High and Rising: Cesarean Section Rates in Brazil, 1998–2008

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Motivation

- Incidence of high cesarean section (CS) rates (DATASUS, 2010):
  - Brazil (52%)
  - Public hospitals (30%)
  - Private hospitals (80%)
- Maximum level recommended by the World Health Organization: 15 percent (Betrán et al., 2007; Belizan et al., 1999; Faúndes & Cecatti, 1991; Villar et al., 2006)
- This study explores:
  - Whether high CS rates in Brazil continued from 1998 to 2008
  - The relationship between CS rates and hospital ownership (public or private) and payment for delivery (public or not)

Place of Delivery in Brazil, 2006

- Place of last delivery for women 15-49 years old (PNDS, 2006):
  - 75.2% at hospitals with free public health care (SUS)
  - 15.4% at hospitals with private insurance
  - 7.9% at hospitals with direct out-of-pocket payment
  - 1.4% at home
  - 0.1% at local health centers

Nonclinical Factors & Cesarean Section

- CS rates vary based on women's nonclinical factors (Estrin, 2000):
  - Income level
  - Education level
  - Onset of prenatal care
  - Insurance coverage
  - Hospital type
  - Payment status

Income Level & Cesarean Section

- Expected relationship between income and CS: negative
- Why? Poorer health, later onset of prenatal care, less access to quality care
- In fact, the opposite is true: as income goes up, so does the CS rate (Betrán et al., 2007; Faúndes & Cecatti, 1993; Janowitz et al., 1985; Moraes & Goldenberg, 2001)

Why Might High CS Rates Be a Problem?

- Increased risks for woman (e.g., infection, death)
- Increased risks for child (e.g., lung prematurity)
- Increased costs to medical system
- Therefore, many argue that CS should only be considered when a vaginal delivery is not recommended for medical reasons (Villar et al., 2006; Souza et al., 2010)

Data and Variables

- Data source: 1998 (n=4,645), 2003 (n=4,263), and 2008 (n=3,660) Brazilian household surveys (PNAD)
- Dependent variable: woman who delivered in a hospital by CS or vaginally in the previous 12 months
- Independent variables:
  - Age: 15–19, 20–24, 25–29, 30–49
  - Years of schooling: 0–3, 4–7, 8–10, 11, 12+
  - Parity: 1, 2, 3+
  - Region: North, Northeast, Southeast, South, Central-West
  - Type of hospital and payment for delivery
- Logistic regressions models for each year

Dependent Variable

– What was the main health care that [woman] received when she was last hospitalized in the previous 12 months?

1. Clinical treatment
2. Vaginal delivery
3. Cesarean delivery
4. Surgery
5. Psychiatric treatment
6. Exams

Type of Hospital and Payment

- The **health establishment** in which [woman] was last hospitalized in the previous 12 months was:
  (1) public; (2) private; (3) do not know
- This last hospitalization was done through **SUS** (free public health care system)?
- Results in **four-category** hospital-payment variable:
  - Public hospital with SUS
  - Private hospital with SUS
  - Public hospital with private for-profit health insurance
  - Private hospital with direct out-of-pocket payment

Cesarean Section Rates by Age, Education & Parity

Variables	Categories	1998		2008	
		Women (%)	Cesarean (%)	Women (%)	Cesarean (%)
Age	15–19	12.4	**27.4**	12.4	**40.3**
	20–24	26.1	**37.7**	24.5	**44.6**
	25–29	26.6	**45.6**	26.1	**55.5**
	30–49	34.9	**53.2**	36.9	**65.7**
Year of schooling	0–3	13.7	**25.8**	5.4	**35.7**
	4–7	34.8	**37.4**	20.1	**42.0**
	8–10	19.0	**44.3**	21.2	**46.3**
	11	20.2	**59.8**	34.4	**60.0**
	12+	12.3	**79.1**	18.9	**82.0**
Parity	1	43.1	**43.9**	50.6	**57.5**
	2	33.3	**47.1**	31.6	**53.6**
	3+	23.5	**34.0**	17.8	**42.3**

Source: 1998, 2003, and 2008 Brazilian household surveys (PNAD).

Cesarean Section Rates by Region & Hospital/Payment Type

Variables	Categories	1998		2008	
		Women (%)	Cesarean (%)	Women (%)	Cesarean (%)
Region	North	3.8	**37.7**	8.9	**48.7**
	Northeast	20.5	**28.5**	24.6	**44.1**
	Southeast	47.5	**49.2**	42.9	**57.3**
	South	18.3	**44.1**	14.7	**59.8**
	Central-West	9.8	**54.3**	8.9	**57.4**
Hospital / Payment	Public / SUS	47.0	**31.0**	55.0	**41.2**
	Private / SUS	9.4	**40.8**	3.1	**56.5**
	Public / Non-SUS	5.9	**49.1**	4.0	**72.4**
	Private / Non-SUS	37.6	**72.9**	37.9	**85.0**
Sample size (n)		4,645	**41.9**	3,660	**52.9**
Population size (N)		2,111,531		1,773,573	

Source: 1998, 2003, and 2008 Brazilian household surveys (PNAD).

Odds Ratios of Getting a CS by Age, Education & Parity

Variables	Categories	1998	2003	2008
Age	15–19	*ref.*	*ref.*	*ref.*
	20–24	1.498**	1.822**	1.125
	25–29	1.928**	2.420**	1.676**
	30–49	2.934**	3.218**	2.423**
Years of schooling	0–3	*ref.*	*ref.*	*ref.*
	4–7	1.430**	1.299*	1.250
	8–10	1.446**	1.593**	1.303
	11	2.023**	1.628**	1.424*
	12+	2.979**	1.921**	1.914**
Parity	1	1.002	1.056	1.362**
	2	*ref.*	*ref.*	*ref.*
	3+	0.595**	0.638**	0.754*

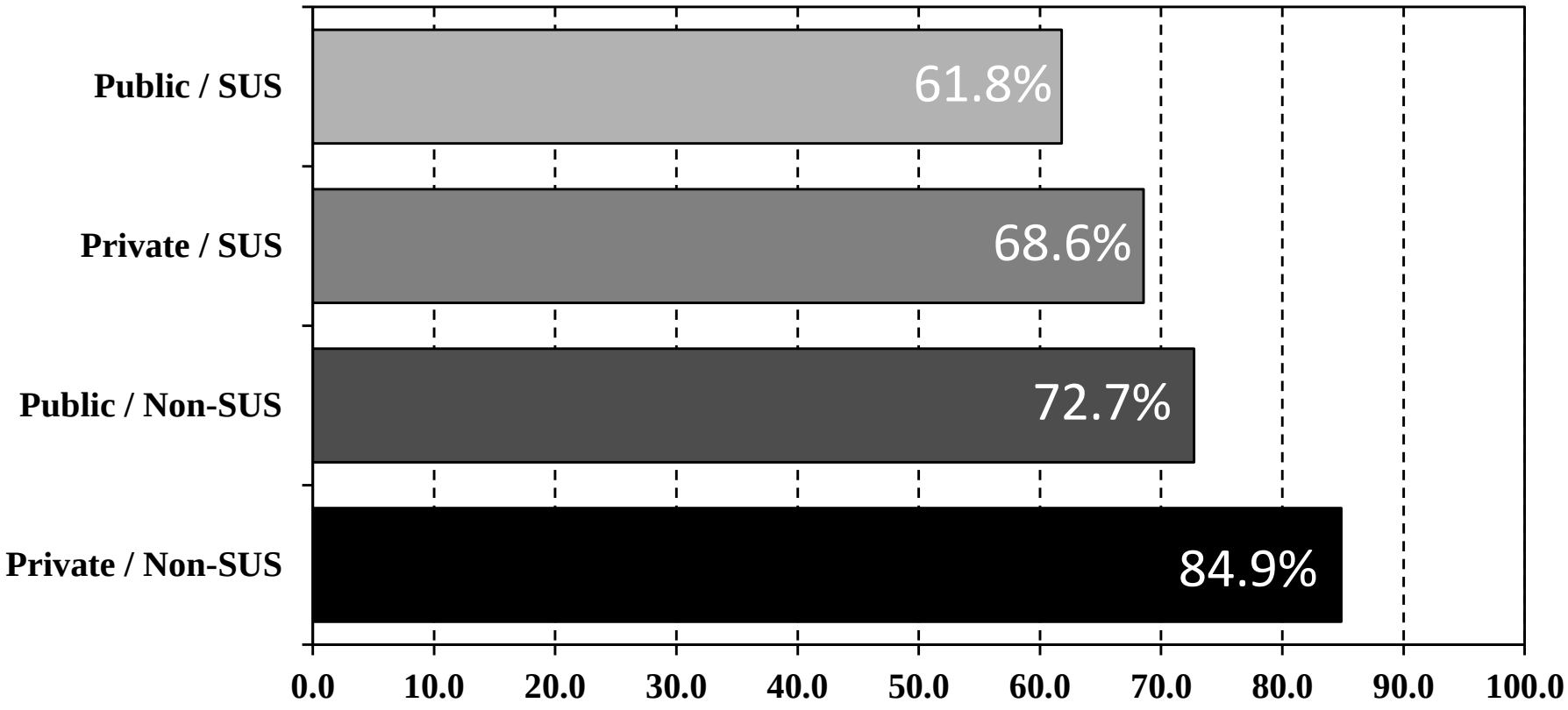
*** Significant at p<0.05; ** Significant at p<0.01.**
Source: 1998, 2003, and 2008 Brazilian household surveys (PNAD).

Odds Ratios of Getting a CS by Region & Hospital/Payment Type

Variables	Categories	1998	2003	2008
Region of residence	North	1.420*	1.018	1.215
	Northeast	*ref.*	*ref.*	*ref.*
	Southeast	1.630**	1.453**	1.092
	South	1.286*	1.440**	1.246
	Central-West	2.138**	1.582**	1.233
Hospital / Payment	Public / SUS	*ref.*	*ref.*	*ref.*
	Private / SUS	1.349*	1.257	1.754*
	Public / Non-SUS	1.649**	2.288**	2.808**
	Private / Non-SUS	3.467**	4.795**	5.426**
Likelihood ratio X^2 test		236.58**	269.03**	260.49**
Sample size (n)		4,645	4,263	3,660

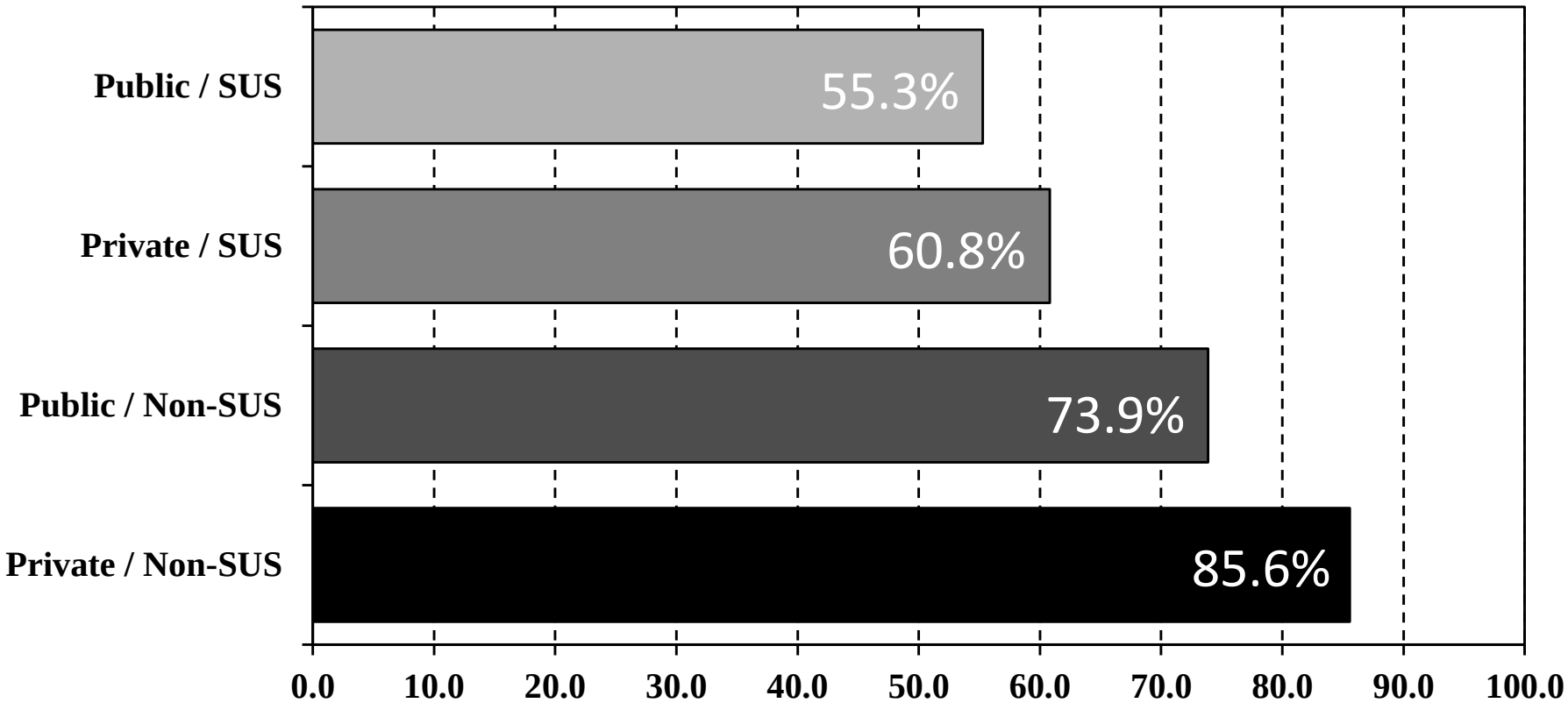
*** Significant at p<0.05; ** Significant at p<0.01.**
Source: 1998, 2003, and 2008 Brazilian household surveys (PNAD).

Predicted CS rates by hospital & payment type for women aged 30–49 with 11 years of schooling and 1 child, Southeast Region, 1998



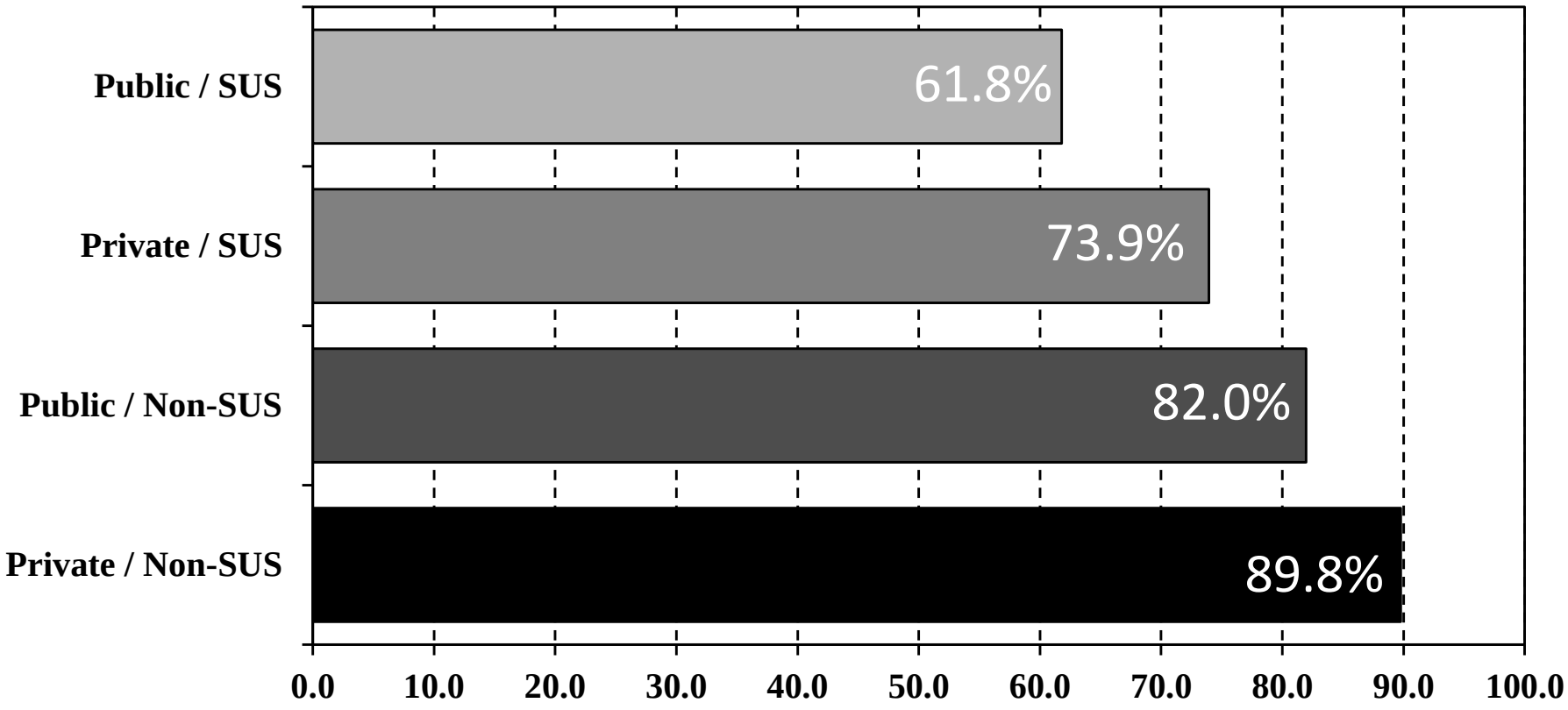
Source: 1998, 2003, and 2008 Brazilian household surveys (PNAD).

Predicted CS rates by hospital & payment type for women aged 30–49 with 11 years of schooling and 1 child, Southeast Region, 2003



Source: 1998, 2003, and 2008 Brazilian household surveys (PNAD).

Predicted CS rates by hospital & payment type for women aged 30–49 with 11 years of schooling and 1 child, Southeast Region, 2008



Source: 1998, 2003, and 2008 Brazilian household surveys (PNAD).

Main Findings

- Models suggest that positive impacts on CS rates by **age**, **education** and **region** decreased over time

- Higher CS rates have been observed in 2008 for women with **one child** compared to those with two children

- The influences of **type of hospital** and **payment of delivery** appear to have been increasing through the years

- Results suggest that incidence of CS is mainly influenced by **private payment of delivery** (in public or private hospitals), and less influenced by individual characteristics of women

Final Considerations

- Scheduling cesarean deliveries minimizes professional disruptions and maximizes an obstetrician's number of private patients:
  - These arrangements favor CS deliveries among women whose private doctor will attend their privately-financed delivery
- Public sector policies have been implemented:
  - 1997 family planning law preventing postpartum sterilization
  - 1998 law establishing a cap on cesarean rates
- But, there is a need to focus interventions on:
  - Doctors who attend deliveries in private hospitals
  - Private health insurance companies reimbursements