

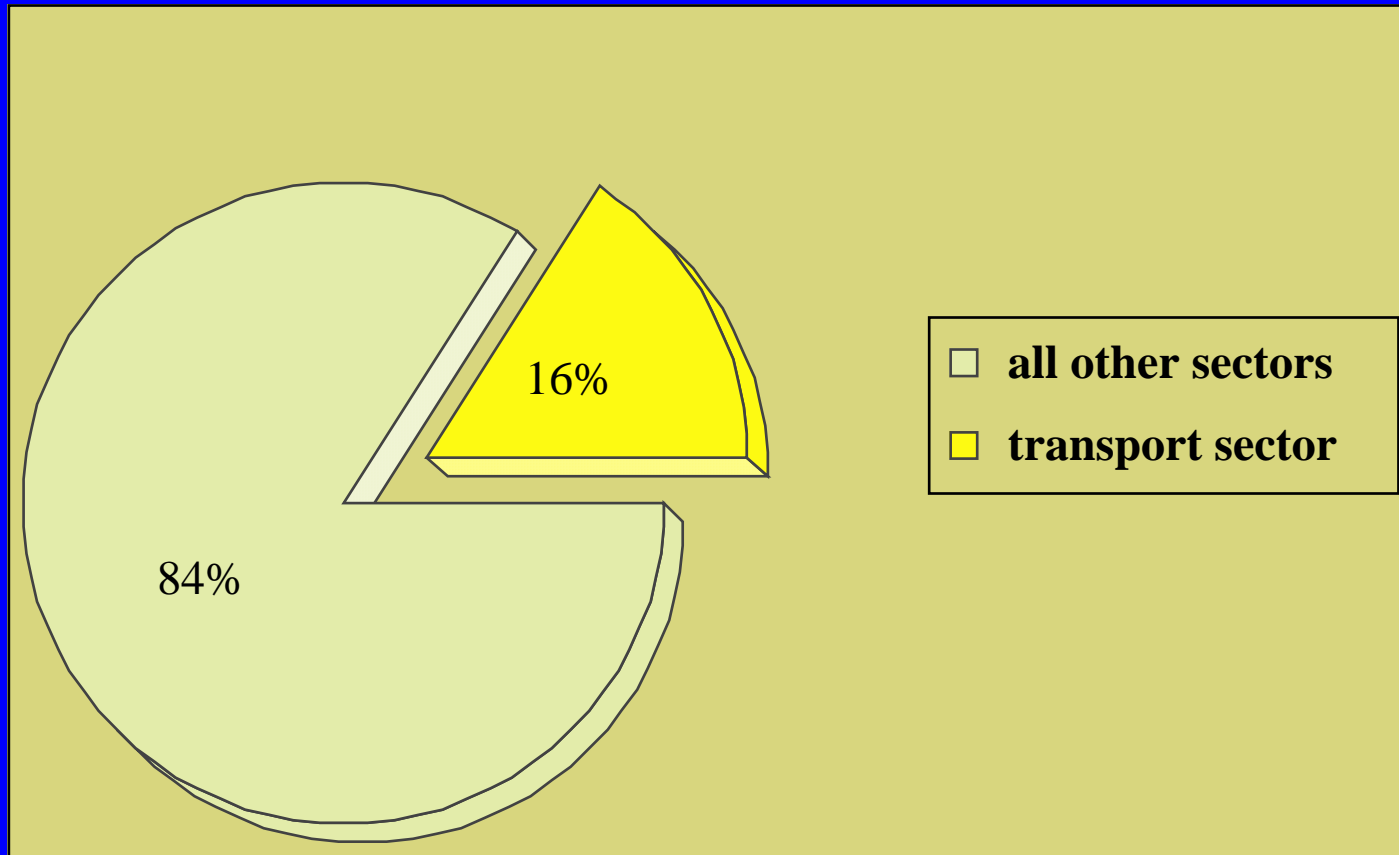
Vehicle emissions in the urban environment - their effects on health

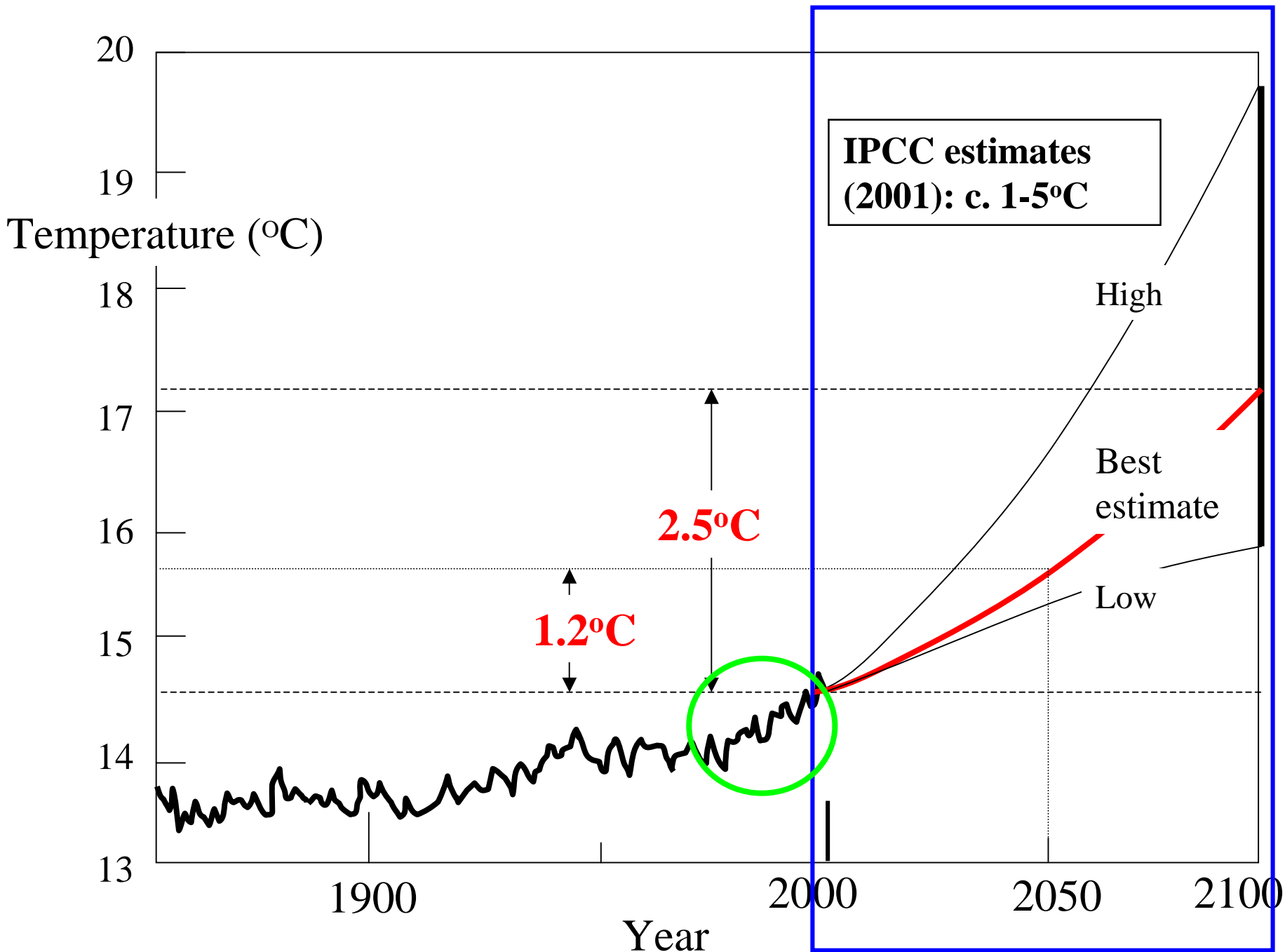
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Greenhouse gases - Transport sector fastest growing contributor to New Zealand greenhouse emissions





Categories of health effects of climate variability and climate change

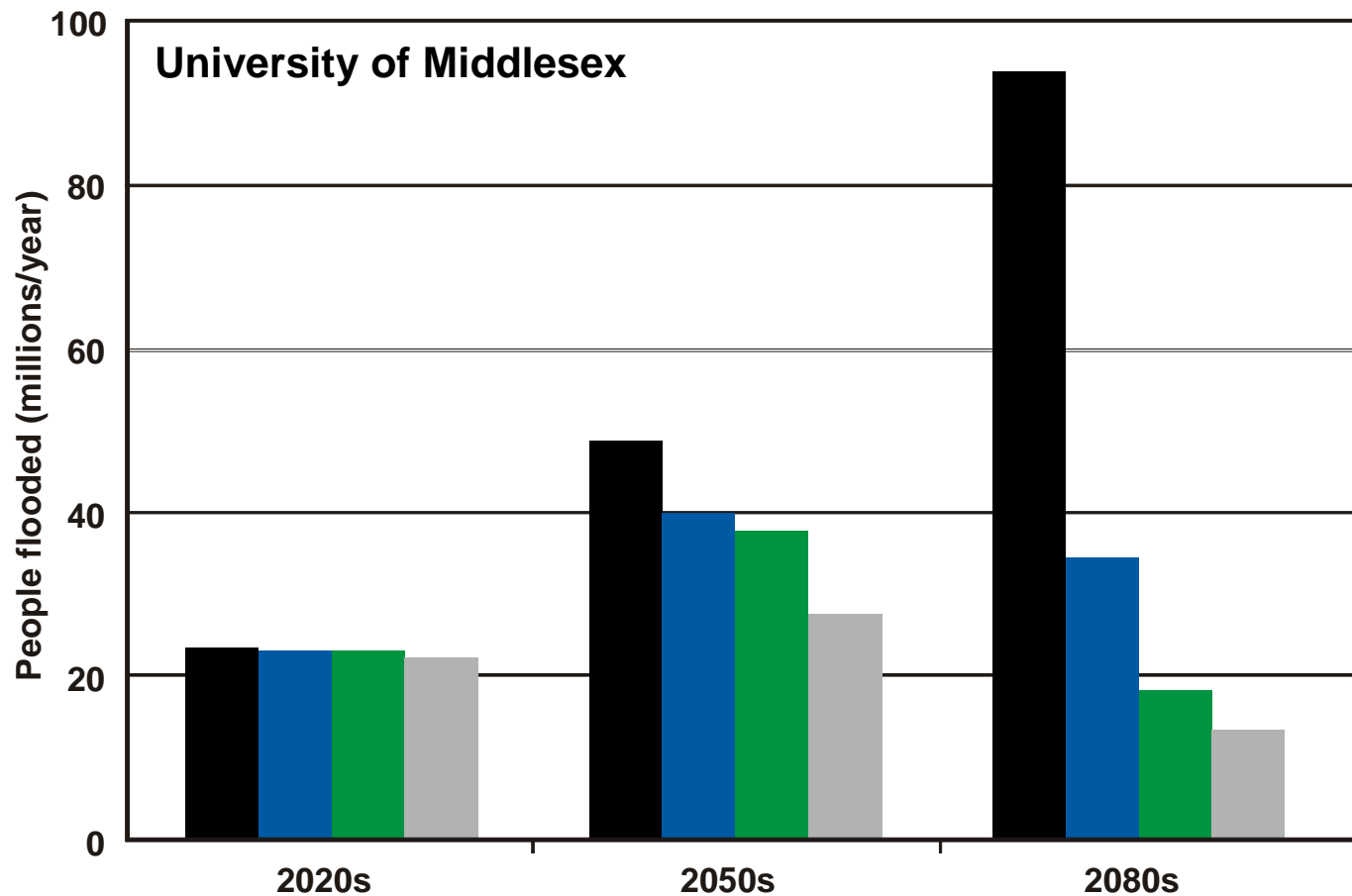
Direct

- Thermal extremes
- Floods and storms

Indirect

- Vector-borne disease
- Other infections
- Food shortages
- Worsening pollution
- Social disruption

Global number of people flooded under three emissions scenarios



Unmitigated emissions 750 ppm stabilisation 550 ppm stabilisation No climate change

Health effects of fine particles

- Increased mortality - acute and long-term
- No evidence of lower exposure threshold
- Stronger effects with smaller particles
- Substantial contribution from vehicle emissions

Dose-response relationships for fine particles, US studies (MfE 2001)

	% change per 10 μ g/m ³ increase in PM10
Daily mortality (all cause)	1.0
Hospital admissions:	
Respiratory disease	1.96
COPD	3.26
Pneumonia	1.42
Heart disease	0.4
Exacerbation of asthma	3.0

Schwartz, Am J Epidemiol 2000

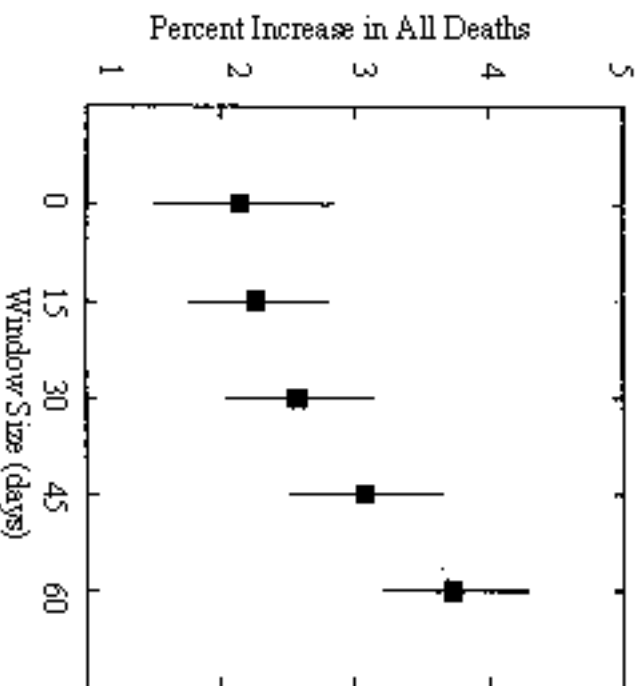
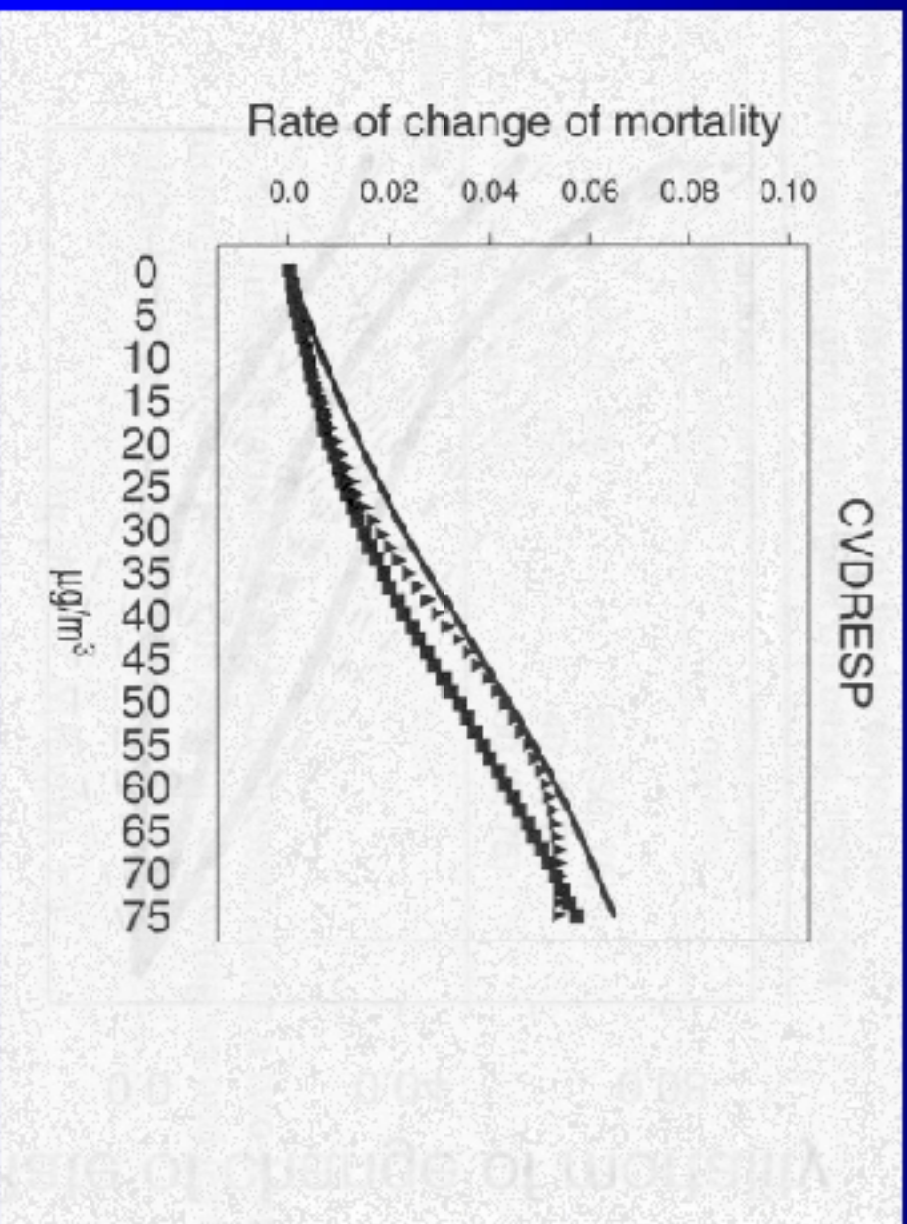


FIGURE 7. Estimated effect of a 10-µg/m³ increase in PM_{2.5} concentration on all-cause mortality in Boston, Massachusetts, in the original published article (12) and the four analyses carried out in this study, using windows of 15, 30, 45, and 60 days.

Daniels, NMMIAPS, Am J Epidemiol 2000



Effect of particles on mortality depends on likely source (Laden 2000)

Likely source	Percent increase in daily deaths	95% CI
crustal	-2.3	-5.8 - 1.2
Motor vehicle	3.4	1.7 - 5.2
coal	1.1	0.3 - 2.0

Public-health impact of outdoor and
traffic-related air pollution: a
European assessment

Kunzli N et al

Lancet 2000; 356: 795-801

Findings:

Air pollution caused 6% of total mortality or more than 40,000 attributable cases per year

About half of all mortality caused by air pollution attributed to traffic

Deaths attributed to traffic emissions approximately twice those caused by road accidents

Economic impact of traffic emissions about 1.7% GDP (Austria, France, Switzerland)

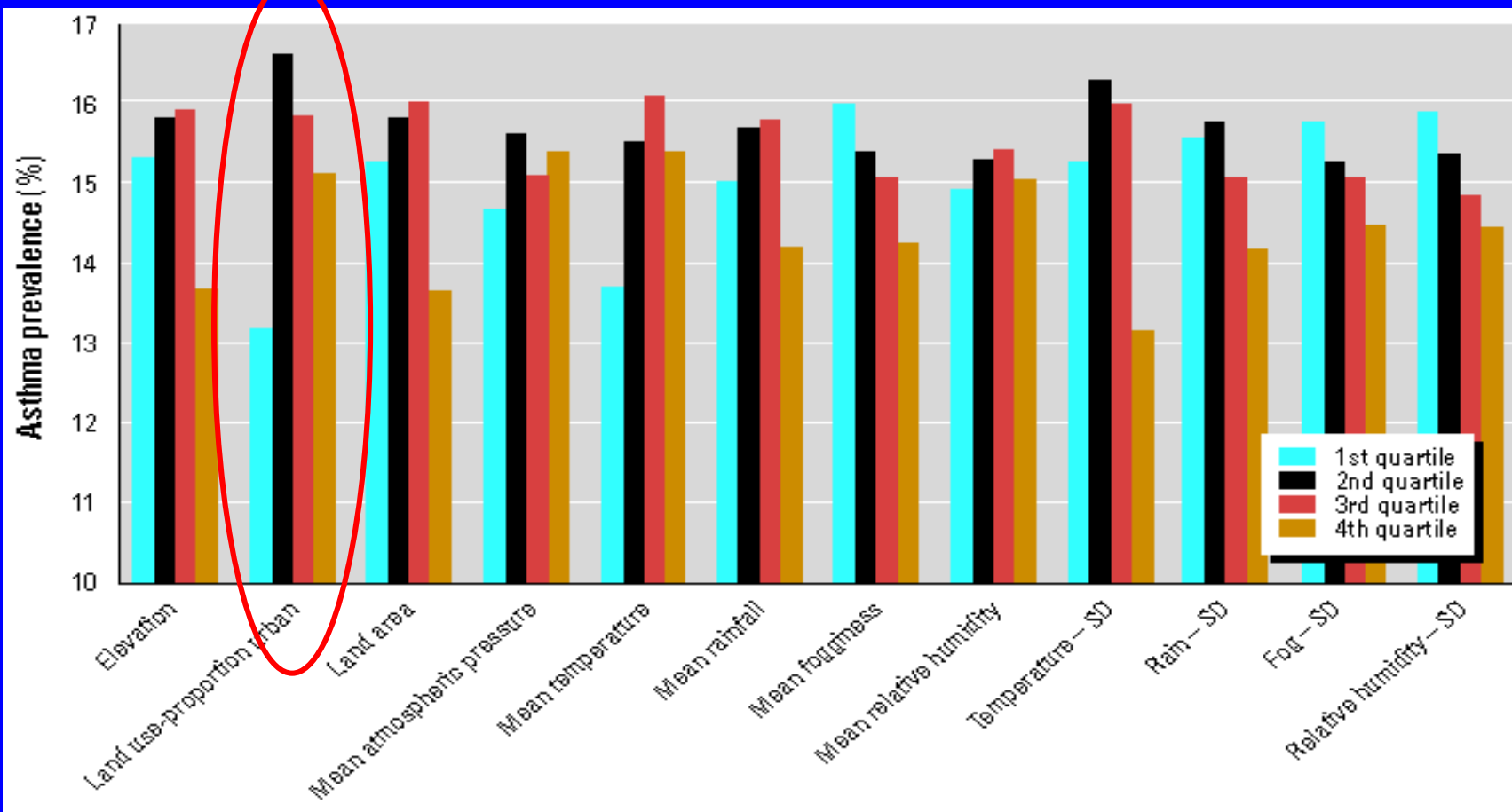
Vehicle emissions and asthma

- Allergic response more pronounced following exposure to vehicle emissions (especially NO₂ and diesel exhaust)
- Vehicle emissions may exacerbate asthma
- Nevertheless, major trends in asthma incidence cannot be explained by air pollution

Exposure to motor vehicle traffic and allergic sensitization, Basel (Wyler et al 2000)

Cars per 24 hrs past place of residence	Pollen sensitization, Adjusted Odds Ratio (95% CI)
24-710	1.0
711-1620	1.99 (0.91-4.38)
1621-5250	2.47 (1.06-5.73)
5251-32504	2.83 (1.26-6.31)

Adjusted for education, smoking, family history.
Duration of residence >10 years



Asthma in New Zealand - high rates, but no consistent association with urban areas

Health effects of ozone

- Ozone an exceptionally potent irritant
- Acute effects include a 2% increase in daily mortality with 50 μ g/m³ increase in daily 1-hour maximum ozone
- Inflammatory effects detectable at much lower doses - no threshold apparent

Health effects of ozone

- Individual susceptibility varies widely
- Stronger effects observed in field studies than in chamber studies - there may be important interactions with other pollutants
- Unclear what the long-term effects may be

Benzene

- Vehicle emissions major source after tobacco smoke
- Carcinogenicity well established
- Assumed that there is no threshold - dose-response relation is uncertain

Diesel exhaust

- Contribute to fine particles
- Associated with allergic sensitization
- Increased rates of lung cancer associated with occupational exposures

Occupational exposure to diesel exhaust and lung cancer (Lipsett 1999)

Study location	Exposure group	RR (95% CI)
Europe	Professional drivers	1.42 (1.07 - 1.89)
North America	Railroad workers (>10 years)	1.55 (1.09 - 2.21)
Europe	Dock workers	1.32 (1.05 - 1.66)

Vehicle emissions and health - conclusions

- Major contributor to global environmental change
- Wide range of immediate effects on health
- In many instances, appears to be no lower threshold apparent

Vehicle emissions and health - conclusions

- High risk groups include children, elderly, persons with asthma, high exposure occupations
- Low risks for individuals, but virtually the whole population is exposed
- Total burden of disease due to emissions similar to that caused by road crashes