Linked Micromap Plots

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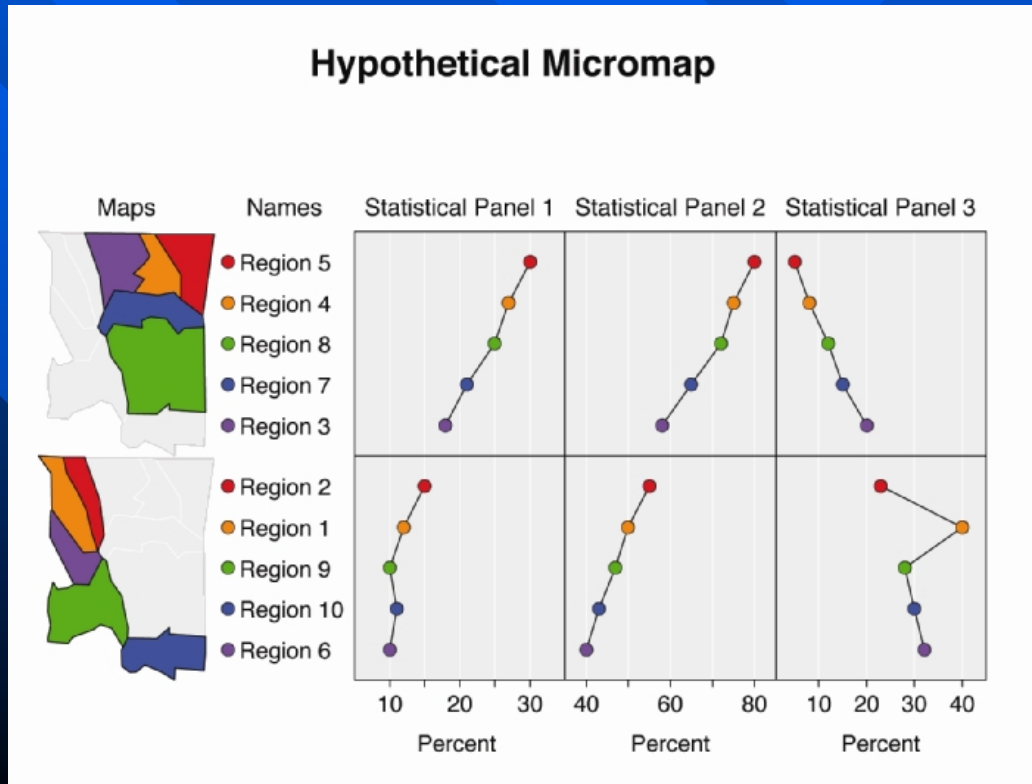
Concept of Micromaps

- Link of row-labeled univariate (or multivariate) statistical summaries to corresponding geographical region
- Focus on statistical display and not on maps
- Useful for
  - environmental data
  - agricultural data
  - medical data
  - public health data
  - economical data

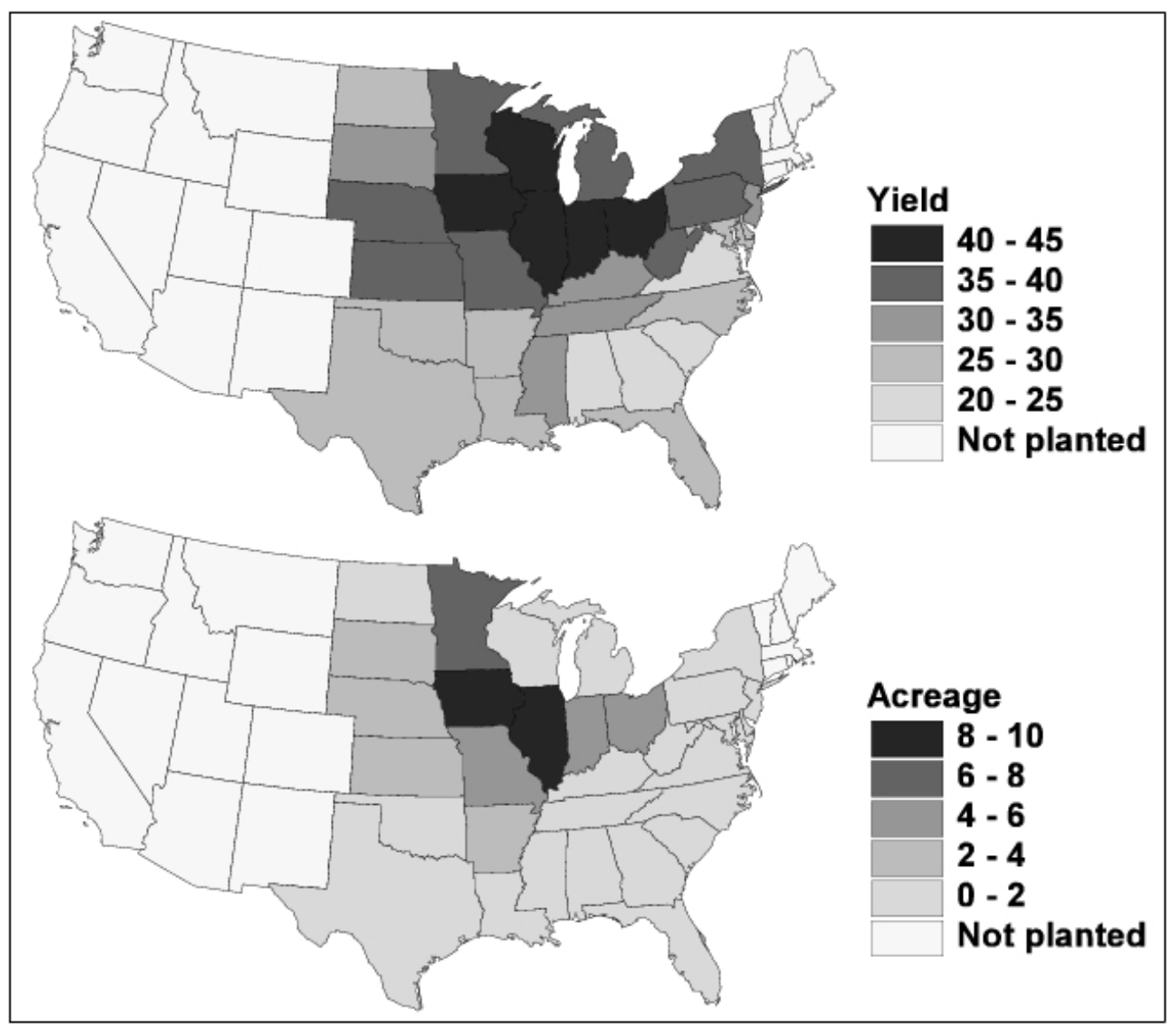


History of Micromaps

- First presented at 1996 American Statistical Association's annual meeting (Olsen, Carr, Courbois, Pierson)
- Initial references:
  - Carr, Pierson (1996) Emphasizing Statistical Summaries …with Micromaps, SCSG*, Vol.7, No.3
  - Carr, Olsen, Courbois, Pierson, Carr (1998) Linked Micromap Plots …, SCSG, Vol. 9, No.1

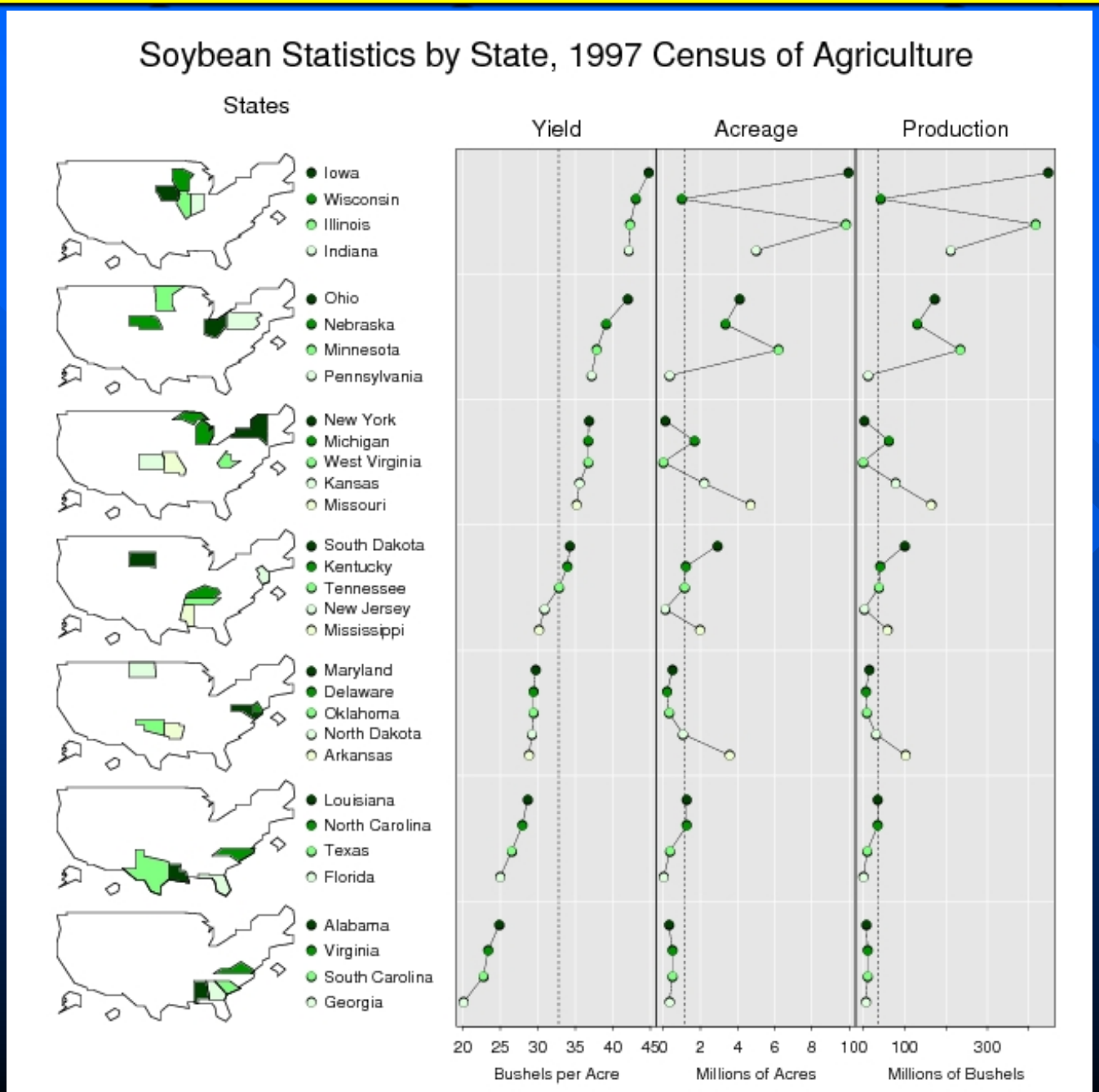
*Statistical Computing & Statistical Graphics Newsletter: http://stat-computing.org/newsletter/archive.html

Choropleth Maps vs Micromaps (1)



From: Symanzik & Carr (2008)

Choropleth Maps vs Micromaps (2)



From:
Symanzik &
Carr (2008)

Limitations of Choropleth Maps

1) Some map regions can be too small to effectively show color.
2) Converting a continuous variable into a variable with a few ordered values results in an immediate loss of information.
3) Difficult to show more than one variable in a choropleth map.

Basic Examples

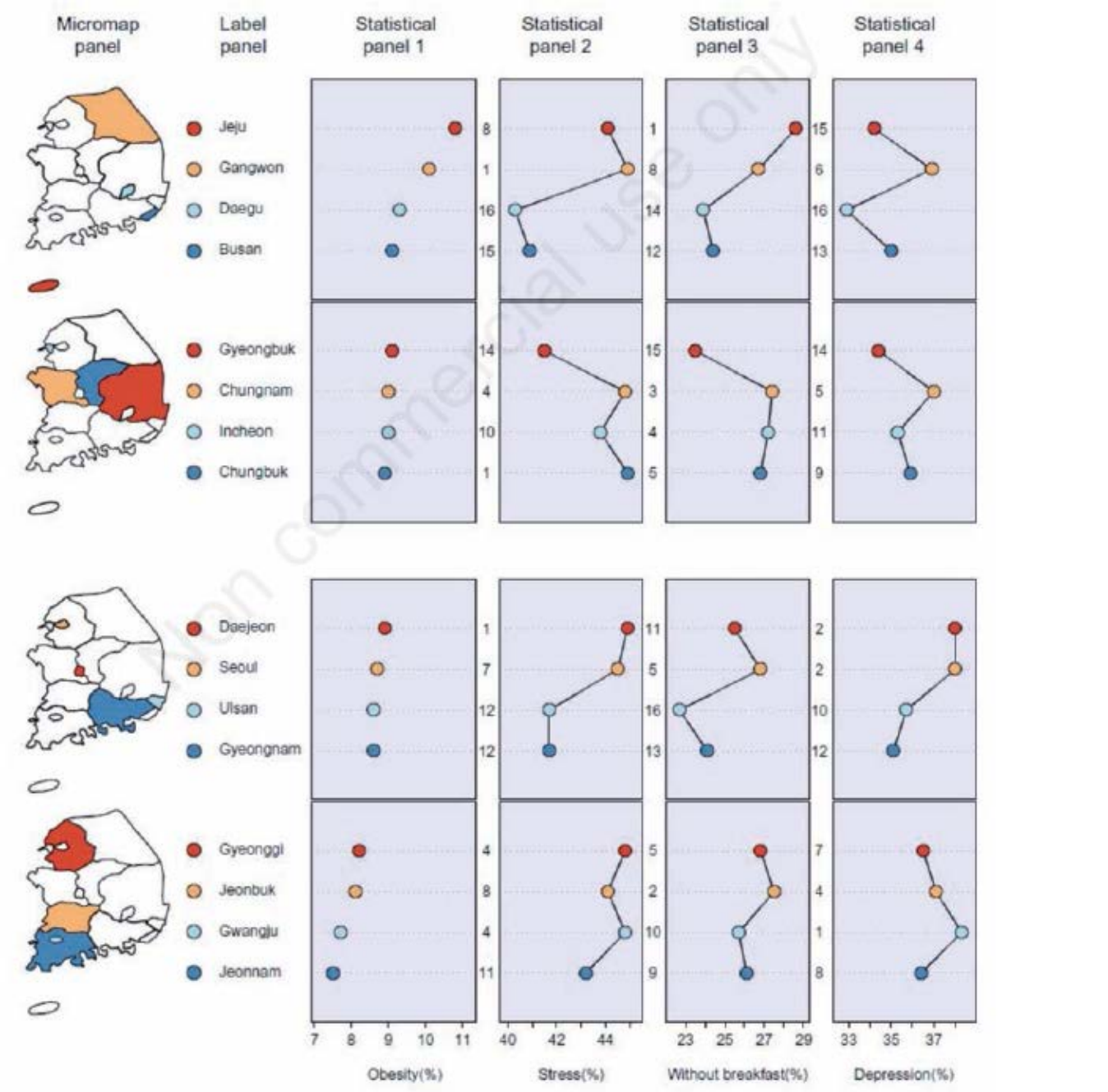


Figure 4. Linked micromap plot showing the relationships among obesity, stress, starting the day without breakfast, and depression based on regional averages in the period 2006-2013.

From: Han et al. (2016)

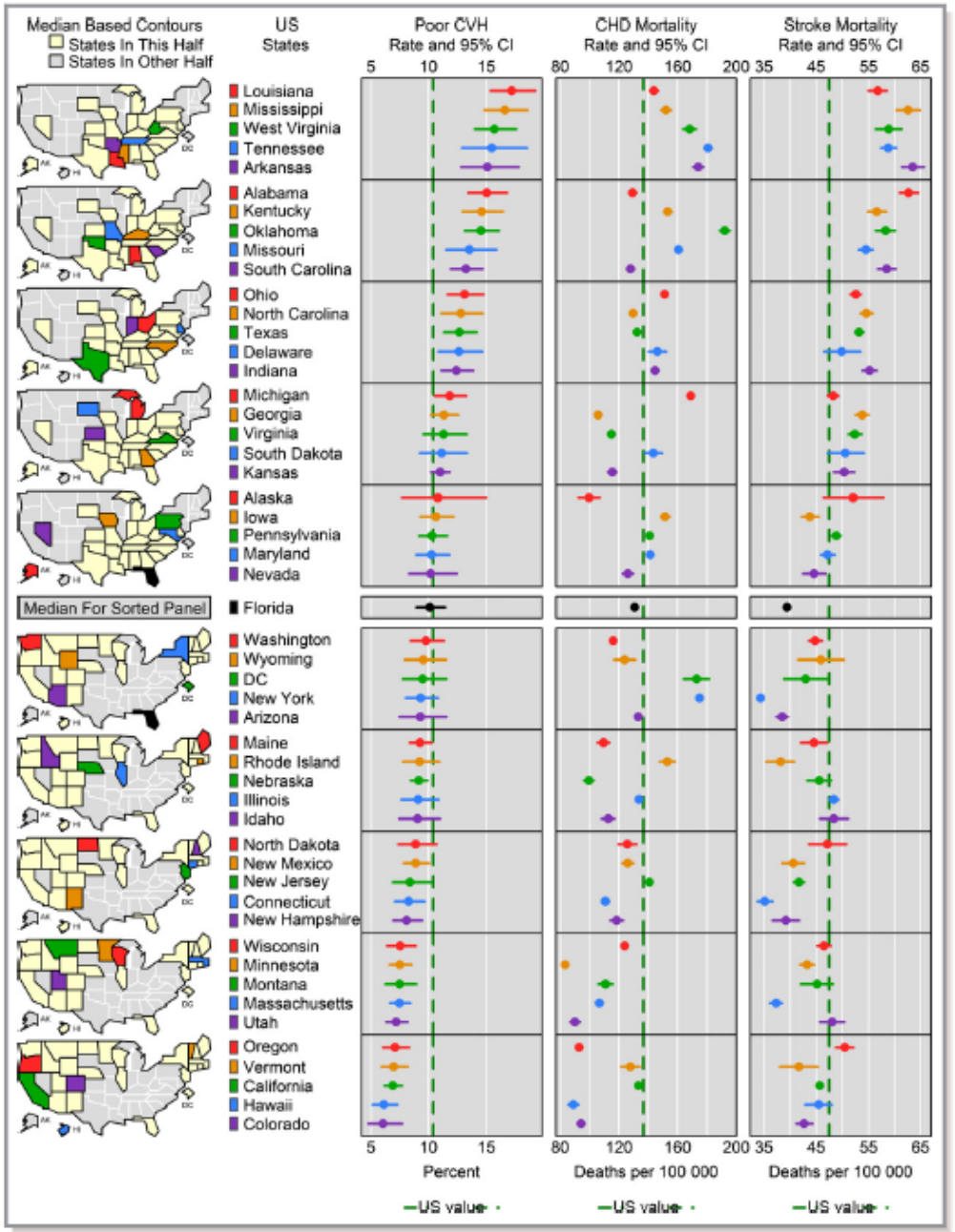


Figure. Linked micromap plot showing age-adjusted prevalence of poor cardiovascular health (CVH) and mortality rates for coronary heart disease (CHD) and stroke by state in 2011. The green lines show the national average (ie, mean) of the prevalence of poor CVH (10.4%), the CHD mortality rate (136.6 per 100 000), and the stroke mortality rate (47.5 per 100 000). Florida (black color) highlights the median of poor CVH among the states and the District of Columbia. AK indicates Alaska; DC, District of Columbia; HI, Hawaii.

From: Gebreab et al. (2015)

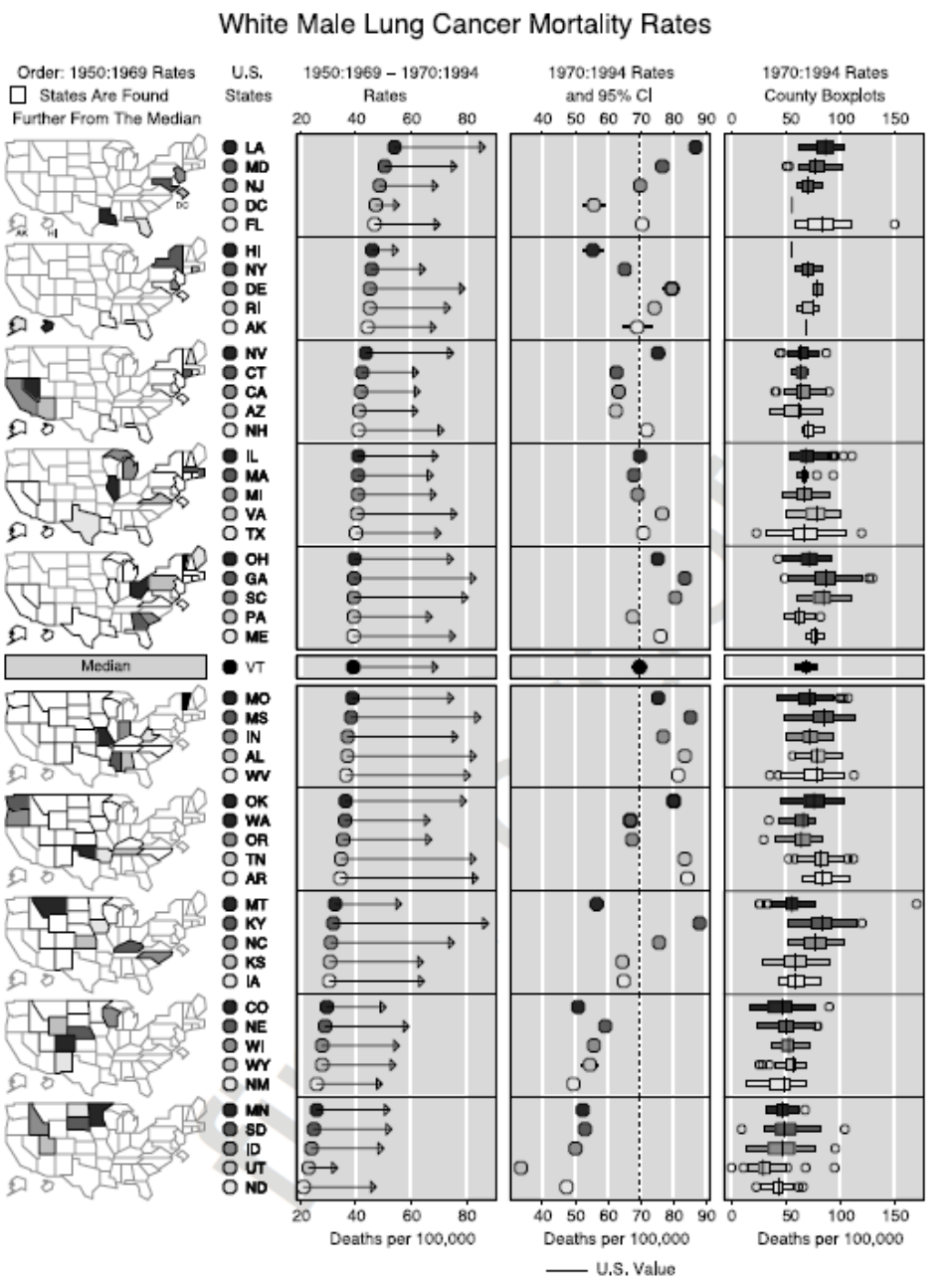


Figure 1.6. [This figure also appears in the color insert.] LM plots, based on data from the NCI Web page, showing summary values for the years 1950 to 1969 and for the years 1970 to 1994 in the *left data panel*, rates and 95 % confidence intervals in the *middle data panel*, and boxplots for each of the counties of each state in the *right data panel*

From: Symanzik & Carr (2008)

Micromap Construction

Micromaps in R

- Two recently developed R Packages:
  - ``micromap'': general purpose; can handle arbitrary shapefiles from Geographic Information Systems (GIS)
  - ``micromapST'': focus on the 50 U.S. states

Regional Micromap Construction

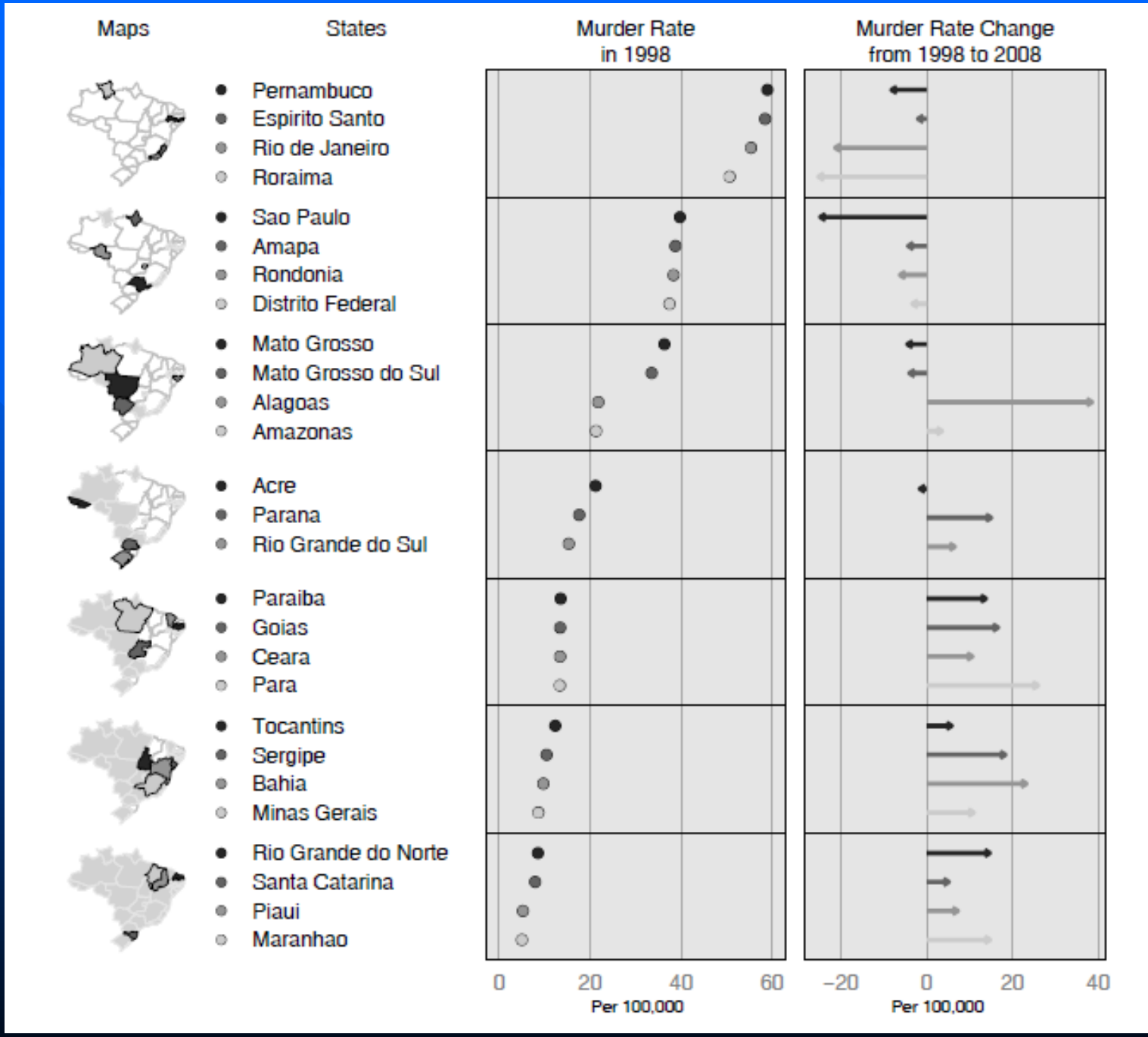
- Modification of existing shapefiles
  - Simplification of boundaries (via Douglas-Peucker 1973 algorithm) [previously solved]
  - Removal of tiny islands [previously solved]
  - Enlarge small areas such as capital regions, e.g, Washington DC in the United States
  - Shift and resize (enlarge or shrink) regions that are far away from the main area, e.g., Alaska or Hawaii in the United States
  - Create R code for the remaining tasks

Brazil Simplification

- UL: Raw
- UR: Thinned boundaries
- LL: Capital region enlarged
- LR: Capital region enlarged & shifted

From: Symanzik et al. (2014)

Brazil Example



From: Symanzik et al. (2014)

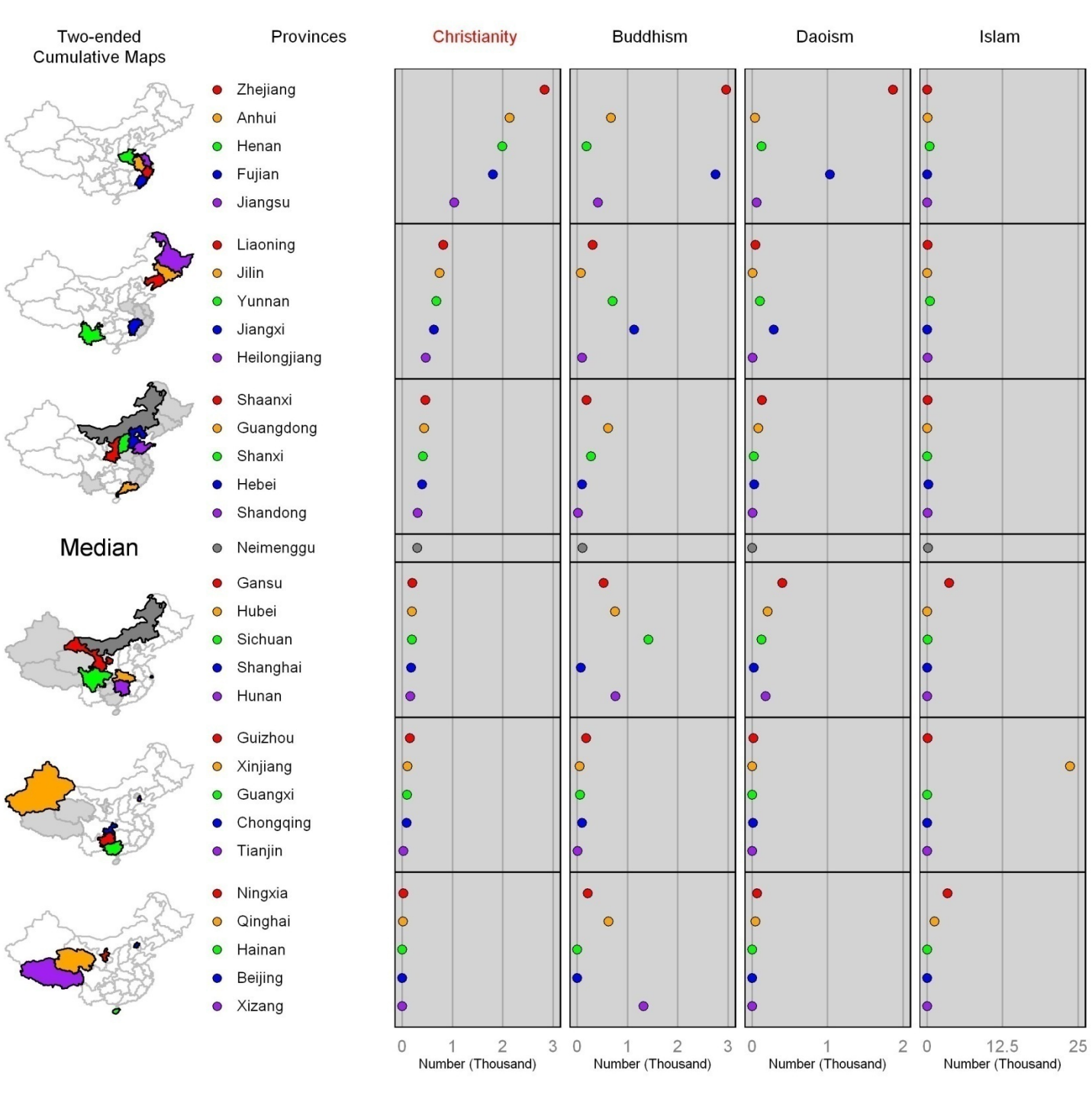
China Simplification

From: Symanzik et al. (2016)

- Left: Raw
- Center: Thinned boundaries & small districts highlighted
- Right: Small districts enlarged

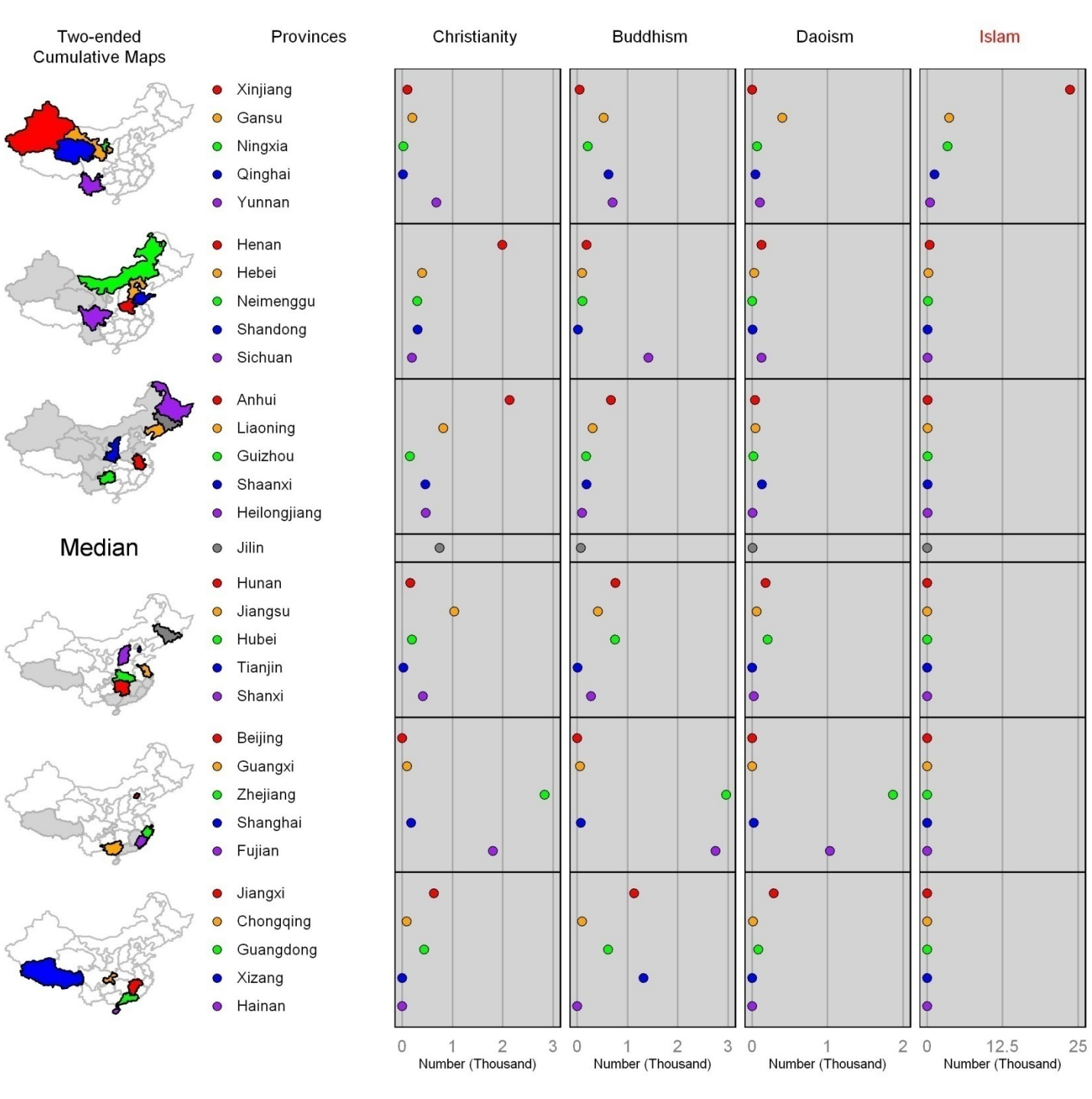
China Example (1)

From: Symanzik et al. (2016)



China Example (2)

From: Symanzik et al. (2016)



Current / Future Work

- Introduce additional data panels to micromap R package, such as line charts (time series plots) and scatterplots

- Further enhance, test, and debug R code for the creation of regional micromaps and add functionality to micromap R package once code is stable

- **Collaborators sought for additional countries & new applications !!!**

References

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Questions ???

– or –

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