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Introducing Lower Zones for analysing neighbourhood patterns of health and social outcomes across New Zealand

Drs Daniel Exeter, Jinfeng Zhao, Arier Lee,
Sue Crengle and Michael Browne
School of Population Health
d.exeter@auckland.ac.nz

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Background

- Statistics New Zealand is responsible for releasing census and other social data at various geographic scales
  - Meshblocks (mean pop 91 max 1,899)
  - Census area units (mean pop 2,108 max 11,700)
  - Territorial Authorities
  - (District Health Boards)
  - Regions
  - New Zealand

- The public may be familiar with larger administrative units such as General Electoral Districts
  - but they potentially mask communities of severe disadvantage
  - Meshblocks are too small to release health data
  - Census areas are too variable in population distribution and social economic status

Background (2)

- Zone design uses geographical boundaries as ‘building blocks’ to create custom geographies
- A number of automated zone design packages exist, but they:
  - Are not user friendly
  - Produce irregular shapes
  - Restrict the number of constraints and/or design criteria that can be applied
  - Struggle to consider elements of the physical and social environment
- In this study, we review these tools and demonstrate the development of a new geographical boundary file for New Zealand
- The new geography is optimized for social and health research

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Zone design criteria

Criteria considered	Type of Constraint	Priority
Geographic contiguity	Hard	5 (high)
Population equality	Hard	5
Respecting existing boundaries of interest (Area Units)	Soft	4
Respecting elements of physical and social environment	Soft	3
Internal homogeneity	Soft	2
Compactness	Soft	1 (Low)

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Zone design tools

Author	Zone Design Tools	Zone Design Criteria Considered						Characteristics
		Contiguity	Population equality	Internal homogeneity	Compactness	Respect boundaries	Respect environment	
Martin (2003), Cockings, Harfoot et al. (2011)	AZTool (VB .NET)	√	√	√	√	√		Automatic, free download, considers 5 criteria, not easy to use.
Flowerdew, Feng et al. (2007)	Fortran program	√	√	√	√	√		Automatic, considers 5 criteria, not easy to use. (not considered in our research)
Guo and Jin (2011)	iRedistrict (Java)	√	√	√	√	√		Automatic, licensed, user friendly. Offers the opportunity to visually and manually preserve areas of interest. (Latest version support homogeneity)
ESRI	ArcGIS Districting	√	√	√	√	√	√	Semi-Automatic, ArcGIS free plug in, user friendly. Considers all 6 criteria and integrates human visual power.

Using ArcGIS Districting to construct Lower Zones

Methods/Procedures

Define Criteria and Rules for Zone Development

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Select Right Tools

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Add Proper Layers as References

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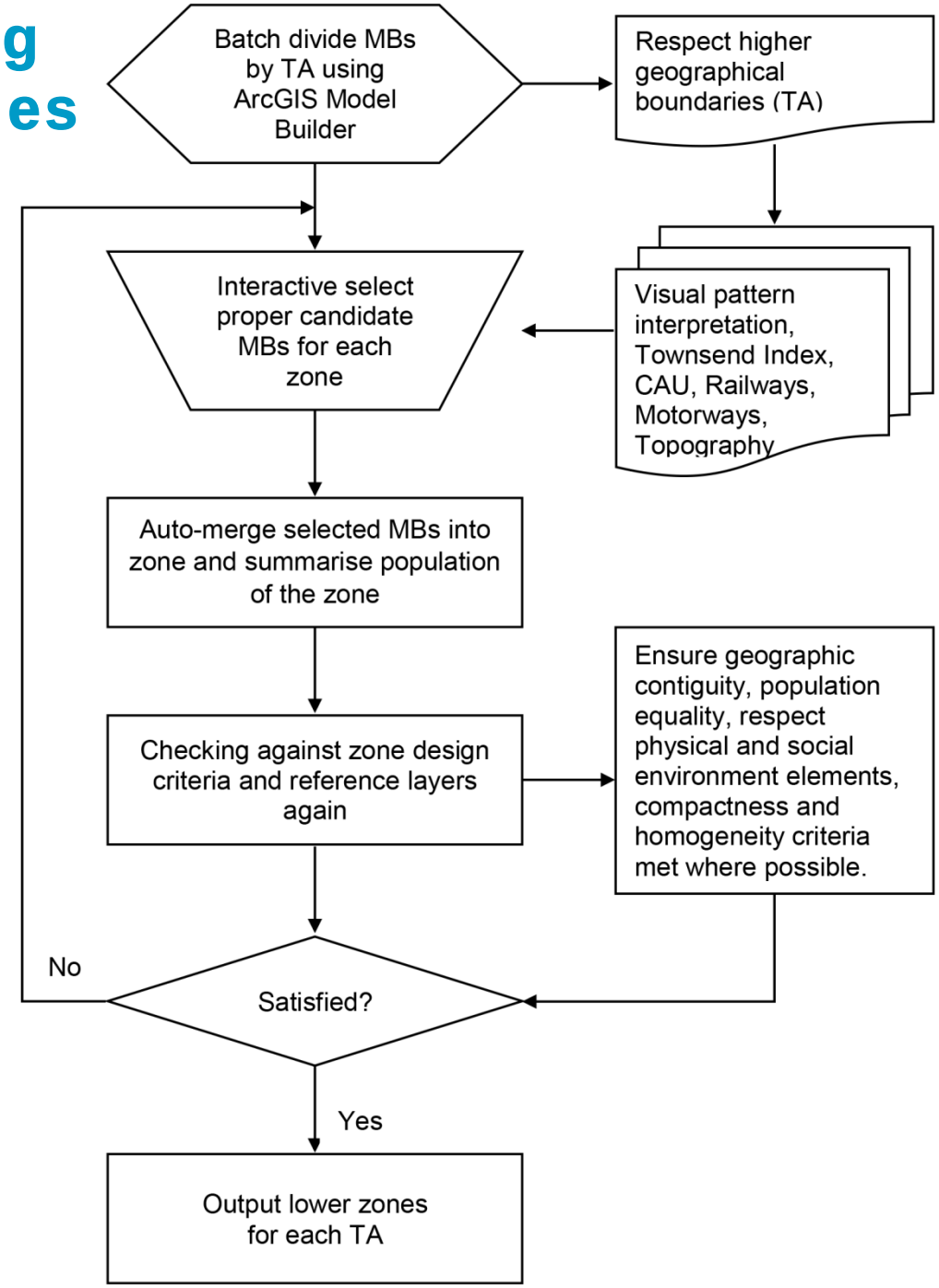
Use an Interactive Tool to Develop Sensible Zones



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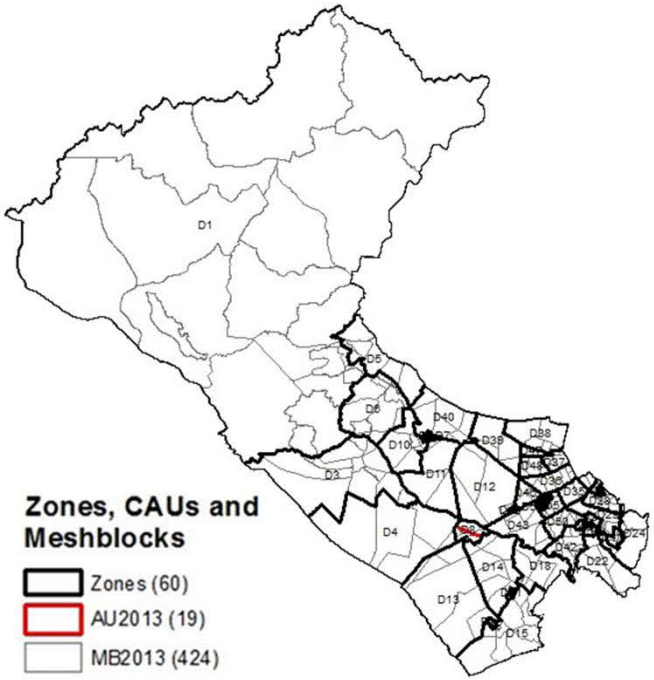
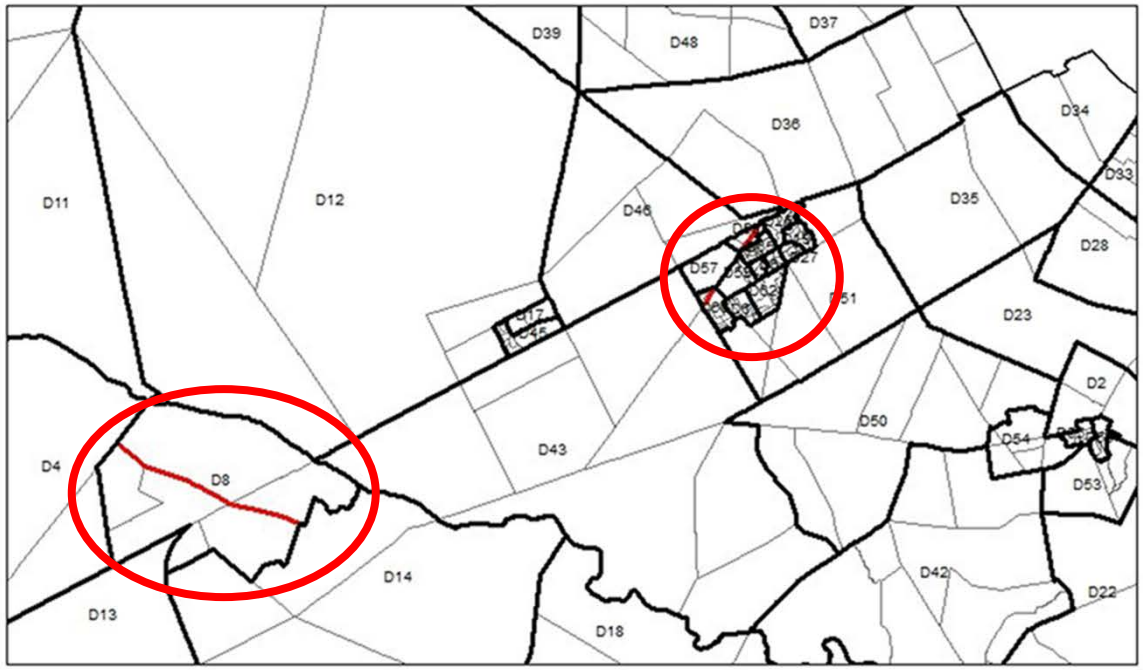
LZ, MB, and CAU boundaries in Selwyn

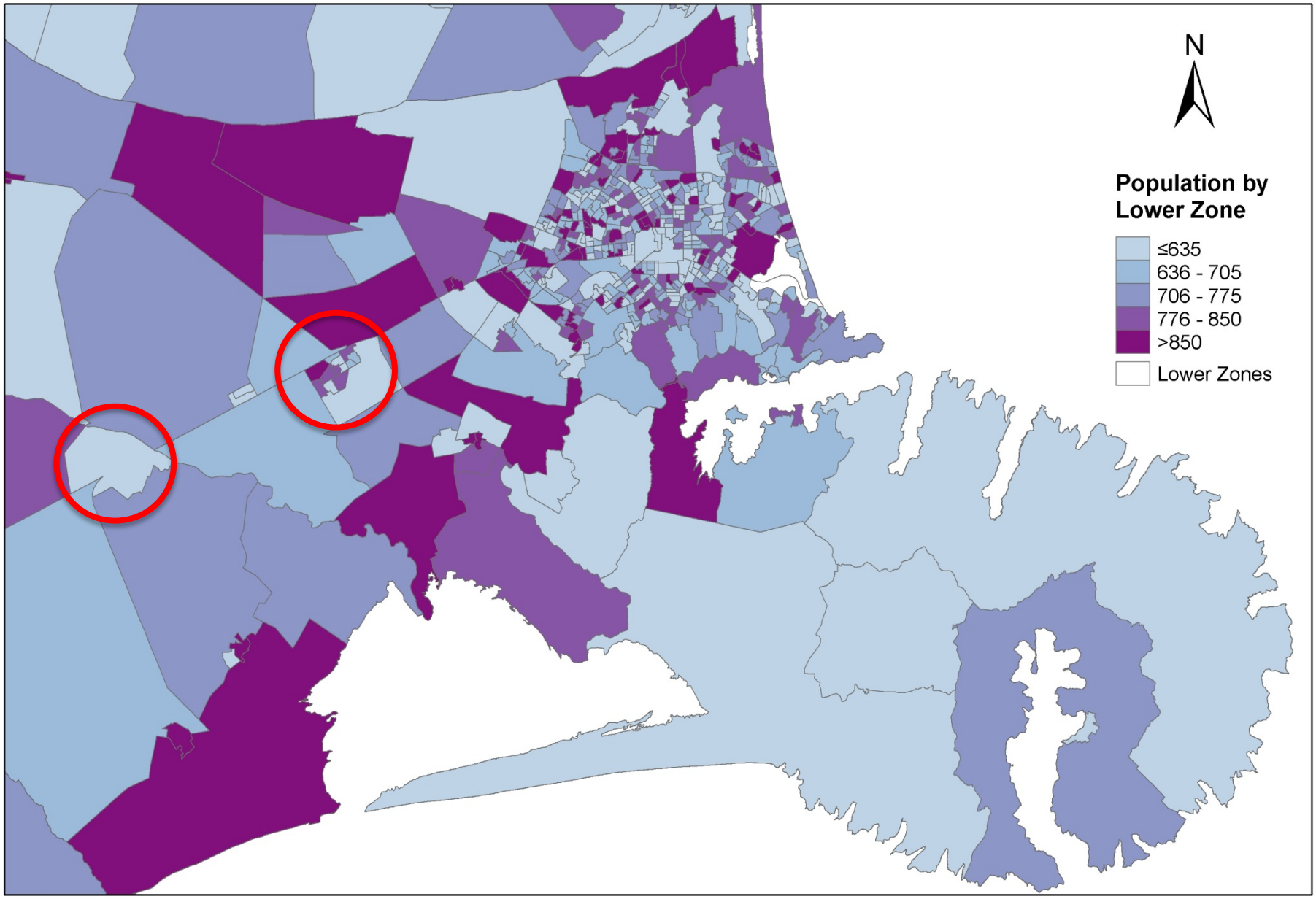
Selwyn District



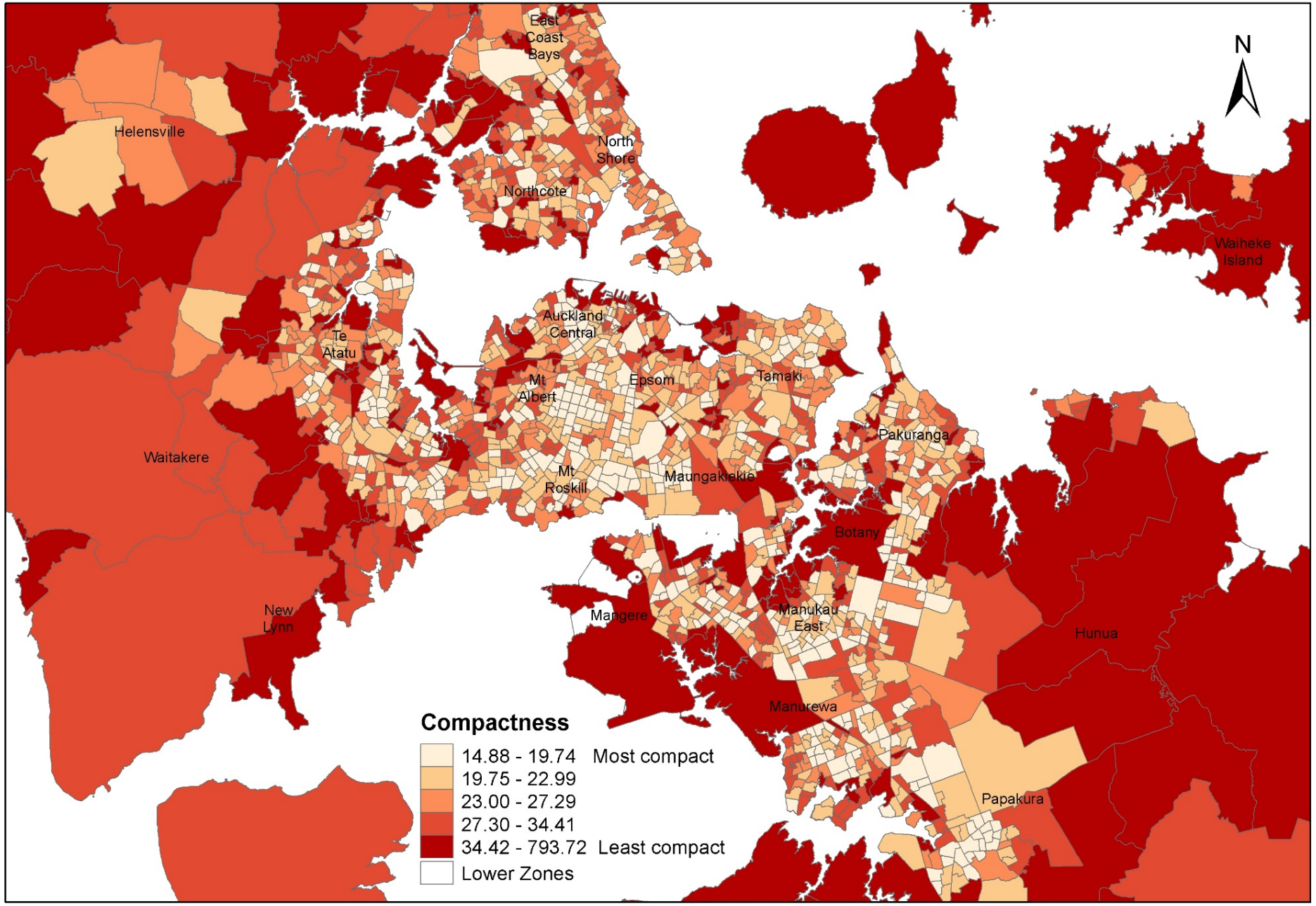
Close-up of Burnham and Rolleston



Lower Zone populations for Christchurch and its surrounds



Lower Zone compactness for Auckland Urban Areas



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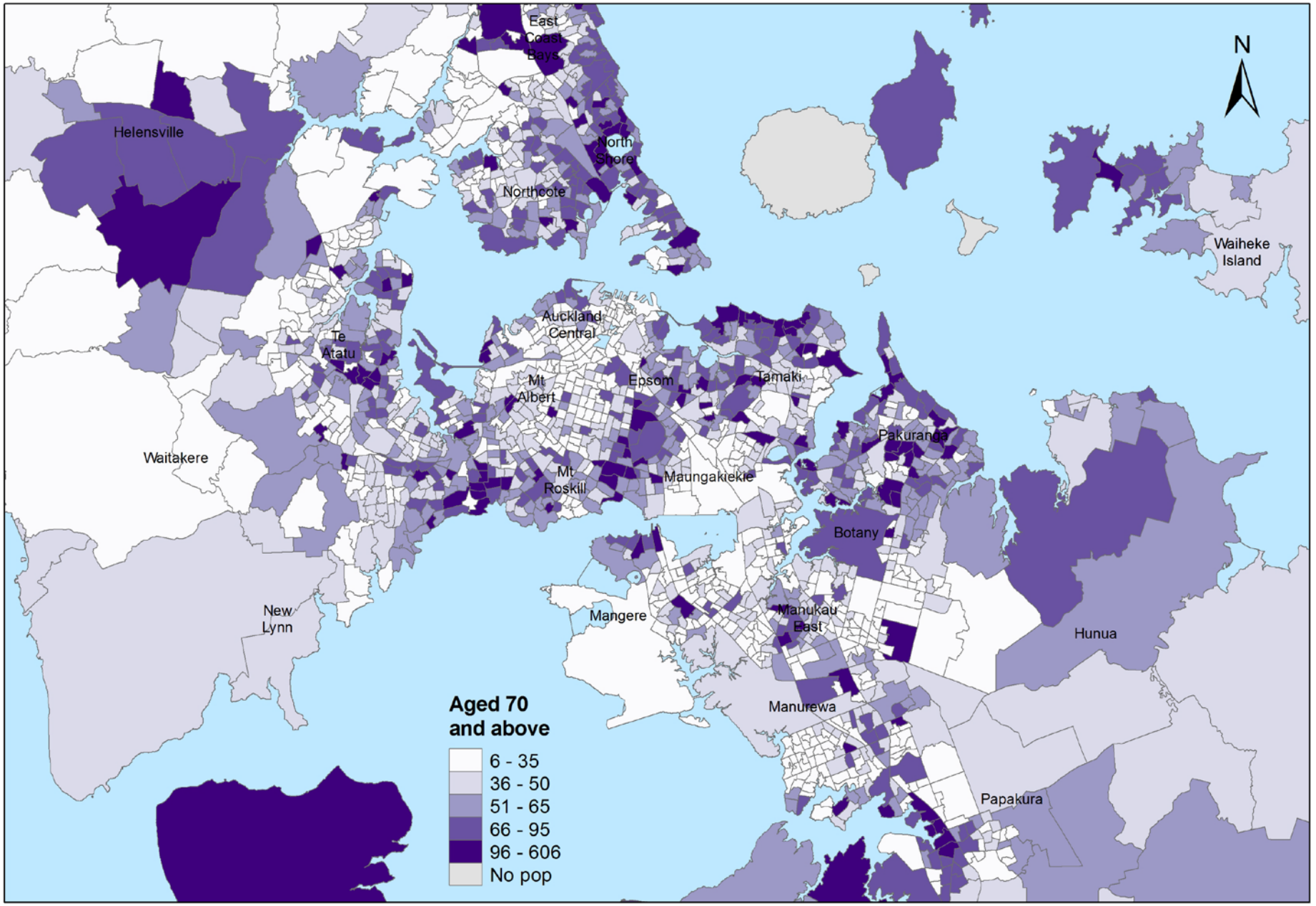
Statistical comparison of three geographic scales

Levels of Geography	Number of Areas	Population		Compactness (P^2A)	
		Mean	STD	Mean	STD
Census Meshblock	45,921	91	73.46	26.77	13.43
Lower Zone	5,958	712	129.57	28.83	26.08
Census Area Unit	1,911	2,108	1,658.68	40.79	48.90

Lower Zones comprise approx. 8 Meshblocks each

Lower Zone populations aged 70+ for Auckland Urban Areas



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Discussion

- Advantages of the Interactive Zone Design Methods
  - Combines computer (ArcGIS) and human visual powers
  - Considers all criteria
  - Shapes are more compact
  - No final checking (as required for automated approaches)
  - Nests (mostly) within Census Areas
- Disadvantage
  - More time consuming, but we believe this was enables us to gain meaningful outputs

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Discussion

- Lower Zones are the base geography for our deprivation research
- Methodology easily integrates data from Meshblocks
- Population size maximises the potential of data from IDI
- We hope that the geography will become a recognised standard for reporting neighbourhood statistics across government agencies, as has occurred in the UK

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Acknowledgements

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