Australian National University

First Australian estimates of education-related inequalities in cause-specific mortality

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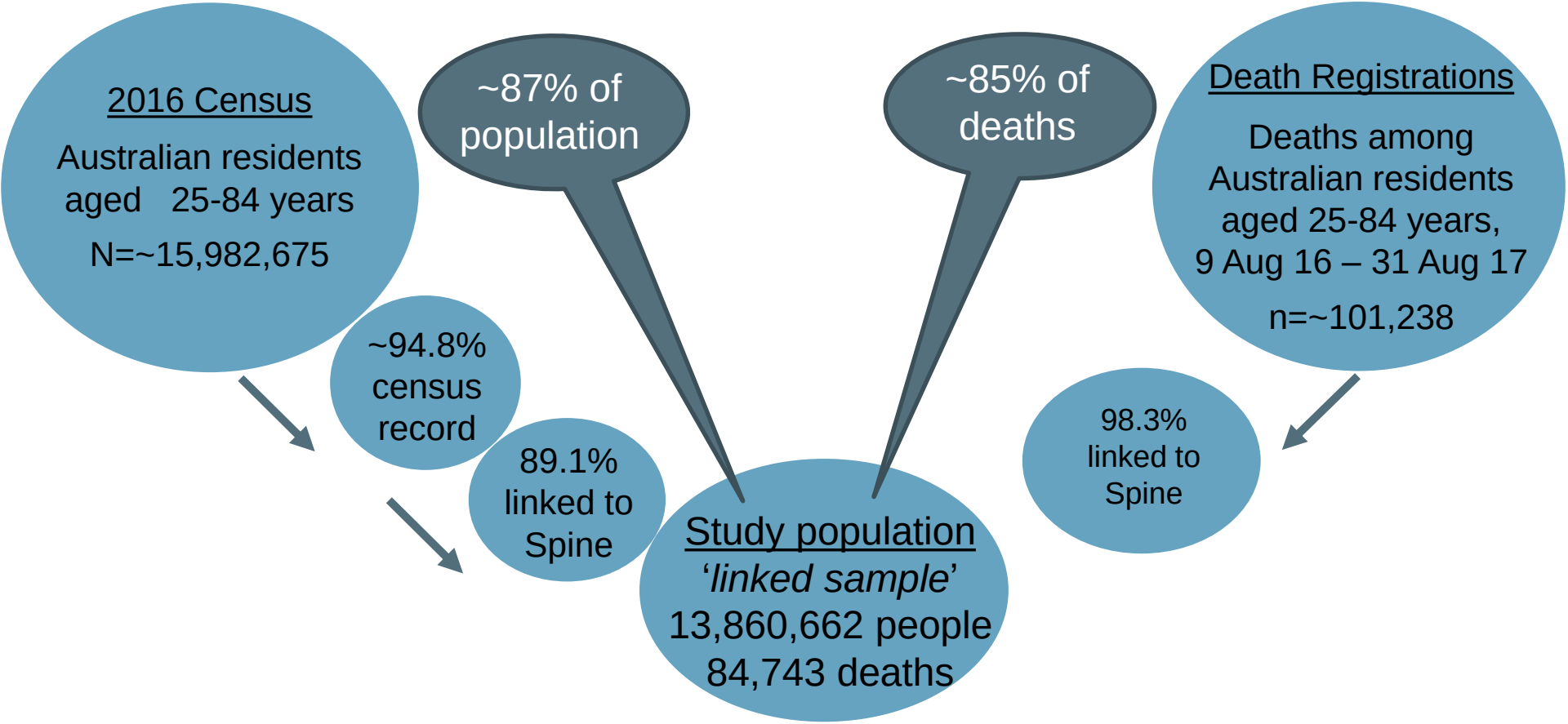
Background

- Socioeconomic inequalities in mortality in all high-income countries
- OECD recommends monitoring these inequalities with linked census-mortality data, using education as the measure of socioeconomic position (SEP)
- Historically, these data not available for Australia. However, MADIP makes this possible

Aim: To quantify education-related inequalities in cause-specific mortality for Australia using census linked to death data

Overview of methods

- Data: Linked 2016 Census and Death Registrations (2016-17), available through MADIP
- Sample: Australian residents aged 25-84 years, completed census + linked to Spine
- Exposure: Education, taken from Census, comparing ‘low’ (no quals) & ‘intermediate’ (high school +/- other quals) to ‘high’ (tertiary education)
- Outcomes: Cause-specific mortality (ICD-10 codes), focus on leading causes of death
- Analyses:
  1. Validation of linked data
  2. Regression to estimate inequalities in mortality


2016 Census
Australian residents aged 25-84 years
N=~15,982,675
~94.8% census record
89.1% linked to Spine
~87% of population
~85% of deaths
Death Registrations
Deaths among Australian residents aged 25-84 years, 9 Aug 16 – 31 Aug 17
n=~101,238
98.3% linked to Spine
Study population
'linked sample'
13,860,662 people
84,743 deaths

Validation of linked data

Compared *linked sample* to *whole Australian population* in regards to:

- Mortality rates
- Inequalities estimates (area-based measure of SEP)

If *mortality rates* differ:

- Apply external estimates to estimate rates/ rate differences
- Doesn't necessarily bias relative measures, so long as difference is consistent with respect to SEP

If (area-based) *inequality estimates* are biased:

- Need to understand for who, in which direction, by how much

Validation analysis – Results

- Mortality rates in sample *different* to rates in population

Mortality rates (per 100,000) for men

	Australian population, 2016*
Age group (years)	
25-34	74
35-44	136
45-54	278
55-64	626
65-74	1478
75-84	4457

*Reported by ABS

Validation analysis – Results

- Mortality rates in sample *different* to rates in population

Mortality rates (per 100,000) for men

	Australian population, 2016*	Linked Sample	% difference
Age group (years)			
25-34	74	59	-20.8
35-44	136	112	-17.8
45-54	278	237	-14.8
55-64	626	587	-6.2
65-74	1478	1510	2.2
75-84	4457	4592	3.0

*Reported by ABS

Validation analyses – Results

Age-standardised mortality rates (ASMR) and rate ratios (RR) by area-based SEP, 25-44yrs

Men		
	ASMR*	
	Full death file	Linked sample
Area SEP		
Most disadvantaged	155	122
2	127	103
3	96	78
4	83	73
Least disadvantaged	65	55

*per 100,000

Validation analyses – Results

Age-standardised mortality rates (ASMR) and rate ratios (RR) by area-based SEP, 25-44yrs

Men				
	ASMR*		RR	
	Full death file	Linked sample	Full death file	Linked sample
Area SEP				
Most disadvantaged	155	122	2.39	2.23
2	127	103	1.96	1.88
3	96	78	1.48	1.42
4	83	73	1.28	1.33
Least disadvantaged	65	55	1.00	1.00

*per 100,000

Validation analyses – Results

Age-standardised mortality rates (ASMR) and rate ratios (RR) by area-based SEP, 25-44yrs

	Men				Women	
	ASMR*		RR		ASMR*	
	Full death file	Linked sample	Full death file	Linked sample	Full death file	Linked sample
Area SEP						
Most disadvantaged	155	122	2.39	2.23	92	67
2	127	103	1.96	1.88	67	54
3	96	78	1.48	1.42	54	47
4	83	73	1.28	1.33	42	42
Least disadvantaged	65	55	1.00	1.00	36	39

*per 100,000

Validation analyses – Results

Age-standardised mortality rates (ASMR) and rate ratios (RR) by area-based SEP, 25-44yrs

	Men				Women			
	ASMR*		RR		ASMR*		RR	
	Full death file	Linked sample	Full death file	Linked sample	Full death file	Linked sample	Full death file	Linked sample
Area SEP								
Most disadvantaged	155	122	2.39	2.23	92	67	2.56	1.72
2	127	103	1.96	1.88	67	54	1.86	1.37
3	96	78	1.48	1.42	54	47	1.51	1.20
4	83	73	1.28	1.33	42	42	1.16	1.08
Least disadvantaged	65	55	1.00	1.00	36	39	1.00	1.00

*per 100,000

Inequalities in leading causes of death

Men 25-44 years

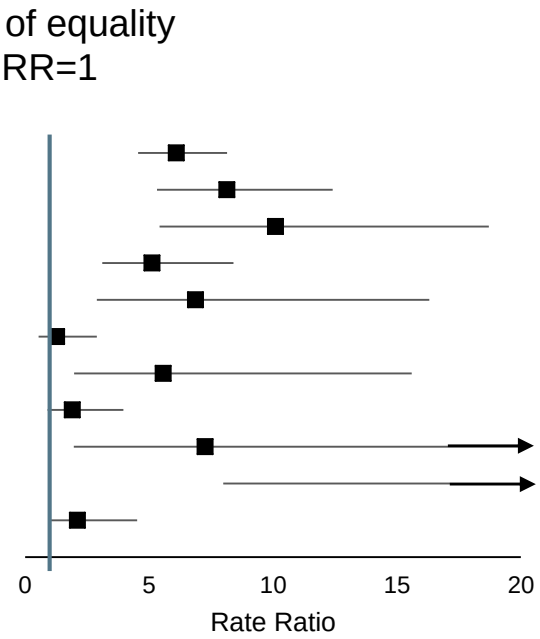
1. Suicide
2. Accidental poisoning
3. Land transport accidents
4. Ischaemic heart disease
5. Symptoms signs ill defined conditions
6. Brain cancer
7. Cirrhosis and other liver diseases
8. Colorectal cancer
9. Assault
10. Diabetes
10. Lymphoma and leukaemias

Inequalities in leading causes of death

Men 25-44 years

(low vs high education)

	Rate Ratio (RR)
1. Suicide	6.10 (4.56-8.15)
2. Accidental poisoning	8.13 (5.32-12.4)
3. Land transport accidents	10.1 (5.42-18.7)
4. Ischaemic heart disease	5.12 (3.12-8.41)
5. Symptoms signs ill defined conditions	6.87 (2.90-16.3)
6. Brain cancer	1.27 (0.55-2.90)
7. Cirrhosis and other liver diseases	5.57 (1.98-15.6)
8. Colorectal cancer	1.90 (0.91-3.96)
9. Assault	7.26 (1.96-26.9)
10. Diabetes	58.9 (7.99-434)
10. Lymphoma and leukaemias	2.11 (0.99-4.52)



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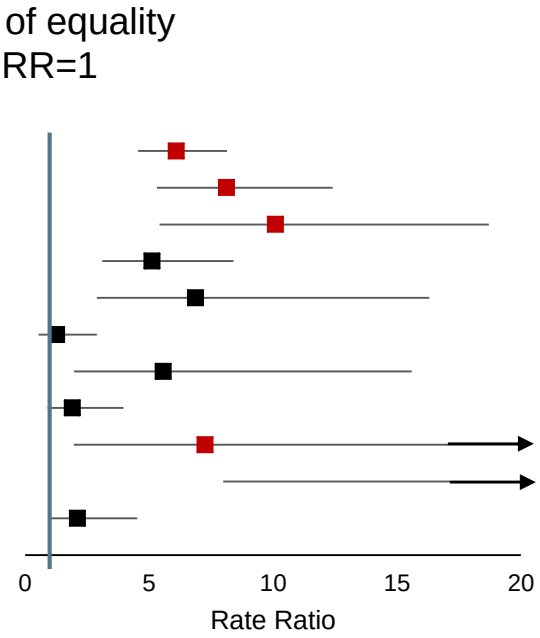

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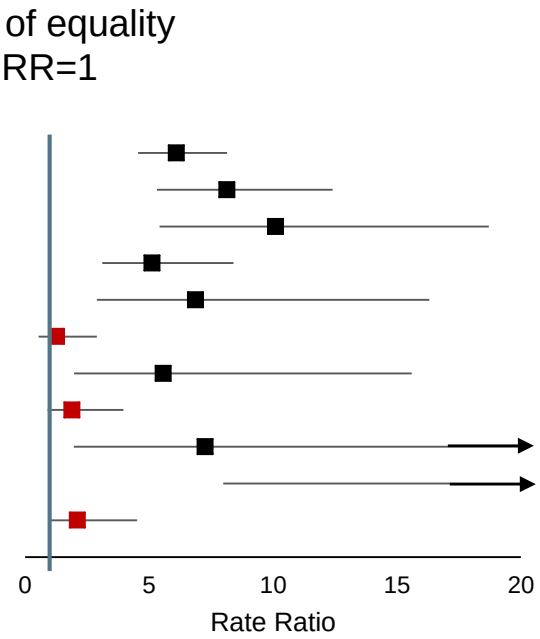
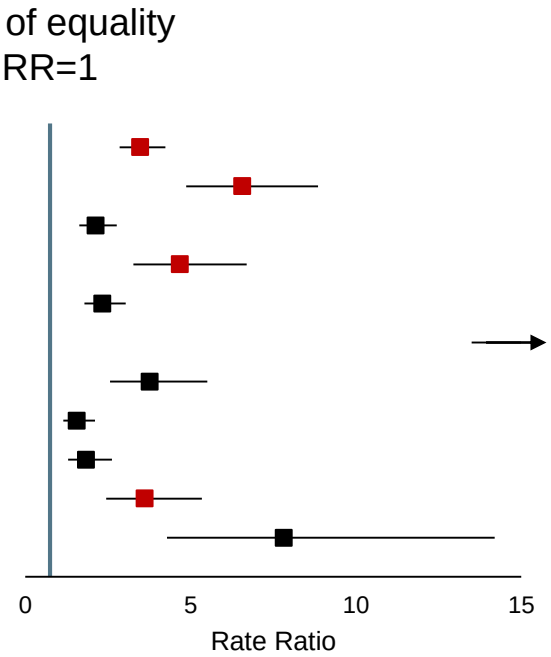


Inequalities in leading causes of death

Men 45-64 years

(low vs high education)

	Rate Ratio (RR)
1. Ischaemic heart disease	**3.48 (2.85-4.24)**
2. Cancer of trachea, bronchus and lung	**6.57 (4.87-8.86)**
3. Suicide	2.13 (1.63-2.77)
4. Cirrhosis and other diseases of the liver	**4.68 (3.27-6.70)**
5. Colorectal cancer	2.33 (1.79-3.04)
6. Chronic lower respiratory disease	33.4 (13.5-82.7)
7. Liver cancer	3.76 (2.56-5.51)
8. Lymphoma and leukaemias	1.56 (1.15-2.11)
9. Cancer of the pancreas	1.84 (1.29-2.62)
10. Cerebrovascular disease	**3.61 (2.45-5.34)**
10. Accidental poisoning	7.82 (4.29-14.2)



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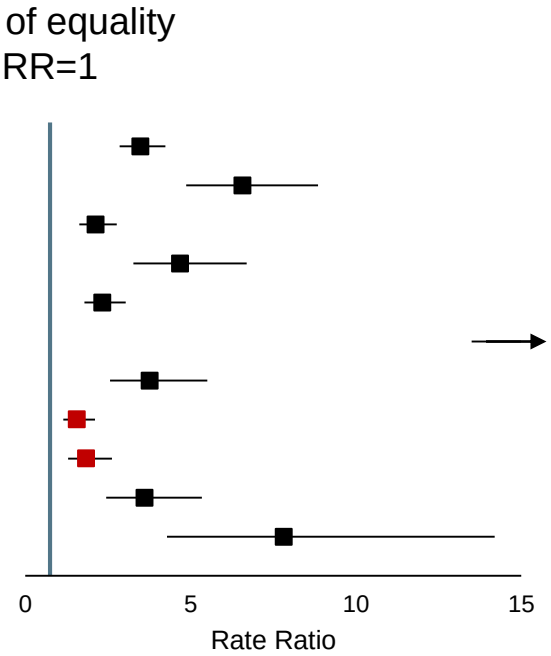

Summary

- Data from the MADIP can be used to estimate education-related inequalities in mortality
- Linked Census and Death Registrations data has high population coverage and good internal validity (except for young women)
- Can be used to highlight opportunities to reduce inequalities and improve health of population
- Also enable Australia to contribute to international comparisons of inequalities in mortality

Questions and comments?

Paper available on MedRxiv

Inequalities according to preventability

Men

	Rate difference	Rate Ratio
Age group 25-44 years		
Amenable to behaviour change	33.0 (27.5-38.4)	7.35 (5.15-10.5)
Amenable to medical intervention	18.2 (14.8-21.6)	5.24 (3.57-7.68)
Amenable to injury prevention	62.4 (55.1-69.7)	6.48 (5.03-8.36)
Non-preventable	5.78 (4.01-7.55)	3.34 (1.97-5.69)
Age group 45-64 years		
Amenable to behaviour change	235 (221-249)	4.52 (3.91-5.21)
Amenable to medical intervention	100 (94.5-106)	3.18 (2.71-3.72)
Amenable to injury prevention	29.0 (27.1-30.8)	2.41 (1.93-3.00)
Non-preventable	65.6 (62.7-68.5)	2.67 (2.28-3.12)
Age group 65-74 years		
Amenable to behaviour change	619 (590-648)	3.28 (2.86-3.75)
Amenable to medical intervention	270 (259-280)	2.27 (1.95-2.63)
Amenable to injury prevention	18.5 (19.1-18.0)	1.75 (1.24-2.47)
Non-preventable	122 (122-122)	1.76 (1.51-2.05)