Big Data and Health: From New Zealand to the UK

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Using big data to tackle inequalities in society: University of Auckland, June 2018
“The era of big data is upon us”

Davies and Green, 2018

• Explosion of (fundamentally different) new data: large datasets, richer temporal and spatial resolution (Cambridge Public Policy SRI, 2016)

• Implications for how we measure and understand social phenomena

Examples:
• Administrative data ➔ linking routine national health databases;
• Social media data ➔ georeferenced tweets;
• Consumer data ➔ consumption patterns; business and retail locations
Example 1: Administrative Data

Risky moves and cardiovascular disease in New Zealand

Team includes: Nichola Shackleton, Dan Exeter (University of Auckland), Paul Norman (University of Leeds)
Research context (II)

- 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

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

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

- More advantaged people tend to migrate to or between less deprived, more attractive locations
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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

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Research Context (I)

• Complex health-migration inter-relationships;
• Importance of deprivation mobility/change for migration-health relationship;
• Residential mobility an important determinant of CVD in Auckland (Exeter et al., 2015);
• Cardiovascular disease (CVD) one of the leading causes of death globally, marked variations between ethnic groups;
• Differences in migration patterns between ethnic groups in New Zealand

• Relationship with ethnic inequalities in CVD?
(BIG!) Data

Patient records anonymously linked with National Health Index (NHI) number

Outcomes (e.g.)
- Lipid testing
- Diabetes
- Hospitalisations
- Medication dispensing

Demographics
- Age
- Gender
- Ethnicity
- NZDep06

Geographies
- Meshblock
- Area Unit
- Electorate
- District Health Board

$n = 94$-$97\%$ population

VIEW Dataset

CVD and Migration Dataset

Eligible if…
- Aged 30-84
- Complete socio-demographic / geographic information
- No prior history of CVD

Study Period
- 36 calendar quarters 01.01.2006-30.06.2014
Methods

Cardiovascular Disease – Residential Mobility – Deprivation

ASSOCIATIONS

• Binary logistic regression—total population & stratified by ethnic group
• Compare risk of CVD for moves with that for stayers
• Ethnic differences?
• Differences by nature of the move?

EFFECTS

• Cox proportional regression (survival analysis) – total population & stratified by ethnic group
• Compare risk of CVD for movers who move before first CVD event with stayers
• Ethnic differences?
• Differences by nature of the move?

TRAJECTORIES

• Trajectory analysis
• Compare CVD risk for movers according to their deprivation trajectory
• Only movers who move before first CVD event
Associations (I)

- Movers significantly higher probability of CVD compared to stayers for all ethnic groups
- Variation between ethnic groups
- Māori and Pacific groups higher probability of CVD than total population, also true for Indian movers
- Does the nature of the move matter?

Source: Darlington-Pollock et al., 2016: 134

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Associations (II)

• Moving within **same deprivation quintile** has different implications for different ethnic groups

• Māori and Pacific groups live in most deprived areas: moves within the same deprivation quintile = moves within the most deprived quintile

• Moving to a more deprived area not always associated with higher risk of CVD

• Is it the move, or is it the person?

Source: Darlington-Pollock et al., 2016: 135

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### Effects: Hazard ratios for Mobile groups relative to Stayers → Risk of CVD

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- Movers significantly **lower risk** of CVD than stayers

Source: Darlington-Pollock et al., 2017
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- Some variation between ethnic groups, Māori movers have the lowest risk of CVD relative to their immobile peers
- Similar risks across the other ethnic groups

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- Some variation in the size of the HR, but CIs overlap – deprivation change does not differentiate risk of CVD for these mobile groups relative to their immobile peers

Source: Darlington-Pollock et al., 2017

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- Variation of a similar magnitude for the different ethnic groups

Source: Darlington-Pollock et al., 2017
Trajectories (I)

- Incorporates repeated measures of deprivation, rather than simplify deprivation trajectories to first and last recorded observation
- Computationally intensive, difficult to implement in large datasets
- Movers have lower risk of CVD than stayers
- Deprivation characteristics of a move have larger impact on relative risk of CVD for younger movers than older movers

Source: Shackleton et al., under review

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Discussion: Strengths and Conclusions

- Invaluable longitudinal dataset covering 94% of NZ’s adult population
- Good statistical power
- Temporal detail: sequencing of moves and health event
- Spatial detail: nature of moves
- Sequencing of the move important: movers more likely to be in good health than stayers
- Limitations of traditional measures of deprivation change: mis-classification of movers when define by difference between first and last recorded observation…
- Scope of data: rich.. but focussed
Example 2: Retail Data (and more!)

Access to Health Assets and Hazards (AHAH)

Dr Mark Green, University of Liverpool
Context

• Better understand how features of the local environment contribute to health inequalities

• Context matters: but difficulties measuring features of it
  • Requires heavy data manipulation
  • Lack of national level data
  • Accessibility of existing data

• Support policy development at small area (neighbourhood) level that can improve health

• Open access, interactive outputs for policymakers, academics, public health professionals, etc…
Access to Healthy Assets and Hazards

Median access of a postcode to its nearest...

- Fast food outlet
- Gambling outlet
- Pubs, bars, nightclubs
- Off-licenses
- Tobacconists
Access to Healthy Assets and Hazards

Median access of a postcode to its nearest…

- GP
- Hospital with A&E
- Pharmacy
- Dentist
- Leisure Service
Access to Healthy Assets and Hazards

Median level of pollutants:
- \( \text{NO}_2 \)
- \( \text{SO}_2 \)
- \( \text{PM}_{10} \)

And:
- Proportion of accessible green space within 900m\(^2\) buffer of a postcode
Access to Healthy Assets and Hazards

Combine each domain into an overall index (equal weightings)

http://maps.cdrc.ac.uk
Thank you!

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

The VIEW programme thanks the Health Research Council of New Zealand for funding

Special thanks to Dr Mark Green and the team at the Centre for Consumer Data Research