ARC CENTRE OF EXCELLENCE IN POPULATION AGEING RESEARCH

Trends in Life and Disability Free Expectancy Inequality in Australia

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Will our extra years be healthy?

1. Changes in LE by SES
2A. Changes in DFLE by SES (i.e. absolute)
2B. Changes in DFLE/LE by SES (i.e. relative)

1. **Changes in LE by SES**

2A. Changes in DFLE by SES (i.e. absolute)

2B. Changes in DFLE/LE by SES (i.e. relative)

Literature context

Social gradient of health well established; explanations include:

- Cultural/behavioural
- Psycho-social
- Selection
- Material

LE by SES is well documented, via different approaches:

- Death certs with social class (e.g. ed, occ)
- Linked admin databases (e.g., tax)
- Surveys
- Ecological, area based

Less on LE trend by SES, less still in Australia:

- *Banham et al. 2011*; 2001-2008 administrative data. Only SA. **Middle doing worse**
- *Stephens et al. 2017*; 2001-2012 area based. Only NSW. **Stable inequality**
- *Tawiah et al. 2021, 2022*; HILDA. 2001-2017; But age 50 and 65. Only tertiles. **mid doing better**
- *Adair & Lopez 2020* area based. 2006-2011, 2011-2016, changing areas. Death rate **widening**

Data and method

Units of analysis

- 325 SA3 in 2001 and 2020 (ASGS-16). Typical population 30,000-130,000

Mortality data

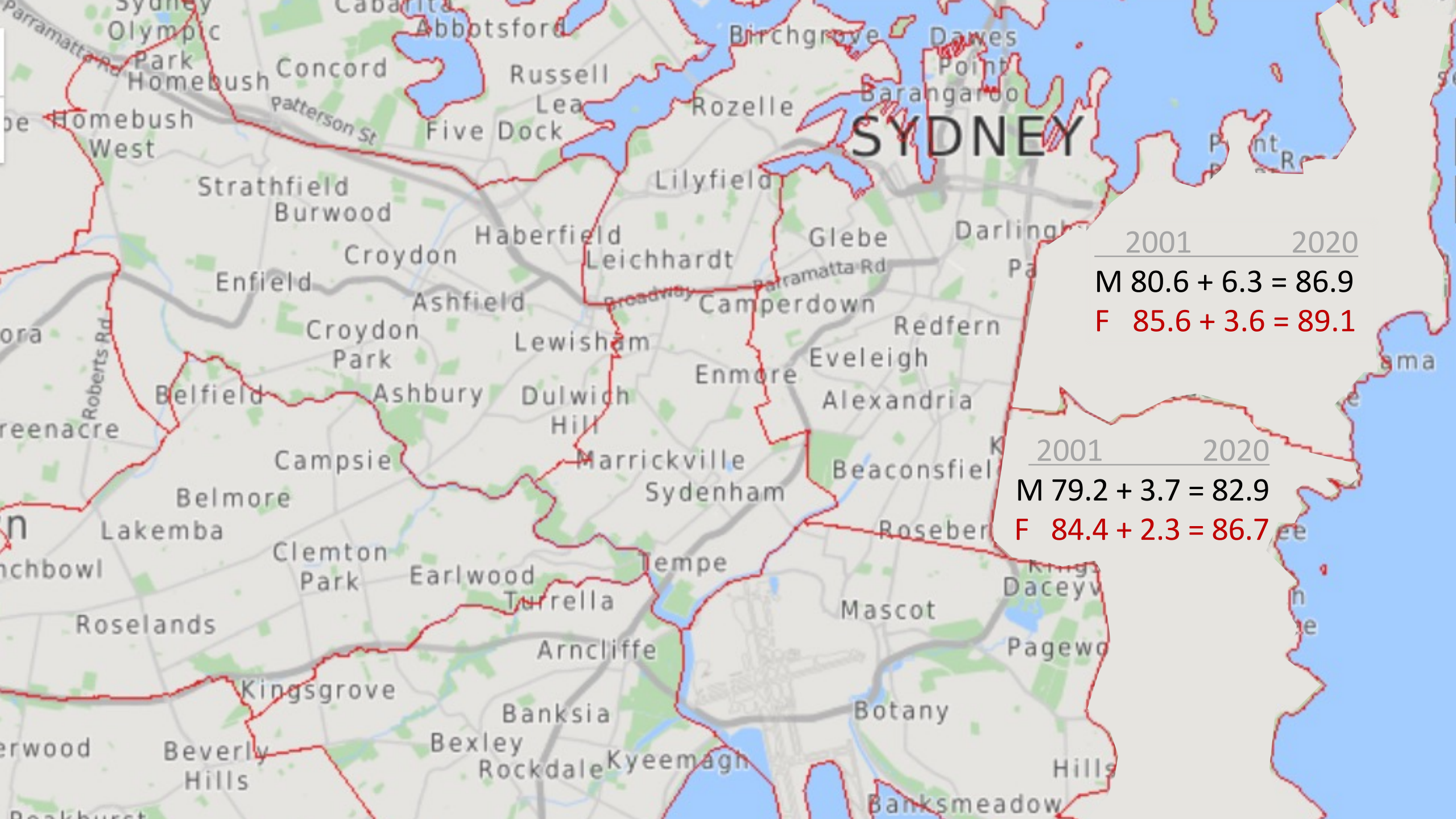
- Deaths for SA3s by 5yr-age groups (top 85+) by sex for 2001-03, 2018-2020
- Tot 135 million person-year observations and 900,000 deaths

Socioeconomic data

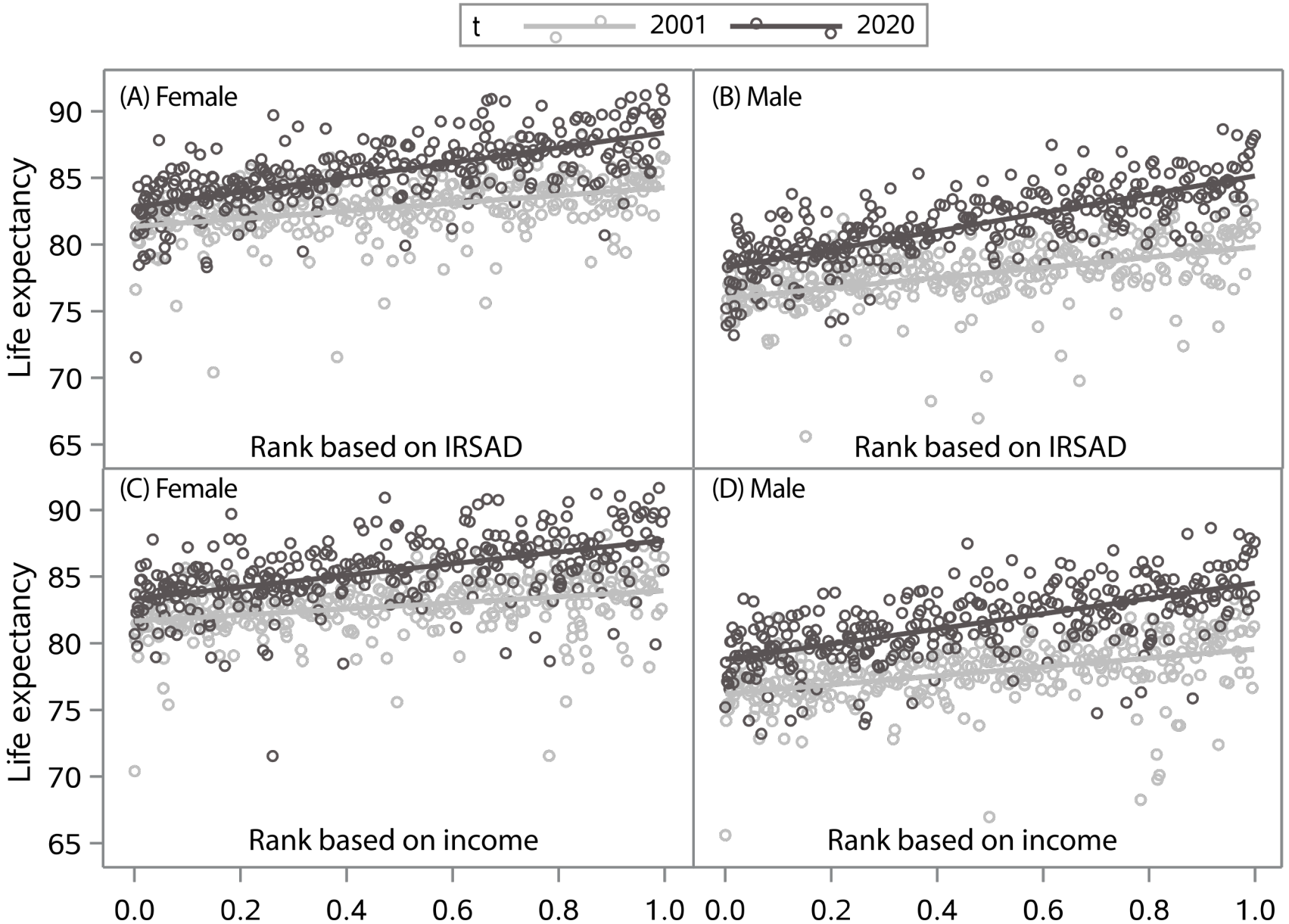
- Census SEIFA IRSAD (comparable, concorded), 2001 and 2021
- Census median equivalised gross hh income, 2001 and 2021

Estimation of gradient change

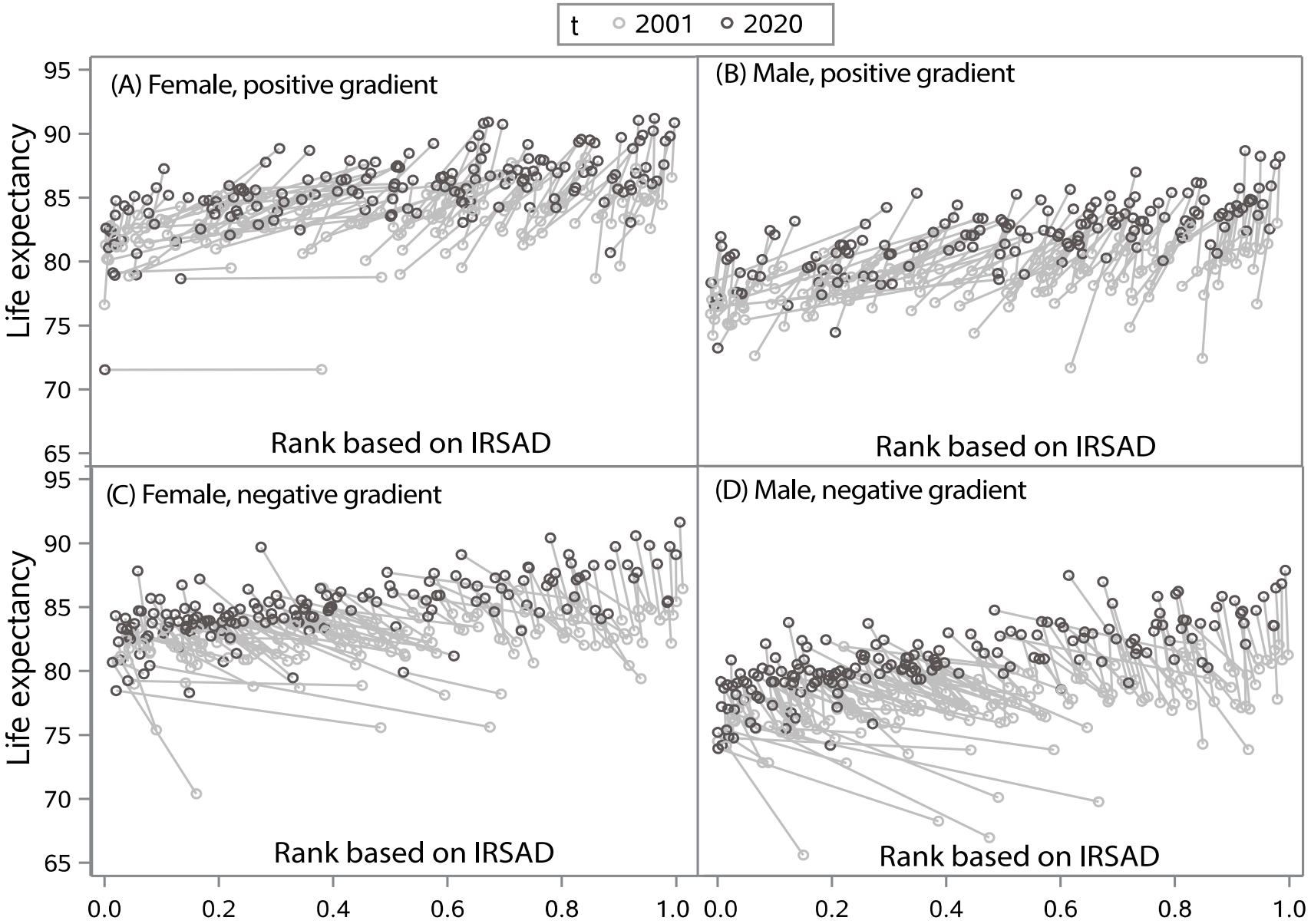
- Pooled, random, and fixed effects models


SYDNEY
2001 2020
M 80.6 + 6.3 = 86.9
F 85.6 + 3.6 = 89.1
2001 2020
M 79.2 + 3.7 = 82.9
F 84.4 + 2.3 = 86.7
Parramatta Rd
Patterson St
Roberts Rd
Broadway
Parramatta Rd
Sydney Olympic Park
Homebush
Concord
Abbotsford
Russell
Lea
Five Dock
Birchgrove
Dawes Point
Barangaroo
Rozelle
Homebush West
Strathfield
Burwood
Lilyfield
Haberfield
Croydon
Leichhardt
Glebe
Enfield
Ashfield
Camperdown
Redfern
Croydon Park
Lewisham
Eveleigh
Enmore
Belfield
Ashbury
Dulwich Hill
Alexandria
Marrickville
Campsie
Sydenham
Belmore
Lakemba
Clemton Park
Earlwood
Tempe
Turrella
Mascot
Roselands
Arncliffe
Kingsgrove
Banksia
Botany
Bexley
Rockdale
Kyeemagh
Beverly Hills
Banksmeadow

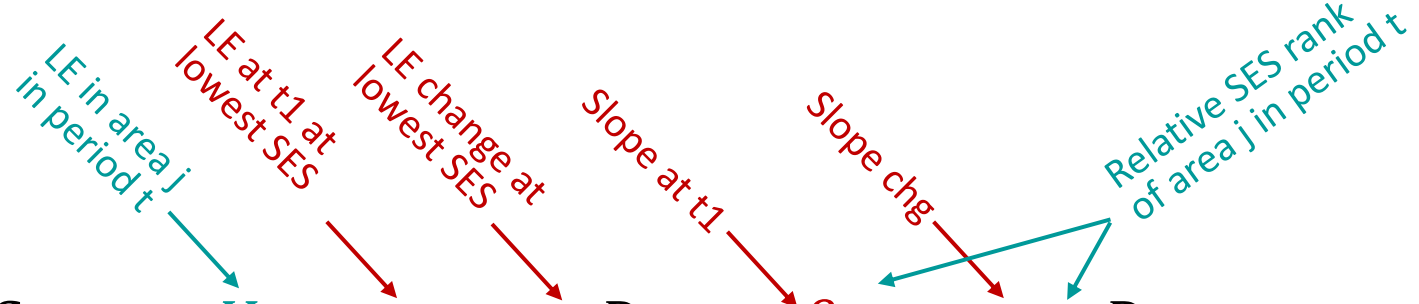
Between-area relationship



Within-area relationship



Estimating the change in slope



OLS: $Y_{jt} = \alpha_1 + \alpha_2 D_{t=2} + \beta x_{jt} + \mu x_{jt} D_{t=2} + e_{jt}$

RE: $Y_{jt} = \alpha_1 + \alpha_2 D_{t=2} + \beta x_{jt} + \mu x_{jt} D_{t=2} + e_{jt} + \gamma_j$

FE: $Y_{jt_2} - Y_{jt_1} = (\alpha_2 - \alpha_1) + \beta(x_{jt=2} - x_{t=1}) + \mu x_{jt=2} + (e_{jt=2} - e_{jt=1})$

Parameter estimates

LE increased about 2 years at the bottom

Social gradient was already steep; 2-5 years; men more unequal

Gradient steepness increased by 1-2 years; more for men

Table 1 Parameter estimates

	α_1		α_2		β		μ	
Male								
IRSAD rank								
Pooled	77.2***	(0.1)	1.8***	(0.2)	4.8***	(0.2)	1.2***	(0.4)
RE	76.2***	(0.2)	2.9***	(0.1)	3.5***	(0.3)	2.0***	(0.3)
FE			2.8***	(0.2)	0.7	(0.8)	2.1***	(0.3)
Income rank								
Pooled	77.6***	(0.1)	1.8***	(0.3)	4.0***	(0.2)	1.0**	(0.5)
RE	76.7***	(0.2)	3.0***	(0.2)	2.6***	(0.3)	1.8***	(0.3)
FE			2.7***	(0.2)	-0.3	(0.7)	2.2***	(0.3)
Female								
IRSAD rank								
Pooled	82.3***	(0.1)	1.2***	(0.2)	3.4***	(0.2)	1.0***	(0.3)
RE	81.6***	(0.2)	2.0***	(0.1)	2.6***	(0.3)	1.6***	(0.3)
FE			2.0***	(0.2)	0.8	(0.8)	1.6***	(0.3)
Income rank								
Pooled	82.6***	(0.1)	1.3***	(0.2)	2.8***	(0.2)	0.9**	(0.4)
RE	82***	(0.2)	2.0***	(0.1)	1.8***	(0.3)	1.5***	(0.3)
FE			1.9***	(0.2)	0.0	(0.7)	1.8***	(0.3)

LE at t1 at bottom

LE chg at bottom

Slope at t1, 2001

Slope chg, 2001-2020

1. Changes in LE by SES

2A. Changes in DFLE by SES (i.e. absolute)

2B. Changes in DFLE/LE by SES (i.e. relative)

Literature on DFLE and/or HLE

AIHW 2022a: SDAC cross-sections 2003-2018; DFLE severe/profound at 0; no SES. **M: compression, F: stable**
AIHW 2022b: Admin BDS data 2003-2022; HLE at 0; no SES. **M: expansion, F: expansion**

Banham et al. 2011: SA admin data 2001-2008; HLE by area IRSD quint.
M&F HLE years: increasing overall, more for middle
M&F HLE%: **stable for poor, expansion for rich → *MORE EQUAL***

Tawiah et al. 2021: HILDA 2001-7 vs 2011-17, DFLE at age 50 (GALI, ADL SF36) by area IRSAD tertiles
M DFLE(GALI) years: increasing, more for rich. F DFLE(GALI) years decrease for poor
M&F DFLE(ADL) years: increasing more for middle and rich
M DFLE(GALI)%: **expansion for poor, stable for rich → *LESS EQUAL***
F DFLE(GALI)%: **expansion for poor, less expansion for rich → *LESS EQUAL***
M DFLE(ADL)%: **stable for poor, compression for rich → *LESS EQUAL***
F DFLE(ADL)%: **expansion for poor, compression for rich → *LESS EQUAL***

Tawiah et al. 2022
HILDA 2001-7 vs 2011-17, DFLE at age 65 (GALI, ADL SF36, SRH, MHI) by ed, occ, tenure tertiles/halves
M&F DFLE(ADL) years: increasing, more for rich
M&F DFLE(ADL)%: **Stable or compression for poor, compression for rich → *LESS EQUAL***

Data and method

Units of analysis
- 325 SA3 (ASGS-16)

Mortality data
- Deaths, ERP by (i) SA3 (ii) 5yr-age groups (top 85+) (iii) sex (iv) 2006 actual, 2018-20

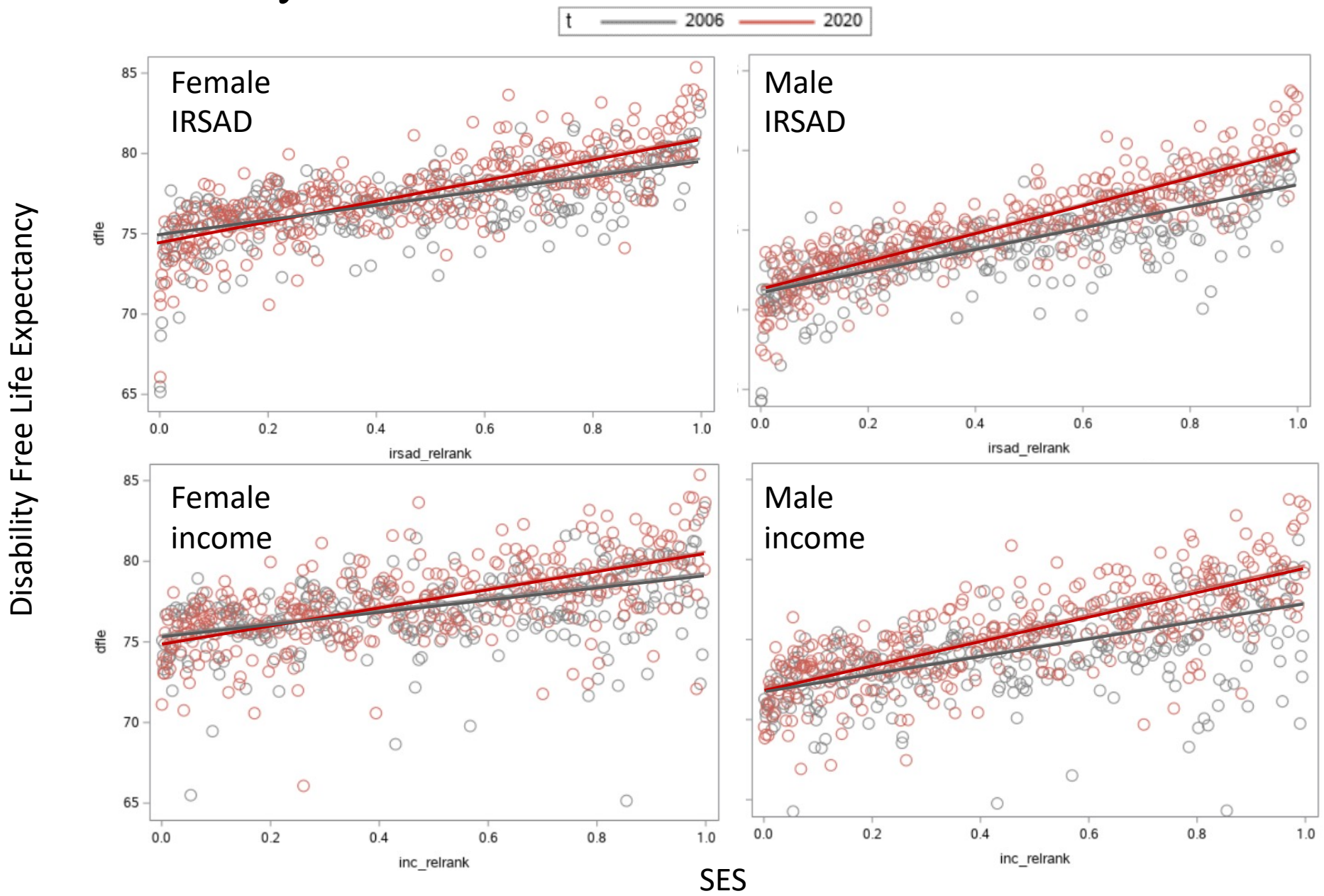
Health status data
- Census questions: need assistance with self-care, mobility, or communication… lasting for 6months+ …because of disability, long term health problem, or effects of old age

Health expectancy estimation
- Sullivan method: Based on life tables and health state prevalence by age. Based on person years a hypothetical cohort would live without profound/severe disability

Socioeconomic data
- Census-based SEIFA IRSAD (comparable, concorded), 2006 and 2021
- Median gross equivalised income, 2006 and 2021

Estimation
- Pooled, random, and fixed effects models

Preliminary results: No increases at bottom



Preliminary results

DFLE stalled for poor men, decreasing for poor women

Gradient even higher than for LE; Gradient already up to 7 years; men more unequal

Gradient increased by about 1.5-2 years; more for men

	α_1		α_2		β		μ	
Male								
IRSAD rank								
Pooled	71.4***	(0.1)	0.0	(0.2)	7.0***	(0.2)	1.7***	(0.4)
RE	71.4***	(0.1)	0.1	(0.1)	6.2***	(0.2)	2.2***	(0.2)
FE	n/a	n/a	0.0	(0.1)	1.9***	(0.7)	2.4***	(0.2)
Income rank								
Pooled	71.9***	(0.1)	-0.1	(0.3)	6.1***	(0.2)	1.7***	(0.5)
RE	72.2***	(0.2)	0.1	(0.1)	4.7***	(0.3)	2.2***	(0.2)
FE	n/a	n/a	-0.1	(0.1)	1.3**	(0.6)	2.4***	(0.2)
Female								
IRSAD rank								
Pooled	74.9***	(0.1)	-0.4**	(0.2)	5.0***	(0.2)	1.6***	(0.3)
RE	75.1***	(0.1)	-0.4***	(0.1)	4.4***	(0.2)	1.8***	(0.2)
FE	n/a	n/a	-0.4***	(0.1)	1.2*	(0.7)	1.8***	(0.2)
Income rank								
Pooled	75.2***	(0.1)	-0.3	(0.2)	4.3***	(0.2)	1.4***	(0.4)
RE	75.6***	(0.2)	-0.4***	(0.1)	3.3***	(0.3)	1.7***	(0.2)
FE	n/a	n/a	-0.4***	(0.1)	0.8	(0.6)	1.8***	(0.2)

DFLE at t1 at bottom

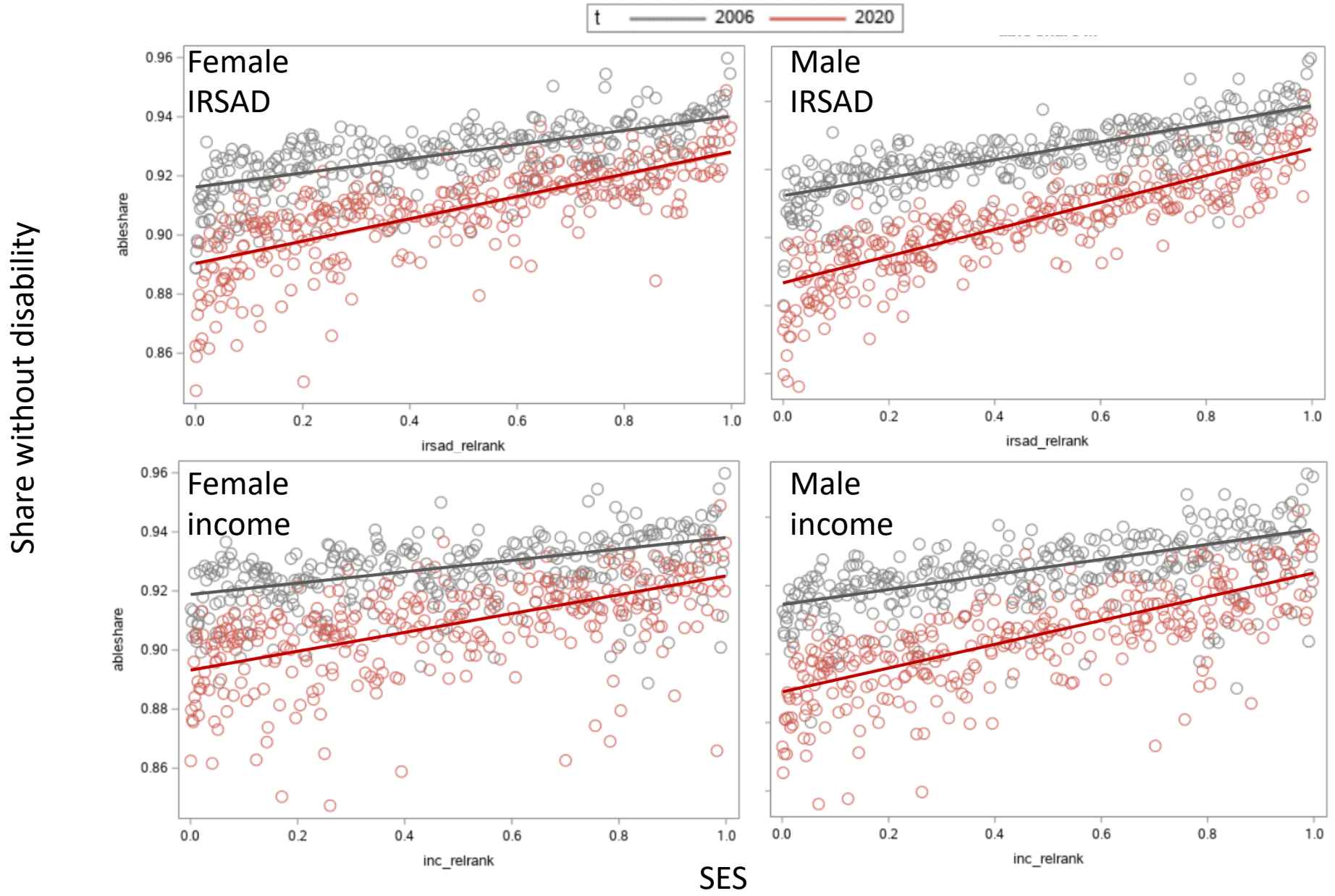
DFLE chg at bottom

Slope at t1

Slope chg

1. Changes in LE by SES
2A. Changes in DFLE by SES (i.e. absolute)
2B. Changes in DFLE/LE by SES (i.e. relative)

Preliminary results: More rel. morbidity expansion



DFLE/LE estimates

DFLE% decreasing at the bottom

Gradient of DFLE% was about 2-3pp higher at the top

Gradient increased. DFLE% at the top is now 1-1.5pp higher still relative to bottom

	α_1		α_2		β		μ	
Male								
IRSAD rank								
Pooled	92.4%***	(0.1%)	-1.8%***	(0.1%)	2.9%***	(0.1%)	1.0%***	(0.2%)
RE	93.3%***	(0.1%)	-2.6%***	(0.1%)	2.4%***	(0.1%)	1.4%***	(0.1%)
FE	n/a	n/a	-2.7%***	(0.1%)	0.6%**	(0.3%)	1.5%***	(0.1%)
Income rank								
Pooled	92.6%***	(0.1%)	-1.7%***	(0.1%)	2.6%***	(0.1%)	0.9%***	(0.2%)
RE	93.6%***	(0.1%)	-2.5%***	(0.1%)	1.8%***	(0.1%)	1.3%***	(0.1%)
FE	n/a	n/a	-2.6%***	(0.1%)	0.6%**	(0.3%)	1.4%***	(0.1%)
Female								
IRSAD rank								
Pooled	90.6%***	(0.1%)	-1.6%***	(0.2%)	2.9%***	(0.1%)	0.9%***	(0.3%)
RE	91.6%***	(0.1%)	-2.6%***	(0.1%)	2.3%***	(0.1%)	1.3%***	(0.1%)
FE	n/a	n/a	-2.5%***	(0.1%)	0.8%*	(0.4%)	1.3%***	(0.1%)
Income rank								
Pooled	90.8%***	(0.1%)	-1.5%***	(0.2%)	2.5%***	(0.2%)	0.7%**	(0.3%)
RE	91.9%***	(0.1%)	-2.5%***	(0.1%)	1.8%***	(0.2%)	1.2%***	(0.1%)
FE	n/a	n/a	-2.5%***	(0.1%)	0.8%**	(0.4%)	1.2%***	(0.1%)

DFLE% at t1 at bottom

DFLE% chg at bottom

Slope at t1

Slope chg

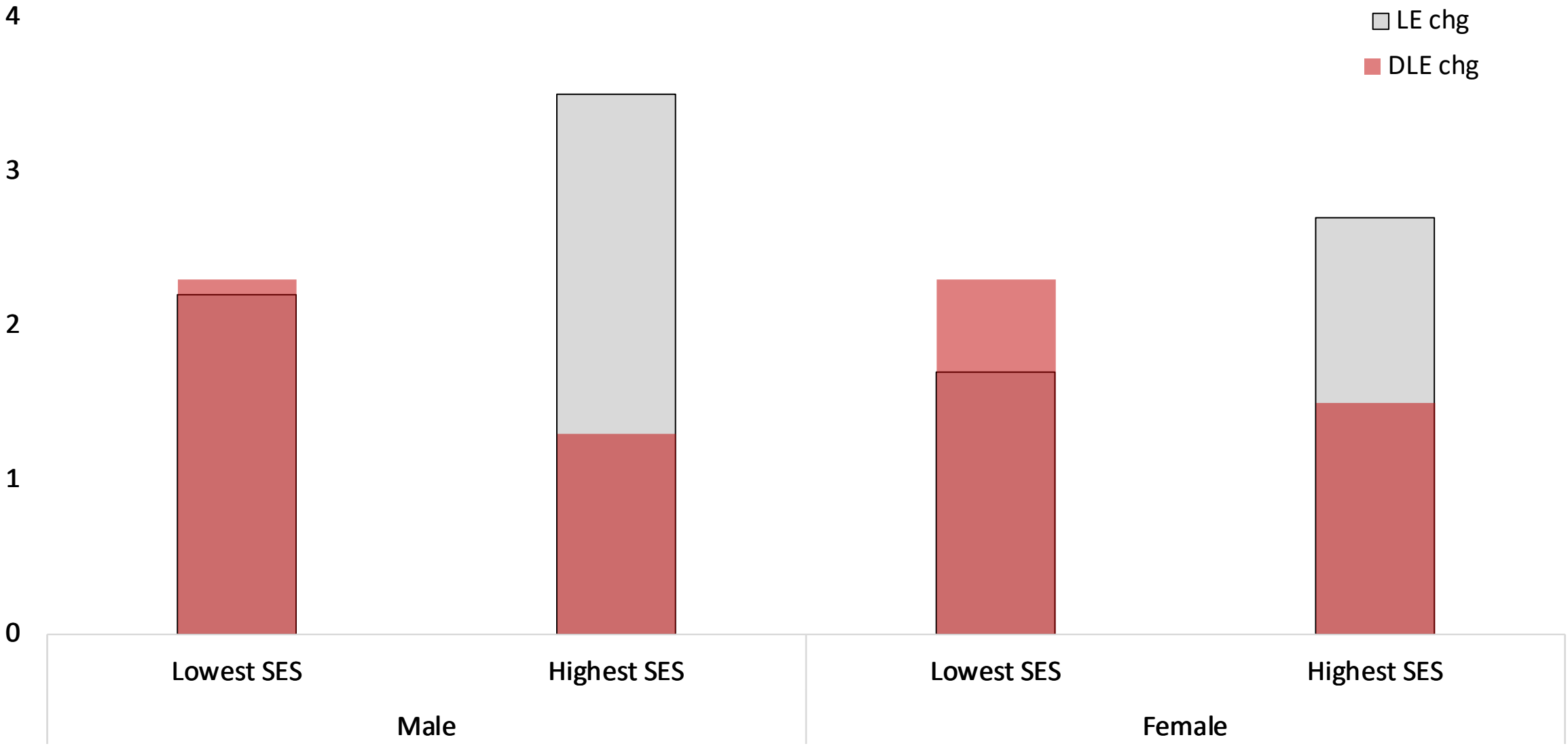
Summary

1. ΔLE by SES: Everyone is gaining more years, but rich gain more
   Slopes were 2-5 years, increased by 1-2 years

2. ΔDFLE by SES: Rich gaining healthy years, but not poor men,
   poor women see declines in healthy years
   Slopes were 3-7 years, increased by 1.5-2 years

3. ΔDFLE/LE by SES: Everyone losing % of healthy life, poor lose more
   Slope was 2-3pp, increased by 1-1.5pp

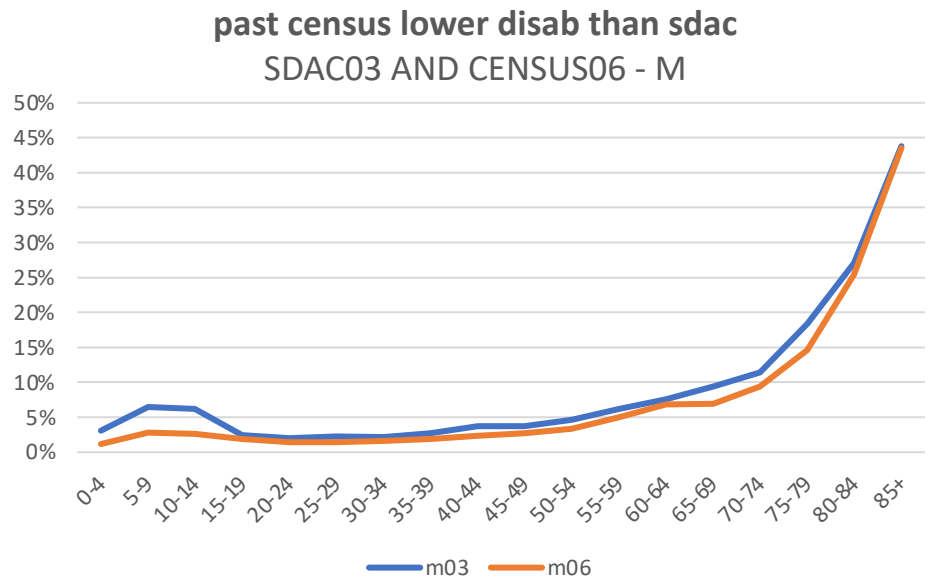
Will our extra years be healthy?

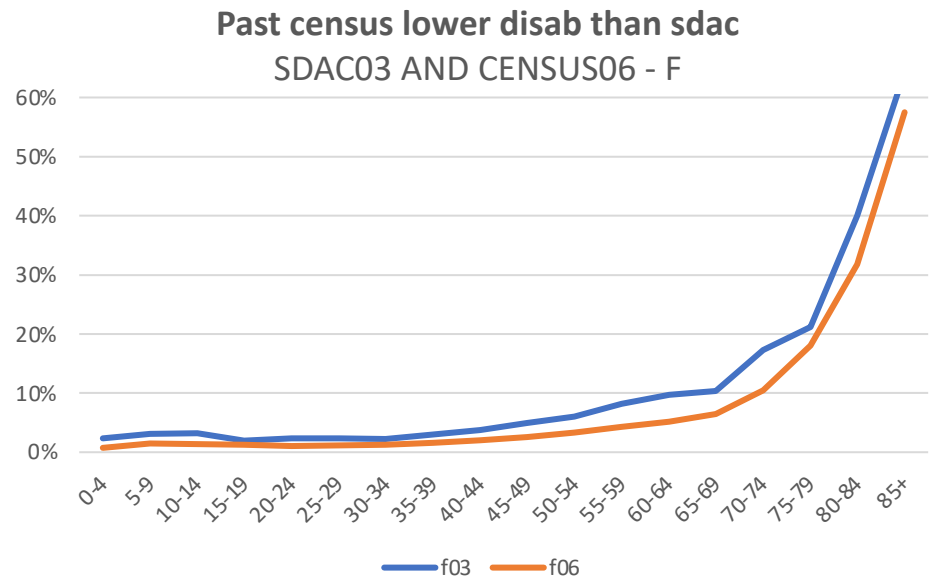


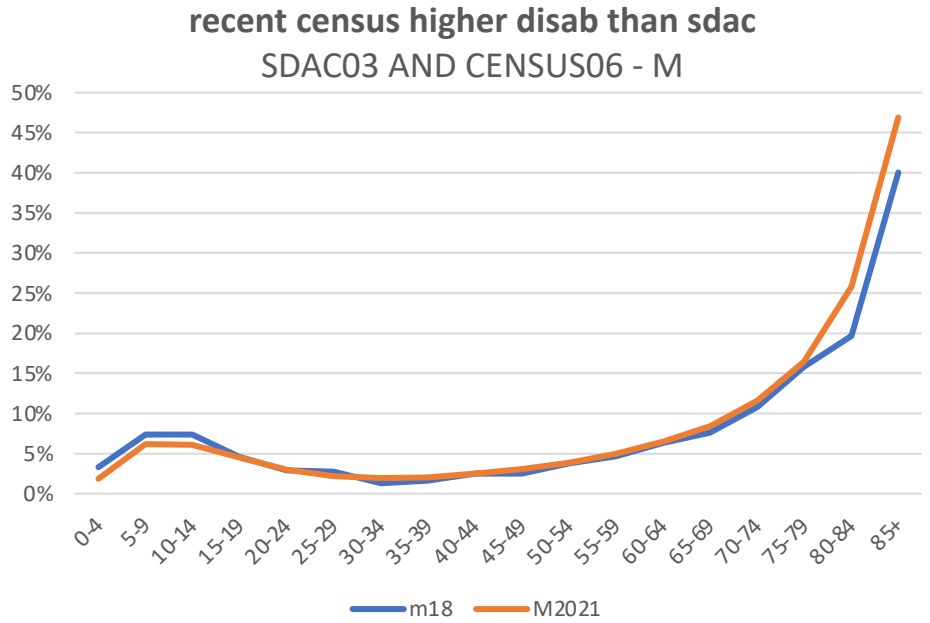
Based on RE model with income as SES

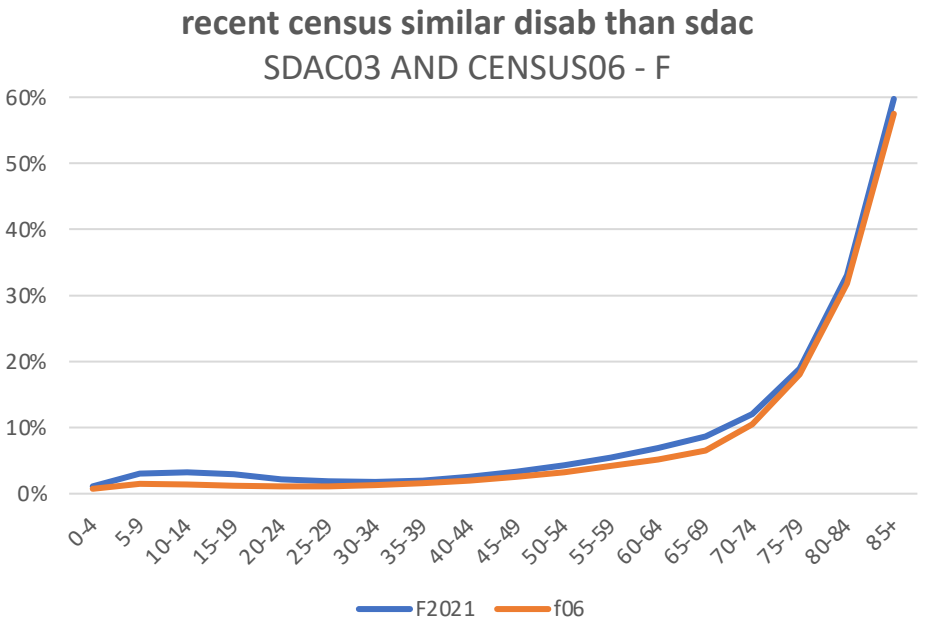
THANKS

My data shows more morbidity expansion than SDAC, which shows compression

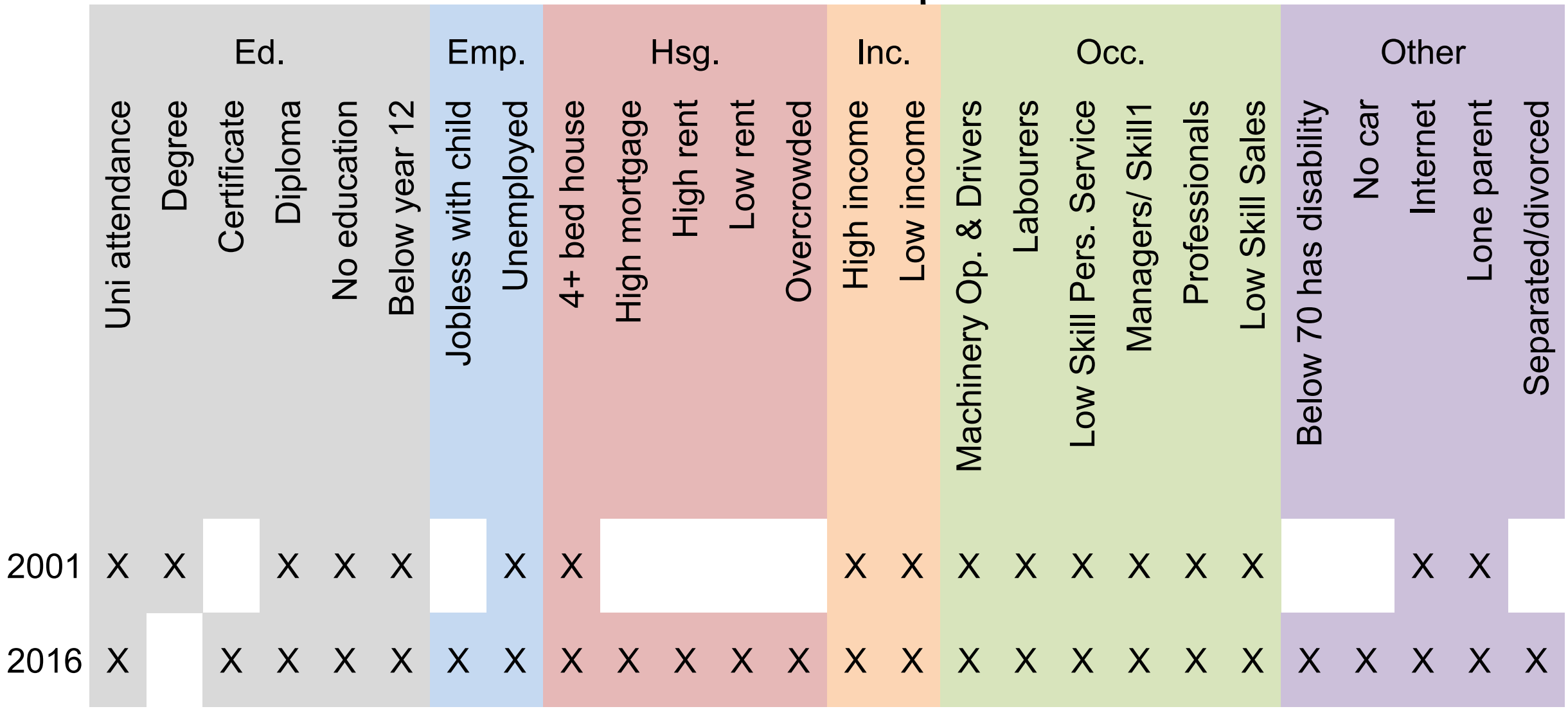




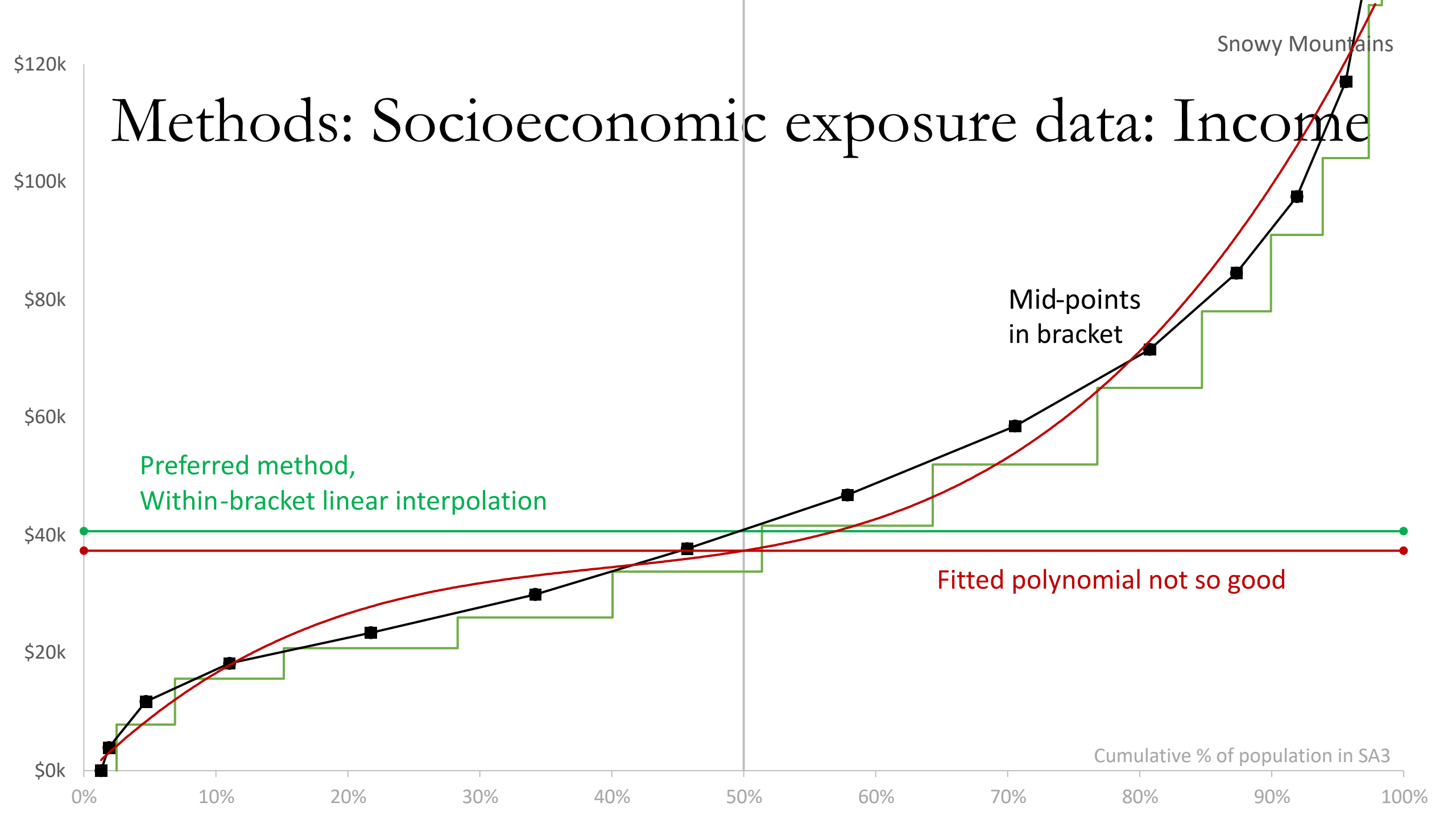




Methods: Socioeconomic exposure data: IRSAD



Methods: Socioeconomic exposure data: Income



Methods – Life expectancy estimation

- Based on abridged life tables method (Chiang 1968)

- Dealing with volatility: (i) pool periods (ii) pool areas (iii) drop very small areas (iv) structured relationship

- Structured relationship: MLE of parameters that smooth relationship between logit probability of dying in area and State (Brass 1971; Stewart 2004)