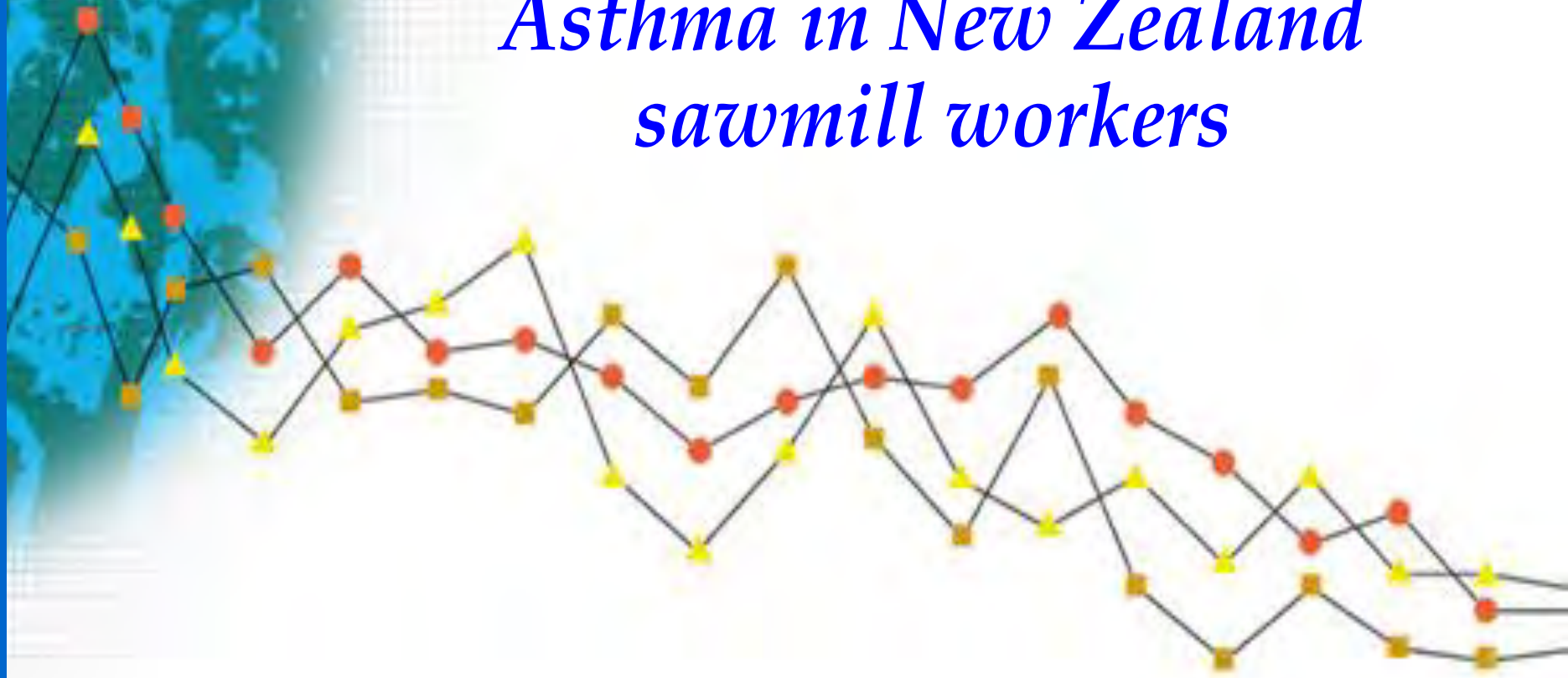
Asthma in New Zealand sawmill workers



Massey University

BROHNZ Building Research in Occupational Health in New Zealand

New Zealand research on respiratory disease in wood workers

Respiratory Cancer:

Kawachi, Pearce, Fraser, 1989

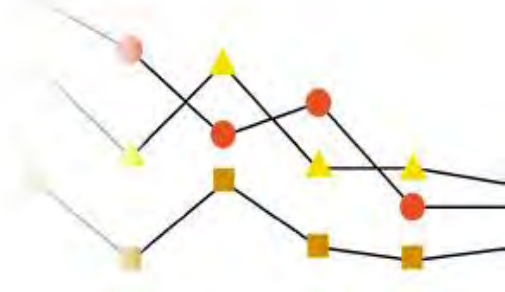
	OR	95% CI
Sawmill workers: Lung	**1.8**	1.2-2.5
Forestry/Logging: Nasopharyngeal	**6.0**	1.0-28.4

OLCANZ, 2009: Lung Cancer and wood dust

NZ JEM category	**Cases/Controls**	**OR (95% CI)**	
Never exposed	142/266	**1**	
Ever exposed	219/443	**0.95**	(0.69-1.29)
High exposure	42/66	**1.46**	(0.82-2.60)

Non-malignant respiratory symptoms:

Norrish *et al*, 1992
Douwes *et al*, 2001
Fransman *et al*, 2003
Douwes *et al*, 2006



Cross-Sectional study: New Zealand Sawmill Workers

- *N=772*
- *Modified ECRHS questionnaire*
- *Job title and work area*
- *Potential confounders*

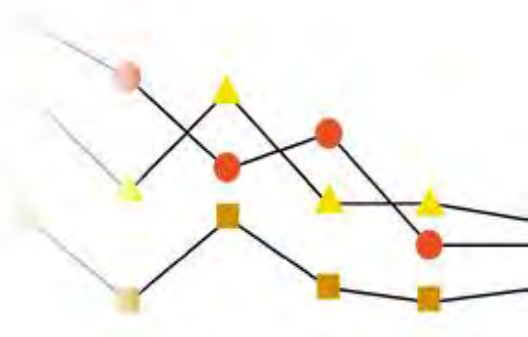
Douwes J, McLean D, Slater T, Pearce N. Asthma and other respiratory symptoms in New Zealand pine processing sawmill workers. *Am J Ind Med*. 2001 Jun;39(6):608-15.

Symptom prevalence and adjusted prevalence odds ratios in NZ sawmill workers

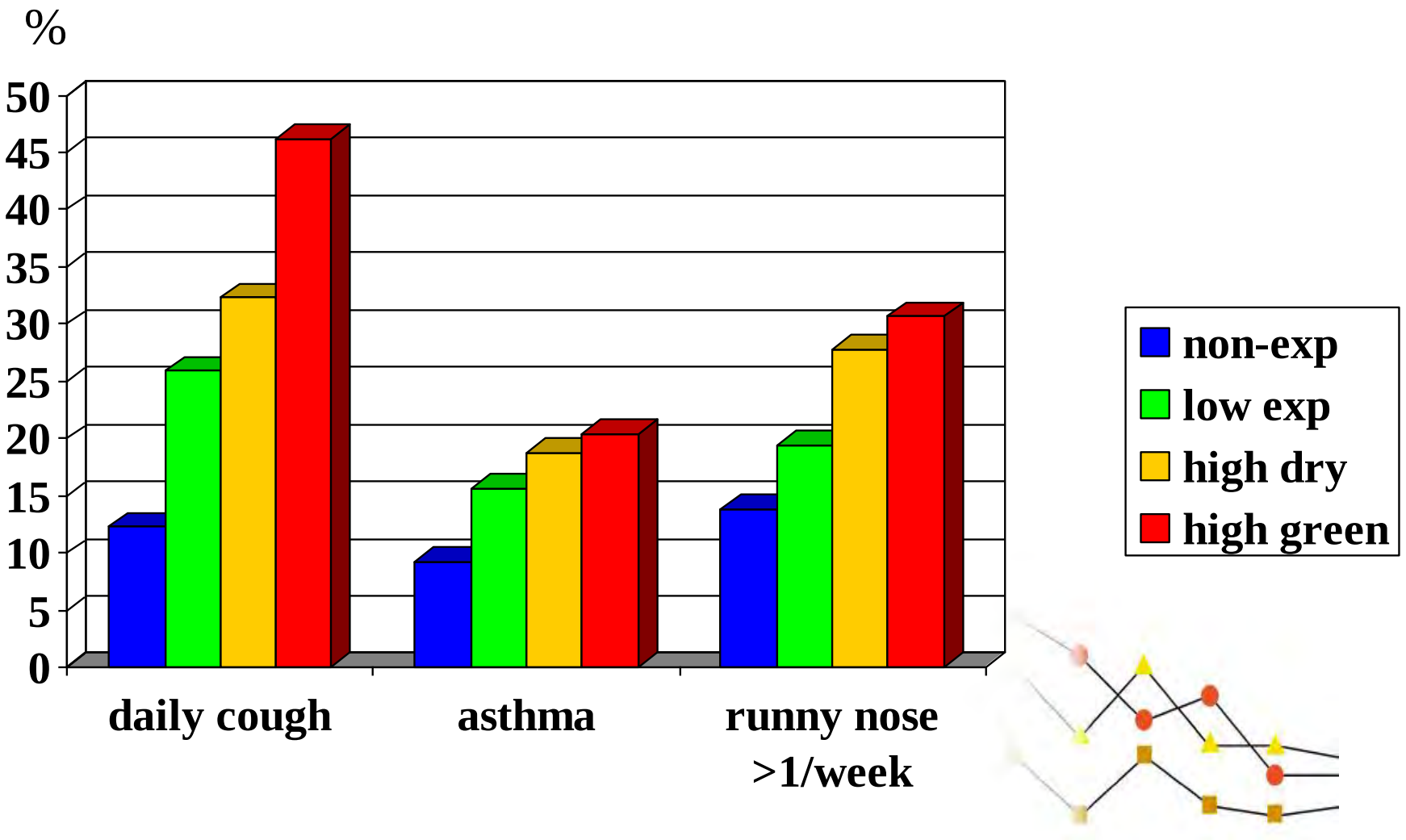
	Exposed Workers (n=704)		
Symptom in last 12 months	**Symptom Prevalence %**	**OR**	**95%CI**
Wheezing	29.6*	**1.4***	1.1 – 1.9
Wheezing without cold	16.0	**1.0**	0.7 – 1.5
Woken by SOB	13.5*	**1.4**	0.9 – 2.1
Asthma attack	7.0	**1.4**	0.8 – 2.4
Asthma medication	9.8*	**1.8***	1.1 – 2.9
Asthma	18.0	**1.6***	1.1 – 2.3

Reference, General population

* P<0.05; compared to general population and adjusted for age, gender and ethnicity



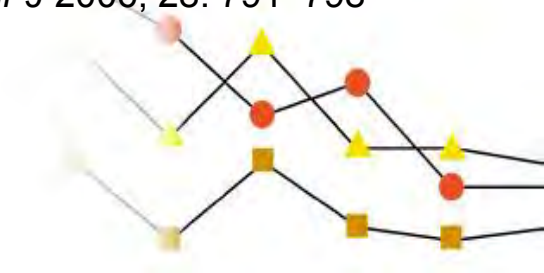
Symptom prevalence and job-title-based wood dust exposure in sawmill workers



Follow-up Study

- 58 asthmatic and 163 non-asthmatic workers
- Randomly selected from the X-Sectional study
- Questionnaire survey
- Objective measurement of:
  - personal exposure
  - Lung function
  - Reactions to common allergens

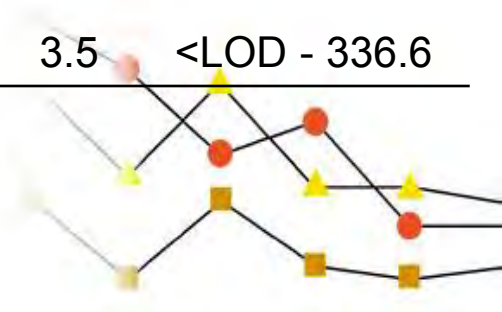
Douwes *et al. Eur Respir J* 2006; 28: 791–798




DANGER
TREATED
MOVING
TALLIER

Personal dust and bacterial endotoxin exposure in NZ sawmill workers by job category

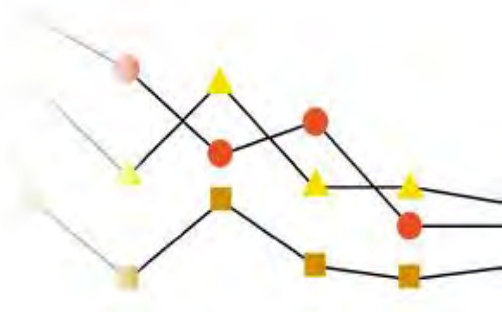
Exposure category	N	Dust concentration (mg/m³) AM	GM	GSD	Range	Endotoxin concentration (EU/m³) AM	GM	GSD	Range
Green mill	47	0.8	**0.6**	2.0	0.2 - 4.4	10.9	**6.7**	2.6	0.5 - 68.8
Dry mill	39	1.0	**0.7**	2.2	0.2 - 3.11	23.7	**7.7**	4.0	0.4 - 336.6
Yard	17	0.6	**0.4**	2.1	0.2 - 2.5	3.4	**2.2**	2.7	<LOD - 13.5
Other	30	0.3	**0.2**	2.5	0.02 - 1.4	6.3	**3.0**	3.5	<LOD - 48.8
Total	136	0.7	**0.5**	2.4	0.02 - 4.4	12.8	**5.1**	3.5	<LOD - 336.6



Lung function[#] by wood dust exposure category

	High dry (95%CL)	High green (95%CL)
FVC	-3.6 (-8.3, 1.1)	-6.3 (-11.3, -1.3)*
FEV1	-3. 9 (-8.4, 0.6)	-5.7 (-10.6, -0.9)*
PEF	-8.0 (-14.2, -1.9)*	-8.1 (-14.8, -1.4)*

[#]Reduction in % predicted
Reference: all non/low exposed workers.
Adjusted for asthma, sex, age, ethnicity, smoking, height.
* *p<0.05*



Lung function[#] by wood dust exposure - stratified for asthma status

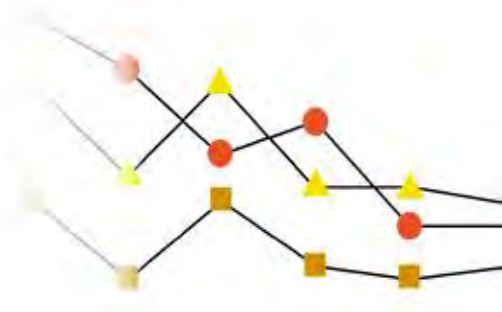
	"High dry"		"High green"	
	Non-asthmatic	Asthmatic	Non-asthmatic	Asthmatic
FVC	-3.33	-5.63	-7.57*	-4.27
FEV_1	-2.92	-12.45*	-5.64	-11.77*
PEF	-6.47	-21.00*	-8.54*	-15.99*

[#]Reduction in % predicted

Reference group: non-asthmatics that are non/low exposed

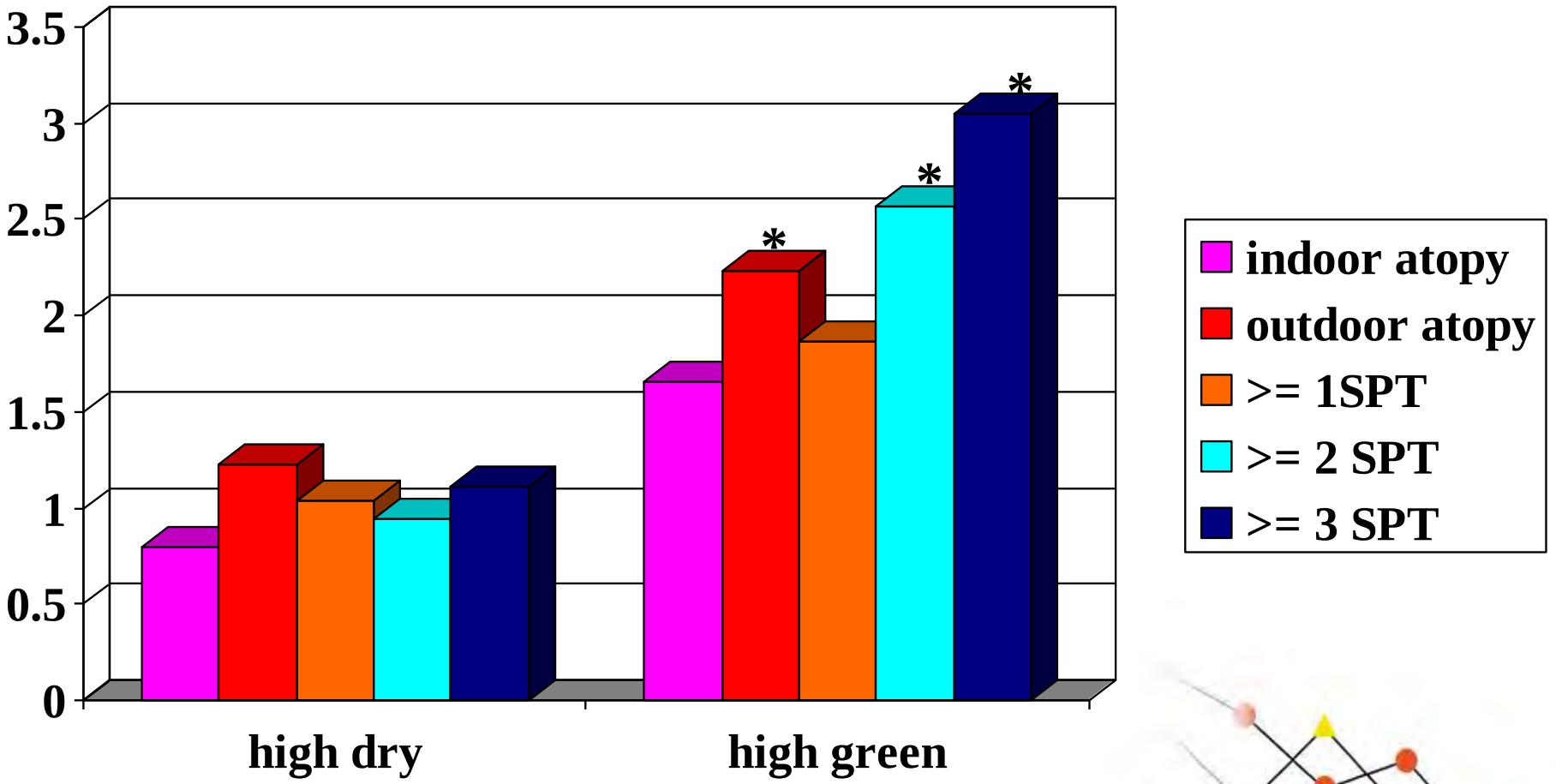
Adjusted for sex, age, ethnicity, smoking, height

* $p<0.05$




2
4
6
8
10
1
3
5
7
9

Exposure and Atopy

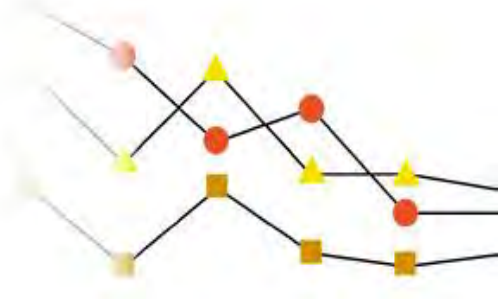


OR *Adjusted for asthma, sex, age, ethnicity, and smoking*

** p<0.05*

What have we observed in New Zealand?

- Increased prevalence of asthma in NZ sawmill workers.
- Exposure to a range of airborne contaminants in wood processing, although levels not „high'.
- Elevated exposure to both "green" and "dry" dust is associated with a significant decline in lung function, of both an obstructive (FEV_1, PEF) and a restrictive (FVC) nature.
- Effects on lung function were observed in both asthmatic and non-asthmatic workers.
- Exposure to high levels of "green" dust was associated with allergy.



What we still don't know

Do these exposures „cause' respiratory disease, or merely exacerbate pre-existing respiratory conditions?

Incidence of asthma and allergies in wood workers?

Progression of the disease, are the effects reversible?

Which exposure(s) are responsible?

- Dust
- resin acids
- Terpenes
- Fungi or bacteria

What mechanism is involved?

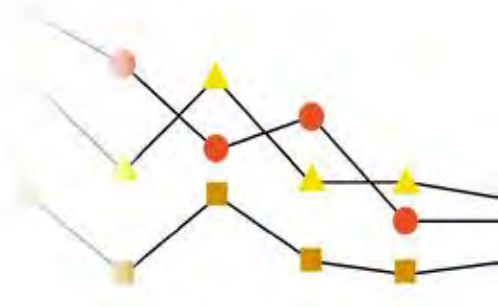
- Allergic
- Non-allergic inflammation

Longitudinal study of respiratory disease in sawmill workers

- Measure the incidence of new cases of allergies and asthma, and examine their associations with sawmill exposures.
- Examine longitudinal changes in lung function, and examine their associations with sawmill exposures.
- Investigate the mechanisms underlying these effects, and the levels at which effects occur.
- Investigate whether the effects are reversible once exposure has ceased.

Methods

- Longitudinal study
- 300 workers followed for 4 years
- Measure associations between wood dust, endotoxins and resin acids exposure and outcome measures over 12, 24 and 36 months.



Main outcome measures

Annual testing over three years to measure:

- **Lung function**.
- Reported symptoms by **questionnaire**.
- **Atopic sensitisation** using skin prick test reactivity to common allergens.
- **Dust exposure**, and specific components in the wood dust.

In final year assess:

- underlying **immunological mechanisms** using sputum induction and exhaled NO.
- **Reversibility** in newly symptomatic workers who leave the industry.