 0.5 \text{ mg/m}^3$

Lung cancer in:	<2 years	2-10 years	>10 years	P-value for linear trend
	OR	OR	OR	
Timber processing machine operators	1.11	4.95	14.11	0.03

TRANSPORT WORKERS

Excess risk of **NHL** and **lung** cancer observed in transport workers in NZ studies.

Diesel exhaust is a Group 1 carcinogen.

For **lung** cancer there is a strong relationship with duration of exposure:



Occupation/Industry	<2 years	2-10 years	>10 years	P-value for linear trend
	OR	OR	OR	
Heavy truck drivers	1.40	2.20	3.44	<0.01
Road transport	0.92	1.49	4.35	<0.01
Road freight transport	0.97	3.87	6.35	<0.01

AGRICULTURE WORKERS - FARMERS



Apart from two early findings of excess **brain** cancer in livestock farmers and dairy farmers, and an excess in **lip** cancer that is consistent with many overseas findings, livestock farmers generally have a reduced risk of most cancers.

AGRICULTURAL WORKERS

Excess risk of Leukaemia, NHL and Multiple Myeloma, and of Bladder and Stomach cancer observed in horticulture workers in 8 NZ studies.



Occupation/Industry	OR	95% CI
NHL		
Field Crop & Vegetable Growers	2.7	1.0-7.3
Nursery Grower/Nursery Worker	3.2	1.0-9.7
Leukaemia		
Market Farmers/Crop Growers	1.8	1.1-3.0
Field Crop & Vegetable Growers	4.0	1.5-10.9
Market Gardener & Related Worker	5.5	1.6-19.0
Fruit Growers	2.0	1.0-4.1
Nursery Grower/Nursery Worker	4.2	1.3-13.4

AGRICULTURAL WORKERS – LEUKAEMIA RISK BY GENDER



Occupation/Industry	Men		Women	
	OR	95% CI	OR	95% CI
6-Agriculture and Fishery Workers	1.3	0.8-2.1	1.4	0.7-2.6
611-Market Farmers and Crop Growers	1.2	0.6-2.2	3.5	1.5-7.9
6111-Field Crop and Vegetable Growers	2.4	0.7-8.7	7.6	1.3-43.8
61112-Market Gardener and Related Worker	2.3	0.4-11.6	15.7	1.7-149.1
6113-Gardeners and Nursery Workers	0.7	0.3-1.8	5.0	1.4-18.6
61131-Nursery Grower, Nursery Worker	0.5	0.1-5.4	11.7	2.3-59.9
A01-Agriculture	1.4	0.8-2.3	1.4	0.7-2.7
A011-Horticulture and Fruit Growing	1.4	0.7-3.1	4.7	2.1-10.6
A0111-Plant Nurseries	-	-	7.8	1.8-32.9
A0113-Vegetable Growing	1.7	0.5-5.9	8.0	1.3-47.8
A011-Horticulture and Fruit Growing	1.4	0.7-3.1	4.7	2.1-10.6

TEXTILE WORKERS

Significant excess risk of **leukaemia**, **lung** and **bladder** cancer has been observed in textile workers and sewing machinists in 3 separate NZ studies.

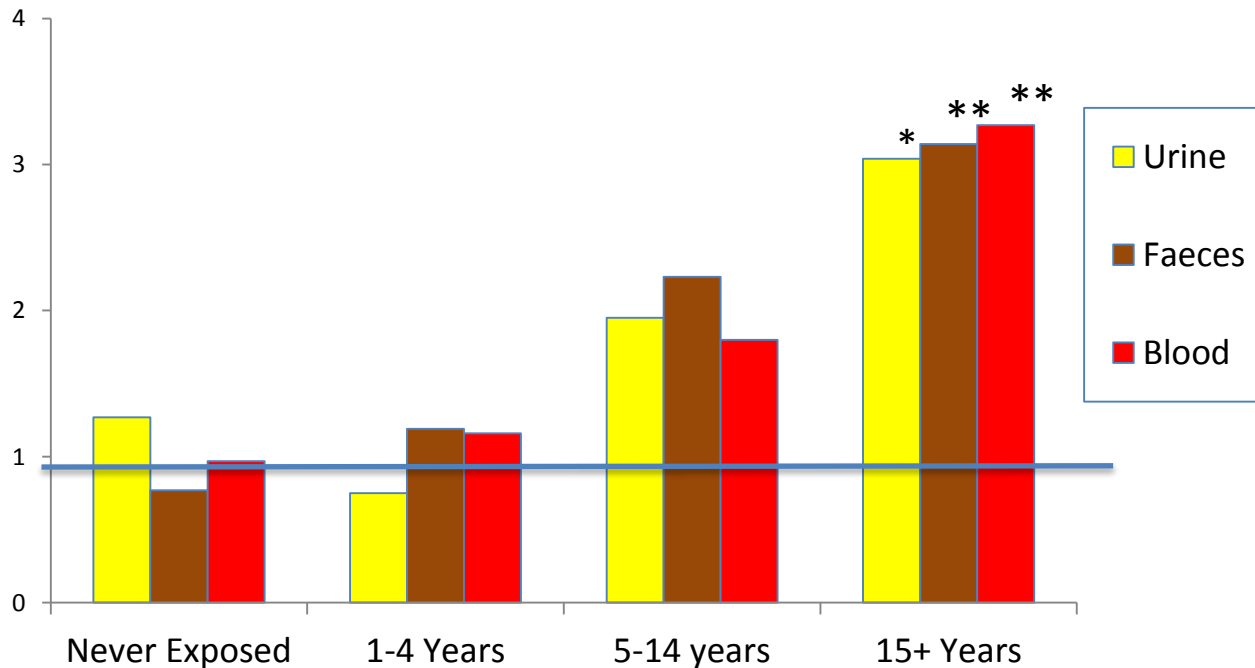
For **lung** cancer there is a strong relationship with duration of exposure:



Occupation/Industry	<2 years	2-10 years	>10 years	P-value for linear trend
	OR	OR	OR	
Textile products machine operators	1.23	1.75	3.24	<0.01
Textile bleaching, dyeing and cleaning machine operators	1.69	2.54	4.19	0.04
Textile product manufacturing industry	1.15	1.30	11.15	0.02

MEAT WORKERS

Excess risk of **Lung cancer**, **NHL**, **Leukaemia** and **Soft Tissue Sarcoma** have been observed in Meat Workers in 8 NZ studies.



OCCUPATIONAL CANCER IN NEW ZEALAND

- A total of 45 NZ studies of occupational cancer in the past 30 years.
- All investigator initiated studies that compete for available health research funding.
- The findings are generally consistent with those reported in the literature from studies conducted in other countries.
- Widespread exposure to the risk factors identified, e.g. of the NZ working population it is estimated that 20% are employed in NHL risk occupations and that 5-6 % are exposed to wood dust.
- Gender differences in risk are evident for some cancers.
- Several new associations suggested.