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Measuring efficiency and effectiveness changes in Brazilian primary care services

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Research Scenario

- Primary Health Care
  - Its role for an economically sustainable health system
  - Focus on analysing the public health care system

- Brazilian state of Santa Catarina
  - About 7 million inhabitants
  - National recognition about good performance in health indicators
  - 295 municipalities – 290 with complete data along the analysed period (2008-2014)

Brasil (2011); Starfield (1994)

Objectives

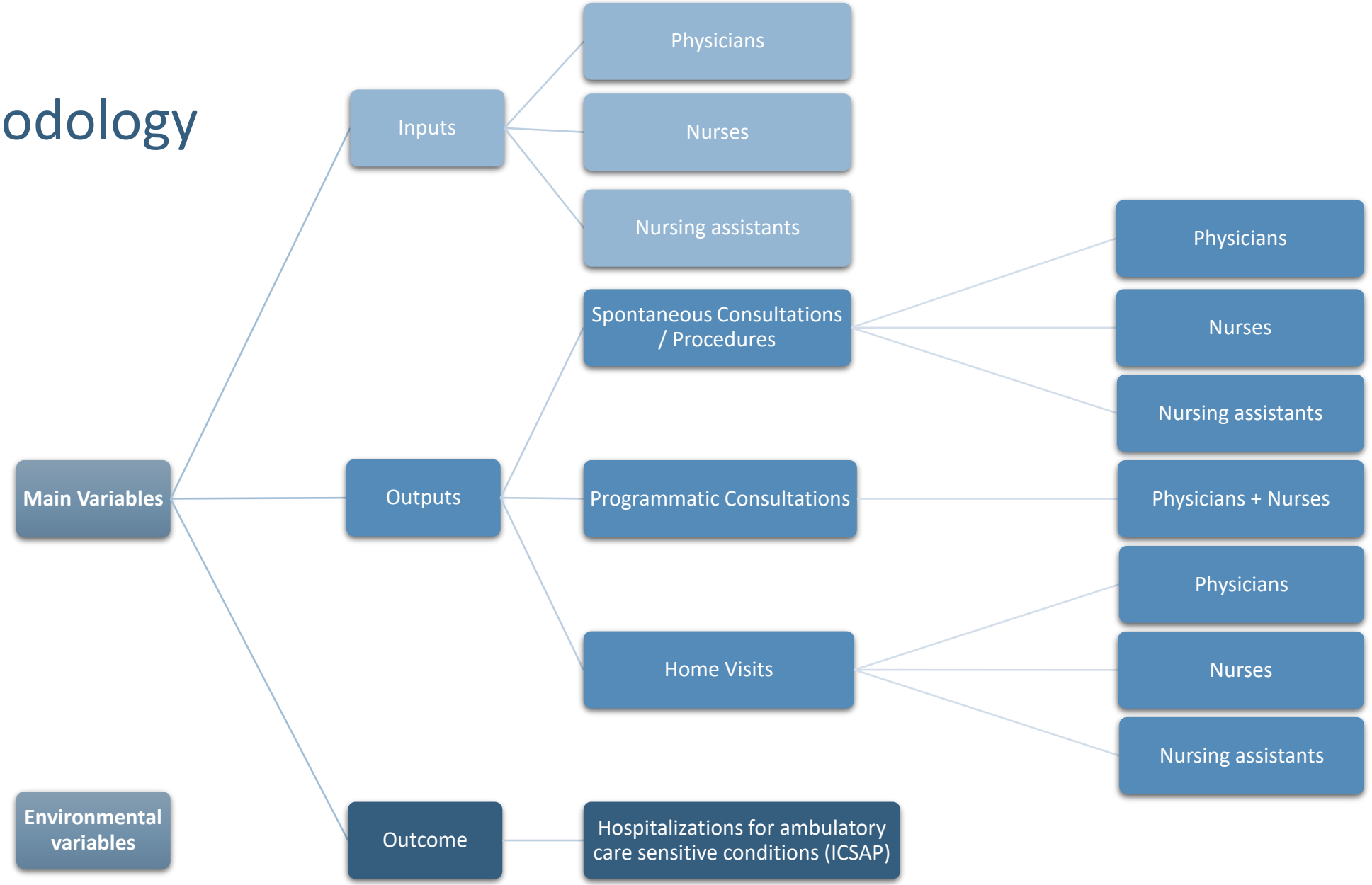
- To identify cities with best performance in primary health care, potential benchmarks
- To analyse the relation between performance (outputs) and health improvement (outcomes)
- To identify factors linked to the results of efficiency and effectiveness

Methodology

- Data Envelopment Analysis (DEA)
  - A DMU represent the primary care services provided by a municipality
  - Output-oriented model (focus on output improvement instead of saving resources)
  - CRS assumption (proportional relation between inputs and outputs; to permit the use of MPI)
  - Malmquist Productivity Index (MPI): to evaluate productivity changes through the years

Thanassoulis (2001)

Methodology



List of Ambulatory Care Sensitivity Conditions (compound the ICSAP indicator)
1. Immunization preventable diseases and sensitive conditions
2. Infectious gastroenteritis
3. Anemia
4. Nutritional deficiencies
5. Ear, nose and throat infections
6. Bacterial pneumonias
7. Asthma
8. Lower airway diseases
9. Hypertension
10. Angina *pectoris*
11. Heart failure
12. Cerebrovascular diseases
13. Diabetes mellitus
14. Epilepsies
15. Kidney and urinary tract infection
16. Skin and subcutaneous tissue infection
17. Inflammatory disease of female pelvic organs
18. Gastrointestinal ulcer
19. Diseases related to prenatal care and childbirth

Brasil (2008)

Adjustments – weight restrictions

- Objective: to undertake fair comparisons through the incorporation of information about reasonable trade-offs between inputs and between outputs
- Advantage: to reflect the current practice and organisation taking into account costs and activities made by the different professionals involved in health care

Podinovski (2004)

Adjustments – use of super-efficiency

- Objective: to find potential outliers to minimize the interference of data noise in the efficiency's analysis
- Chosen cut-off: technical efficiency ≥ 120%
  - 18 DMUs in this condition in at least one year

272 municipalities (DMUs)

Banker & Chang (2006)

Results

- Deterioration of productivity from 2008 to 2014 due to:

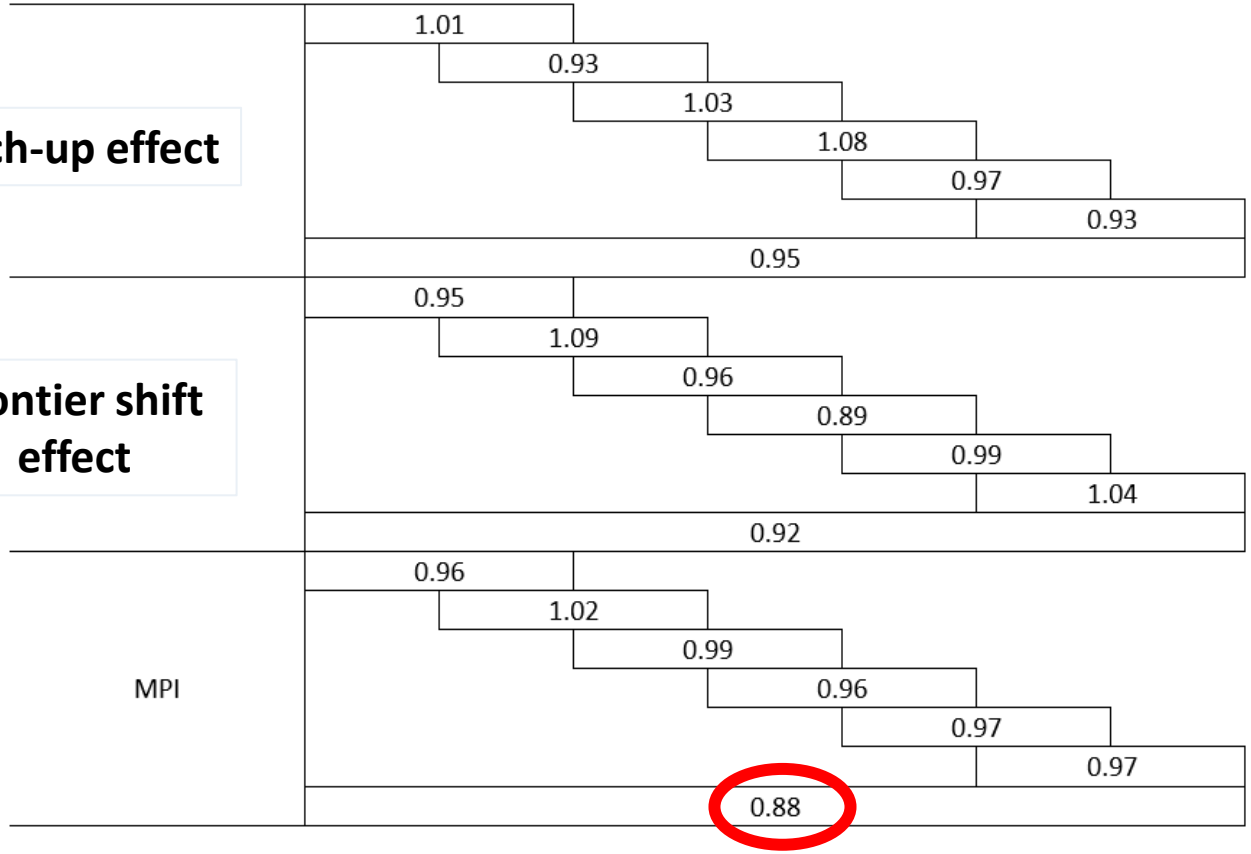
An increase in the mean distance to the frontier

(on average, municipalities are further away from the frontier)

+

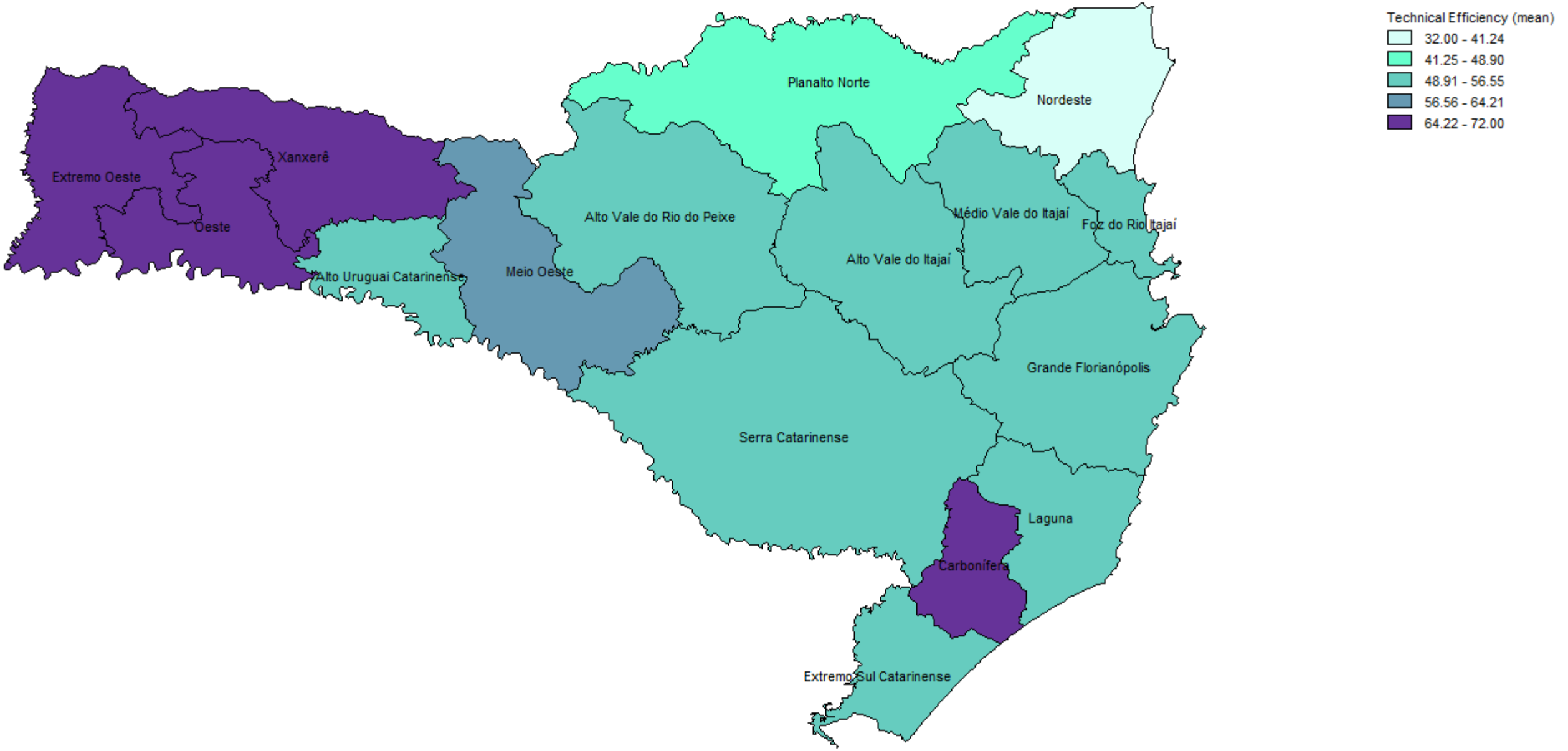
Technological regression

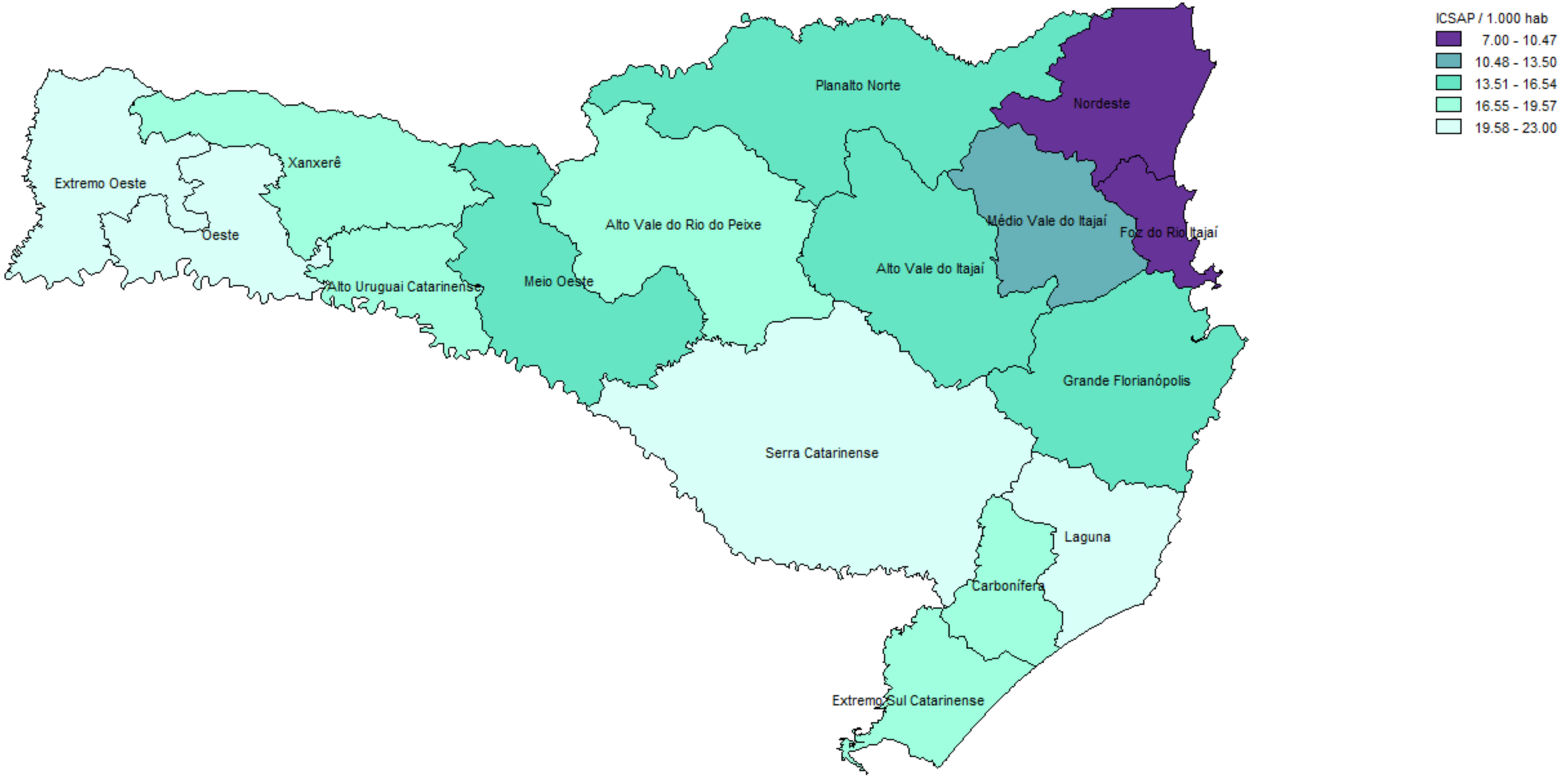
Indicators (means)	2008	2009	2010	2011	2012	2013	2014	mean
Efficiency	58.33%	58.07%	54.37%	55.83%	59.08%	57.19%	53.57%	56.64%
ICSAP/1.000 hab	19.46	17.85	17.25	16.14	15.94	15.98	16.39	17.00
% ICSAP	30.58%	29.45%	28.88%	26.54%	24.80%	23.70%	21.63%	26.51%
% non-ICSAP	69.42%	70.55%	71.12%	73.46%	75.20%	76.30%	78.37%	73.49%



Decrease in the mean efficiency (away from the frontier)

Technological regression


Technical Efficiency (mean)
32.00 - 41.24
41.25 - 48.90
48.91 - 56.55
56.56 - 64.21
64.22 - 72.00
Planalto Norte
Nordeste
Xanxerê
Extremo Oeste
Oeste
Alto Vale do Rio do Peixe
Médio Vale do Itajaí
Foz do Rio Itajaí
Alto Vale do Itajaí
Alto Uruguai Catarinense
Meio Oeste
Grande Florianópolis
Serra Catarinense
Laguna
Carbonífera
Extremo Sul Catarinense


ICSAP / 1.000 hab
7.00 - 10.47
10.48 - 13.50
13.51 - 16.54
16.55 - 19.57
19.58 - 23.00
Planalto Norte
Nordeste
Xanxerê
Extremo Oeste
Oeste
Alto Vale do Rio do Peixe
Médio Vale do Itajaí
Foz do Rio Itajaí
Alto Vale do Itajaí
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Laguna
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Preliminary clues

Correlations										
Variables	**Efficiency**	**ICSAP**	**Tot Pop**	**Elderly rate**	**Health Teams**	**GDP**	**Municipal HDI**	**Income**	**Poverty**	**Illiteracy**
Efficency	1	,158**	-,207**	,094**	,118**	-,095**	-,161**	-,085**	,100**	,190**
ICSAP		1	-,230**	,205**	,139**	-,186**	-,210**	-,218**	,145**	,305**
Pop Tot			1	-,545**	-,532**	,254**	,429**	,336**	-,210**	-,524**
Elderly rate				1	,307**	-,057*	-,050*	0,014	-0,042	,176**
Health Teams					1	-,104**	-,296**	-,284**	,155**	,423**
GDP						1	,376**	,366**	-,268**	-,292**
Municipal HDI							1	,850**	-,712**	-,760**
Income								1	-,759**	-,702**
Poverty									1	,607**
Illiteracy										1

** Spearman correlation is significant at the 0.01 level

* Spearman correlation is significant at the 0.05 level

Ferreira et al. (2013): Population has a negative influence in efficiency

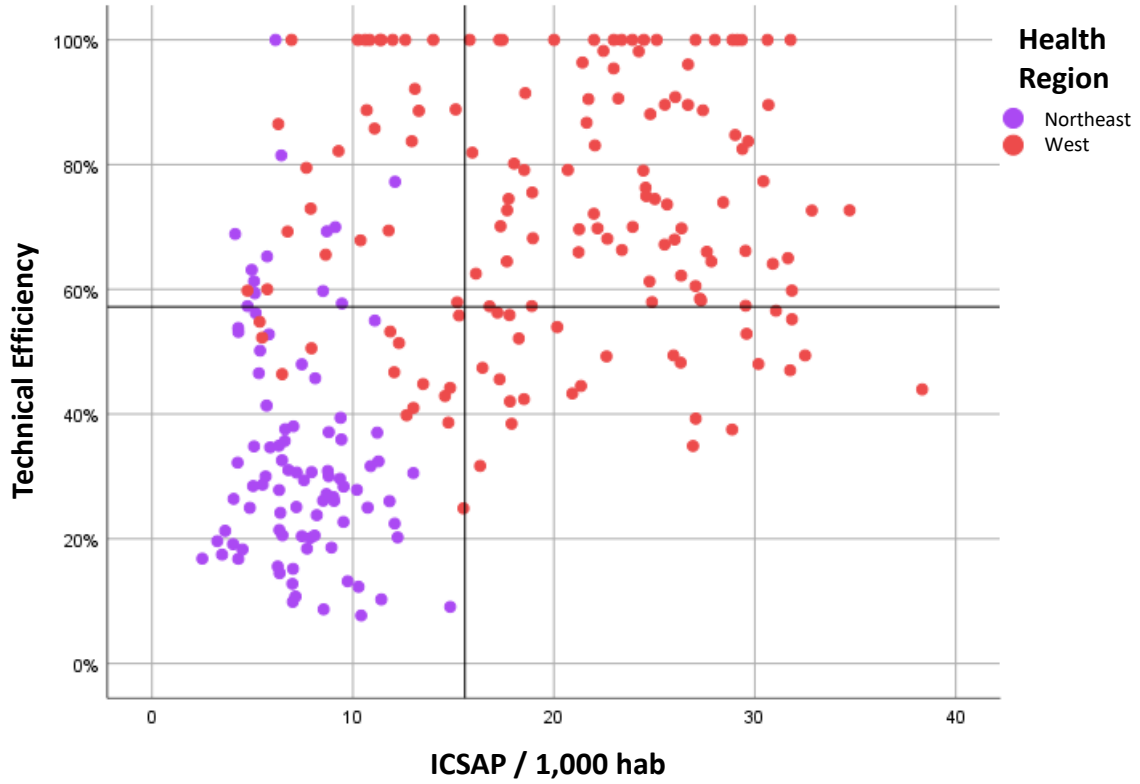
Total Population (mean)	
Northeast	69,280
West	14,795

% elderly (mean)	
Northeast	11.32%
West	13.74%

Illiteracy (mean)	
Northeast	3.71%
West	7.81%

Health Expenditure (mean)	
Northeast	R$ 485.22
West	R$ 584.09

GDP (mean)	
Northeast	R$ 28,706.98
West	R$ 25.576.03

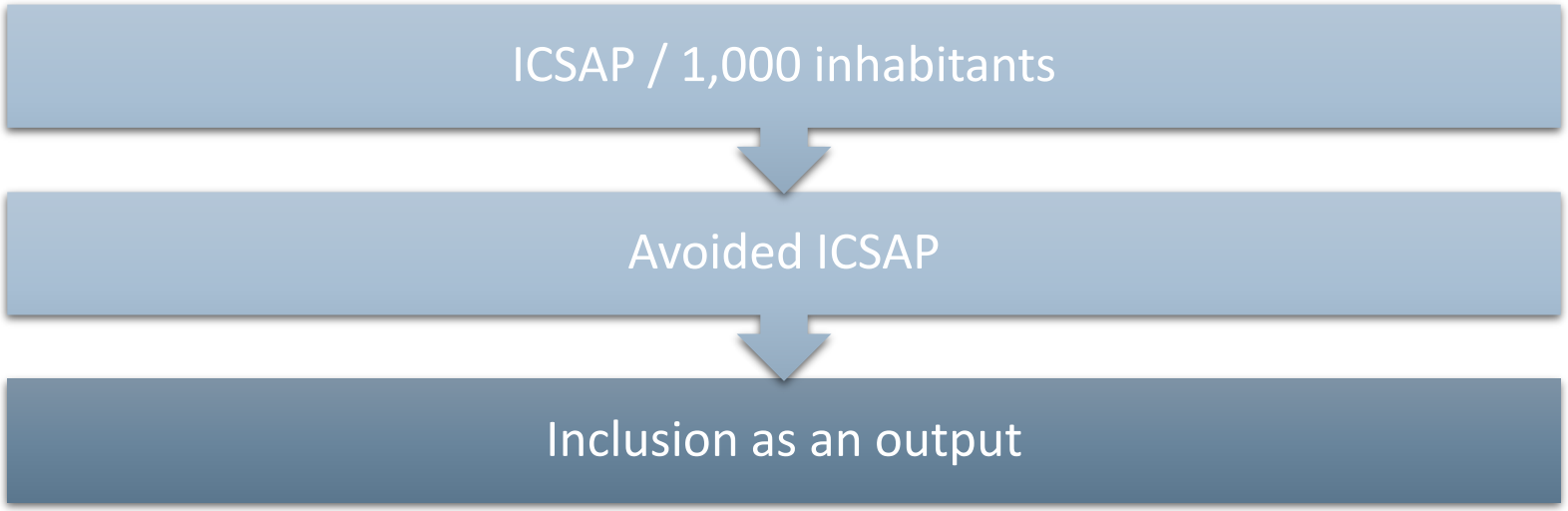


Moura et al. (2010): GDP negatively correlated, and Illiteracy positively correlated with ICSAP

Possible paths to follow

- To analyse relations between the efficiencies and the outcome observed
  - Inclusion of ICSAP in a second stage analysis of DEA
    - Transform ICSAP indicator in a variable to be maximized
- To investigate the influences of environmental variables in the obtained efficiencies
  - Second stage analysis using environmental variables or include some of them in the first step
  - To standardise ICSAP accounting for population age structure
  - To include data regarding ICSAP detailed by the 19 categories as outcomes in a DEA model to measure effectiveness (including weights according to the severity level of different comorbidity groups)

First attempts – incorporating the quality in the productivity analysis



2008 - 2014	Q	C	F	MPI
Initial Analysis	-	0.95	0.92	0.88
Analysis including ICSAP	**1.04**	0.92	0.92	0.89

Färe et al. (1995)

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Thank you!