Adding value to administrative data: Research methods, research data

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Data linkage Research Conversation, Adelaide

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University of
Western Sydney
Bringing knowledge to life

Potentially preventable hospitalisations by condition type, NSW, South Eastern Sydney LHD, 2009-10

Potentially preventable hospitalisations by condition type, NSW, South Eastern Sydney LHD, 2009-10

Potentially preventable hospitalisations by Local Government Area, NSW, 2008-09 to 2009-10

Potentially preventable hospitalisations by Local Government Area, NSW, 2008-09 to 2009-10

Potentially preventable hospitalisations by Local Government Area, NSW, 2008-09 to 2009-10

Table 3.11: Potentially avoidable hospitalisations[1] by sub-category/condition and Health Region, South Australia, 2005/06 and 2006/07
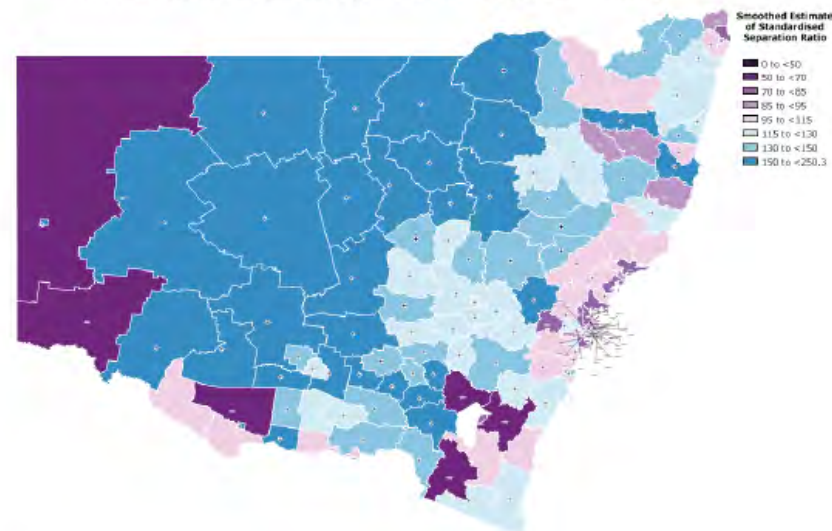Ratio of rates in each Health Region to State rate (based on data in Table 3.10)

Health Region rate above State rate by █ 50% or more ▓ 25 to <50% ░ 10 to <25%

Sub-category/condition	Central Nthn Adelaide	Southern Adelaide	Hills Mallee Sthn	South East	Wakefield	Mid North	Riverland	Eyre	Northern & Far Western
Vaccine-preventable	0.95	0.82[t]	1.15	0.60[tt]	1.09	0.95	0.71	1.95[tt]	1.24
Influenza and pneumonia	0.93	0.86	1.14	0.67	1.22	0.67	0.73	2.10[tt]	1.30
Other vaccine-preventable diseases	1.05	0.71	1.22	0.34	0.65	2.05	0.65	1.37	1.06
Chronic	0.90[tt]	0.97[t]	0.93[tt]	1.07[t]	1.02	1.62[tt]	1.11[t]	1.16[tt]	1.61[tt]
Iron deficiency anaemia	0.84[tt]	1.65[tt]	0.79[t]	0.92	0.88	0.49[tt]	0.57[tt]	0.29[tt]	0.92
Diabetes complications	0.90[tt]	0.90[tt]	0.86[tt]	1.08	1.01	1.67[tt]	1.13[t]	1.17[t]	1.76[tt]
Rheumatic heart disease	0.83	0.69	0.53	0.88	0.50	1.00	0.57	0.69	0.63
Hypertension	0.50[tt]	0.63[tt]	1.28	1.35	1.51[t]	5.06[tt]	2.33[tt]	4.43[tt]	3.06[tt]
Congestive cardiac failure	0.89[tt]	0.97	0.99	1.23[t]	1.12	1.47[tt]	1.13	1.57[tt]	1.51[tt]
Angina	0.96	0.75[tt]	1.10	1.35[tt]	1.24[tt]	1.50[tt]	1.17	1.09	1.18
Chronic obstructive pulmonary disease	0.94[t]	1.00	0.86[tt]	0.95	0.90	1.53[tt]	1.08	1.09	2.14[tt]
Asthma	0.92[tt]	0.95	1.08	0.91	1.08	1.97[tt]	1.15	0.97	1.20
Acute	0.91[tt]	0.95[tt]	0.92[tt]	1.10[tt]	1.04	1.55[tt]	1.24[tt]	1.16[tt]	1.60[tt]
Dehydration and gastroenteritis	0.80[tt]	0.96	1.07	1.80[tt]	1.20[tt]	1.86[tt]	1.23[t]	1.12	1.67[tt]
Convulsions and epilepsy	0.93[t]	0.79[tt]	0.99	0.85	1.13	1.38[t]	1.26	1.50[tt]	2.22[tt]
Ear, nose and throat infections	0.88[tt]	0.99	0.96	0.91	1.03	1.91	1.26	1.44	1.52
Dental conditions	0.97	0.93[t]	0.85[tt]	0.85[t]	0.97	1.21	1.50[tt]	0.96	1.66[tt]
Perforated/bleeding ulcer	1.08	0.90	0.75	0.88	1.09	0.99	0.89	0.61	0.77
Appendicitis	0.92	1.15	1.22	0.99	0.61	1.56	1.00	0.62	0.91
Cellulitis	0.87[tt]	0.99	0.88	1.28[t]	1.17[t]	1.80[tt]	1.20	1.21	1.41[tt]
Pyelonephritis (includes urinary tract infections)	1.01	0.97	0.83[t]	0.86	0.90	1.38[tt]	0.96	1.00	1.21
Pelvic inflammatory disease	0.91	1.08	0.74	1.14	0.88	1.18	1.17	1.18	2.08[tt]
Gangrene	1.00	1.15	0.66	1.26	0.48[tt]	0.70	1.00	1.02	1.54
Total avoidable admissions	0.91[tt]	0.96[tt]	0.93[tt]	1.08[tt]	1.03[tt]	1.58[tt]	1.16[tt]	1.17[tt]	1.59[tt]

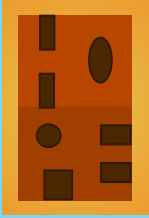[1] Admissions resulting from ACS conditions

Sources

NSW Admitted Patient Data Collection and ABS population estimates (HOIST). Centre for Epidemiology and Research, NSW Department of Health.

Adding value

- Applying new methods to linked administrative data
    - example: the IHOPE Study
- Linking research datasets to administrative data
   - example: the APHID Study

IHOPE

- Indigenous Health Outcomes Patient Evaluation

  - funded by NHMRC project grant #573113

  - CIs: Louisa Jorm, Alastair Leyland, Tim Churches, Mary Haines, Sandra Eades, Sanja Lujic

  - Researchers: Deborah Randall, Michael Falster, Tim Harrold, Tracie Reinten, Holger Möller, Kathleen Falster
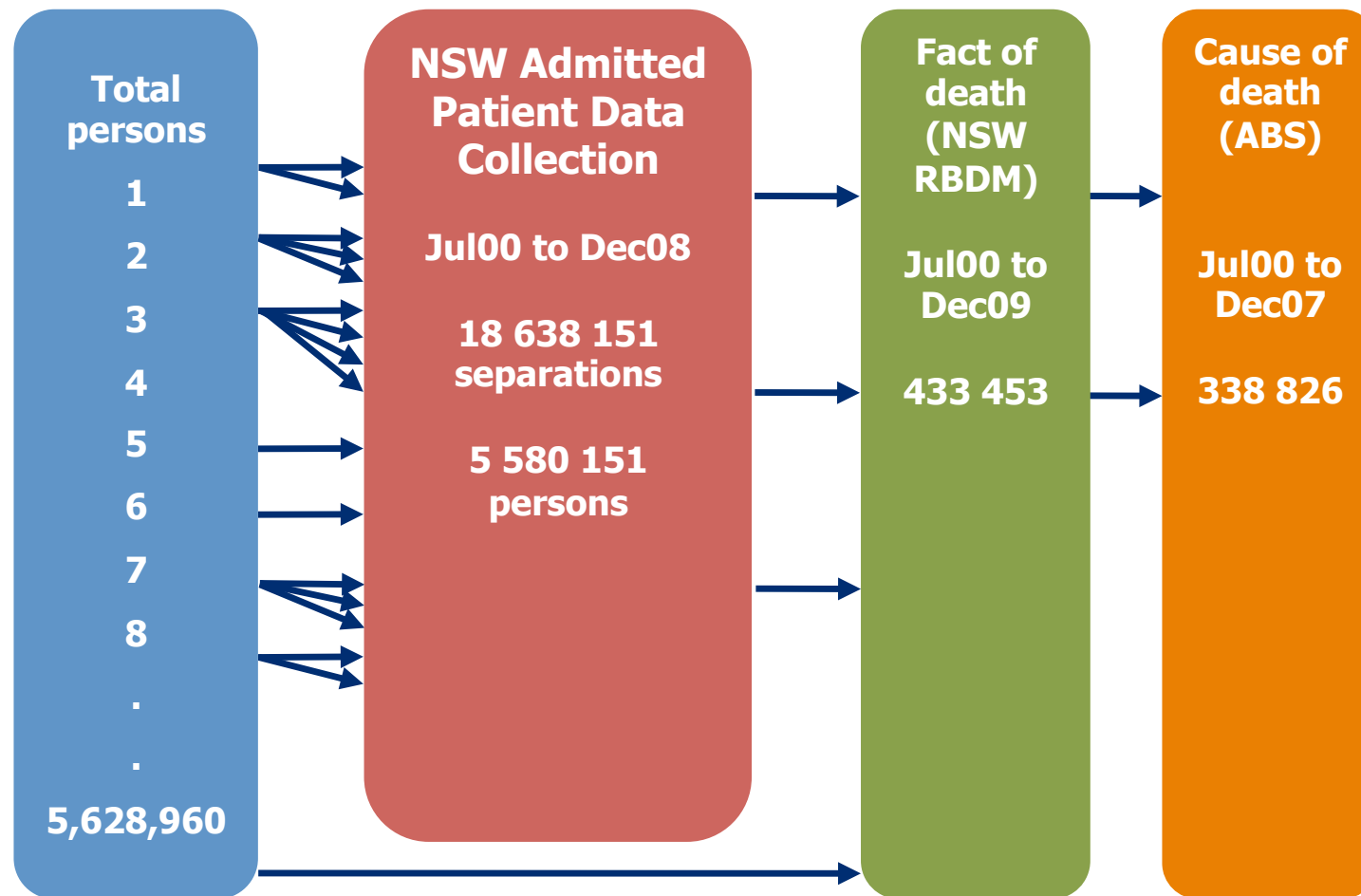
  - Community and policy reference group

Aims of the IHOPE project
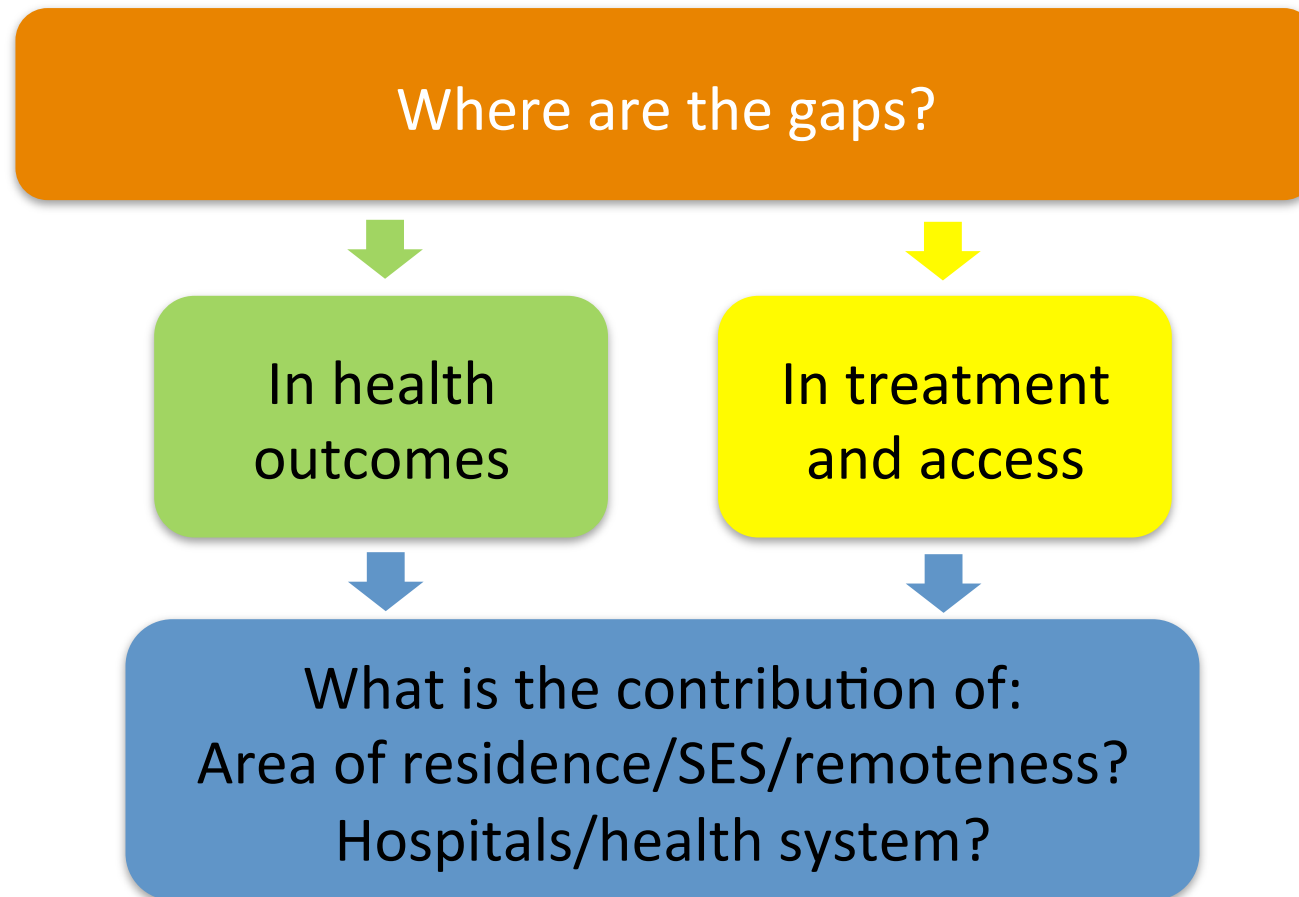
Methods: IHOPE data

Research areas to date

- Heart disease
- Transport injuries
- Dental procedures
- Cataract procedures
- Otitis media procedures in children
- Potentially preventable hospitalisations
- Improving identification of Aboriginal people using linked data

Methods: multilevel modelling

- Models data that are clustered
  - eg live in same neighbourhood, go to the same hospital, same classroom
  - more similar than those in other areas, hospitals, classrooms because of shared exposure (often unmeasured)
  - can impact on standard errors and parameter estimates if not taken into account

- Particular issue for Aboriginal health research
  - geographic distribution of Aboriginal people
  - ~40% of Aboriginal people live in major cities compared with ~70% of non-Aboriginal people
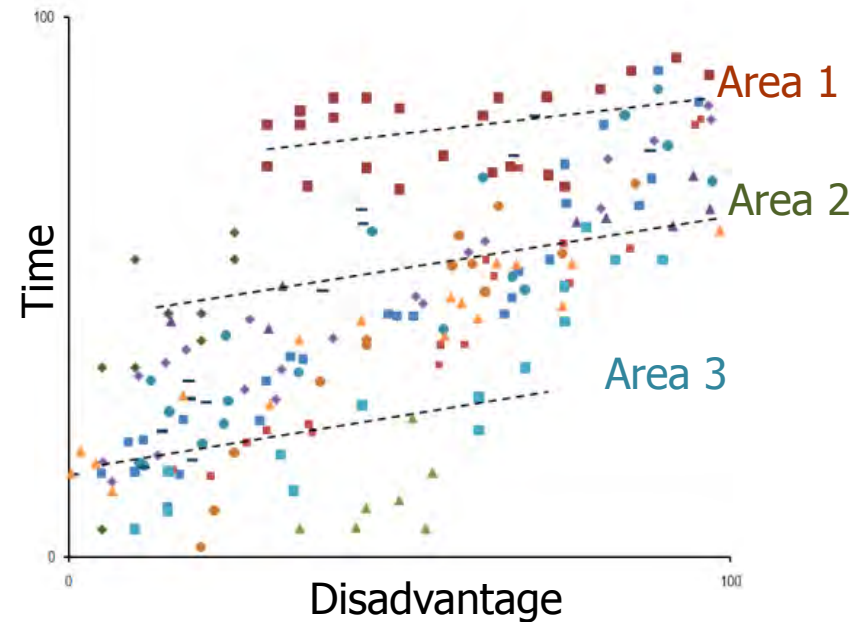
How is multilevel modelling different?

Single level regression model

Multilevel regression model
(random intercept)
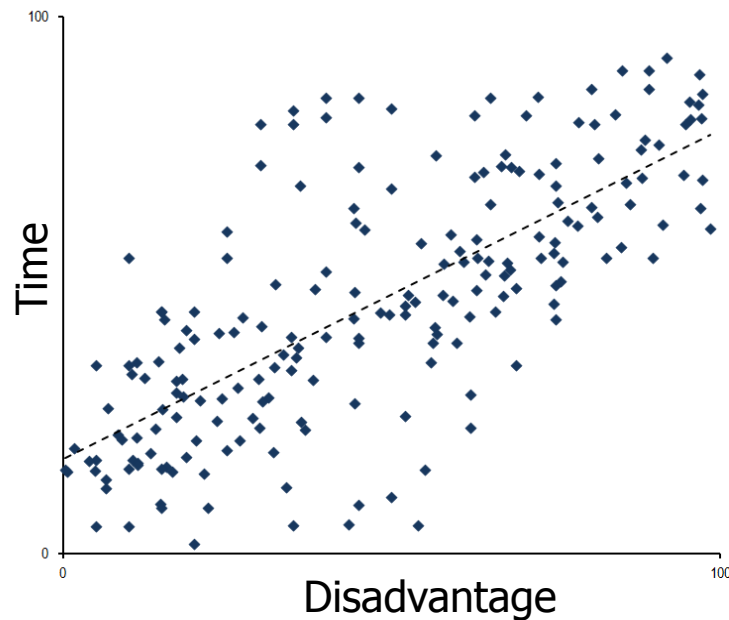
Fits an average association

Strength of association may vary
between areas
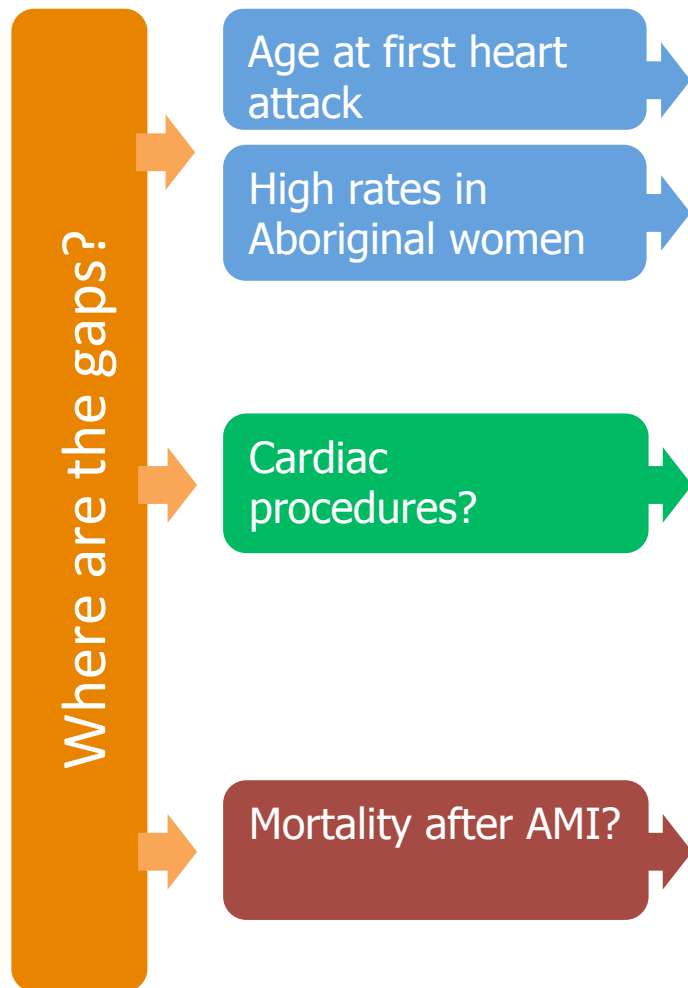
Summary of selected IHOPE findings
- acute myocardial infarction
- serious road traffic injuries
- cataract procedures

Acute myocardial infarction

Where are the gaps?

- Age at first heart attack
- High rates in Aboriginal women
- Cardiac procedures?
- Mortality after AMI?

Characteristics of people admitted to hospital with AMI

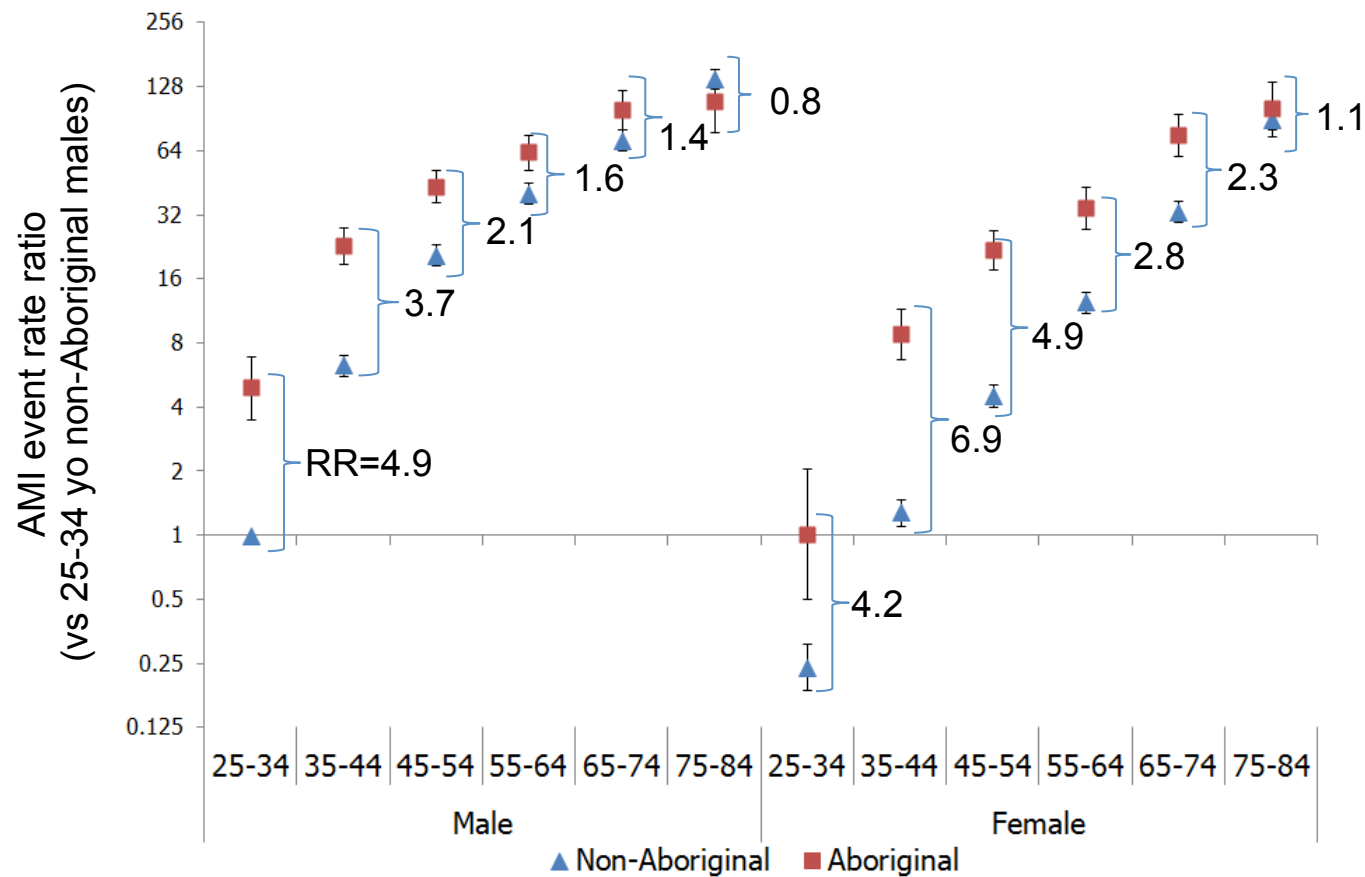|	Aboriginal	Non-Aboriginal
Average age	54 yo	66 yo
Current smokers	51%	27%
Private health insurance	16%	45%
Live in most disadvantaged areas	48%	26%
First admitted to:		
- major city hospital	33%	67%
- hospital with specialist cardiac facilities	27%	44%

Findings: AMI incidence rates

- The age-standardised incidence of AMI in NSW between 2002 and 2007 was:
  - 464 per 100,000 for Aboriginal people
  - 234 per 100,000 for non-Aboriginal people
- An Aboriginal person has 2.1 (2.0-2.2) times the risk of an AMI as a non-Aboriginal person of the same age, sex and year of event, from the same area of residence
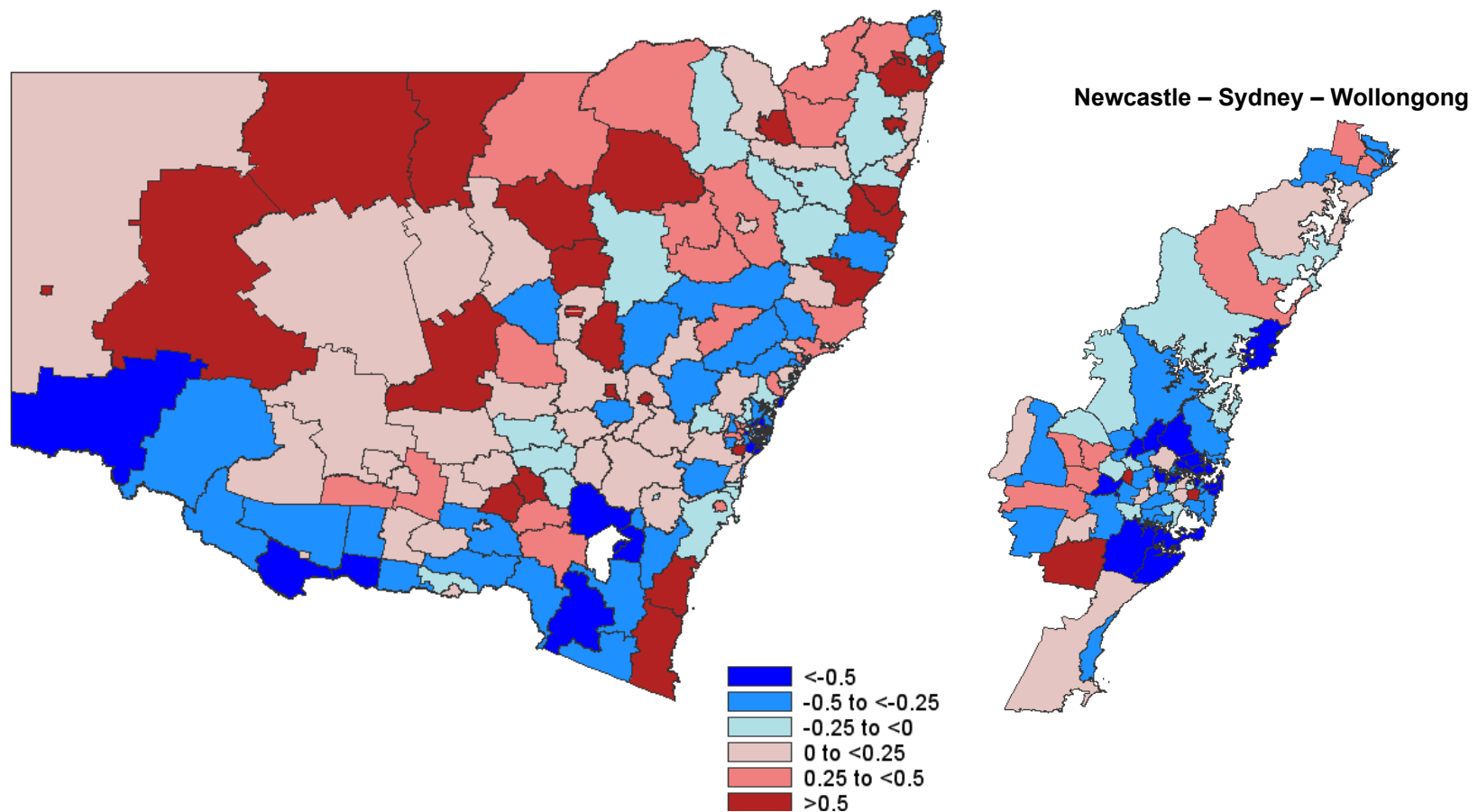
Findings: AMI incidence rates

The disparity is greatest in younger age groups and for females

Where are the higher rates for Aboriginal people?

Rates of AMI for Aboriginal people vary by Statistical Local Area, with higher rates generally in regional and rural areas

Newcastle – Sydney – Wollongong

<-0.5
-0.5 to <-0.25
-0.25 to <0
0 to <0.25
0.25 to <0.5
>0.5

Where is the higher disparity for Aboriginal people?
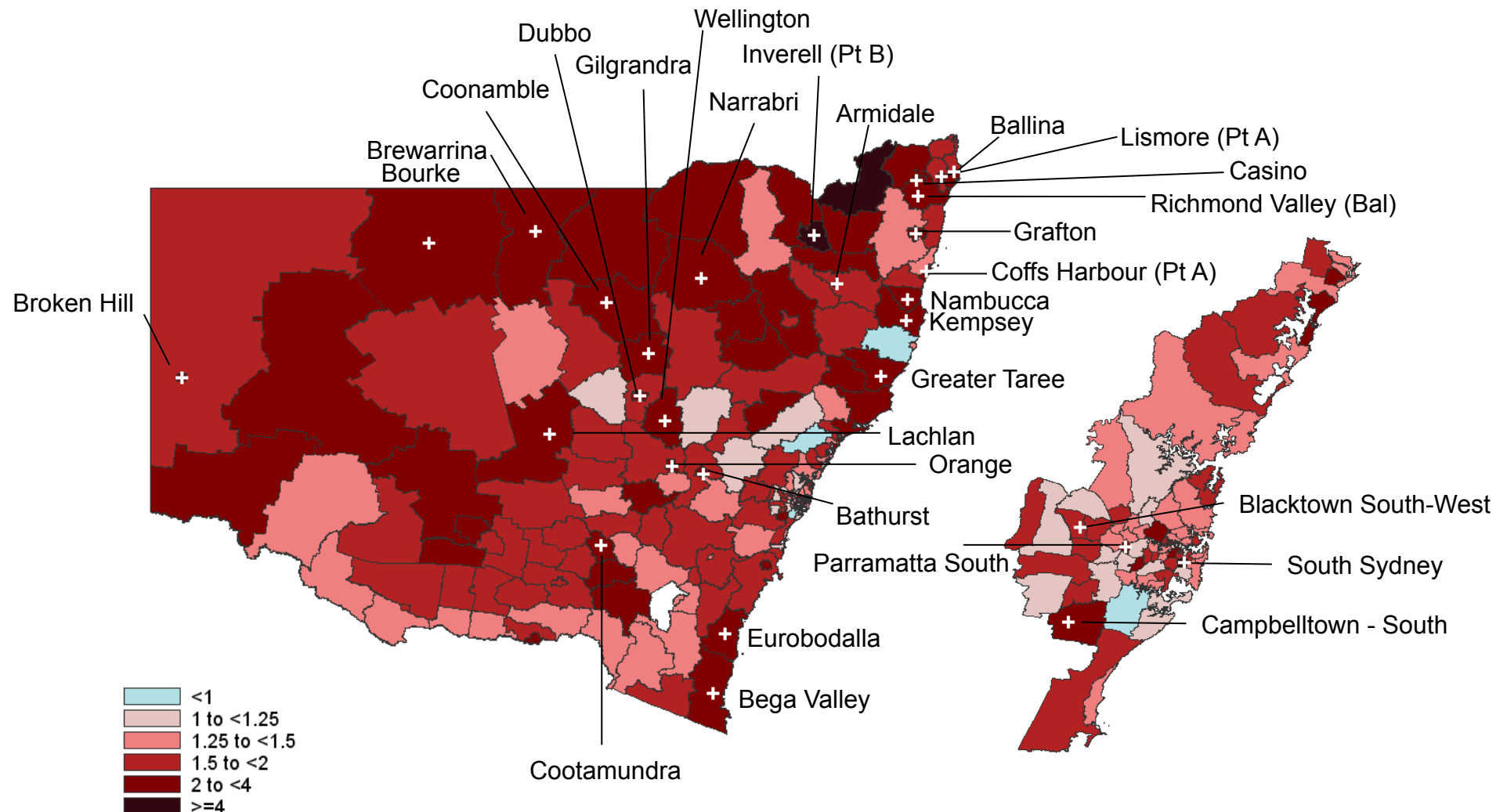
Almost all areas in NSW have a higher incidence of AMI for Aboriginal people compared with non-Aboriginal people

Newcastle – Sydney – Wollongong

Legend:
- <1
- 1 to <1.25
- 1.25 to <1.5
- 1.5 to <2
- 2 to <4
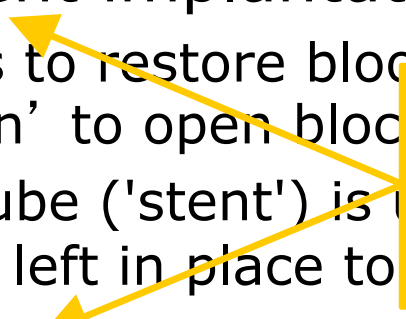- >=4
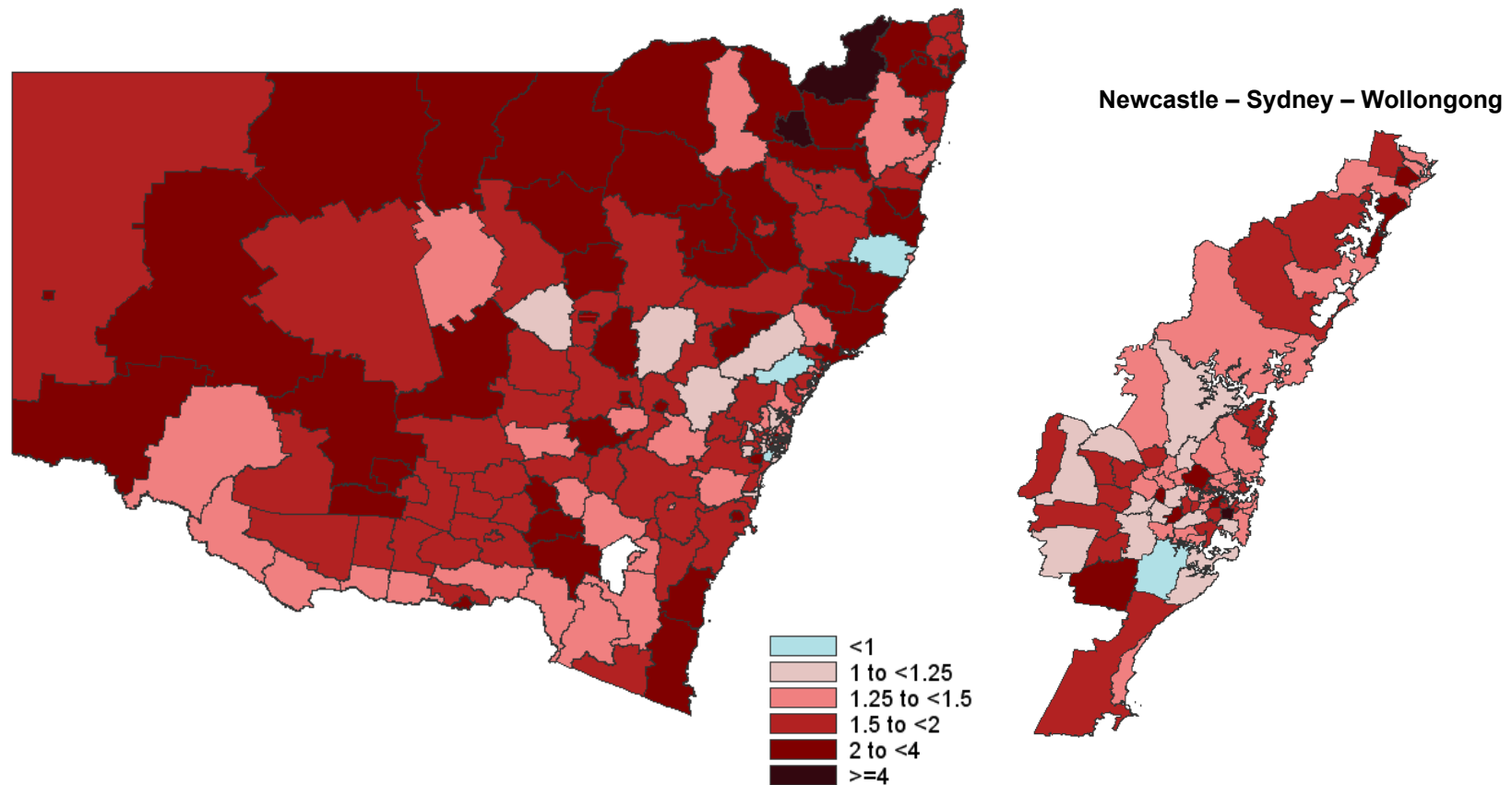
"High incidence, high disparity" areas

Treatments for AMI

- **Thrombolysis or fibrinolysis**
  - clot-dissolving medicines administered directly into the blood stream

- **Angioplasty and stent implantation**
  - procedure that aims to restore blood flow to the heart with a 'balloon' to open bloc
  - expandable metal tube ('stent') is ... site, expanded, and left in place to

- **Coronary artery bypass graft surgery (CABG)**
  - procedure where blood flow is redirected around a narrowed area in one or more coronary arteries, allowing blood to flow more freely to heart muscle

Revascularisation procedures

Disparity in revascularisation rates

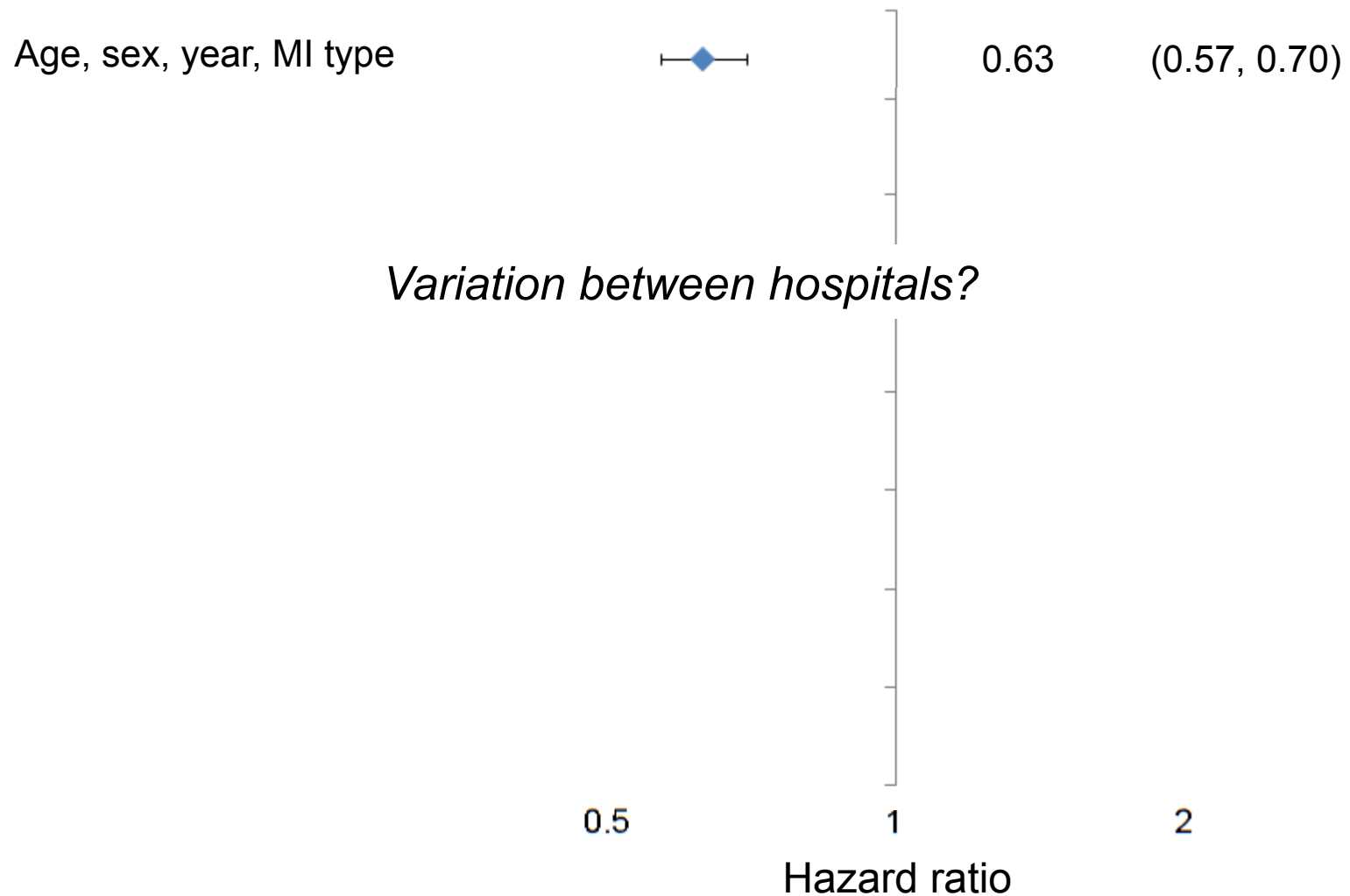Age, sex, year, MI type   0.63   (0.57, 0.70)
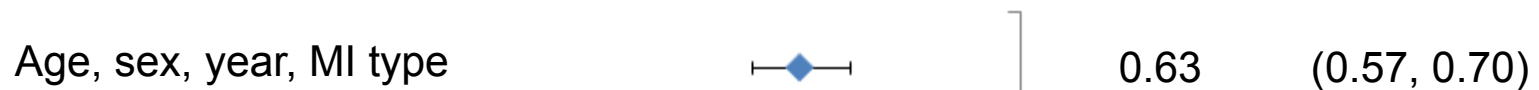
*An Aboriginal person in NSW has a **37%** lower hazard of revascularisation within 30 days of AMI than a non-Aboriginal person of the same age, sex, year of admission and AMI type*
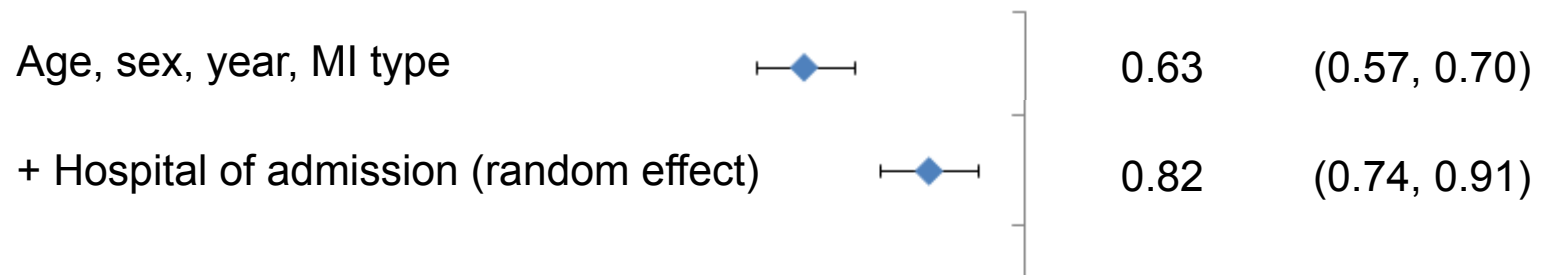
0.5   1   2

Hazard ratio

What factors are influencing this gap?

Age, sex, year, MI type   ◆   0.63   (0.57, 0.70)

Variation between hospitals?

0.5   1   2

Hazard ratio

What factors are influencing this gap?

Age, sex, year, MI type — 0.63 (0.57, 0.70)

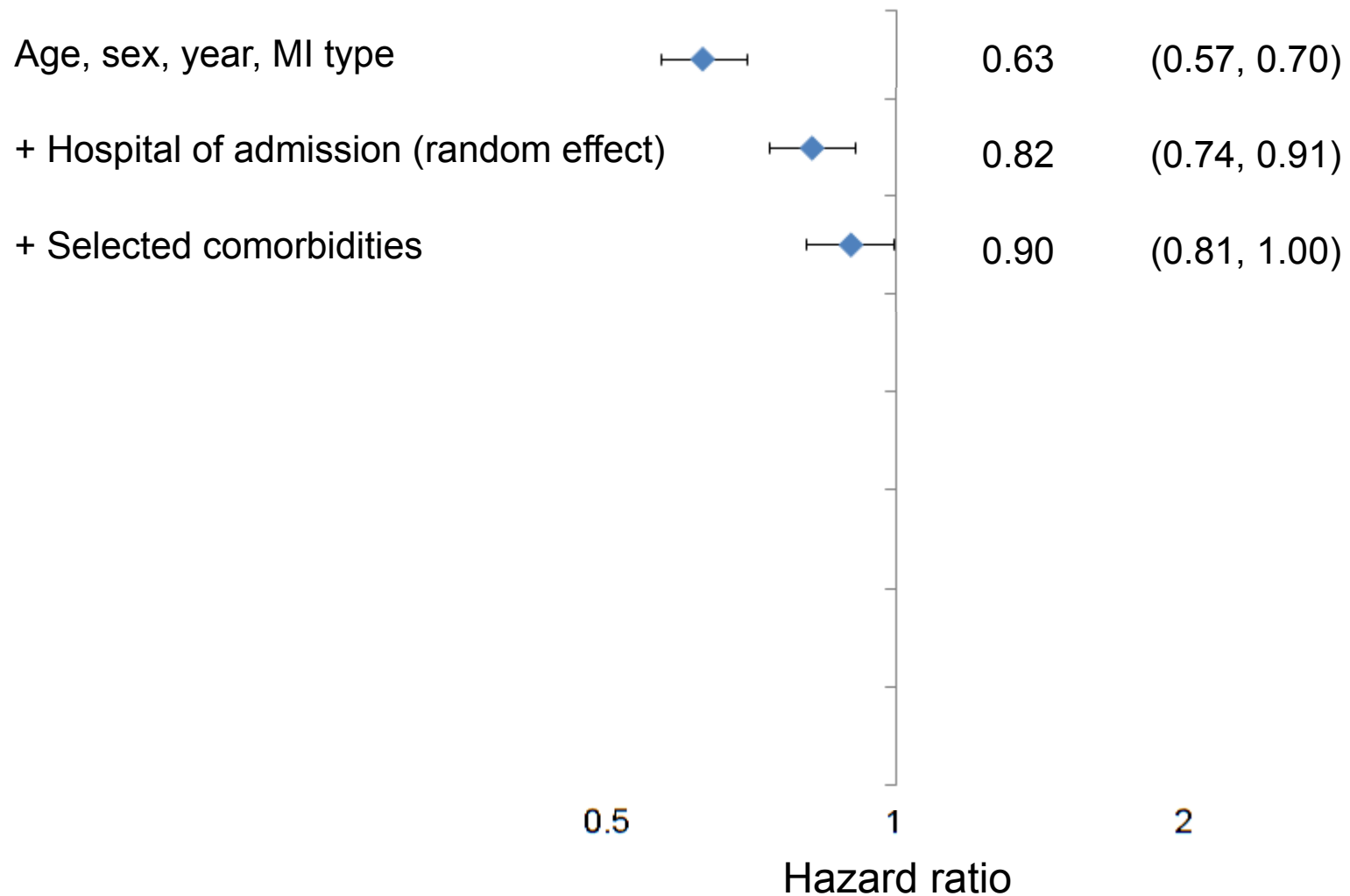+ Hospital of admission (random effect) — 0.82 (0.74, 0.91)

*Once we compare within hospitals, the disparity reduces - an Aboriginal person has a **18%** lower hazard of revascularisation than a non-Aboriginal person of the same age, sex, year of admission, AMI type, admitted to the same hospital*

Hazard ratio

What factors are influencing this gap?

	Hazard ratio	
Age, sex, year, MI type	0.63	(0.57, 0.70)
+ Hospital of admission (random effect)	0.82	(0.74, 0.91)
+ Selected comorbidities	0.90	(0.81, 1.00)

0.5   1   2

Hazard ratio

Comorbidity burden on admission

Aboriginal people have higher rates of these conditions recorded in hospital data than non-Aboriginal people

What factors are influencing this gap?

	Hazard ratio	
Age, sex, year, MI type	0.63	(0.57, 0.70)
+ Hospital of admission (random effect)	0.82	(0.74, 0.91)
+ Selected comorbidities	0.90	(0.81, 1.00)
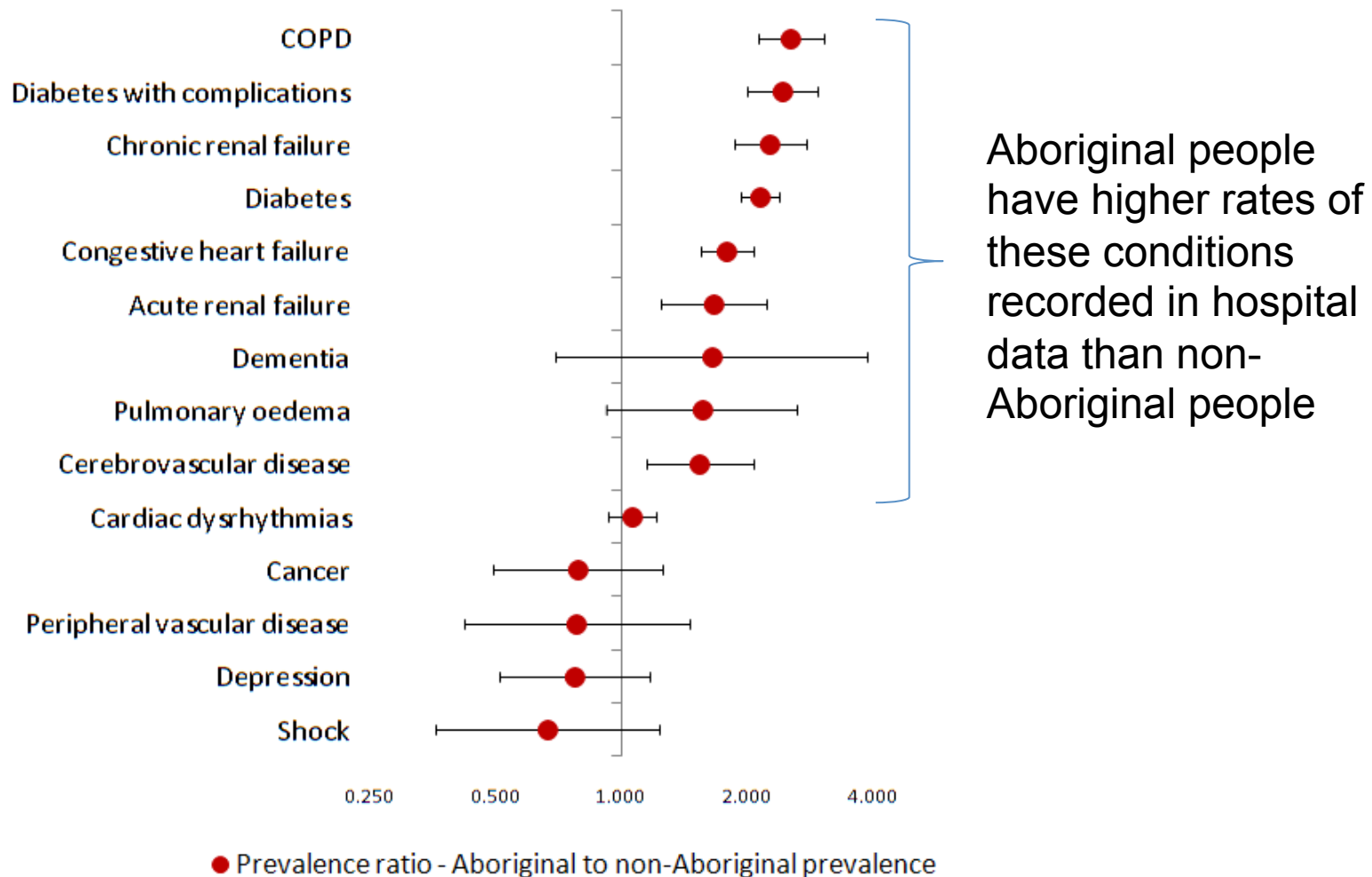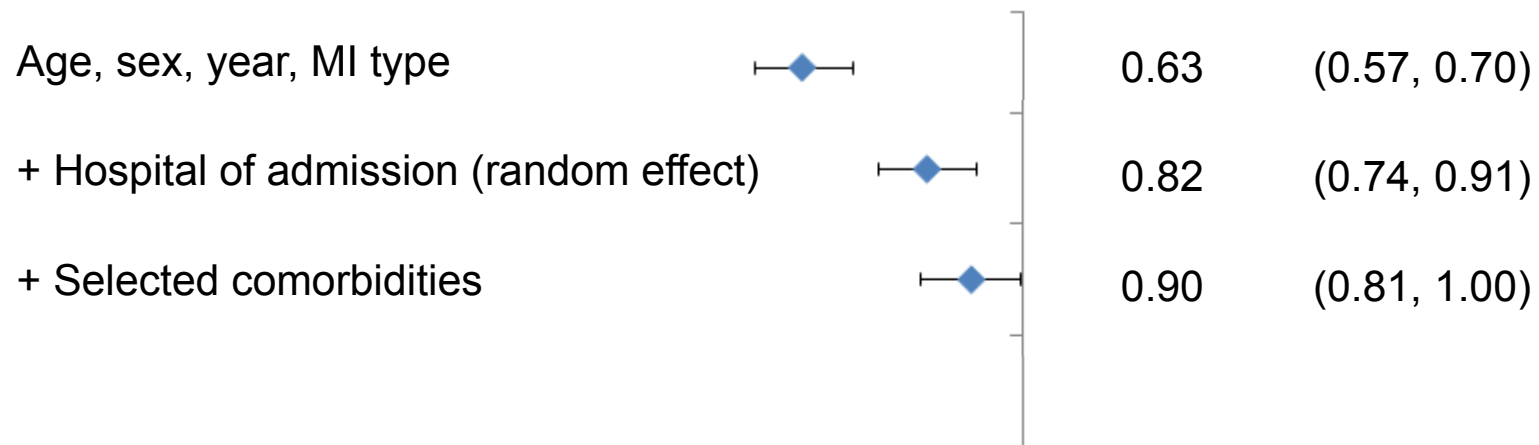
Once we adjust for comorbidities the gap is further reduced

0.5 1 2

Hazard ratio

What factors are influencing this gap?

	Hazard ratio	95% CI
Age, sex, year, MI type	0.63	(0.57, 0.70)
+ Hospital of admission (random effect)	0.82	(0.74, 0.91)
+ Selected comorbidities	0.90	(0.81, 1.00)
+ Substance use (incl. smoking, alcohol, drugs)	0.92	(0.83, 1.02)
+ Private health insurance	0.96	(0.87, 1.07)
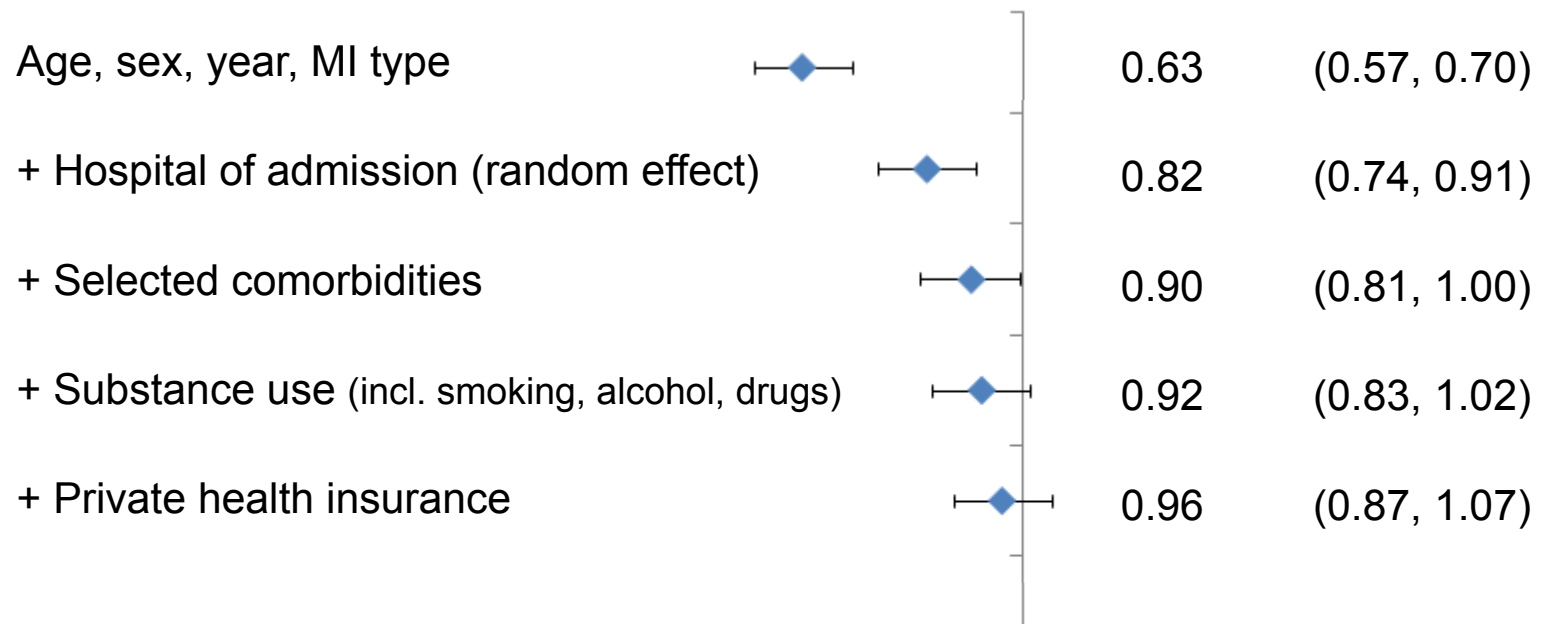
After adjusting for substance use and private health insurance, there is no longer a significant difference

Hazard ratio (0.5, 1, 2)

Findings: Mortality after AMI admission

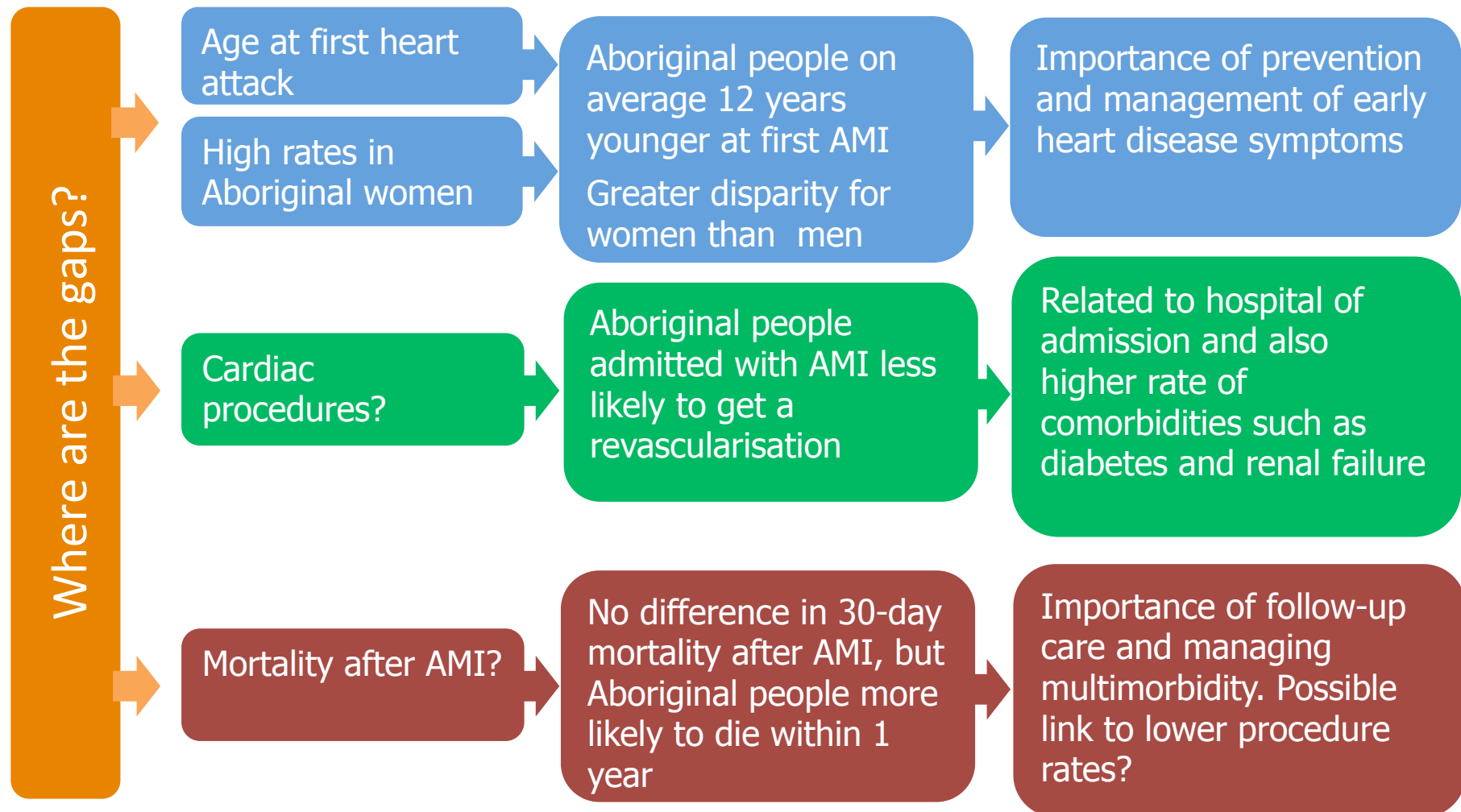**Mortality within 30-days**

Adjusted for:	Aboriginal to non-Aboriginal OR (95% CI)
+ Age, sex, year, hospital of admission	1.07 (0.83-1.37)

No significant

No significant difference

Mortality within 365-days

Adjusted for:	Aboriginal to non-Aboriginal OR (95% CI)
+ Age, sex, year, hospital of admission	1.34 (1.10-1.63)

Aboriginal patients more likely to die

No longer significant difference

Summary - Acute myocardial infarction

Where are the gaps?

- Age at first heart attack
- High rates in Aboriginal women

→ Aboriginal people on average 12 years younger at first AMI

Greater disparity for women than men

→ Importance of prevention and management of early heart disease symptoms

- Cardiac procedures?

→ Aboriginal people admitted with AMI less likely to get a revascularisation

→ Related to hospital of admission and also higher rate of comorbidities such as diabetes and renal failure

- Mortality after AMI?

→ No difference in 30-day mortality after AMI, but Aboriginal people more likely to die within 1 year

→ Importance of follow-up care and managing multimorbidity. Possible link to lower procedure rates?

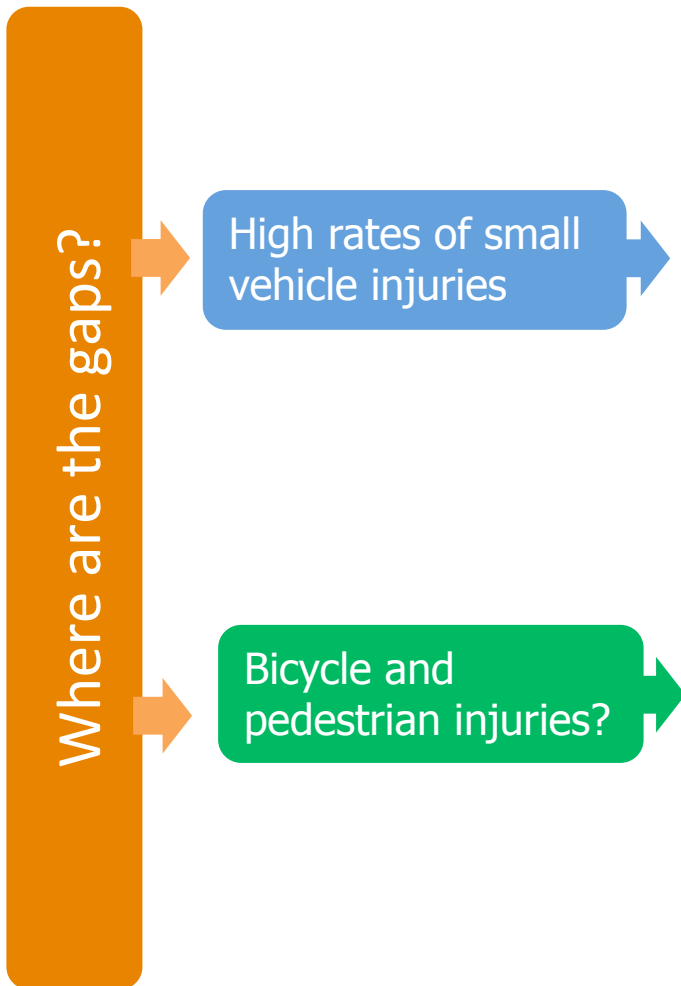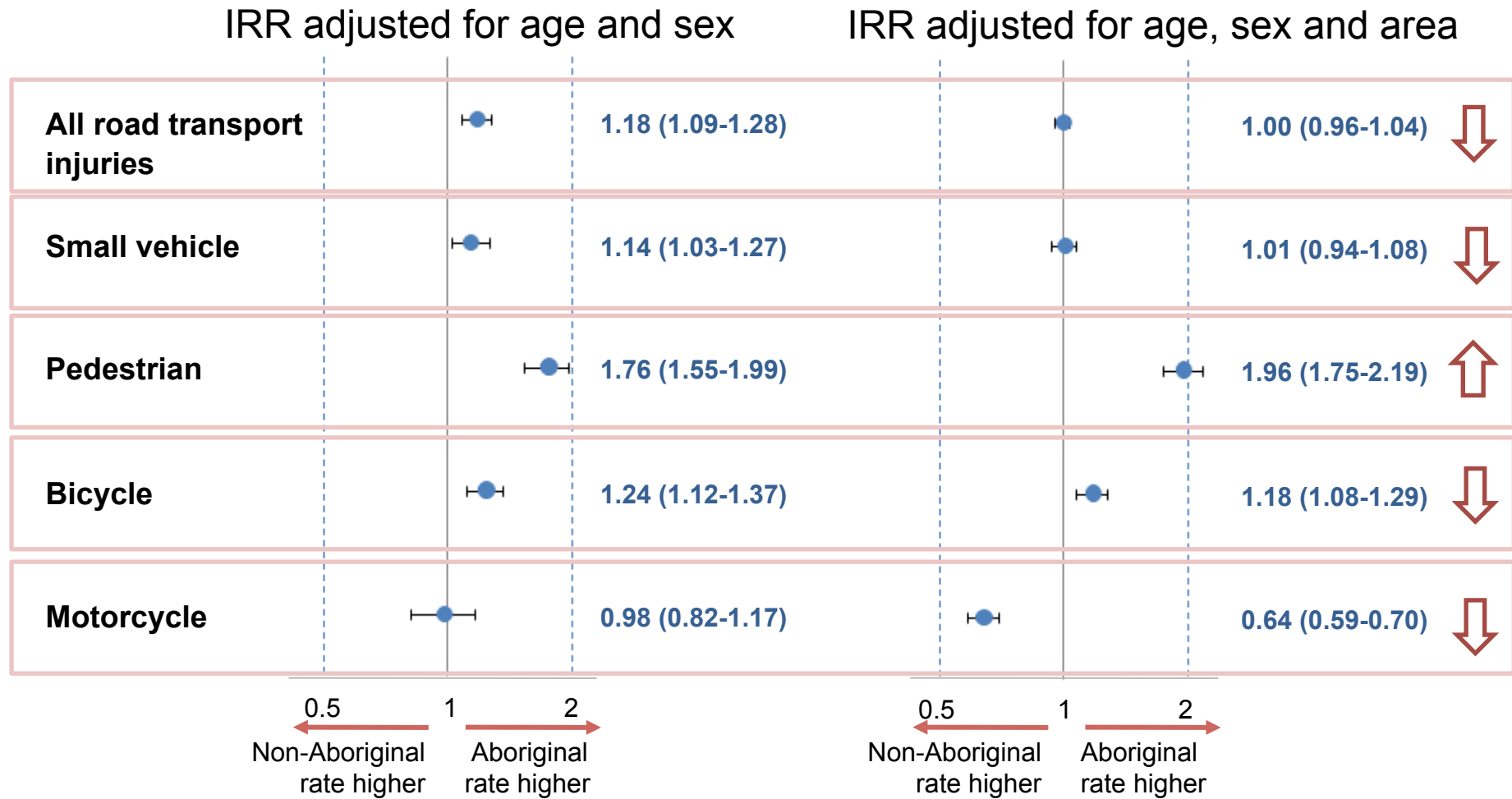# Outcomes to date

- Impact of Aboriginal identification algorithms on disparities published in *Australian and New Zealand Journal of Public Health*

- Mortality outcomes paper published in *BMC Public Health*

- Revascularisation paper published in *Circulation*

- Incidence rates paper under review (*Health and Place*)

- Presented findings on procedure rates to the Chief Health Officer and the Centre for Aboriginal Health at the Ministry of Health
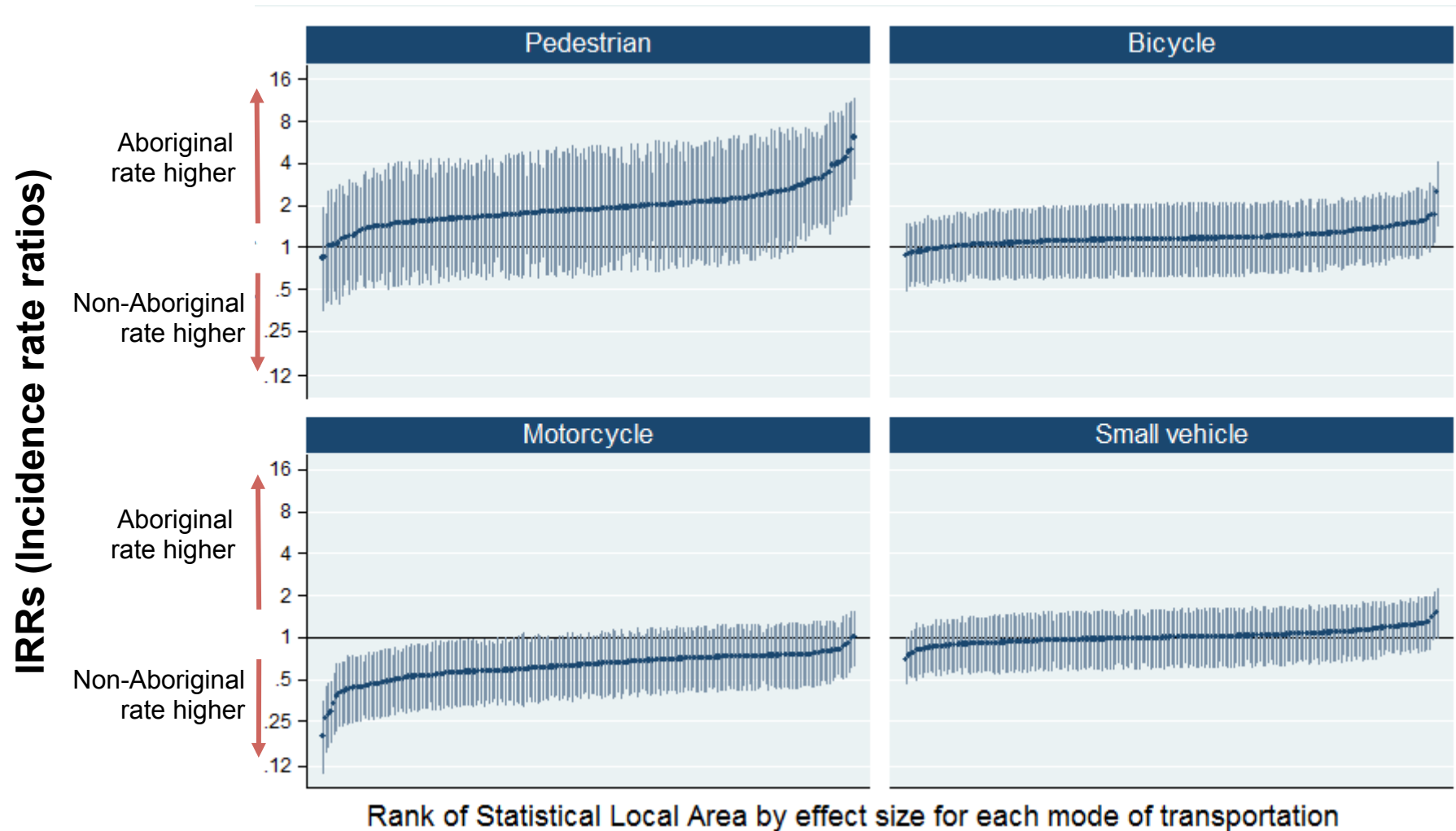
Serious road traffic injuries

Where are the gaps?

High rates of small vehicle injuries

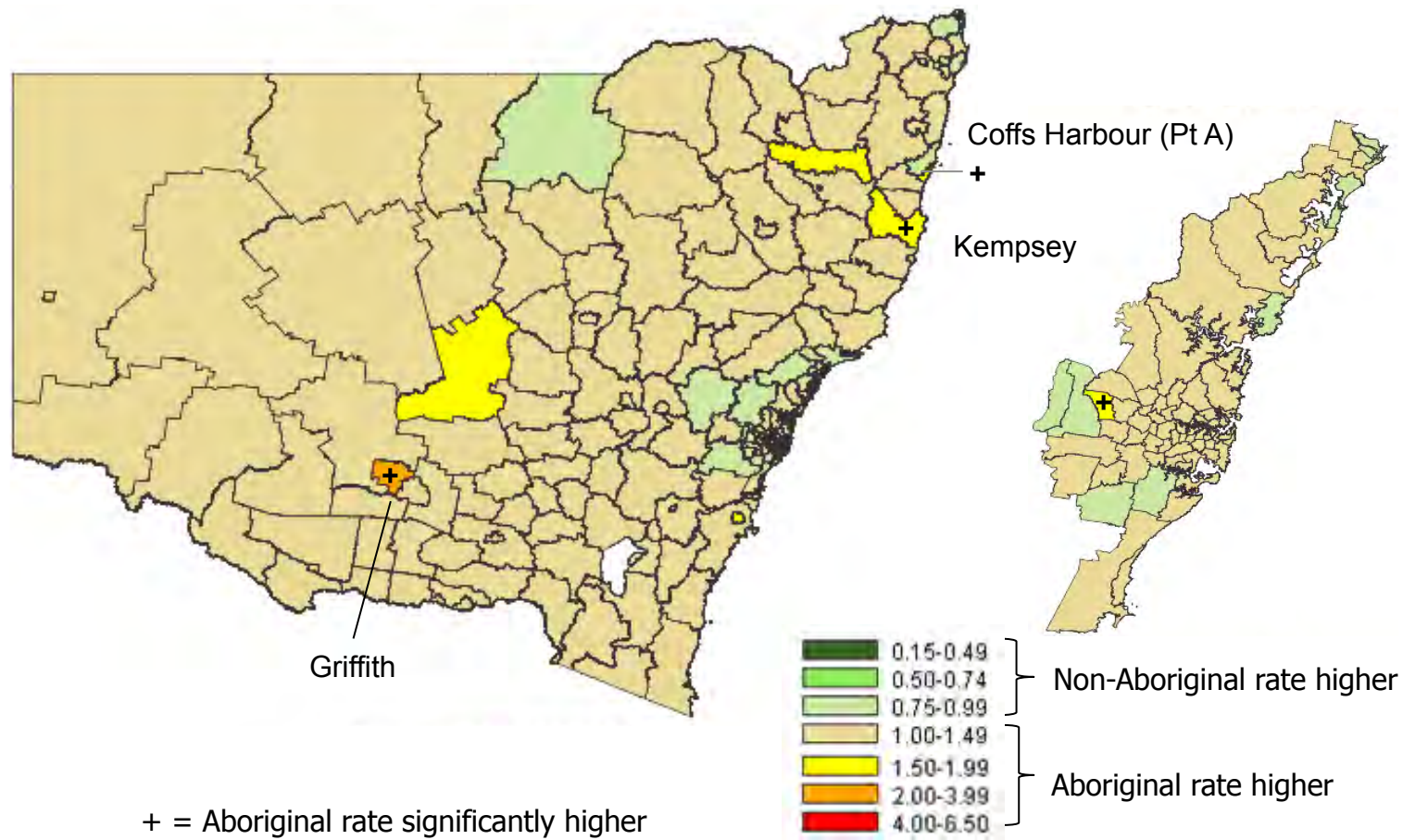Bicycle and pedestrian injuries?

Is there a disparity in injury rates?

Serious road traffic injury disparities by area

Bicycling injury rate ratio

Pedestrian injury rate ratio
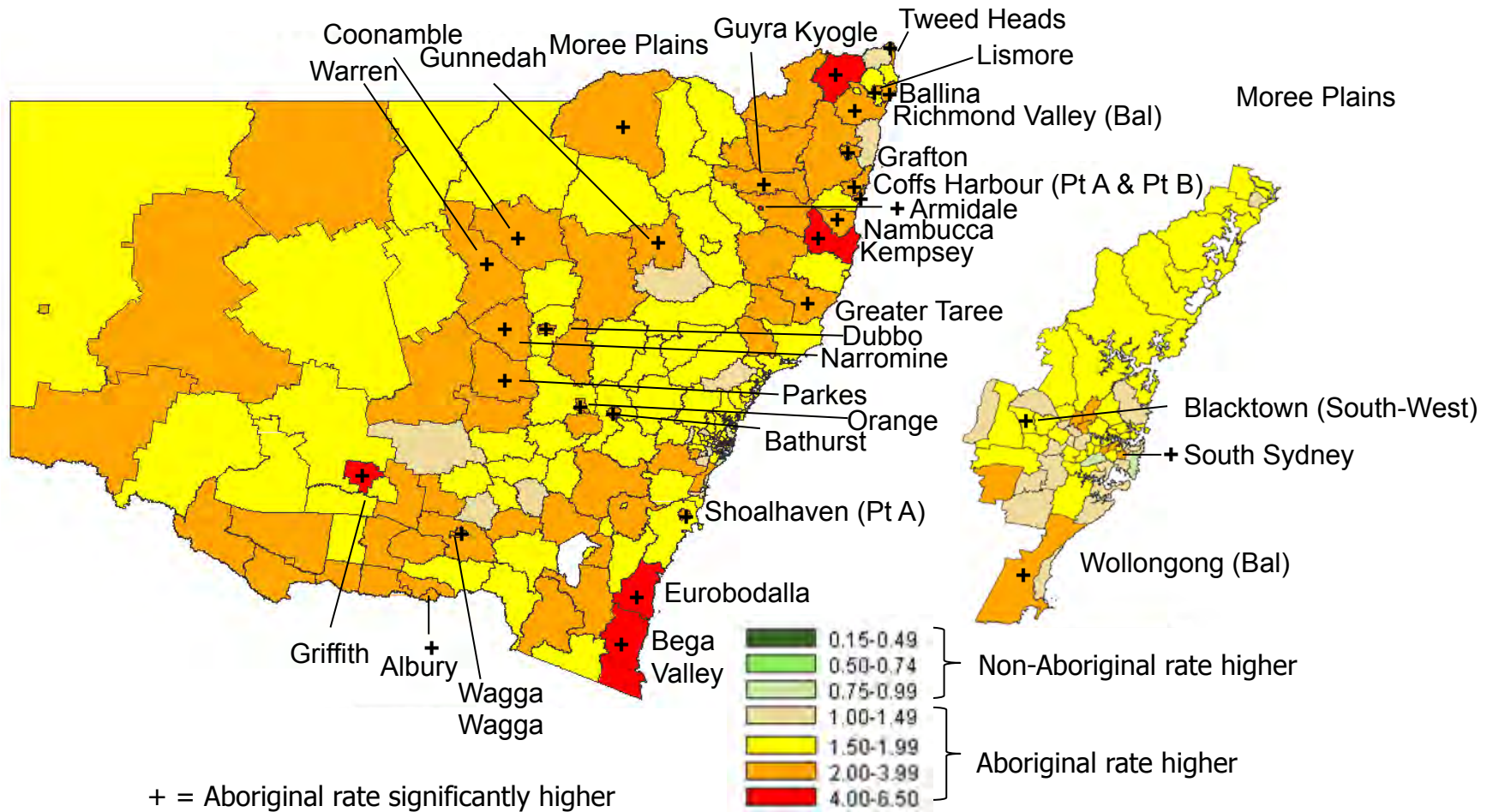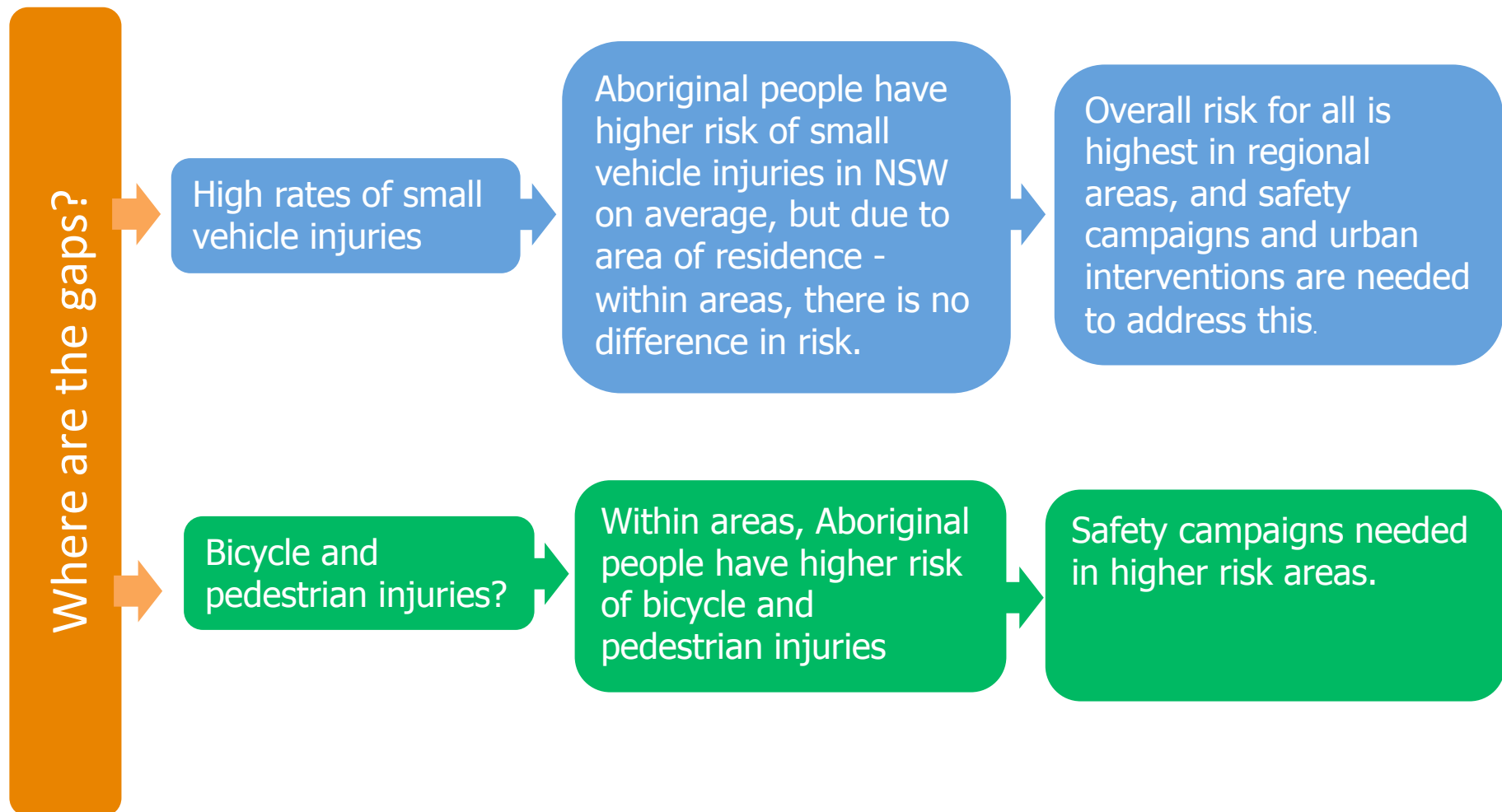
Summary - Serious road traffic injuries

Where are the gaps?

High rates of small vehicle injuries → Aboriginal people have higher risk of small vehicle injuries in NSW on average, but due to area of residence - within areas, there is no difference in risk. → Overall risk for all is highest in regional areas, and safety campaigns and urban interventions are needed to address this.

Bicycle and pedestrian injuries? → Within areas, Aboriginal people have higher risk of bicycle and pedestrian injuries → Safety campaigns needed in higher risk areas.

Outcomes to date

- **Presentation to IHOPE reference group**
  - how to work with specific local communities with high rates?

- **Paper published in *Accident Analysis and Prevention***
  - linked to by the Australian Indigenous Health*InfoNet* website

- **Presentation to NSW cross-Agency Aboriginal policy committee scheduled**

- **PhD student working on more detailed analysis of childhood injury**

Cataract procedure rates

Where are the gaps? → Lower rates of cataract surgery →

Rates of cataract surgery in NSW 2001 to 2008

- 641 per 100000 for Aboriginal people and 863 per 100000 for non-Aboriginal people, which is a rate ratio of 0.74 (0.71-0.77)
  - Despite evidence that Aboriginal people have a higher prevalence of cataracts

# Disparity by SES and remoteness

Socio-economic status of area of residence
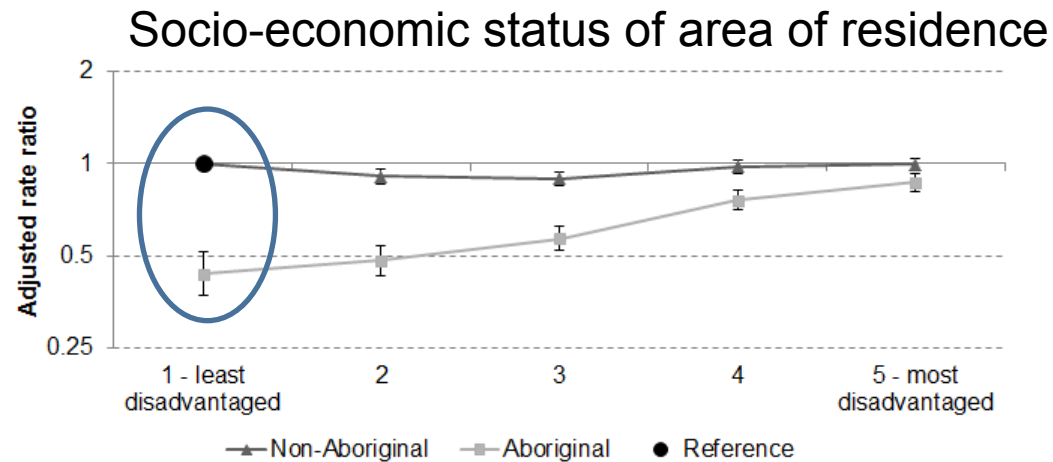
Disparity is greatest in less disadvantaged and more urban areas

Remoteness of area of residence
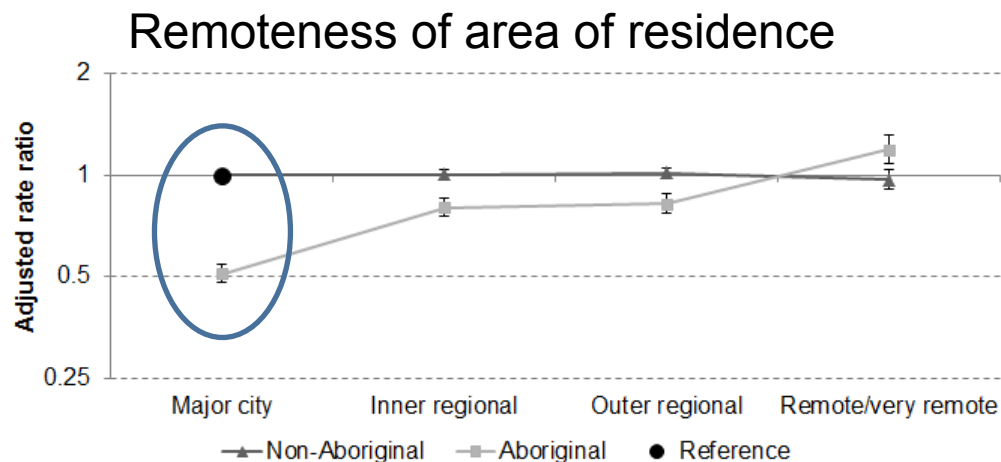
How do rates of cataract surgery for Aboriginal people vary by area

Rates of cataract surgery by Statistical Local Area

Newcastle – Sydney – Wollongong

- -1 to <-0.5
- -0.5 to <-0.25
- -0.25 to <0
- 0 to <0.25
- 0.25 to <0.5
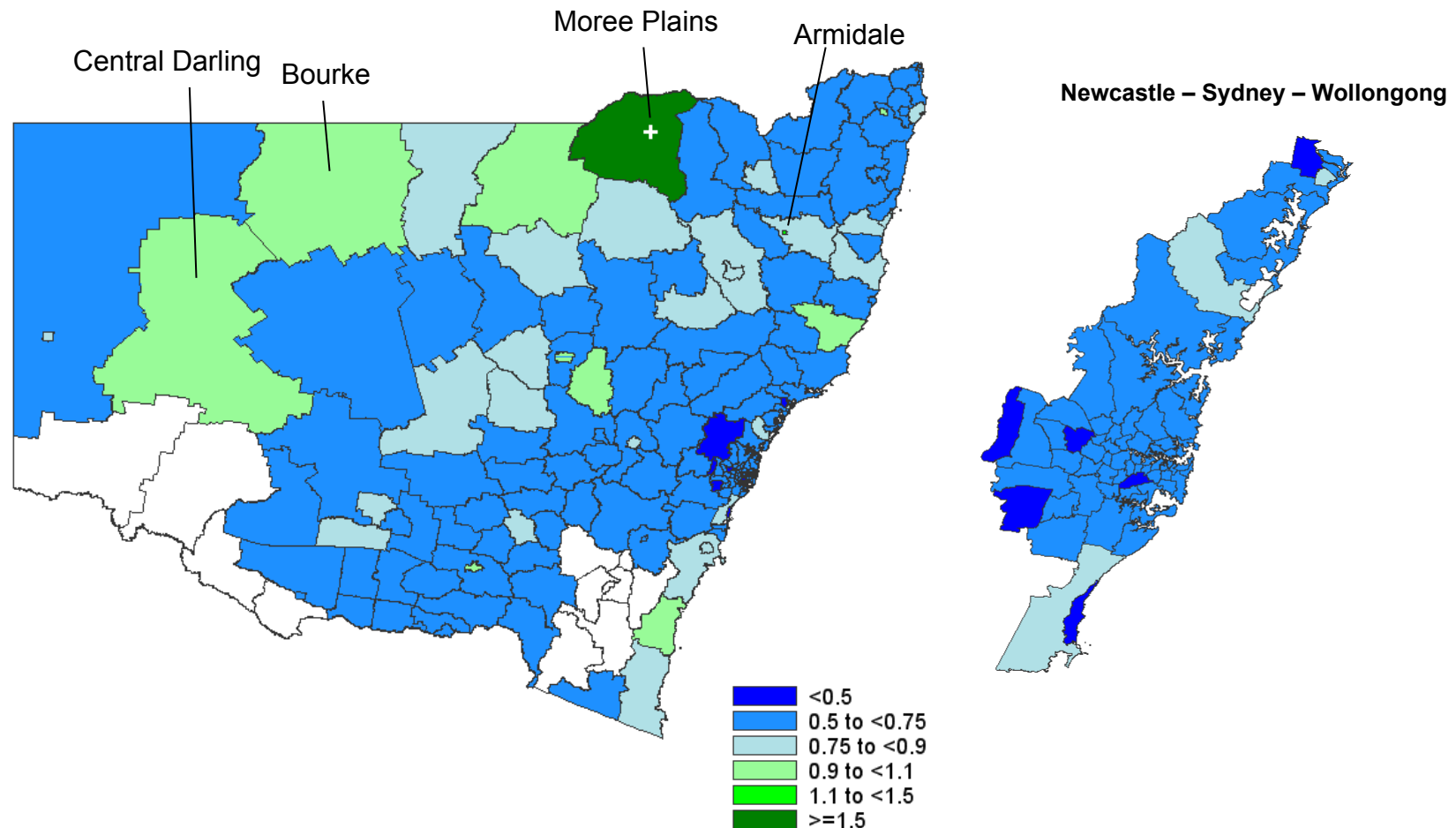- 0.5 to 1
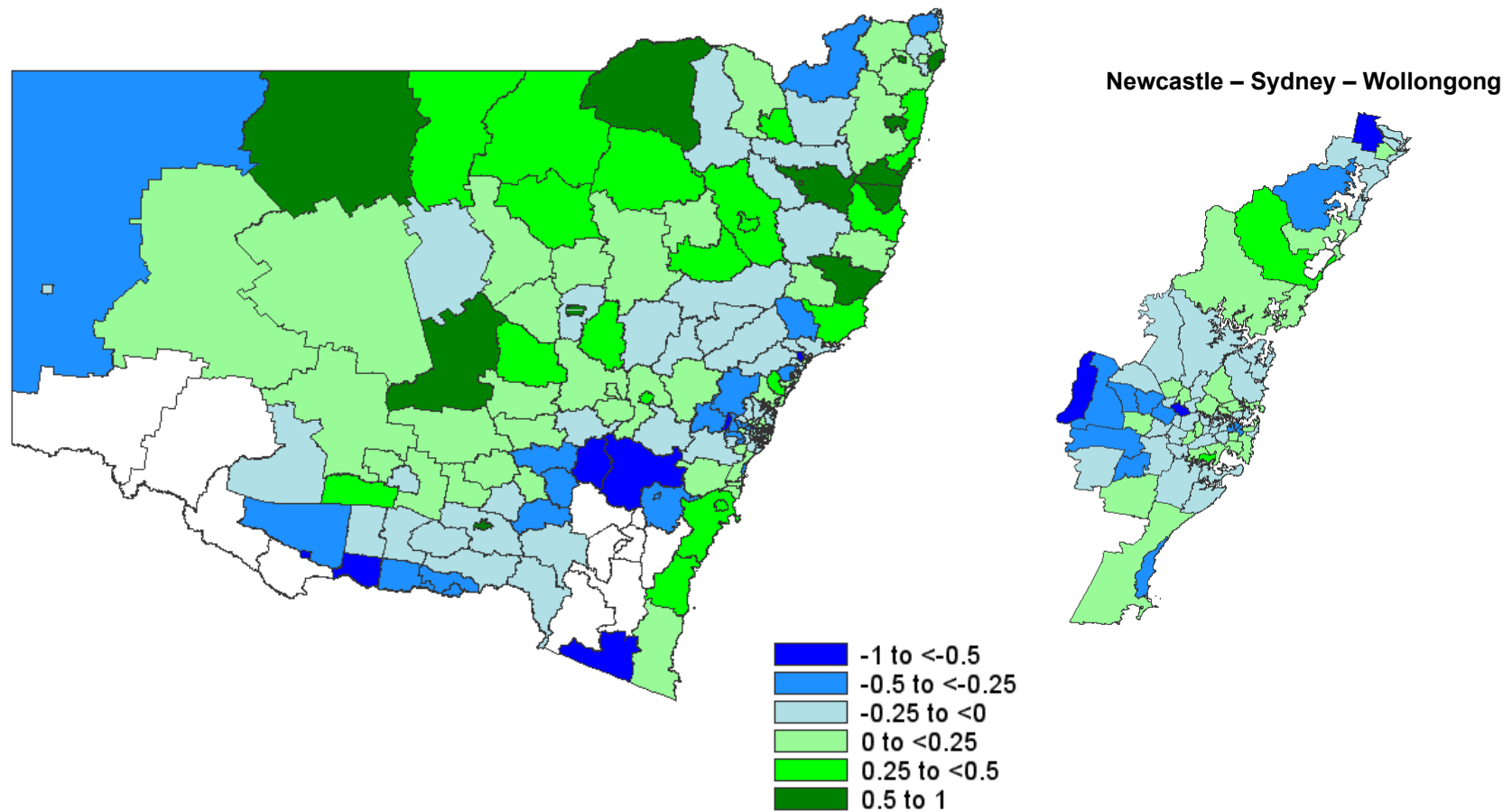
How does the disparity in surgery rates vary?

The rate of cataract surgery is lower for Aboriginal people in almost all areas in NSW, with the exception of a couple of areas
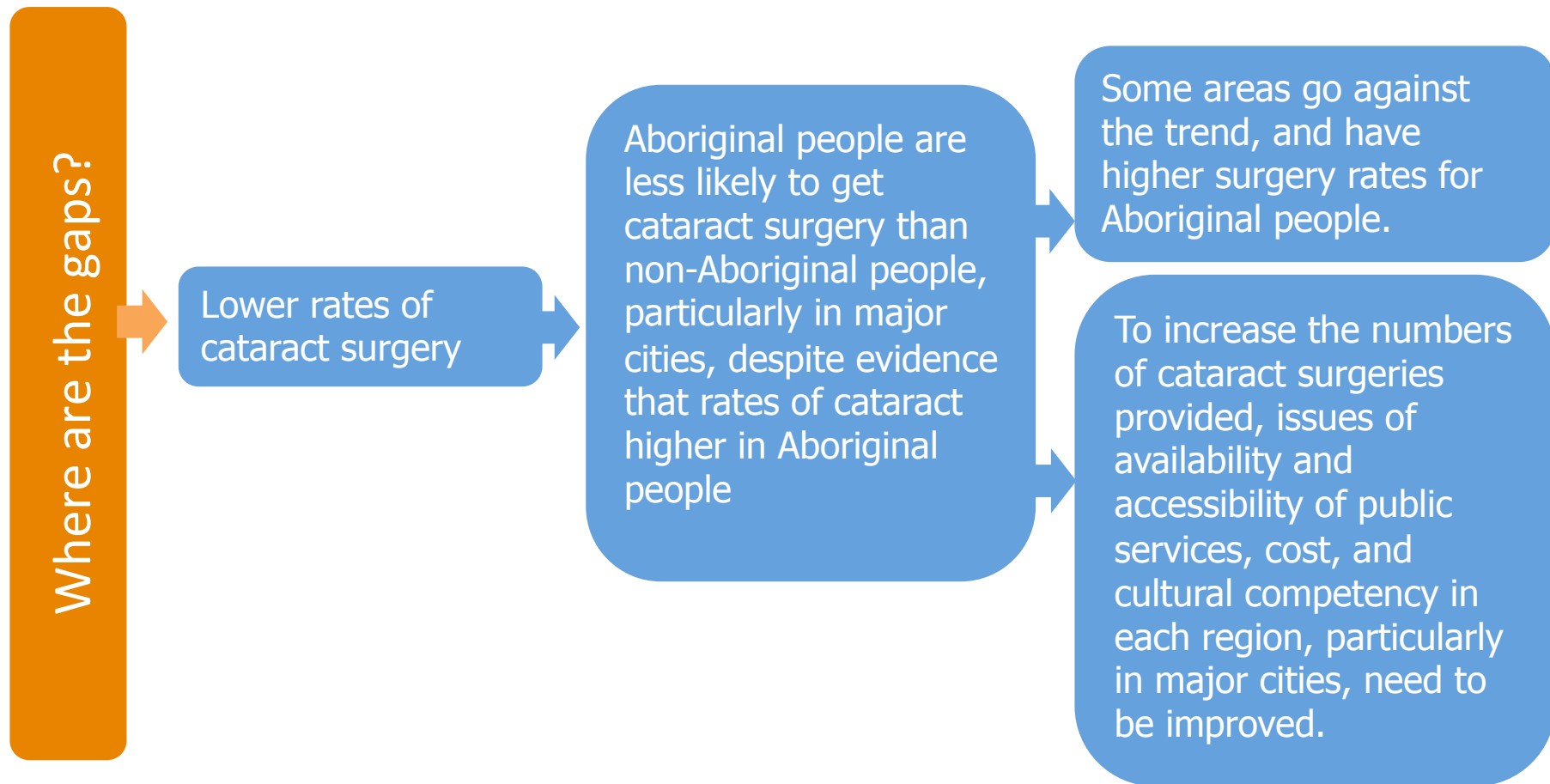

Newcastle – Sydney – Wollongong

Legend:
- <0.5
- 0.5 to <0.75
- 0.75 to <0.9
- 0.9 to <1.1
- 1.1 to <1.5
- >=1.5
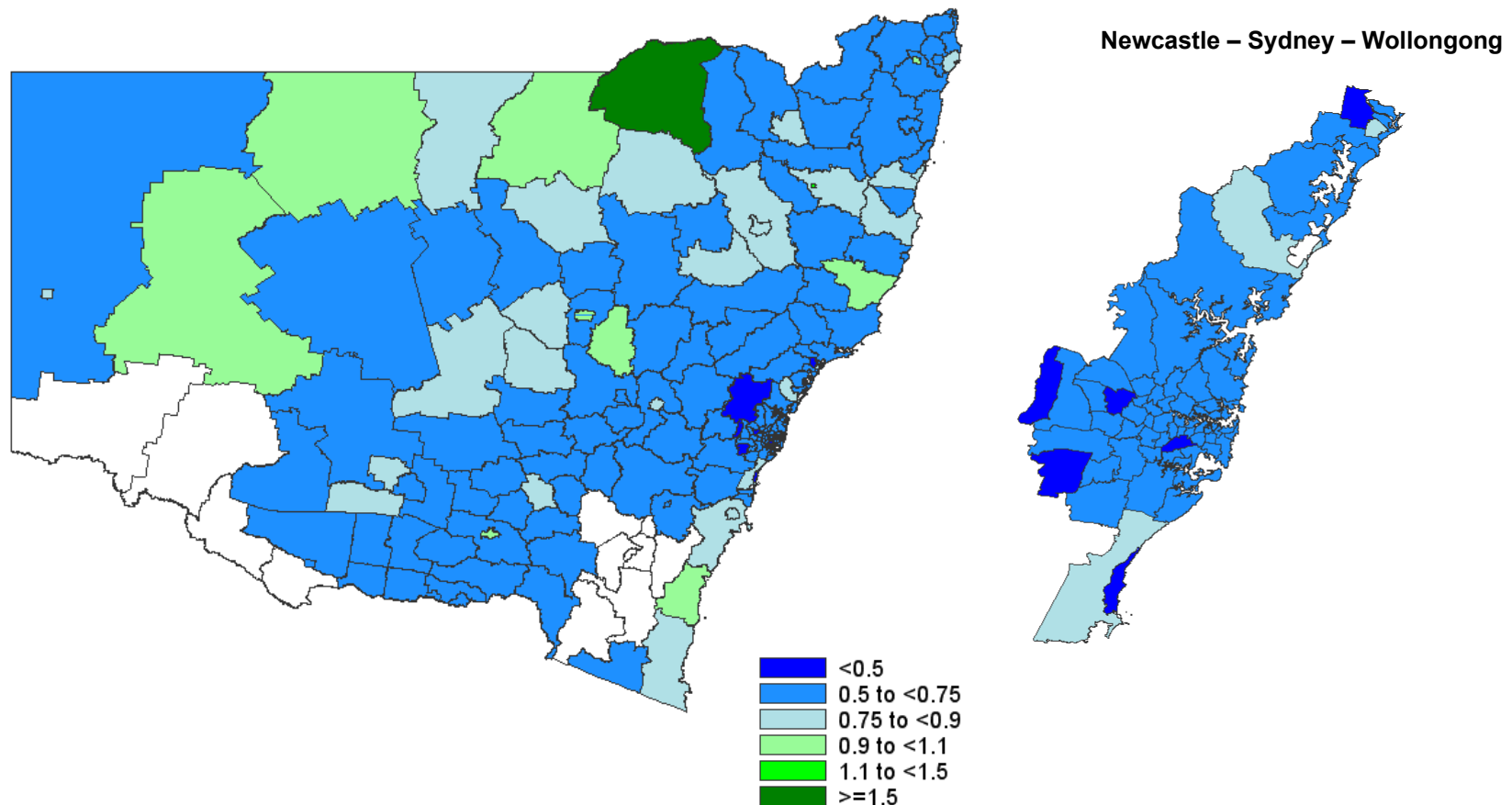
Areas with higher rates of surgery for Aboriginal people

Legend:
- <0.5
- 0.5 to <0.75
- 0.75 to <0.9
- 0.9 to <1.1
- 1.1 to <1.5
- >=1.5

Summary - Cataract procedure rates

Where are the gaps?

Lower rates of cataract surgery

Aboriginal people are less likely to get cataract surgery than non-Aboriginal people, particularly in major cities, despite evidence that rates of cataract higher in Aboriginal people

Some areas go against the trend, and have higher surgery rates for Aboriginal people.

To increase the numbers of cataract surgeries provided, issues of availability and accessibility of public services, cost, and cultural competency in each region, particularly in major cities, need to be improved.

Outcomes to date

- Presented preliminary findings to the International Centre for Eyecare Education (ICEE) Aboriginal program group
- Summary of findings sent to Vision2020
- Paper accepted by *Journal of Clinical and Experimental Ophthalmology*
- Presentation to Eye, Ear and Dental Health Section at OATSIH scheduled

APHID

- Assessing Preventable Hospitalisation InDicators (APHID)

- Funded by NHMRC Partnership Project Grant #1036858

- Commenced in 2012

BMJ
open
accessible medical research

Assessing Preventable Hospitalisation InDicators (APHID): protocol for a data-linkage study using cohort study and administrative data

Louisa R Jorm,[1,2] Alastair H Leyland,[3] Fiona M Blyth,[4,2] Robert F Elliott,[5] Kirsty M A Douglas,[6] Sally Redman,[2] on behalf of the APHID Investigators

Partners and partner organisations

University of Western Sydney

- Louisa Jorm
- Michael Falster
- Sanja Lujic
- Deborah Randall

MRC Social and Public Health Sciences Unit, Glasgow

- Alastair Leyland

The Sax Institute

- Sally Redman

University of Aberdeen

- Robert Elliott
- Marjon van der Pol
- Damilola Olajide

University of Sydney

- Fiona Blyth

Australian National University

- Kirsty Douglas
- Danielle Butler

Australian Commission on Safety and Quality in Health Care

- Neville Board

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- Nigel Lyons
- Sonia Wutzke
- Chris Shipway
- Hunter Watt
- Kate Needham

NSW Bureau of Health Information

- Jean-Frederic Levesque
- Kim Sutherland
- Douglas Lincoln
- Diane Watson

The **APHID** study: Who we are
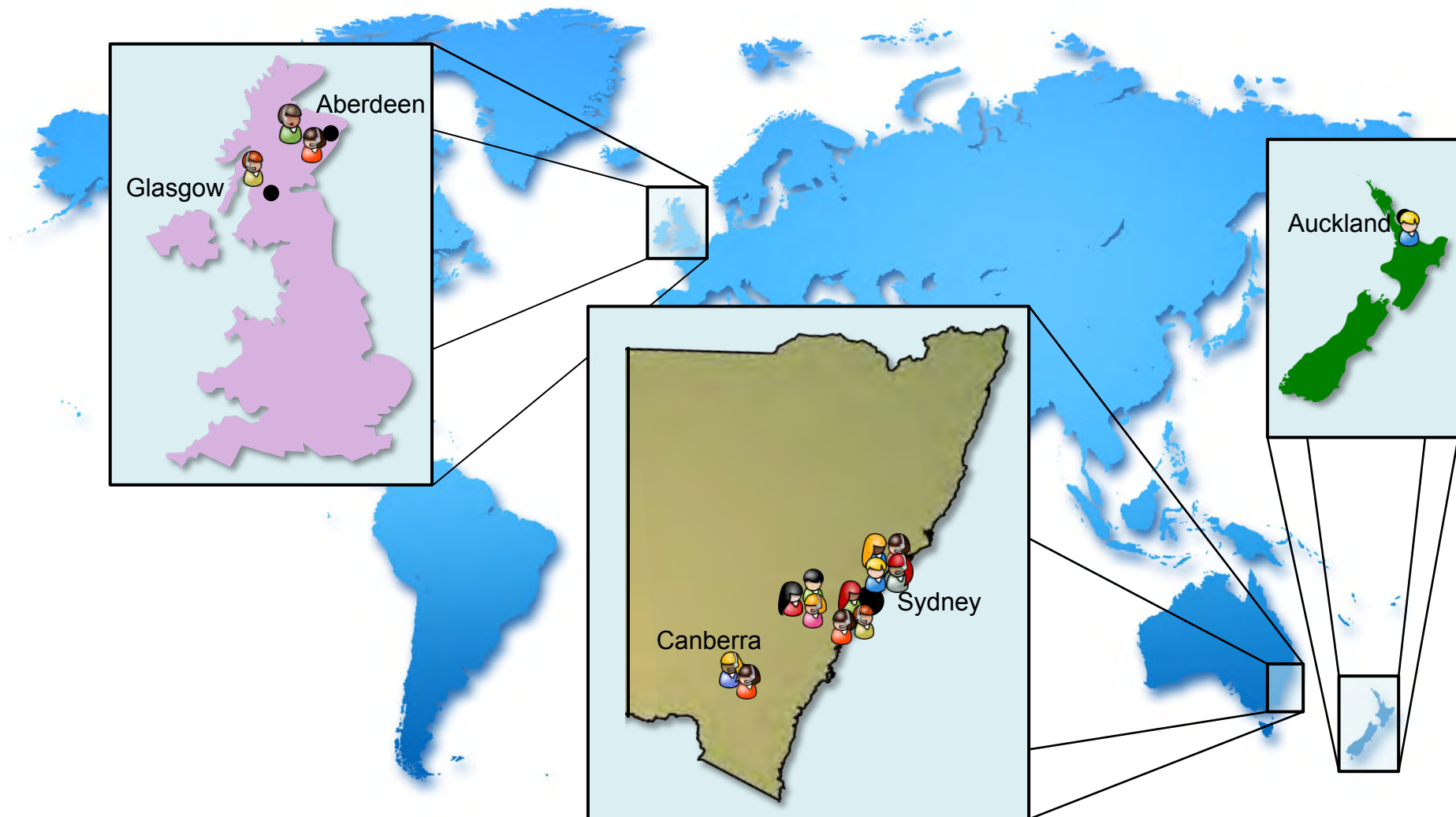
Potentially Preventable Hospitalisations (PPH)

Those which could be potentially prevented by timely and effective provision of primary and preventative care

Chronic	Acute	Vaccine preventable
▪ Asthma	▪ Dehydration & gastroenteritis	▪ Influenza and pneumonia
▪ Congestive heart failure	▪ Pyelonephritis	▪ Other vaccine-preventable conditions
▪ Diabetes complications	▪ Perforated/bleeding ulcer	
▪ Chronic obstructive pulmonary disease	▪ Cellulitis	
▪ Angina	▪ Pelvic inflammatory disease	
▪ Iron deficiency anaemia	▪ Ear, nose & throat infections	
▪ Hypertension	▪ Dental conditions	
▪ Nutritional deficiencies	▪ Appendicitis with generalised peritonitis	
▪ Rheumatic heart disease	▪ Convulsions & epilepsy	
	▪ Gangrene	

Variation in PPH between areas
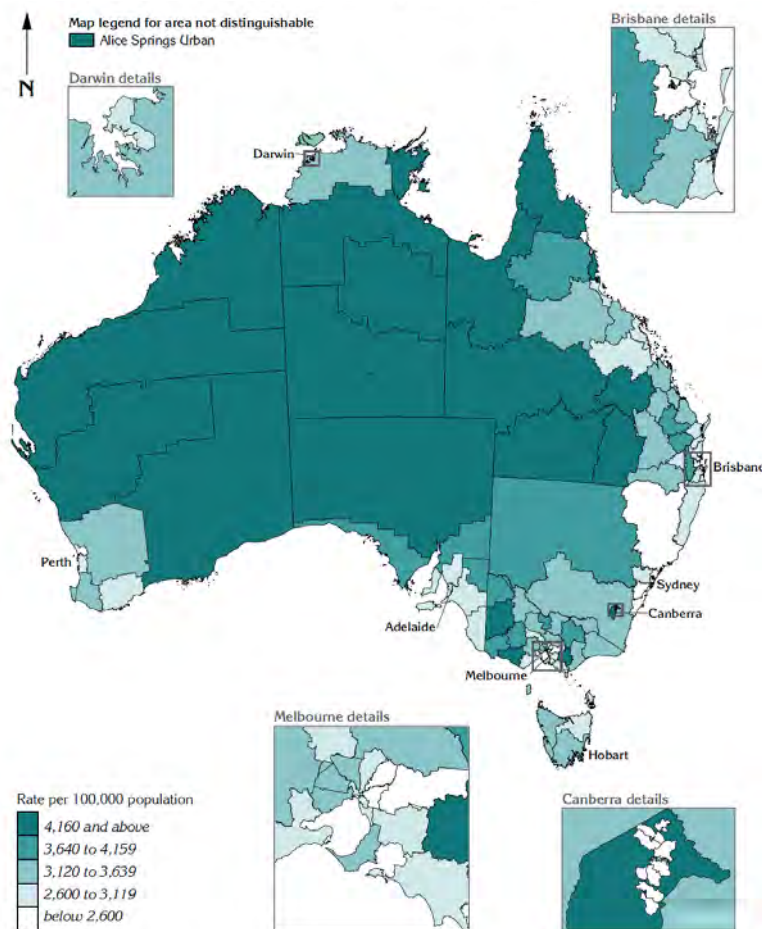
- Indicator of access to and quality of the primary health care system

- Rates of PPH are calculated for and compared between geographic regions

- Variation in PPH ~ variation in health service accessibility

- Currently used in Australia as part of the 2012 National Healthcare Agreement

Atlas of avoidable hospitalisations in Australia, PHIDU

What is the evidence base for PPH?

- Early literature identified correlation between PPH and socio-economic measures (income, health insurance)

- Hypothesised that socioeconomic barriers inhibiting access to primary care were resulting in higher rates of hospitalisation.

- Many research articles correlating area based rates of PPH with:

  - SES barriers to care - income, health insurance status, race, and area-level deprivation

  - Availability of primary care services – density of GPs in area, remoteness, availability of community centres, self-rated access to care

Gaps in the literature

- Many additional factors contribute to risk of admission, including:
    - Demographics (age, sex, ethnicity)
    - Risk factor behaviour
    - Disease prevalence and severity
    - Availability of hospital care
    - Quality of care received
- Generalisability of research from the US to an Australian setting
- It can be difficult to assess the extent to which an admission is truly 'preventable' through access to quality primary care

Objectives of the APHID study

1. Link questionnaire data from 267,000 participants in the 45 and Up study to prospective data on use of primary care services, hospitalisations, ED presentations and deaths

2. Better understand what drives variation in PPH admissions – individual-, geographic- or service-level factors?

3. Establish how the use and quality of primary care services impact on hospital admissions for PPH diagnoses

4. Quantify how these results vary between components of the PPH indicator

5. Make recommendations regarding refinements to the indicator

The 45 and Up Study

- The 45 and Up Study
- 267,153 men and women aged over 45 in NSW
- Recruited from 2006 to 2008
- Sampled through Medicare Australia
- Completed baseline questionnaire
- Consent for long-term follow-up

The 45 and Up Study

- Of the 267,153 participants...
- 46% are male
- 56% live in regional or remote areas
- Average age of 62, with 10% aged over 80
- 0.8% Aboriginal or Torres Strait Islander
- 10% language other than English at home

APHID data

45 & Up Study	NSW Admitted Patient Data Collection	MBS	PBS	Emergency Department Data Collection

45 & Up Study
- Prospective cohort of 267,091 men and women aged over 45 in NSW
- Questionnaire data
- Completed 2006-2008

NSW Admitted Patient Data Collection
- Census of all hospital separations in NSW public and private hospitals and day procedure centres
- Linked data, 2000-2010
- N=1,206,742 records

MBS
- Claims for subsidised medical and diagnostic services in Australia
- Linked data, 2004-2011
- N=46,203,507 records

PBS
- Claims for subsidised pharmaceuticals In Australia
- Linked data, 2004-2011
- N= 35,453,776 records

Emergency Department Data Collection
- Presentations to 80 EDs (75% of NSW presentations)
- Linked data, 2006-2011
- N= 347,602 records

APHID data

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Emergency Department Data Collection
- Presentations to 80 EDs (75% of NSW presentations)
- Linked data, 2006-2011
- N= 347,602 records

+ Fact of death to 2012

APHID data

45 & Up Study	NSW Admitted Patient Data Collection	MBS	PBS	Emergency Department Data Collection

Detailed data for 267,153 people...

... WHO they are
... HOW they have interacted with the primary health system
... WHETHER they were admitted to hospital
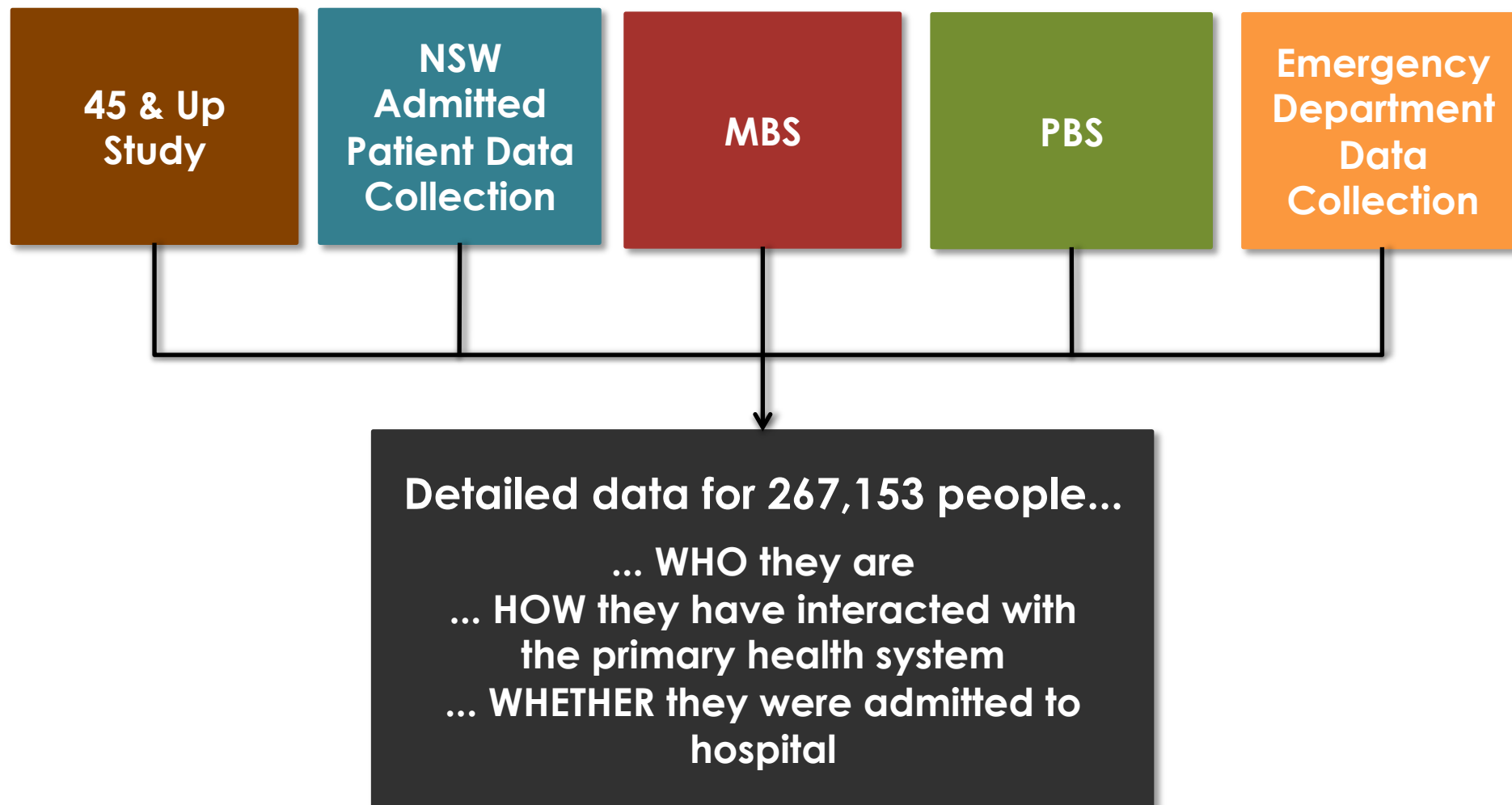
APHID data

267,153 people...

...hey are
...interacted with
...ealth system
...were admitted to
...ital
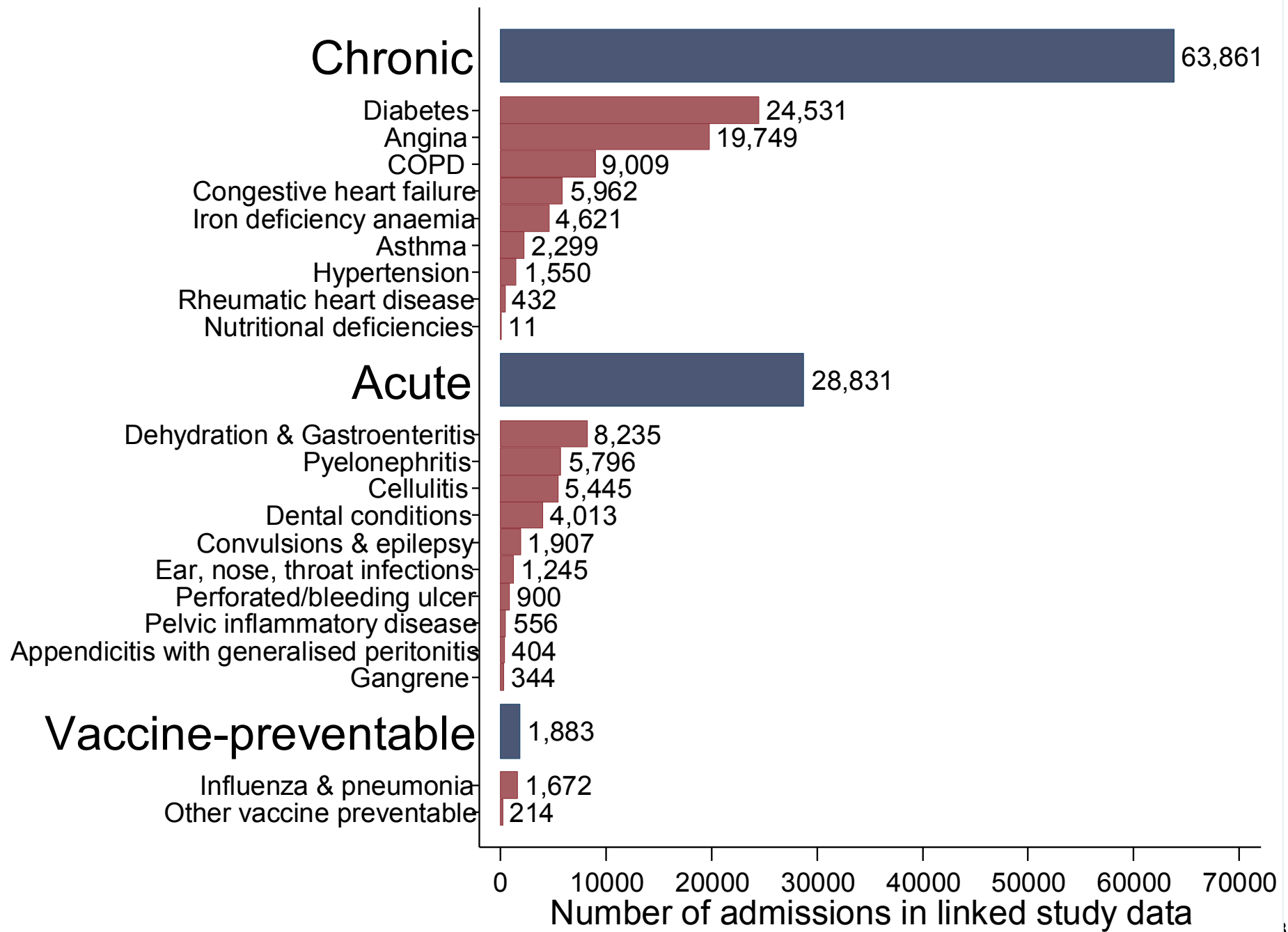
Chronic — 63,861
- Diabetes — 24,531
- Angina — 19,749
- COPD — 9,009
- Congestive heart failure — 5,962
- Iron deficiency anaemia — 4,621
- Asthma — 2,299
- Hypertension — 1,550
- Rheumatic heart disease — 432
- Nutritional deficiencies — 11

Acute — 28,831
- Dehydration & Gastroenteritis — 8,235
- Pyelonephritis — 5,796
- Cellulitis — 5,445
- Dental conditions — 4,013
- Convulsions & epilepsy — 1,907
- Ear, nose, throat infections — 1,245
- Perforated/bleeding ulcer — 900
- Pelvic inflammatory disease — 556
- Appendicitis with generalised peritonitis — 404
- Gangrene — 344

Vaccine-preventable — 1,883
- Influenza & pneumonia — 1,672
- Other vaccine preventable — 214

Number of admissions in linked study data

Explaining variation in rates of PPH

Method
Multilevel logistic regression model
PPH admission in 2 years from study entry
People clustered in SLA of residence

Step (1)
What individual-level characteristics are associated with PPH?

Step (2)
How much variation is there between geographic areas?

Step (3)
What explains the area-level variation?

Explaining variation in rates of PPH

Method

Multilevel logistic regression model
PPH admission in 2 years from study entry
People clustered in SLA of residence

Step (1)

What individual-level characteristics are associated with PPH?

Predisposing factors

Enabling factors

Health need factors

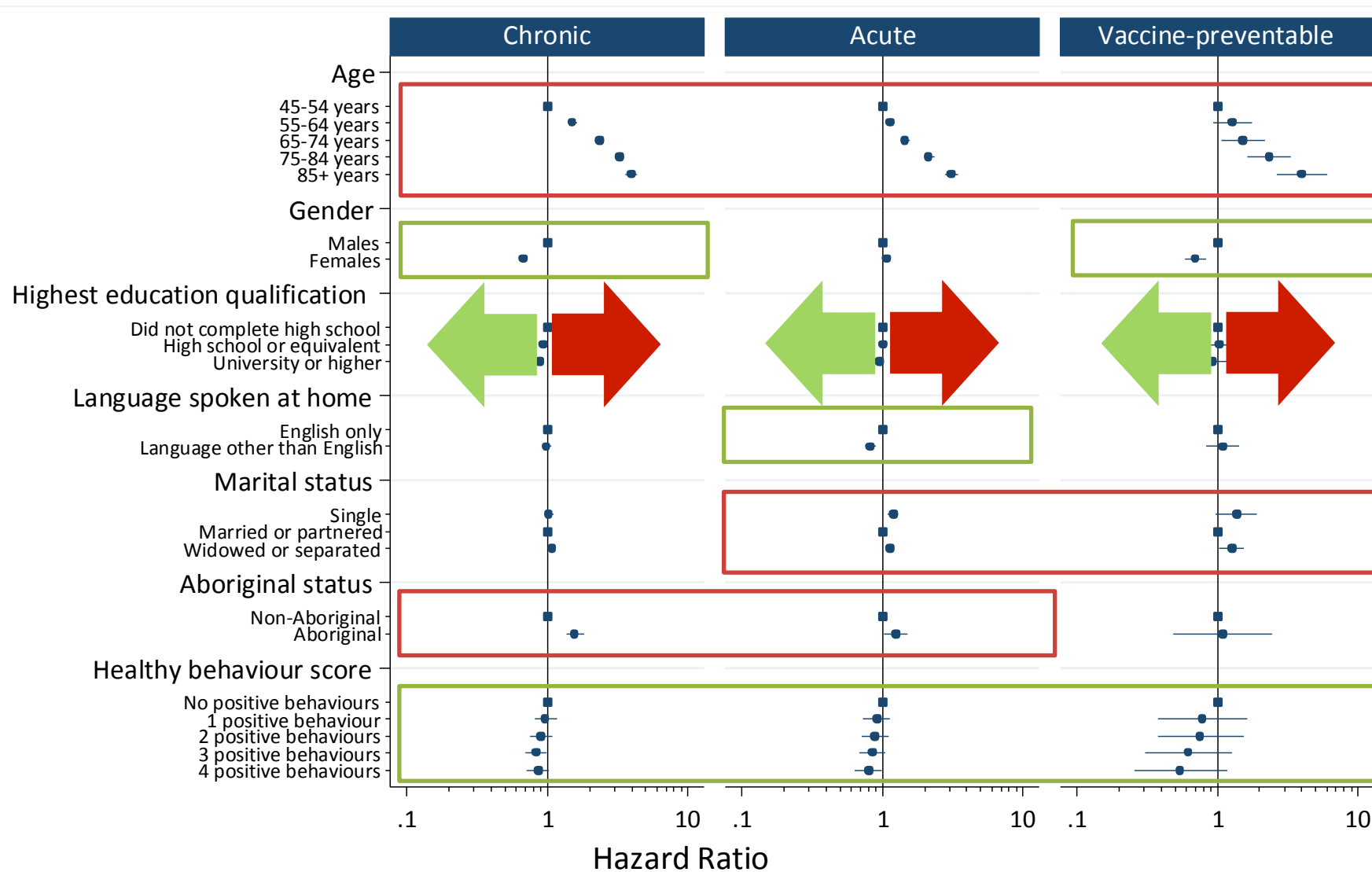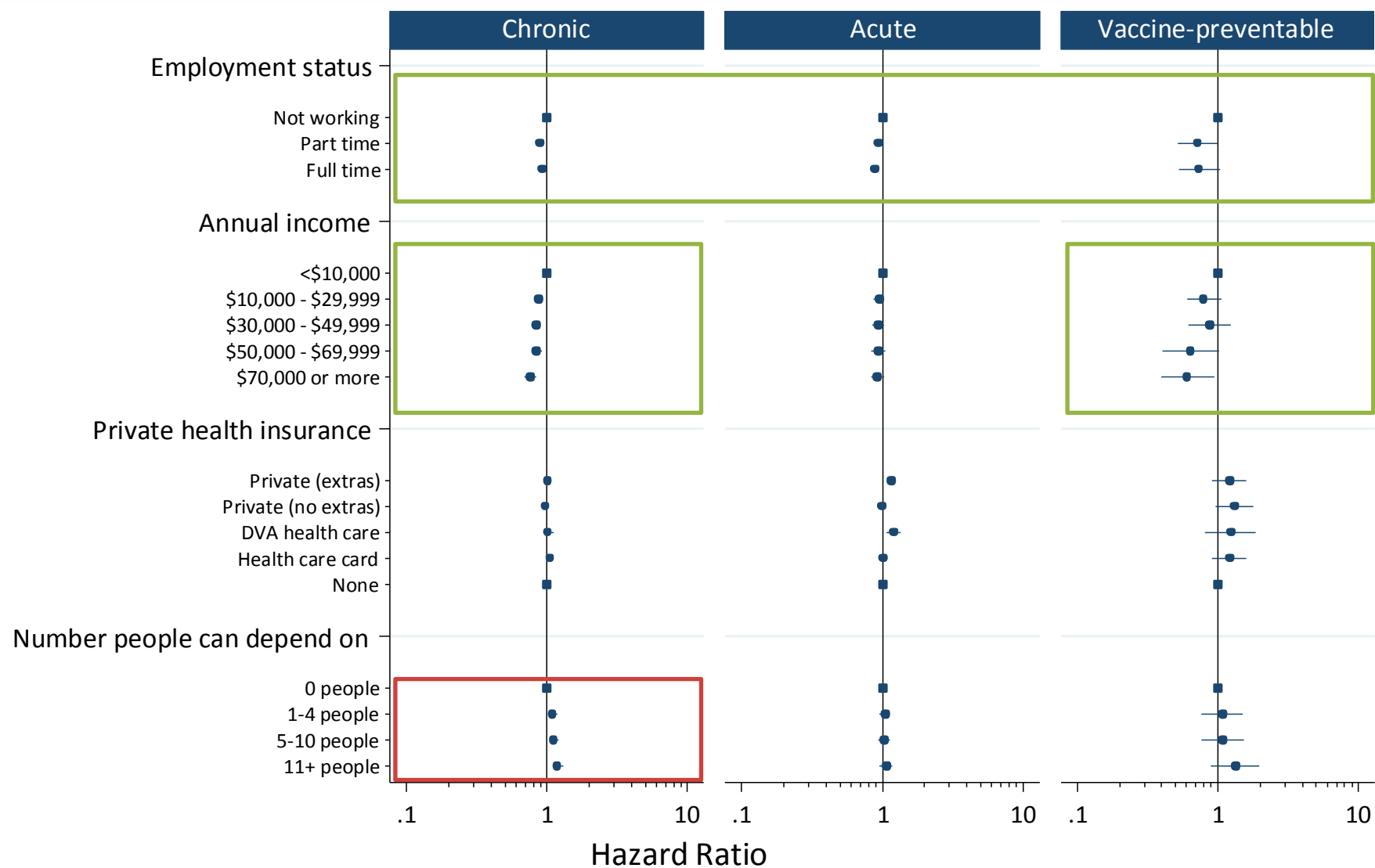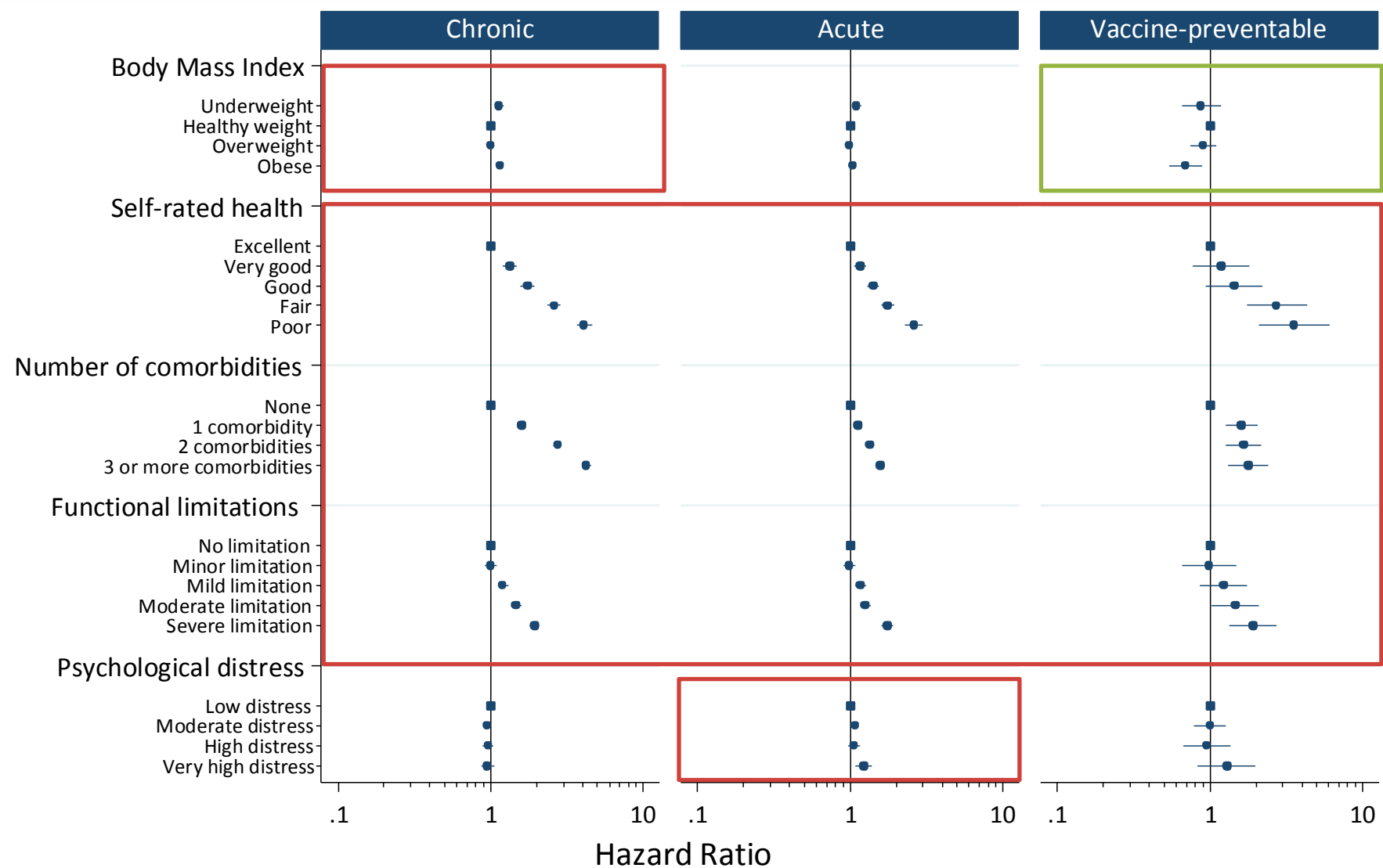# Explaining variation in rates of PPH

Method

Multilevel logistic regression model
PPH admission in 2 years from study entry
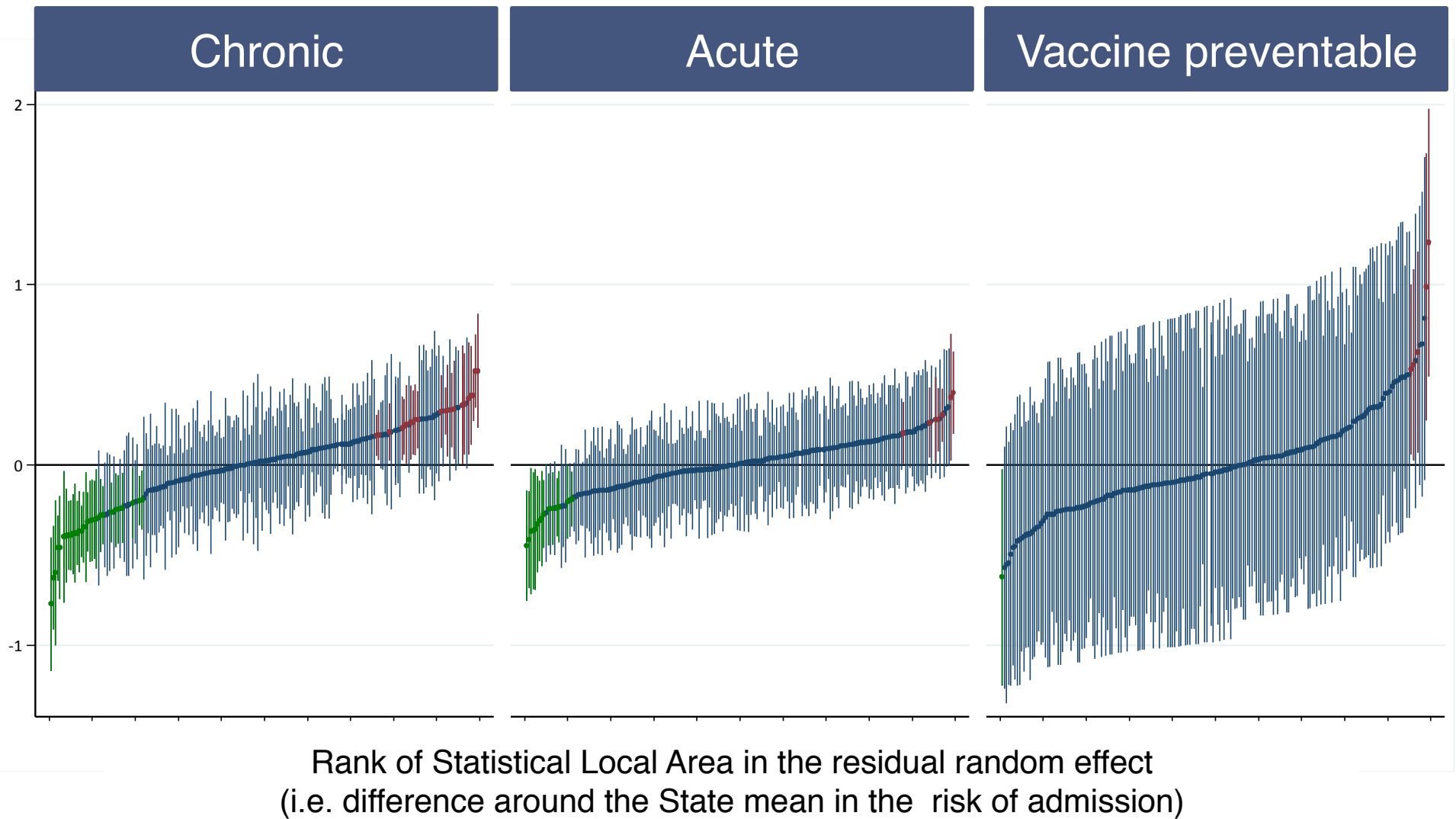People clustered in SLA of residence

Step (1)

What individual-level characteristics are associated with PPH?

Step (2)

How much variation is there between geographic areas?

Variation between geographic areas

Rank of Statistical Local Area in the residual random effect
(i.e. difference around the State mean in the risk of admission)

Variation between geographic areas

| Chronic | Acute | Vaccine-preventable |

1.9% of variation is attributable to geography

1.3% of variation is attributable to geography

8.1% of variation is attributable to geography

Age & sex adjusted

Explaining variation in rates of PPH

Method
Multilevel logistic regression model
PPH admission in 2 years from study entry
People clustered in SLA of residence

Step (1)
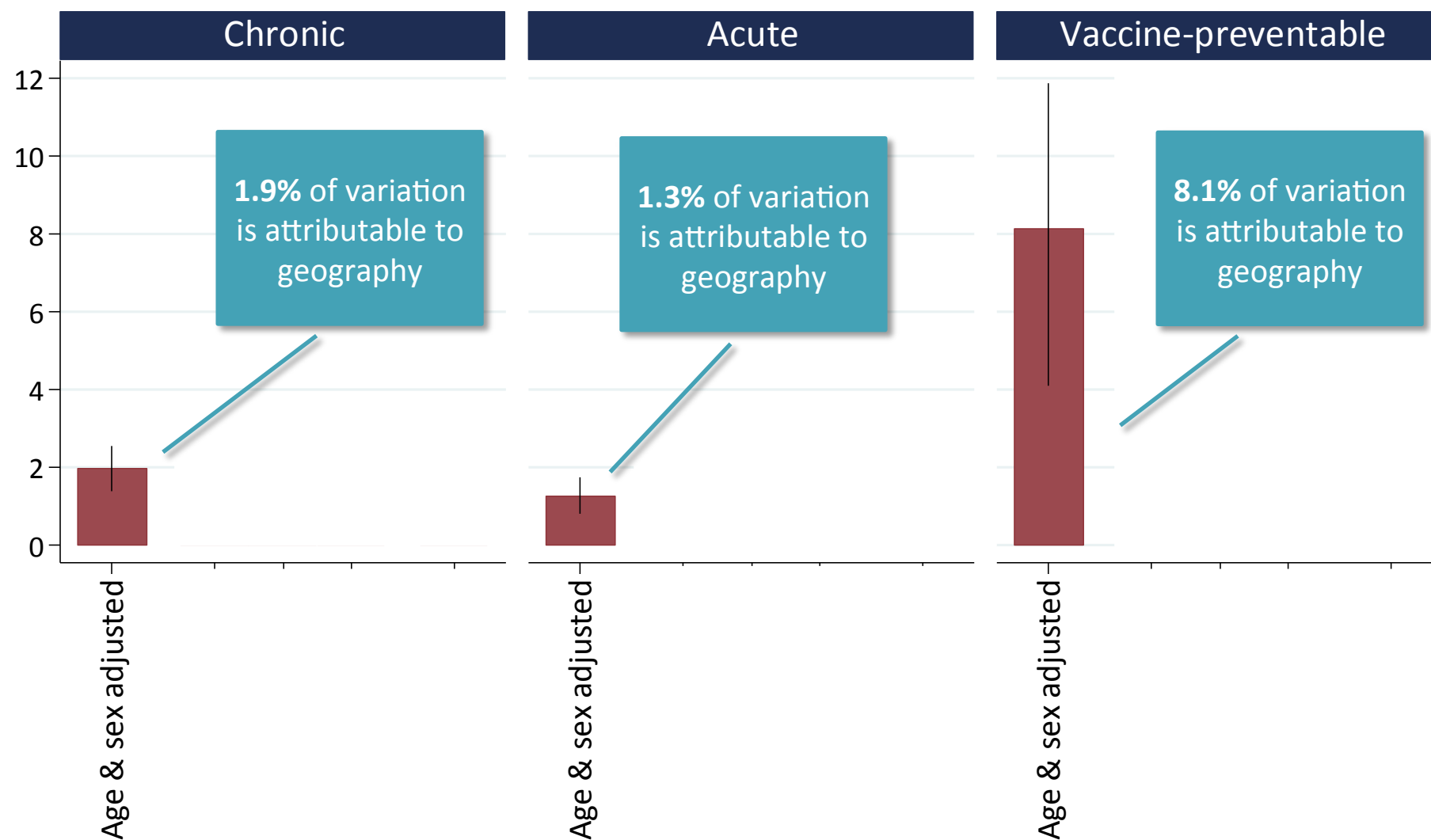What individual-level characteristics are associated with PPH?

Step (2)
How much variation is there between geographic areas?

Step (3)
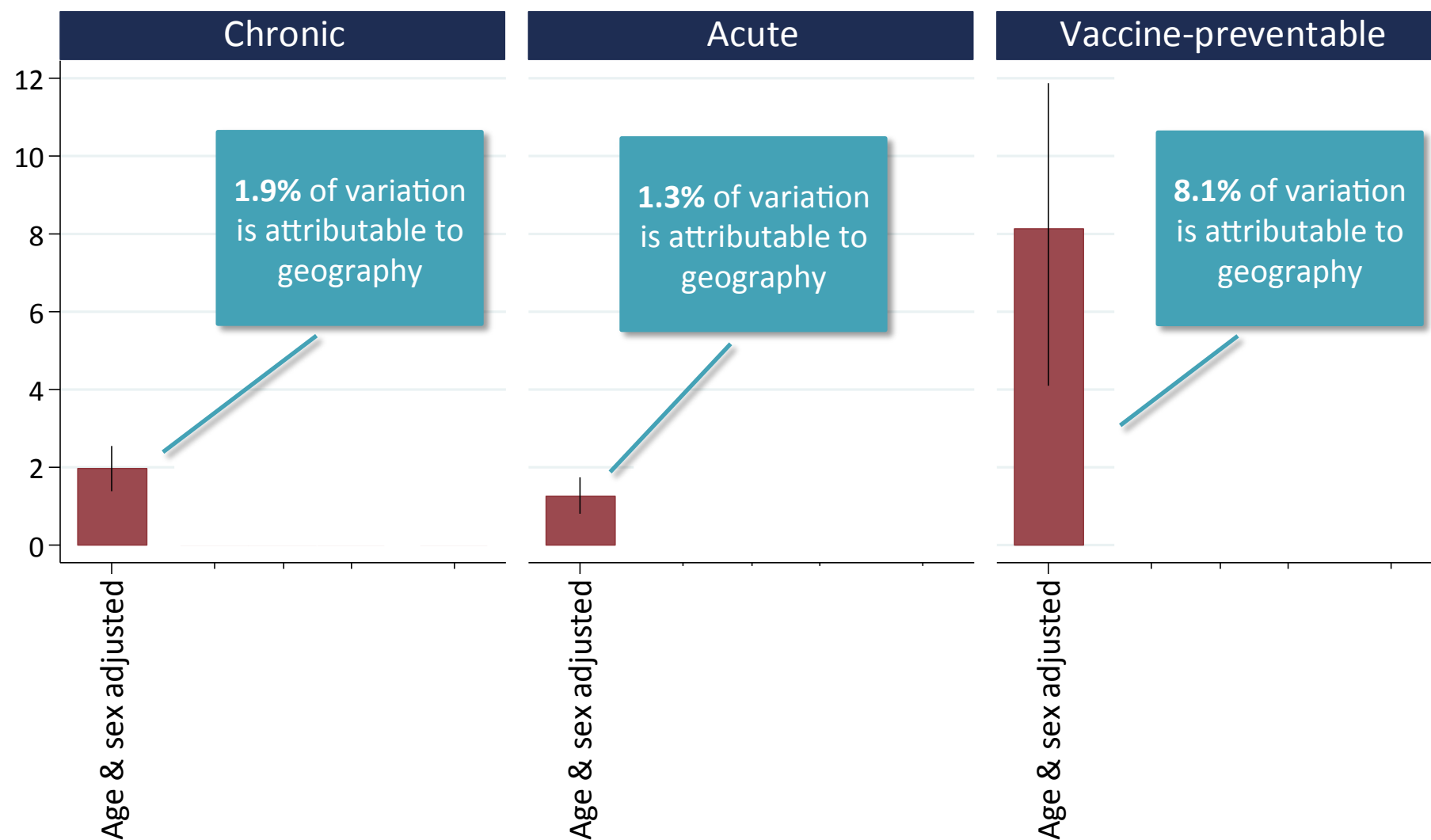What explains the area-level variation?

Explaining area level variation

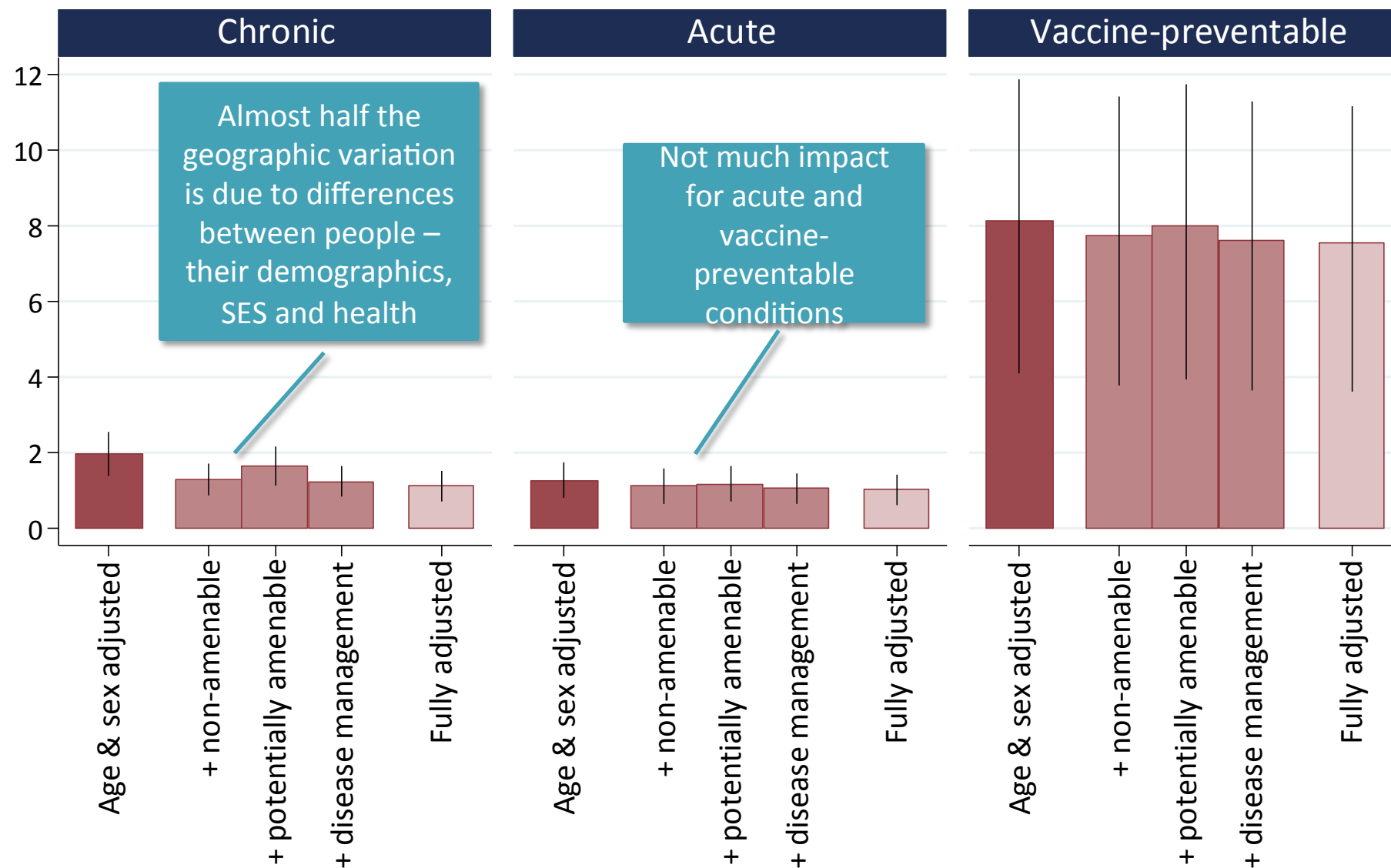Which personal characteristics explain area-level variation?

Not primary care amendable	Potentially amenable factors	Amenable to disease management
▪ Education ▪ Language spoken at home ▪ Marital status ▪ Aboriginal status ▪ Income ▪ Employment ▪ Health insurance status ▪ Number of people can depend on	▪ Healthy behaviours ▪ Body Mass Index	▪ Self-reported health ▪ Number of co-morbidities ▪ Functional status ▪ Psychological distress

Explaining area level variation

Explaining variation for chronic conditions
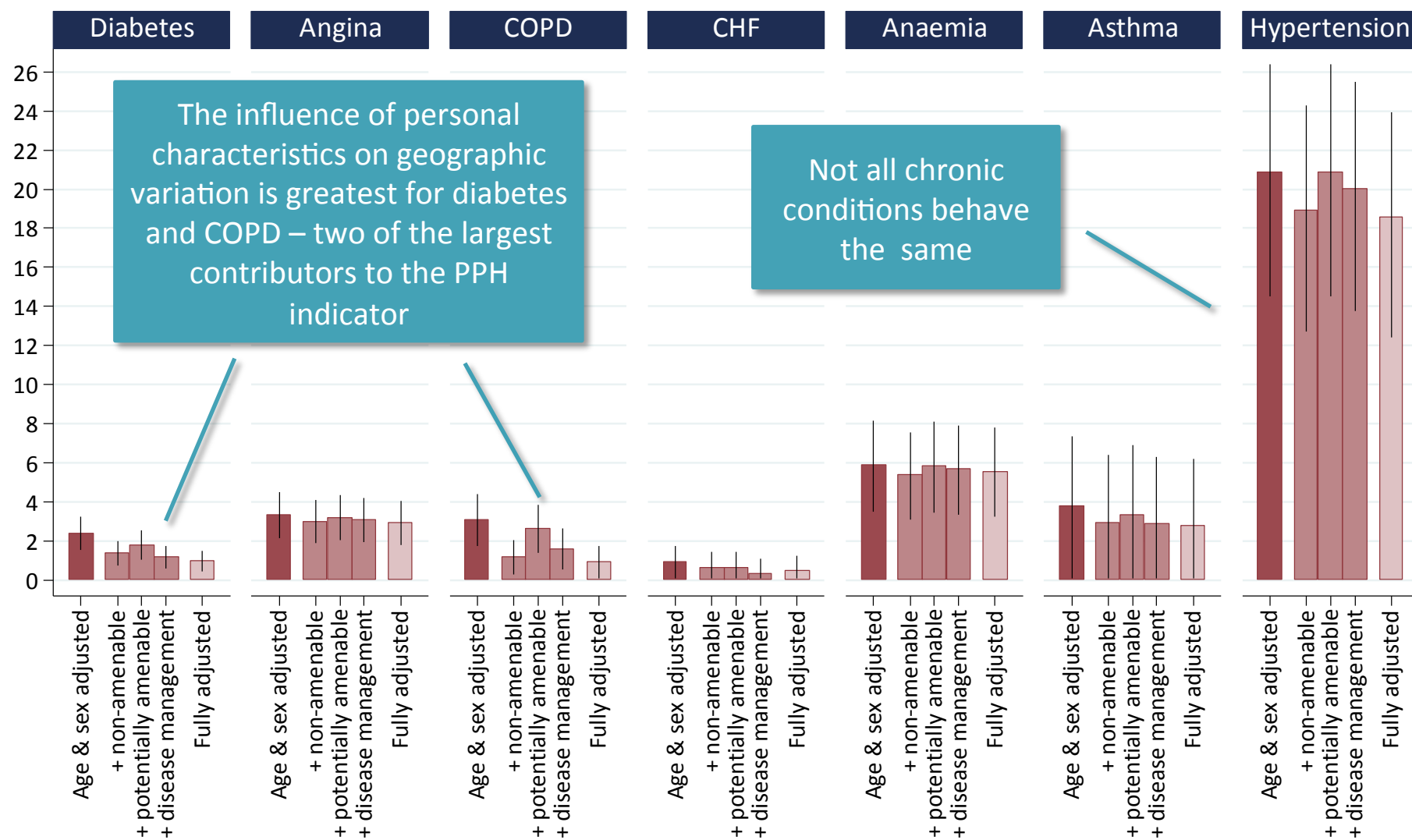
Explaining area level variation

Which area characteristics explain area-level variation?

- Remoteness
- Medical practitioners per 10,000 population
- GPs per 10,000 population
- Perceived access to care

Remoteness (ARIA+)

medical practitioners per 10,000
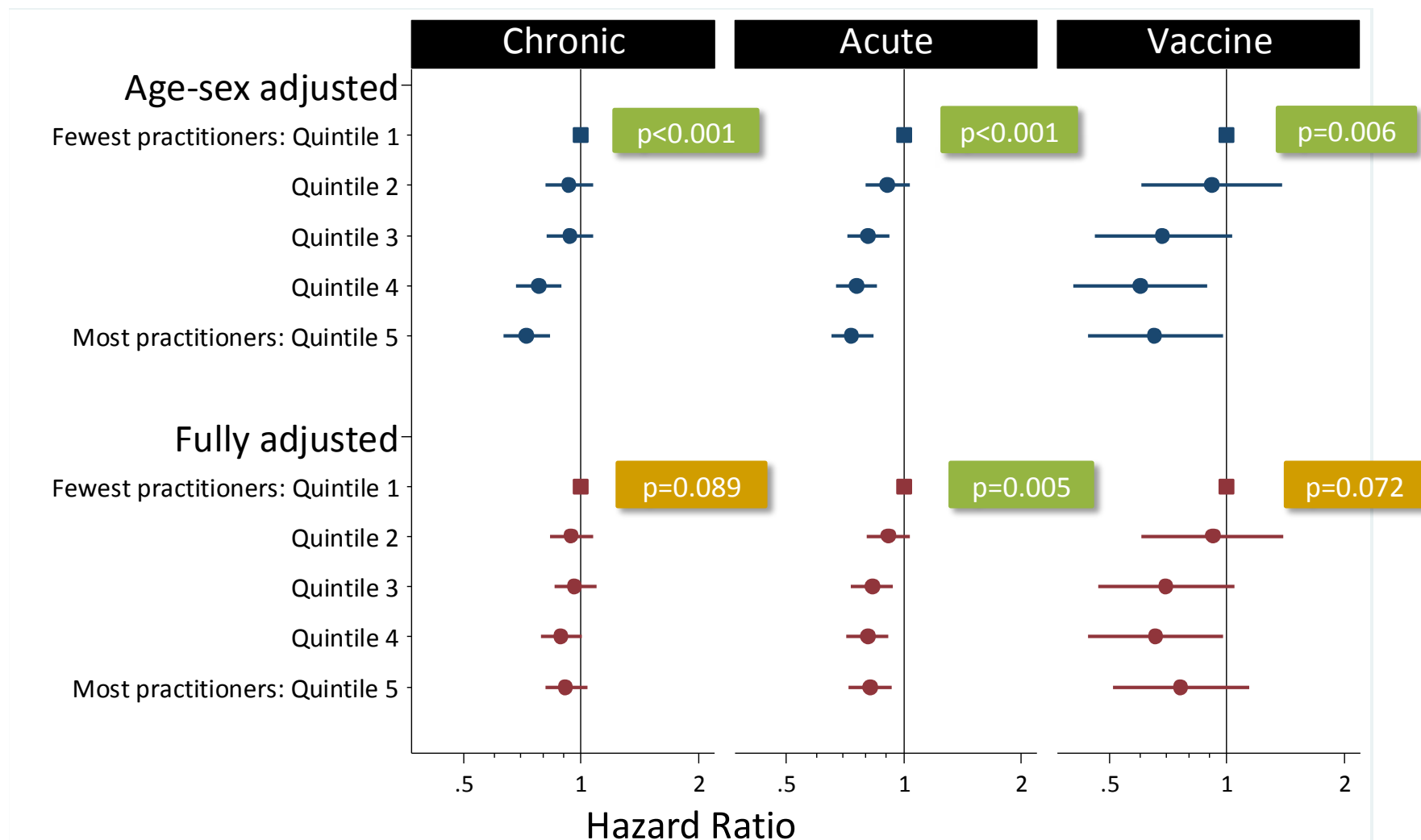
GPs per 10,000 population
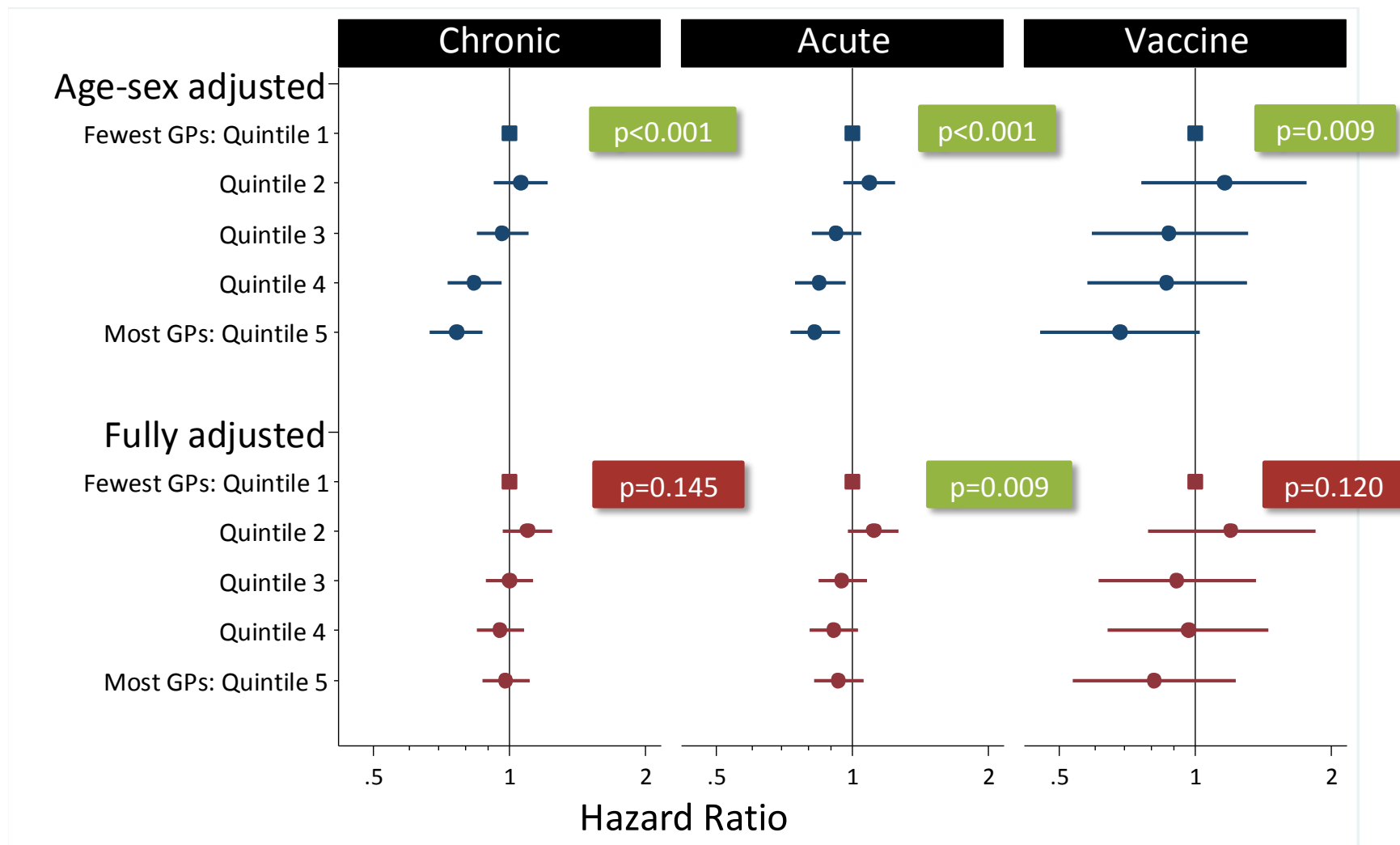
Perceived difficulty in accessing care
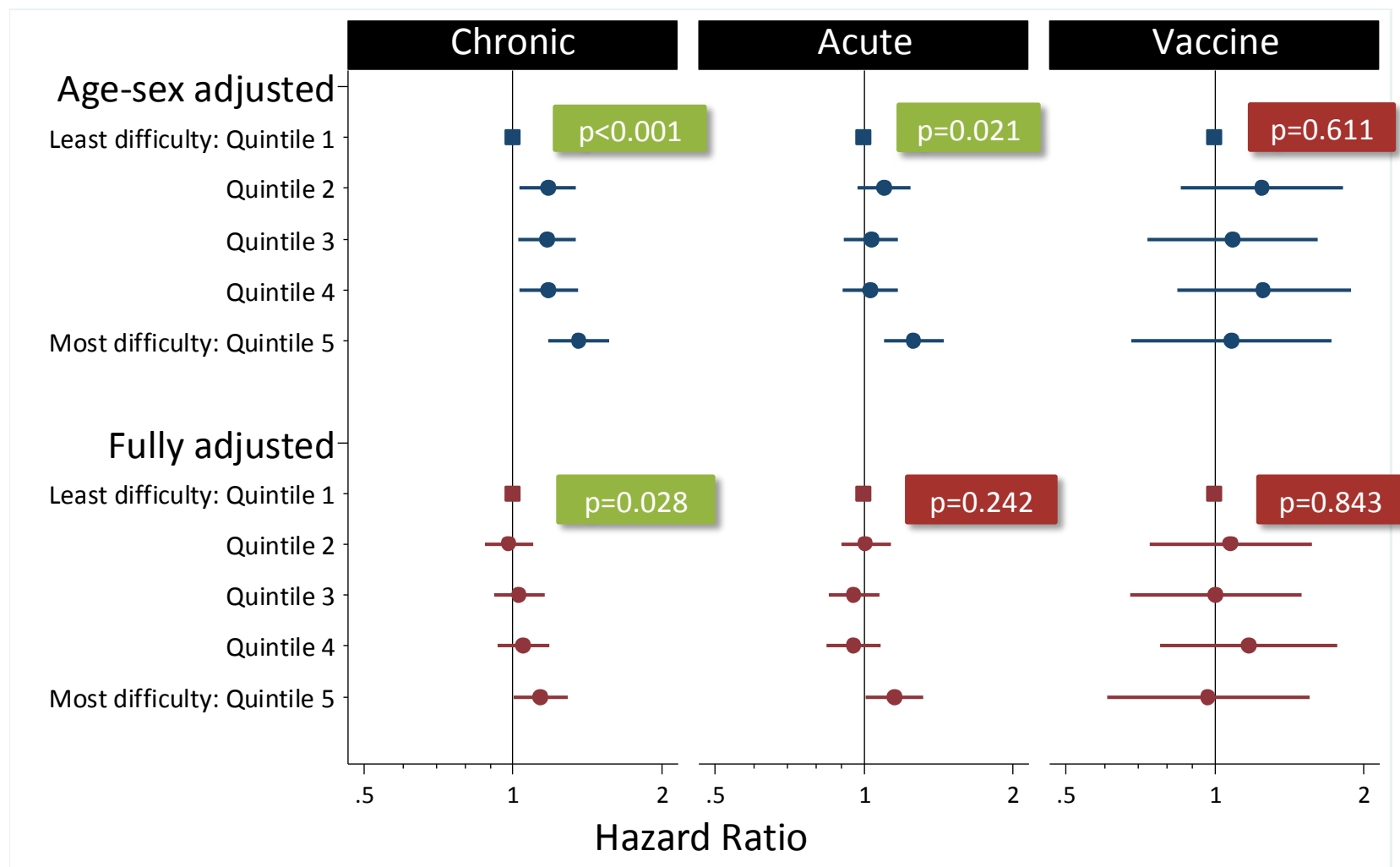
Key findings so far

(1) Social determinants of health are a key driver of PPH admission, and should be adjusted for if possible

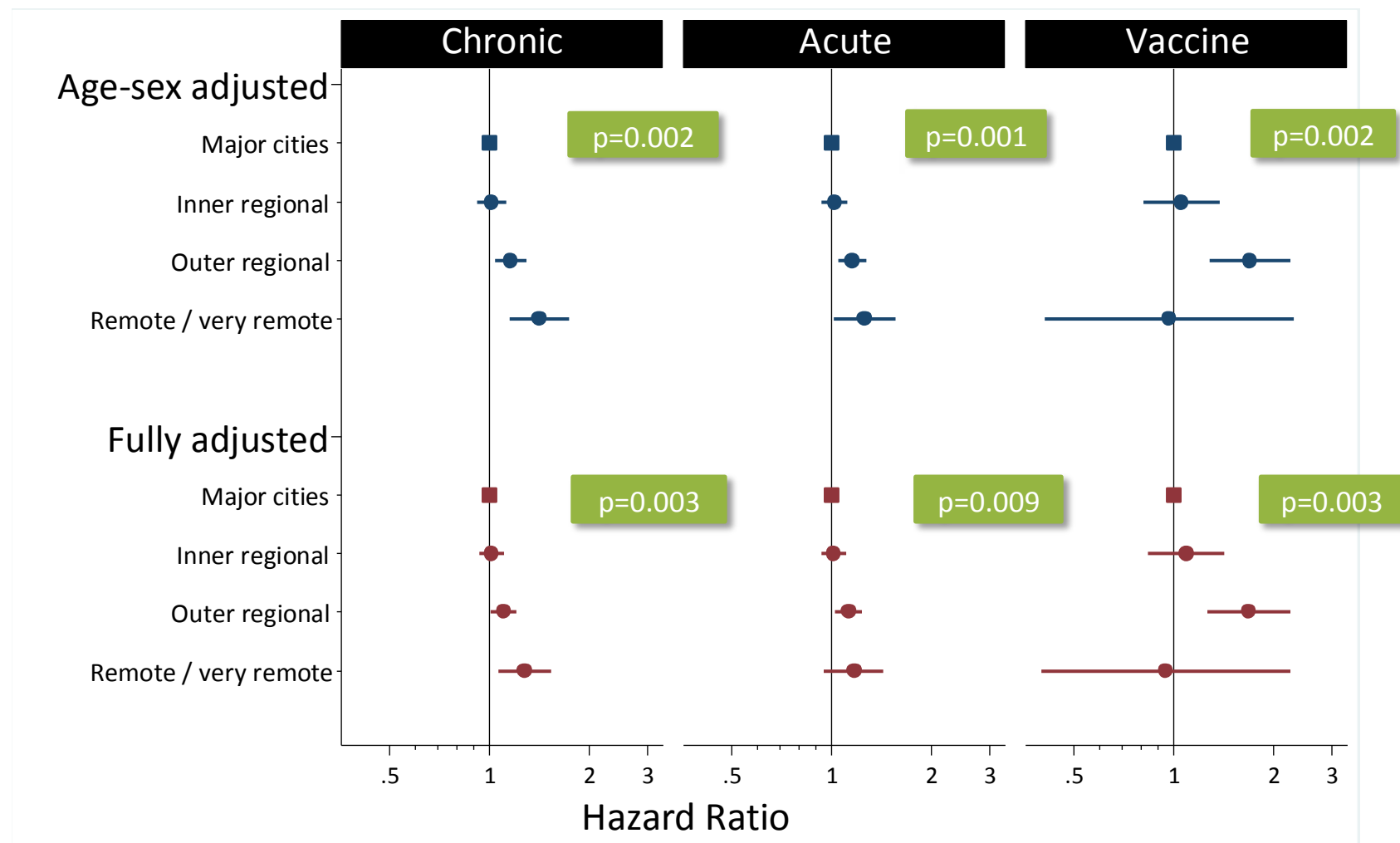(2) The aggregate indicator masks important differences between PPH conditions and their relationship with primary care

(3) Features of local health provision may play a relatively minor role in driving PPH admissions.

BUT.... still much more work to do!

- Additional measures that better reflect different aspects of health service provision (e.g. FTE and FWE workforce)

- Recommendations on revising the indicator to maximise the association with accessibility of primary care.

Adding value

- Applying new methods to linked administrative data
  - example: the IHOPE Study
- Linking research datasets to administrative data
  - example: the APHID Study

Potentially preventable hospitalisations by condition type, NSW, South Eastern Sydney LHD, 2009-10

Potentially preventable hospitalisations by condition type, NSW, South Eastern Sydney LHD, 2009-10

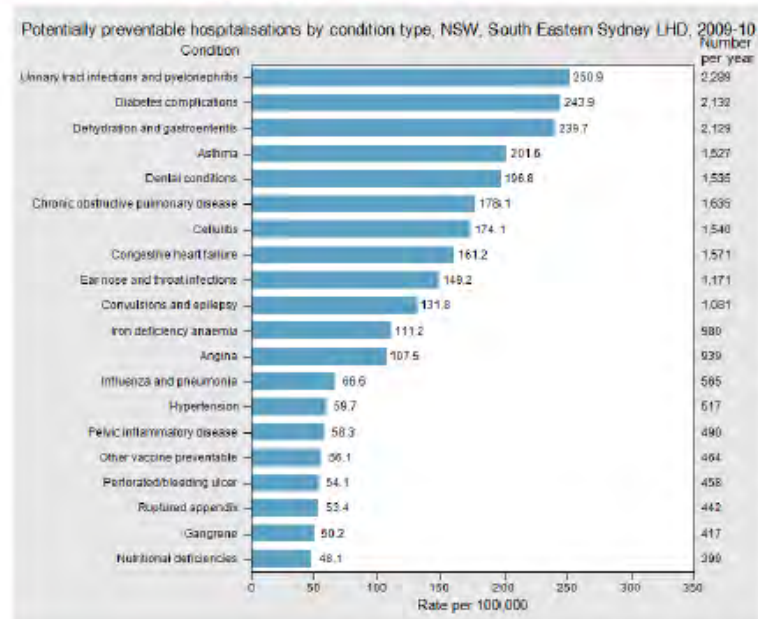| Condition	Rate per 100,000	Number per year
Urinary tract infections and pyelonephritis	250.9	2,289
Diabetes complications	243.9	2,132
Dehydration and gastroenteritis	239.7	2,129
Asthma	201.6	1,527
Dental conditions	196.8	1,535
Chronic obstructive pulmonary disease	178.1	1,639
Cellulitis	174.1	1,540
Congestive heart failure	161.2	1,571
Ear nose and throat infections	149.2	1,171
Convulsions and epilepsy	131.8	1,081
Iron deficiency anaemia	111.2	980
Angina	107.5	939
Influenza and pneumonia	66.6	565
Hypertension	59.7	517
Pelvic inflammatory disease	58.3	490
Other vaccine preventable	56.1	464
Perforated/bleeding ulcer	54.1	458
Ruptured appendix	53.4	442
Gangrene	50.2	417
Nutritional deficiencies	48.1	399

Table 3.11: Potentially avoidable hospitalisations[1] by sub-category/condition and Health Region, South Australia, 2005/06 and 2006/07
Ratio of rates in each Health Region to State rate (based on data in Table 3.10)
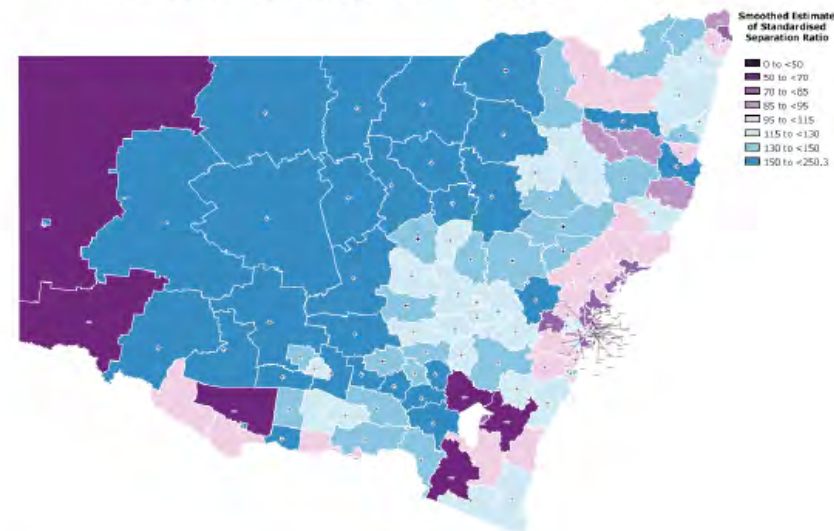
Health Region rate above State rate by: ☐ 50% or more ☐ 25 to <50% ☐ 10 to <25%

| Sub-category/condition	Central Nthn Adelaide	Southern Adelaide	Hills Mallee Sthn	South East	Wakefield	Mid North	Riverland	Eyre	Northern & Far Western
Vaccine-preventable	0.95	0.82*	1.15	0.60**	1.09	0.95	0.71	1.95**	1.24
Influenza and pneumonia	0.93	0.86	1.14	0.67	1.22	0.67	0.73	2.10**	1.30
Other vaccine-preventable diseases	1.05	0.71	1.22	0.34	0.65	2.05	0.65	1.37	1.06
Chronic	0.90**	0.97*	0.93**	1.07*	1.02	1.62**	1.11*	1.16**	1.61**
Iron deficiency anaemia	0.84**	1.65**	0.79*	0.92	0.88	0.49**	0.57**	0.29**	0.92
Diabetes complications	0.90**	0.90**	0.86**	1.08	1.01	1.67**	1.13*	1.17*	1.76**
Rheumatic heart disease	0.83	0.69	0.53	0.88	0.50	1.00	0.57	0.69	0.63
Hypertension	0.50**	0.63**	1.28	1.35	1.51*	5.06**	2.33**	4.43**	3.06**
Congestive cardiac failure	0.89**	0.97	0.99	1.23*	1.12	1.47**	1.13	1.57**	1.51**
Angina	0.96	0.75**	1.10	1.35**	1.24**	1.50**	1.17	1.09	1.18
Chronic obstructive pulmonary disease	0.94*	1.00	0.86**	0.95	0.90	1.53**	1.08	1.09	2.14**
Asthma	0.92**	0.95	1.08	0.91	1.08	1.97**	1.15	0.97	1.20
Acute	0.91**	0.95**	0.92**	1.10**	1.04	1.55**	1.24**	1.16**	1.60**
Dehydration and gastroenteritis	0.80**	0.96	1.07	1.80**	1.20**	1.86**	1.23*	1.12	1.67**
Convulsions and epilepsy	0.93*	0.79**	0.99	0.85	1.13	1.38**	1.26	1.50**	2.22**
Ear, nose and throat infections	0.88**	0.99	0.96	0.91	1.03	1.91	1.26	1.44	1.52
Dental conditions	0.97	0.93*	0.85**	0.85*	0.97	1.21	1.50**	0.96	1.66**
Perforated/bleeding ulcer	1.08	0.90	0.75	0.88	1.09	0.99	0.89	0.61	0.77
Appendicitis	0.92	1.15	1.22	0.99	0.61	1.56	1.00	0.62	0.91
Cellulitis	0.87**	0.99	0.88	1.28*	1.17*	1.80**	1.20	1.21	1.41**
Pyelonephritis (includes urinary tract infections)	1.01	0.97	0.83*	0.86	0.90	1.38**	0.96	1.00	1.21
Pelvic inflammatory disease	0.91	1.08	0.74	1.14	0.88	1.18	1.17	1.18	2.08**
Gangrene	1.00	1.15	0.66	1.26	0.48**	0.70	1.00	1.02	1.54
Total avoidable admissions	0.91**	0.96**	0.93**	1.08**	1.03**	1.58**	1.16**	1.17**	1.59**

[1] Admissions resulting from ACS conditions

Potentially preventable hospitalisations by Local Government Area, NSW, 2008-09 to 2009-10

Potentially preventable hospitalisations by Local Government Area, NSW, 2008-09 to 2009-10

Smoothed Estimate of Standardised Separation Ratio
- 0 to <50
- 50 to <70
- 70 to <85
- 85 to <95
- 95 to <115
- 115 to <130
- 130 to <150
- 150 to <250.3

Potentially preventable hospitalisations by Local Government Area, NSW, 2008-09 to 2009-10
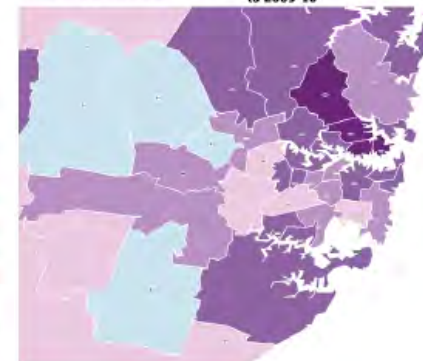
Sources

NSW Admitted Patient Data Collection and ABS population estimates (HOIST). Centre for Epidemiology and Research, NSW Department of Health.

Thank you!