

WIP

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3 Introduction

3.1 Context

The importance of health regions in the planning of Brazil's Unified Health System (SUS).

3.2 Current challenges

- heterogeneous criteria
- politically driven definition
- limited use of robust statistical methods

3.3 Research problem

How can we propose a data-driven health regionalization method that accounts for uncertainty and temporal dynamics?

3.4 Objectives

- Apply the Bayesian space-time partitioning model to propose and evaluate health regionalizations in Brazil.
- Explore health data sources (hospitalizations, health infrastructure, mortality, primary care coverage).
- Define probabilistic health regions based on these data.
- Compare estimated regions with official health regions and with the REGIC (IBGE).
- Discuss implications for health policy and planning.

4 Literature Review

4.1 Health regionalization in Brazil

- Historical background of SUS regionalization
- Health regions (IBGE / Ministry of Health definitions)
- Critiques and practical challenges in implementation

4.2 Spatial regionalization methods

- Classical approaches: SKATER, AZP, k-means with contiguity constraints
- Applications in health: hospital catchment areas, regional health planning studies

4.3 Bayesian and space-time approaches

- Key reference: [Bayesian space-time partitioning by sampling and pruning spanning trees](#)
- Advantages: explicit uncertainty, robustness to noise, temporal flexibility

5 Methodology

5.1 Data sources

- DataSUS ([opendatasus](#))
- Tabnet/CNES (hospital resources: beds, equipment, professionals)
- IBGE (demography data)

5.2 Statistical model

- Graph representation of municipality adjacency
- Spanning trees and partitioning via pruning
- Bayesian specification (priors, cohesion functions, parameters).
- Inference algorithm (Gibbs sampler)

5.3 Software

- R
 - [microdatasus] (<https://github.com/rfsaldanha/microdatasus>)

5.4 Evaluation strategy

- Compare estimated partitions with official health regions, REGIC 2018
- Metrics: rand index, Jaccard, F1-score
- Error measures (MAE, MSE) on aggregated health indicators
- Visualization: probability maps showing clustering uncertainty, transition zones

6 Results

7 Discussion

8 Conclusion