Using multiple longitudinal datasets to inform a micro-simulation model of the early life-course

COMPASS Colloquium
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THE UNIVERSITY OF AUCKLAND
Whare Wānanga o Tāmaki Makaurau

Barry Milne
COMPASS Research Centre
University of Auckland
New Zealand
www.compass.auckland.ac.nz

MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT
HIKINA WHAKATUTUKI

What are we doing – and why?

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- To build a realistic simulation model of the early life course (0-13) for policy purposes, we are:
  1. Combining information across four longitudinal studies into a unified (more robust) data set.
     - To analyse to get rules for transitioning people from one state to the next
  2. Weighting the combined dataset by ethnicity
     - To analyse a sample that has a representative ethnic balance
  3. Preparing a synthetic birth cohort from 2006 Census
     - So that our simulation represents NZ today
- I will talk about 1 and 2 now, and 3 later

Four Studies

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- Christchurch Health & Development Study (CHDS)
  - 1265 children born in ChCh 1977. Followed since
- Dunedin Multidisciplinary Health & Development Study (DMHDS)
  - 1037 children born in Dunedin 1972/3. Followed since
- Pacific Islands Families Study (PIFS)
  - 1398 children born at Middlemore, 2000, with at least one parent of Pacific Islands ethnicity. Followed since
- Te Hoe Nuku Roa Study (THNR)
  - Longitudinal study of Māori households (beginning 1995)
    - Auckland, Wellington, Manawatu, Gisborne, Northland, Southland, Nelson
  - 568 children (0-12) assessed at least twice in four waves

1. Data integration

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- Original model based on CHDS
  - Use data from DMHDS & PIFS on those constructs used in CHDS-based model; ignore other constructs
- Issues around
  - Different times
  - Same constructs measured differently
  - Missing data
  - Ensuring combined is representative of NZ
- Solutions

1. Data integration - Different times

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- Associations between X & Y assessed using longitudinal GEE analyses
  - Utilises data from all the ages available from the three studies (THNR not used)

Age	Y_{CHDS}	Y_{DMHDS}	Y_{PIFS}	X_{CHDS}	X_{DMHDS}	X_{PIFS}
Birth	✓	✓	✓	✓	✓	✓
1	✓		✓	✓		✓
2	✓		✓	✓		✓
3	✓	✓		✓	✓	
4	✓		✓	✓		✓
5	✓	✓		✓	✓	
6	✓		✓	✓		✓
7	✓	✓		✓	✓	

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1. Data integration - Construct measurement

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- 30/36 constructs measured identically between CHDS & DMHDS; 24/26 between CHDS & PIFS
- 4 DMHDS constructs measured otherwise identically but cover different timeframe (e.g., past 2 years in DMHDS; past 1 year in CHDS)
  - Random imputation to subset to one year (r~0.65)
- 2 DMHDS & 2 PIFS constructs measured using different scales
  - Conduct disorder, Harsh punishment
  - Align to same metric using min/max points

1. Data integration - Missing data

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- ‘Holes’ in data in each study filled in
  - 60% vars have <10% missing; 14% vars have 20-30%
  - Model-based multiple imputation using within-study models, imputing vars with least error first (following SGP)
- Constructs in DMHDS/PIFS with missing ages
  - 15% constructs
  - Model-based multiple imputation using within-study models (or another study if time trends important)
- Missing constructs in DMHDS/PIFS
  - 4/40 constructs in DMHDS, 14/40 constructs in PIFS
  - Model-based multiple imputation using CHDS study models

2. Weighting by ethnicity

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- Combined CHDS, DMHDS & PIFS not representative of NZ's ethnic distribution currently
  - Weight by ethnicity:

Ethnicity	DMHDS	CHDS	PIFS	Combined	Census	Weight
NZ European	90.1%	86.1%	2.8%	**55.9%**	**58.2%**	58.2/55.9 = **1.04**
Maori	8.4%	10.7%	6.2%	**8.4%**	**24.2%**	24.2/8.4 = **2.88**
Pacific	1.5%	3.2%	91.0%	**35.7%**	**9.2%**	9.2/35.7 = **0.26**
Asian					**8.5%**	

2. Weighting by ethnicity - Cultural affiliation

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- Likely that CHDS & DMHDS Māori not representative of Māori nationally
- Solution?
  - Use cultural affiliation as 'representativeness' indicator
  - Compare cultural affiliation between CHDS & DMHDS Māori and THNR Māori, and weight CHDS & DMHDS distributions to look like THNR
  - CHDS, DMHDS & THNR each have items on
    - Marae visit, Tangi attendance, involvement in Māori groups, language understanding, Māori language TV/radio
    - NB, No Māori cultural affiliation items in PIFS
  - Draw principal component from these items and compare CHDS & DMHDS against THNR quintiles

2. Weighting by ethnicity
- Cultural affiliation distributions

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Quintiles	THNR (%)	CHDS (%)		DMHDS (%)	
1 - low	20.0	53.7		66.7	
2	20.0	22.3		12.3	
3	20.0	8.3		7.0	
4	20.0	12.4		5.3	
5 - high	20.0	3.3		8.8	

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2. Weighting by ethnicity
- Cultural affiliation weights

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Quintiles	THNR (%)	CHDS (%)	Weight	DMHDS (%)	Weight
1 - low	20.0	53.7	20/53.7 **=0.37**	66.7	=20/66.7 **=0.30**
2	20.0	22.3	20/22.3 **=0.90**	12.3	=20/12.3 **=1.63**
3	20.0	8.3	20/8.3 **=2.41**	7.0	=20/7.0 **=2.86**
4	20.0	12.4	20/12.4 **=1.61**	5.3	=20/5.3 **=3.77**
5 - high	20.0	3.3	20/3.3 **=6.06**	8.8	=20/8.8 **=2.27**

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2. Weighting by ethnicity
- Cultural affiliation assumptions

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- A Māori sample representative on cultural affiliation will be a representative Māori sample
  - Perhaps. Geographic differences??
- THNR is a representative Māori sample
  - Probably for regions sampled.
  - Te Kupenga (Māori Social Survey) another option?
- Cultural affiliation is measured well by the items we used
  - Probably. Cultural affiliation items load on one factor.
- Cultural affiliation is stable across the life-course
  - Possibly. Items measured longitudinally (THNR) correlated moderately - strongly

Summary and Next Steps

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- Integration of data from datasets feasible
  - Bit of work, similarity of constructs has helped
- Method to make analysis sample ethnically representative
  - Weighting; including weighting to attempt to get a representative sample of Māori
- Analyses about to be undertaken
  - Can compare results from one vs. three studies
  - Can compare results for weighted vs. unweighted analyses