Using Personal Names to Explore Cultural, Ethnic and Linguistic Structure in Populations

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Berkeley Demography
September 24, 2014

Diversity and segregation in urban communities

Long standing interest in urban neighbourhoods, urban neighbourhood change, diversity and segregation of urban populations

Some previous publications

Hong S-Y and O’Sullivan, D. 2012. Detecting ethnic residential clusters using an optimisation clustering method. *International Journal of Geographical Information Science*, 26, 1257–1277.

Xue J, Friesen W and O’Sullivan D. 2012. Diversity in Chinese Auckland: Hypothesising multiple ethnoburbs. *Population, Space and Place*, 18, 579–595.

O’Sullivan D. 2009. Changing neighborhoods - neighborhoods changing: a framework for spatially explicit agent-based models of social systems. *Sociological Methods and Research*, 37, 498–530.

Reardon SF, Farrell CR., Matthews SA, O’Sullivan D, Bischoff K and Firebaugh G. 2009. Race and space in the 1990s: changes in the geographic scale of racial residential segregation, 1990-2000. *Social Science Research*, 38, 55–70.

Lee BA, Reardon SF, Firebaugh G, Farrell CR, Matthews SA and O’Sullivan D. 2008. Beyond the census tract: patterns and determinants of racial segregation at multiple geographic scales. *American Sociological Review*, 73, 766–791.

Reardon SF, Matthews SA, O’Sullivan SA, Lee BA, Firebaugh G, Farrell CR and Bischoff K. 2008. The geographic scale of metropolitan segregation. Demography, 45, 489-514.

O’Sullivan D and Wong DW. 2007. A surface-based approach to measuring spatial segregation. Geographical Analysis, 39, 147–68.

Reardon SF and O’Sullivan D. 2004. Measures of Spatial Segregation. *Sociological Methodology*, 34, 121–62.

O’Sullivan D. 2002. Toward micro-scale spatial modelling of gentrification. *Journal of Geographical Systems*, 4, 251–74.

Some personal background

- Belfast 'Catholic'
- Meet Fintan and Malachy. . .
- Still matters today

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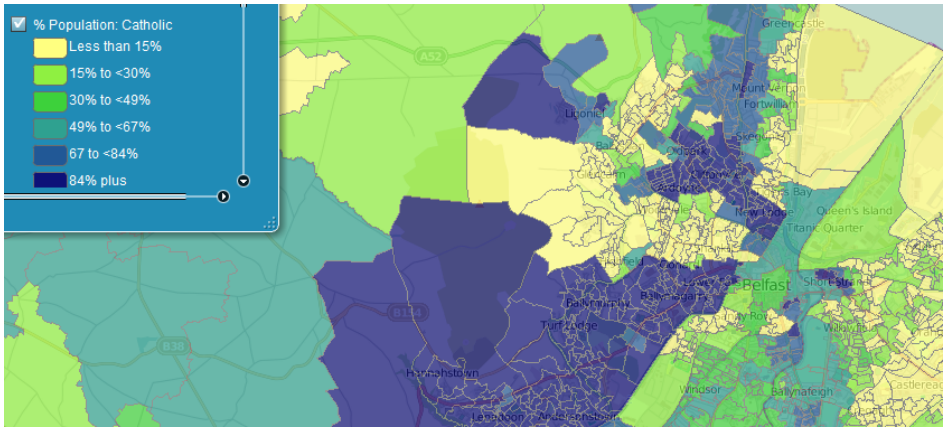
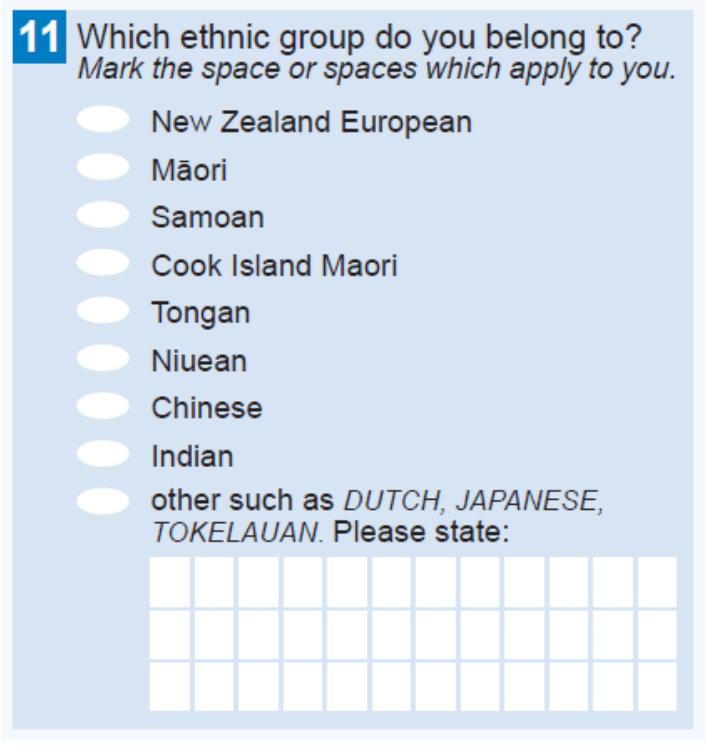


Source: airomaps.nuim.ie

The limits of conventional ‘identity’ data

- ‘Identity’ is a tricky, multi-dimensional concept
- Standards for how to collect data don’t match
- Conventional instruments don’t capture it well
  - Census ‘tick boxes’
  - Census ‘write-ins’



11 Which ethnic group do you belong to?
Mark the space or spaces which apply to you.

- New Zealand European
- Māori
- Samoan
- Cook Island Maori
- Tongan
- Niuean
- Chinese
- Indian
- other such as *DUTCH, JAPANESE, TOKELAUAN.* Please state:

Source: Statistics New Zealand, www.stats.govt.nz

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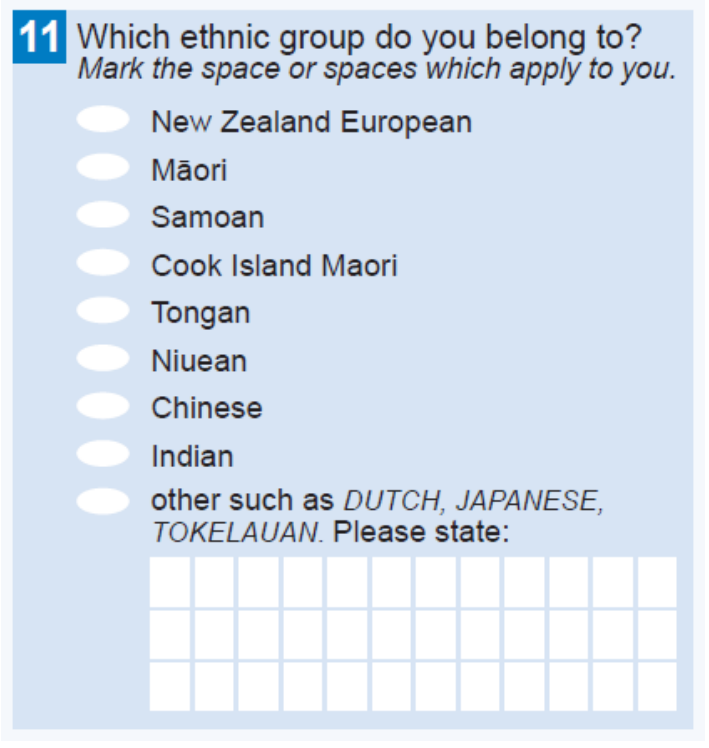

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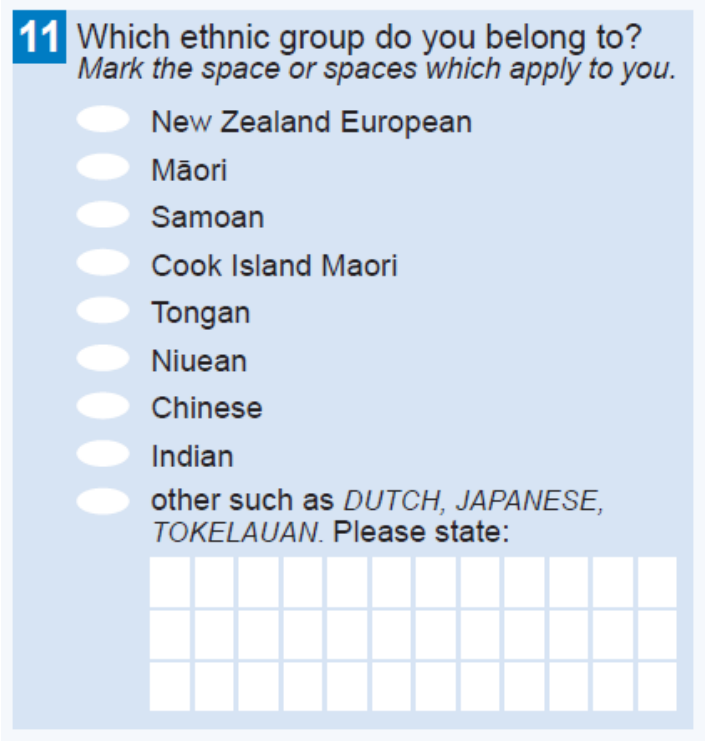

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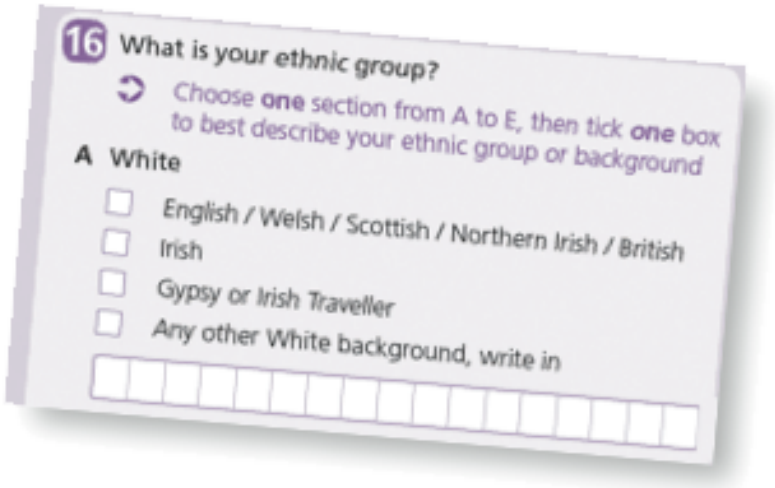

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The New Zealand Herald

nzherald.co.nz WEDNESDAY OCTOBER 8, 2008 12:54AM NZT

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Email urges 'New Zealander' for Census

By Julie Middleton

A fast-spreading email appeal is urging people to state their ethnicity as "New Zealander" in next Tuesday's Census.

Census

- Make your vote count this year, Koreans urged
- One in three working more than 50 hours a week - Census

The email, which came to the Herald from several sources, reads: "Maybe we can get the powers-that-be to sit up and recognise that we are proud of who we are and that we want to be recognised as such, not divided into sub-categories and all treated as foreigners in our own country.

Names as markers of identity

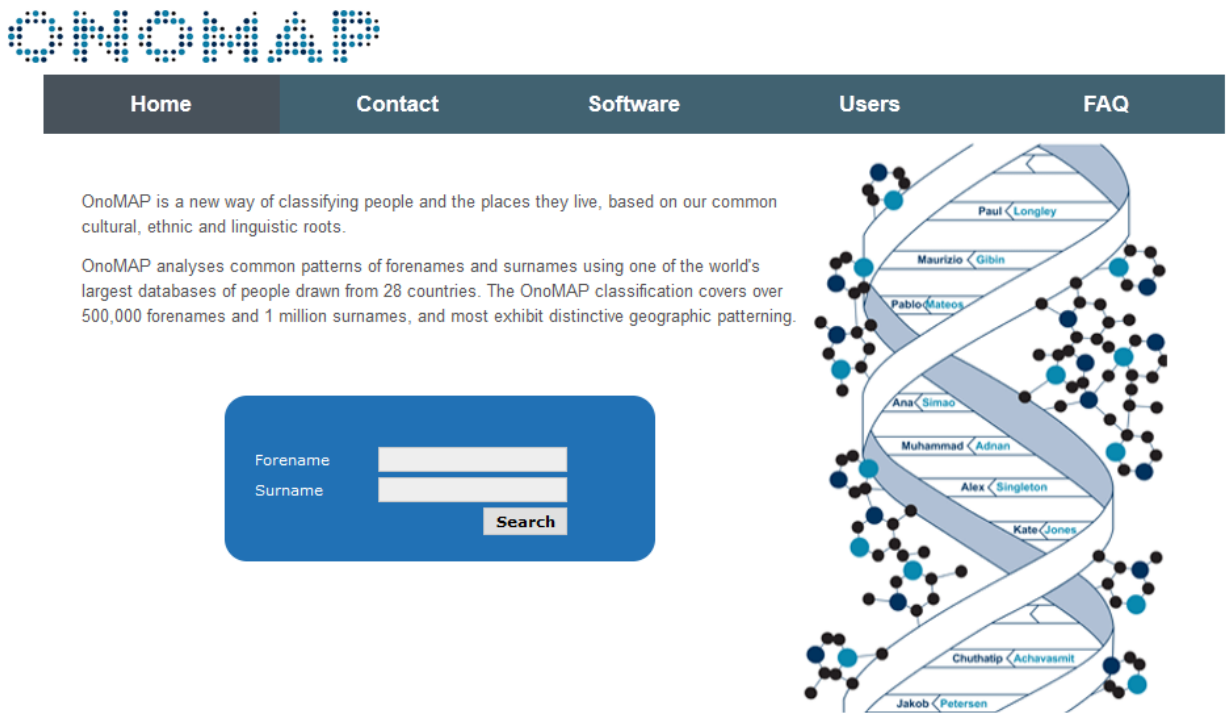
- Readily available
- Minimally invasive
- May carry complex (if limited) information

Previous work

- Mateos P. 2007. A review of name-based ethnicity classification methods and their potential in population studies, *Population Space and Place*, 13, 243–63.
- Mateos P, Webber R and Longley PA. 2007. *The Cultural, Ethnic and Linguistic Classification of Populations and Neighbourhoods using Personal Names*. CASA Working Paper 116, University College London.
- Mateos P. 2007. *An Ontology of Ethnicity Based upon Personal Names: With Implications for Neighbourhood Profiling*. PhD Thesis, University College London

Onomap and the names project at UCL

Mateos’s work helped to develop the *Onomap* classification of names into cultural-ethnic-linguistic (CEL) groups, which has been made spatial by the World Names Mapper project



www.onomap.org

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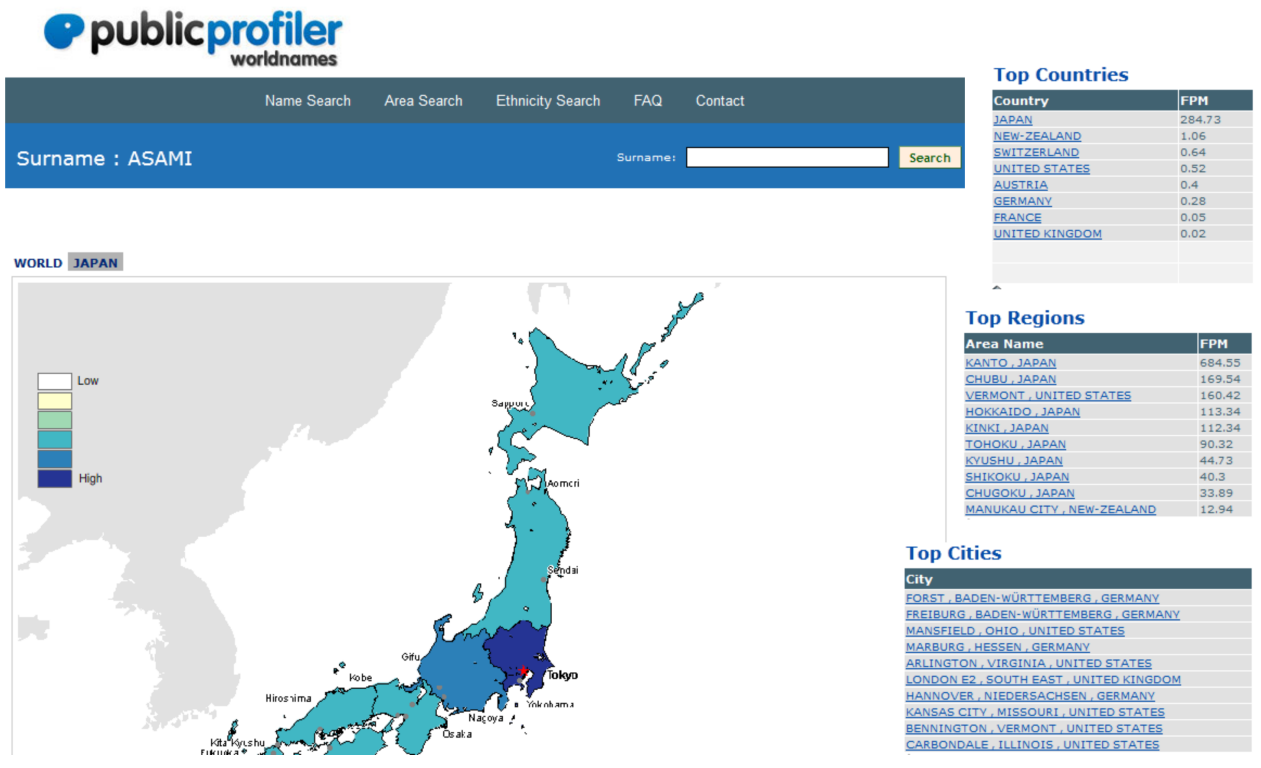
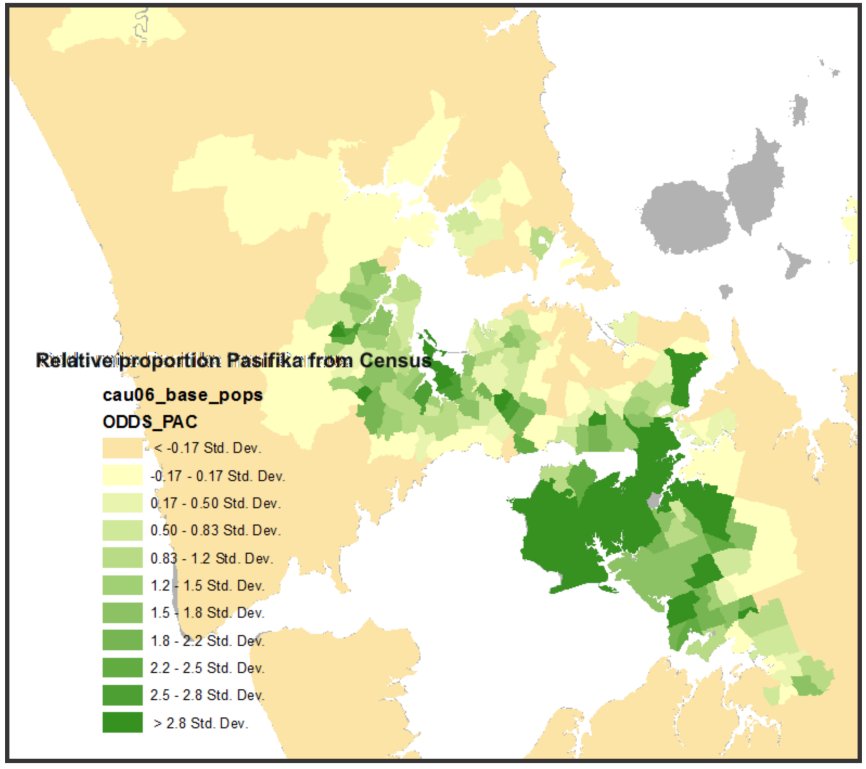
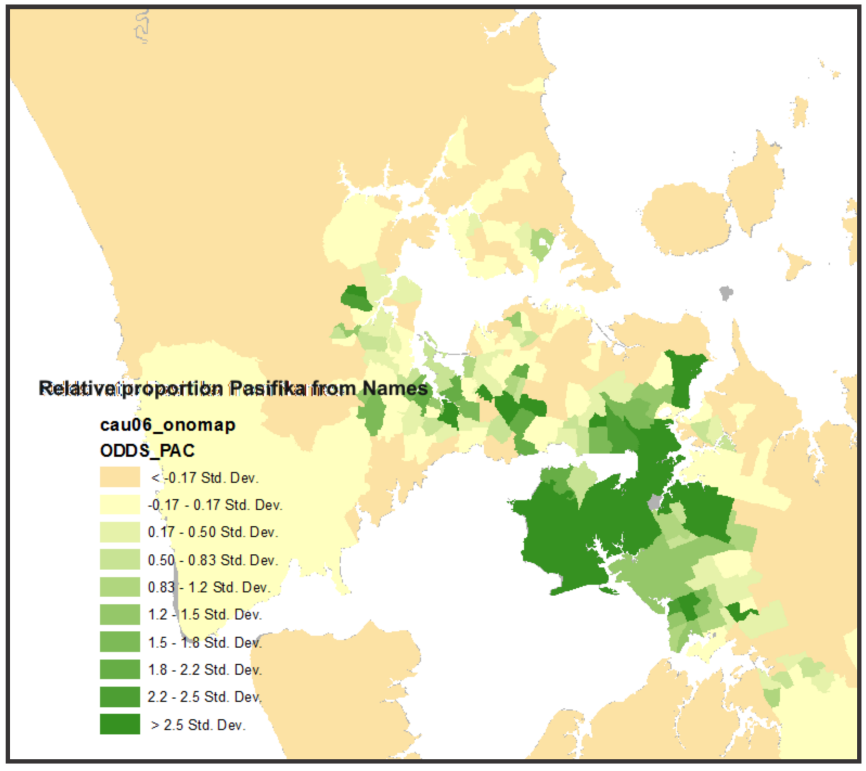


worldnames.publicprofiler.org/Default.aspx

Example names maps from New Zealand



Pacific people south Auckland (census)



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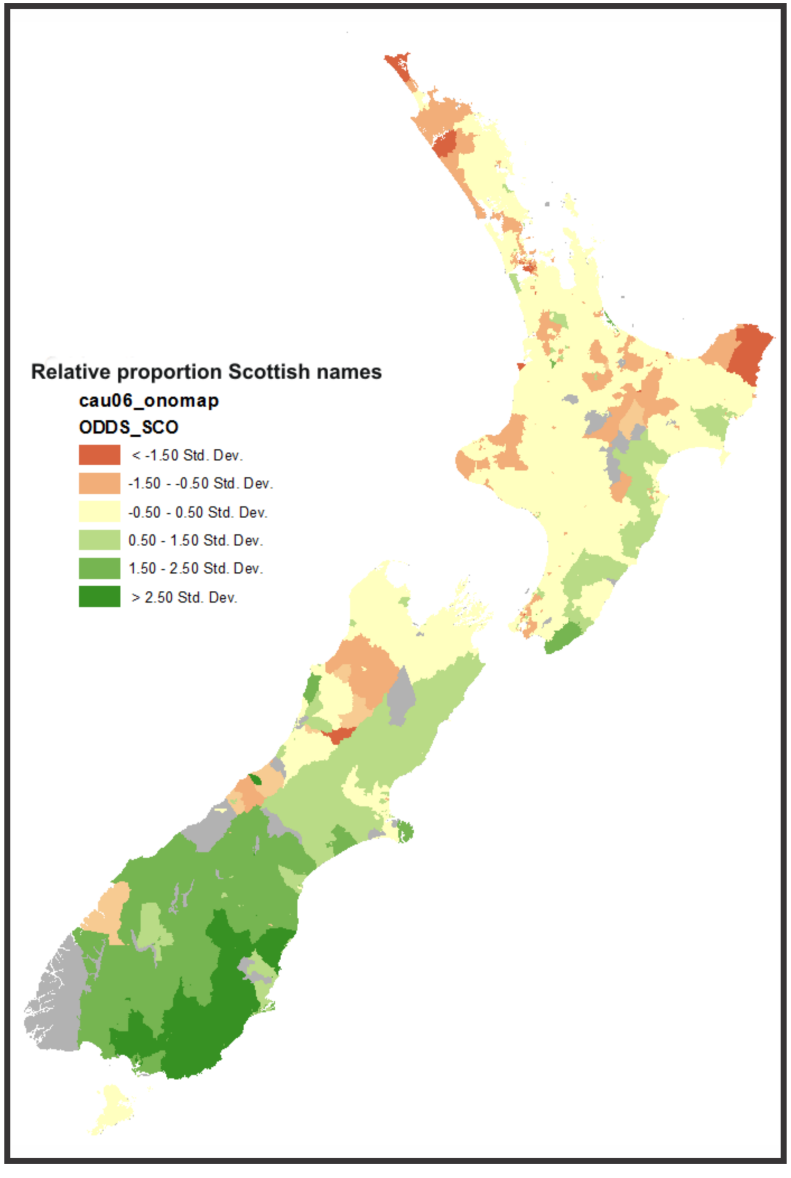

Scottish names countrywide

- No ’Scottish’ category in the New Zealand census
- Counts derived from Electoral Roll
- Map reflects the disproportionately Scottish origins of early European migration to the South Island (as well as more recent non-European immigration in the North Island)

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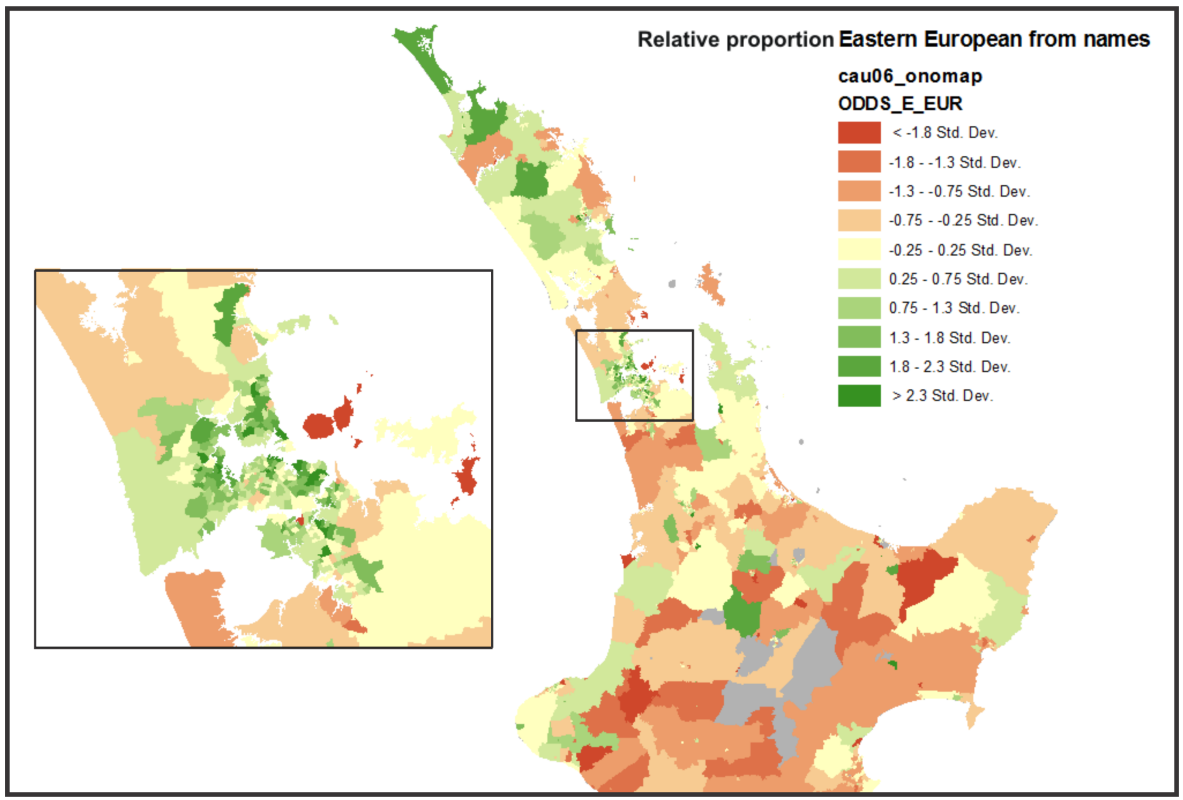
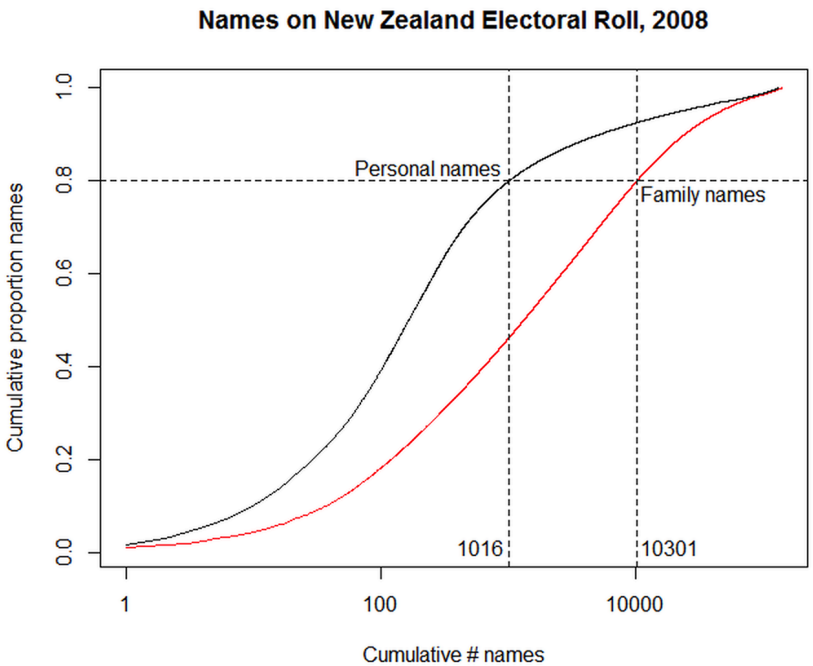


Eastern European names, west Auckland

Babich, Fistonich (Villa Maria), Mazuran, Nobilo, Sapich, Soljan, Yukich (Montana)...

Difficulties with names as data

- *Very* unevenly distributed



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- Prone to misspellings, with no easy fixes, e.g.,
  - Is MICHEAL a real name?
  - Should ABBAGAIL - ABBEGAIL - ABBIGAIL - ABBYGAIL be 'corrected'?
- Interpretation labour-intensive, dependent on expert knowledge

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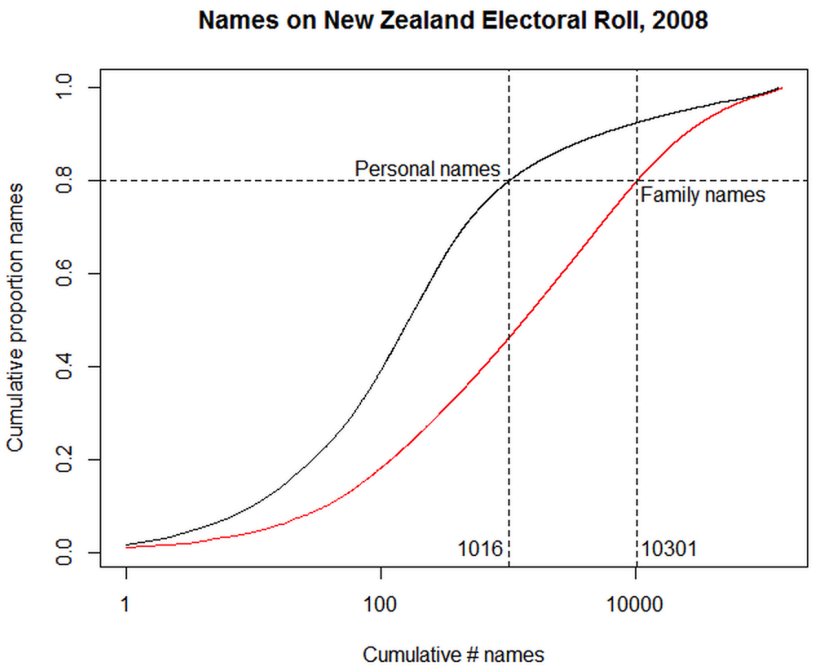

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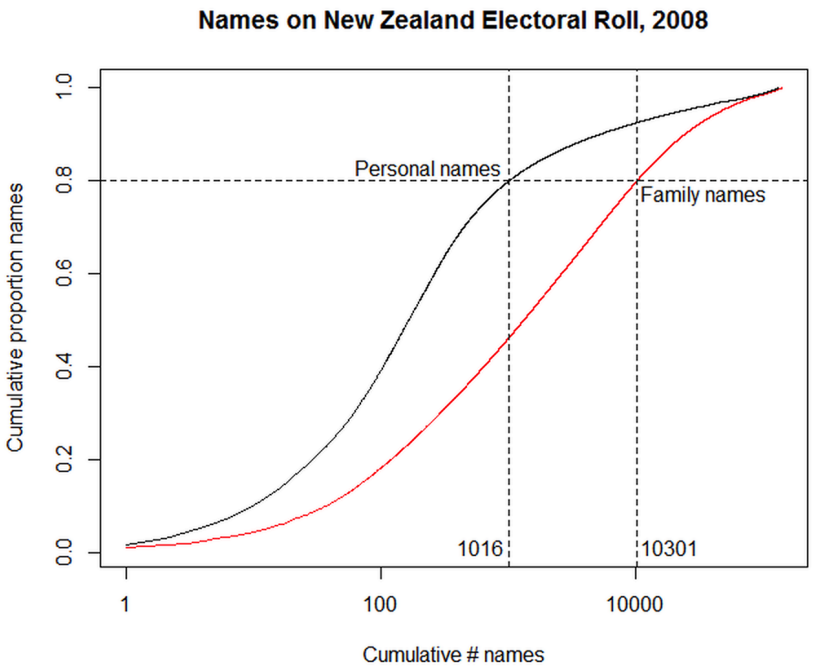

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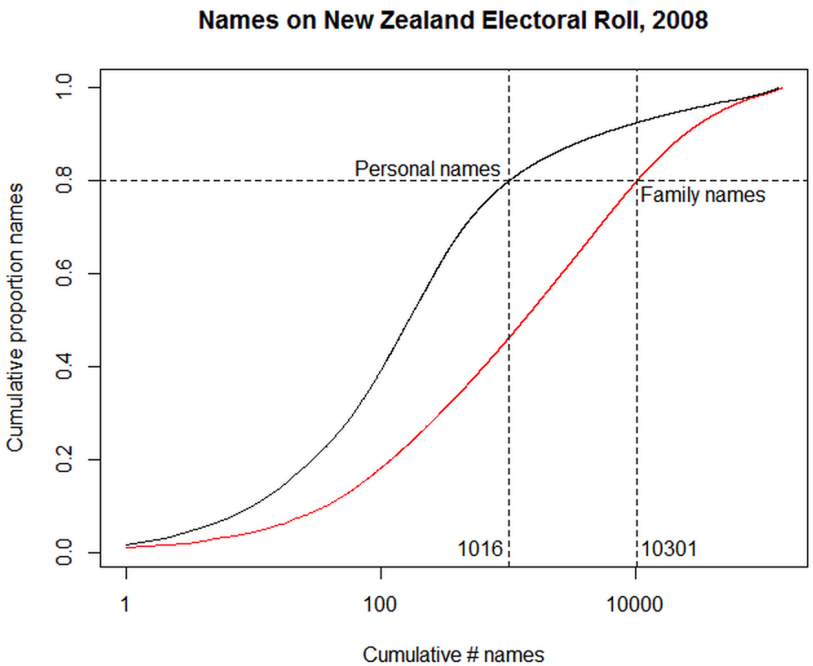

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What about when we meet a name we don't know?

The New Zealand case presented some specific challenges

- A major problem dealing with names unknown to Onomap from previous experience, esp. Māori, Pacific names
- We had limited expert knowledge
- ⇒ Is there a way to infer 'new' groups from the relationships between names?
- ⇒ concept of a network of names

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Relationships between names: from lists to networks

Pablo

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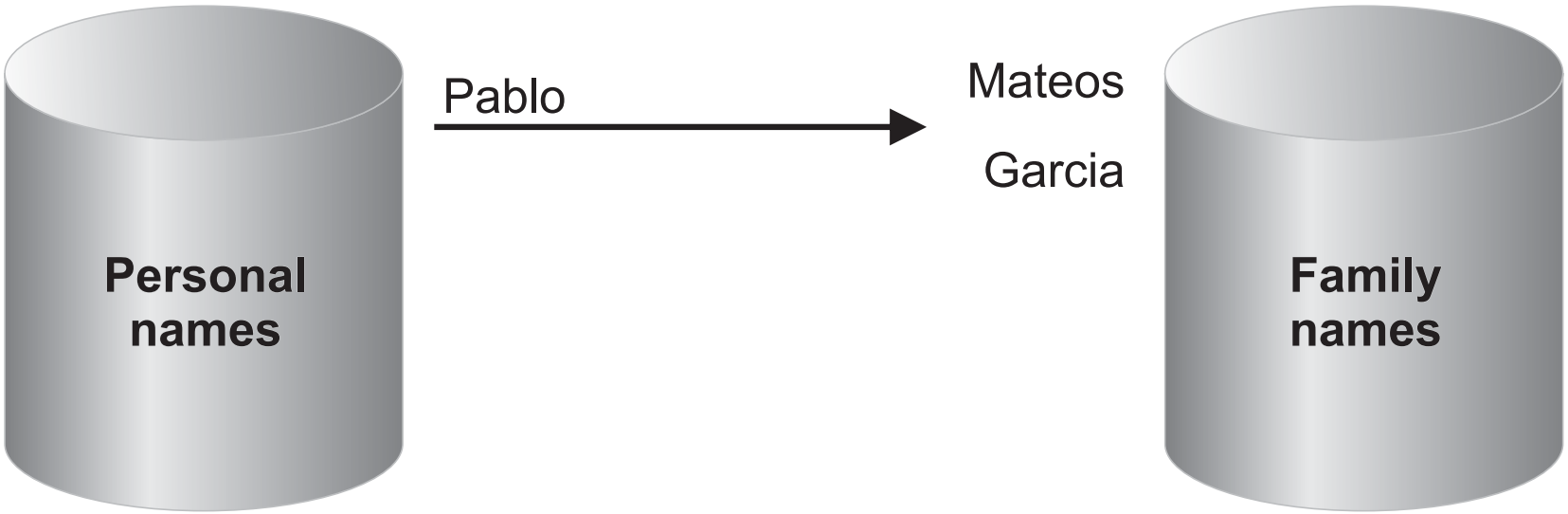

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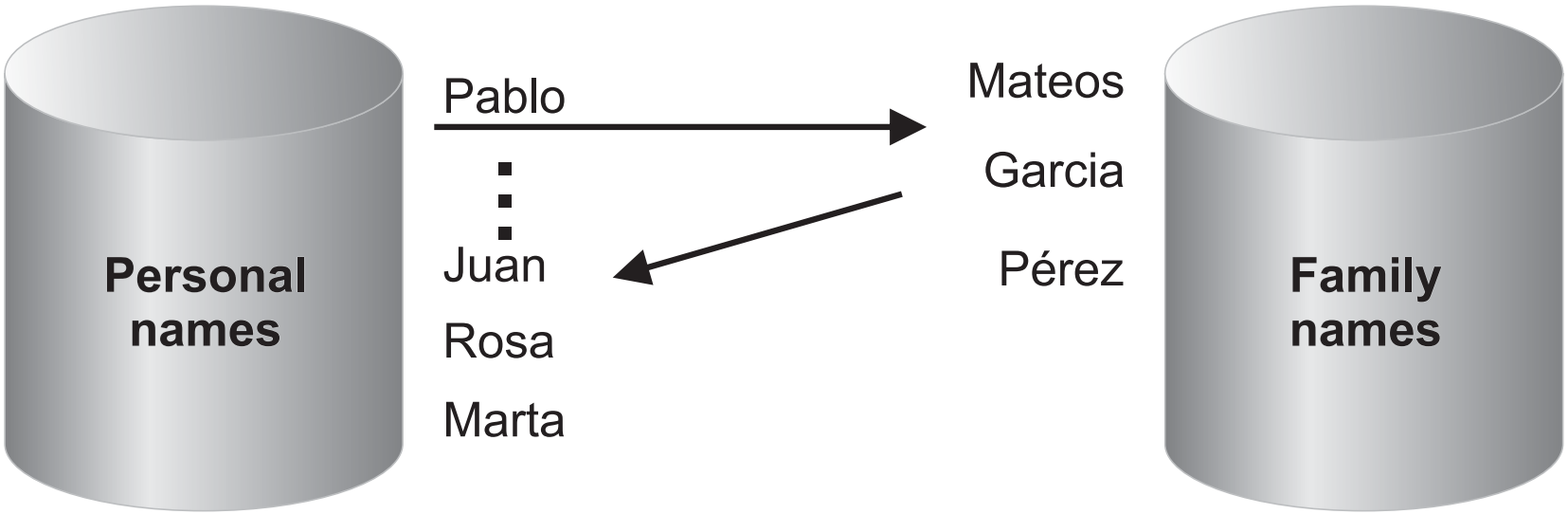

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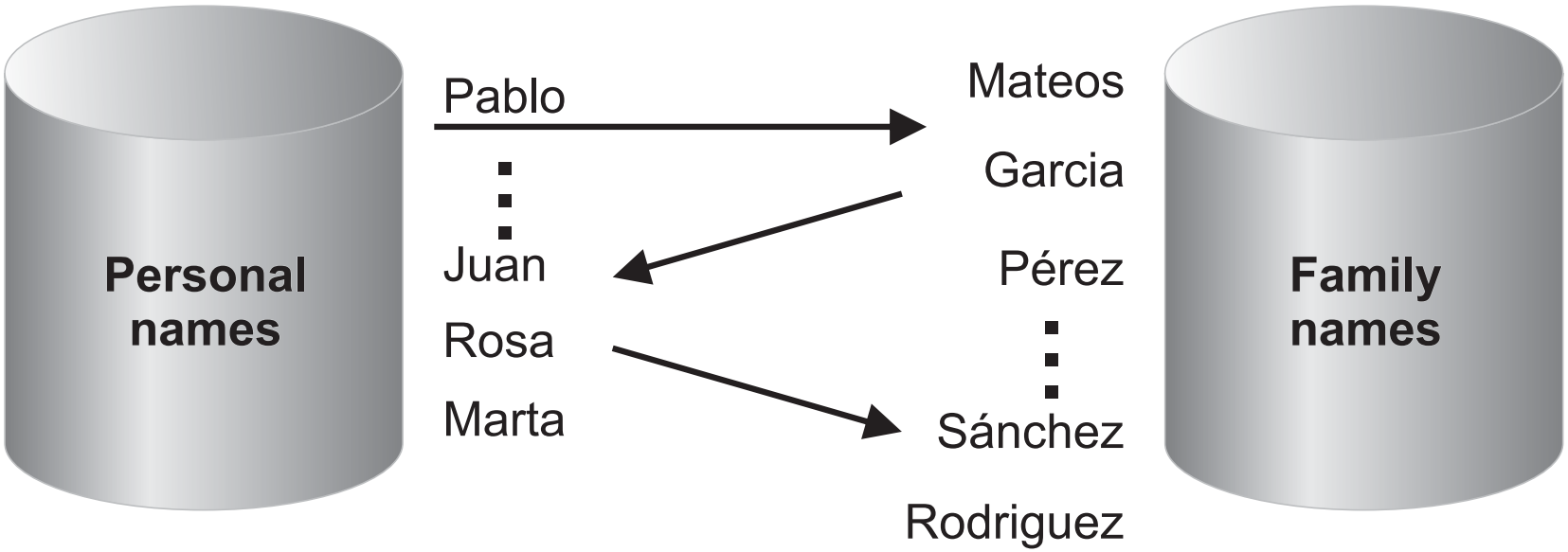

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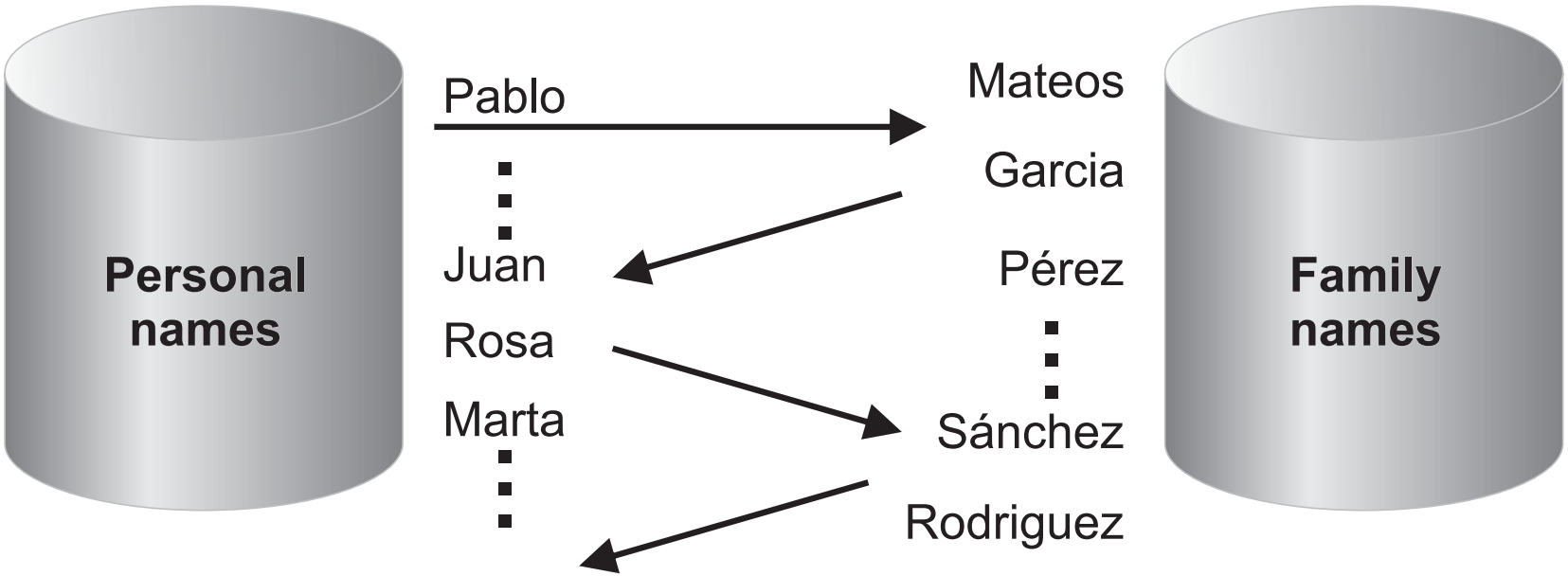
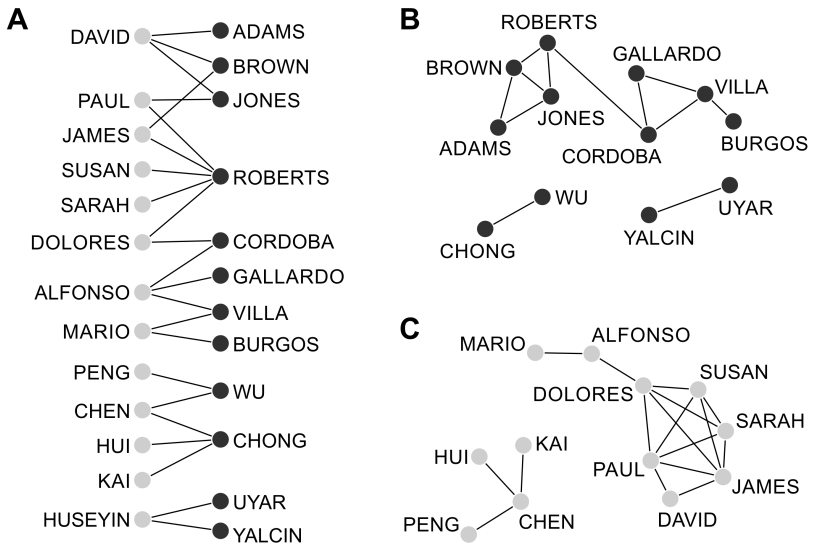


From two-mode to one-mode networks

We can replace all the back and forth database querying with some matrix arithmetic



Graph adjacency matrix maths

Form a given name-family name coincidence matrix, $\mathbf{A} = [w_{gf}]$, where w_{gf} is strength of association between g-name g and f-name f

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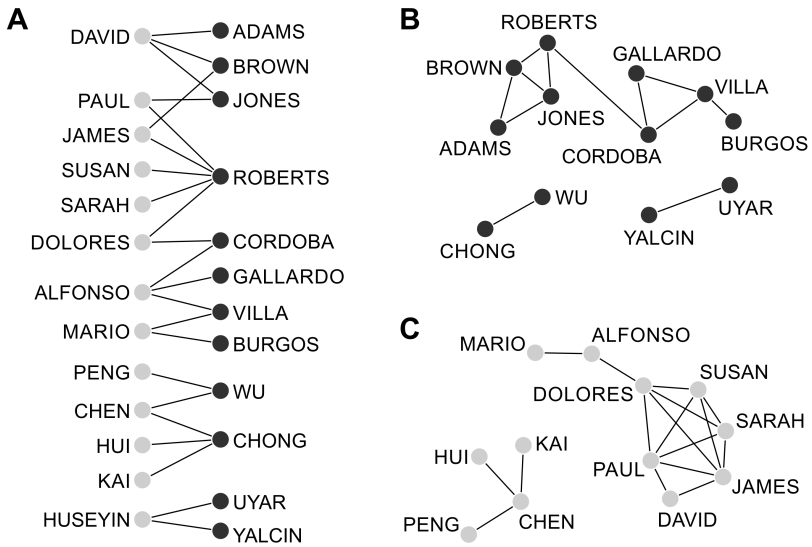

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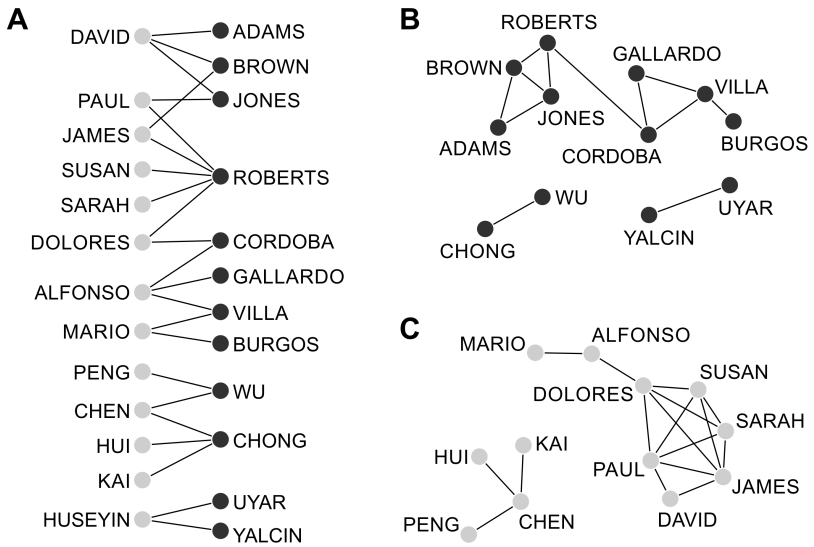

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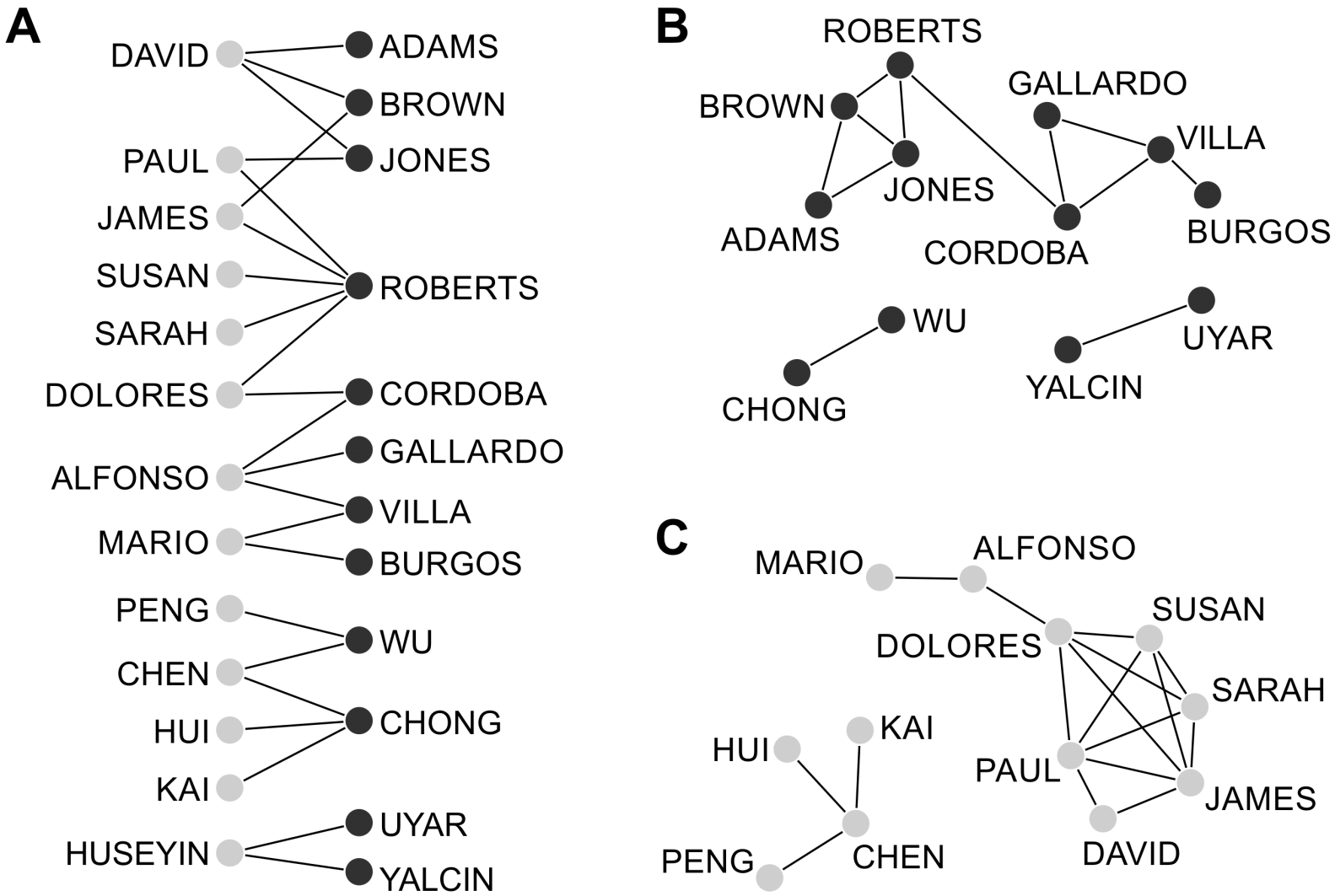

Salience matters more than frequency

A key issue is how to determine the w_{gf} strengths (weights) of association

- Common names form majority of given name $\Leftrightarrow$ family name links
- But *interesting* given name links are those that are common with respect to a family name relative to overall prevalence
- After some experimentation, we arrived at

$$w_{gf} \propto \frac{n_{gf}}{\sqrt{n_g \left(n_g - 1\right)}}$$

where n_{gf} is the number of times a particular combination occurs, and n_g is the total number of occurrences (across all family names) of that given name

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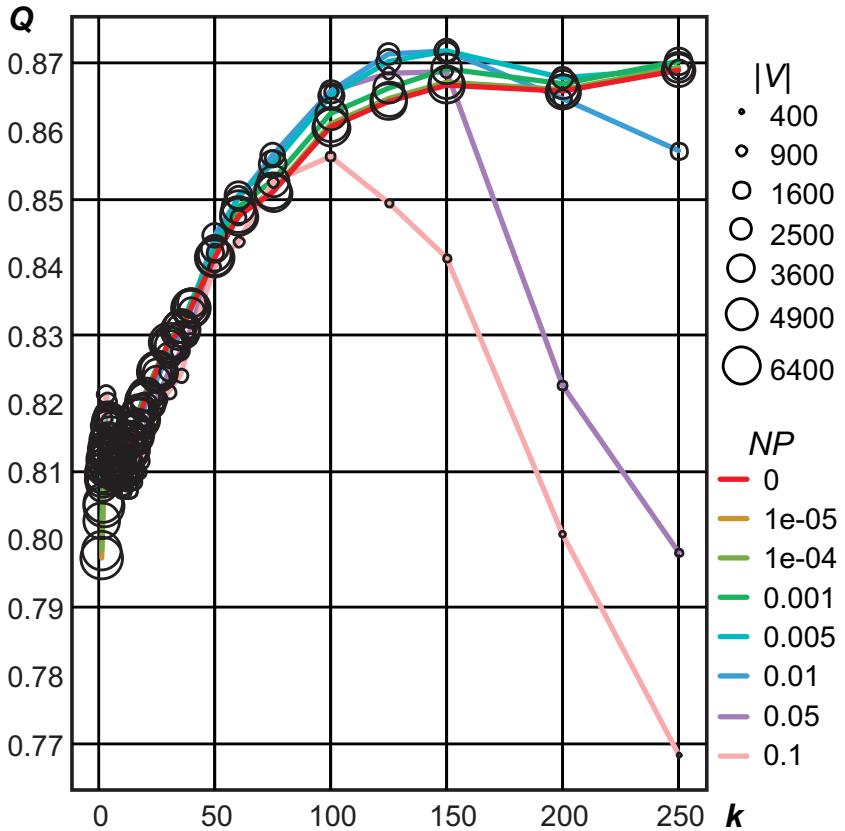
Salience matters more than frequency

- 'Raw' networks extremely densely connected
- Filter by removing links between family names weaker than some NP threshold
- Also where w_{gf} is less than some factor k above expectation
- In practice, the quality (modularity Q) of subsequent graph community detection depends on these filters



k is relative prevalence of a given-name vs expectation
Q is modularity, a measure of how 'clean' the clusters are

Datasets

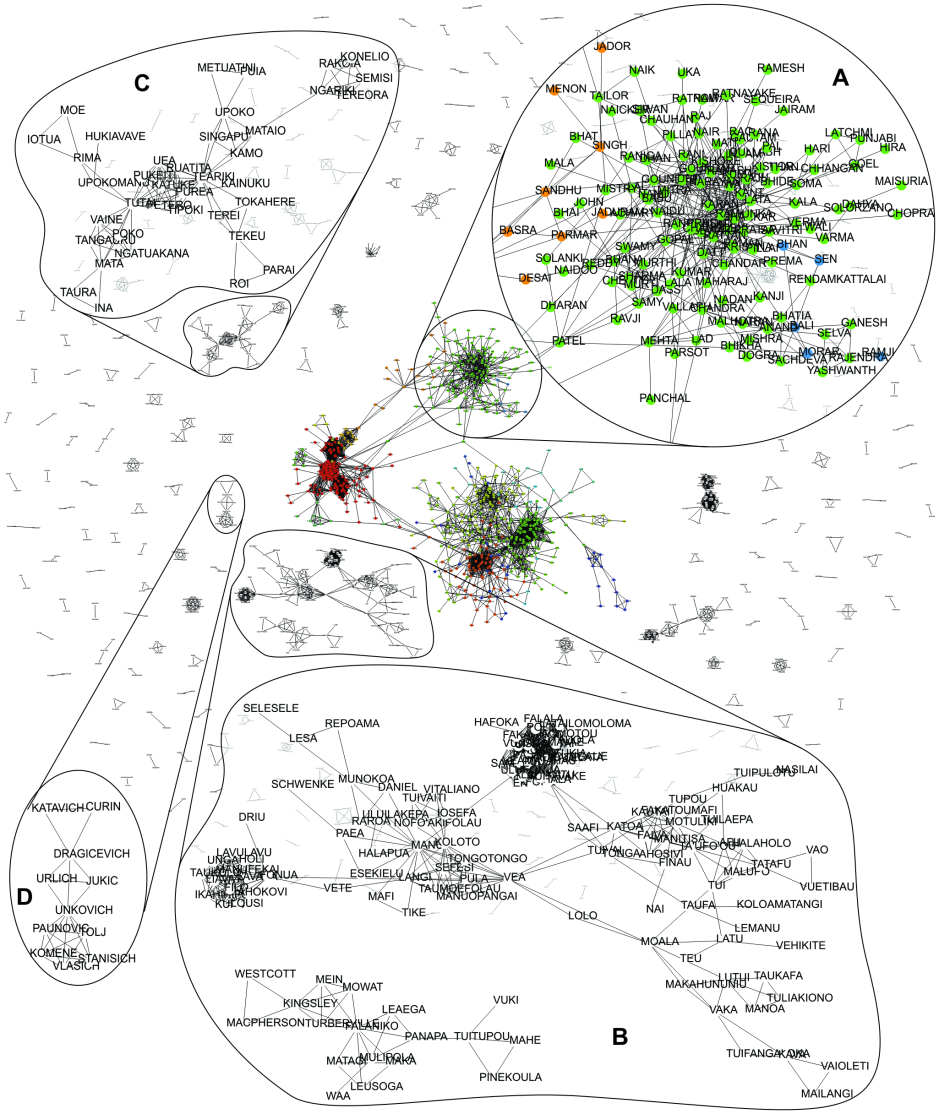
Auckland, New Zealand

- 912,858 registered voters from the 2008 Electoral Roll
- 79,855 unique f-names
- 88,760 unique g-names
- 711,807 unique p-f pairs
- Small yet ethnically and culturally diverse
- Many names somewhat unique to New Zealand
- A good testbed for methods

'Diagnostic' synthetic dataset

- 30,479 surnames tagged as one of 40 cultural, ethnic and linguistic (CEL) groups
- tagged names used to retrieve a subset of names from a 300 million person database
- 118.3 million persons from 17 countries
- 4.6 million unique f-names
- 1.8 million unique g-names
- 46.3 million unique g-f pairs

The Auckland names network



The filtered Auckland network

- A - South Asian names in 3 or 4 clusters
- B - Samoan / Tongan / Pacific names
- C - Māori names
- D - Eastern European names

Previously untagged names grouped separately from those already tagged. Colours are clusters found by community detection method of Clauset, Newman and Moore

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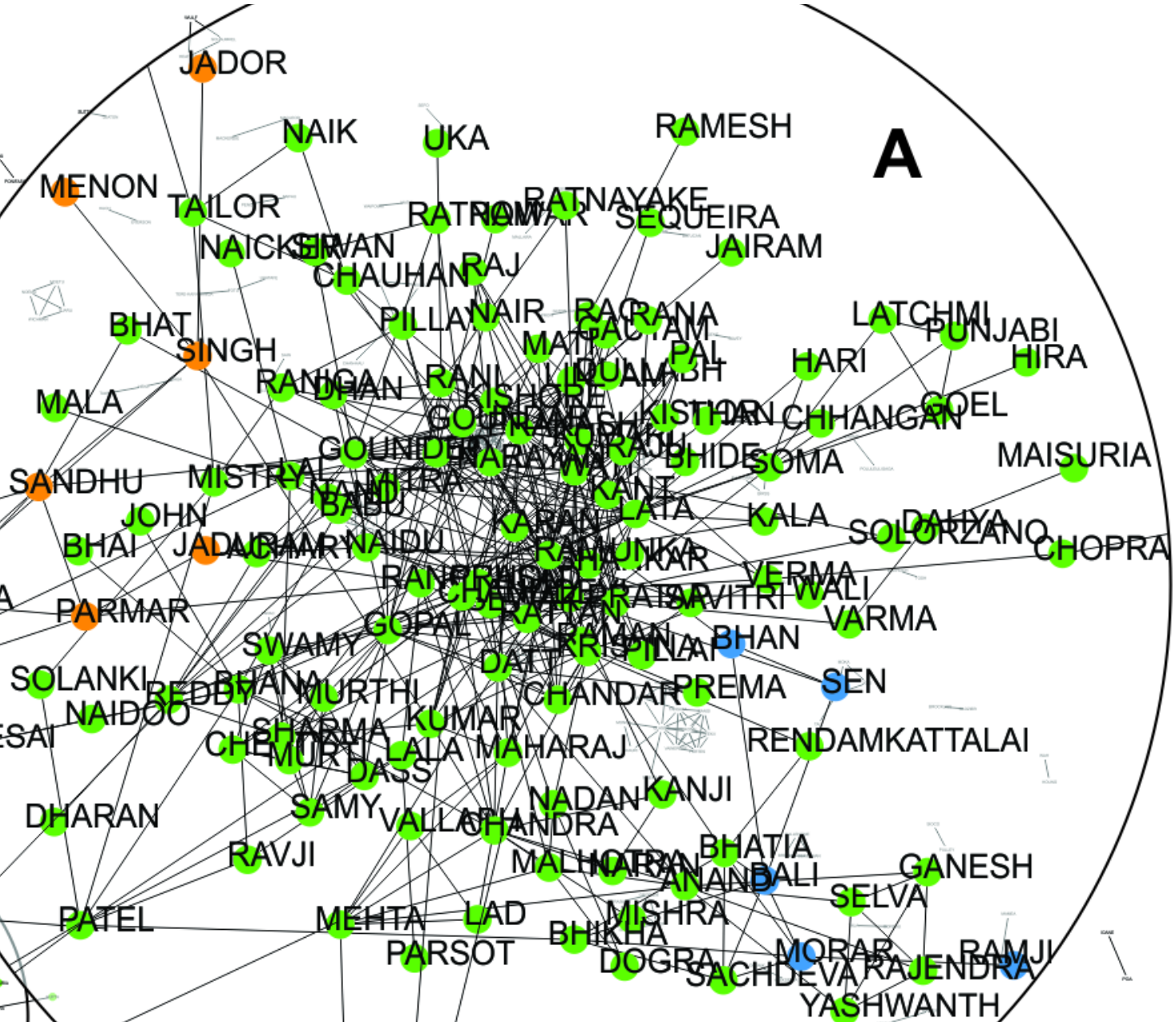

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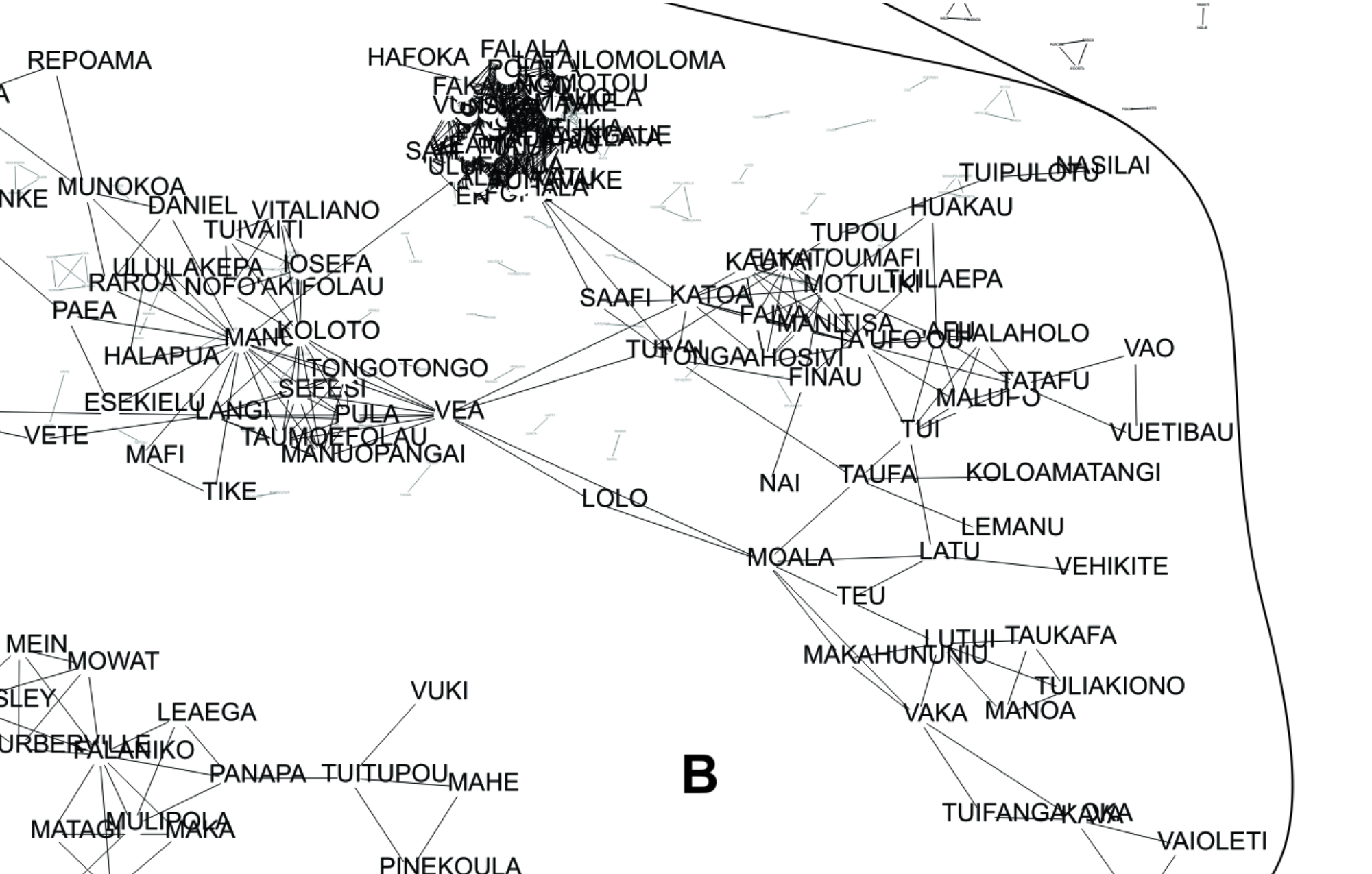

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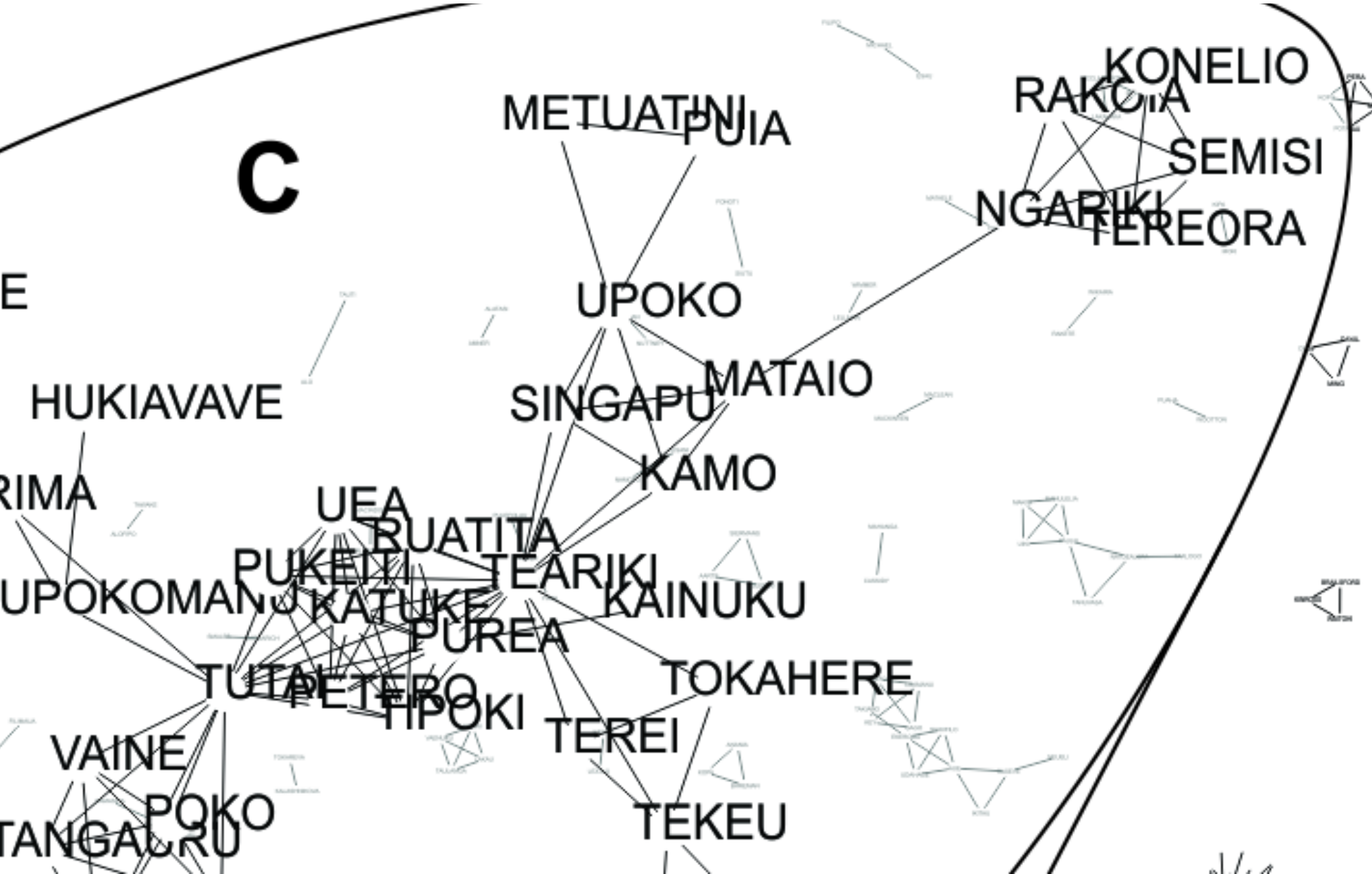

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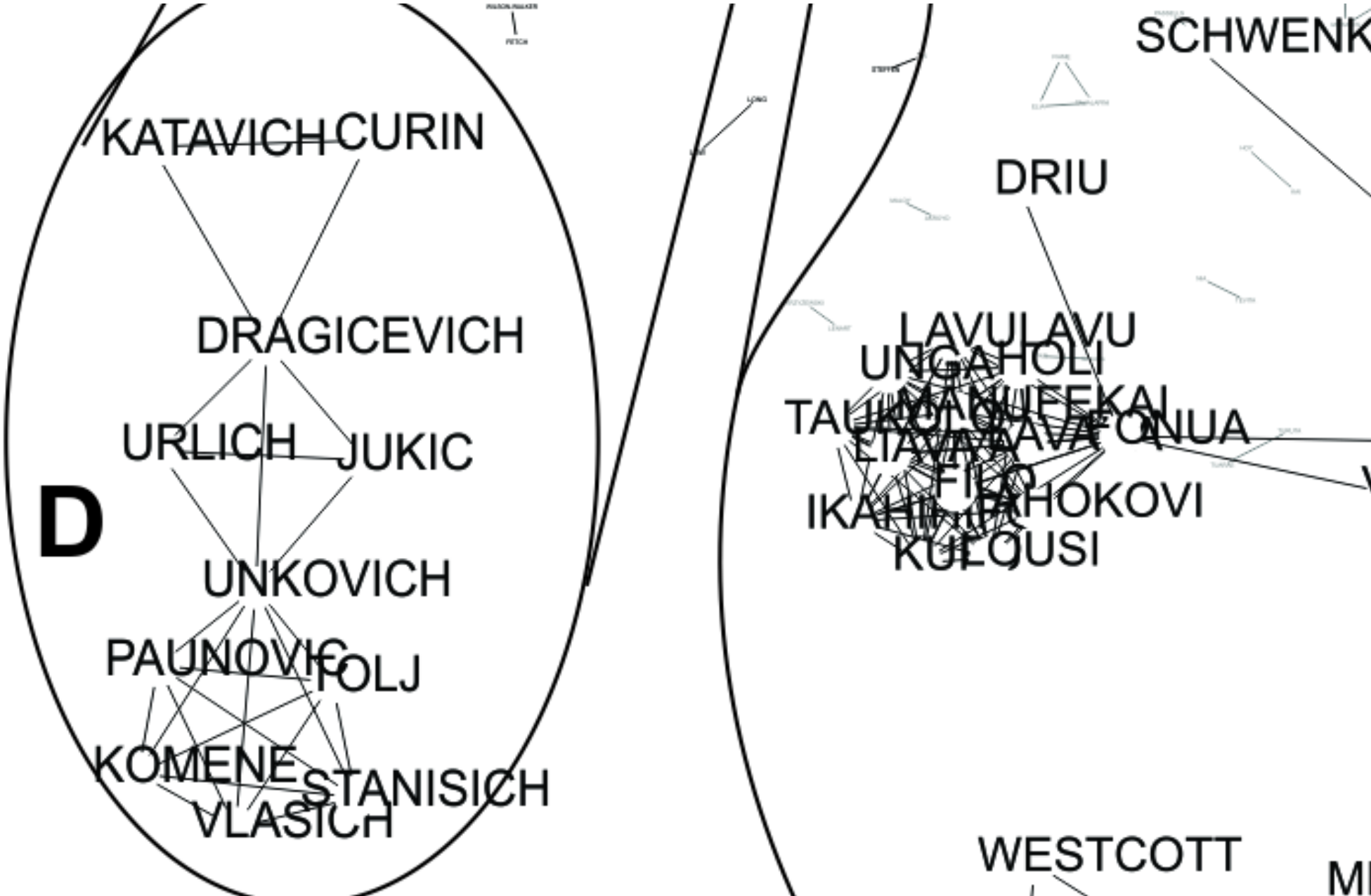

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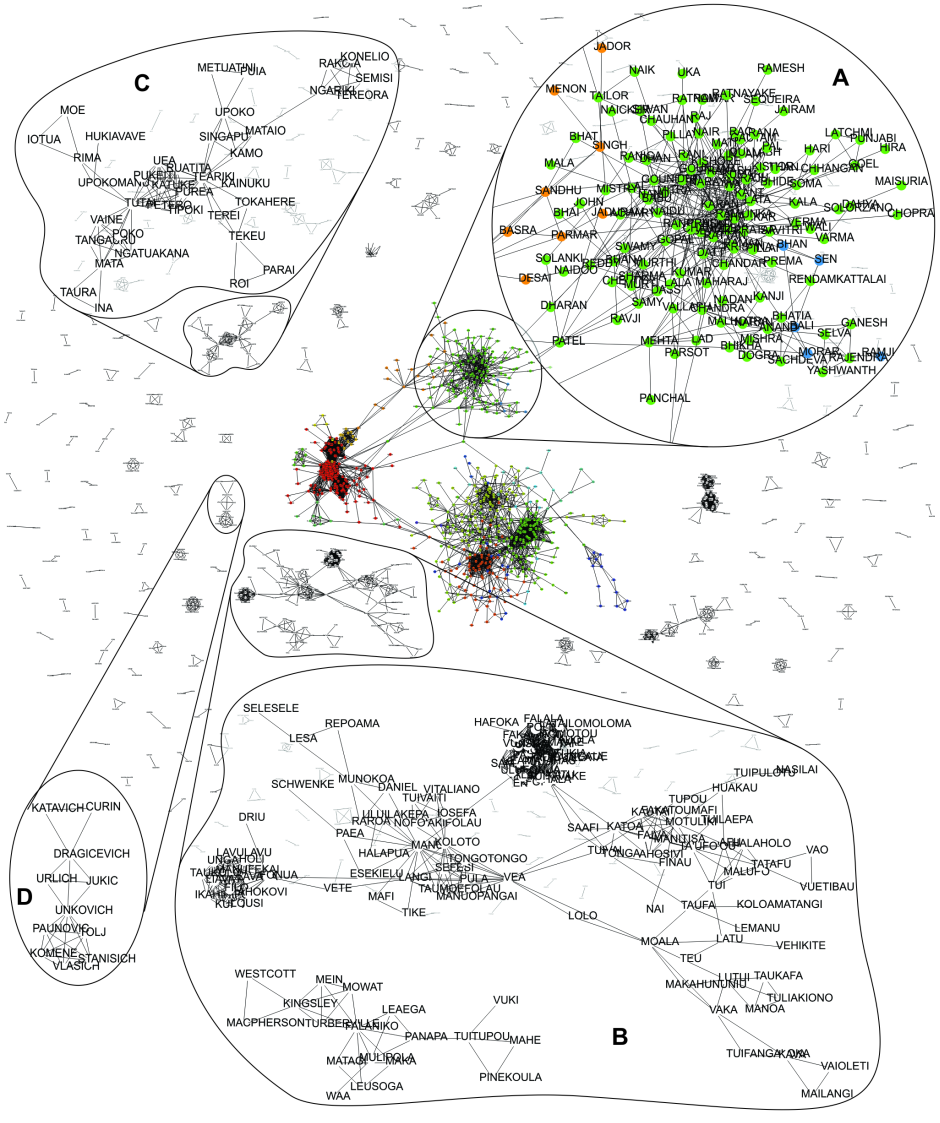
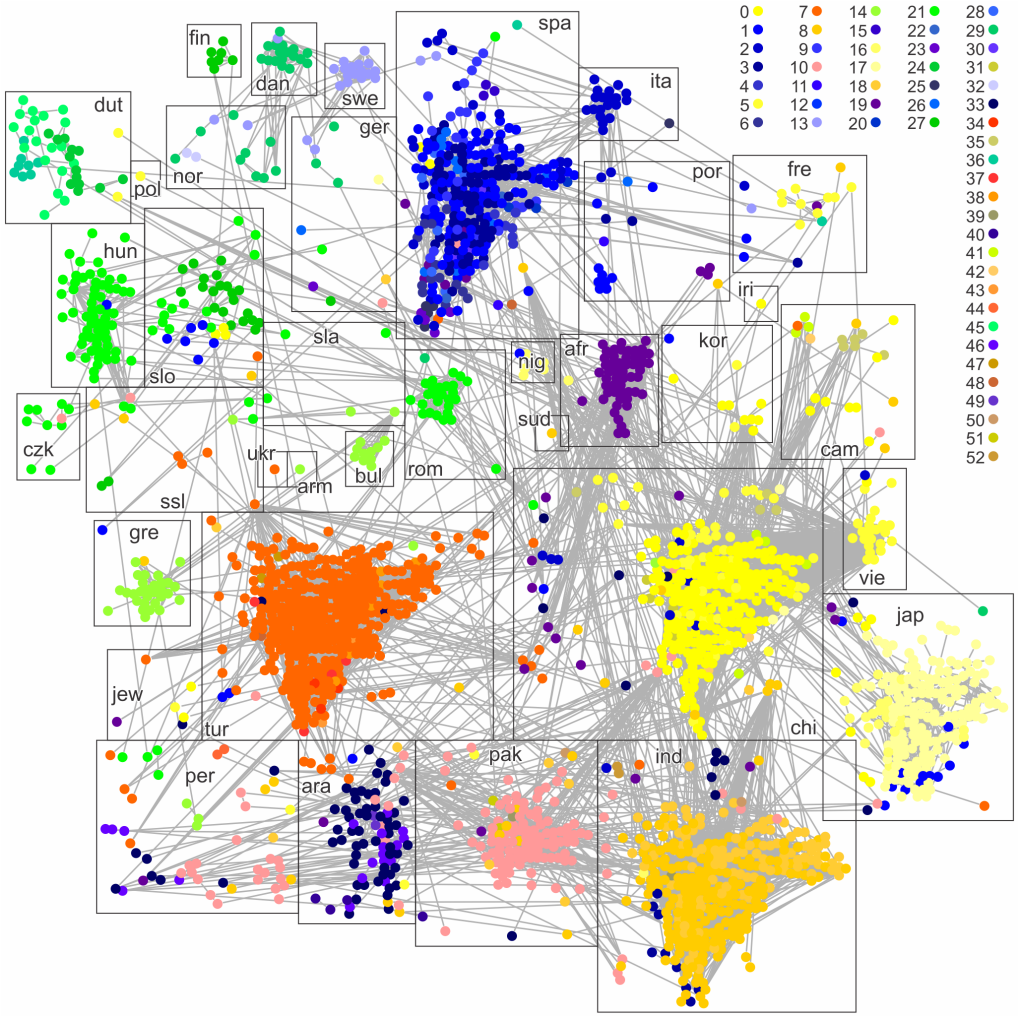


The filtered Auckland network

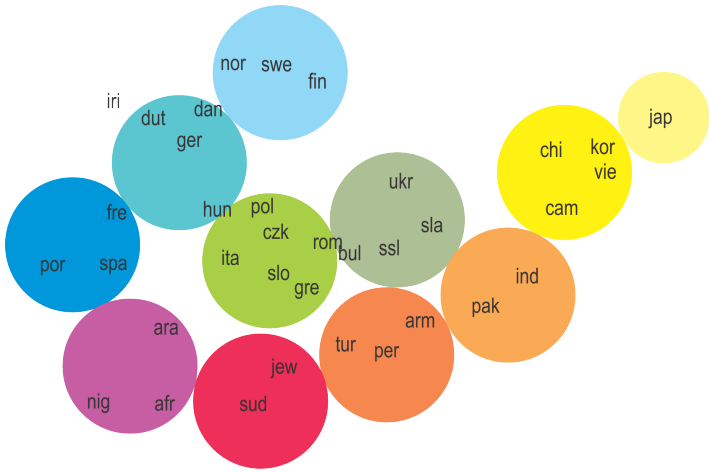
- A - South Asian names in 3 or 4 clusters
- B - Samoan / Tongan / Pacific names
- C - Māori names
- D - Eastern European names

Previously untagged names grouped separately from those already tagged. Colours are clusters found by community detection method of Clauset, Newman and Moore

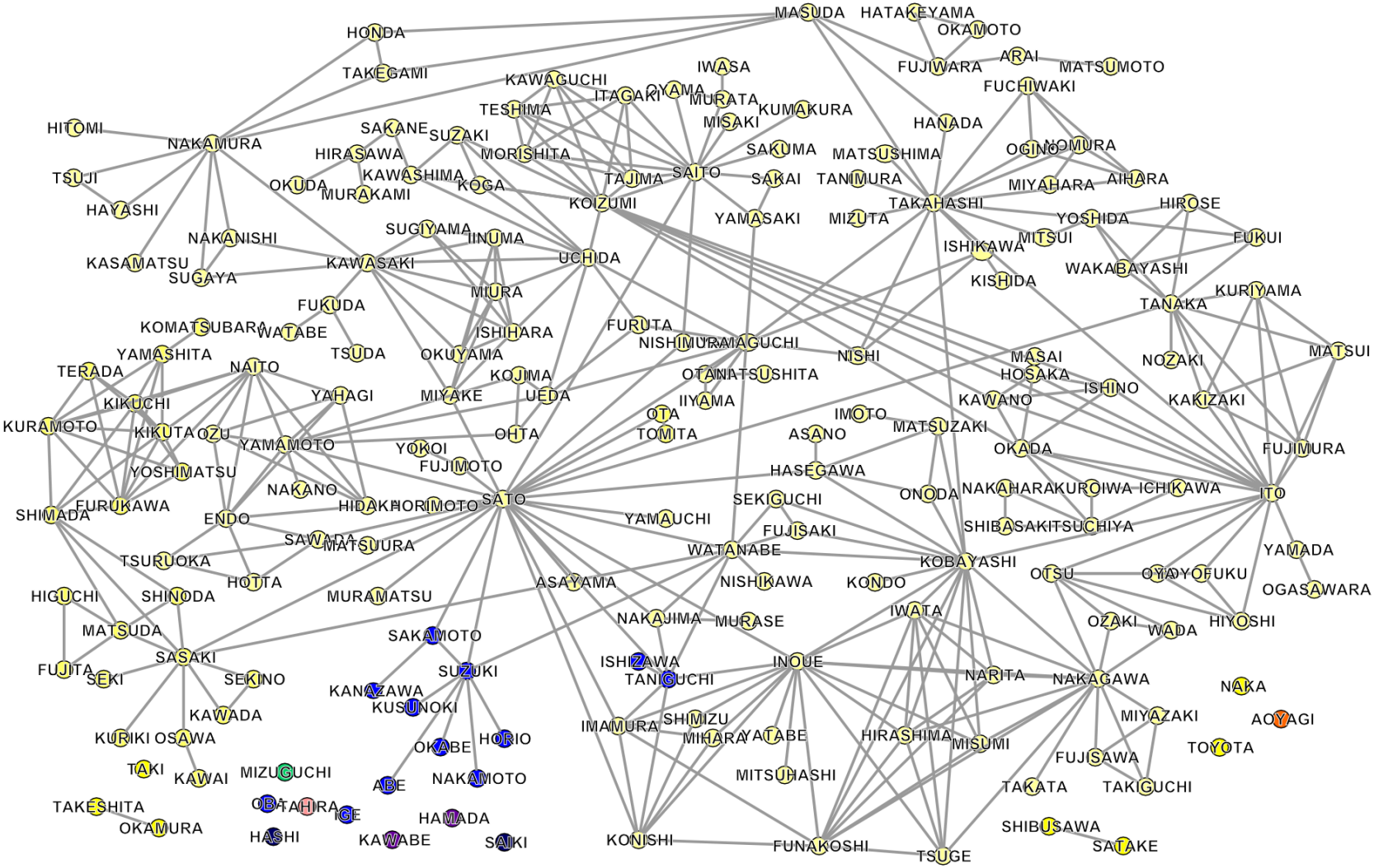
‘Diagnostic names’ network



- Colours reflect assignment to different ‘communities’ by the community detection algorithm
- Boxed groupings are expert-determined CEL associations



'Japanese' names network



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Technically:

- Investigate methods for automatically 'cleaning' the names
- Perhaps automate determination of parameters to partition networks cleanly...
- ...or better, find a way to visualize all the detail
- Look into 'label propagation' methods that might allow inference of group associations for new or unknown names

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- Consider how to spatially embed the network
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- They perhaps enable a more nuanced view of CEL affiliation than pre-defined 'tick-box' affiliations
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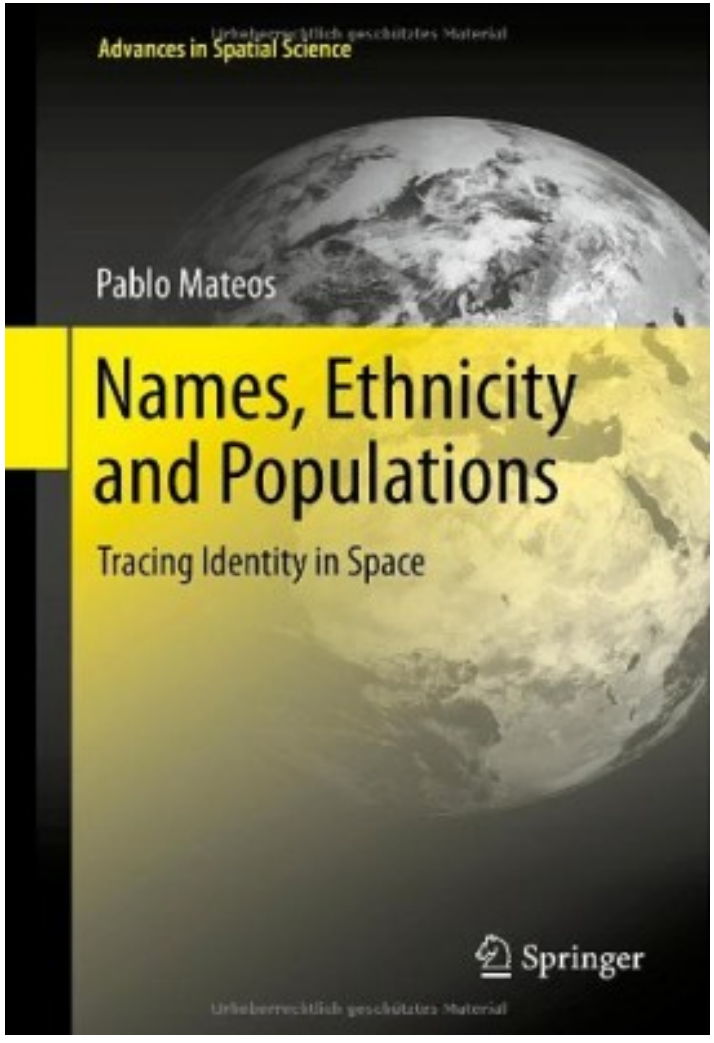
More information

Published paper

Mateos, P., P. A. Longley, and D. O'Sullivan. 2011. Ethnicity and Population Structure in Personal Naming Networks. *PLoS ONE*, **6**(9) e22943. DOI: 10.1371/journal.pone.0022943

Websites

http://www.onomap.org
http://worldnames.publicprofiler.org



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RES-172-25-0019 Web-based dissemination of the geography of genealogy
RES-149-25-1078 The Genesis Project: GENerative E-Social Science
PTA-026-27-1521 The Geography and Ethnicity of People's Names

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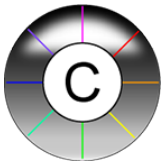
University of Auckland Study Leave grant-in-aid 2008
University of Tokyo Visiting Position 2012

Free software and tools
Python `numpy`, `scipy`, `igraph`

Graph visualization tools
Cytoscape (from biosciences)



yEd (for graph drawing)