

VUW, Does Inequality Matter?

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Methodological issues: is the thesis robust?



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Inequality does matter



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Inequality matters for many things, and for many reasons:

- Values
- Social contracts and cohesion

Inequality matters for health:

- But not as universally and simplistically as the *Spirit Level* might suggest

Structure of presentation



1. Wilkinson, BMJ (1992) – seminal paper
2. Case example: Income inequality and health hypothesis:
 - Curvilinear association at individual-level ...
 - ... but is there a pollution/spill-over/ecologic effect?
3. The limits of cross-sectional analyses:
 - Confounding
 - Reverse causation (or endogeneity)
 - Leverage
4. Snippets from New Zealand
5. Better research – example of where to next



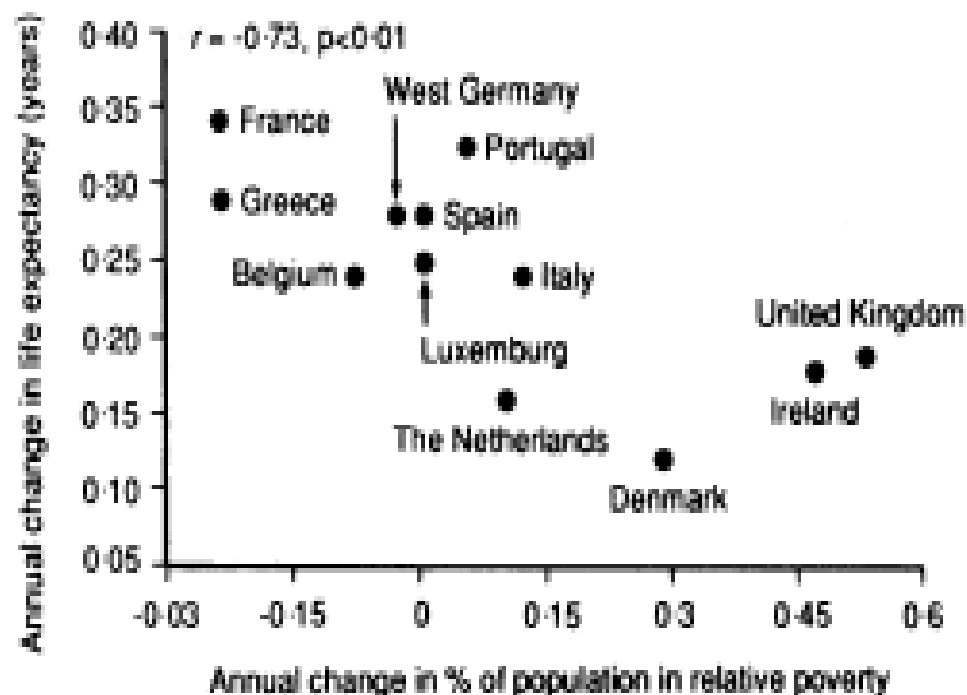
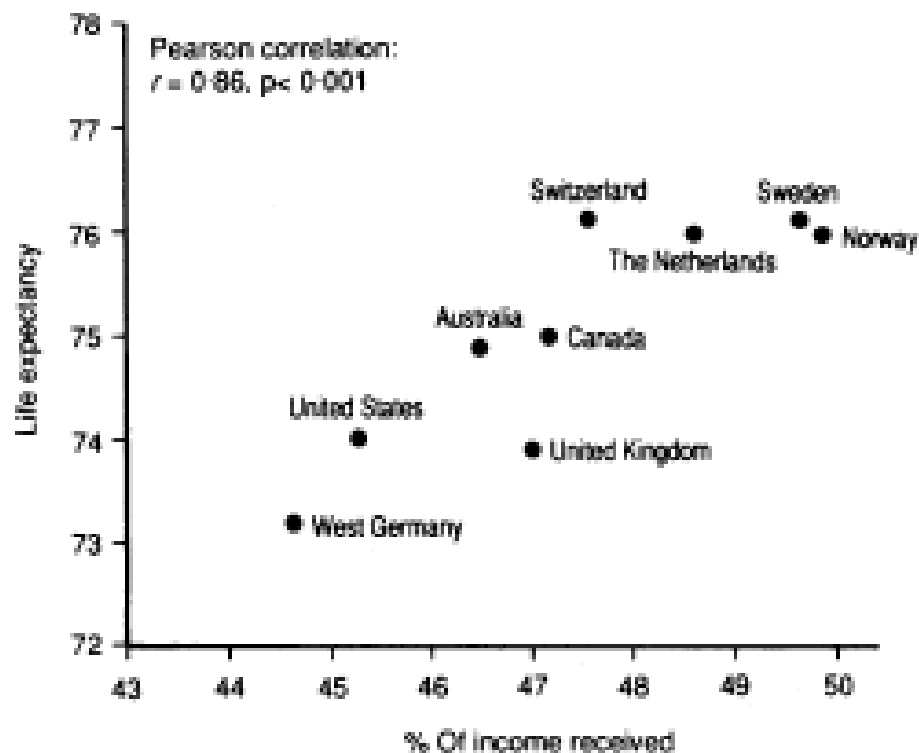
Income distribution & life expectancy

BMJ, 1992. Science, advocacy or 'article of faith'?

For Debate

Income distribution and life expectancy

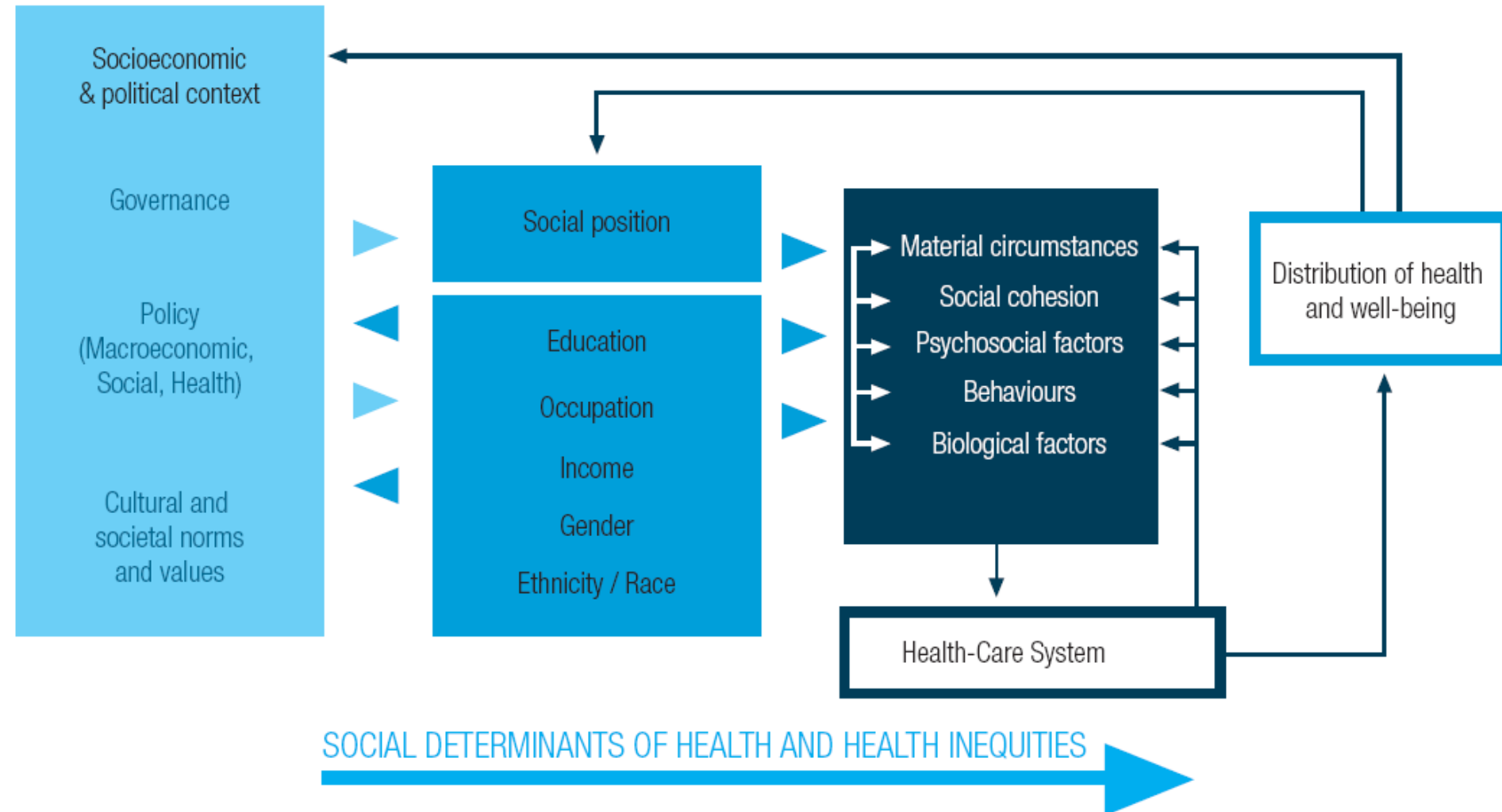
R G Wilkinson





Is it plausible that income affects health?

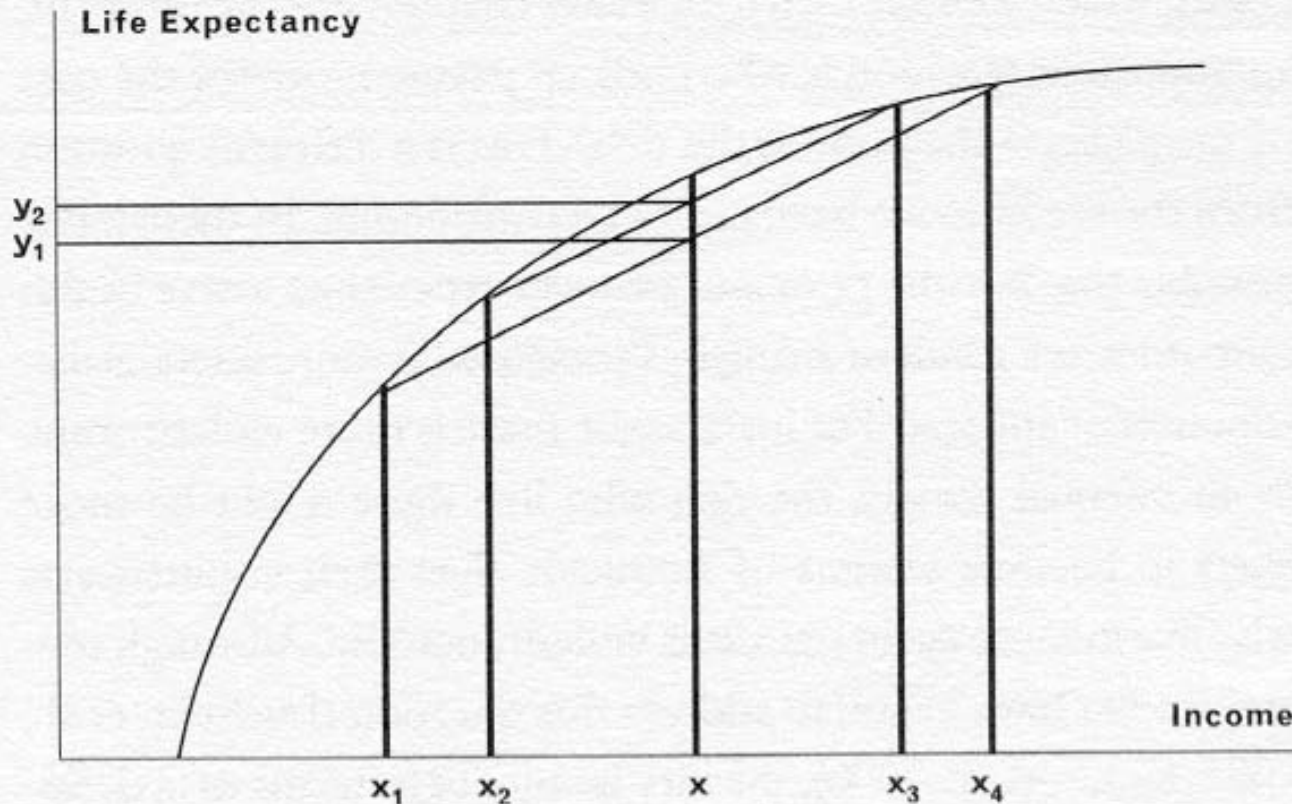
WHO Commission on Social Determinants of Health



The income inequality hypothesis

Mechanisms: **1. Curvilinear association**; 2. Spill-over

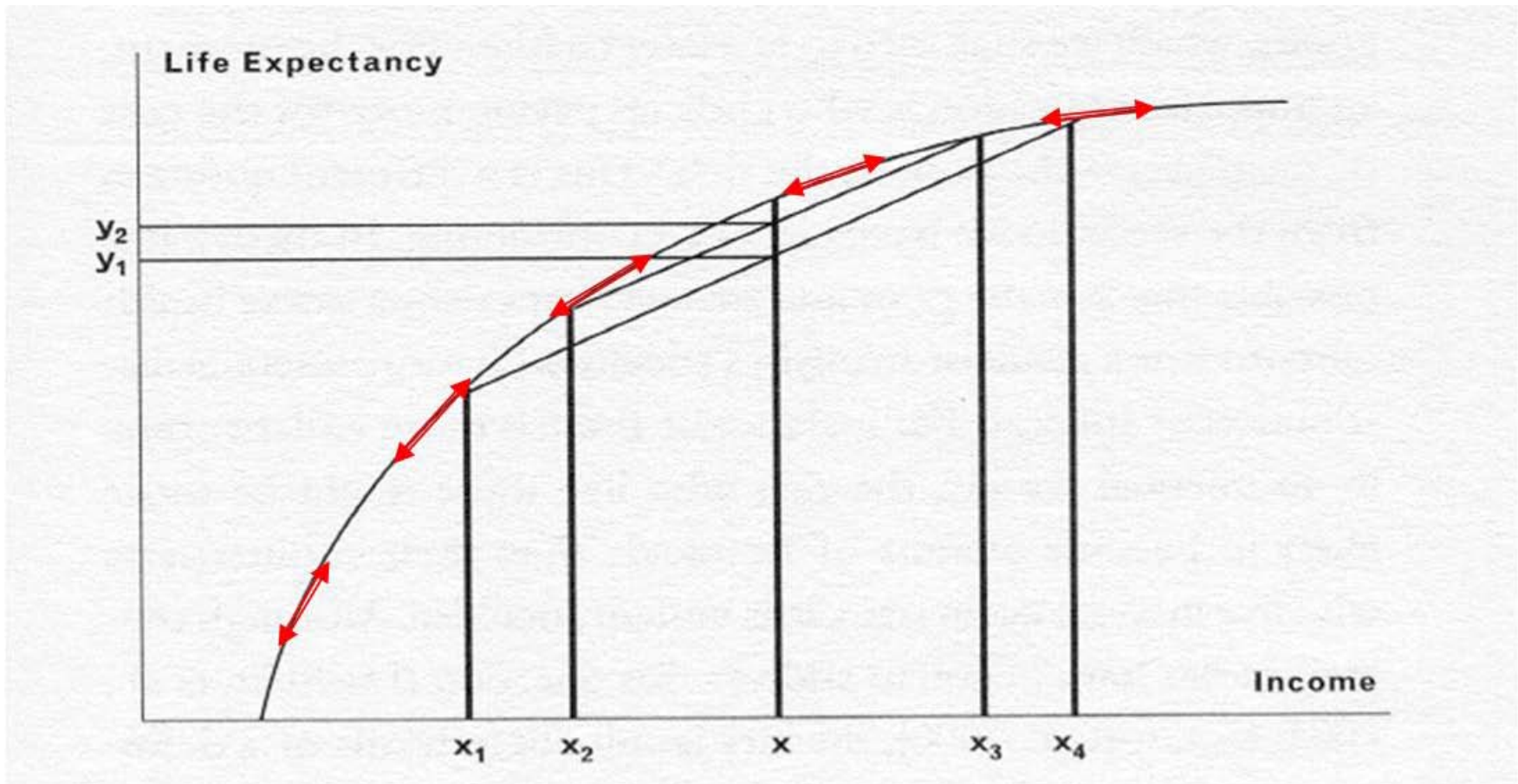
THE CONCAVE RELATIONSHIP BETWEEN INCOME AND LIFE EXPECTANCY



The income inequality hypothesis

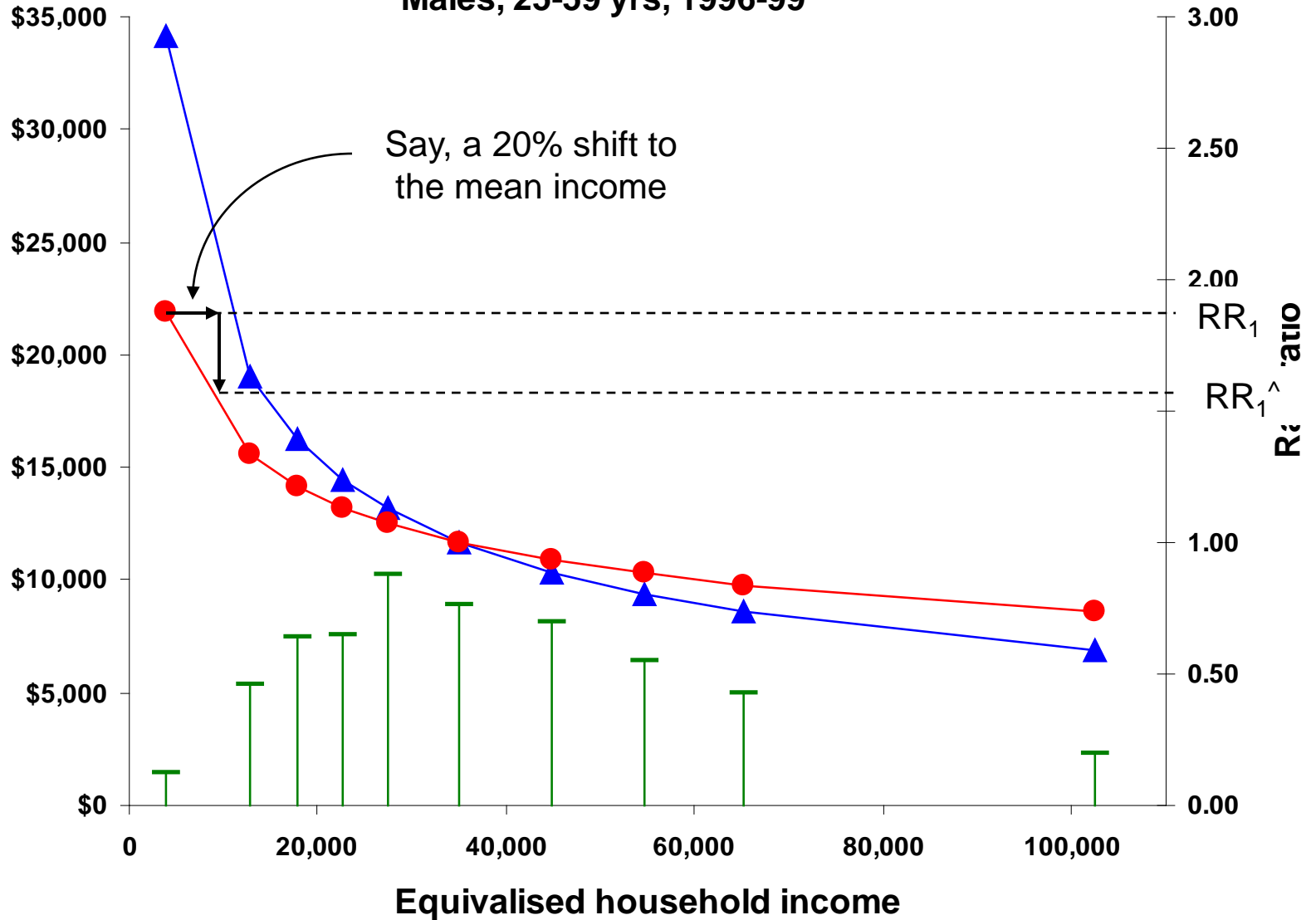
Mechanisms: **1. Curvilinear association**; 2. Spill-over

Our aim: To model changes in overall mortality rates and socio-economic inequalities in mortality that might arise from redistribution of income



Males, 25-59 yrs, 1996-99

Density of people per \$1,000 range of income



- Density of people per \$1,000
- Modeled age/ethnicity adjusted rate ratios
- Modeled multivariable rate ratios

Mortality rate

7%



Overall
rate

Multivariable model

20%
reduction
Gini

Mortality rate

7%

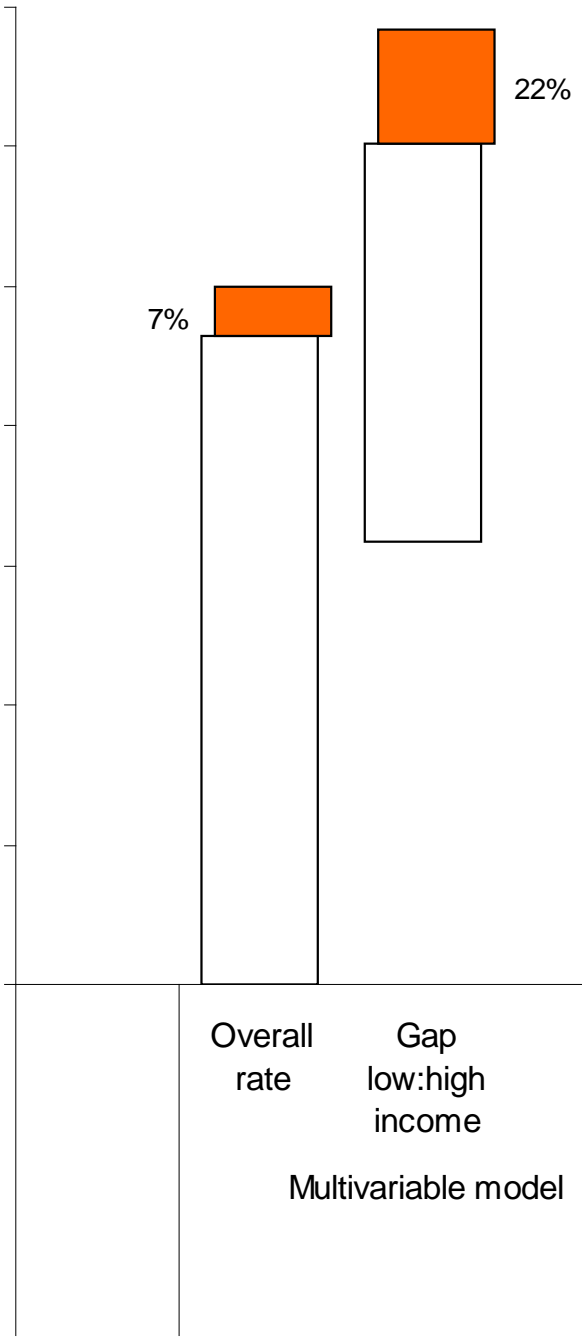
Overall
rate

Gap
low:high
income

22%

Multivariable model

■ 20%
reduction
Gini



Mortality rate

7%

Overall
rate

Gap
low:high
income

Multivariable model

22%

3.3%

Overall
rate

Gap
low:high
income

Income-mortality associaiton half
that in multivariable model

1.3%

11%

20%
reduction
Gini

Mortality rate

7%

22%

3.3%

11%

1.3%

4.2%

20%
reduction
Gini

Overall
rate

Gap
low:high
income

Multivariable model

Overall
rate

Gap
low:high
income

Income-mortality associaiton half
that in multivariable model

Overall
rate

Gap
low:high
income

Income-mortality associaiton 20% of
that in multivariable
model

The challenge we responded to...

Blakely & Wilson. *Shifting dollars, saving lives*. Soc Sci Med. 2006



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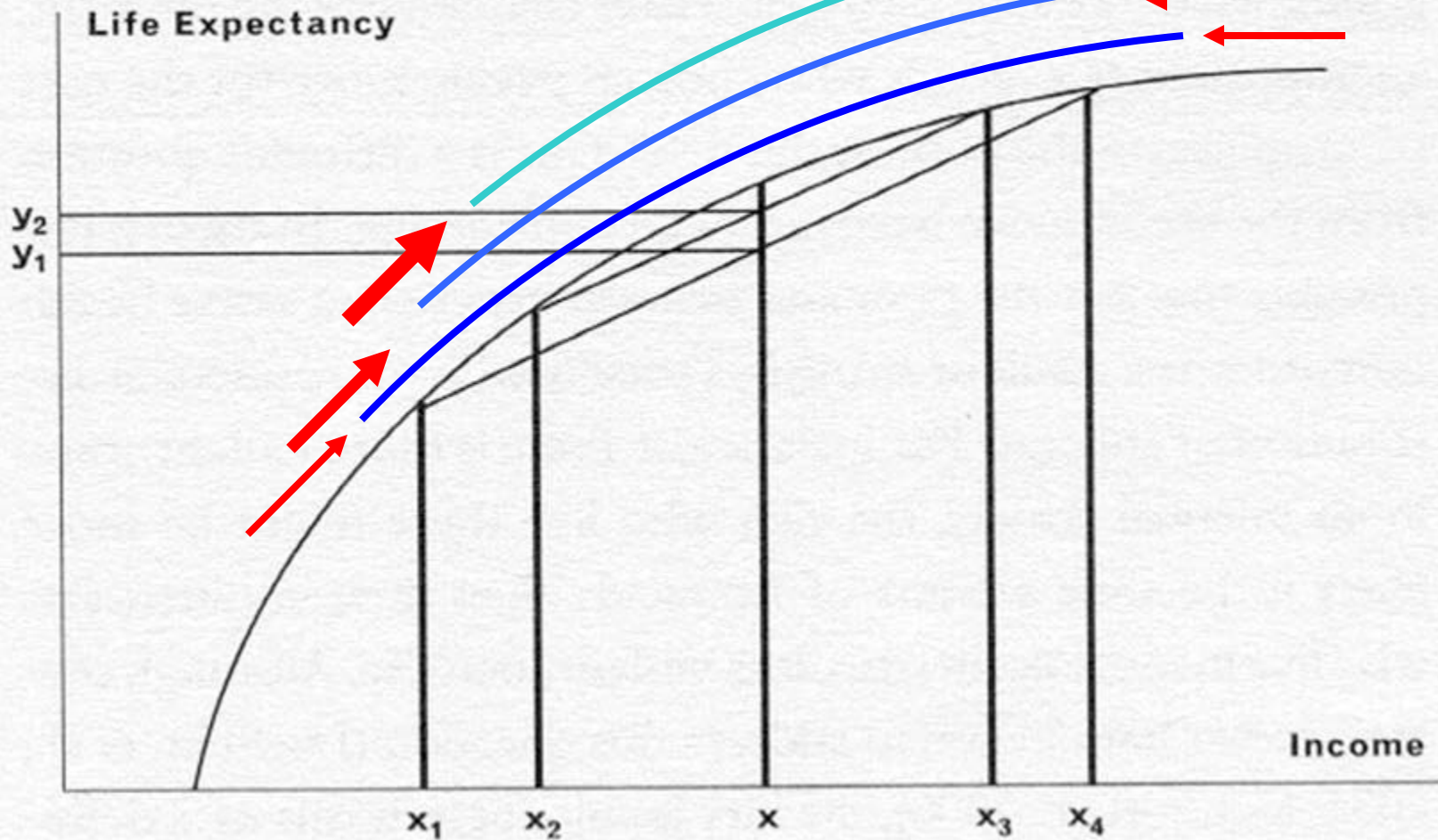
“An important role of social epidemiology is to inform policy debates on reducing inequalities in mortality with, where possible, quantified effects. Many researchers have pointed to the non-linear association of income with mortality as a win-win scenario – narrowing income distributions will both improve overall mortality, and reduce inequalities....

However, when challenged as researchers to *quantify* the impact of income redistribution on overall population health and inequalities in health, we are not aware of any research that has provided such explicit estimates....

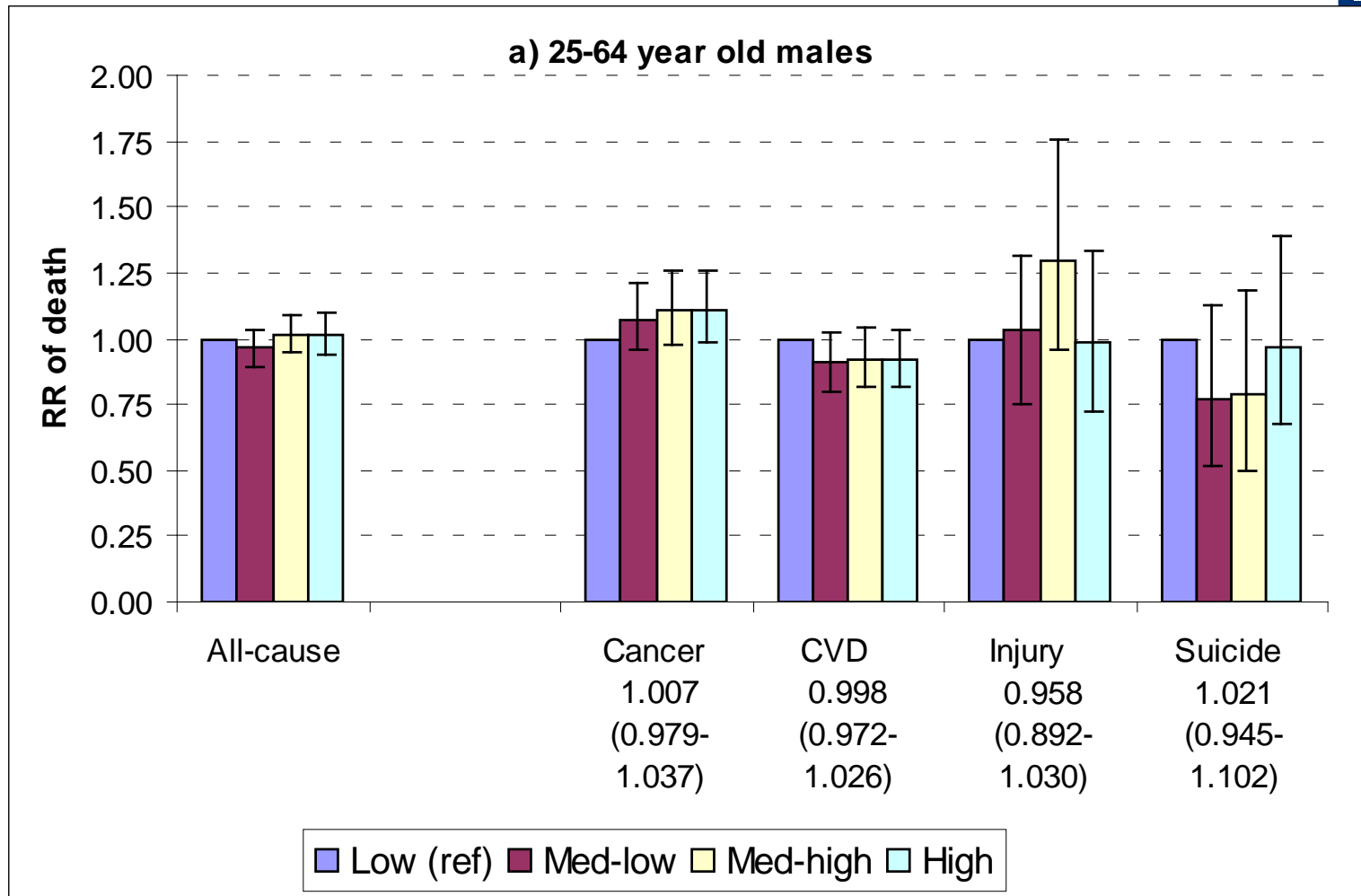
Whilst these estimates will inevitably be uncertain, and must come with an ‘uncertainty warning’, in our view the provision of such quantitative estimates sharpen the policy analysis and debate.”

The income inequality hypothesis

Mechanisms: 1. Curvilinear association; **2. Spill-over**



No (spill-over) association in NZ



The income inequality hypothesis

Mechanisms: 1. Curvilinear association; 2. Spill-over



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- There is strong evidence that the curvilinear association of income with health means that we would expect income inequality to predict (some) differences in health between countries/states
- However, the presence of a ‘spill-over’ (or pollution or ecologic) effect is highly contested:
 - Evidence reasonably strong across states in the US, but still might be due to confounding by history and ‘deep’ factors
 - Not reliably found outside of the US, including in New Zealand.

Limits of cross-sectional analyses

Confounding, reverse causation, leverage



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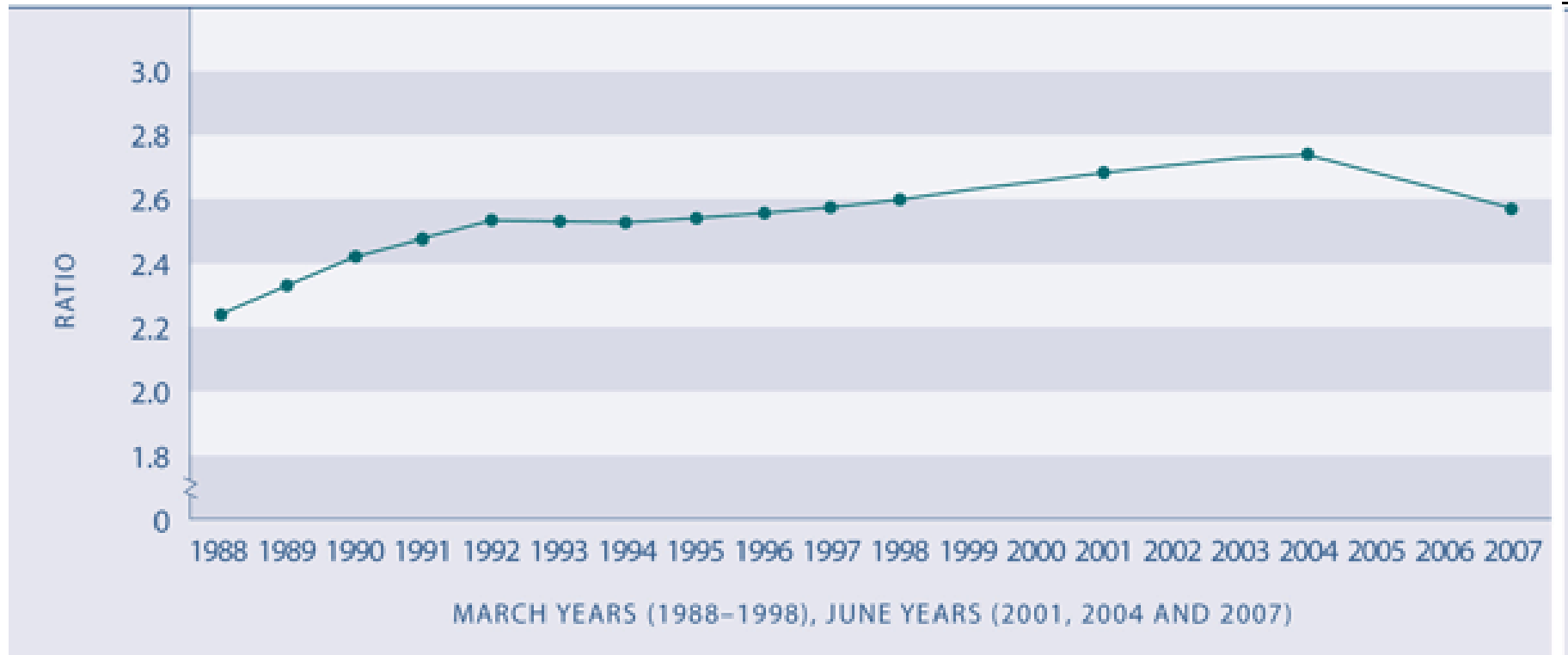
- Confounding:
 - Some third variable causes both income inequality and 'outcome' (e.g. political history ... but is this part of the mechanism under study?)
- Reverse causation:
 - Poor health causes low income, generating association. General consensus is that this is far from a complete explanation
- Leverage
 - Ecologic analyses very susceptible to one (or a few) high-leverage outliers (e.g. homicide rate in USA so high, that 'pulls' regression line up).

Income inequality trends in NZ

Ratio of 80th:20th percentile equivalent disposable income



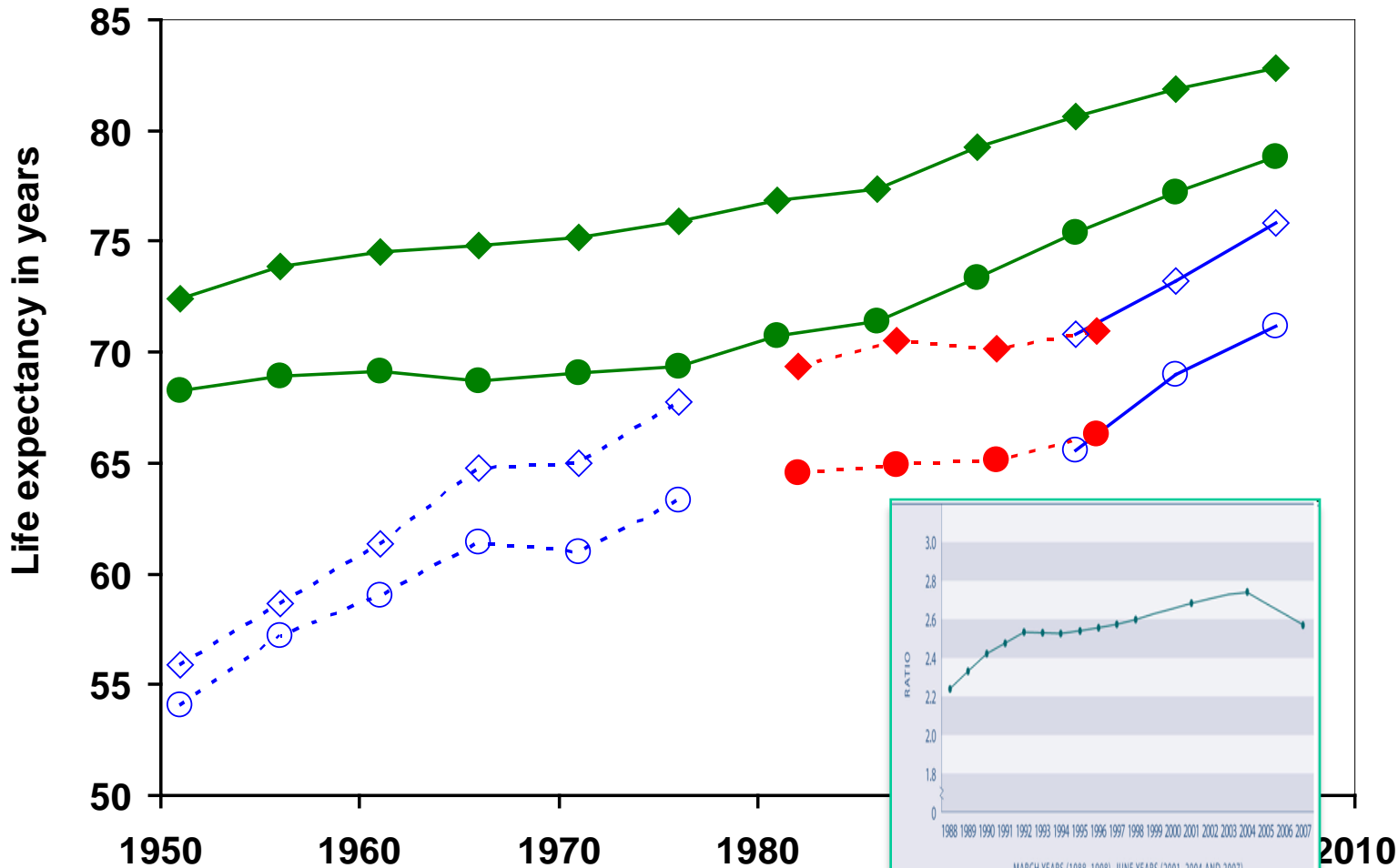
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Life expectancy trends by ethnicity



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- Non-Māori (SNZ) Male
- Māori (SNZ) Male
- Māori (NZMCS) Male
- Māori (MoH latest) Male

- ◆ Non-Māori (SNZ) Female
- ◇ Māori (SNZ) Female
- ◆ Māori (NZMCS) Female
- ◇ Māori (MoH latest) Female



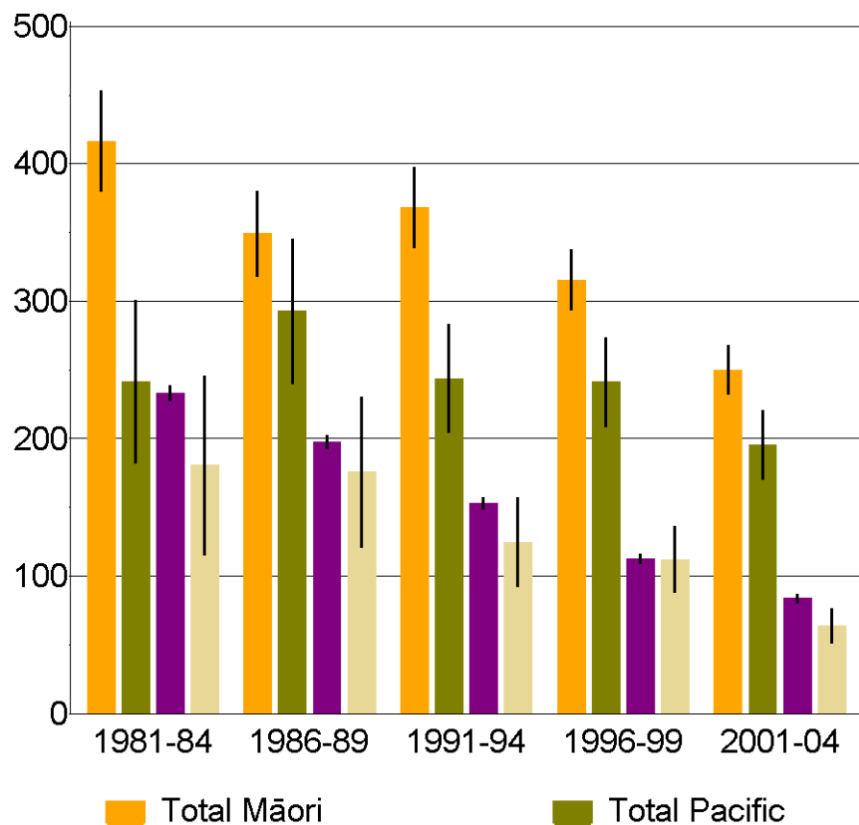
- Lots of evidence of cross-sectional associations.
- But do changes in income inequality actually predict changes in health:

“.... between 1978 and 2000 those regions experiencing the largest increases in income inequality had the largest declines in mortality ($r = 0.81, p < 0.001$). Understanding the social determinants of population health requires appreciating how broad indicators of social and economic conditions are related, at different times and places, to the levels and social distribution of major risk factors for particular health outcomes.”

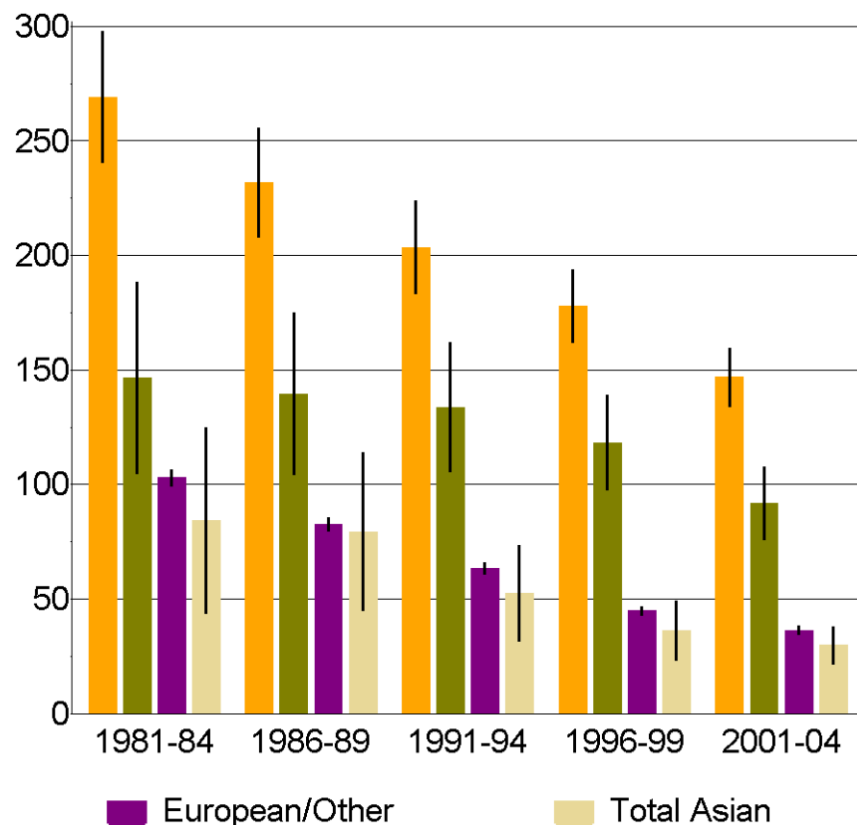
CVD mortality rates by ethnicity



CVD 1-74 yrs Males



CVD 1-74 yrs Females

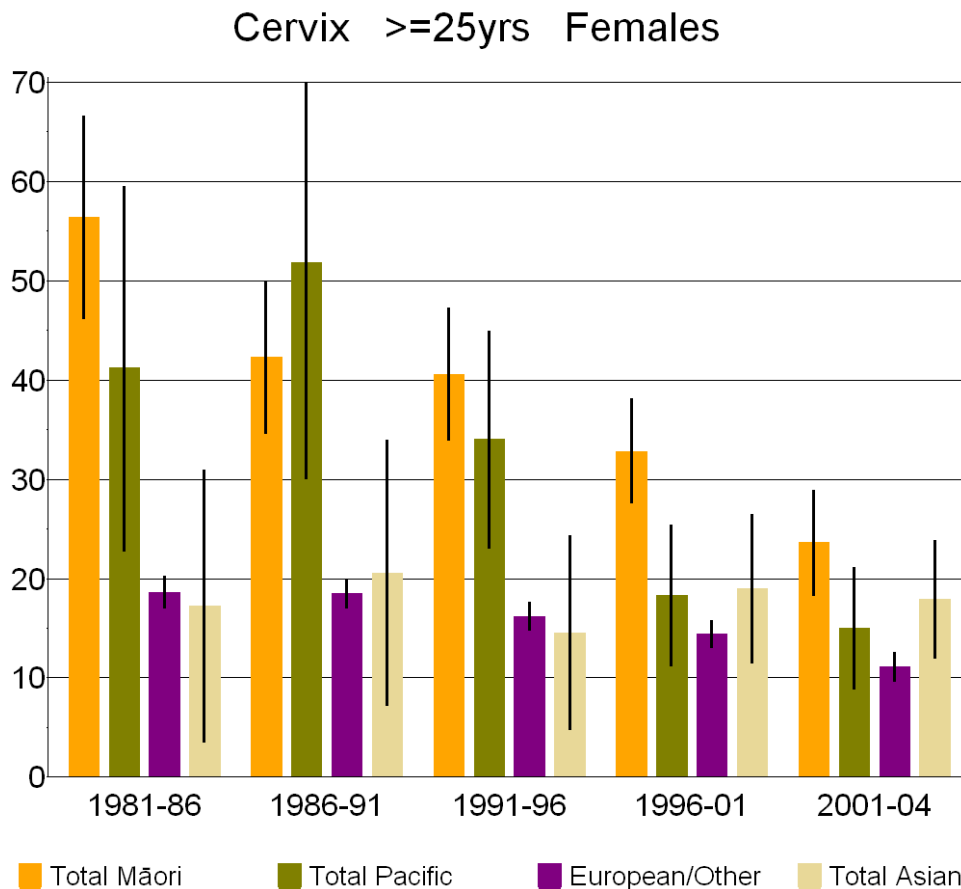


Cervical cancer incidence by ethnicity

CancerTrends – standardised rates per 100,000



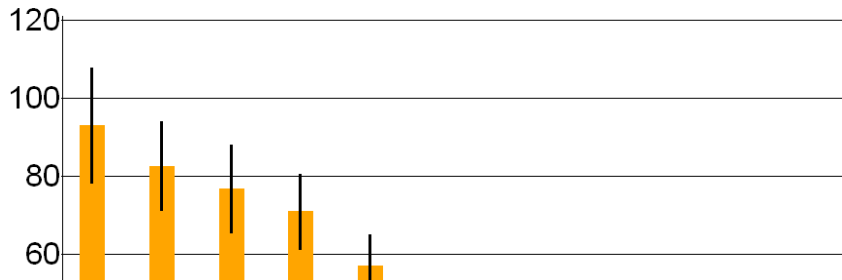
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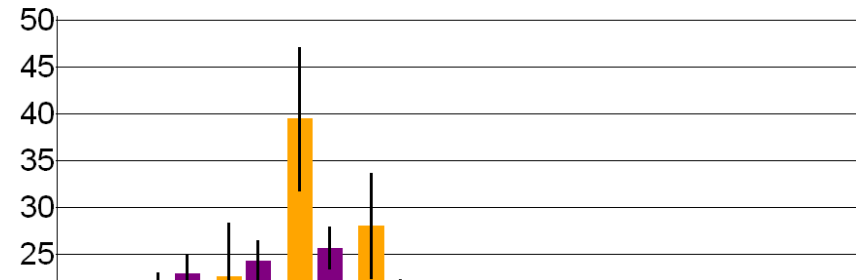
Suicide and injury death rates by ethnicity



Injury 1-74 yrs



Suicide 1-74 yrs



Correlation not necessarily causation

Babones (2008) Soc Sci Med.

Cross-sectional.



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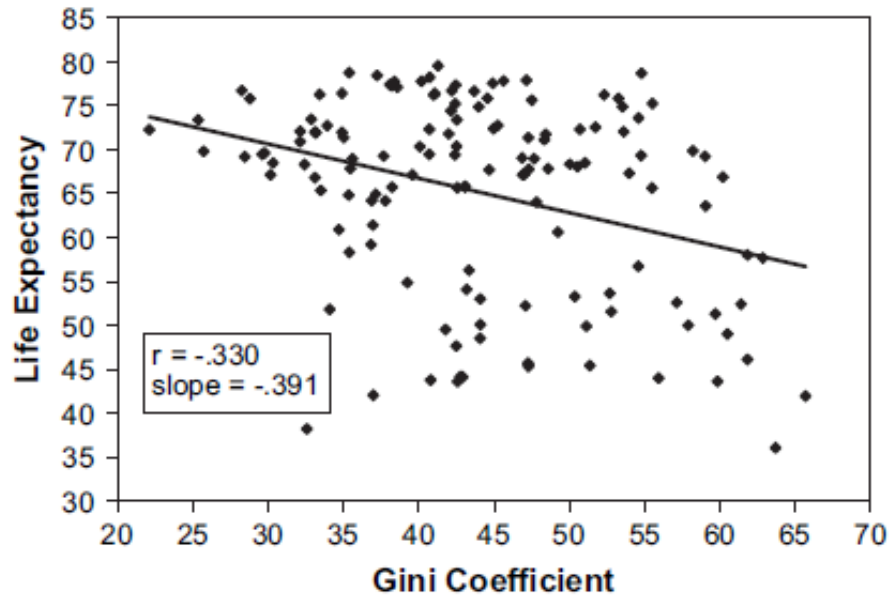


Fig. 1. Relationship between income inequality and life expectancy, 1995 ($N = 137$).

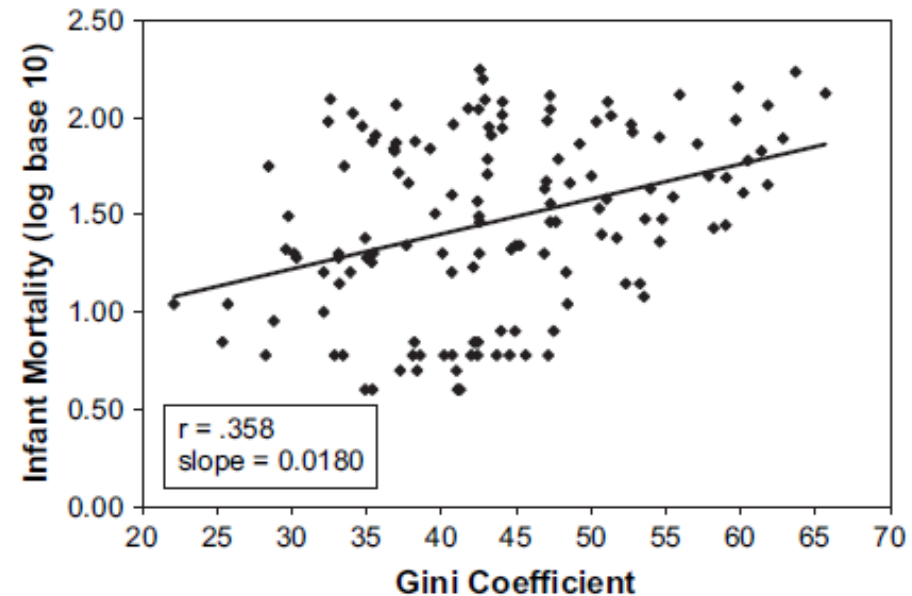


Fig. 2. Relationship between income inequality and infant mortality, 1995 ($N = 135$).



Correlation not necessarily causation

Babones (2008) Soc Sci Med. Difference modelling.

- Up to 125 countries, testing association of change (from 1970 to 1995) in Gini with change in mortality
- Life expectancy and infant mortality association 'as expected' in simple regression, **but** largely disappears once adjusting for GDP change
- Association always 'paradoxical' for homicide

Table 4
Difference models for population health – standardized coefficients

Year	Variables	All cases				
		Simple regression		Multiple regression		
		Gini	<i>N</i>	Gini	GDP per capita	<i>N</i>
All cases	Life expectancy	-0.186*	125	-0.031	0.215*	96
	Infant mortality	0.244**	126	0.091	-0.519**	92
	Murder rate	-0.247	30	-0.343+	-0.335+	26
Trend cases	Life expectancy	-0.291*	58	-0.055	0.142	45
	Infant mortality	0.427**	61	0.162	-0.545**	45
	Murder rate	-0.338	22	-0.448+	-0.308	19

+ $p < 0.10$; * $p < 0.05$; ** $p < 0.01$.

Concluding thoughts

Inequality matters regardless of health ... but considering health



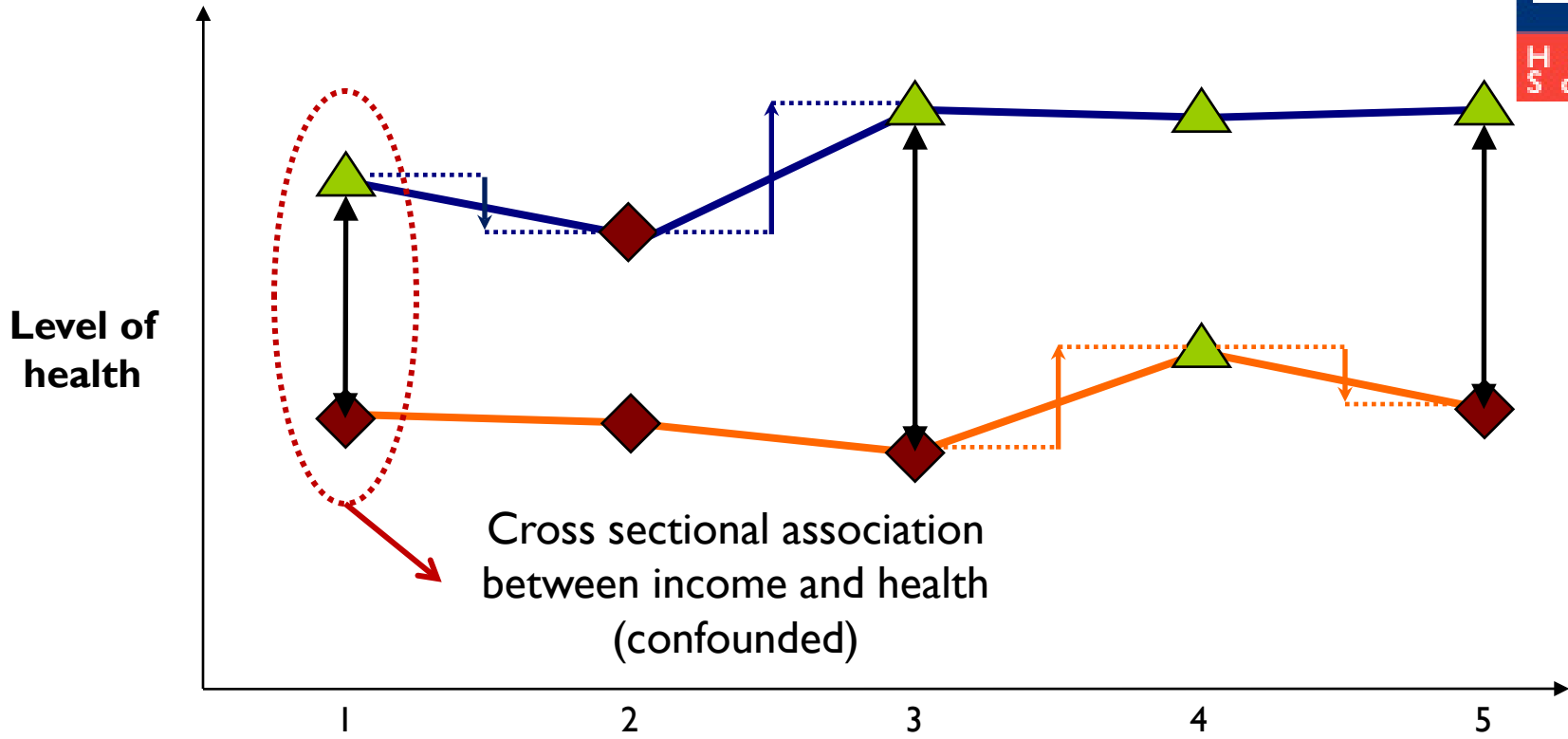
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- Strong evidence that curvilinear association should produce differences in health by income inequality **but** unclear whether any 'spill-over effect'
- Plenty of good theoretical arguments why (income) inequality may affect social outcomes such as health.... **but** very challenging to quantitatively demonstrate/prove due to limited data, time lags, and detecting 'signal' (due to other confounding variables and/or measurement error)
- Lots of other determinants of health may ride-over a distal causes such as income inequality (e.g. tobacco, CVD epidemic) ... **and** thankfully provide alternative policy alternatives (e.g. Māori Affairs Select Committee and smokefree New Zealand)
- Wilkinson has made an invaluable contribution, and the weight of evidence is impressive **but** the strength of causal inference offered by each analysis in isolation is limited, and able to be challenged.

Income and health changes over time



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↑ Within individual changes
↕ Between individual changes

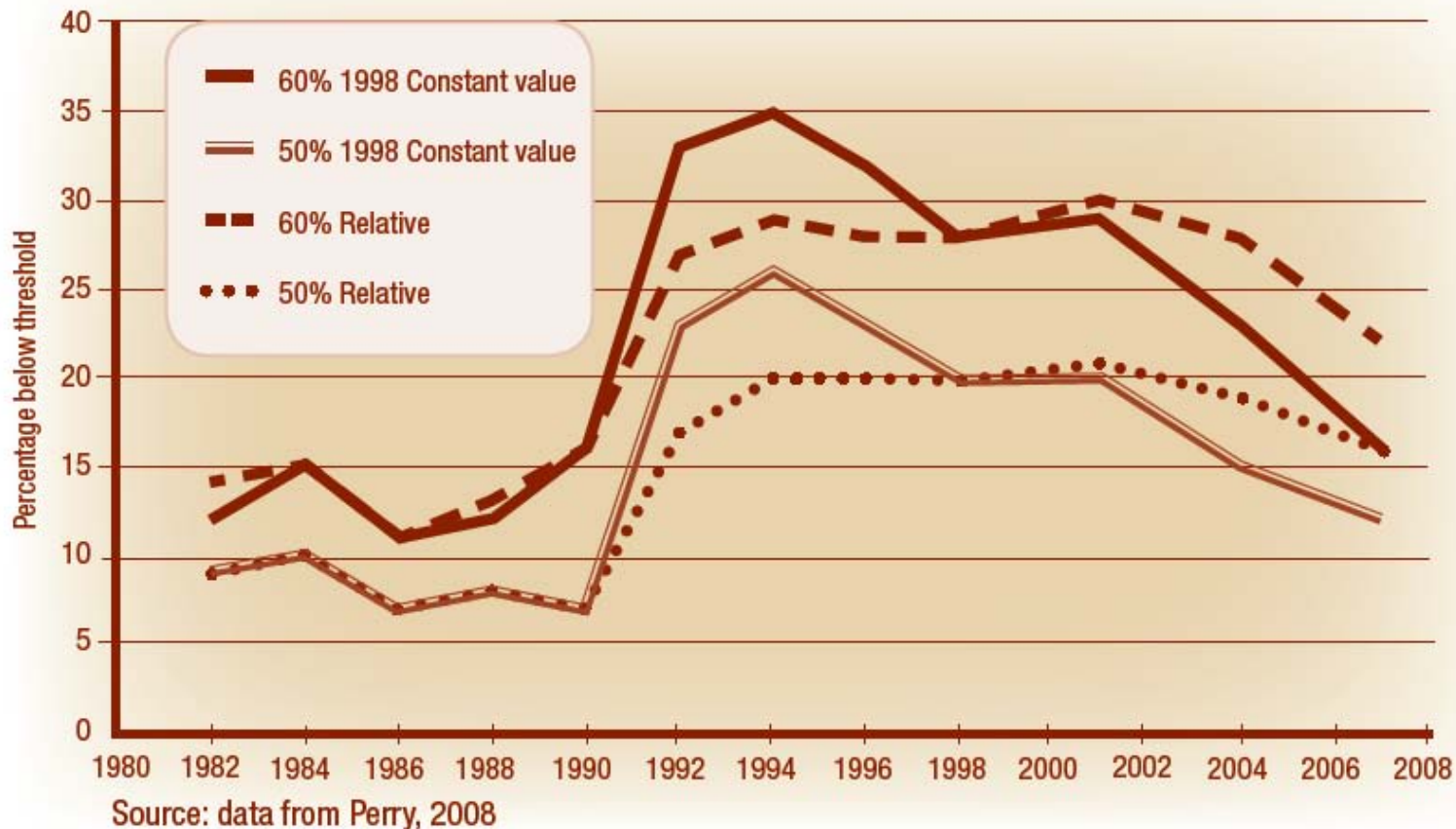
▲ High income
◆ Low income

— Individual 1
— Individual 2

Child poverty rates

Source: Perry 2008; Fletcher and Dwyer 2008

Figure 2: Child poverty rates, using selected thresholds, after housing costs

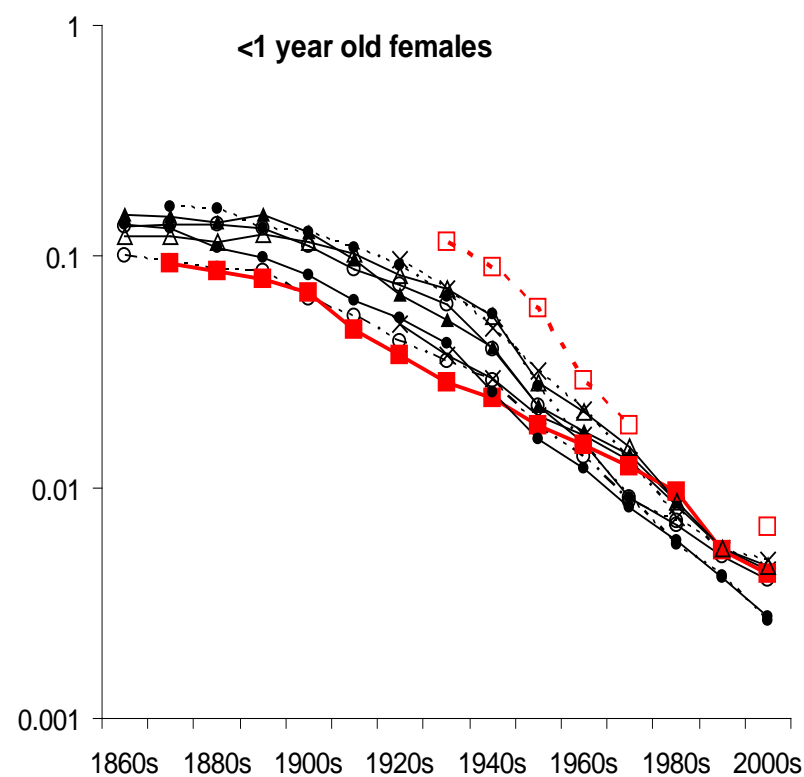
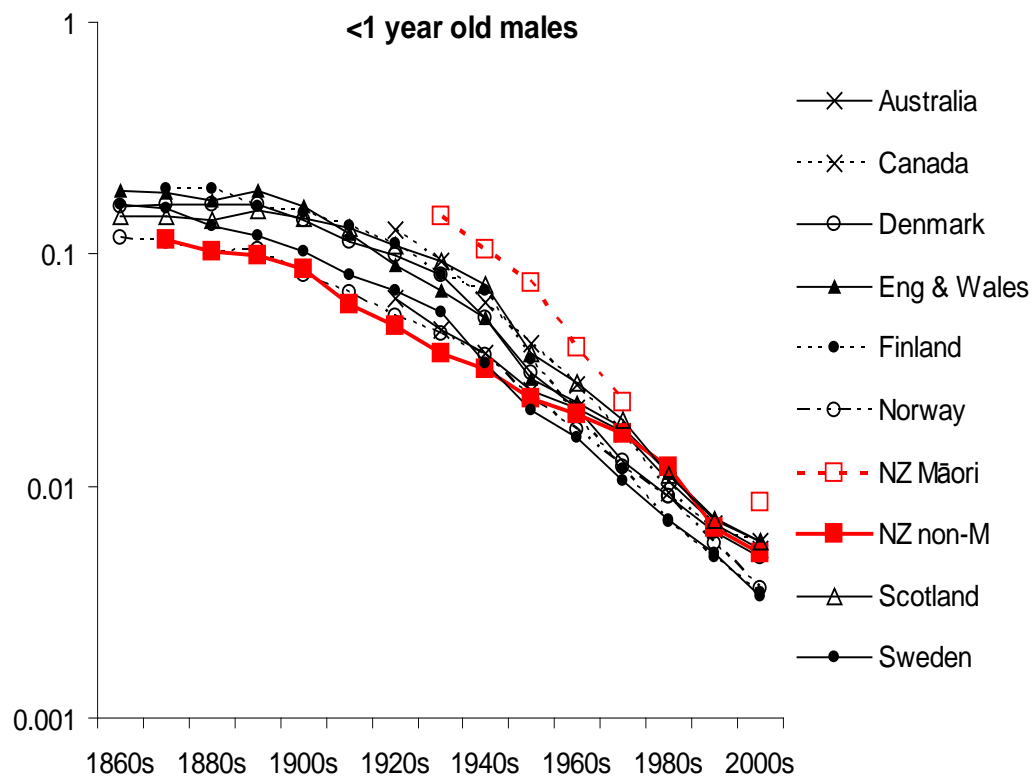


Long-run mortality trends in NZ

Infant mortality mortality



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Example: Unemployment and mortality



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Stuckler et al, 2009, Lancet; multi-country panel study

- 26 European countries from 1970 to 2007
- Fixed effects analysis = extremely good control for confounding
- 1% increase in unemployment associated with:
 - No statistically significant association, for all-cause mortality
 - 0.79% (95% CI 0.16 to 1.42) increase in suicide < 65 yrs
 - 0.79% (95% CI 0.06 to 1.52) increase in homicides
 - 1.39% (95% CI 0.64 to 2.14) decrease in road traffic crash mortality
 - 0.31% (95% CI -0.15 to 0.77) increase in IHD mortality
- Which for to a 5% increase in unemployment in NZ means:
 - 20 more suicides per year (range 3 to 40)
 - 3 more homicides per year (range 0 to 6)
 - 33 fewer RTC deaths per year (range 15 to 51)
- **But** the strength association varied with degree of social protection policy - i.e. interaction such that active labour market programmes muted impact of unemployment