Creating an Australian geocoded synthetic Census to calculate access to services for different groups of the population

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Outline

- Project
- Literature Review
- Method
- Validation
- Results

Project

- LIEF Grant
  - Calculate geographic access to services and facilities to help plan an equitable resource allocation for Health services
    - Create a synthetic population
    - Geocode to dwellings
    - Calculate time to services/facilities
  - Recognise that don’t have this data but essential when locating services
  - Also essential for geographic analysis using own geographies
  - Synthetic – anyone can use it with no privacy concerns
- Long term project over 2024 and 2025

Literature Review

- Synthetic Populations

Literature Review – Countries using synthetic populations

- Germany (Munnich et al, 2021 - Mikrosim)
- UK (Wu et al, 2022)
- US (Whitworth, 2022)
- Canada (Spielauer et al, 2013)
- American Samoa (Xu et al, 2017)
- Australia (Mokhtrain et al, 2014; Tanton et al, 2011)
- Bangladesh (Rubinyi et al, 2022)
- Namibia (Thomson et al, 2018)
- Austria (Templ et al, 2017)

Literature Review - Methods

- Sample based and sample free synthetic populations
    - Sample based needs a starting sample
        - Synthetic population contains people from the sample
    - Sample free is purely synthetic
        - No confidentiality risk from sample
- Decided on sample free so anyone can use

Method

- Stages
  - Derive full synthetic population for SA2 based on limited aggregate data from Census
    - Separate Household, Family and Person files
    - Assign people to families based on family type and age
      - Use rules, eg, not more than 10 years apart initially for marriage
    - Assign families to households
  - Assign to dwelling register
    - Enhanced G-NAF using ABS address register
    - Currently random by SA2 but can add rules when have more information

Validation

- Against aggregate SA2 data
  - This is the data we started with
- ABS is partner on grant and talking about individual level validation against Census data
  - Waiting for University PLIDA access

Validation – Total Population

- Absolute value of difference to Census data by SA2
- Because have at SA2 level, can show distribution in boxplot
    - Median (50%), 25%, 75%, extremes

Validation – by Age and Gender

Validation – Number of households and families

Validation – Family type and number of people in family

Number of dependent and non-dependent children in family

Number of people in household

Overall Validation

- Absolute difference as a % for each SA2
- Averaged to get difference across Australia

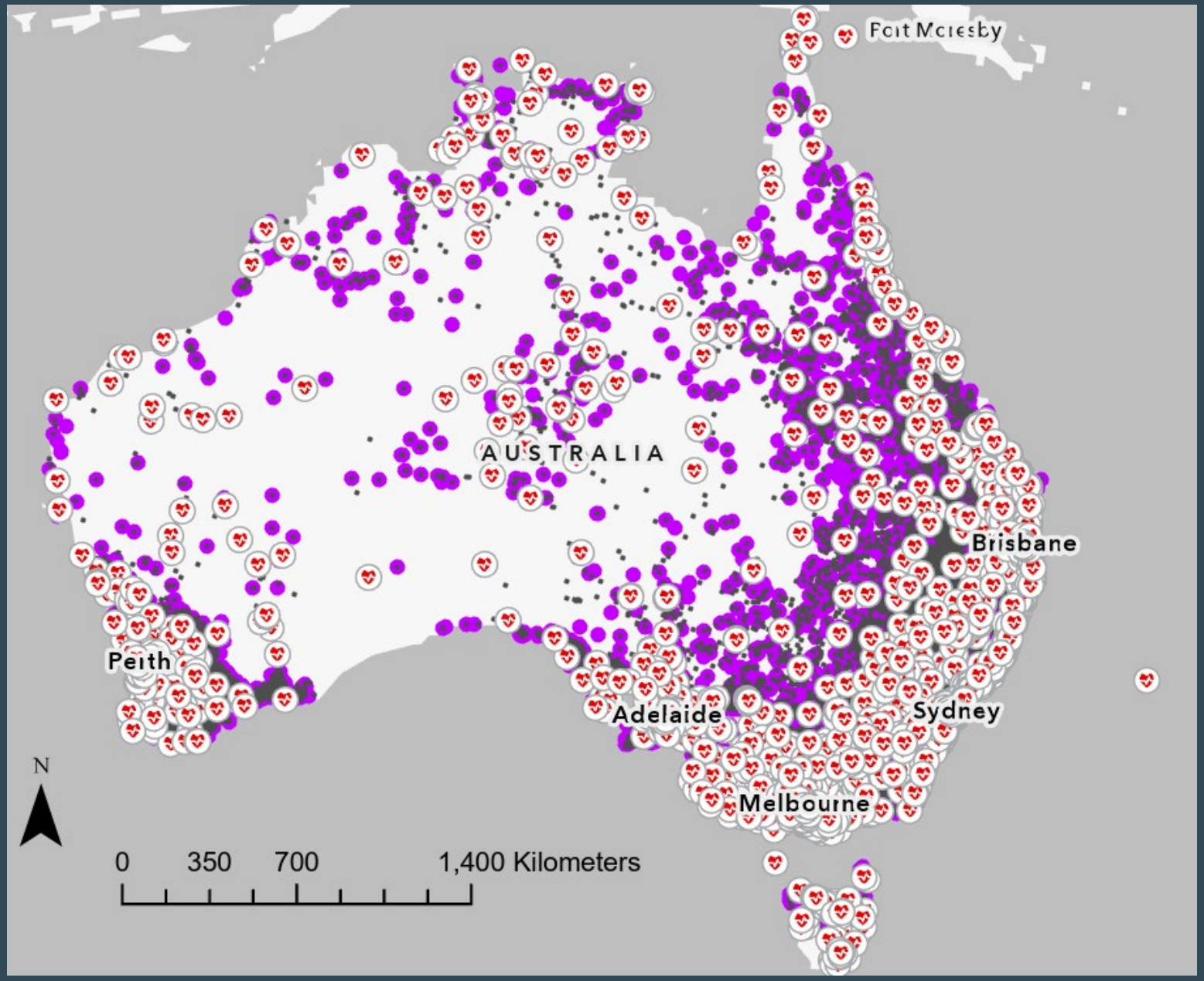
Benchmarking

- Know total number of households in SA2
- Geocoding to G-NAF better if HH total in SynPop matches G-NAF
- Force number of HH in SynPop to known SA2 HH counts

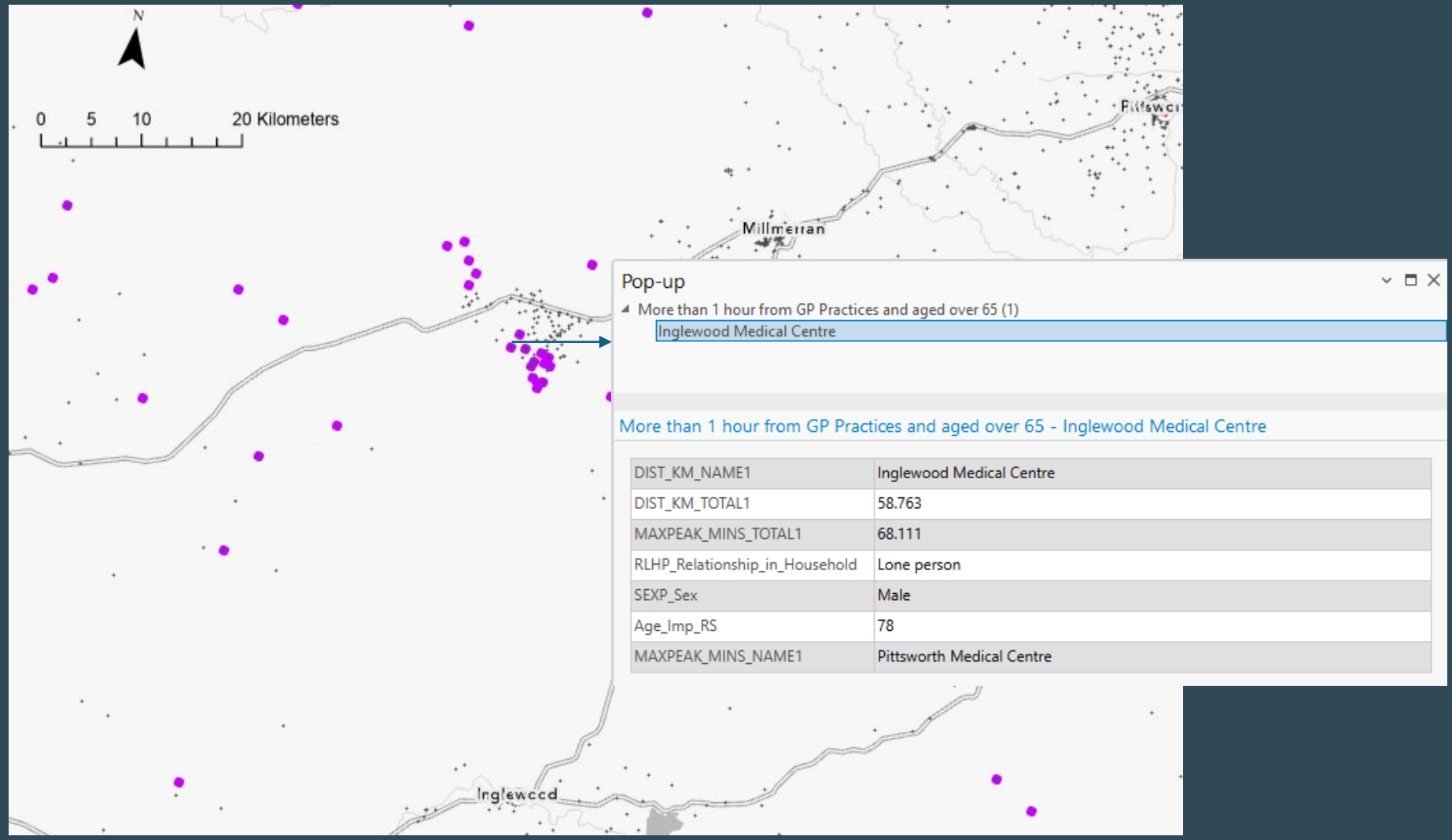
Time to services

- Travel time on road network
- Conservative assumptions about speed if don’t have speed

Time to services



Results - Millmerran



Further work

- Non Private Dwellings
  - Prisons/nursing homes have 700 people/families/households in 1 building
  - Not a problem for hospitals, hotels as using usual residence data
  - Is a problem for nursing homes, prisons, etc
- Same sex couples
  - ABS has the data on Census but need to incorporate into SynPop
- Impute other variables using microsimulation probabilistic methods
- Working with ABS to validate and refine
- Add policy microsimulation models – need unit record data

Policy Modelling

- Microsimulation models need unit record data
- We have geocoded unit record data
  - Tax/Transfer model
    - Impact of changes in tax rates at household level
  - Housing model
    - Impact of changes in CGT at dwelling level

Lessons

- Is possible to get a synthetic census with good results
- Won't be exactly the same as Census – don't want it to be
  - We have the Census already
  - If want SA2 level data, use the Census
- Is useful for calculating distance and time to residences of particular groups of the population
  - Need to aggregate as do have model error and isn't actual Census data
- Can be used to link to other microsimulation models, eg, tax/transfer
  - Get policy change impacts to households and aggregate to small areas
- Spatial analysis where need smallest area possible
  - Cluster analysis, impact of pollution, reducing MAUP
- Other uses?

Thanks

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- Centre for Australian Research into Access, Deakin University
  - Vin Versace, Neil Coffee, Marcus Blake, Sam Quinsey

Literature

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Questions

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