

A spatiotemporal analysis of C-section rates in Portuguese NHS hospitals

03.09.2015

Céu Mateus, Health Economics Group, Lancaster University, UK

Carla Nunes, National School of Public Health, Nova University of Lisbon, Portugal

- 1. Objectives**
- 2. Background**
- 3. Data**
- 4. Methodology**
- 5. Results**
- 6. Conclusions**

Objectives

The current work aims to:

- i) Characterize the spatio-temporal pattern of c-section rates;**
- ii) To identify the importance of the results for decision makers**

Background

- **NHS type system funded through taxation (~60%) and out-of-pocket payments (~40%)**
- **Universal coverage**
- **For inpatient hospital care, access does not depend on income (ability to pay) but is rather based on need**
- **Hospitals' inpatient budget is based on DRG**
 - (volume x CMI x base rate)
- **Physicians are paid a monthly salary not dependent on activity/volume (no FFS)**

Methodology

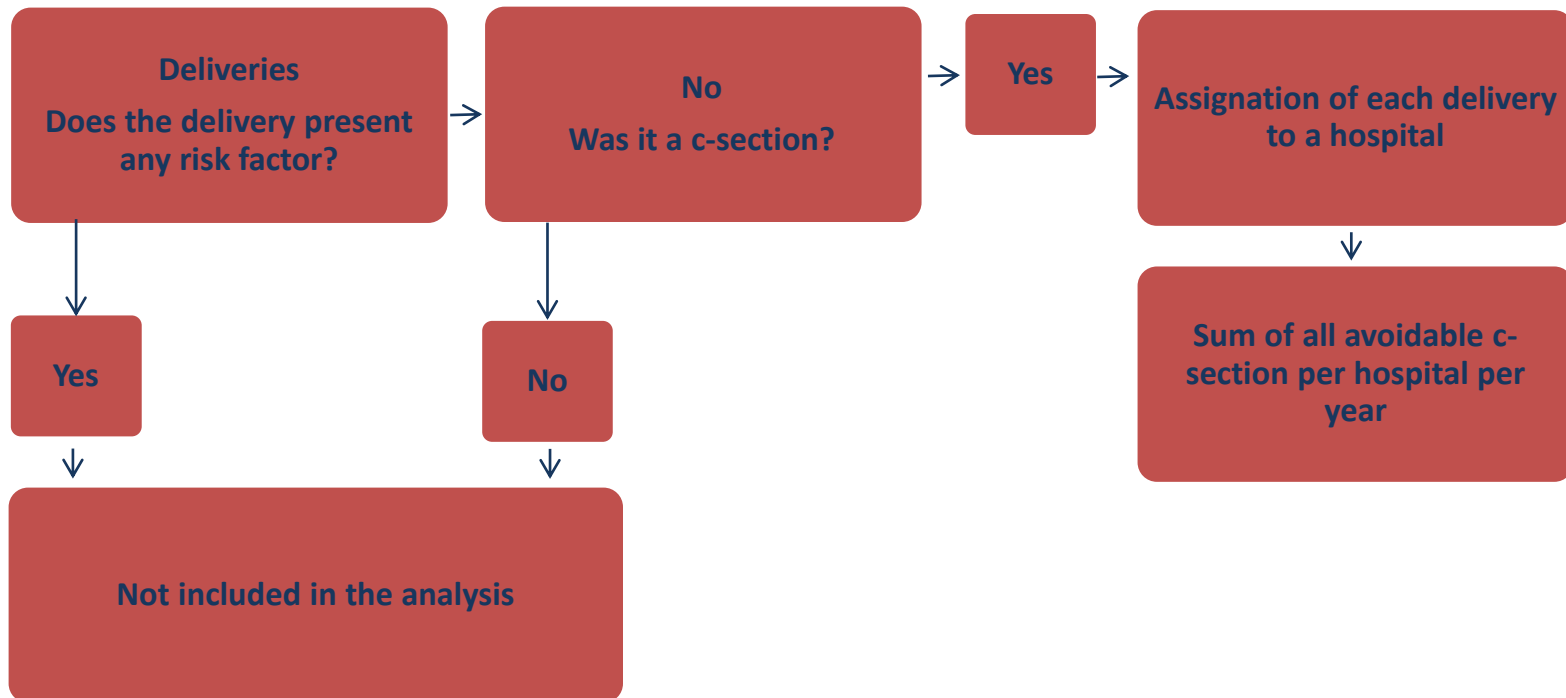
Data

- **278 territorial units**
- **DRG database 2002-2009 - only NHS hospitals**
 - **Deliveries: Hospitalizations registered under AP-DRG 21.0 codes: 370-371 (c-sections), 373-373 (normal deliveries) between 2002 and 2009; Deliveries with other surgical procedures were excluded;**
 - **Risk factors: Deliveries with the characteristics expressed below were identified (ICD-9-CM codes);**

18 < Maternal age < 40	Mal presentation of fetus (652.X1)	Maternal pyrexia (659.21)
Early or late labour (644.21; 645.21)	Disproportion (653.X1)	Complications of pregnancy or labour (640.X1 ; 641.X1; 642.X1; 643.11; 643.21; 643.81; 646.X1; 647.X1; 648.X1; 660.X1)
Multiple gestation (651.X1)	Septicemia (659.31)	

Methodology

- **Avoidable c-sections:**



Methodology

- **Space-time unit of analysis: Municipality/year**
- **Clustering methods mainly based on spatial-temporal scan statistics developed by Martin Kulldorff**
 - **Descriptive statistics**
 - **Retrospective space-time analysis scanning for clusters with high or low rates using the Discrete Poisson model**
 - **Spatial variation in temporal trends analysis scanning for clusters with increasing or decreasing rates using the Discrete Poisson model**
- **Software SatScan™**

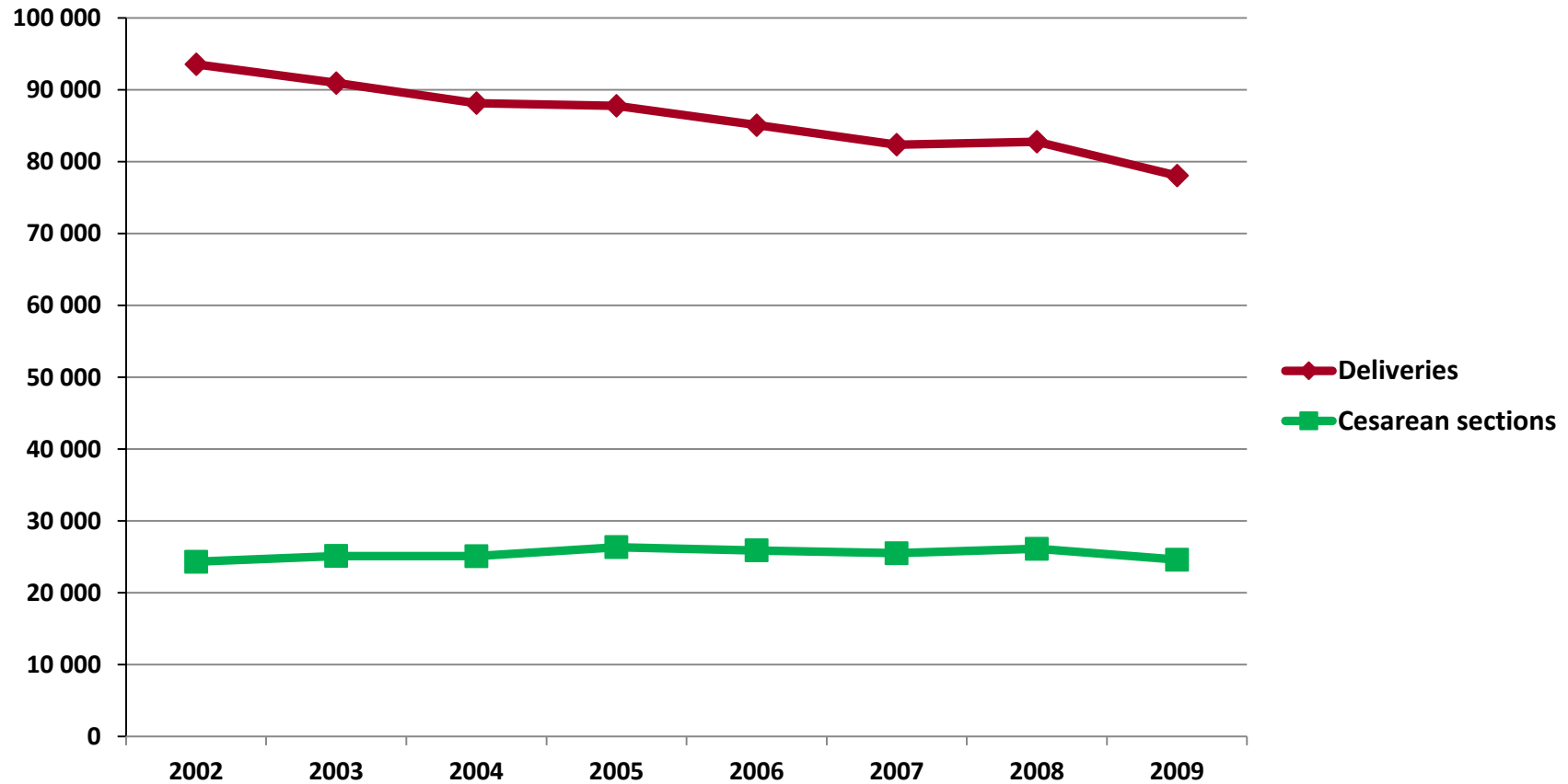
Deliveries and c-sections, 2002-2009

Year	2002	2003	2004	2005	2006	2007	2008	2009
NHS Hospitals	50	50	50	50	49	40	40	40
Deliveries	93,556	90,955	88,145	87,776	85,090	82,364	82,772	78,072
Cesarean sections	24,336	25,126	25,114	26,355	25,903	25,526	26,121	24,613
ALOS	4.9	4.8	4.8	4.7	4.6	4.6	4.6	4.5
% C-section	26.0%	27.6%	28.5%	30.0%	30.4%	31.0%	31.6%	31.5%

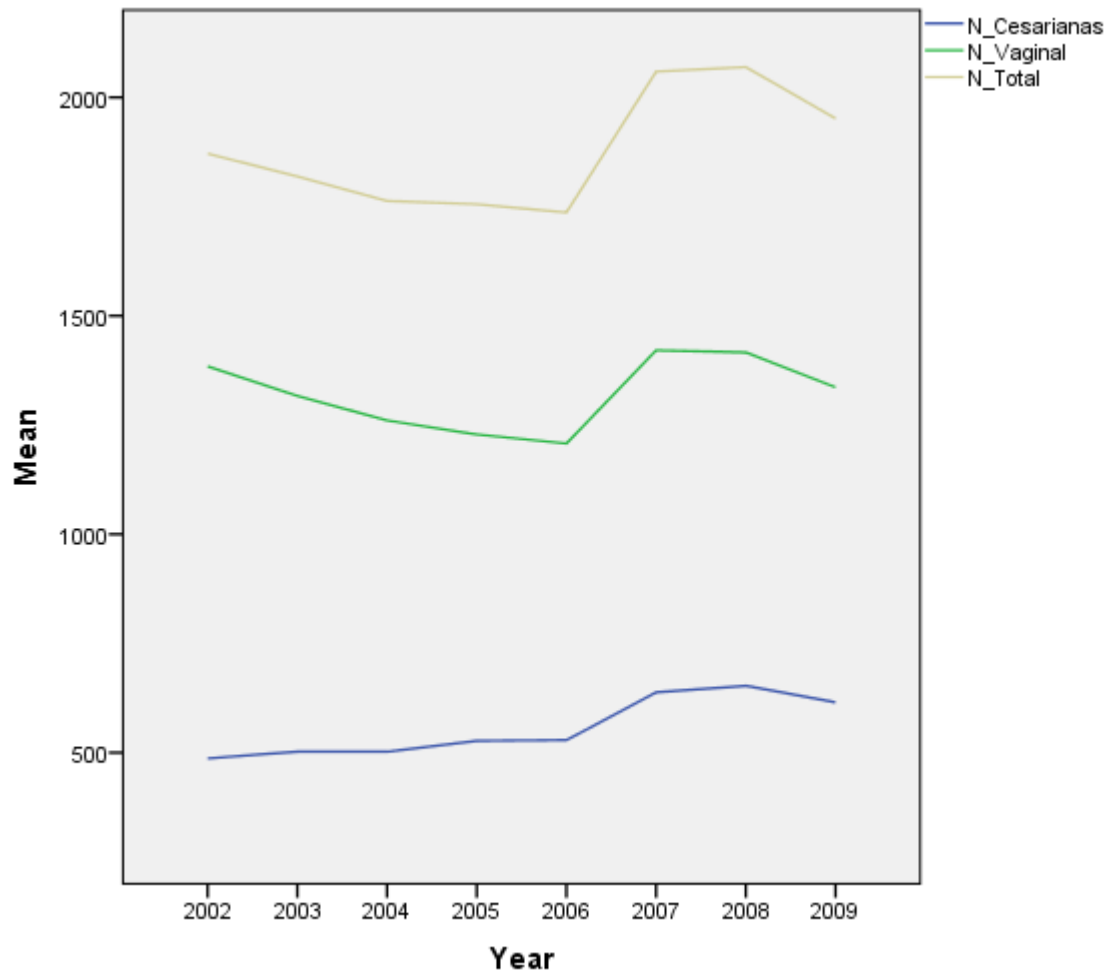
Data reveals an increasing trend of c-section rates;

After standardization hospitals still reveal variability in the rates of c-section.

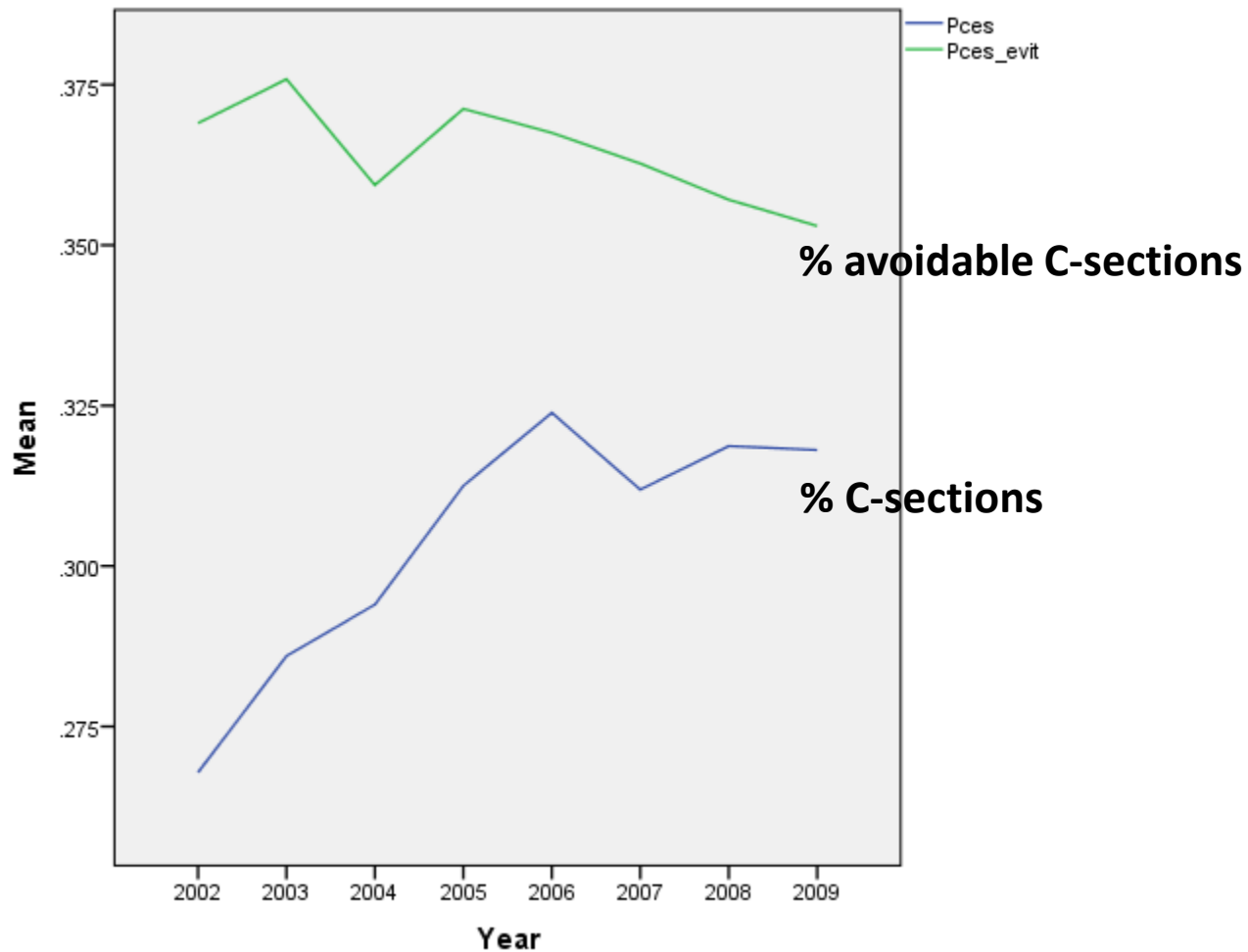
Deliveries and c-sections, 2002-2009



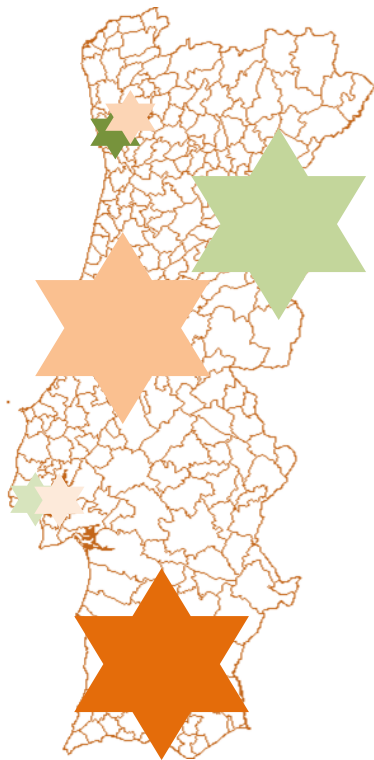
Average number of c-sections, vaginal deliveries, total deliveries



Average percentage of c-sections and avoidable c-sections



High and low cluster C-sections



	Cluster	Time period	Obs/Exp ($p < 0.001$)
HIGH	A	2005-2008	1.23
	B	2006-2009	1.22
	C	2006-2009	1.21
LOW	D	2002-2005	0.76
	E	2002-2005	0.88
	F	2003-2006	0.69
		2002	0.85

C-sections spatial variation in temporal trends

Global Time trend: 2.683% annual increase



Trends (p<0,001, all increase)

Inside: + 5.948%

Outside: + 2.397%

Inside: + 6.391%

Outside: + 2.486%

Inside: +5.155%

Outside: + 2.527%

Inside: + 0.309%

Outside: + 2.904%

Inside: + 1.377%

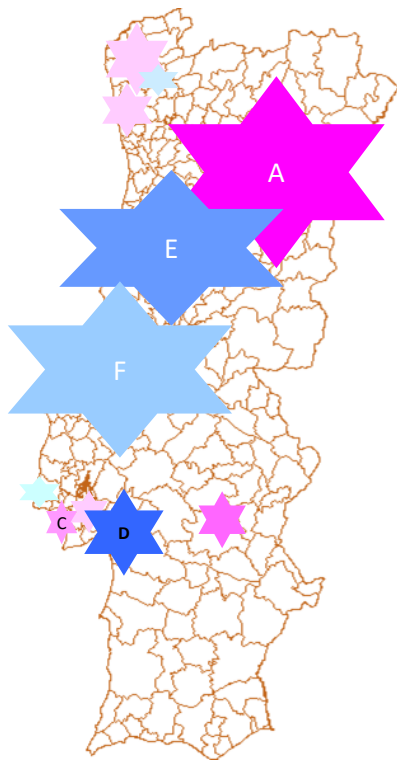
Outside: + 2.983%

Inside : + 1.305%

Outside: + 2.958%

Other 5 small clusters (with increase and decrease trends) were identified (p>0.001). Must be confirmed: Small number of cases!

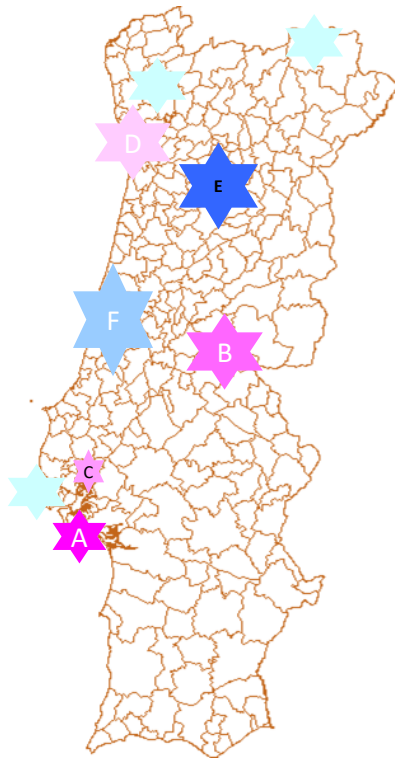
High and low cluster avoidable C-sections



	Cluster	Time period	Obs/Exp (p<0.001)
HIGH	A	2005-2008	1.39
	B	2006-2009	1.76
	C	2006-2009	1.60
		2006 -2009	1.43
		2005-2008	1.12
		2002-2005	1.19
	LOW	D	2006-2008
E		2002-2005	0.45
F		2002-2005	0.77
G		2003-2006	0.64
		2003-2006	0.70

Avoidable C-sections temporal trends

Time trend: 0.138% annual decrease



	Cluster	Trends
Inside decreasing trend	A	Inside : - 9.374% Outside : + 0.386%
	B	Inside: -18.662% Outside: -0.043%
	C	Inside : -9.140% Outside: -0.045%
	D	Inside: - 2.079% Outside: + 0.203%
Inside increasing trend	E	Inside: + 8.696% Outside: - 0.251%
	F	Inside : + 5.603% Outside: -0.690%
		Inside: + 4.333% Outside: -0.252%
		Inside: +7.999% Outside : -0.227%
		Inside: +2.486% Outside: - 0.310%

Limitations

- **Identified clusters are very sensitive to the parameters selected in the clustering process;**
- **There are clusters with small numbers – might not be relevant.**
- **Private hospitals not included**

Conclusions (1)

- **C-sections**
 - High clusters mean more 20% in big cities – more meaningful in the recent past and in the north of the country
 - Low clusters – found in the south, between 15% and 30%
- **Avoidable c-sections**
 - High clusters in the North for hospitals located in the suburbs and in Lisbon
 - Low clusters in the Centre and South and around big cities
- **Different behaviours demand different policies**
- **Big changes likely to be related with small numbers**

Thank you

