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# Patterns of deliveries in a Brazilian birth cohort: almost universal cesarean sections for the better-off

## Padrões dos partos em uma coorte de nascimentos: cesarianas quase universais para os ricos

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### ABSTRACT

**OBJECTIVE:** To describe the patterns of deliveries in a birth cohort and to compare vaginal and cesarean section deliveries.

**METHODS:** All children born to mothers from the urban area of Pelotas, Brazil, in 2004, were recruited for a birth cohort study. Mothers were contacted and interviewed during their hospital stay when extensive information on the gestation, the birth and the newborn, along with maternal health history and family characteristics was collected. Maternal characteristics and childbirth care financing – either private or public healthcare (SUS) patients - were the main factors investigated along with a description of C-sections distribution according to day of the week and delivery time. Standard descriptive techniques,  $\chi^2$  tests for comparing proportions and Poisson regression to explore the independent effect of C-section predictors were the methods used.

**RESULTS:** The overall C-section rate was 45%, 36% among SUS and 81% among private patients, where 35% of C-sections were reported elective. C-sections were more frequent on Tuesdays and Wednesdays, reducing by about a third on Sundays, while normal deliveries had a uniform distribution along the week. Delivery time for C-sections was markedly different among public and private patients. Maternal schooling was positively associated with C-section among SUS patients, but not among private patients.

**CONCLUSIONS:** C-sections were almost universal among the wealthier mothers, and strongly related to maternal education among SUS patients. The patterns we describe are compatible with the idea that C-sections are largely done to suit the doctor's schedule. Drastic action is called for to change the current situation.

**DESCRIPTORS:** Parturition. Cesarean Section, trends. Perinatal Care. Obstetrics. Socioeconomic Factors. Cohort Studies.

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Received: 7/15/2010

Approved: 3/9/2011

Article available from: [www.scielo.br/rsp](http://www.scielo.br/rsp)

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## RESUMO

**OBJETIVO:** Descrever o padrão dos partos em uma coorte de nascimentos, comparando partos normais e cesarianos.

**MÉTODOS:** Todos os recém-nascidos de moradoras da área urbana de Pelotas (RS) em 2004 foram recrutados para uma coorte de nascimentos. As mães foram entrevistadas ainda no hospital, quando informações detalhadas sobre a gestação, o parto e o recém-nascido, junto com um histórico da saúde materna e características da família foram coletadas. Características maternas e o financiamento do parto foram os principais fatores estudados. Também se fez uma descrição da distribuição das cesáreas por hora do dia e dia da semana. Técnicas padrão de análise descritiva e testes qui-quadrado para comparar proporções e regressão Poisson para explorar o efeito independente de preditores da cesárea foram os métodos utilizados.

**RESULTADOS:** A taxa global de cesarianas foi de 45%, 36% entre pacientes do SUS e 81% no serviço privado, onde se relatou que 35% das cesarianas foram eletivas. As cesarianas foram mais frequentes nas terças e quartas-feiras, com uma redução de cerca de um terço aos domingos, enquanto os partos normais apresentaram distribuição uniforme ao longo da semana. O horário das cesarianas no setor público e no privado foi muito diferente. A escolaridade materna se associou positivamente com a cesariana entre as mães do serviço público, mas não do privado.

**CONCLUSÕES:** A cesariana foi muito frequente entre as mães mais ricas, e fortemente associada com a escolaridade materna entre pacientes do SUS. Os padrões descritos são compatíveis com a hipótese de que as cesáreas são feitas, em grande parte, para atender a conveniência das agendas dos médicos. A situação atual só será revertida com políticas radicais.

**DESCRITORES:** Parto. Cesárea, tendências. Assistência Perinatal. Obstetrícia. Fatores Socioeconômicos. Estudos de Coortes.

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## INTRODUCTION

Despite international recommendations that cesarean section (C-section) rates should be kept below 15%,<sup>3</sup> they have increased worldwide in the last three decades. Globally, C-sections account for around 15% of child-birth deliveries, but rates as high as 50% are seen in some countries.<sup>13</sup> Although rates below 5% may reflect lack of access to health services,<sup>24</sup> high rates do not necessarily mean improved perinatal care. In high-income populations, C-section rates are mostly below 25%, and the lowest ones (below 15%) are reported in Nordic countries.<sup>22</sup> The highest rates are reported in middle-income countries such as China, Mexico and Brazil (around 40%).<sup>22</sup> Recently rates above 30% were reported in the United States and Australia.<sup>15</sup> C-section rates appear to be increasing in most countries.

It is a challenge to achieve adequate C-section rates as it entails a balance between performing appropriately indicated C-sections while avoiding unnecessary interventions that do not provide better health outcomes and can cause complications to the mother and the infant.<sup>29</sup>

Unfortunately, medical indications such as fetal distress or preeclampsia are not the only reasons for C-section deliveries. The mother's request based on cultural factors, past experience, concerns about the baby's well-being or even fear of labor are frequently the actual reasons for C-sections.<sup>18,23</sup> Some authors have argued that C-section delivery has become a matter of choice and mothers see it as an option.<sup>12,20</sup> Many obstetricians are apparently ready to agree with the mother's request for an elective C-section claiming reduced risk of pelvic floor or fetal injury, maintenance of sexual function, and physician-patient convenience.<sup>32</sup> Defensive medicine, i.e., delivering care in a way to avoid lawsuits has also been documented as a reason for C-sections.<sup>14</sup>

Challenging the idea that C-sections are harmless recent evidence shows they are associated with maternal morbidity and mortality. A multicenter study<sup>30</sup> in Latin America assessed the risks and benefits associated with C-section compared to vaginal delivery in more than a hundred thousand births. The conclusion was that

C-section delivery reduced the risk of fetal death in breech presentations and the risk of intrapartum fetal death in cephalic presentations. On the other hand, C-sections increased the risk of severe maternal and neonatal morbidity and mortality in cephalic presentations.<sup>30</sup> A study in the United States on elective C-sections showed that more than one third of deliveries were before 39 complete weeks of gestation and that the children born were at a higher risk of mortality and several other adverse neonatal events.<sup>26</sup> A multicountry study based on the World Health Organization (WHO) Global Survey on Maternal and Perinatal Health also found increased risks for adverse short-term maternal outcomes (death, intensive care unit admission, blood transfusion and hysterectomy) among women undergoing C-sections without medical indication in all three continents where the survey was conducted – the Americas, Africa and Asia.<sup>25</sup>

In Latin America most countries present high C-section rates.<sup>29</sup> Brazil has a particularly worrying situation as nearly 50% of all deliveries are C-sections and this rate is as high as 80% in the private sector.<sup>1</sup> In 1970 C-section rates were around 15%<sup>10</sup> but since then this situation has dramatically changed. C-section rates doubled in the 1980s, and they were right below 40% in 1984. Researchers in Brazil became alarmed by the increasing trend and potentially harmful effects of unnecessary C-sections.<sup>9</sup> The rates remained stable until 2000 when they started to increase again and reached the current levels.<sup>a</sup> During this period, the Brazilian health sector has undergone a complete reform with the creation of a national unified public health system in 1988, the *Sistema Único de Saúde* (SUS). The SUS is based on the principle of universal comprehensive care. With respect to childbirth deliveries, starting from the mid-1990's more than 90% of deliveries in Brazil were hospital-based, and more than 80% financed by the SUS.<sup>8</sup>

Increasing C-section rates have been reported in many countries and this issue has been widely discussed. The health system organization and availability of midwives or obstetric nurses are contributing factors for this issue. The mothers-to-be develop strong relationships with midwives from prenatal to postnatal care visits increasing the likelihood of vaginal births.<sup>28</sup> In Brazil, regardless of financing or budget constraints, obstetricians assist almost all deliveries and their convenience may play an important role in the decision about the type of delivery.<sup>17</sup> There is widespread evidence that doctors' attitudes during the prenatal and peri-delivery period may increase the likelihood of a C-section.<sup>16,21,27</sup>

In view of increasing C-section rates in Brazil, there are growing concerns about its indiscriminate use. Thus, given the availability of detailed high quality data on

births included in the Pelotas 2004 birth cohort, we prepared this paper in order to evaluate patterns of delivery mode in this setting.

## METHODS

A birth cohort study was started in 2004 in the city of Pelotas, state of Rio Grande do Sul, Southern Brazil, following two other birth cohorts launched in 1982 and 1993. Pelotas has approximately 340,000 inhabitants (according to projections based on the 2000 Population Census, Brazilian Institute of Geography and Statistics).

From January 1<sup>st</sup> to December 31<sup>st</sup>, 2004, all the five hospitals in the city were visited on a daily basis by a team of trained interviewers. Eligible mothers – those living in the urban area of Pelotas – were interviewed within 24 hours after delivery. A total of 4,231 live born babies were successfully recruited to the study (only 32 mothers refused to participate [0.8%]). Non-hospital deliveries (20 in total) were also included in the cohort since the mothers and the infants born were taken to the maternity hospital immediately after delivery and were also recruited. Multiple and out-of-hospital births, and those with missing information about type of delivery were excluded from the analyses, so that 4,126 births remained. The exclusion of multiple and out-of-hospital births was motivated by very high and very low odds of a C-section, respectively. Their effect would be negligible since only 188 births were excluded through these criteria.

Detailed information about the family's socioeconomic conditions, maternal lifestyle, obstetric history, prenatal care, gestational morbidity, and birth conditions was collected during the interview. Newborns' measurements including weight, length, and circumferences of head, thorax and abdominal were taken and their gestational age was assessed. These children were visited at 3, 12, 24 and 48 months of age. A detailed account of the cohort methods is given elsewhere.<sup>6,7</sup> Comparisons with the previous Pelotas birth cohorts are also available.<sup>7</sup>

Information including type of delivery, analgesia, labor induction, gestational problems, reasons for C-sections, maternal schooling, age, skin color, family income, household assets, and source of payment for the birth was reported by the mothers during the interview during their hospital stay. The date and time of delivery, as well as birth weight were obtained from hospital records. The reasons for C-sections given by the mothers were grouped into three categories: fetal (acute fetal distress, cephalopelvic disproportion, dystocia, post-maturity); maternal (hemorrhage, failure of labor to progress,

<sup>a</sup> Ministério da Saúde. Rede Interagencial de Informações em Saúde - RIPSa. Indicadores e Dados Básicos de Saúde - Brasil-2008 [cited 2010 May 6]. Available from: <http://tabnet.datasus.gov.br/cgi/ibd2008/matriz.htm>

preeclampsia, eclampsia, diabetes); and elective (previous C-section, tubal ligation, mother's request, doctor's choice, scheduled C-section). Maternal schooling was categorized as 0–4, 5–8, 9–11, and 12+ completed years of schooling. Skin color/race was self-reported, and originally recorded in five categories (white, black, mixed, native and Asian). Given the very small number of mothers (<1%) in the latter two groups, they were recoded as white. The national wealth index (IEN), an asset-based economic indicator, was used for classification of socioeconomic position (SEP).<sup>5</sup> The study sample was divided into groups based on cut-off points of the reference quintile for the city's population. They are different from the sample quintiles, and percentages in each reference quintile differ from 20% since the fertility rate is inversely associated with SEP. The source of payment for birth was classified as public (covered by the SUS) or private (including both private insurance and direct out-of-pocket payment).

The analysis was performed using Stata v.10.1 (StataCorp., Stata Statistical Software Release 10, College Station, TX, 2009). Standard descriptive

techniques were used, along with  $\chi^2$  tests for comparing proportions. A Poisson model<sup>4</sup> was used to explore the independent effect of C-section predictors and to estimate their adjusted prevalence ratios. The proportions of C-sections by maternal schooling and source of payment for birth adjusted for other predictors were obtained with the use of a Poisson model using Stata's margins command.

The study was approved by the Research Ethics Committees at the Universidade Federal de Pelotas Medical School and at WHO (Geneva). Prior to the interview, the study objectives, requirements for their participation and confidentiality issues were explained to the mothers. They were given opportunity to ask questions and then were asked to sign an informed consent form. A copy was provided to them.

## RESULTS

Table 1 shows sociodemographic characteristics of the mothers and source of payment for birth along with C-section proportions for each subgroup. Most mothers

**Table 1.** Characteristics of mothers and source of payment for birth with C-section prevalence by subgroup, plus adjusted prevalence ratios of C-section in the Brazilian National Health System (SUS) and private patients. Pelotas, Southern Brazil, 2004.

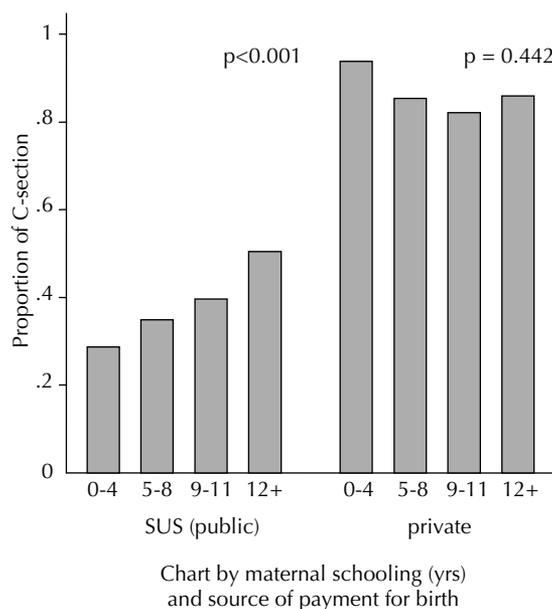
Variable	n	%	% C-sections	SUS Adj. PR	Private Adj. PR
All	4,126	100	45.0		
Age (years)			p<0.001	p<0.028	p = 0.420
12–19	785	19.0	34.3	1.00	1.00
20–34	2,790	67.7	46.5	1.13	1.12
35–46	549	13.3	52.3	1.25	1.13
Self-reported skin color			p<0.001	p<0.013	p = 0.194
White	2,518	61.7	47.4	1.00	1.00
Black	669	16.4	43.4	1.18	1.04
Mixed	891	21.9	39.5	0.98	1.08
Maternal schooling (years)			p<0.001	p<0.001	p = 0.292
0–4	633	15.4	30.2	1.00	1.00
5–8	1,680	40.8	37.3	1.20	0.92
9–11	1,360	33.1	50.6	1.29	0.86
12+	442	10.7	77.2	1.59	0.87
Wealth quintile index (IEN)			p<0.001	p<0.091	p = 0.053
1 (lowest)	994	24.2	31.7	1.00	1.00
2	838	20.4	37.2	1.09	0.94
3	900	21.9	41.1	1.13	0.90
4	655	16.0	51.8	1.23	0.97
5 (highest)	719	17.5	69.7	1.22	1.06
Source of payment for birth			p<0.001		
Public (SUS)	3,338	81.0	35.8		
Private	783	19.0	84.3		

Missing information for each variable: age=2; skin color=48; schooling=11; IEN=20; source of payment for birth=5  
IEN: wealth quintile index  
SUS: Brazilian National Health System

were 20–34 years old, but 19% of them were teenagers. Most mothers reported being white (62%), and having 5–11 years of schooling (74%). Less than 7% had graduated. C-section rates were positively associated with age, schooling and socioeconomic position when all mothers were analyzed. C-sections were also more frequent among white women.

A total of 1855 (45%) mothers had C-sections. The vast majority of deliveries (81%) were financed by the SUS. The C-section rate was 36% in deliveries paid by the SUS, compared to 84% among those paid by private sources. The adjusted effects of the predictors studied were estimated by Poisson regression that was fitted separately for SUS and private patients. The results (Table 1) show no associations among private patients. Among SUS patients, however, C-sections were positively associated with maternal age and schooling. More educated mothers had 59% more C-sections compared to those with less than five years of schooling. Also, black mothers had 18% more C-sections than white ones. Figure 1 shows the proportions of C-sections by maternal schooling and source of payment, without adjustment for other covariates. Among women who had vaginal deliveries (N=2,271), 67% had an episiotomy and 4% received analgesia.

Figure 2 shows that vaginal births did not vary according to day of week – all bars lie within the 95% distribution limits ( $p = 0.899$ ). The same was not true for C-sections and a clear pattern was seen, with a larger number of births occurring on Tuesdays and Wednesdays, and fewer than expected births occurring on weekends ( $p < 0.001$ ).



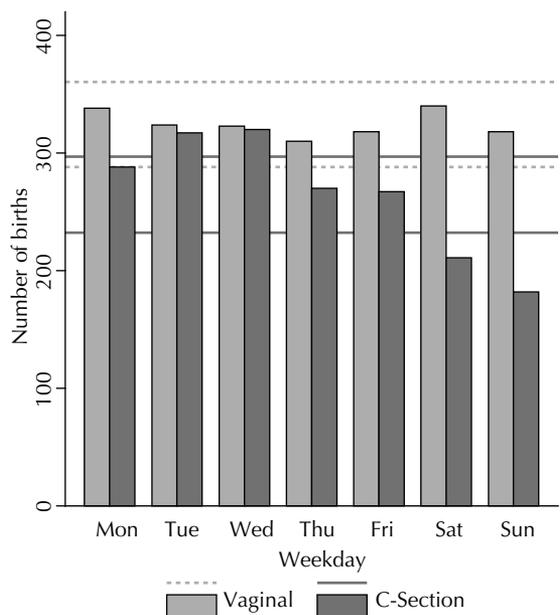
**Figure 1.** C-section prevalence by maternal schooling and source of payment for birth (public or private). Pelotas, Southern Brazil, 2004.

There was a similar pattern regarding time of the day. The mean number of deliveries by C-section from midnight to 6 am is less than a quarter of those between noon and 6 pm ( $p < 0.001$ ). Much less evident differences were seen during other times of the day. There were also strong differences of C-section time between private and public patients. Figure 3 shows peaks in the morning and late afternoon among private patients. Among public patients, C-sections increased after 10 am and then after 2 pm. In both groups, there was a clear reduction in the number of births during lunchtime (12 noon to 2 pm).

According to the reasons given by the mothers, 23% of C-sections were elective, 41% due to maternal causes and 36% due to fetal causes (Table 2). Significant variations were observed according to age, socioeconomic status and source of payment. Elective C-sections were reported more frequently by better-off and older than poor and younger women. Private patients also reported elective C-sections more often than SUS patients.

## DISCUSSION

Since 1985 the general consensus is that the proportion of C-sections should not be much higher than 15%.<sup>3</sup> Althabe & Belizán (2006)<sup>2</sup> have pointed out the lack of any gain in terms of infant or maternal health where C-section rates are above 15%. In fact, recent studies have suggested that unnecessary C-sections can be detrimental,<sup>26,29</sup> in contrast to what is commonly believed.



**Figure 2.** Number of vaginal and C-section deliveries by weekday. Lines indicate the 95% distribution limits based on Poisson distribution. Pelotas, Southern Brazil, 2004.

**Table 2.** Reported reasons for C-section by maternal and delivery characteristics. Pelotas, Southern Brazil, 2004.

Variable	Fetal reasons n (%)	Maternal reasons n (%)	Elective reasons n (%)	p-value
All	577 (36.3)	653 (41.1)	360 (22.6)	
Age (years)				p<0.001
12–19	101 (43.4)	120 (51.5)	12 (5.2)	
20–34	398 (35.6)	453 (40.6)	266 (23.8)	
35–46	78 (32.6)	80 (33.5)	81 (33.9)	
Self-reported skin color				p=0.150
White	382 (37.9)	397 (39.4)	229 (22.7)	
Black	83 (31.7)	125 (47.7)	54 (20.6)	
Mixed	105 (34.7)	125 (41.3)	73 (24.1)	
Maternal schooling (years)				p=0.049
0–4	53 (31.7)	67 (40.1)	47 (28.1)	
5–8	203 (37.5)	241 (44.6)	98 (18.1)	
9–11	215 (36.0)	239 (40.0)	144 (24.1)	
12+	104 (37.6)	103 (37.2)	70 (25.3)	
Wealth quintile index (IEN)				p<0.001
1 (lowest)	101 (36.6)	123 (44.6)	52 (18.8)	
2	114 (40.7)	111 (39.6)	55 (19.6)	
3	120 (37.2)	153 (47.4)	50 (15.5)	
4	105 (36.8)	112 (39.3)	68 (23.9)	
5 (highest)	132 (32.2)	147 (35.9)	131 (32.0)	
Source of payment for birth				p<0.001
Public (SUS)	409 (39.0)	470 (44.8)	170 (16.2)	
Private	168 (31.1)	183 (33.8)	190 (35.1)	

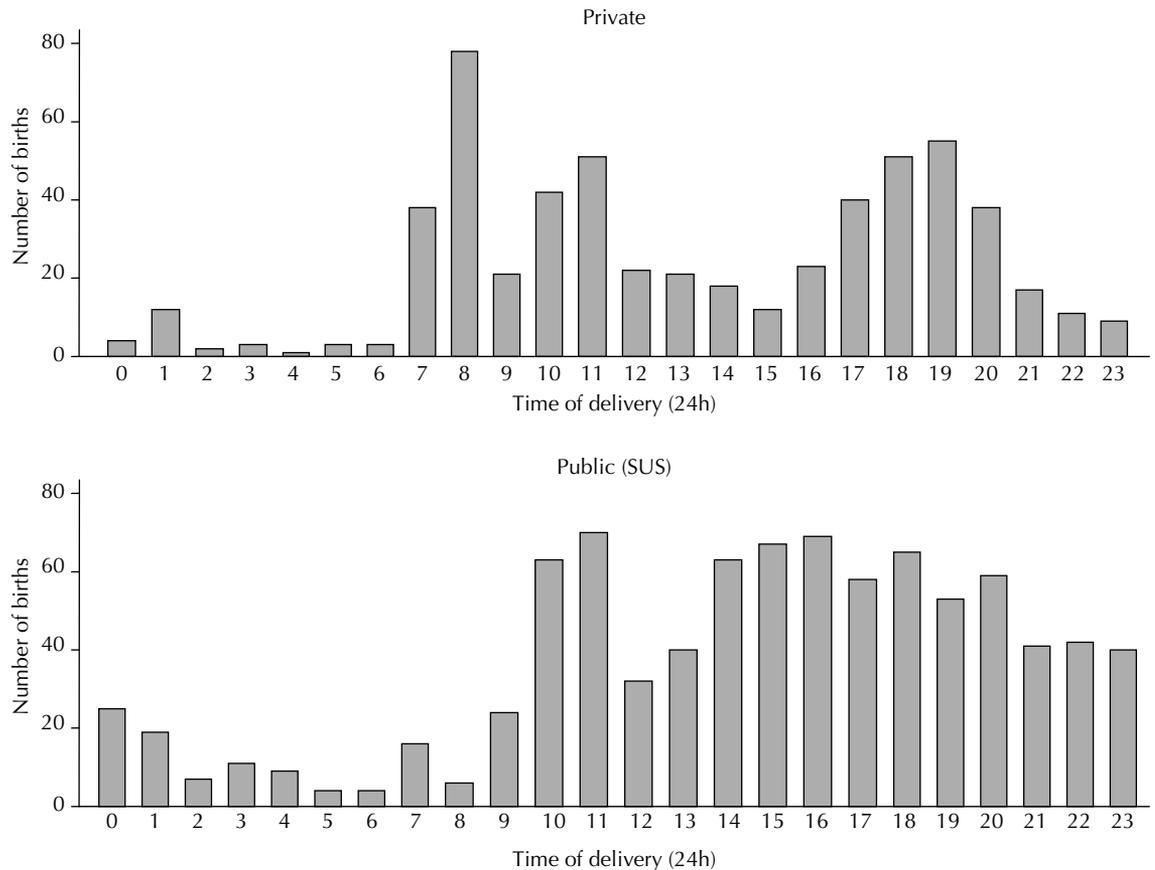
SUS: Brazilian National Health System

There is also an ongoing debate on the causes for increasing C-section rates. Much has been written about why and how much mothers-to-be request their doctors a C-section. The reasons include fear of childbirth pain, along with the perception that C-sections are safe,<sup>18</sup> the view that they are a superior form of medical care since they are so common among the better-off women, and also its use as a strategy to prevent low-quality care.<sup>11</sup> But how frequently do mothers actually push their doctors into doing a C-section? And do they have the power to get it from their obstetricians if they are not willing to do so? Few studies sought to answer these questions. A study carried out in the UK found that, despite women reported the usual reasons such as fear of labor, and a traumatic previous experience, few of them actually requested a C-section,<sup>33</sup> which was confirmed by most obstetricians.

A recent study in Brazil explored the views of pregnant women about type of delivery along the pregnancy and the observed outcome. Two private maternity hospitals were studied and an astonishing rate of 88% of C-sections was observed.<sup>16</sup> In the beginning of their pregnancies, a third of the women were already inclined to have a C-section, half reported a preference

for vaginal delivery and 17% were undecided. By the end of their pregnancies, the mothers in the original C-section group had not change their preference, but 56% in the vaginal delivery group had changed their minds towards a C-section, as well as 3/4 of the undecided women. However, their preferences did not make much of a difference as C-section rates were greater than 90%, except in the group of women who kept their preference for a normal delivery among which “only” 73% had a C-section. The alert for an imminent cesarean section epidemic had already been given in 1991,<sup>10</sup> when investigators from Pelotas were concerned about the 28% C-section rate recorded in the 1982 Pelotas Birth Cohort.

Our study found a marked difference in C-section rates between public and private patients (36% and 84%, respectively), what has been well-documented in Brazil.<sup>1</sup> Among public patients, these rates seem to be limited only by the restrictions imposed by the SUS. Among private patients, the only limit for C-sections seems to be feasibility, since some parturients or their doctors may arrive too late at the hospital, when labor is so advanced that a C-section is no longer possible. In both groups C-section rates are well above those recommended by WHO despite several efforts to encourage



Charts by source of payment for birth

**Figure 3.** Number of C-section births per hour occurring from Monday to Friday by source of payment for birth. Pelotas, Southern Brazil, 2004.

vaginal deliveries and limit C-sections: payment of delivery analgesia for SUS patients (1998), the Pact for C-section Rate Reduction between the Brazilian Ministry of Health and state health departments (2000), enforcement of a ceiling of 27% C-section rate for states that did not sign the Pact (2002), and a national mass campaign, “Humanization of Normal Childbirth and Reduction of Unnecessary Cesareans” (2006).

The discussion of who is primarily responsible for the increase in C-sections – doctors or mothers – may be moot, but a historical perspective is useful. In Brazil, in the 1970s, the social security system that preceded SUS paid more for a C-section than for a vaginal delivery. Added to the fact that the former can be carried out in an hour or less, whereas a vaginal delivery requires several hours, there was a sharp increase in C-sections (from 15% in 1970 to 31% in 1980),<sup>9</sup> that was concentrated among middle class families that were social security users. Private doctors providing care to better-off families charged more for C-sections than for vaginal deliveries. Consequently C-sections also represented increased income, resulting in higher C-section rates for this group as well. As described by Béhague et al,<sup>11</sup>

and confirmed in the present study, C-sections became associated to the better off and therefore were associated with the idea of high-quality care.

Today, in Pelotas, providing high-quality private care means that the same doctor provides both prenatal and delivery care. Except when a C-section is scheduled ahead, a patient will call her doctor when they go into labor. Because midwives do not carry out deliveries, the physician will have to go to the hospital specifically for this task. If it takes place during the day the doctor will have to cancel other appointments, and if it takes place during the night in lost sleep or leisure time. Therefore, it is not surprising that doctors prefer to perform quick scheduled C-sections rather than spending hours assisting their patients for a vaginal delivery. Although insurance payments for C-sections and vaginal deliveries are now virtually the same, the payment/time ratio is still markedly favorable to cesareans.

The pattern of C-sections reported here strongly supports the previous assertions. The concentration of deliveries in the middle of the week at specific times – differently for private and public patients –, almost never on Sundays or at early hours, all seem

to point to a situation that is defined by the doctor, in agreement with the mother. The change in the minds of mothers towards C-section is achieved along their pregnancy, with repeated contact with the doctor during prenatal care.<sup>9,16</sup> In 1993, Faúndes & Cecatti were already stressing that obstetricians who work individually, rather than in a group, were hard pressed to save time and keep an organized schedule.<sup>18</sup> Preference for C-sections can easily arise from that.

The strong trend of increasing C-section rates with maternal schooling among public patients is consistent with two hypotheses. First, if maternal request is an important factor, maybe more educated mothers can be more persuasive and get the C-section they desire, as suggested by Béhague.<sup>11</sup> Alternatively, doctors can perceive them as closer to private patients and thus more deserving of “better” care. Or they can opt for a cesarean just to play safe, believing that C-sections are associated with fewer complications and lower risk of lawsuits (they are now increasing in Brazil). In any case, the study results show an appalling scenario of inequity within the public health service.

The situation in one Brazilian city is not much different from more prosperous parts of the country. A broad national picture of how delivery care is provided is given by Waniez et al (2006).<sup>31</sup> Different from

countries where deliveries are mostly dealt with by midwives, or where doctors seem to believe that a vaginal birth is the best option,<sup>19</sup> deliveries in Brazil can only be performed by doctors. Analgesia during vaginal labor is seldom provided for public patients and thus mothers have to choose between labor without analgesia or a C-section, and the fear of pain is a common complaint among mothers of low socioeconomic condition.<sup>11</sup> In our study only 4% of the mothers received analgesia during a normal delivery, regardless of their source of payment. Also, episiotomy was performed in two thirds of normal deliveries, adding discomfort to the puerperal period.

The present study provided strong evidence on a well-established culture of C-sections, which is corroborated by a study carried out in Switzerland with mothers of different nationalities. Brazilian mothers had the higher C-section rate (41%). There seems to be a vicious circle and only a dramatic change in childbirth policy can reverse this trend towards C-sections in a near future in Brazil. Barros et al (1986)<sup>9</sup> and Faúndes & Cecatti (1993)<sup>17</sup> recommendations made decades ago of reducing repeat C-sections, raising public awareness on the pros and cons of both types of childbirth deliveries, reorganizing obstetric care with the reintroduction of midwives when C-section rate in Brazil was 38% are still applicable.

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The 2004 Pelotas Birth Cohort was supported by the World Health Organization (HQ/04/072979), the Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq - Grant No. 476727/2003-0), the Fundação Nacional de Saúde (MS/FNS 4589/04) and Pastoral da Criança.

The authors declare no conflicts of interests.