Disentangling the triple helix of mortality inequality: forms of capital, solidarity and local area mortality in Australia

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Basic approach

- Mortality is a social process
  - Defined by risk (probability) of dying
  - Varies by age and sex
  - Varies over time and space
  - Time and space as proxies for social conditions in which people live their lives

- Looking at:
  - Overall level of mortality (life expectancy at birth / average risk)
  - Effects of social conditions

BIG QUESTION: How can we **explain** mortality differences?

- Long line of investigation, from Antonovsky (1967) to Marmot (2004) and beyond: Material Differences. Little conceptualisation, defined in terms of income, of education, of occupation. Assumed interchangeability
- Bourdieu (1986): Capital is accumulated labour, enables people to appropriate social energy through the exploitation of living labour.
  - Takes time to accumulate
  - Reproduce itself in identical or expanded form,
  - Structured: Not everything is equally possible or impossible
- Process "in becoming"

Three forms of capital

➡Material capital
  ➡Income (flow) and wealth (stocks) of material goods
➡Cultural capital
  ➡Socially valuable knowledge which the individual acquires;
  ➡objectified in material objects, academic qualifications;
  ➡institutionalised in the recognition these are accorded.
➡Social Capital
 ➡Resources linked through a network of personal relations

Related, but not equivalent (Partially ordered scale)
High probability of inter-generational transmission

The social context

➥Distinguish social CAPITAL from structure of social relations in which people live
  ➥Density of social networks
  ➥Structure of familial relationships
  ➥Durkheimian concepts of social integration and social regulation
➥Capital is individual, accumulated through inheritance and action, can distinguish population groups by the general amount of capital available
➥Structure is a given set of conditions in which individuals live their lives, public good, rather than personal investment

Australia, Population Density 2011
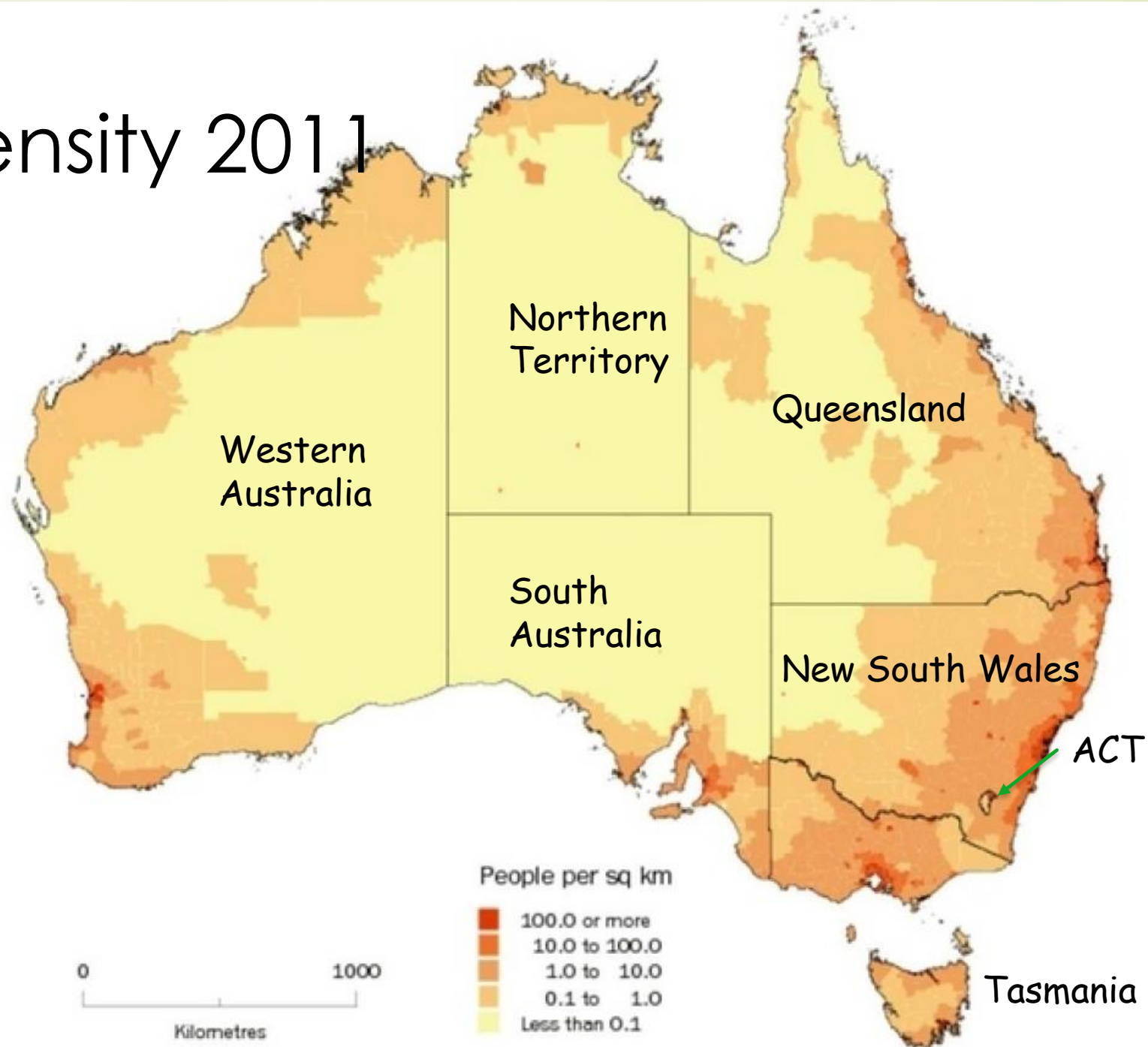
A leap of faith (defying ecological fallacies!)

- Mortality data at our disposal are area aggregates. No individual level data, so analysis at local area level.

- Assume

  - Areas reasonably homogeneous, so average measure of social conditions is reasonable estimate of individual conditions

  - No major interactions between individual and area characteristics, e.g. richer people at greater risk in poorer areas

Australian local areas

➤2,073 local areas (SA2): average 10K, central range 5K to 15K. Exclude very small areas (population < 1,000)

➤Data from Census 2011

➤Combine variables to create scales, measure reliability (goodness of scale) by Cronbach alpha (a) – should be at least 0.75.

Measuring Capital

- Social conditions: Capital

  - Economic capital (median personal incomes, household incomes, rental, mortgage levels), α = 0.919

  - Cultural capital (education: proportion postgraduate; Occupation: proportion professional; Sector: proportion in finance, informatics, professional/scientific), α = 0.917

  - Social capital (proportion NWEurope/Oceania origin; proportion Australian born; proportion citizen; proportion Anglican religion. Note: Exclude Indigenous descent) α = 0.927

Local Area Structure

- Traditional family structure (proportion married; SMAM (r); I_m; proportion single-parent (r)), $\alpha = 0.804$

- Physical remoteness: five categories, City, Inner Regional, Outer Regional, Remote, Very Remote

- Indigenous (> 50 %) (27 localities)

- State / Territory

- All continuous variables centred at mean

# Standardised Mortality Ratio

- Mortality is age dependent, young populations have few deaths, older populations have more deaths

- Standardise: local number of deaths – by sex -- relative to national mortality rates

- Standardised mortality ratio (SMR)

  - 1: Mortality at national level

  - Less than 1: mortality lower than national level

  - More than 1: mortality higher than national level

- Measure mortality by SMR, deaths 2009 – 2013

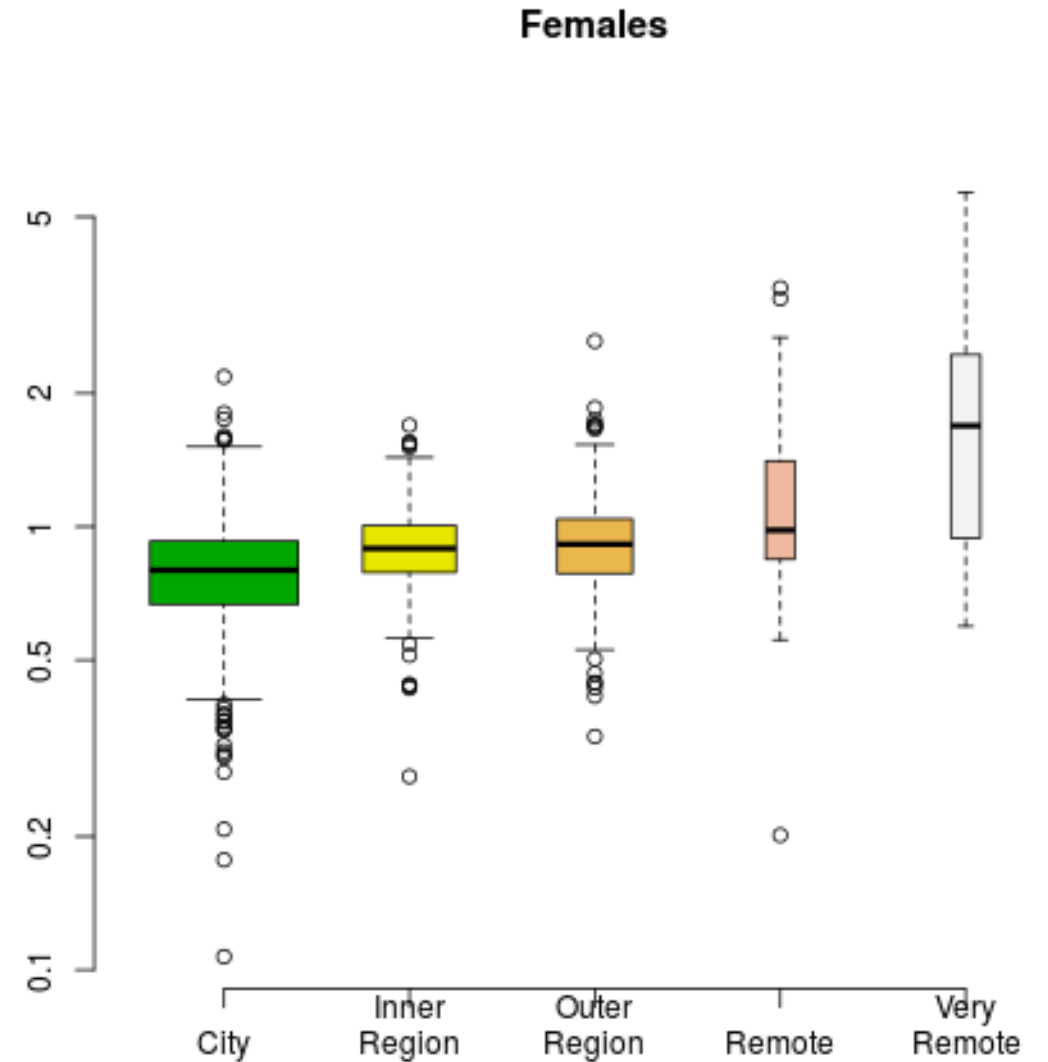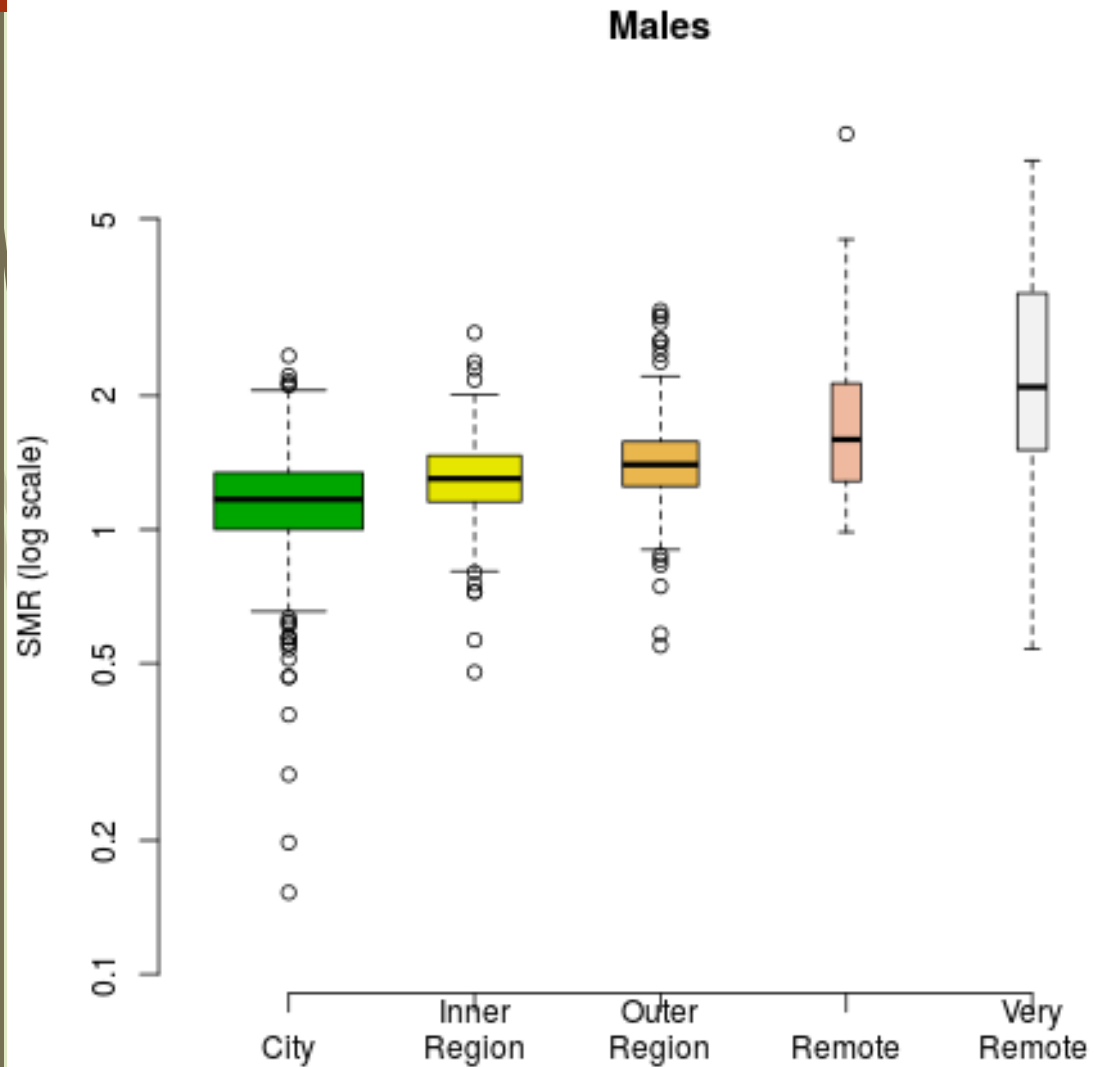 - log(SMR): national average at 0, range -0.2 to 0.2 (SMR range 0.80 to 1.25)

SMR, by Sex
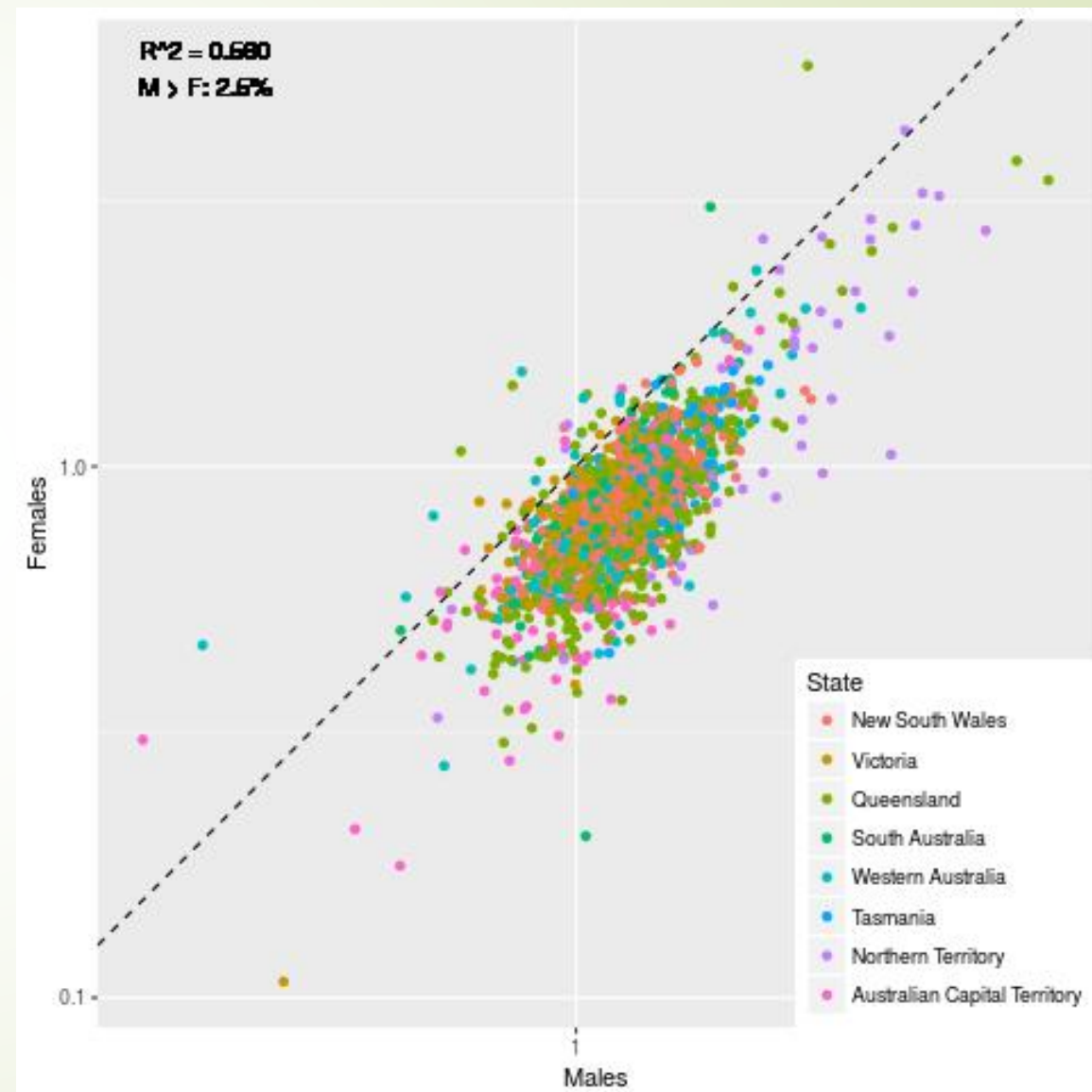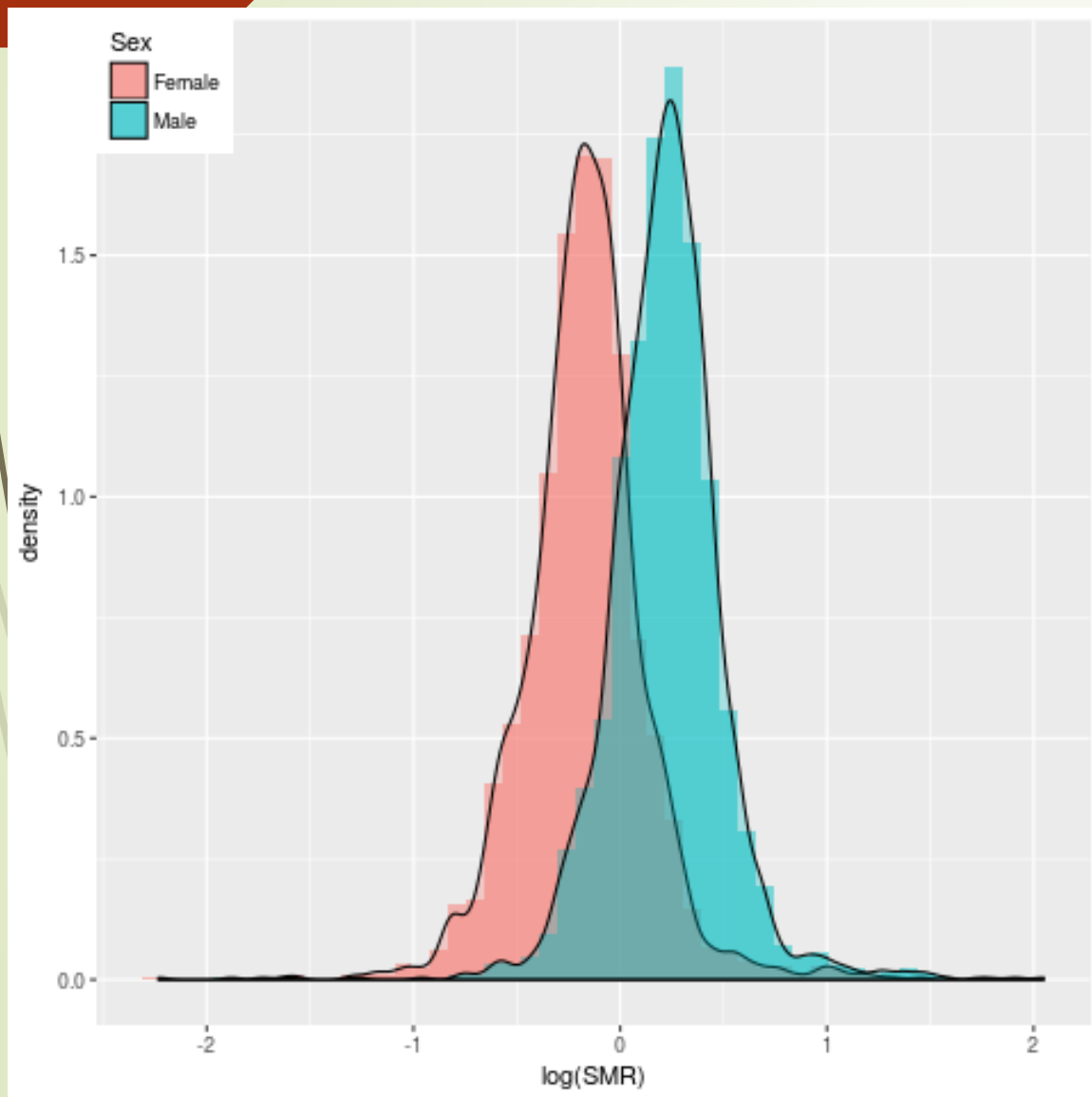
Mortality by State and Territory
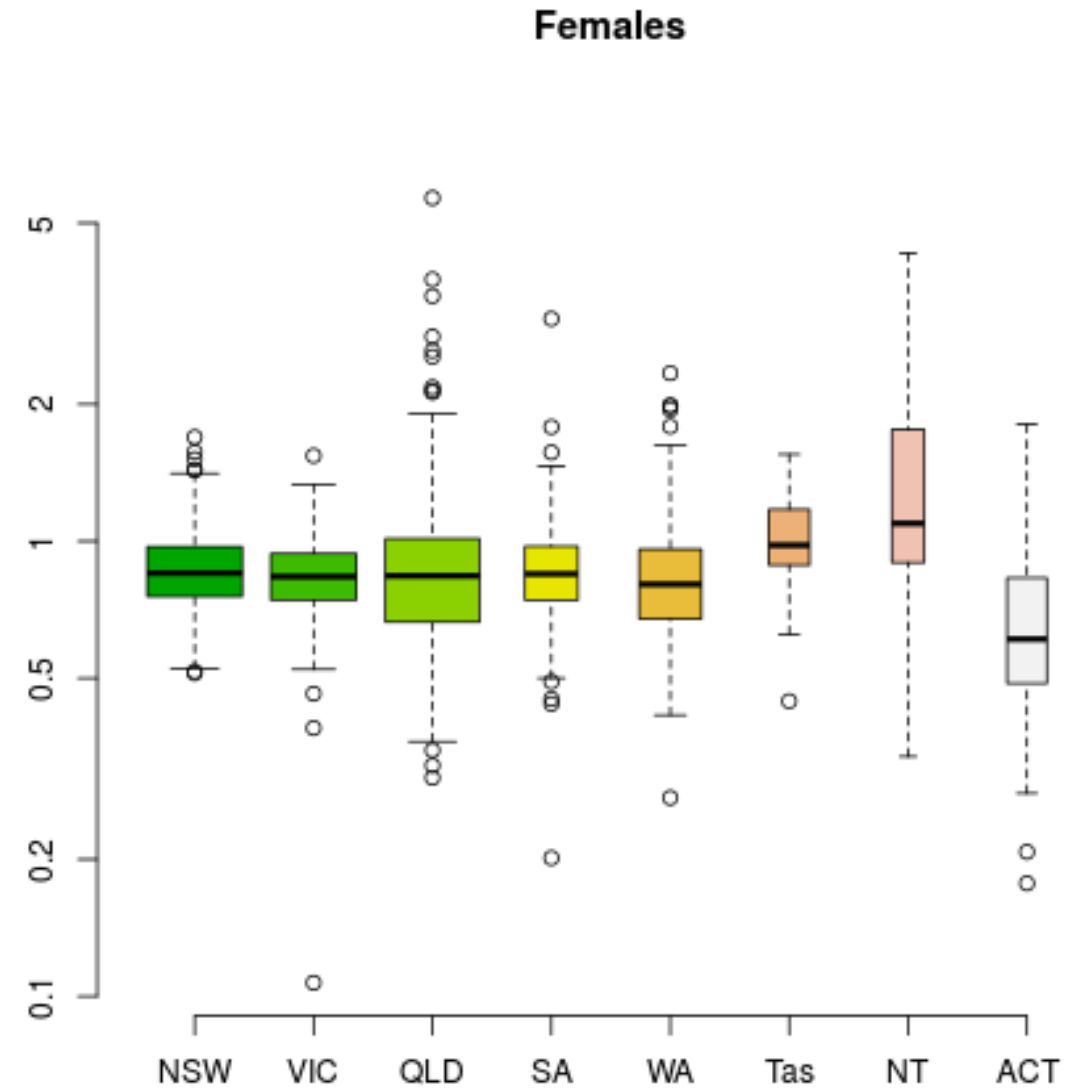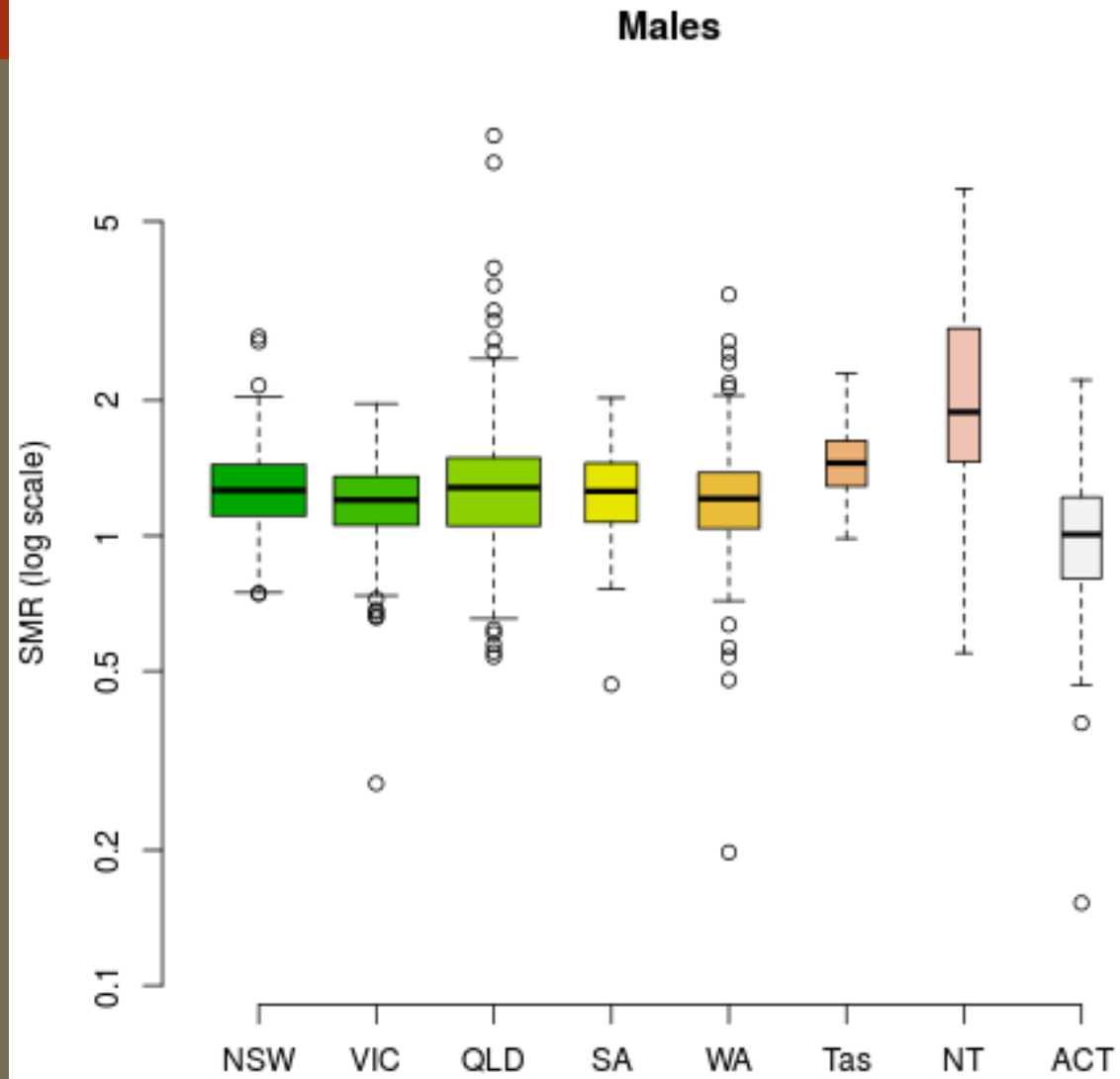
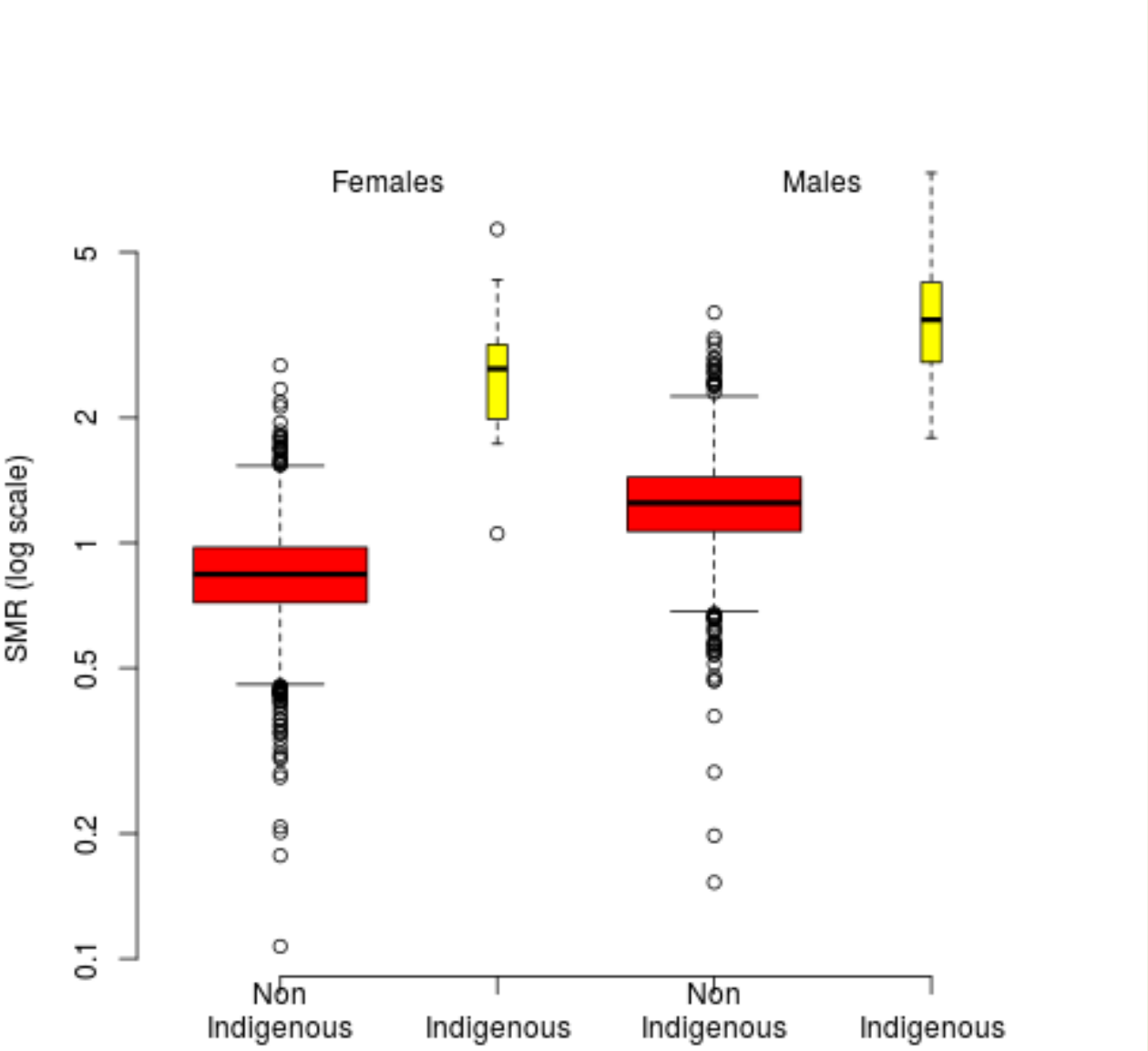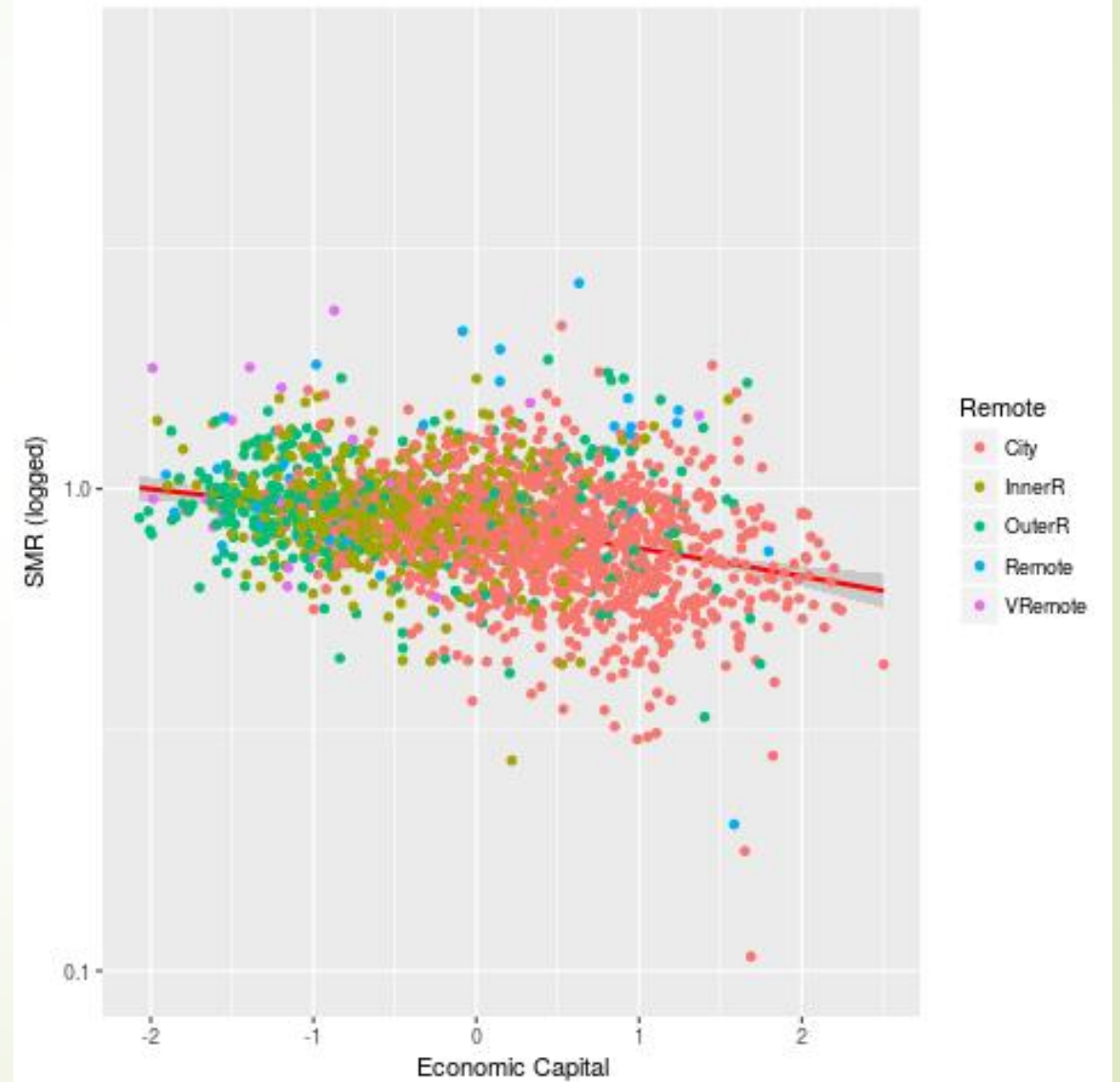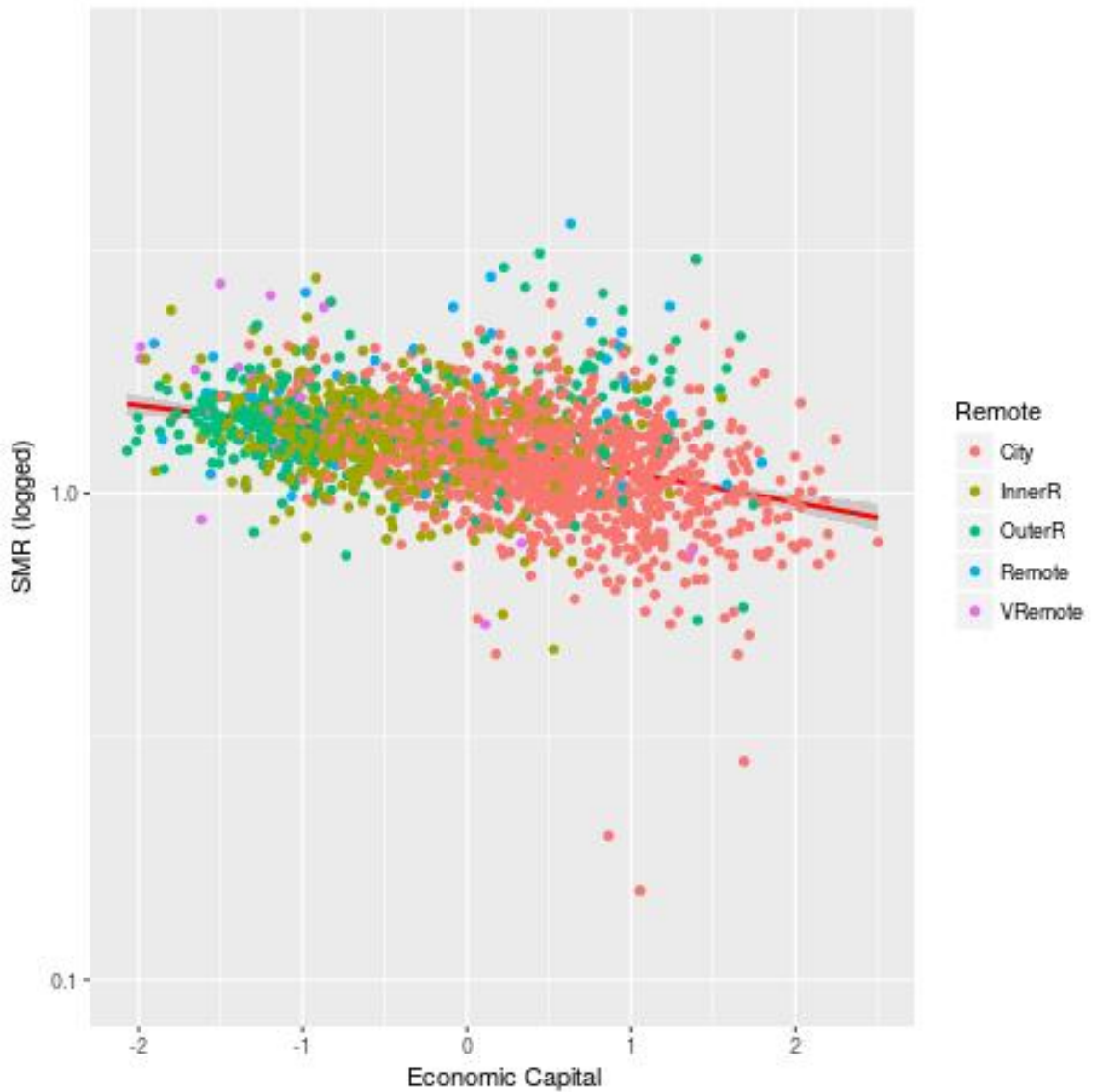# Mortality by Remoteness

Mortality by Indigeneity

Mortality and Economic Capital
(excluding 27 Indigenous locations)

Males   Females
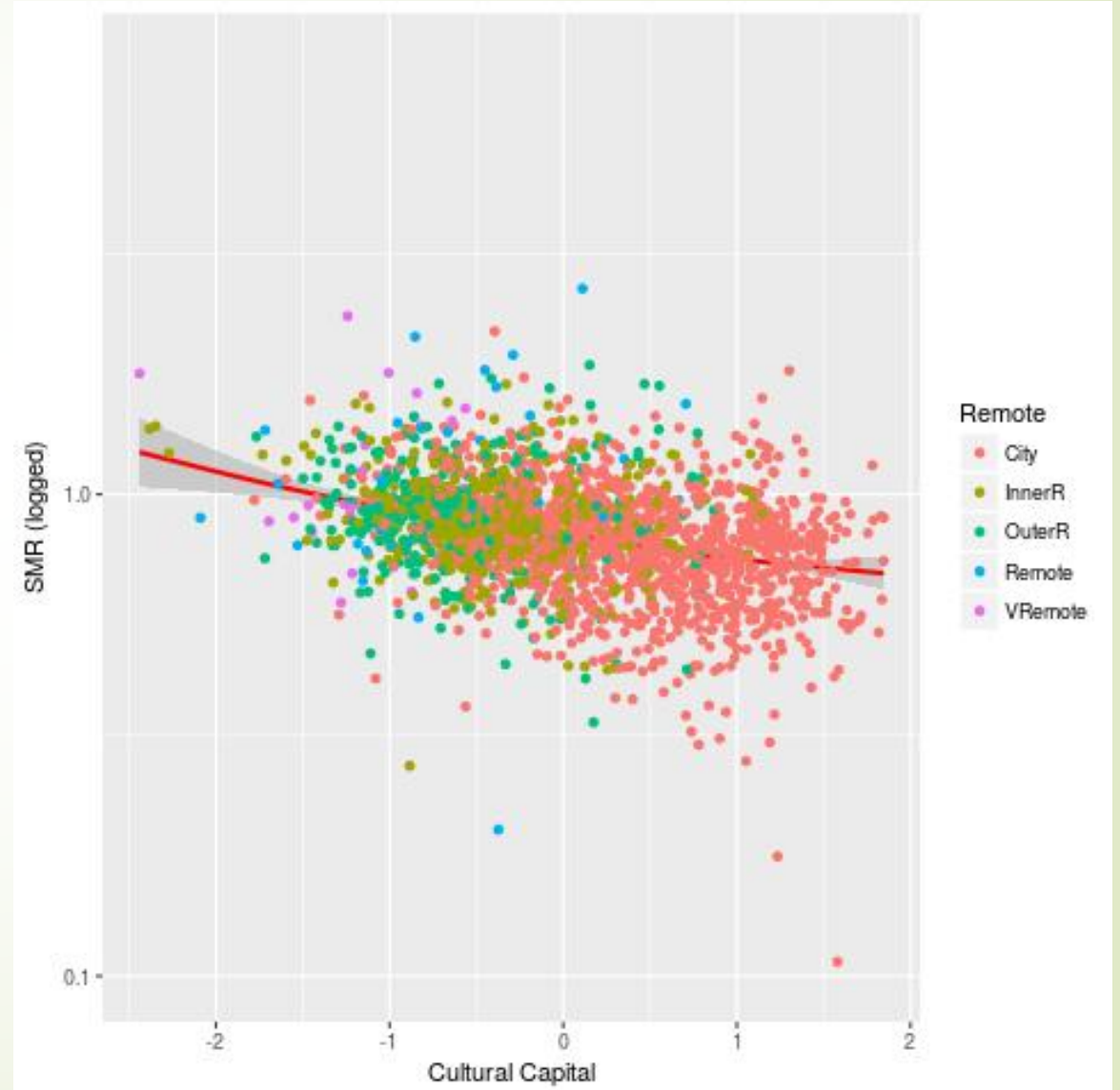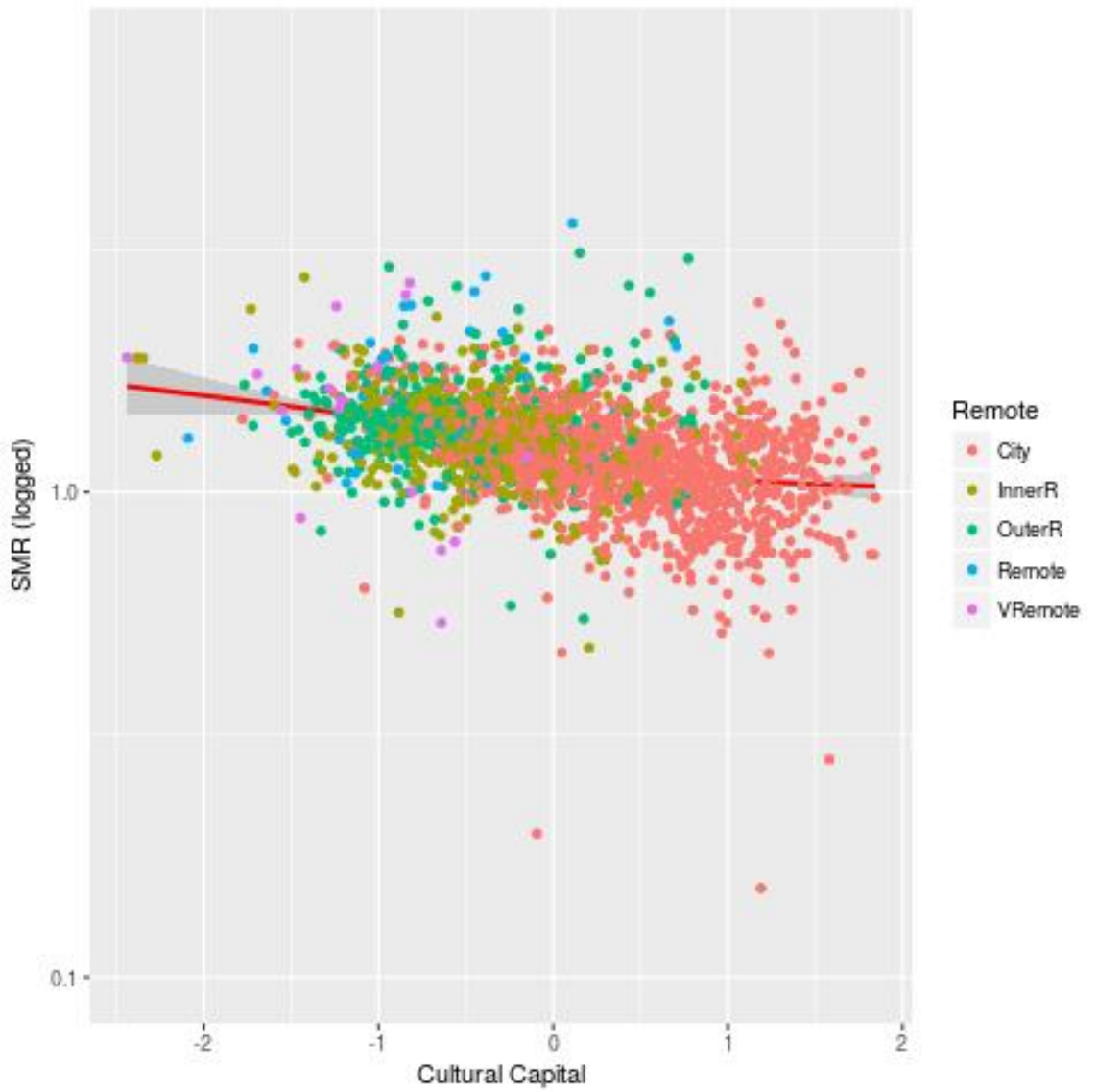
Mortality and Cultural Capital
(excluding 27 Indigenous locations)

Males
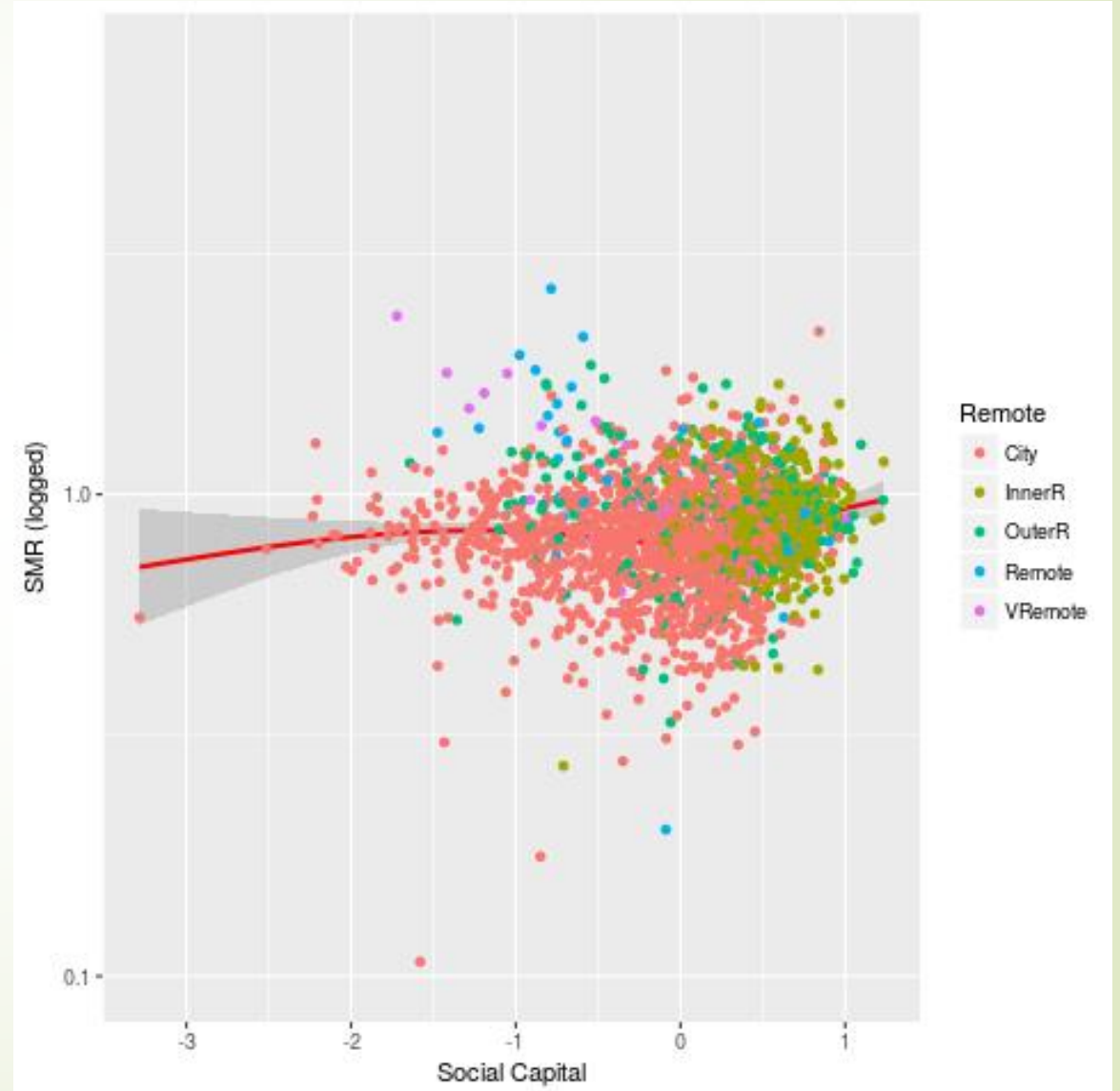
Females

Mortality and Social Capital
(excluding 27 Indigenous locations)
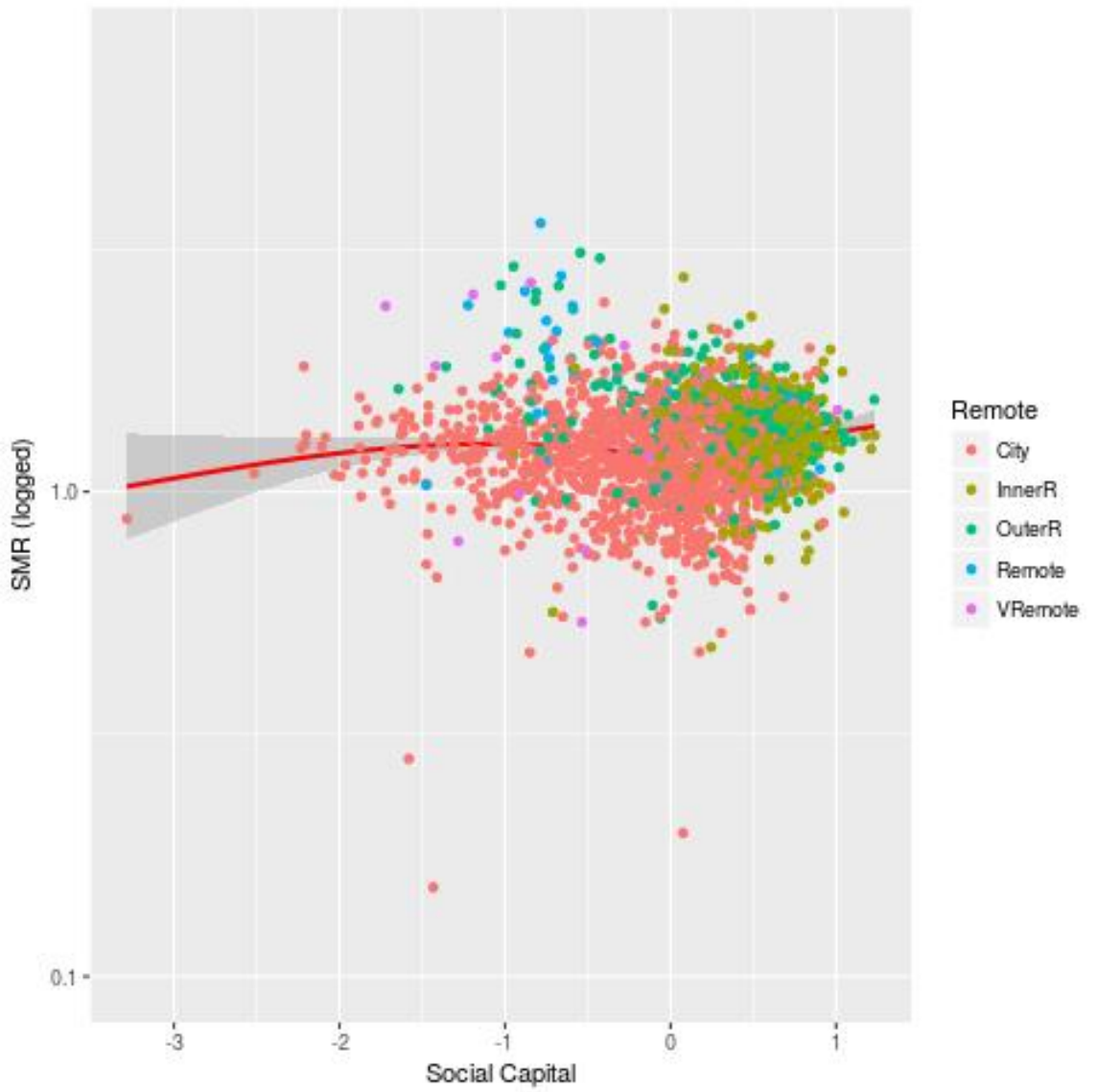
Males   Females

Mortality and Traditional Marriage
(excluding 27 Indigenous locations)

Males

Females
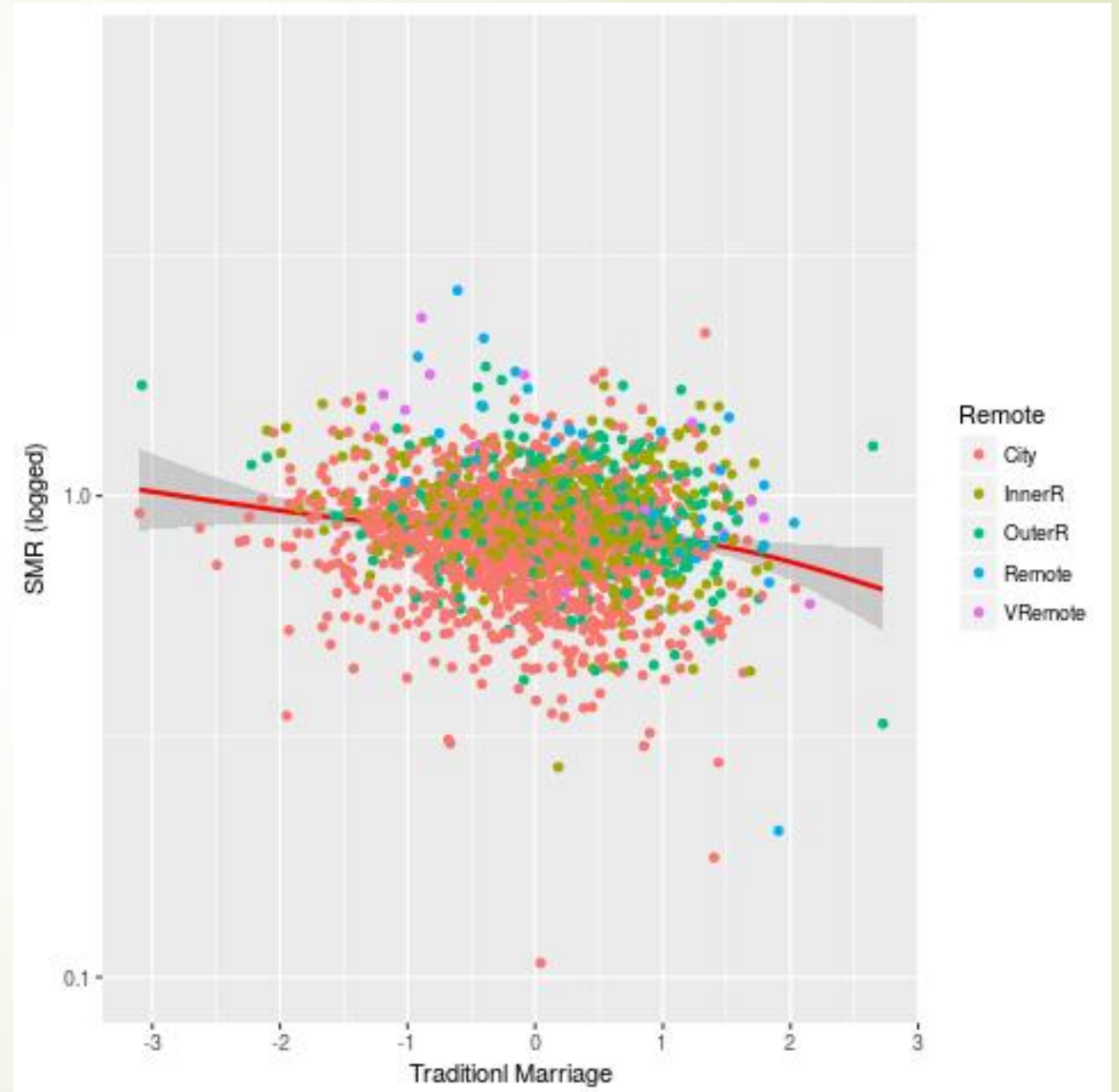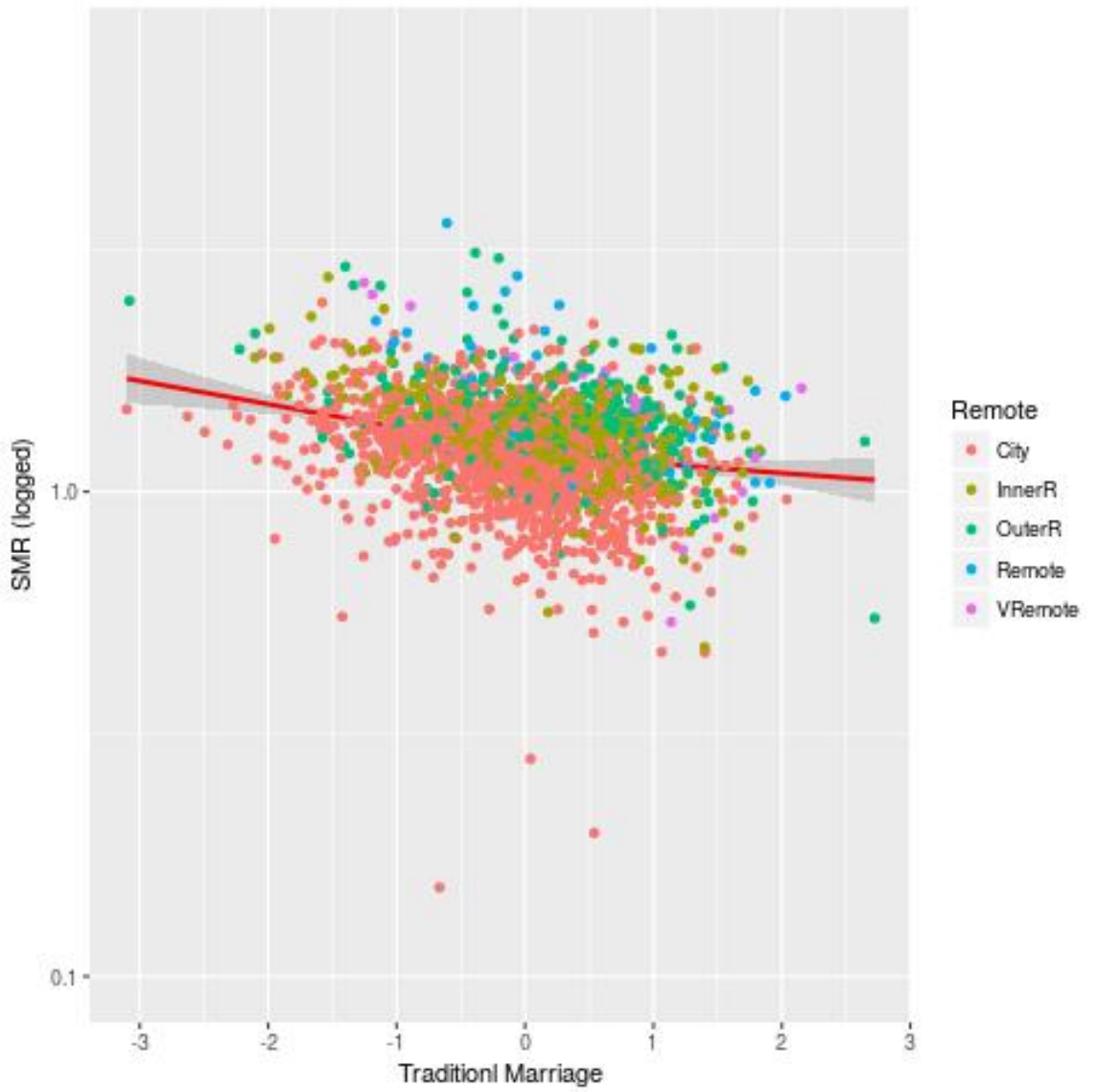
Relations between the variables
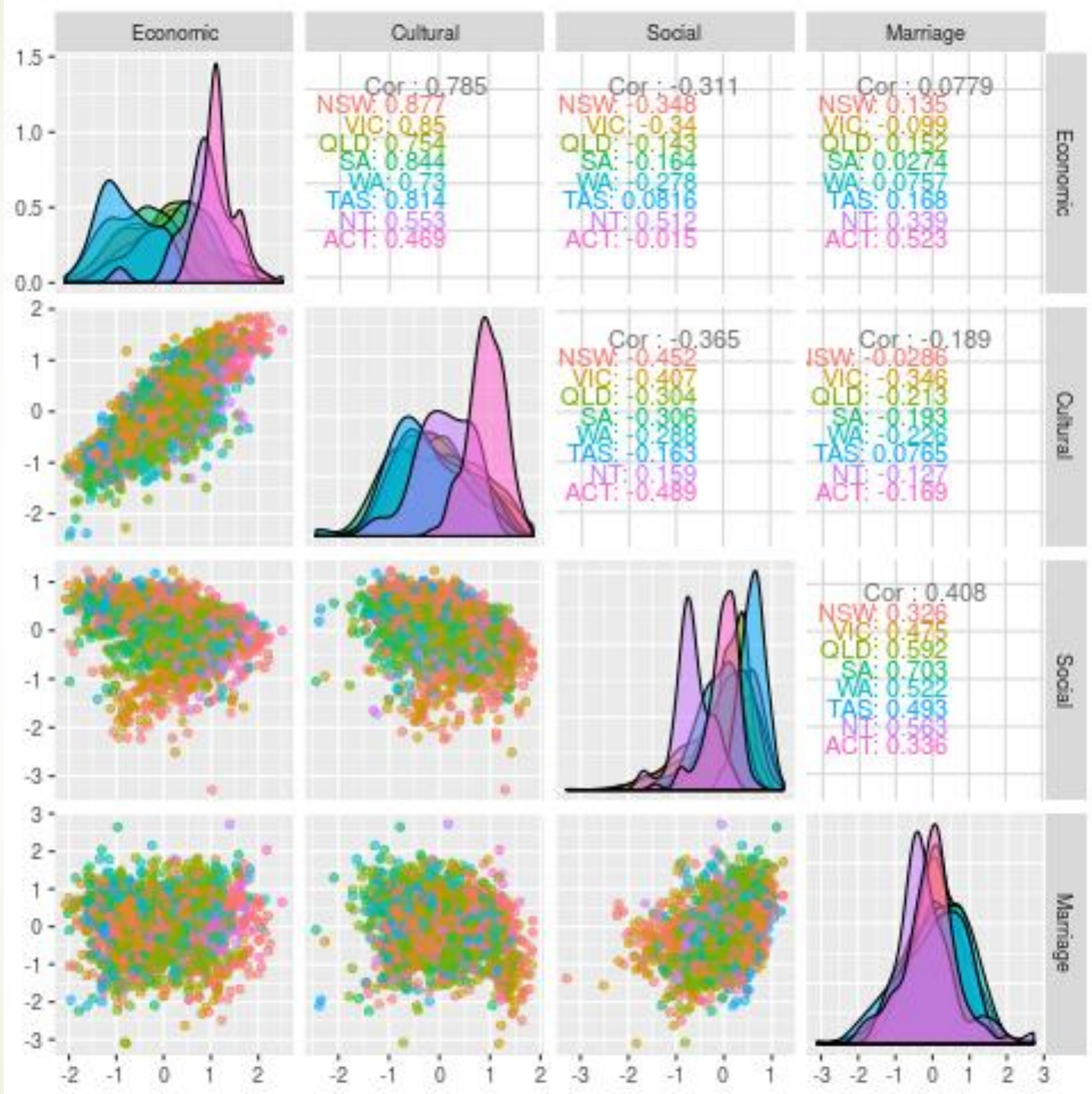
The models

- Dependent variable: Observed deaths over 5 years
  - Offset: (Log)Expected number of deaths (SMR)
- Data overdispersed: $\bar{x} = 174.1$; $s^2 = 16398.14$
- Use negative binomial model (multilevel)
- Model 1: Baseline, sex
- Model 2: Add Location – State, Remoteness, Indigeneity
- Model 3: Add Economic, Cultural, Social capital; Family structure (marriage)
- Random effects: Locality

Multilevel Negative Binomial regression: 5-year deaths

Relative Risks with z-values

		Model 1		Model 2		Model 3	
		Females	Males	Females	Males	Females	Males
	Intercept	**4.26**	**6.28**	**4.13**	**6.06**	**4.24**	**6.18**
State (Baseline NSW)							
	Victoria			**0.976**	**0.947**	**0.992**	**0.957**
				-1.72	-3.98	-0.59	-3.51
	Queensland			**0.962**	**0.982**	**0.949**	**0.973**
				-2.84	-1.35	-4.23	-2.21
	South Australia			**0.988**	**0.960**	**0.988**	**0.947**
				-0.61	-2.09	-0.66	-3.10
	Western Australia			**0.934**	**0.943**	**0.927**	**0.953**
				-3.85	-3.37	-4.59	-2.93
	Tasmania			**1.104**	**1.056**	**1.116**	**1.049**
				3.90	2.16	4.71	2.06
	Northern Territory			**1.099**	**1.211**	**1.141**	**1.279**
				2.32	5.18	3.33	6.84
	ACT			**0.832**	**0.837**	**0.878**	**0.903**
				-6.32	-6.21	-4.67	-3.76

Multilevel Poisson regression: 5-year deaths

		Model 1		Model 2		Model 3	
		Females	Males	Females	Males	Females	Males
Remoteness (City)							
	Inner			**1.082**	**1.101**	**1.038**	**1.053**
				6.42	7.97	2.70	3.75
	Outer			**1.106**	**1.160**	**1.043**	**1.090**
				6.75	10.08	2.53	5.27
	Remote			**1.254**	**1.308**	**1.160**	**1.224**
				6.23	7.74	4.29	6.16
	V. Remote			**1.240**	**1.256**	**1.138**	**1.150**
				4.40	5.11	2.74	3.28
Indigineity (baseline = not)							
	Indigenous			**2.372**	**2.126**	**1.902**	**1.443**
				13.33	12.54	10.03	6.21

Multilevel Poisson regression: 5-year deaths

		Females	Males	Females	Males	Females	Males
Capital (continuous)							
	Economic					**1.046**	**1.016**
						4.09	1.52
	Cultural					**0.871**	**0.874**
						-12.20	-12.25
	Social					**1.003**	**1.000**
						-0.33	-0.02
	Marriage					**0.938**	**0.886**
						-9.00	-17.42
Random Effects (Variances)							
	Locality	0.0541		0.0358		0.0272	

Multivariate Regression (Neg. Bin): Level of Mortality

➡ **State and Territory:**

V. LOW	LOW	HIGH
ACT	NSW	Northern Territory
	Queensland	Tasmania
	Victoria	
	Western Australia	

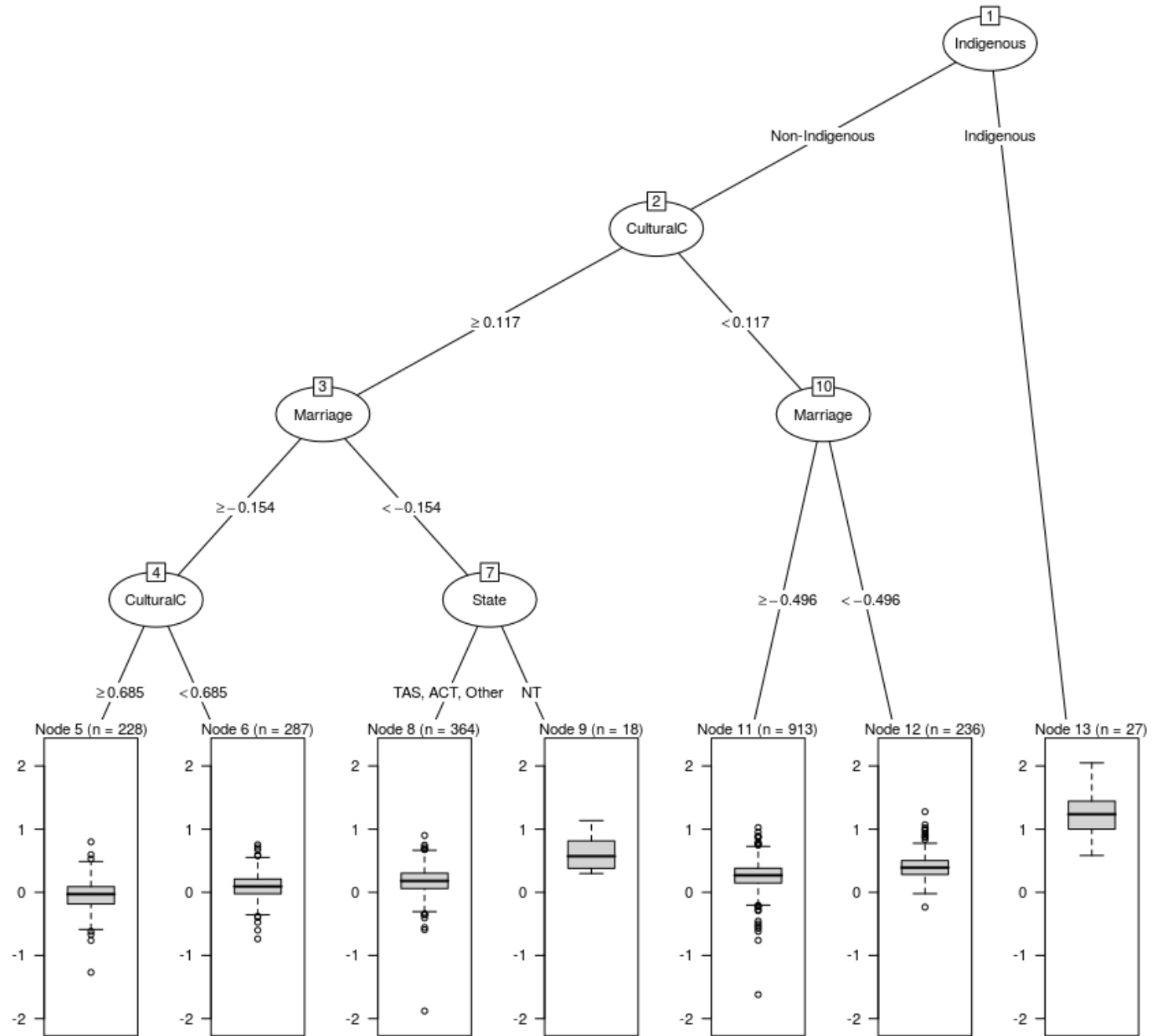| City	<	Inner Region	<	Outer Region	<	Remote	<	Very Remote

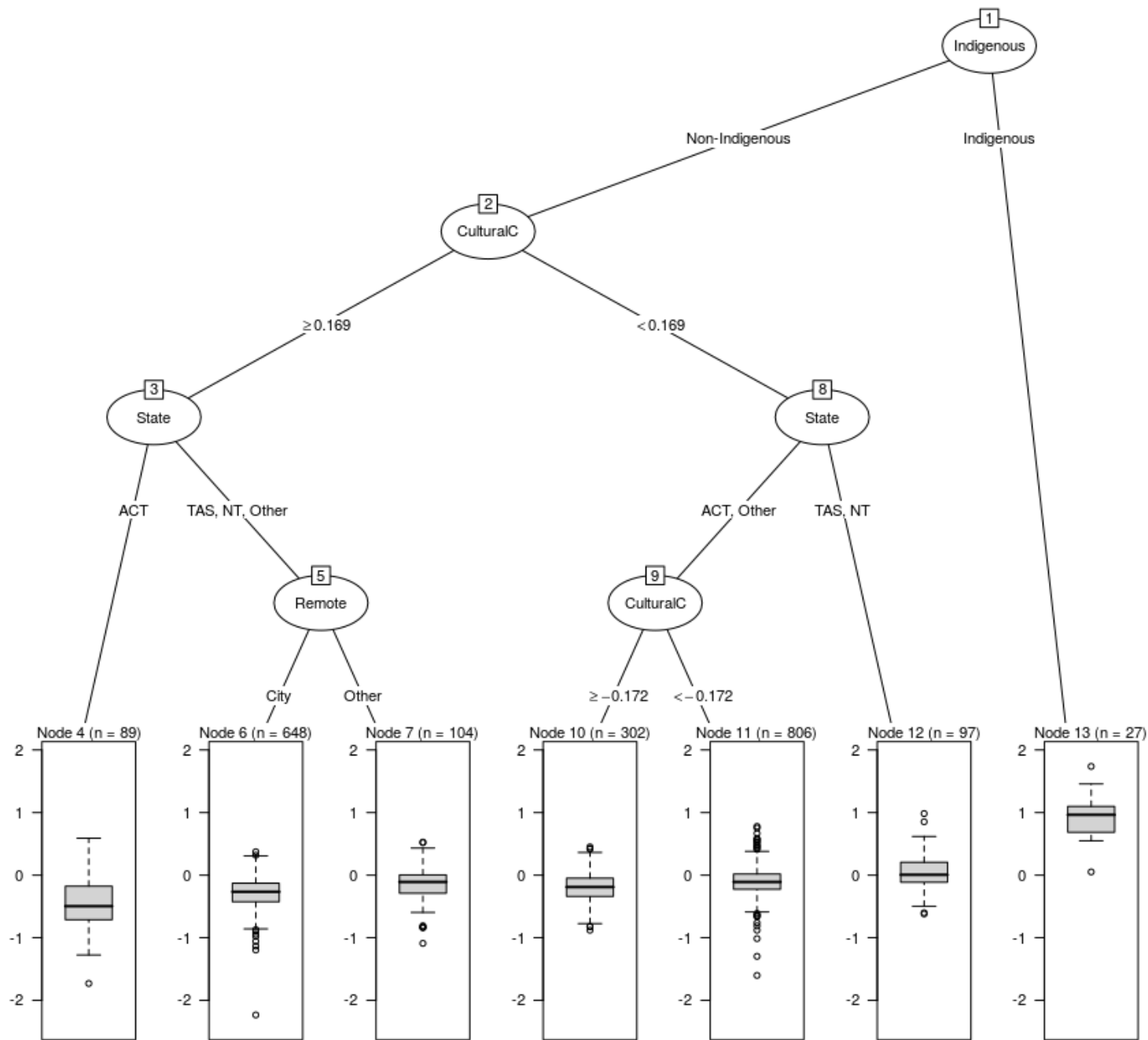➡ Indigenous locations almost DOUBLE the mortality level (Net!)

- Scales (net strength of reduction of mortality)

➡Cultural > (Social > Economic (-ve?))
➡Marital commitment (traditional family structures) reduces mortality

Partition Tree Analysis log(SMR) (Males)
$R^2 = 0.232$

Partition Tree Analysis log(SMR) (Females) $R^2 = 0.159$

Summary & Conclusion

1. Basic Australian pattern much as anywhere else – you're better off young, rich and healthy than the opposite
2. Definite regional patterns (remoteness, Northern Territory) not only as reflection of concentration of Indigenous population
3. Cultural resources (education, employment patterns) the most important as markers of low-mortality populations
4. Traditional family structure reduces mortality

Conclusions

➥Indigenous areas have 200% net mortality. Note separate branch on tree

➥Multilevel model for SA3, SA4, marginally improves model. Small untapped regional effects (on top of "State" and "Remoteness")

➥Overall, strength of explanation low, especially for females

➥Suggests importance of social and medical services in reducing mortality for vulnerable populations. Housing policy of intermingling

➥Prevention still better than cure!

Thank You!!!

Comments? Suggestions?

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