Causal relationships between social and economic factors and health in New Zealand: SoFIE-Health, the Story So Far

Dept Public Health Seminar
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Health Inequalities Research Programme
University of Otago, Wellington, NZ
Outline

- Social determinants of health
- Evidence and causation
- SoFIE-Health
- Some key results
- Reflections from Tony
Figure 4.1 Commission on Social Determinants of Health conceptual framework.

Social Determinants of Health

Source: Amended from Solar & Irwin, 2007
Causation

- Association does not prove causation.
- More complex analyses are needed.
- Experiments or interventions are best for “proving” associations are causations.
- In many cases, such studies are impractical or unrealistic.
- Longitudinal data is the next best thing
  - To examine the whether a change in an exposure “causes” a change in an outcome.
Longitudinal Panel Data

- Panel surveys encourage more reliable analytical techniques, to assess causal sequences.

- Panel surveys follow individuals through time, and observe how their experiences and behaviours are influenced by the wider social and economic conditions in which they find themselves.

- Therefore panel surveys play a major role in understanding social change.
Does a change in H cause a change in L or vice versa?
Longitudinal Fixed Effect Models

- Handles both within-person correlated-error and unobserved heterogeneity (between-person variability)

\[ y_{it} = x_{it} \beta + \alpha_i + \epsilon_{it} \]

- \( \alpha_i \) are fixed parameters (fixed effects) to be estimated or differenced/conditioned out
- \( \epsilon_i \sim \mathcal{N}(0, \sigma^2 I) \), iid (a disturbance/shock to \( y \))
- \( \alpha_i \) can be correlated with \( \epsilon_{it} \)
SoFIE-Health

Goal 1: Determining the impact of labour market factors, asset wealth, income and family dynamics on health

\( \Delta \text{Social factors} \rightarrow \Delta \text{health} \): What is the association of changes in family circumstances, labour force status, benefit receipt and income with changes in health status and behaviour?

Goal 2: Determining the impact of health status on labour market factors, income trajectories, asset wealth and family dynamics

\( \text{Illness} \rightarrow \Delta \text{social factors} \): What is the impact of cancer diagnosis and hospitalisations for major illness on income and asset trajectories, labour force status and family circumstances?

Goal 3: Determining the contribution of access, continuity and co-ordination of primary health care to health status and to social inequalities in health
SoFIE-Health Team
Survey of Family, Income and Employment - “SoFIE”

- Statistics New Zealand
- 8-year longitudinal
- First wave, 1 October 2002
- Collects annual information on demographics, income, labour force participation, education, household and family structure.
- Assets and liabilities - waves 2, 4, 6, and 8.
- Health - waves 3, 5, and 7.
SoFIE-Health Module

- 20 minutes of health-related questions
  - health-related quality of life (SF-36),
  - mental health (Kessler-10),
  - perceived stress (PSS-4),
  - chronic diseases,
  - smoking,
  - alcohol intake and
  - primary health care usage

- Consent to record linkage of hospitalisation, cancer registration and mortality data.
Domains of SoFIE-Health

**Family Structure**
- Family, household composition change
- Residential mobility

**Socioeconomic factors**
- Income levels, change
- Govt benefits
- Labour force status, spells
- Wealth, savings

**Individual Deprivation**
Lack of material necessities (food, clothing, warm house)

**Behavioural risk factors**
- Tobacco, Alcohol
- Primary health care
- Access, continuity of care
- Stress

**Self-reported health**

**Acute illness, injury**

**Mental Illness**

**Chronic Disease**

**Hospitalisation events, cancer regs, mortality**
Goal 1: $\Delta$ Social factors $\rightarrow$ $\Delta$ health

- Determining the impact of labour market factors, asset wealth, income and family dynamics on health
  - Do labour market factors such as hours of work and job separations influence subsequent health status?
  - Does change in income predict change in self-rated health?
  - How do labour market factors, family structure, asset wealth and income trajectories relate to health risk factors and health status?
Does change in income predict change in self-rated health?
Does *change* in income predict *change* in self-rated health? No

<table>
<thead>
<tr>
<th>Variables</th>
<th>Odds ratio</th>
<th>95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amalgamated conditional logit regression model†</td>
<td>1.009</td>
<td>0.995</td>
</tr>
<tr>
<td>Household annual income*</td>
<td>1.009</td>
<td>0.995</td>
</tr>
<tr>
<td>Hybrid proportional odds model†</td>
<td>1.006</td>
<td>0.997</td>
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</tbody>
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- Supported by international literature –
Does change in income from tax credits predict change in health?

Figure 4.1 Commission on Social Determinants of Health conceptual framework.

Source: Amended from Solar & Irwin, 2007
Does *change* in income from tax credits predict *change* in health? No

- This study found that becoming eligible for IWTC or a substantial ($1,000) increase in the IWTC amount was not associated with any detectable difference in SRH over the short term.

- Supported by international literature
  - Pega Cochrane Review 2013
Does moving into “income poverty” impact health?

Figure 4.1 Commission on Social Determinants of Health conceptual framework.
Does moving into “income poverty” impact health? Yes, BUT

- Increasing numbers of years in low income leads to worsening health
- Increasing numbers of years in deprivation leads to worsening health
- Deprivation has a stronger impact on health than low income
Does becoming a parent impact mental health? Yes

- Becoming a first-time parent leads to better mental health and psychological distress.
- Having a second or subsequent child has less of an impact.
- Perhaps counter-intuitive results.

First-time parenting may help mental health.
Do changes in economic factors impact smoking?
Do changes in economic factors impact smoking? Sort of

- Increasing personal income in youth increased the odds of smoking (OR 1.42: 95%CI 1.16 to 1.74)
  - Contradicts ‘simple’ social determinants theory that improving social circumstances → ↑health/behaviour

- Increasing neighbourhood deprivation increased smoking (OR 1.83: 95%CI 1.18 to 2.83)
  - Consistent with ‘simple’ social determinants theory – and strong!

- Increasing individual deprivation increased smoking
Do changes in smoking impact mental health? Yes

- Smoking uptake leads associated with increased psychological distress ($\beta 0.22; 95\%\text{CI} 0.01 \text{ to } 0.43$)
- Increased psychological distress if tried (but failed) to quit - but non-significant
- Increasing individual deprivation increased smoking
Goal 2: Illness $\rightarrow$ $\Delta$ social factors

- Determining the impact of health status on labour market factors, income trajectories, asset wealth and family dynamics
  - Does pre-existing health status predict labour market, income and family mobility?
  - Do sex, ethnicity, and socio-economic position buffer the impact of pre-existing health status on subsequent labour market, income and family mobility?
  - Does pre-existing health status predict job separations for respondent-reported reasons other than “health status”?
Illness $\rightarrow \Delta$ social factors

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Source: Amended from Solar & Irwin, 2007
Does a health shock impact employment? Yes

- A health shock was associated with a significantly increased risk of subsequent non-participation in the labour force.
- The association was largest in younger men and women (but not significantly different).
Is it: social causation? or health selection?

- Social Causation
- Commonly found by international literature
Does childhood social position impact adult health?

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Source: Amended from Solar & Irwin, 2007
Does childhood social position impact adult health?

Does childhood social position impact adult health?

Odds of childhood SEP (low v high) on health
Model 1: adjusted for age, sex and ethnicity
Model 2: M1 + Education
Model 3: M1 + Labour Market Activity
Model 4: M1 + Household Income
Model 5: M1 + NZ Area Deprivation
Does childhood social position impact adult health?
Fixed Effect Model Reflections

- Handles both within-person correlated error and unobserved heterogeneity (between-person variability)
- Evidence of an effect is strong causal inference
- Does not control for unobserved time-varying confounding
- Limited precision – need “enough” change
- Doesn’t control for reverse causation or simultaneity
SO WHAT?

Kristie Carter
Tony Blakely

SO WHAT?
Disclaimer and data access

- Access to the data used in this presentation was provided by Statistics New Zealand under conditions designed to give effect to the security and confidentiality provisions of the Statistics Act 1975.
- The results presented are the work of the researchers, not Statistics New Zealand.
- We take full responsibility for the results, and Statistics New Zealand will not be held accountable for any error or inaccurate findings within this presentation.
- All figures and graphs are based on numbers rounded to base five.
References to Published Papers

- Gunasekara, F., Carter, K., & Blakely, T. Glossary for econometrics and epidemiology. *J Epidemiol Community Health, 2008;62;858-861*


- Van der Deen, FS, Carter, KN, Wilson, N, Collings, S. Failed quit attempts appear to increase levels of psychological distress in smokers in a large New Zealand cohort. *BMC Public Health 2011; 11(598).*


Mckenzie, S., Carter, K. Do transitions into parenthood lead to changes in mental health? Findings from three waves a population-based study. *J. Epidemiol Comm Health*. 2012;published online Dec 2012.


