

Statistical methods that enhance national data to align with regional health policy objectives

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ViCBiostat, January 2018

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Australian Government

Department of Health

Overview

- Background
- Indigenous smoking prevalence
- Requirements for regional analysis
- Selling small area estimation
- Conclusions

Background

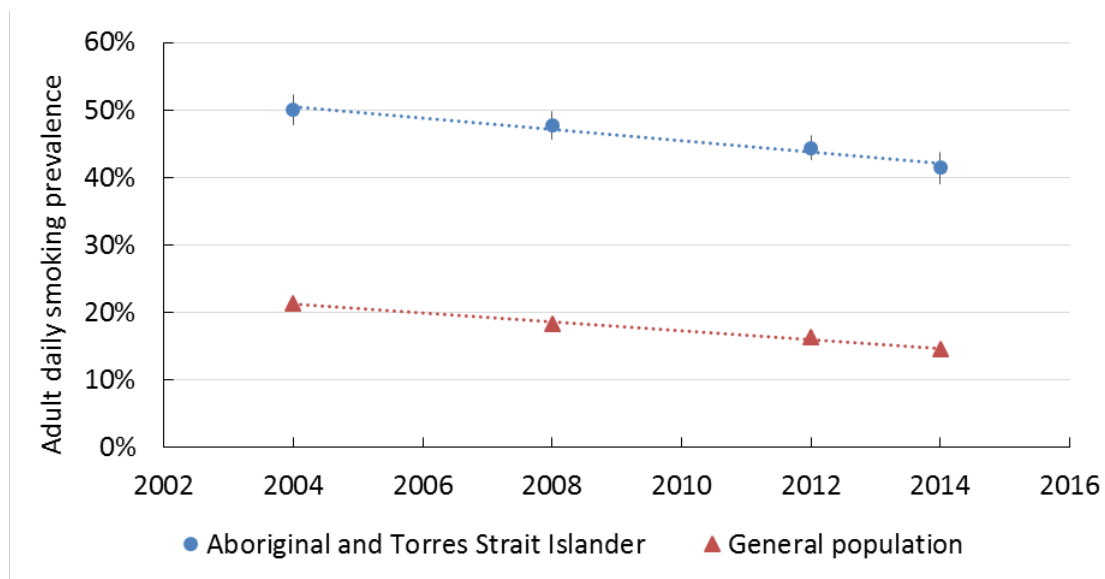


For Aboriginal and Torres Strait Islander people:

- Over 30% of disease burden is attributable to health risk behaviours (AIHW 2016)
- Tobacco is a leading health risk behaviour, ~12% (AIHW 2016)
- 39% of Indigenous adults smoke (ABS 2016)
- Since mid-2000 - Public health argument for targeted interventions

35,000 fewer smokers in Aboriginal and Torres Strait Islander population over last 10 years

- 8.6% point decline in smoking rates
- Particular strong declines in young adults, females and populations in urban areas



Ray Lovett et al. (2017) Deadly Progress. Public Health Research & Practice 27, e2751742.

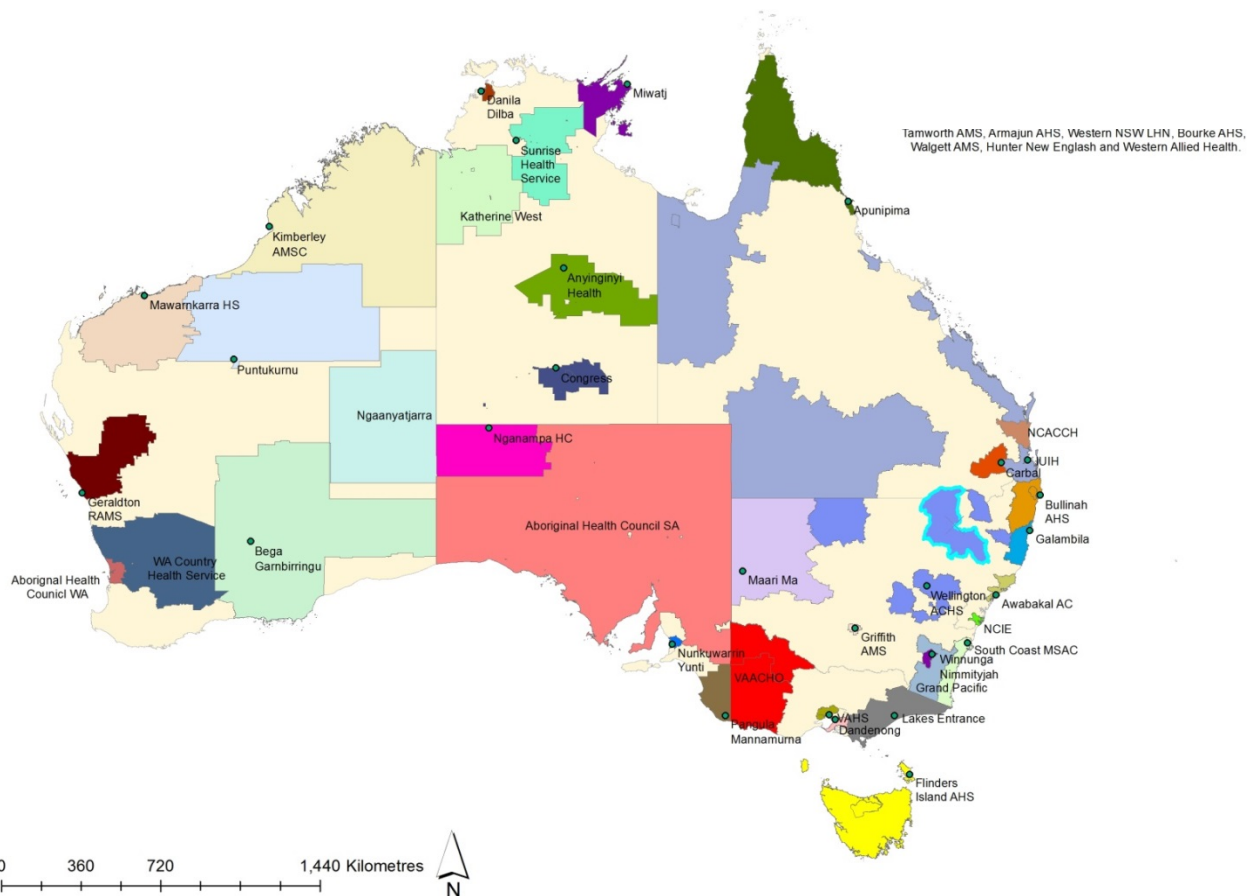
Smoking prevalence - current

- 39% Aboriginal and Torres Strait Islanders smoked in 2014/15, down from 49% in 2002
 - Higher for remote areas than non-remote
 - Varies by state and sex
 - Previous localised surveys – very high prevalence
- We don't know what is happening regionally

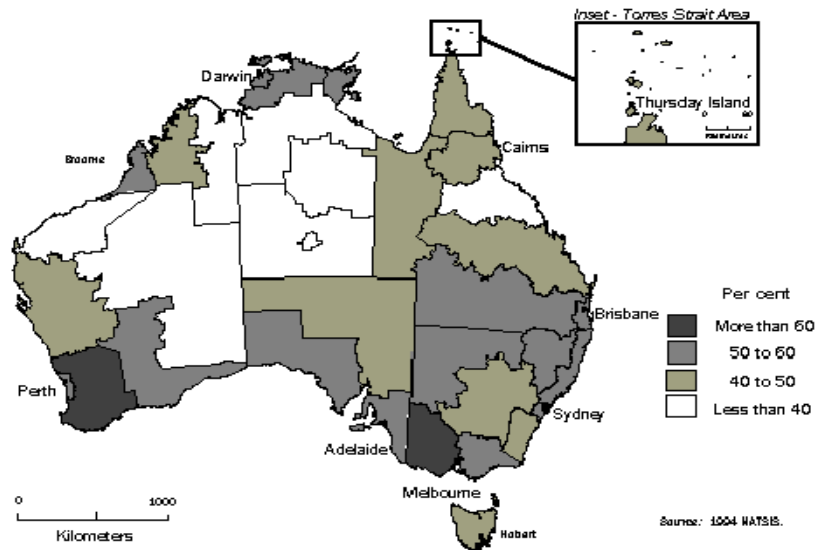


Funding tobacco control

Tackling Indigenous Smoking Regional Tobacco Control Grants 2016



Indigenous smoking prevalence (1994)



Females



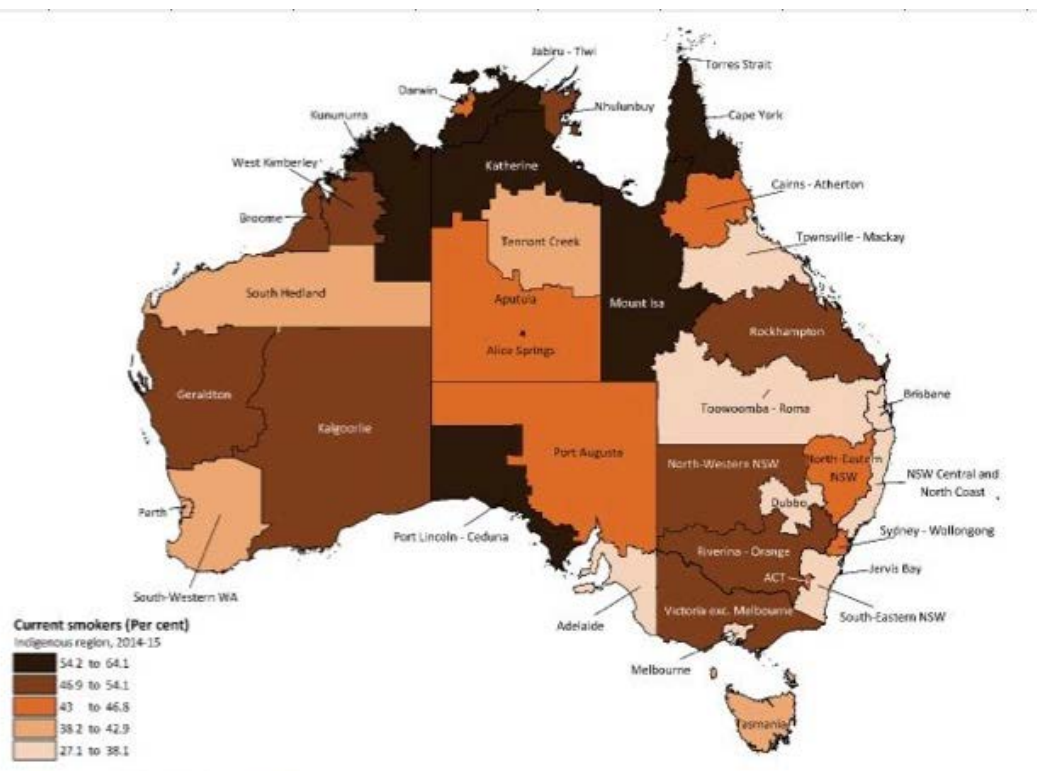
Males

Source: Cunningham 1997



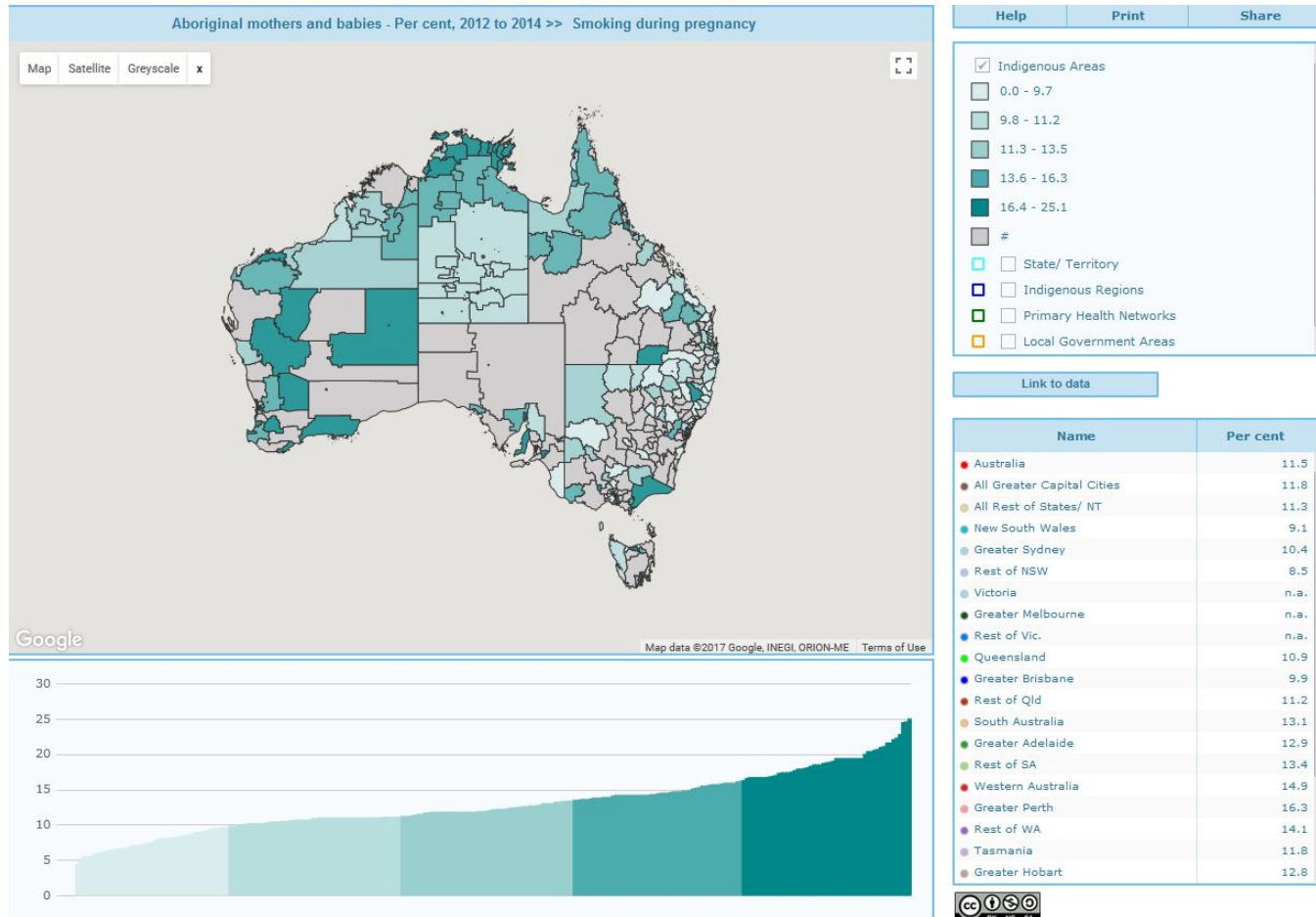
Indigenous smoking prevalence (2015-)

- DoH
- PHIDU
- NCEPH



Source: ABS and AIHW analysis of 2014-15 NATSISS

Aboriginal and Torres Strait Islander Health Performance Framework

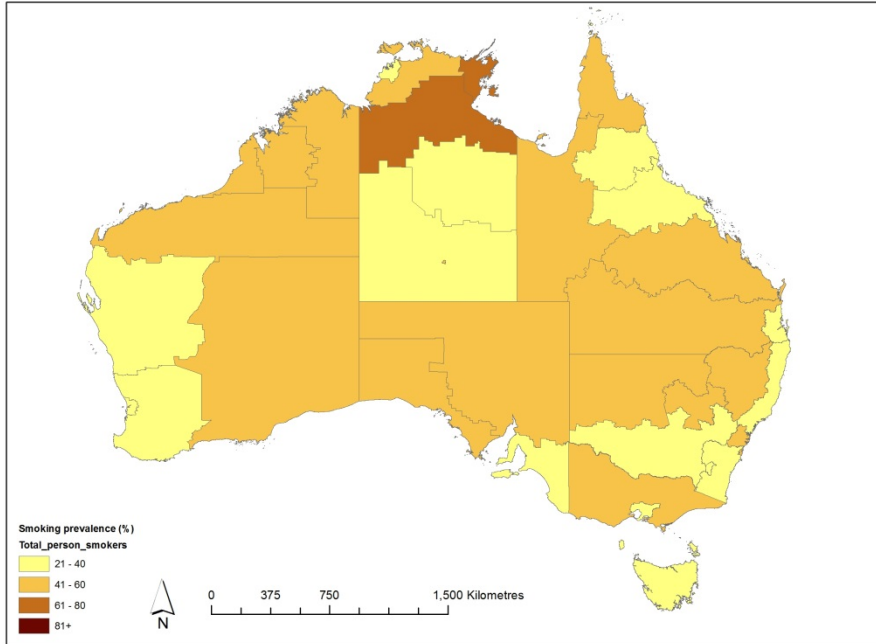


Population < 100

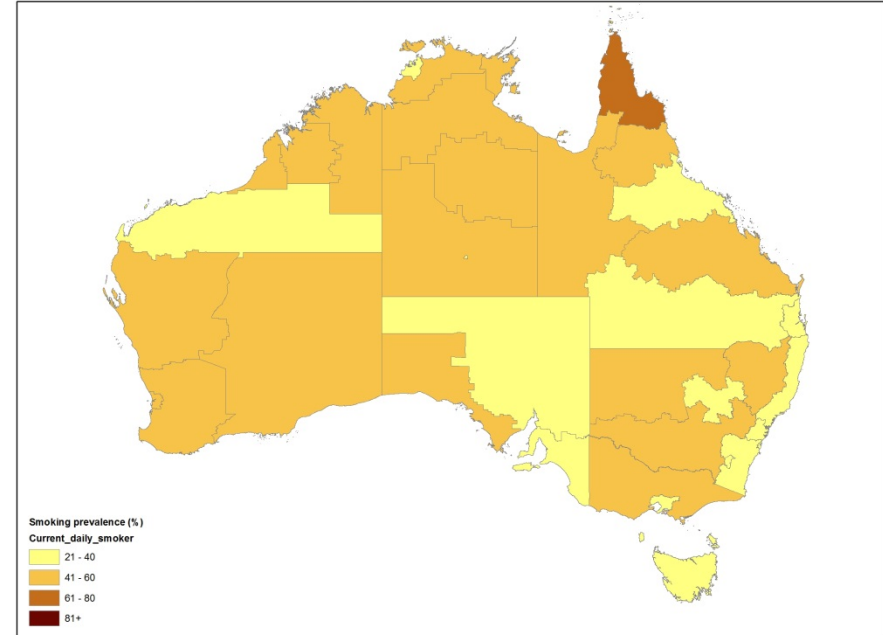
- Even modelled estimates may be suppressed



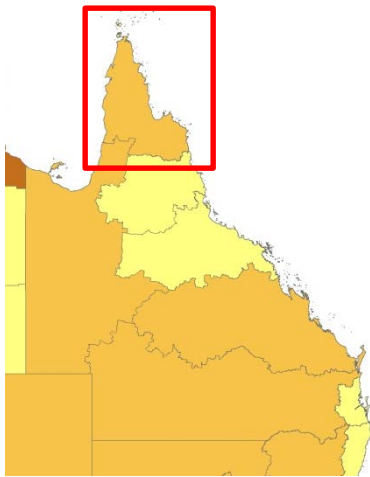
Smoking prevalence in Aboriginal and Torres Strait Islander populations 2012-13



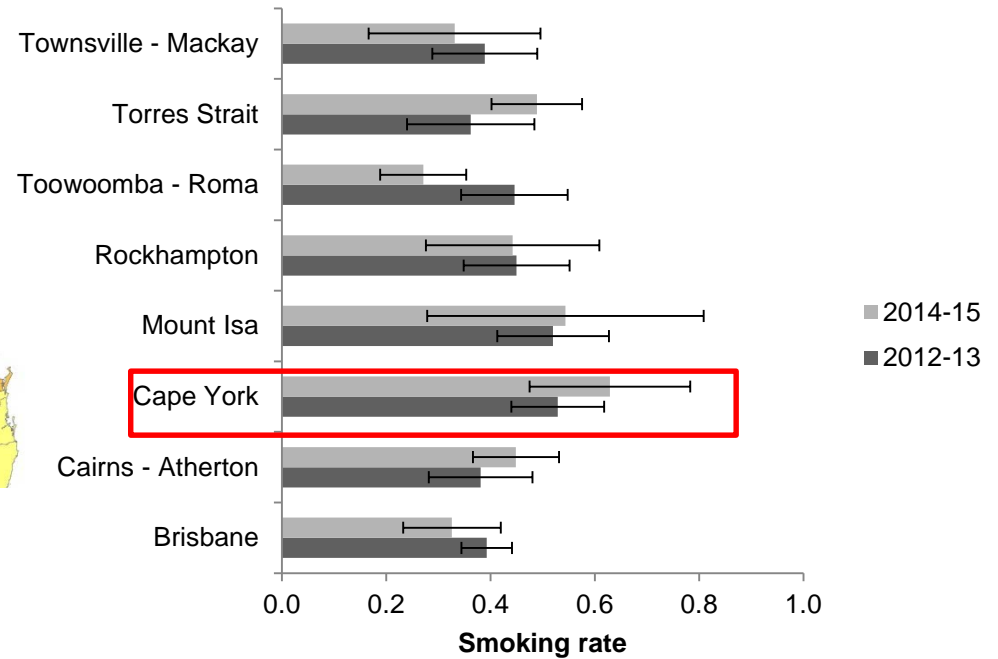
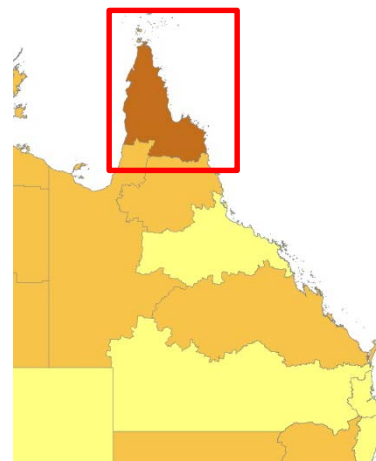
Smoking prevalence in Aboriginal and Torres Strait Islander populations 2014-15



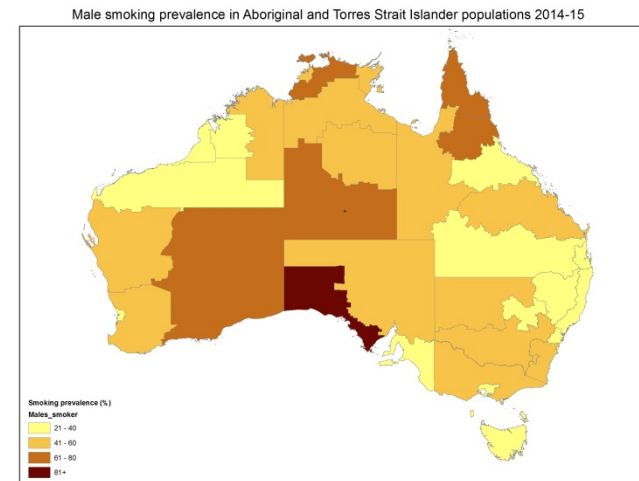
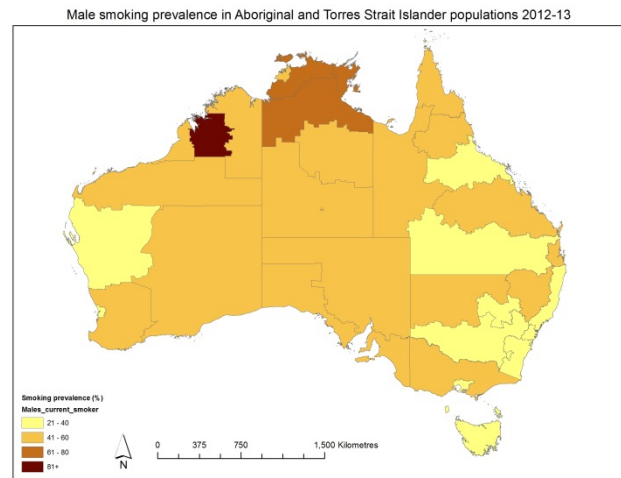
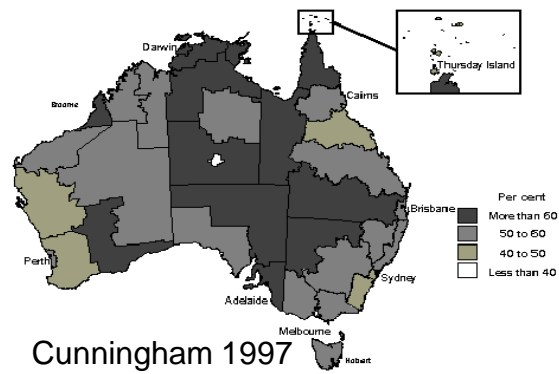
2012-13



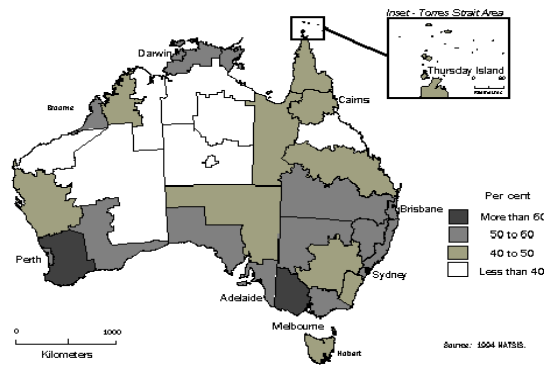
2014-15



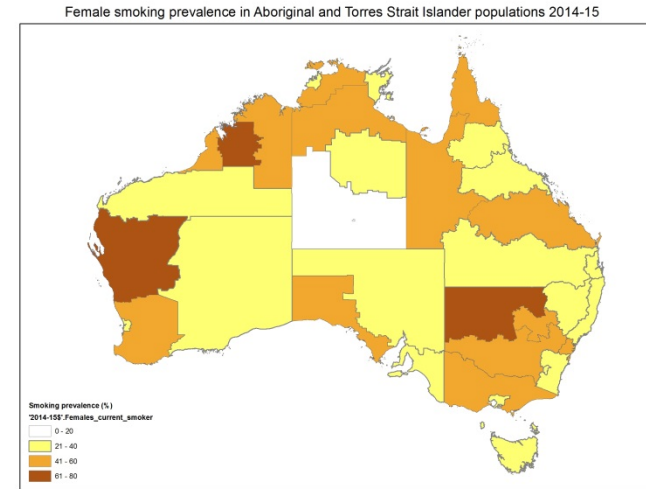
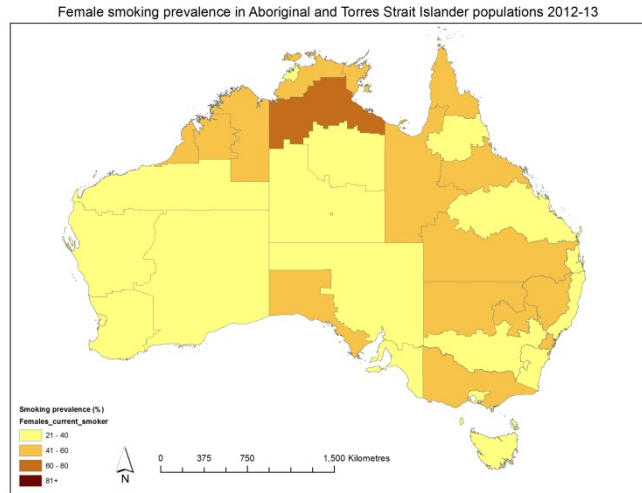
Male smoking prevalence 1994, 2012/13 and 2014/15



Female smoking prevalence 1994, 2012/13 and 2014/15



Cunningham 1997

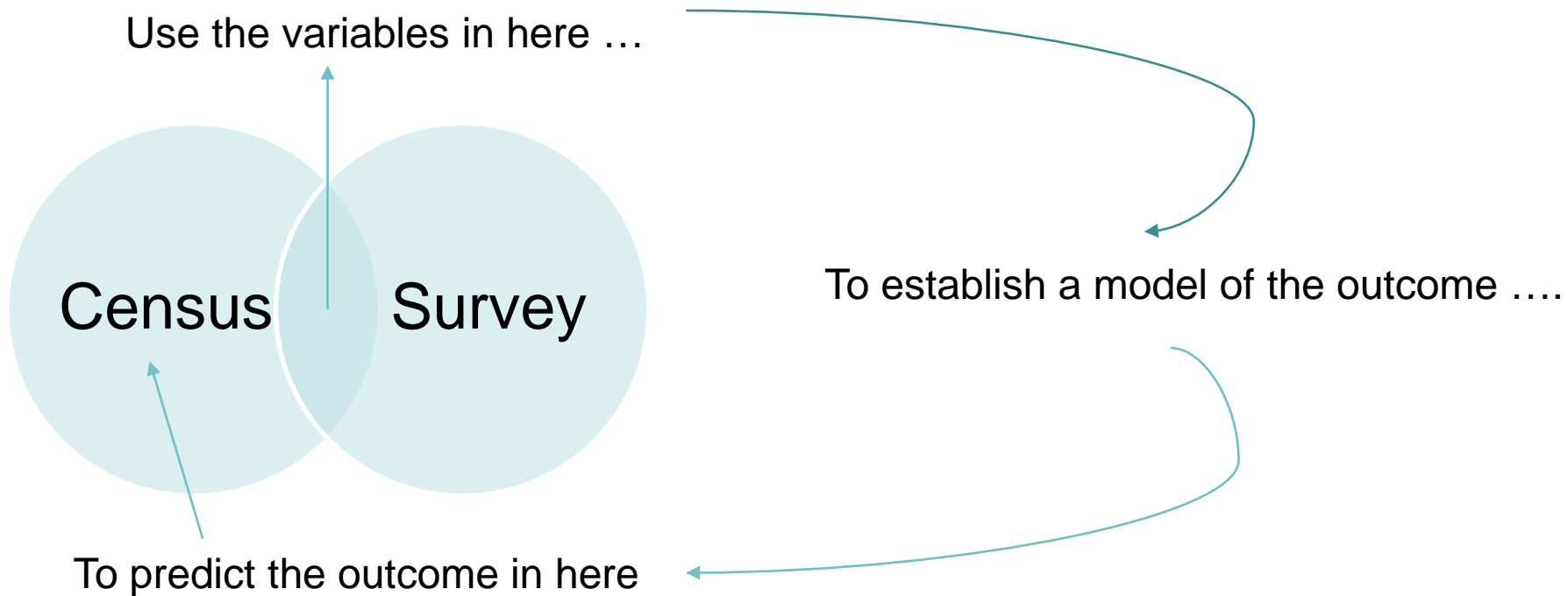


Why ask for this?

- ABS surveys are the only data available to understand smoking prevalence at this scale
- Regional level analysis is needed when you have regional program delivery
- Likely to benefit other Indigenous program areas

Requirements for regional analysis: analysis end

- Conceptual model of SAE ...



Steps in classical SAE

- Identify relevant data: “census” and “survey”
- Identify and verify matching questions (and geocoding) in census and survey
- Merge and clean data at individual level
- Create cluster level (contextual) means from census and merge with survey
- Regression model of outcome (daily smoking) on cluster level means

- Finalise unit record level census data with survey-matched and cluster level variables
- Apply survey-based model to census data to generate SAEs
- Check quality and precision of SAEs
- Further model development, maps
- Dissemination

Criticisms of small area estimation

- Adds random noise
- Too much work
- The wrong work
- Establishing the survey model is hard
- Changes are small

- Multiple imputation is unsatisfactory because it adds random noise to the data ...
- Multiple imputation does not pretend to *create* information through simulation but to *represent* ... information

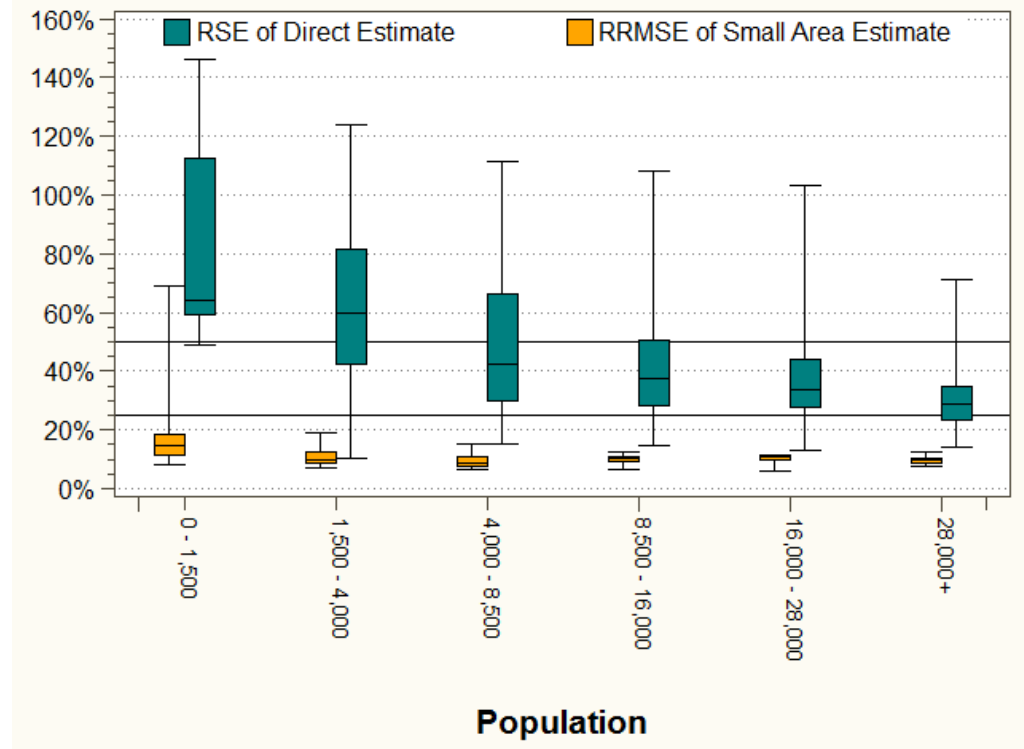


<http://crazystable.squarespace.com/journal/tag/Raphael>

- Multiple imputation is too much work

...

- Compared to what?

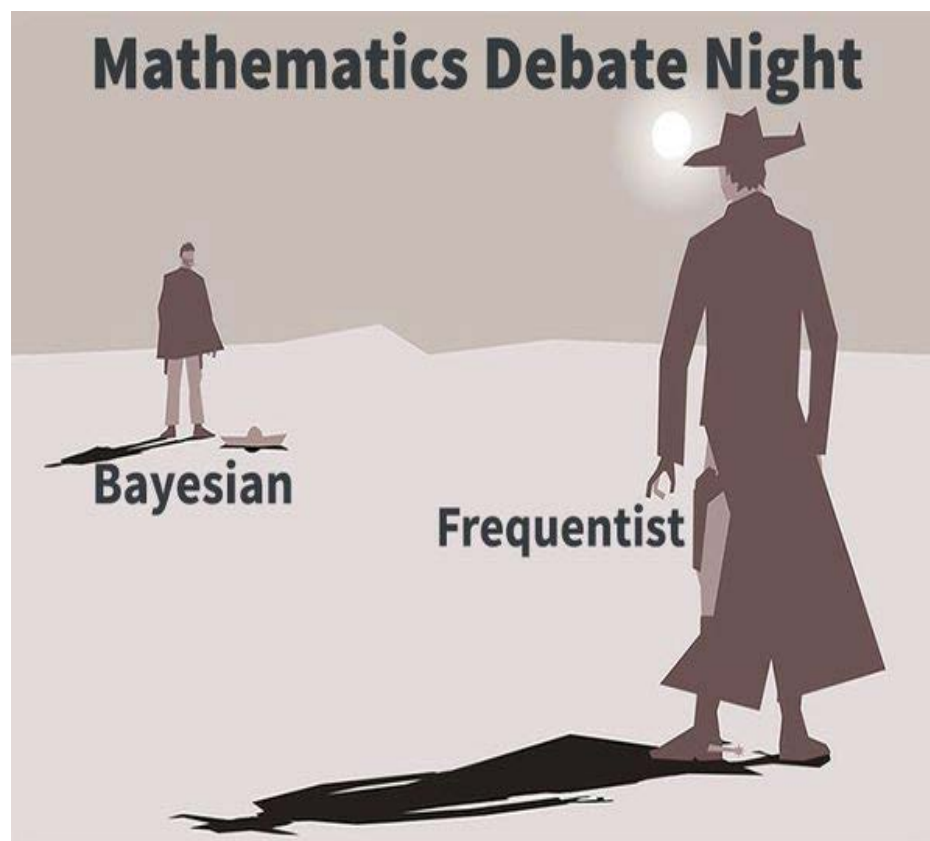


- SAE is the wrong work, we should advocate for better data collection ...
- And what are we going to do while we wait?



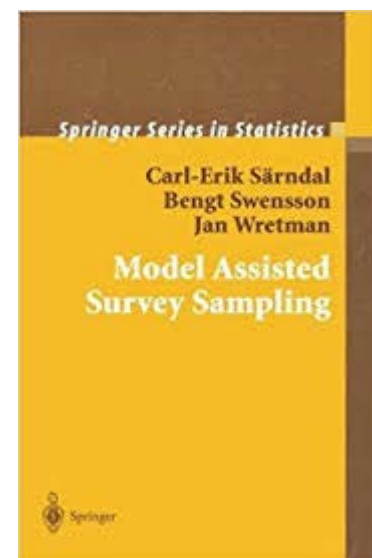
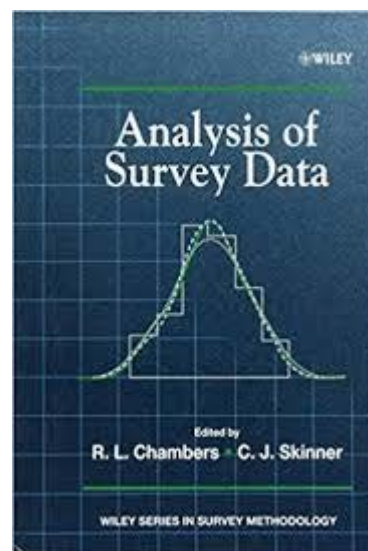
Establishing the survey model is hard

...



- SAE is the wrong work, Models have no place in analyses of ABS data ...
- Even a weighted estimate can be thought of in terms of an underlying model

$$\hat{y}_{\text{HT}} = \frac{1}{n} \sum_{i \in S} \tilde{w}_i y_i$$

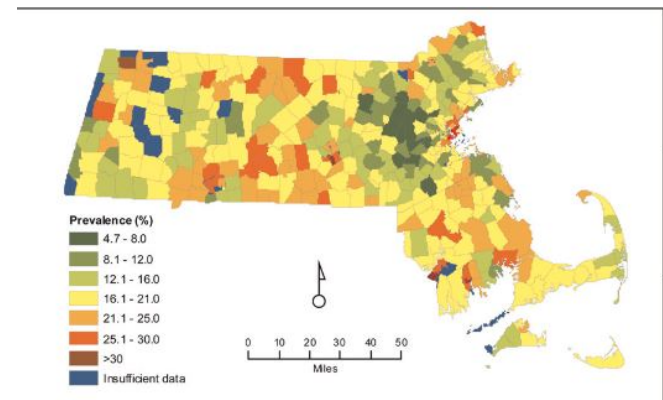
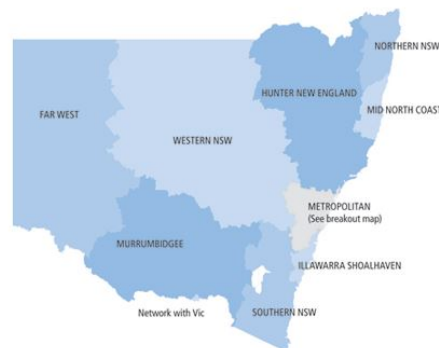
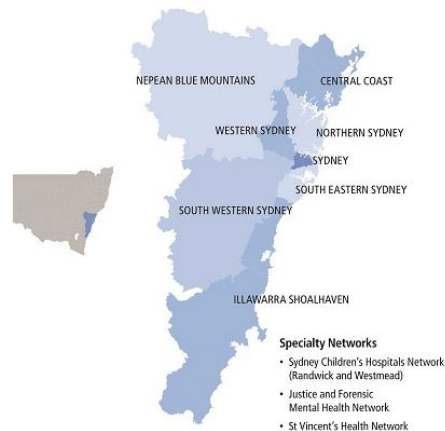


- SAE is the wrong work, you should never impute an outcome ...



Multilevel modelling works

- NSW
- England
- Massachusetts



Selling small area estimation ...

This agglomeration which was called and which still calls itself the Holy Roman Empire was neither holy, nor Roman, nor an empire.



“Smoking prevalence is decreasing ...
the interventions are working!”

- Is it even possible to answer this question?



Conclusions

- Regional analysis is important for regional program delivery
- Trends are important – smoking influenced by gender and remoteness
- Options to improve future data collection