Why are we not Outraged - We should be able to do better!

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Historical Works

- Let’s take a moment to look at some historical works
- Health and Place (Health Geography) has a long history
- And if we were doing maps like these then – what should we be doing now?

Social Science & Medicine
Volume 50, Issues 7–8, 1 April 2000, Pages 915-921

Finke's 1792 map of human diseases: the first world disease map?

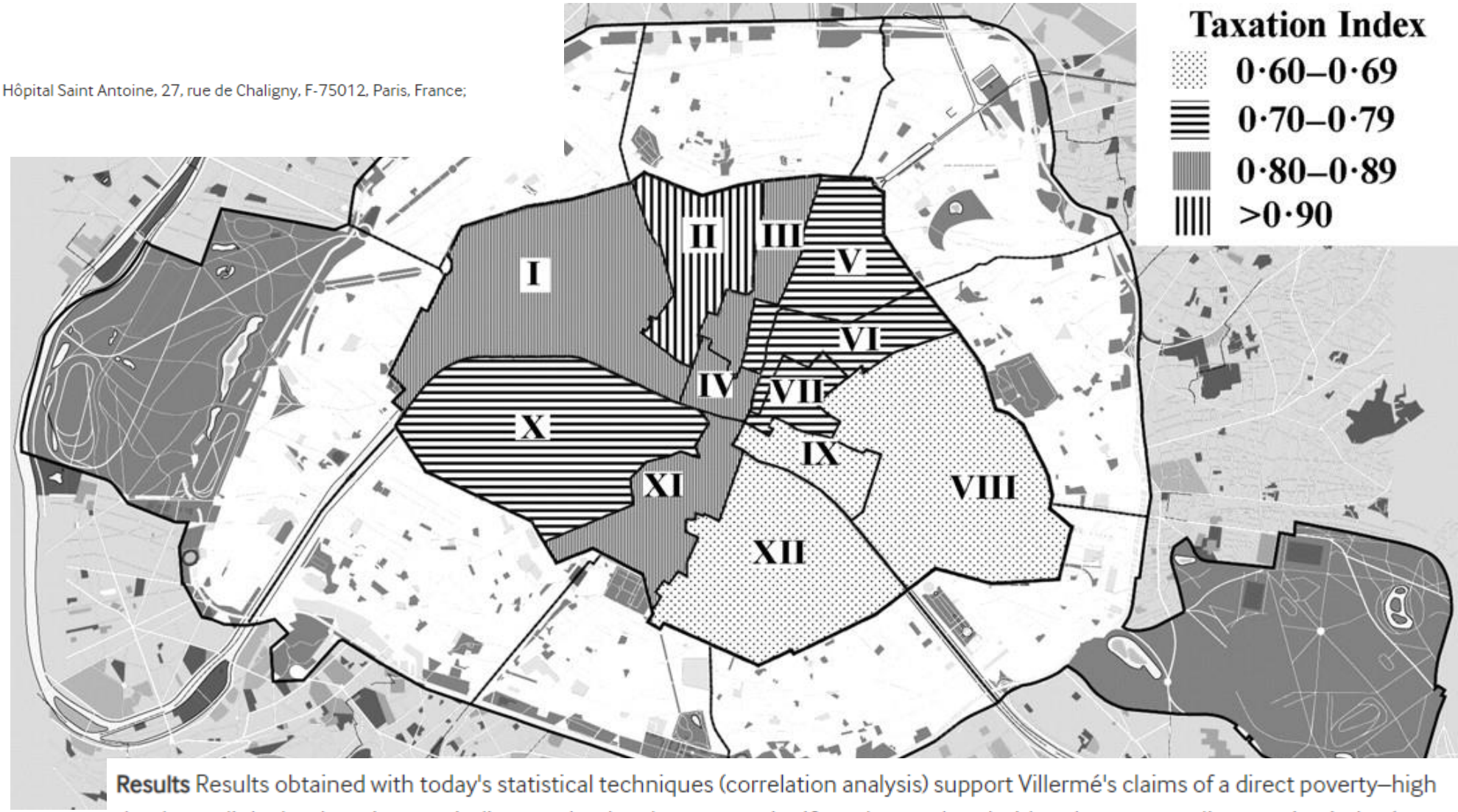
Frank A Barrett

Evidence-based public health policy and practice

Louis-René Villermé (1782–1863), a pioneer in social epidemiology: re-analysis of his data on comparative mortality in Paris in the early 19th century

C Julia [1], A-J Valleron [1, 2, 3]

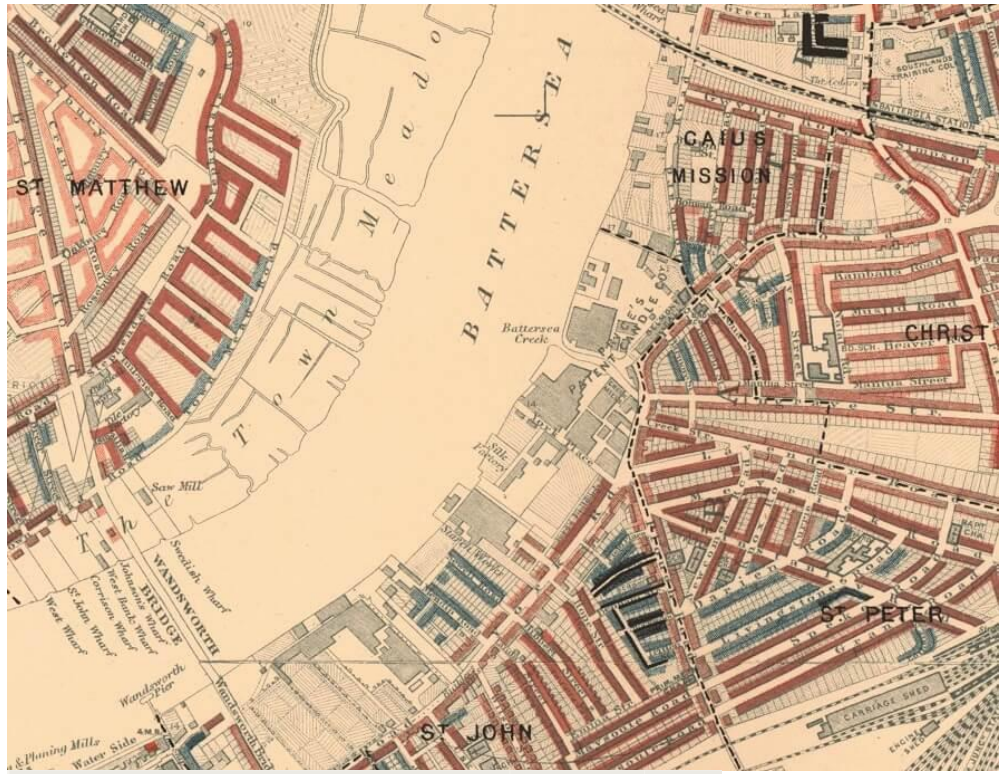
Correspondence to Chantal Julia, Unité de Santé Publique, Hôpital Saint Antoine, 27, rue de Chaligny, F-75012, Paris, France; julia@u707.jussieu.fr



Results Results obtained with today's statistical techniques (correlation analysis) support Villermé's claims of a direct poverty–high death rate link: the three income indicators that he chose were significantly correlated with at-home mortality: taxation index (r=–0.83, p<0.002), average rent (r=–0.83, p<0.002), trade taxation index (r=–0.67, p<0.05), while population density variables were not associated with mortality.

https://jech.bmj.com/content/65/8/666

SES 1890s style: Charles Booth



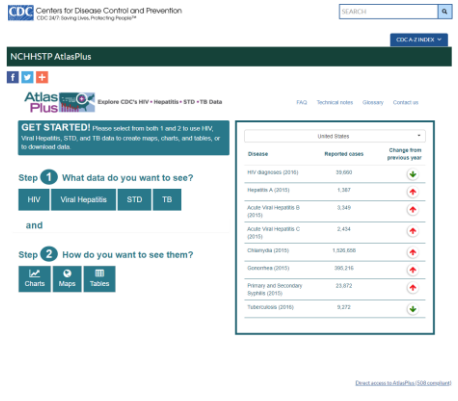
Classification	Colour	
Lowest class. Vicious, semi-criminal.	Black	
Very poor, casual. Chronic want.	Dark blue	
Poor. 18s. to 21s. a week for a moderate family.	Light blue	
Mixed. Some comfortable others poor.	Purple	
Fairly comfortable. Good ordinary earnings.	Pink	
Middle class. Well-to-do.	Red	
Upper-middle and upper classes. Wealthy.	Yellow	

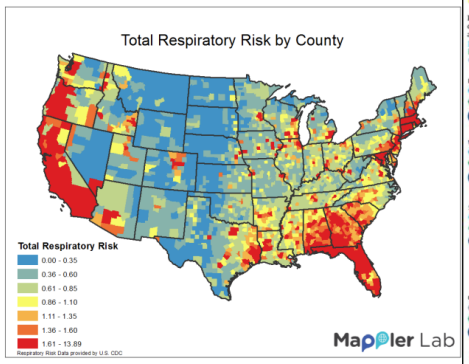
https://booth.lse.ac.uk/learn-more/what-were-the-poverty-maps

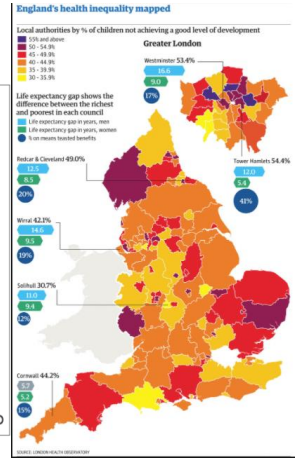
Now

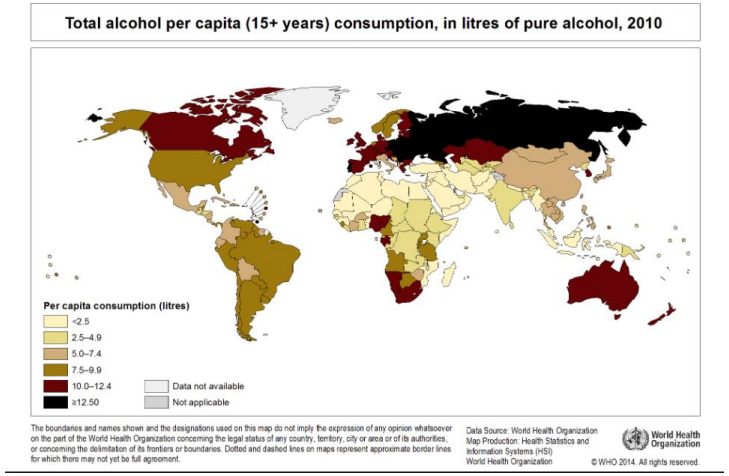
- How do we report health data now?

World Examples





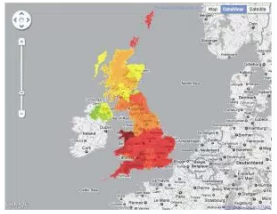


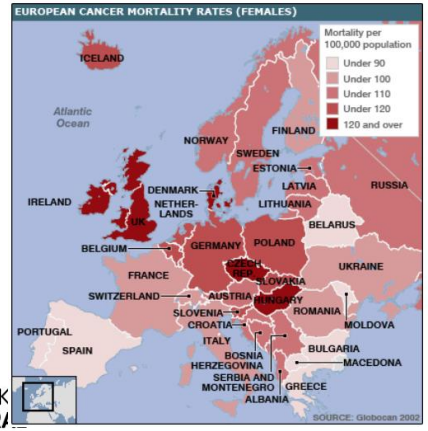


New map shows undiagnosed dementia cases in UK

March 8, 2011 Sachiye Day

A study of dementia diagnosis in UK produced by The Alzheimer's Society and Alzheimer's Scotland with the help of the supermarket chain Tesco predicts that more than a million people will suffer from dementia by 2021 in the UK. The researchers say their figures show that half a million people are now living without a diagnosis.

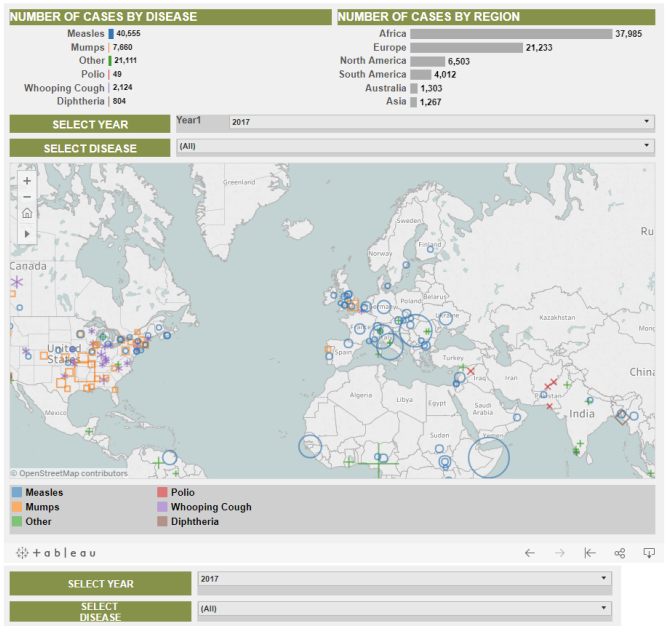




Vaccine-preventable disease outbreaks

Browse our interactive map to track outbreaks of vaccine-preventable diseases around the globe.

The map uses information published by news, governments and global health organisations to plot outbreaks of vaccine-preventable disease over time, including measles, mumps, polio, rubella and whooping cough (pertussis). Originally created and published by the US-based Council on Foreign Relations in 2008, this interactive tool is widely recognised by the global health community for its role in raising awareness of the continued prevalence of easily preventable diseases.



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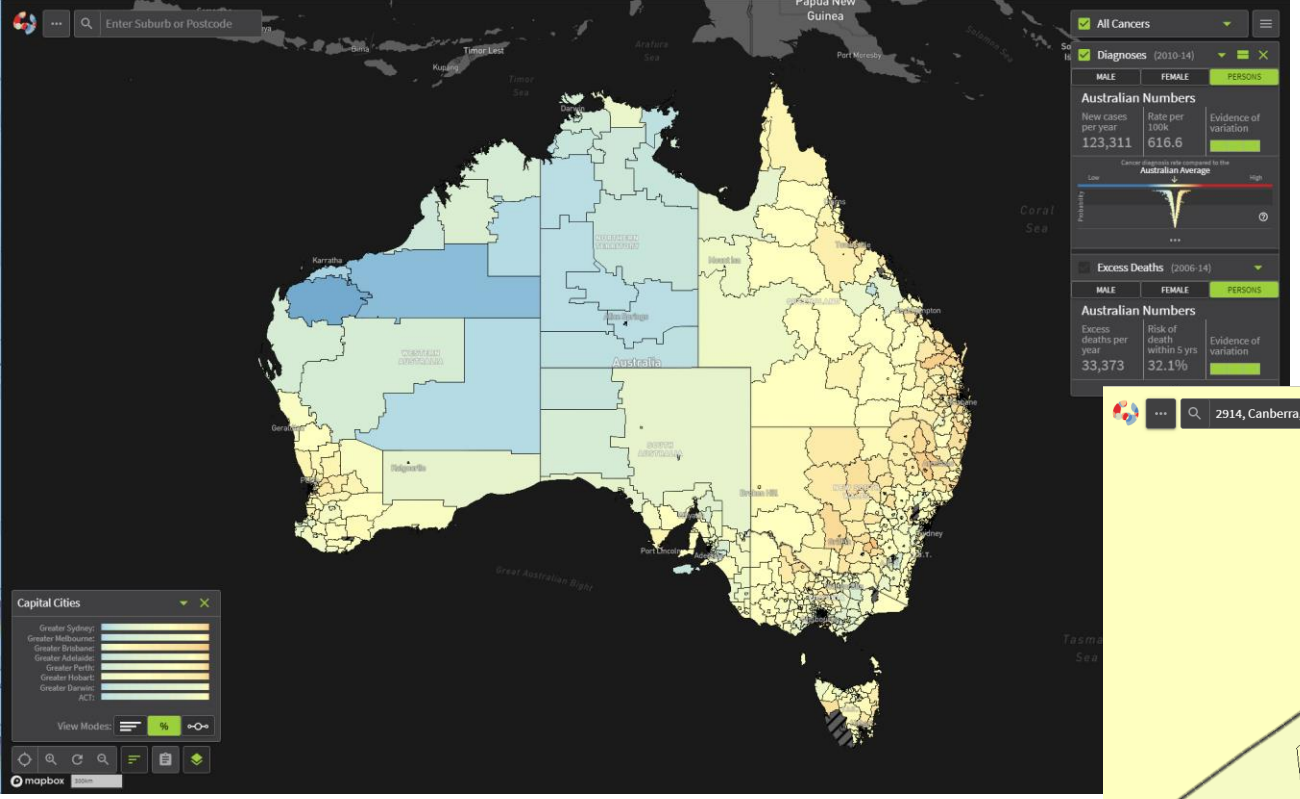
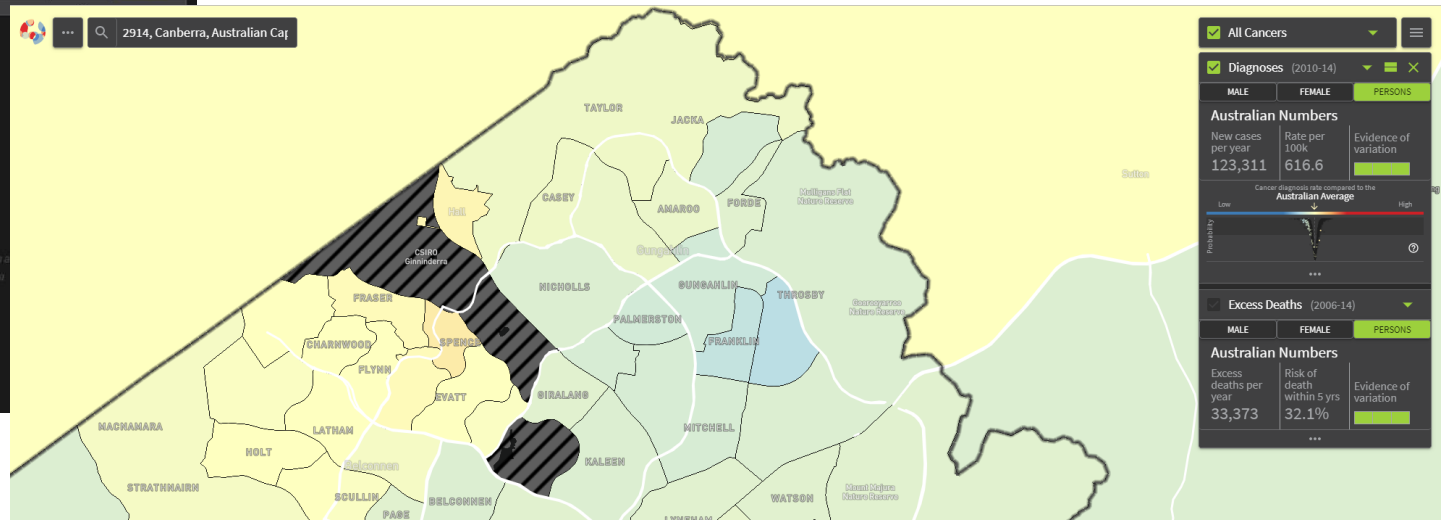


Cancer Maps

By Statistical Areas Level 2 (SA2) .



Cancer registries use address information of usual residence at the time of diagnosis to determine the SA2 information. The method by which each cancer registry allocates this varies. Cancer Registries in New South Wales, Australian Capital Territory, Tasmania, Victoria and Western Australia apply geocoding methods to the full street address. In Queensland and South Australia, the combination of suburb and postcode were used to map to SA2 areas, either through geocoding or using a concordance file. In Northern Territory, suburb name is used in the urban areas (Darwin and Alice Springs) while a range of location information is used for areas in rural and remote areas. Additional manual checks and verification are conducted on an ongoing basis by Registry staff to increase the completeness and accuracy of the processes.

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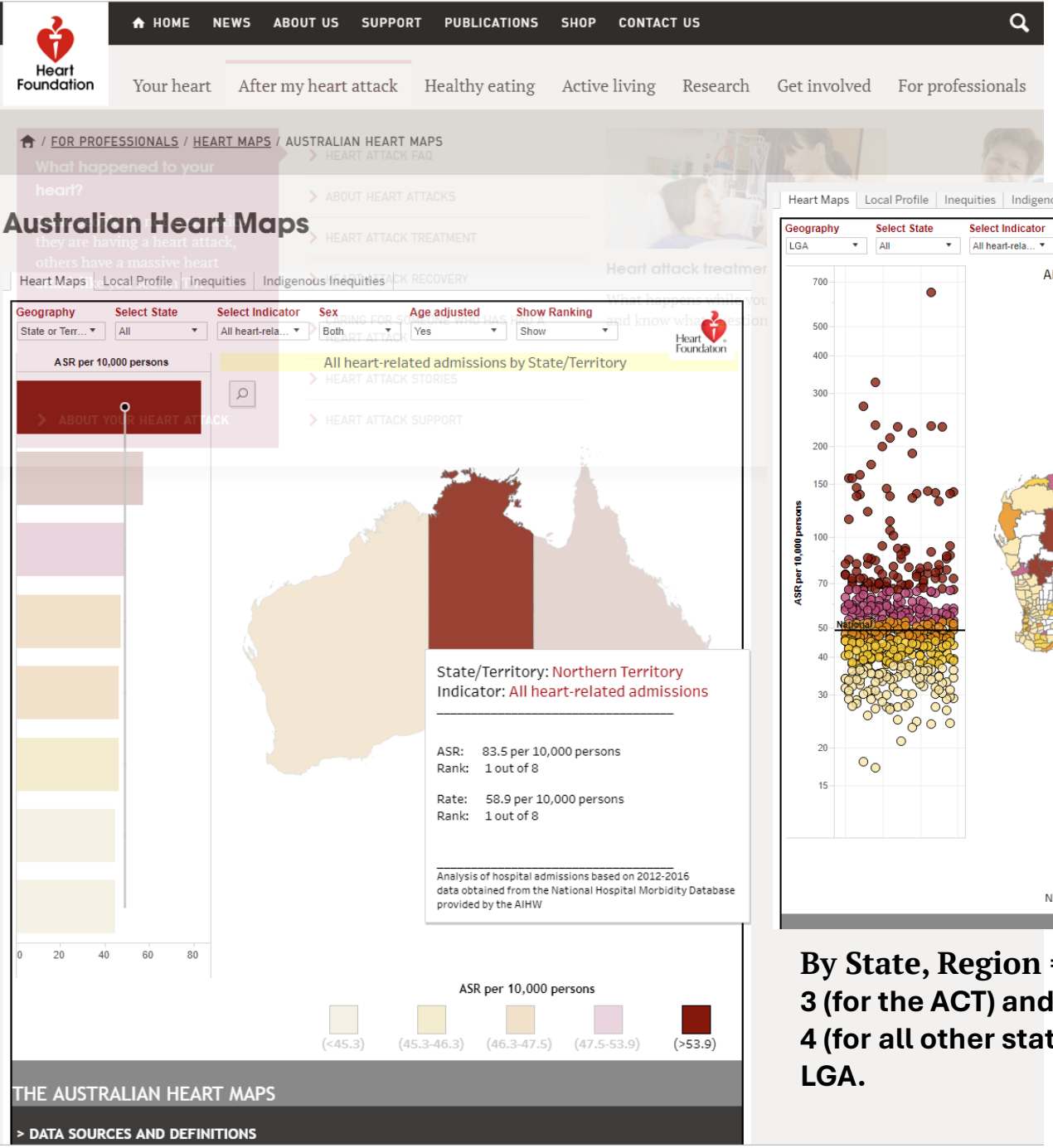
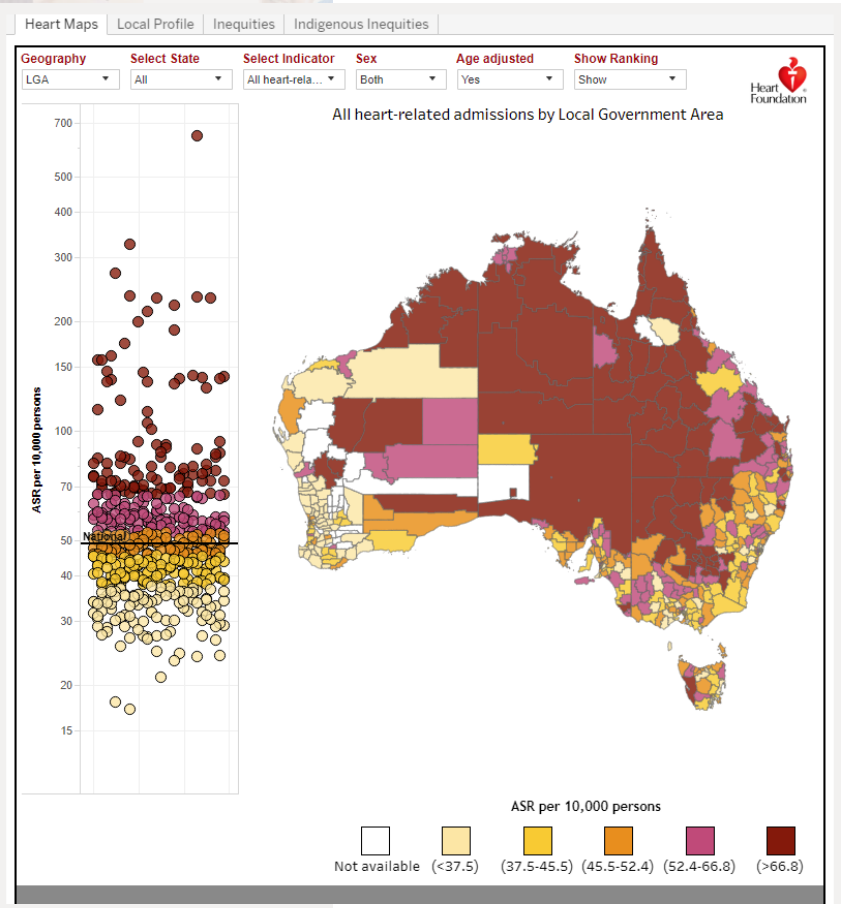
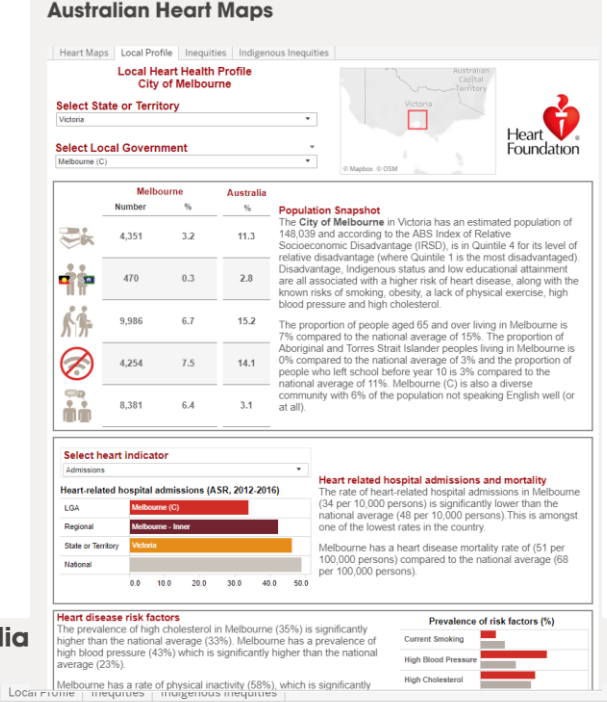
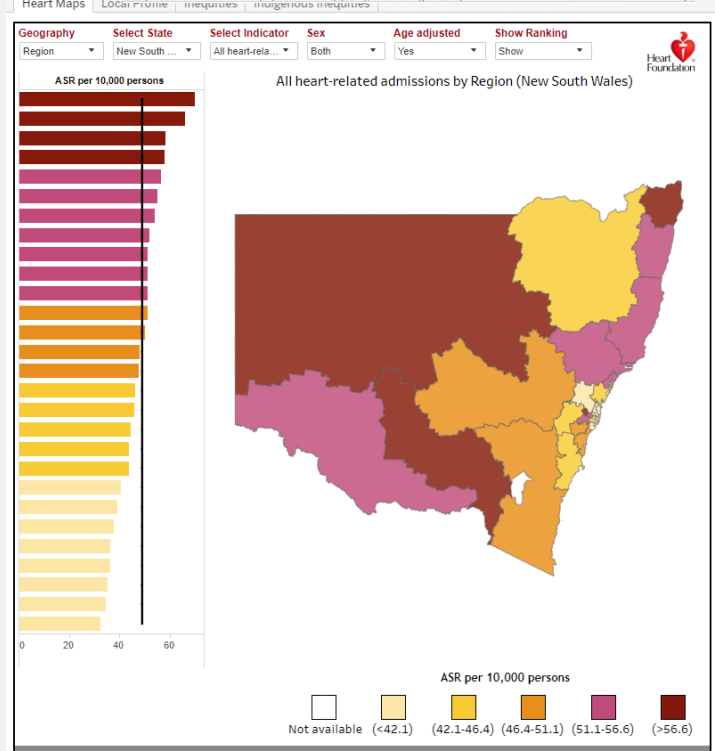
https://atlas.cancer.org.au/app

Heart Maps: Older Version.





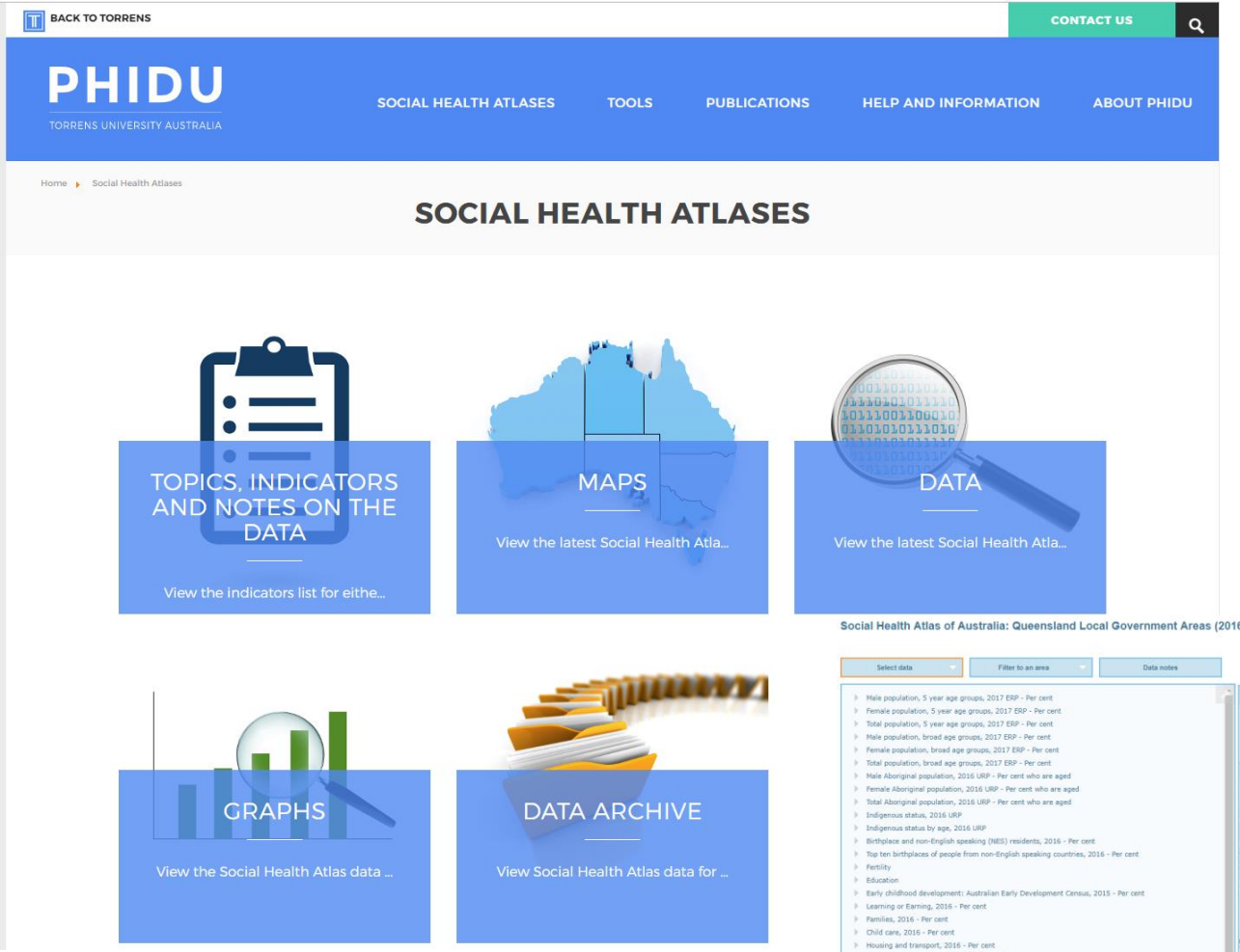


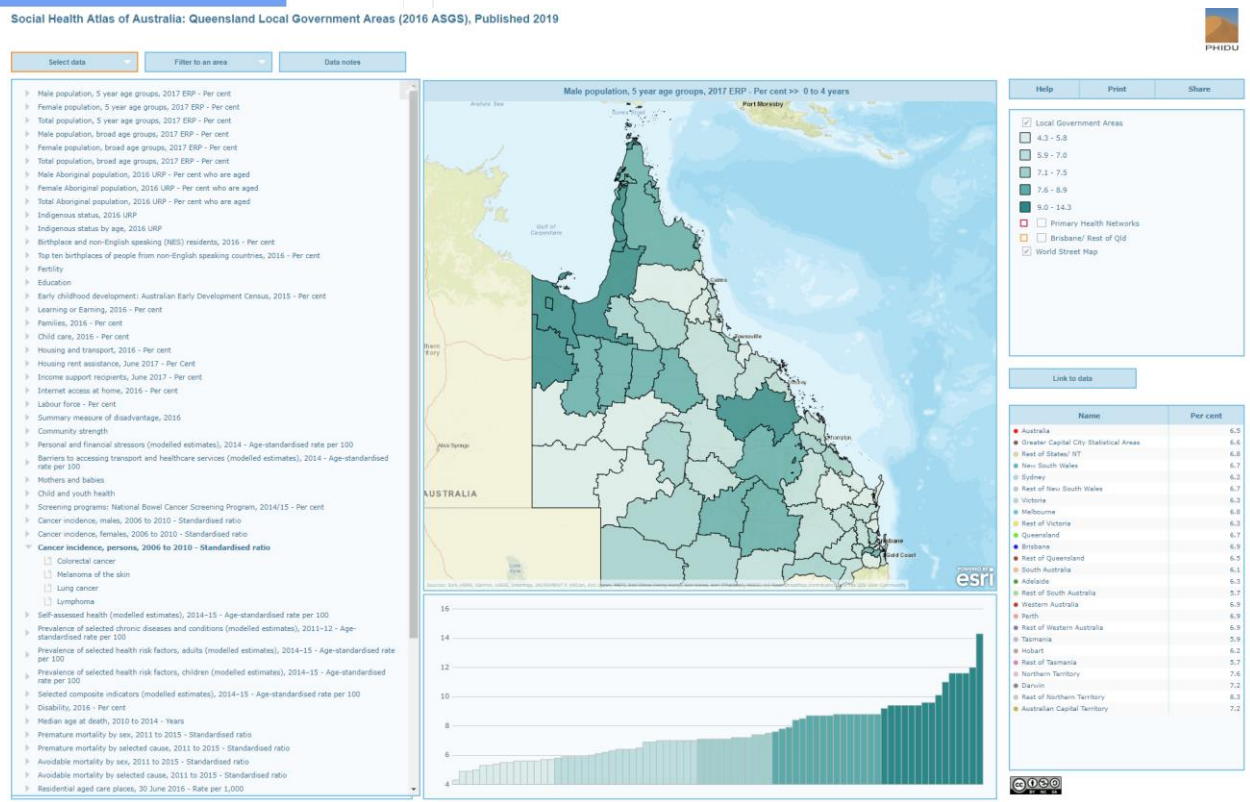


By State, Region = statistical Area Level 3 (for the ACT) and Statistical Area Level 4 (for all other states and Territories) or LGA.

https://www.heartfoundation.org.au/for-professionals/heart-maps/australian-heart-maps

Social Health Atlas





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http://phidu.torrens.edu.au/social-health-atlases

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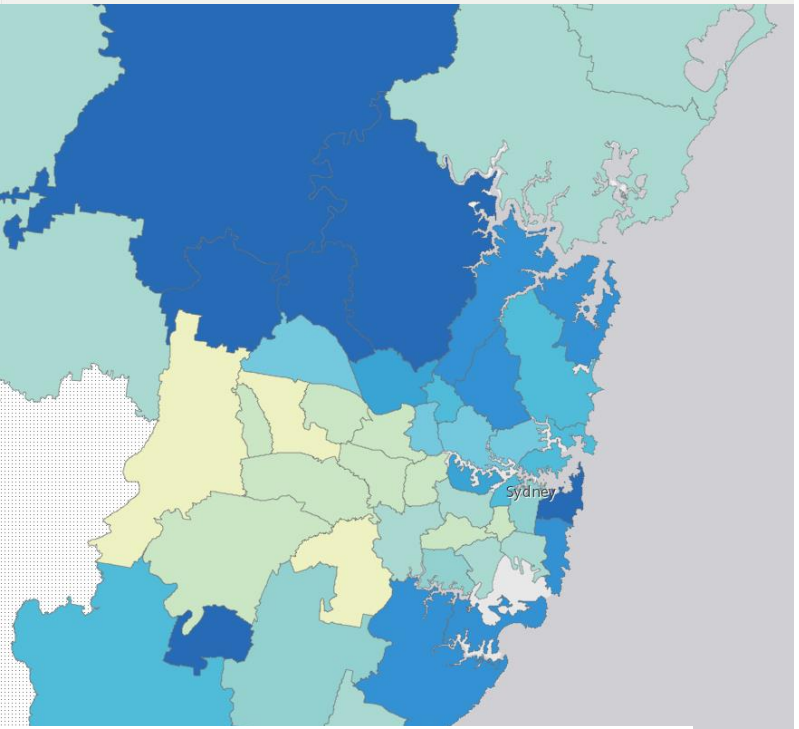
The Australian Atlas of Healthcare Variation



2.1 Colonoscopy hospitalisations, all ages - Map

Figure 2.4: Number of hospitalisations for colonoscopy per 100,000 people of all ages, age and sex standardised, by Statistical Area Level 3 (SA3) of patient residence, 2016–17

NORTHERN TERRITORY GOVERNMENT

Department of **Health**

Home › For health professionals and NGOs › F

Remote Health Atlas

This site provides remote health resources for nc

- Clinical Protocols
- Emergency Kits
- Evacuation Centre Management
- Health Record Guidelines
- Health Record Application Forms
- Medical Students
- Men's Business
- Pathology Stores Order Forms
- Pharmacy Guidelines
- Pharmacy Forms
- Pharmacy Resources
- Point of Care Pathology
- Remote Alcohol and Other Drugs Workforce Program
- Research Proposals
- Specialist and Clinical Services Outreach

Contact:

For further information e-mail: CAProfPracNurse.THS@nt.gov.au

Last updated: 02 November 2018

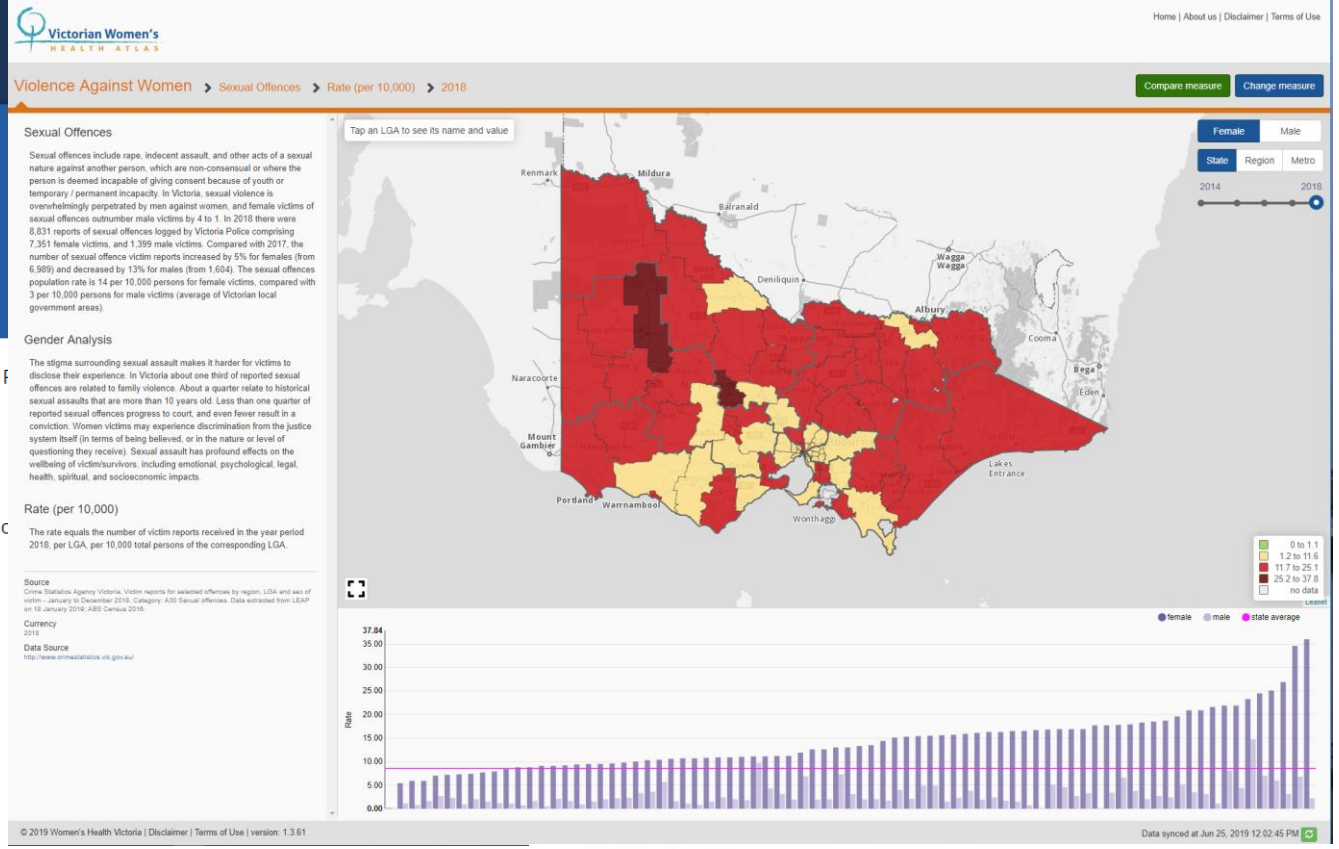
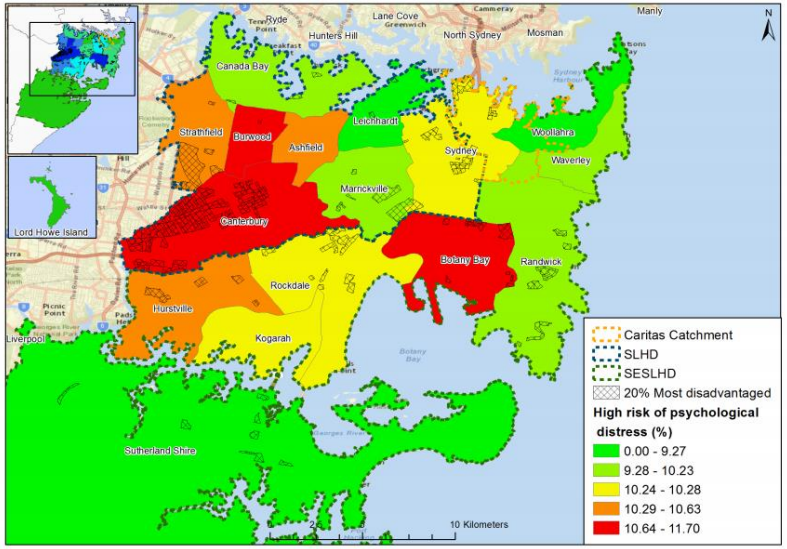


Figure 13. High psychological distress



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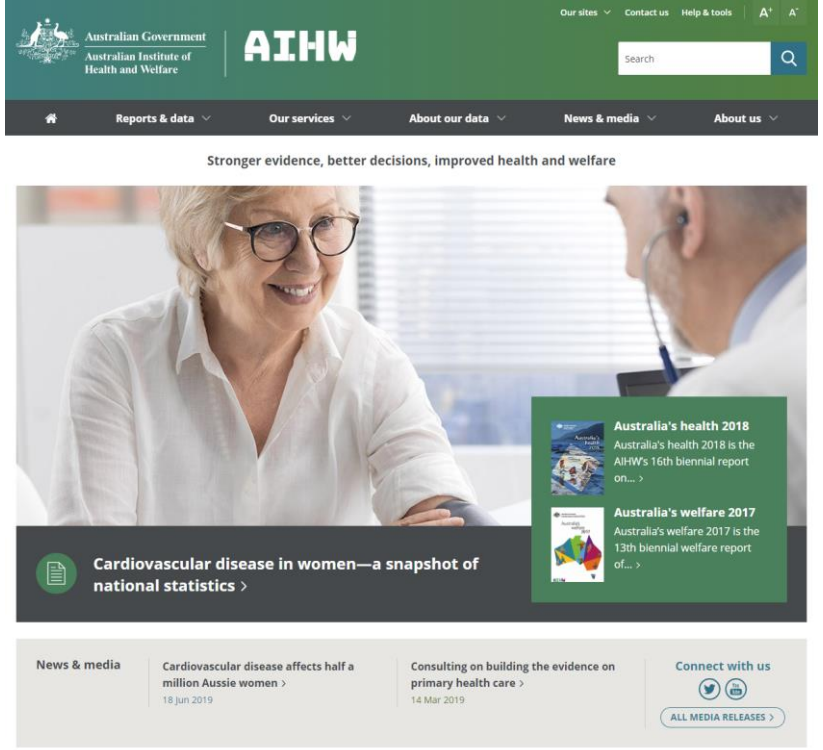
https://acsqhc.maps.arcgis.com; https://health.nt.gov.au/professionals/remote-health-atlas; https://victorianwomenshealthatlas.net.au/#!/; https://www.ceshpn.org.au/preview/mental-health-1/1713-the-integrated-mental-health-atlas-of-the-central-and-eastern-sydney-phn/file



AIHW

AIHW data by geography

HEALTHY COMMUNITY **Indicators** — The latest information for people in a PHN area. EXPLORE THE DATA ›

Primary topic	Report[1] or resource	Geography reported
Alcohol, Smoking, Illicit use of drugs	National Drug Strategy Household Survey 2016: detailed findings	PHN area, SA4
Alcohol & other drug treatment services	Alcohol and Other Drug Treatment Services in Australia 2016–17	PHN area, SA2
Behaviours & risk factors	Health risk factors in 2014–15	PHN areas
Cancer	Cancer Incidence and Mortality Across Regions (CIMAR) books	GCCSA, PHA, PHN area, SA3, SA4
Cancer	Cancer incidence and mortality in Australia by small geographic areas	PHN area, SA3
Cancer	Cancer screening in Australia by small geographic areas 2015–2016	PHN area, SA3
Cancer	Incidence of selected cancers in 2009–2013	PHN area, SA3, SA4
Cancer	Participation in national cancer screening programs in 2015–2016	PHN area, SA3
Diabetes	Incidence of insulin-treated diabetes in Australia	PHN area, SA3
Expenditure, Primary health care	Medicare Benefits Schedule GP and specialist attendances and expenditure in 2016–17	PHN area, SA3
Expenditure	Patients' out-of-pocket spending on Medicare services	PHN area, SA3
Chronic kidney disease	Geographical variation in chronic kidney disease	PHN area
Homelessness services	Specialist homelessness services annual report 2017–18	SA4
Homelessness services	Specialist Homelessness Services Collection data cubes 2011–18	SA2, SA3, SA4, LG ad PHN
Hospitals, Primary health care	Potentially preventable hospitalisations in Australia by small geographic areas	PHN area, SA3
Hospitals	Potentially preventable hospitalisations in 2015–16	PHN area, SA3
Hospitals, Primary health care	Use of emergency department and GP services in 2015–16	PHN area, SA3
Indigenous Australians	Indigenous eye health measures 2017	PHN area
Indigenous health & welfare services	Indigenous health check (MBS 715) data tool	PHN area
Indigenous health & welfare services	Spatial distribution of the supply of the clinical health workforce 2014: relationship to the distribution of the Indigenous population	PHN area, SA3

- **Primary Health Network (PHN) areas—PHNs boundaries defined by the Australian Government Department of Health. There are 31 PHN areas that cover the whole of Australia.**
- **Statistical Areas—Statistical Areas are a geographical classification defined by the Australian Bureau of Statistics: Statistical Areas Level 1 (SA1s); Statistical Areas Level 2 (SA2s); Statistical Areas Level 3 (SA3s); and Statistical Areas Level 4 (SA4s).**

Due to the smaller number of results in these smaller areas, and the strict privacy and confidentiality controls applied to data, results are sometimes unable to be reported for all areas in Australia.

National minimum data sets and data set specifications: typically SA2

https://www.aihw.gov.au/ https://meteor.aihw.gov.au/content/index.phtml/itemId/676382

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AIHW by Geography

- AIHW list 68 reports by geography

AIHW Spatial Geography	
Unit	Count*
PHN	51
SA1	0
SA2	10
SA3	32
SA4	16
GCCSA	9
PHA	2
Postcode	2
IREG	4

- More than one unit per report is possible.
- National minimum data set specification is SA2 (10 of 68!)

Spatial Unit 2016	count	Mean Sq Km	Median Sq Km	SD Sq Km	Min Sq Km	Max Sq Km
SA1	57,523	133.6	0.2	3,150.5	0.002	**328,260**
SA2	2,292	3,354.3	13.8	25.0	0.5	**513,384**
PHN*	31	284,004.1	32,767.0	537,870.2	671.4	**2,518,556**
LGA	563	13,655.6	2,421.9	43,895.3	1.1	**622,489**
SSC	**13304**	**502.4**	**37.37**	**3,763.2**	**0.04**	**178,407**

The largest PHN would be 10th on the world country size list.
For reference – New Zealand 264,537 km^2 and UK is 242,741 km^2

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https://www.aihw.gov.au/about-our-data/aihw-data-by-geography (accessed 25/06/2024)

Why does this matter?

Several Concerns

- MAUP
- Ability to identify health issues at a scale that is meaningful!!!
- Let's revisit the John Snow Cholera outbreak in London.
- Famous and often cited as start of spatial epidemiology (or as I like to refer to it – Health Geography).
- Could the same outcome be achieved with existing data supply regimes?

Could John Snow solve the Cholera Epidemic with current data privacy laws?

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John Snow (not GOT)

- 1854, the Soho district in London was in the grip of a cholera outbreak with thousands sick and 600 deaths.
- John Snow a surgeon and general practitioner, used what is now referred to as the start of spatial epidemiology, to solve the cholera outbreak in Soho, London.
- One of the most used examples of spatial methods to solve a health problem.
- John Snow mapped the cholera cases/deaths and reportedly used this to pinpoint the Broad Street pump as the likely source.

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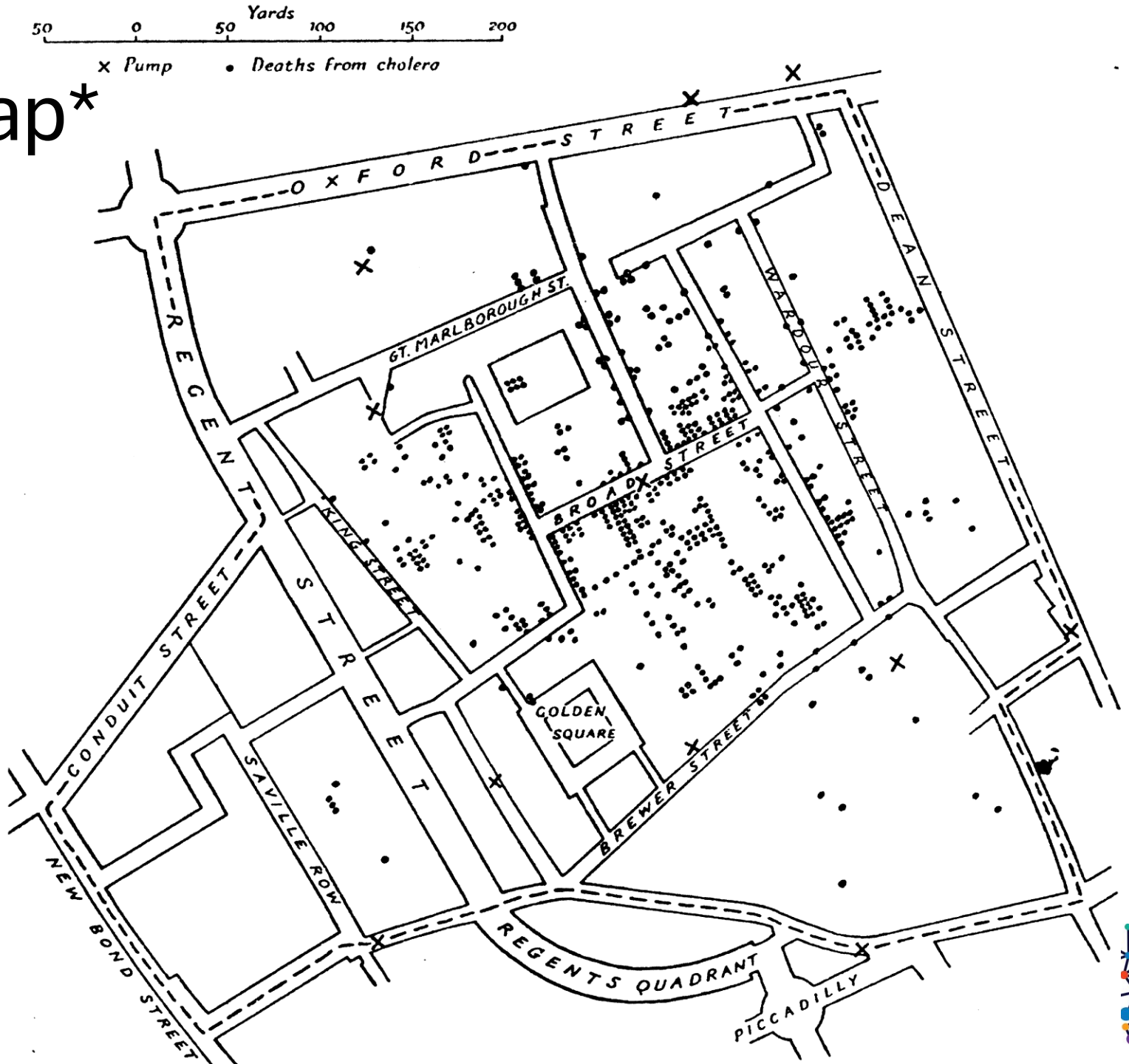
John Snow Map*



- *John Snow's map of cholera deaths in London 1854. Deaths are marked by dots and water pumps by crosses. Version of Gilbert [294]. c 1958 Blackwell Publishing.

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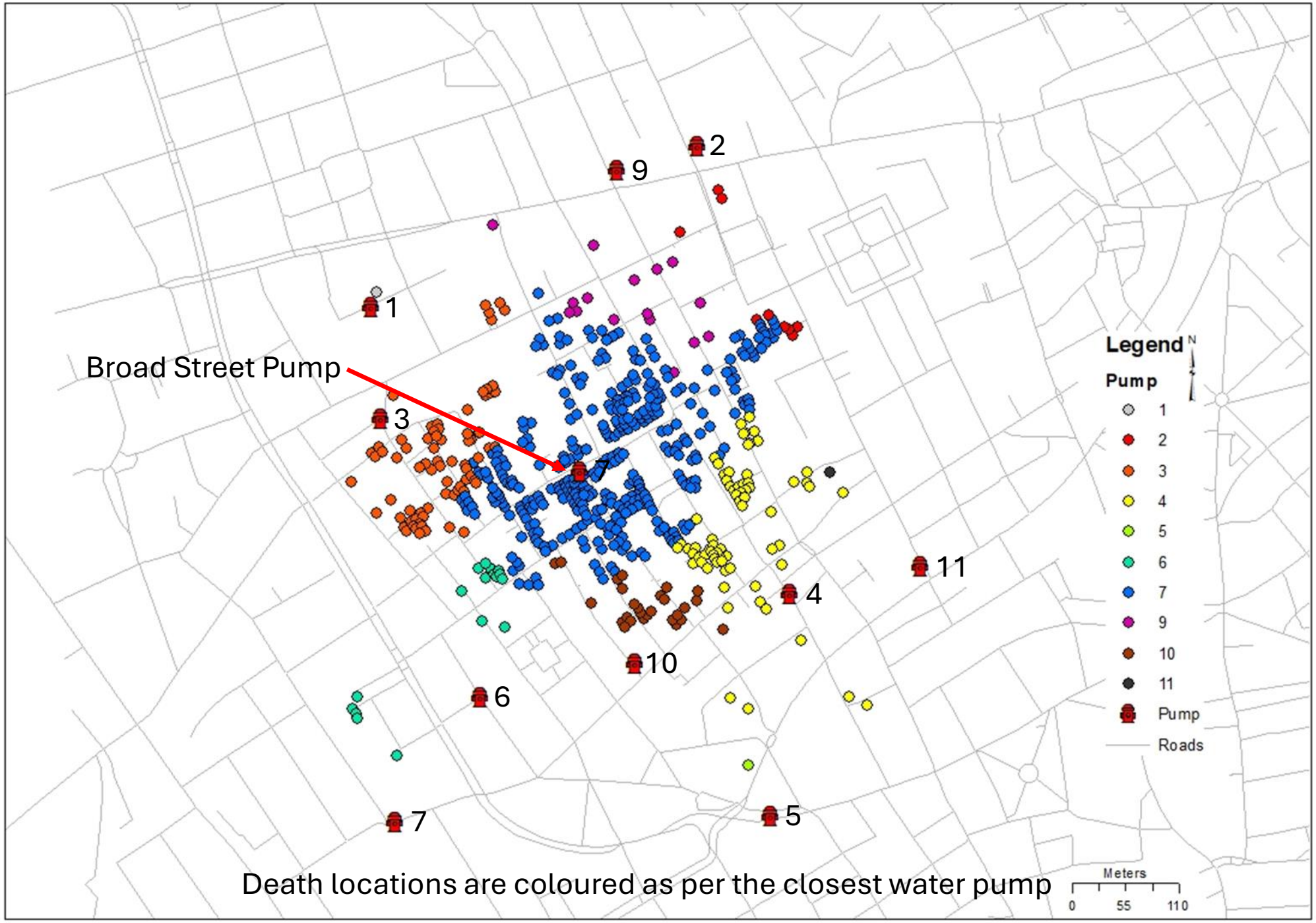
Network Analysis: closest pump



Death locations are coloured as per the closest water pump

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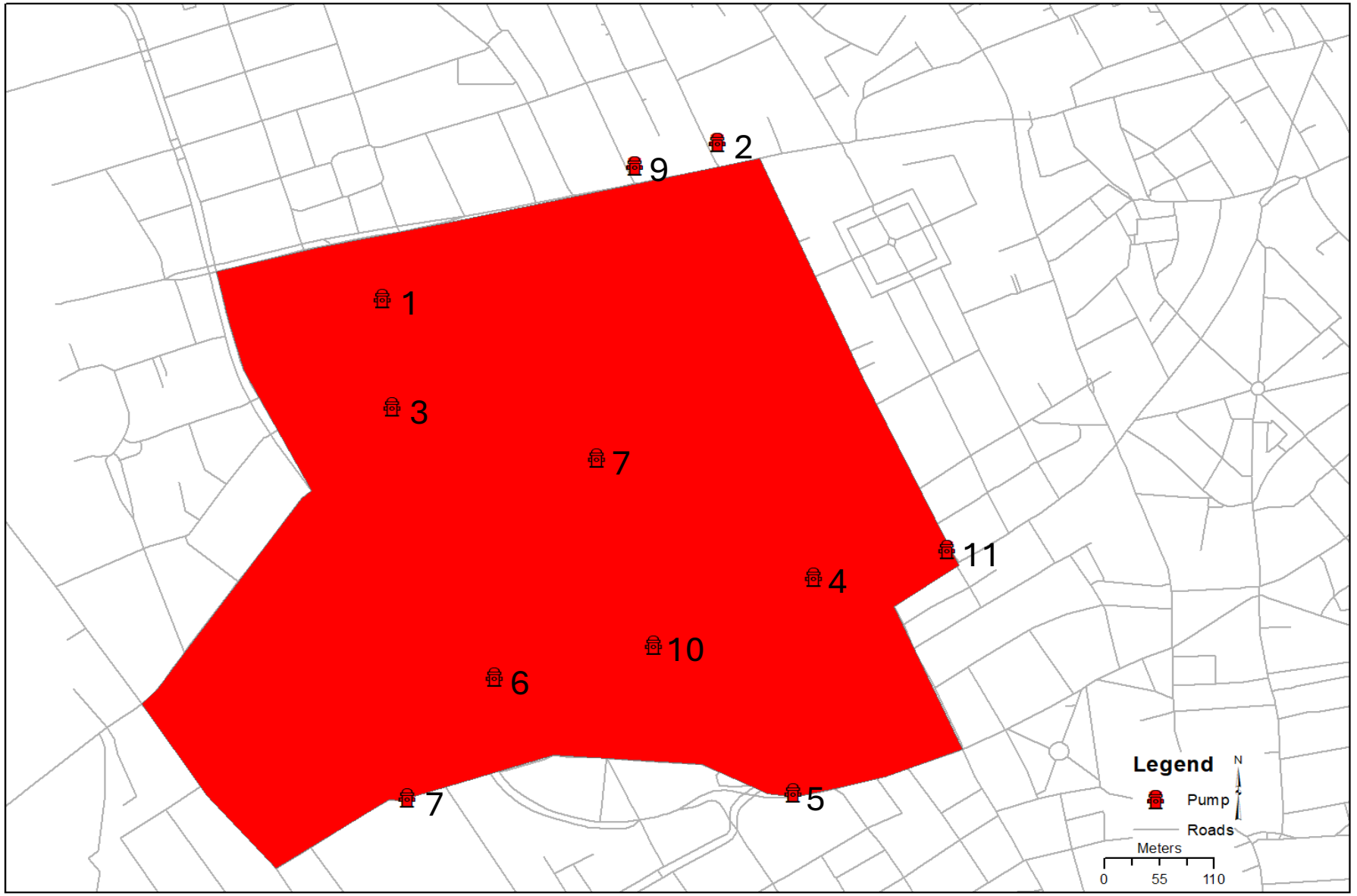
Now!

- Fast forward to the 21st century and would this be possible?
- Data provided by administrative units.
- Aggregated to area of analysis.
- More akin to what we get now!
- Cholera problem not solved.



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MAUP

The modifiable areal unit problem!

Don’t mention the MAUP
I didn’t and I think I got away with it!

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MAUP

- 40 years (1979) since Openshaw and Taylor defined the modifiable areal unit problem (MAUP).
- Highlighted the need to account for or solve MAUP.
- Significant growth in place and health research.
- Researchers may not identify with geography.
- Rise of desktop geographic information systems and improved spatial data availability.
- MAUP and the use of spatial methods no longer the domain of the geographer.

MAUP

- MAUP described with two key aspects - scale and zonation.
- Scale effect, major analytical differences depending on the size of units (generally correlations more pronounced for bigger units).
- Zonation effect zonation (Openshaw calls it the aggregation effect) - major differences depending on how the study area is divided (even at the same scale).

https://www.researchgate.net/publication/236219780_Paper [accessed Jun 18 2019].

MAUP

- MAUP is rarely discussed in spatial epidemiology.
- Results from analysis of health datasets are very sensitive to how the spatial zones are constructed, which makes the needs to consider MAUP important.
- In particular, zone design is likely to influence descriptive statistics of the health variables as well as the coefficients of any correlation or regression analysis undertaken (Flowerdew et al., 2008).

Analysing the Impact of MAUP on the March of Atopy in England using Hospital Admission Data

Nick Bearman[1], Nicholas J. Osborne[1], Clive Sabel[1,2]

[1]European Centre for Environment and Human Health, University of Exeter Medical School, Knowledge Spa, Royal Cornwall Hospital, Truro, TR1 3HD

[2]Department of Geography, College of Life & Environmental Sciences, University of Exeter, Amory Building, Rennes Drive, Exeter, EX4 4RJ

https://www.researchgate.net/publication/236219780_Paper [accessed Jun 18 2019].

MAUP Example using the ABS SEIFA Index

- ABS* calculate several Indices
- ABS confidentiality prohibits unit record census data being made available
- ABS provide SEIFA for spatial units
  - Collection District (pre 2011) or SA1 smallest unit
  - Also (pre 2011)Suburb, Postal Area, SLA,LGA and 2011 the SA1-SA4
- Remember MAUP & Ecological Fallacy
- Lets look at some of these spatial units

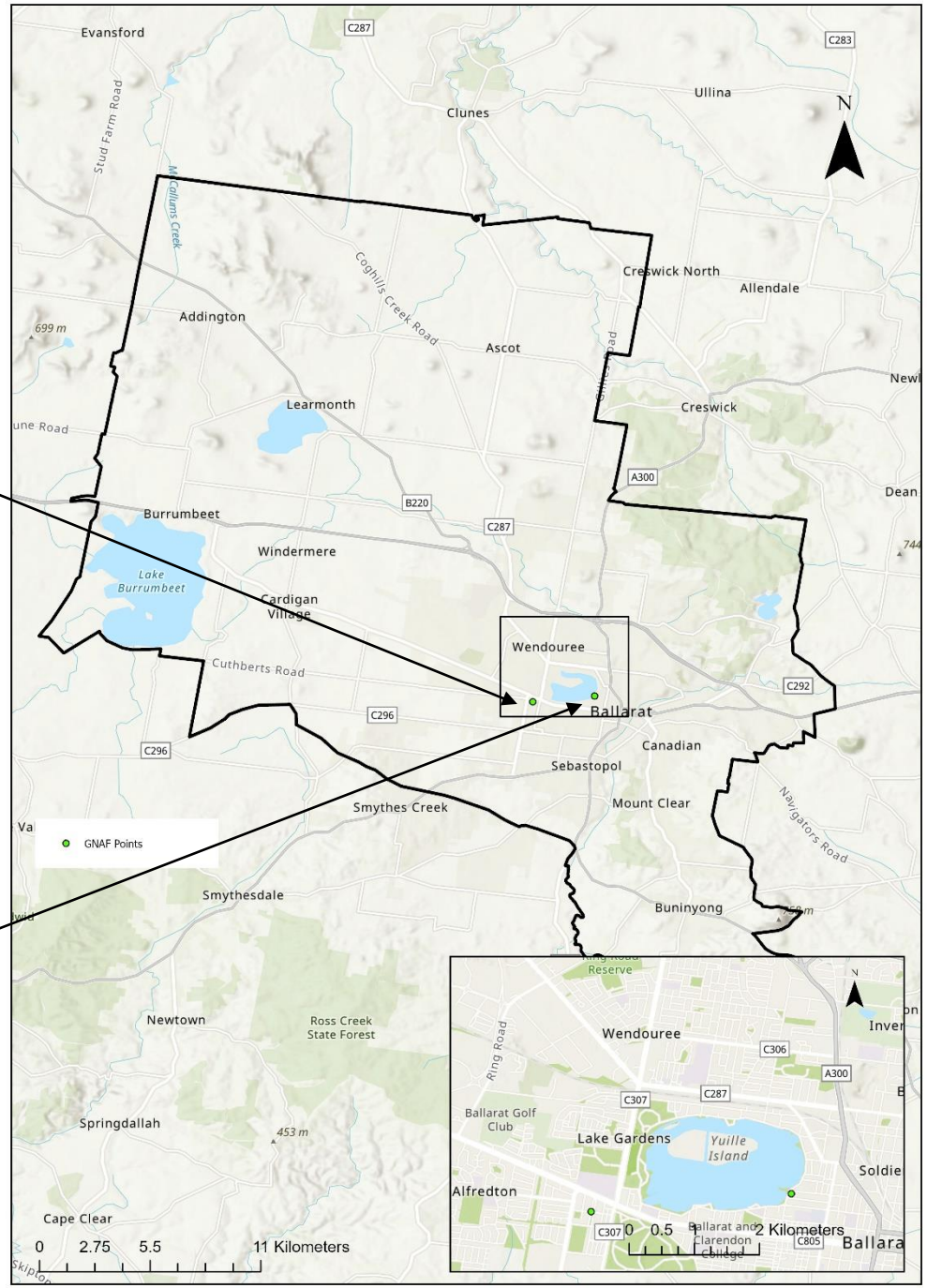
* Australian Bureau of Statistics

Ballarat: Base Map

SEIFA: Index of Relative Disadvantage

One house in a lowest decile SA1 (most disadvantaged)

One house in a highest decile SA1 (least disadvantaged)



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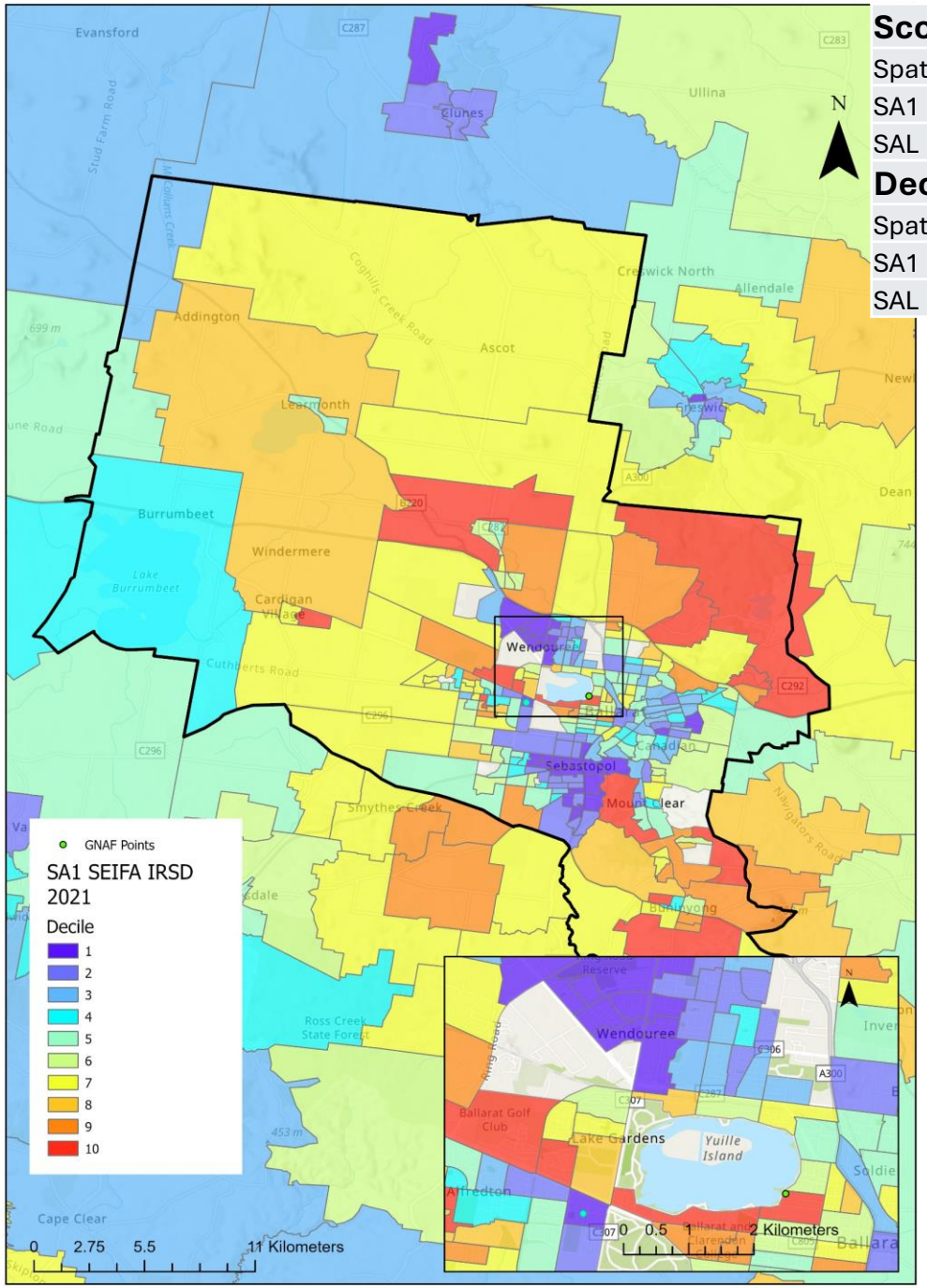
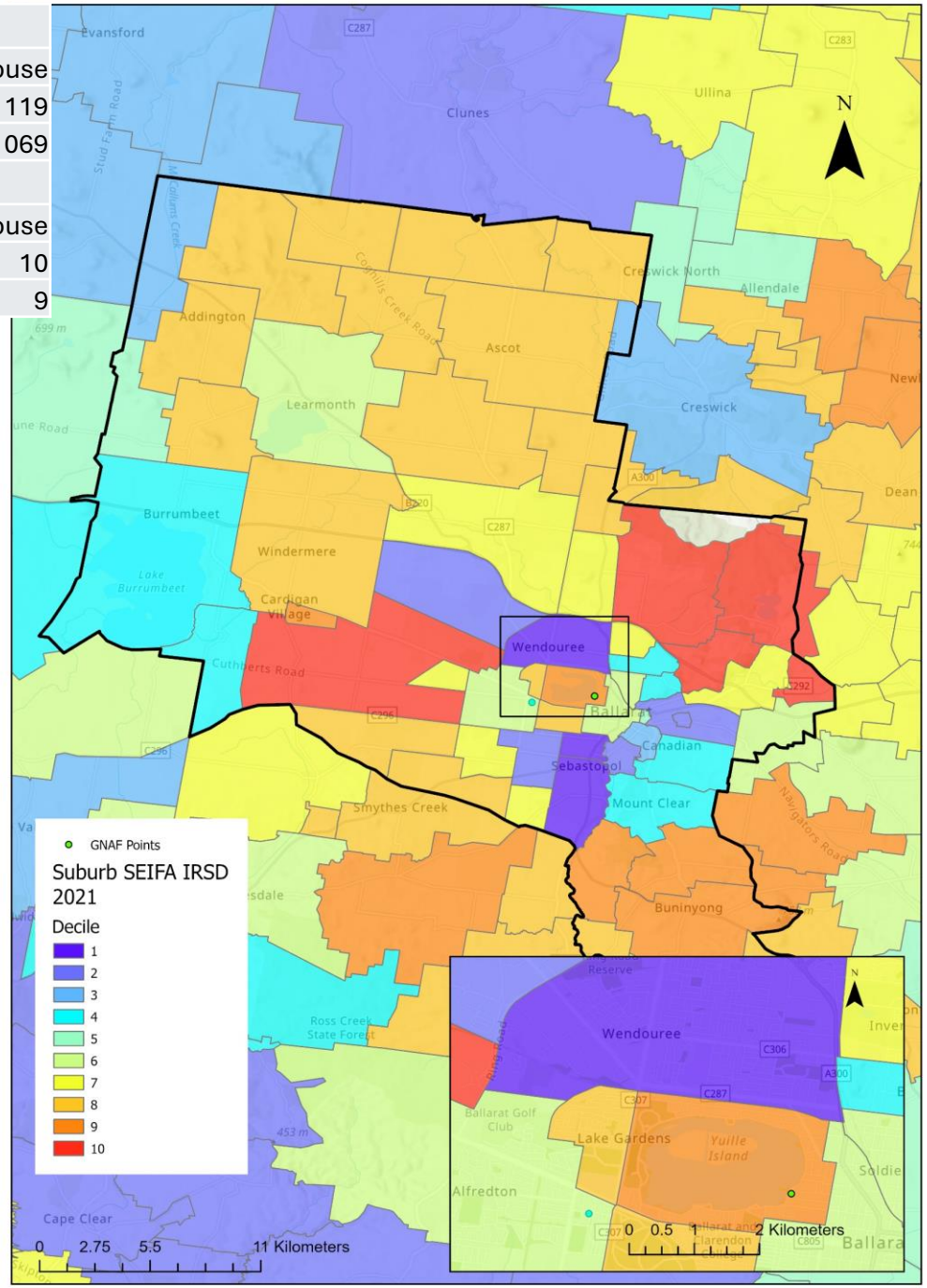
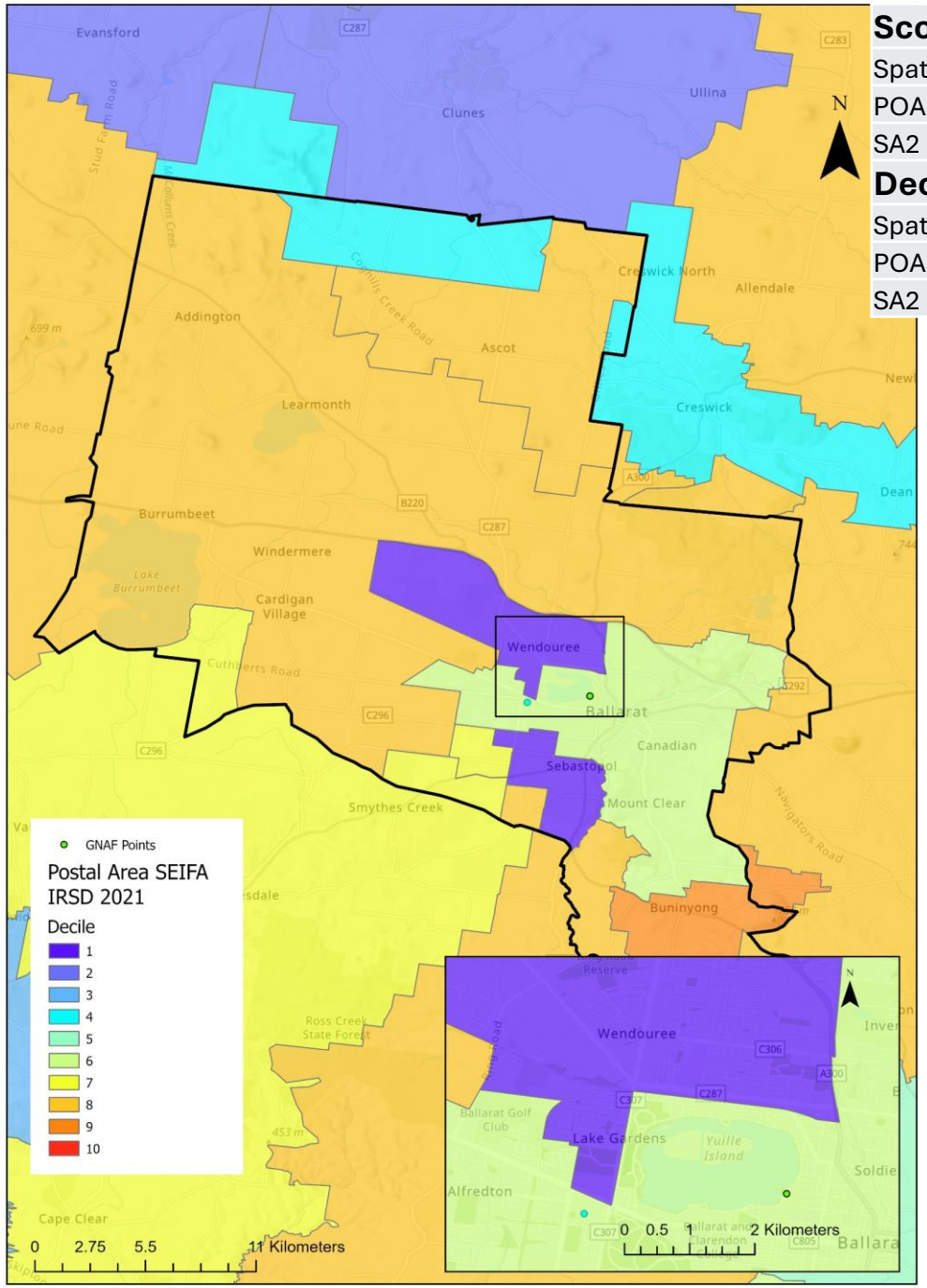
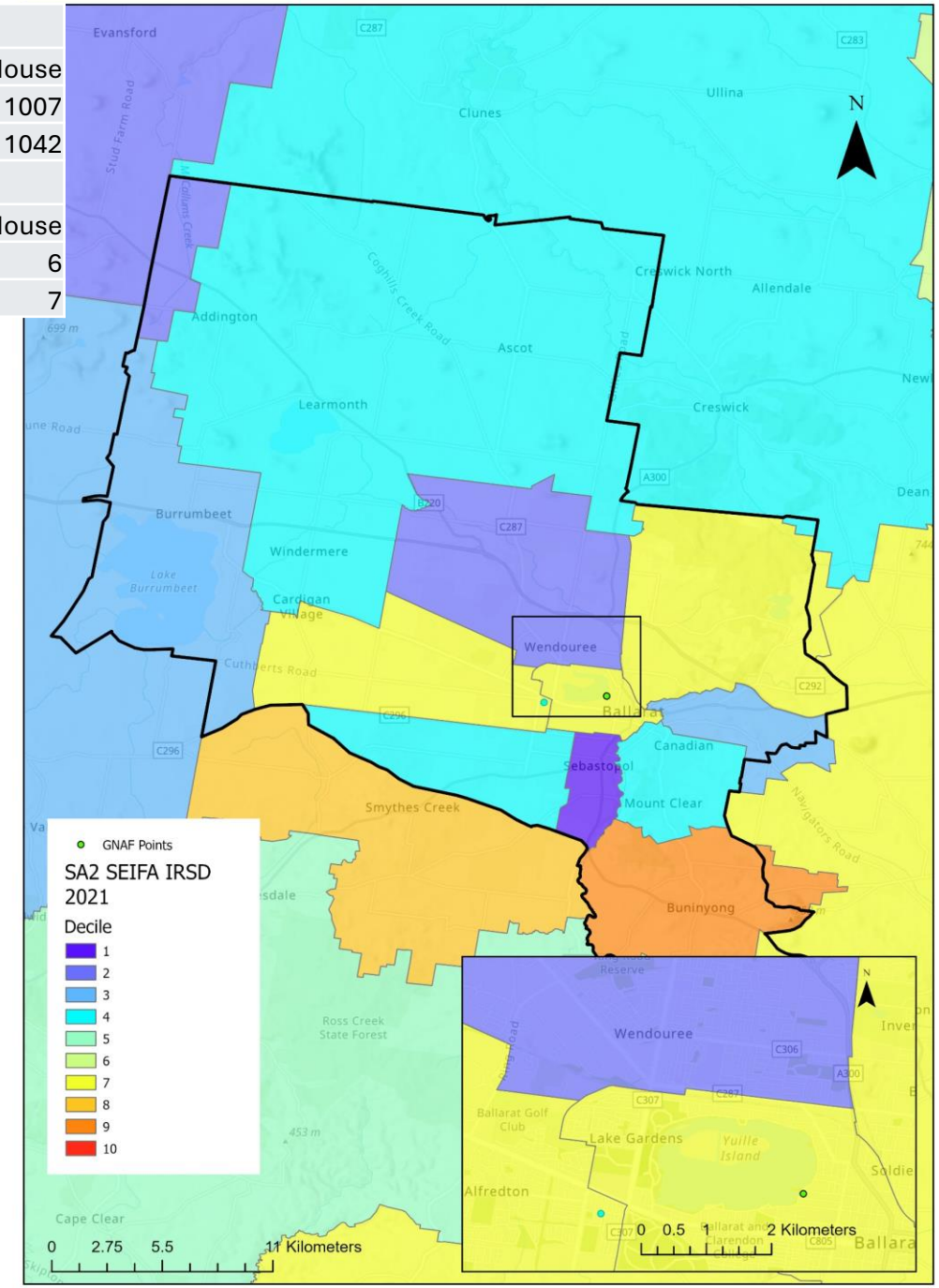
Score		
Spatial Unit	Low SEIFA House	High SEIFA House
SA1	832	1119
SAL	1026	1069
Decile		
Spatial Unit	Low SEIFA House	High SEIFA House
SA1	1	10
SAL	6	9

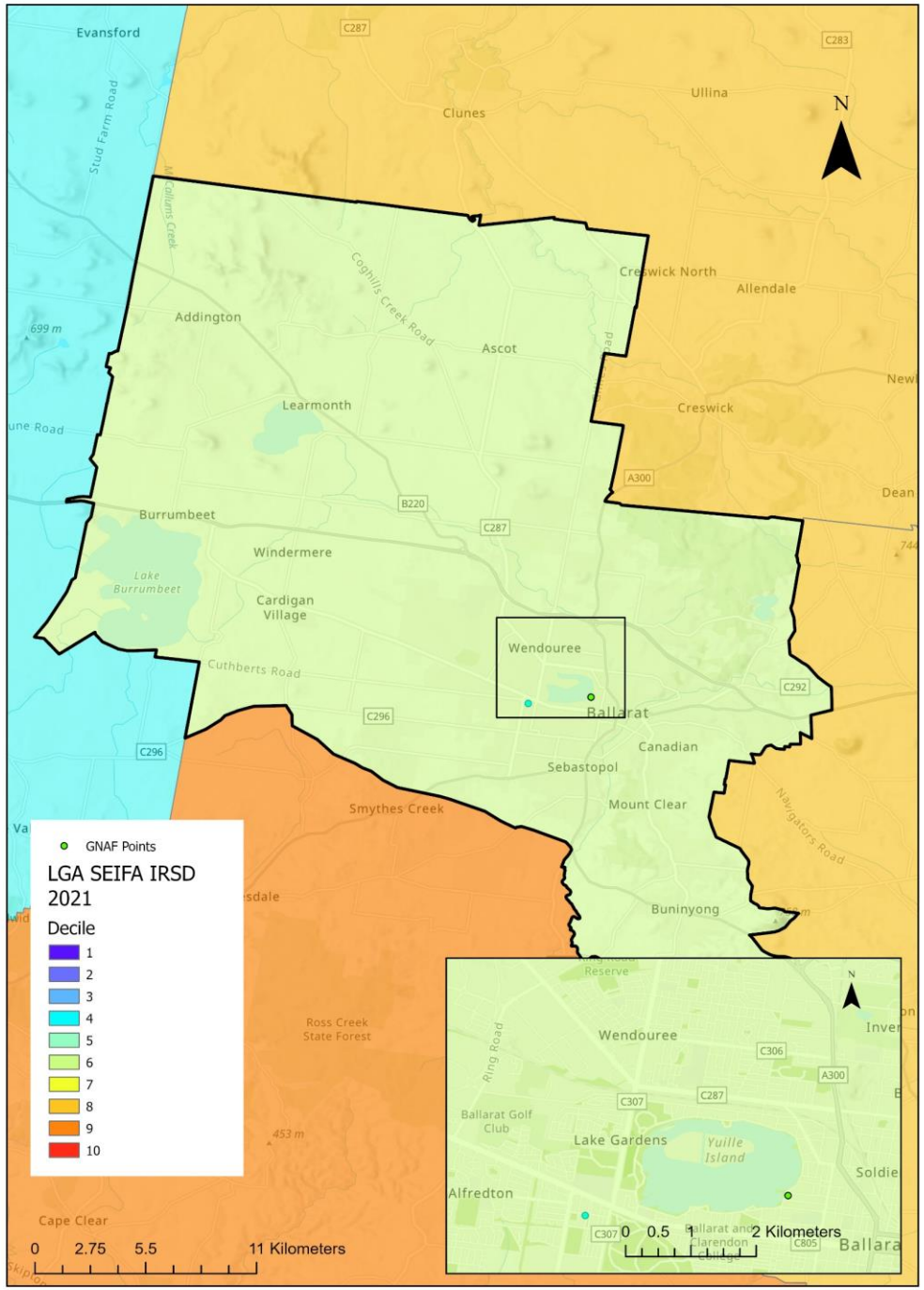




Score		
Spatial Unit	Low SEIFA House	High SEIFA House
POA	1007	1007
SA2	1035	1042
Decile		
Spatial Unit	Low SEIFA House	High SEIFA House
POA	6	6
SA2	7	7







Score		
Spatial Unit	Low SEIFA House	High SEIFA House
LGA	986	986
Decile		
Spatial Unit	Low SEIFA House	High SEIFA House
LGA	6	6

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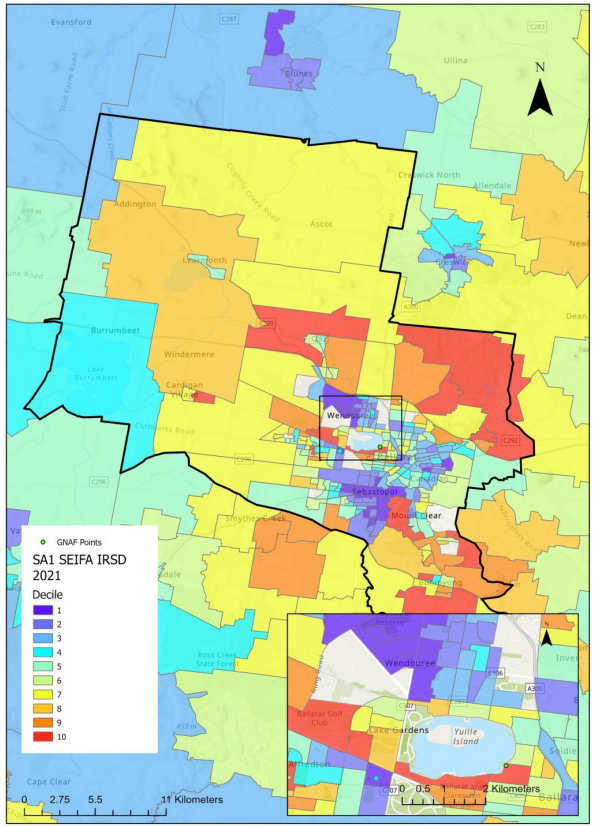
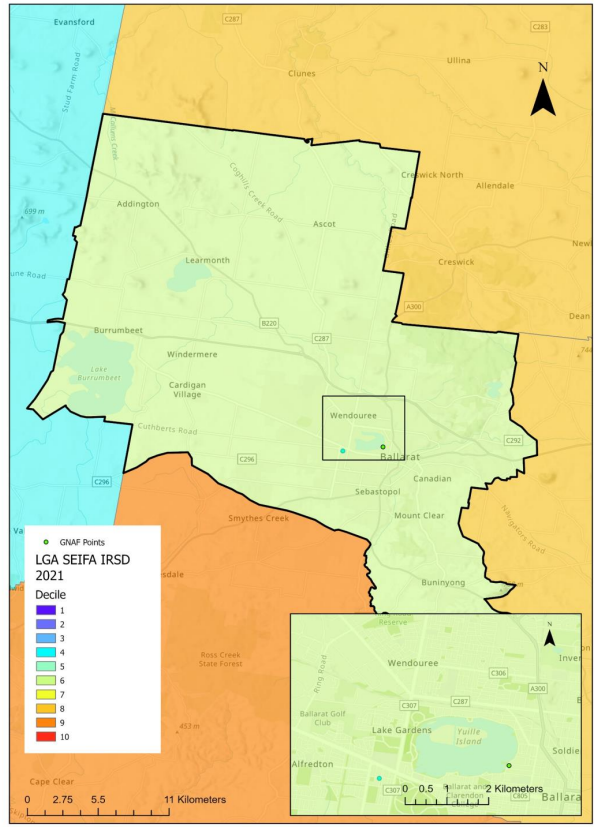


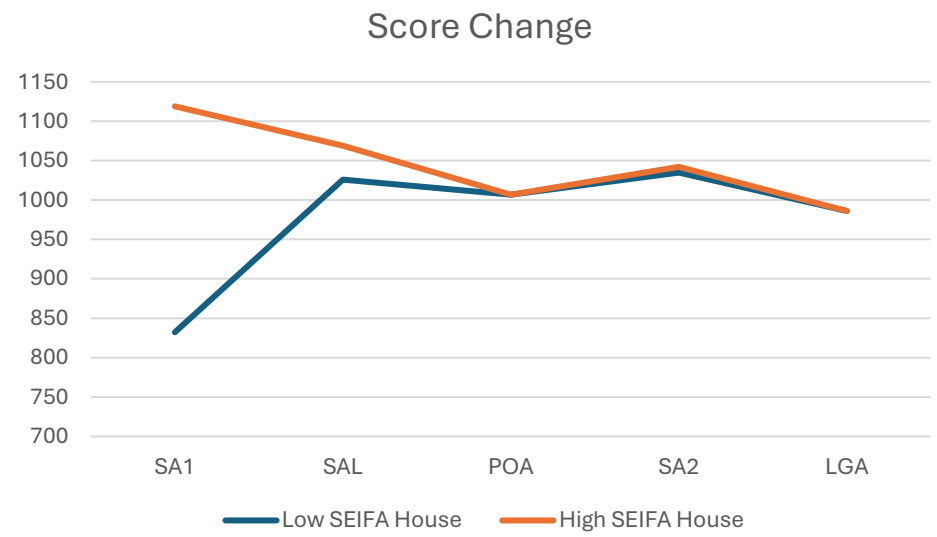
Score

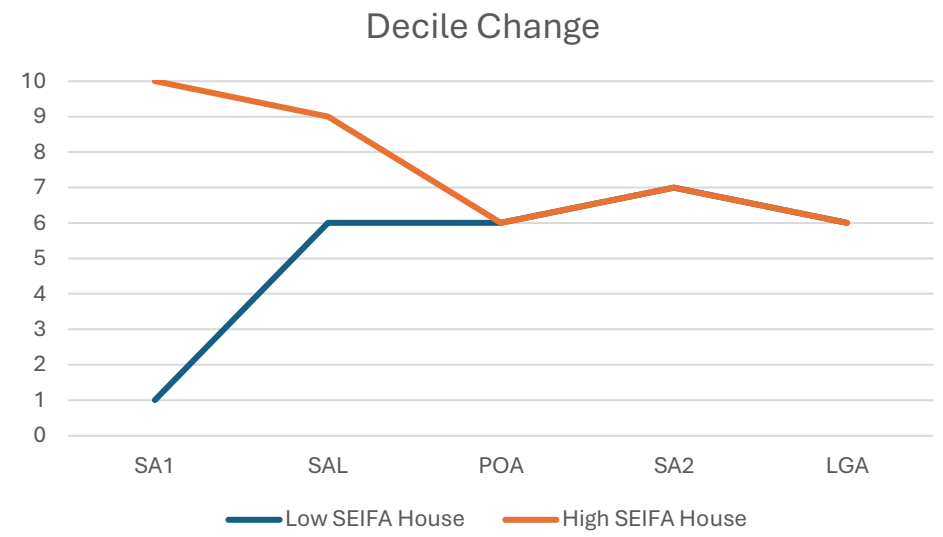
Spatial Unit	Low SEIFA House	High SEIFA House
SA1	832	1119
SAL	1026	1069
POA	1007	1007
SA2	1035	1042
LGA	986	986
Change	**154**	**-133**

Decile

Spatial Unit	Low SEIFA House	High SEIFA House
SA1	1	10
SAL	6	9
POA	6	6
SA2	7	7
LGA	6	6
Change	**5**	**-4**







MAUP

- Wide use of spatial methods created a large volume of place-health articles.
- Loss of spatial understanding and uneven recognition (reduced, overall) of the importance of the MAUP.
  - E.g. the widespread exploration of health outcomes and exposures measured using a variety of administrative spatial units (mesh blocks, census tract, suburbs, postcodes, county, state etc) without a clear understanding that this invokes MAUP.
- It is time to reassert the importance of the geographer in place health research teams?

SEIFA Example

- AIHW above use SA2 or larger spatial units for reporting – how does that account for the pattern of disadvantage that is evident at the SA1 or at the individual level?
- As most of the health outcome analysis in Australia uses the same spatial units – what are we able to identify?
- Broad patterns
- But not detailed patterns
- But we have the data the computing power and the expertise – so what is stopping better analysis.

COVID response

- Locked down:
- LGAs – Cities and States

- Did not use location intelligence
- Contact tracing and not location-based tracing (proximity)

Health Data

- Hard health outcomes difficult to access at a spatial scale that is meaningful
- Confidentiality problems
- We have the technology but generally lack the access to data
- Data available for administrative units that are not meaningful!
- MAUP issues

Health Data

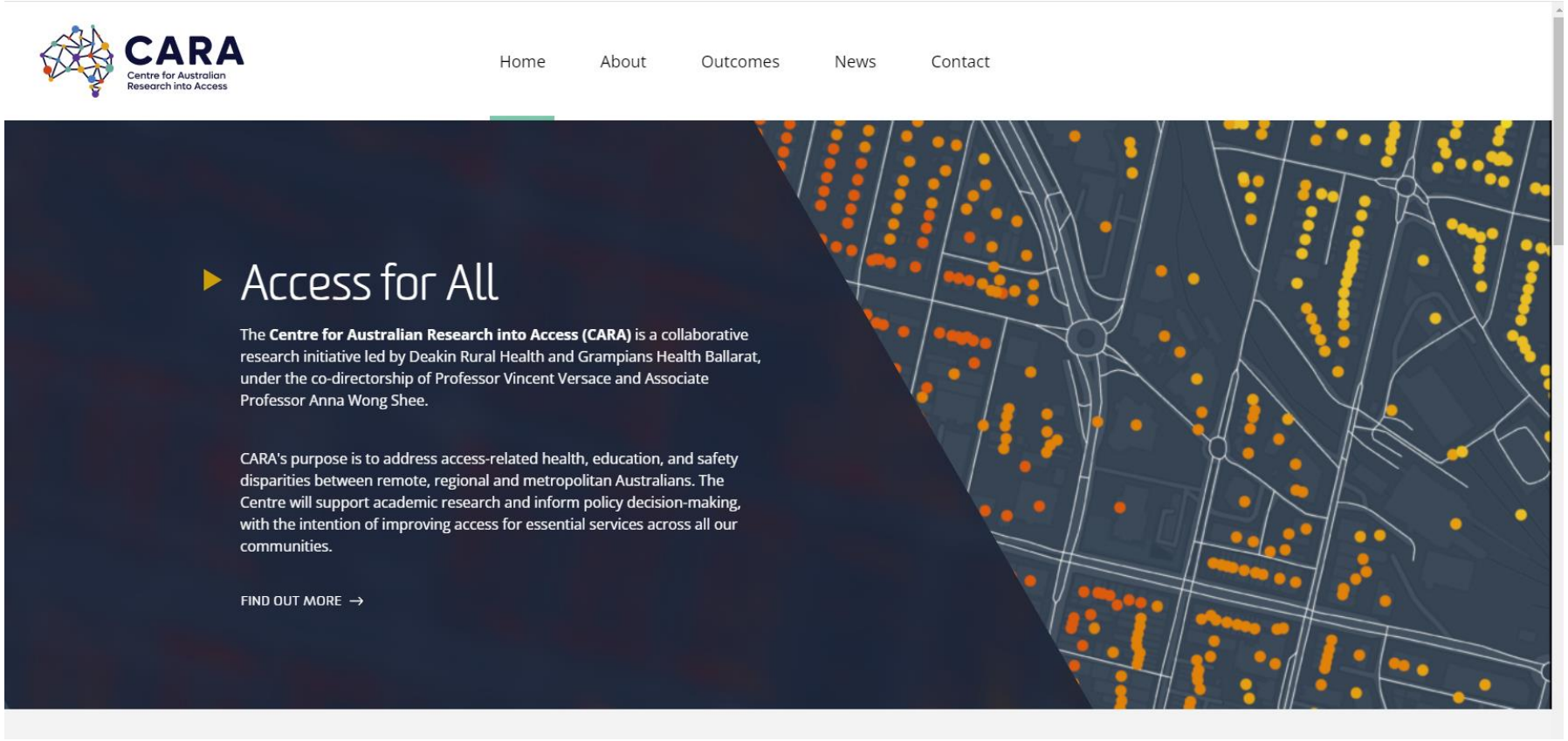
- Data linkage costs
- Poor quality data especially address data
- Enormous cost and time to geocode health data
- Apart from these issues – it is very difficult to get data for research

We should be OUTRAGED!

- We see significant technology improvements
  - (3D Cadastre); LIDAR; Geoscape, but….
- Health spatial data provision is very constrained!
- If we cannot improve the scale of data provision – we should at least recognise that MAUP could be a limitation/factor in the research outcomes!
- We could do so much!
- Highlights the importance of health geography
- Part of the solution?

CARA

- The Centre for Australian Research into Access



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CARA Centre for Australian Research into Access

Centre for Australian Research into Access (CARA)

- Significant **advancements** in geospatial technologies over the last 30 years.
- **Little or no change** in the geography of demographic and health data (scale).
- CARA offers a **paradigm shift** in the research and understanding of access to services.
- CARA developed **fast** network processing infrastructure that can be applied at the **dwelling scale**.
- **Distance and time** to a list of services and facilities at the GNAF point along the road network across **the whole of Australia**.
- Partnered with **Grampians Health** which provides **detailed health data** for 48,000 km^2 and is home to nearly **250,000 people**.
- We will be analysing health data at the **unit record** level and **address location**.

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ARA
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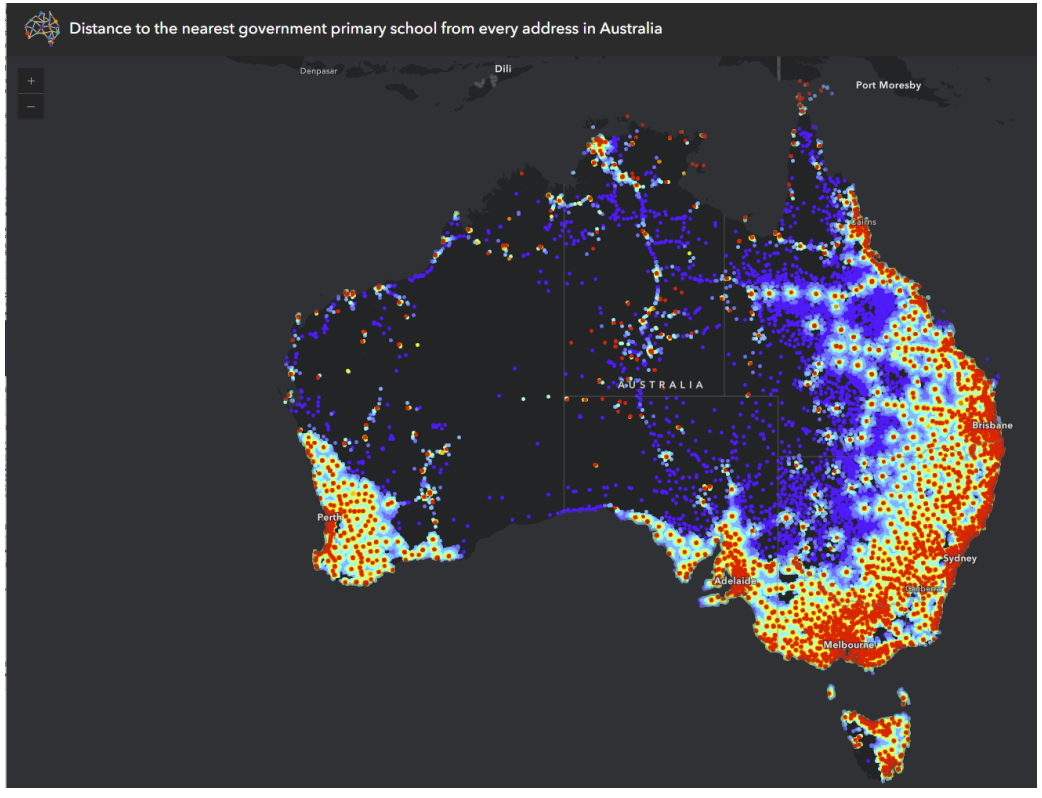
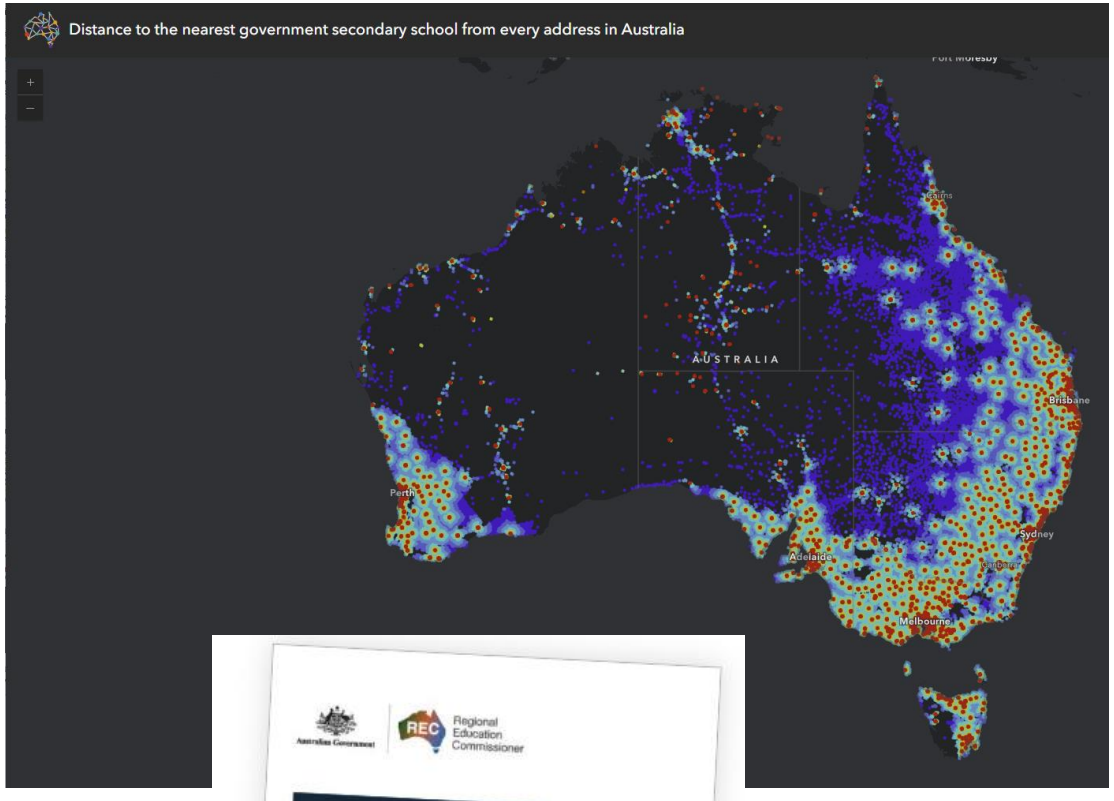
into Access

Centre for Australian Research into Access (CARA)

- Provided distance maps for the Rural Education Commissioner





Just completed a review of the Modified Monash Model for Health Workforce planning for Commonwealth Health

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https://www.education.gov.au/regional-education-commissioner/resources/regional-education-commissioner-annual-report-2023

CARA Centre for Australian Research into Access

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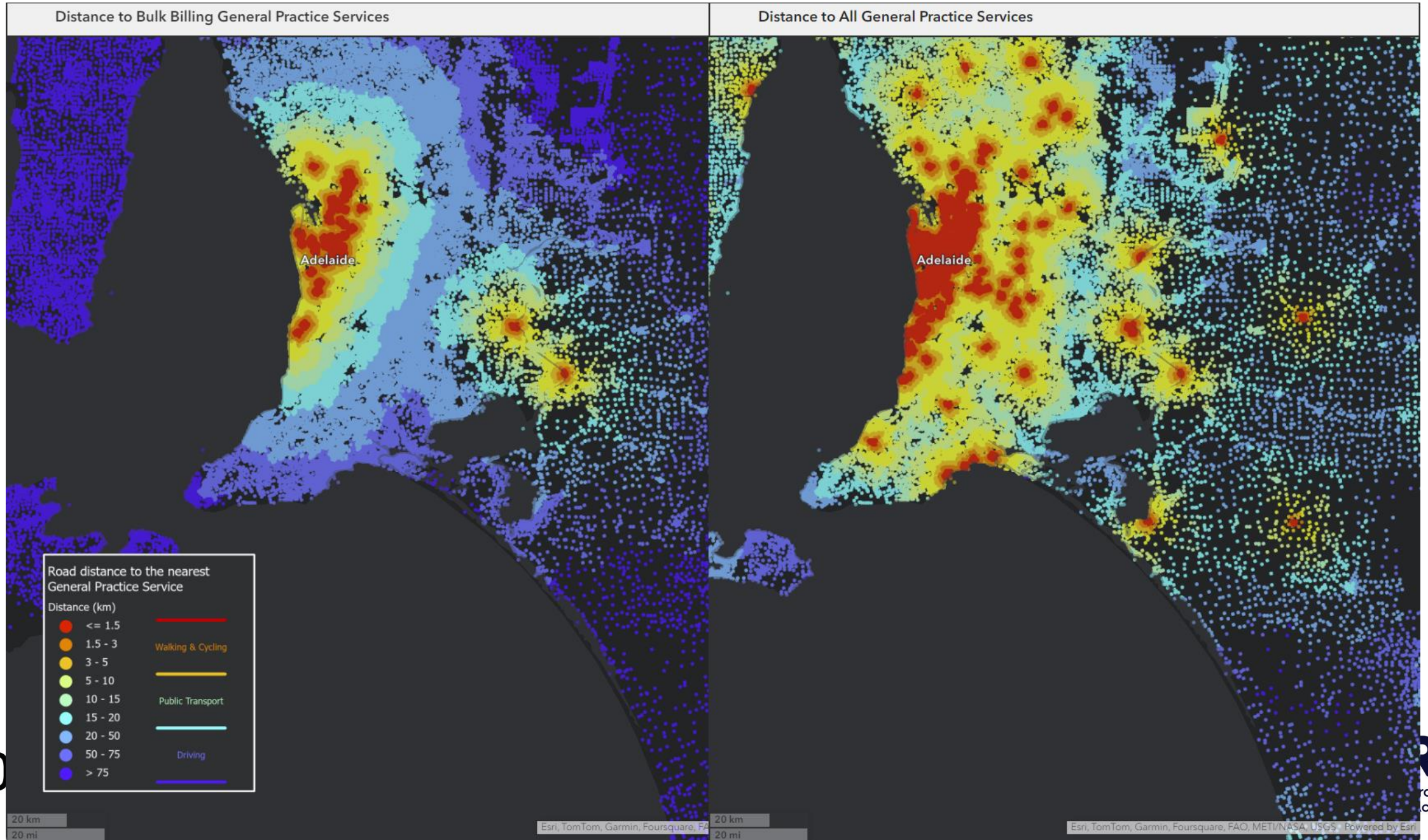

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Synthetic Population

- At CARA
- We are building a GNAF point based data set with time and distance to a vast list of services and facilities (as per the last few slides and more in a later presentation)
- Working with the ABS address register to identify dwelling points (to remove non-dwelling GNAF points)
- Working with Professor Robert Tanton to build a synthetic population at the GNAF point.

Synthetic Population

- Once the synthetic population is completed, we will look to add other data:
  - National Health Survey
  - Expenditure
  - Other survey data (YTBD)

- Then we will analyse relationships and associations using the synthetic population
- The only way to indicate if our work is not correctly identifying issues is to use the real data!!!!

Final Thoughts

- As a research community we should be more critical of health data supply
- We should be using every means to highlight what we can do V what we are allowed to do
- Health is one of the largest national/state budget items, so getting a more informed base for policy should be a priority
- Perhaps if we make more noise this may change in the future
- These data are available – but not accessible
- We need to change that!!