This is an author produced version of *Selective migration and changing health / deprivation relationships*.

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**Conference or Workshop Item:**

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Selective migration and changing health / deprivation relationships

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Where are we going?

Background:
- Changes in self-reported health
- Who has thought about this before?
- Health-deprivation-migration inter-relationships
  - N.B. Sub-national migration
  - International literature ‘Healthy migrant effect’
- Using ONS Longitudinal Study

For the population as a whole:
- How changes affect health levels in deprivation extremes
- Overall health deprivation relationship changes

Some more angles:
- Is this the same for different ethnic groups?
- Is this the same by age?
- Are there similarities for another country, health outcome & ethnic context?
Limiting long-term illness question in 1991 Census

- Do you have any long term illness, health problem or handicap which limits your daily activities or the work that you can do? Include problems which are due to old age. (Yes/No)

LLTI & Deprivation

(Area data)

Q5 : Q1 ratio

1991 = 1.61

2001 = 2.13

Might the change in gradient be due to migration?
Selective migration affecting local health rates?

Farr (1864) & Welton (1872)
  • Age dimensions & life course
  • Area types
  • Movements affect both origins & destinations

Migration a neglected factor?
  • Prothero (1977)
  • Learmonth (1988)
  • Bentham (1988)
  • Gatrell (2002)
Inter-relationships: health, deprivation & migration

Health

• Majority of migrants are young & relatively healthy
• Some people may / may not move because of their health
• A migrant’s health may be affected by the process
• Migrants may spread disease

Migration

• More advantaged people tend to migrate to or between less deprived, more attractive locations
• Less advantaged people tend to drift into (or be trapped in) more deprived locations

Deprivation

• Gradient of health status along deprivation gradient
• Healthy people live in less deprived locations & vice versa

Calculation & variable issues

• Inputs to calculations may have different ‘qualities’ of data recording within the same (e.g. Census) and between different sources
Migration & changing health / deprivation relationships?

Area A
Lower social classes
Overcrowding
High unemployment
Poorer health

Area B
• Higher social classes
• More sparsely populated
• Low unemployment
• Better health
Migration & changing health / deprivation relationships?

**Area A**
- Lower social classes
- Overcrowding
- High unemployment
- Poorer health

- Differences in health between migrants and non-migrants?
- Size of the migrant flows?
- Differences in health between the migrant flows?
- Demographic and socioeconomic attributes of migrants and non-migrants?
- Health & other attributes of those ‘left behind’?

**Area B**
- Higher social classes
- More sparsely populated
- Low unemployment
- Better health
ONS Longitudinal Study for England (& Wales)

- c. 1% sample, c. 500k at each census & c. 350k across censuses
Transitions between deprivation quintiles using the LS

Transitions by both migrants and non-migrants
Changes affecting the deprivation extremes

1991 to 2001 SIRs for LLTI

Migrants

Non-Migrants

Deprivation quintile between 1991 and 2001

Stable Q1 Changed to Q1
Changed from Q1
Changed from Q5
Changed to Q5
Stable Q5

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1991 to 2001 SIRs for LLTI

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Changes affecting the deprivation extremes

2001 to 2011 SIRs for LLTI

Migrants

Non-Migrants

Deprivation quintile between 2001 and 2011
Overall effects on inequality: putting people back

1991-2001
Rate ratio
Movement: 1.82
No movement: 1.67

2001-2011
Rate ratio
Movement: 1.79
No movement: 1.75
Changes by ethnic group? 2001 to 2011

All Minority Ethnic Groups

Migrants

Non-Migrants

Indian Ethnicity
Selective migration affecting local health rates?

Health-deprivation relationship

• More exaggerated than if nobody moved & / or if areas didn’t change

But …

• Disaggregating the moves between deprivation categories by age shows some different directions
  e.g. Unhealthy elderly migrants moving from more to less deprived areas

What about different ages?
Are health inequalities evident at all ages?

The notion that mortality inequalities across area deprivation may vary by age is logical

- Not every cause of death increases with age
- Not every cause of death related to the deprivation

Mortality (1997-99) ratio most : least deprived IMD quintile

(Dibben & Popham, 2012 for England)
Variations by age: an alternative / additional ‘explanation’

In addition to the interaction between the cause–age & cause–deprivation relationships …

Population migration may redistribute the population such that the health–deprivation relationship varies by age

Proposition based on:

• Distinctive age schedule of migration
• Types of areas people typically move from & to at different ages
• Migration process itself is health selective
Cross-sectional inequalities by age

England & Wales
Ratio Most : Least deprived by Carstairs quintile

Mortality (2000-02)

Limiting long-term illness (2001)
Longitudinal LLTI inequalities by age

**Age 0-9 in 1991 & 10-19 in 2001**

- Graph showing the percentage of persons in each quintile per year for age 0-9 in 1991 and 10-19 in 2001.
- Odds Ratio graph comparing the quintiles for the same age groups.

**Age 10-19 in 1991 & 20-29 in 2001**

- Graph showing the percentage of persons in each quintile per year for age 10-19 in 1991 and 20-29 in 2001.
- Odds Ratio graph comparing the quintiles for the same age groups.
Longitudinal LLTI inequalities by age


Longitudinal LLTI inequalities by age

Age 40-49 in 1991 & 50-59 in 2001

Age 50-59 in 1991 & 60-69 in 2001
Longitudinal LLTI inequalities by age

Age 60-69 in 1991 & 70-79 in 2001

Age 70-79 in 1991 & 80+ in 2001
How might we use this information?

Investigations of health-deprivation relationships

- Direct / Indirect standardisation often all age or ‘premature’ (excluding elderly)
- What if other age boundaries applied?
Health-deprivation-migration inter-relationships

Are any of the above applicable:

- In another country?
- For a different health outcome?
- Where ethnicity is also relevant?

The role of deprivation transitions in explaining health inequalities in New Zealand

- Cardiovascular disease (CVD) one of the leading causes of death globally, with marked variations between ethnic groups
- In Auckland, residential mobility found to be an important determinant of CVD (Exeter et al., 2015)
- Propensity to migrate varies by ethnic group, as does risk of CVD
- Exploring relationship between CVD, residential mobility and ethnicity may be revealing as to ethnic health inequalities in CVD
Explore how residential mobility and the nature of a move interacts with risk of CVD for different ethnic groups in New Zealand:

- Do movers in New Zealand have higher risk of CVD?
- Is risk of CVD for movers attenuated by baseline deprivation?
- Do patterns observed for movers and stayers in NZ vary for specific ethnic groups?
- How does risk of CVD vary by ethnic group for stayers?

Illustrate some of the ‘selection effects’ behind migration events which may influence ethnic health gradients
Vascular Informatics using Epidemiology and the Web (VIEW) longitudinal data

- Encrypted National Health Index numbers used to anonymously link 4 nationally held datasets
- Eligibility based on age, complete socio-demographic information and no prior history of CVD
- Study period 01/01/06 – 30/06/14

Methods

- Binary logistic regression: model odds of CVD adjusting for:
  (1) mover status; (2) mover status and baseline deprivation; (3) deprivation change; (4) deprivation transitions; (5) stable deprivation for stayers
- Interaction effects by ethnic group explored via ethnic-specific models

3,465,324 participants in the New Zealand Vascular Atlas Cohort

- 8,245 duplicate records
- 254 participants with unspecified gender
- 119,957 participants with missing geographic information or deprivation status
- 823,756 participants aged under 30 or over 85 years, and with prior history of CVD (pre 2006)
## Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>Female; Male</td>
</tr>
<tr>
<td>Age</td>
<td>30-44; 45-54; 55-64; 65-74; 75-85</td>
</tr>
<tr>
<td>Ethnicity (prioritised)</td>
<td>Maori; Pacific; Indian; Other Asian; New Zealand European &amp; Other (NZEO)</td>
</tr>
<tr>
<td>CVD hospitalisations (events)</td>
<td>CVD; No CVD</td>
</tr>
<tr>
<td>Deprivation (NZDep2006)</td>
<td>Q1 - least deprived; Q2; Q3; Q4; Q5 – most deprived</td>
</tr>
<tr>
<td>Deprivation change (for movers)</td>
<td>Stayers; Less deprived; churn; More deprived</td>
</tr>
<tr>
<td>Deprivation transitions (for movers)</td>
<td>Stayers; Across Q1; Into Q1 (Q2-Q4); Out of Q1 (Q2-Q4); Across Q2, Q3, Q4; Out of Q5 (Q1-Q4); Into Q5 (Q1-Q5)</td>
</tr>
<tr>
<td>Stable deprivation (for stayers)</td>
<td>Movers; Stable Q1; Stable Q2; Stable Q3; Stable Q4; Stable Q5</td>
</tr>
</tbody>
</table>
Model CVD, adjusting for age, sex, [ethnicity], mover status (stayer = reference)
Model CVD, adjusting for age, sex, [ethnicity], mover status and baseline deprivation (Q1 = reference)
Model CVD, adjusting for age, sex, [ethnicity], deprivation transitions (stayers = reference)
Model CVD, adjusting for age, sex, [ethnicity], stable deprivation for stayers (movers = reference)
Postscript

England ONS Longitudinal Study LLTI

- Lowest and highest levels of LLTI for migrants within least and most deprived areas. Similar by ethnic group.
- Changes to least & from most deprived areas and opposite direction mainly associated with concomitant levels of self-reported health.
- Systematic movements between differently deprived areas at different ages leads to age-specific inequalities; greatest in mid-life.

New Zealand VIEW CVD

- Residential mobility important determinant of CVD in NZ apparent through relationship with deprivation mobility.
- Movers have higher risk of CVD than stayers.
  - More work on timing of events & survival forthcoming.
- Similarities in distribution of risk of CVD for:
  - (1) NZEO and Maori (2) Pacific, Indian and Other Asian.

- Migration at least maintains overall area inequalities.
- Overall health (dis)advantage consistent with deprivation change.
- For CVD, movers may have greater health risk.
References

Welton T A (1872) On the effect of migrations in disturbing local rates of mortality, as exemplified in the statistics of London and the surrounding country, for the years 1851-1860. Journal of the Institute of Actuaries 16: 153

Data suppliers / funders

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VIEW data provided by Analytical Services at the New Zealand Ministry of Health, Encryption of unique identifiers by www.enigma.co.nz
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