# Cut down on the prevalence of cesarean sections in Brazil: a time-series from 2000 to 2017

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**ABSTRACT**

Cesarean section was developed to reduce maternal-fetal morbidity and mortality, however when performed without scientific evidence it is associated with complications. This study analyses the temporal trend and factors associated with cesarean section in Brazil, its regions and Federation Units between 2000 and 2017. Ecological study. The prevalence of cesarean sections and maternal variables were identified from the Information System on Live Births. The Prais-Winsten method was used for time series analysis. In the whole period there were 53.497.303 births in Brazil, 48.4% by cesarean section. Between 2000 and 2009, the mean cesarean section in Brazil increased from 39.7% (SD 9.8) to 53% (SD 9.4) between 2010 and 2017 with an annual variation of 1.7 p.p (95%CI 1.6; 1.8). There is stability between 2010 and 2017, with a slight decline from 2015 in the Southeast region with an annual variation of -0.9 (95%CI -1.5; 0.0). It is observed that the caesarean section has remained stable in most macro-regions and even decreasing in the southeast and in the group of women with higher education, not adolescents and better prenatal coverage. It is believed that Brazil has reached the plateau in the prevalence of cesarean section (60%) in most states and in the next years there is a decrease in these prevalences.

**KEYWORDS**: Cesarean Section; Epidemiology; Time Series Studies

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## INTRODUCTION

The cesarean section is a surgical intervention developed to reduce the risk of death and of maternal-child clinical occurrences during pregnancy and labor[1]. However, when performed without the support of scientific evidence, the cesarean section increases six-fold the risk of serious complications to the mother-fetus binomial[2].

Recently, cesarean sections started to be performed more frequently and indiscriminately in the entire world, raising from 6.7% in 1990 to 19.4% in 2014[3]. The rates vary from 0.6% in South Sudan to 58% in the Dominican Republic, being 14 times higher than the average in countries of the Western and Central Africa[4].

In 2009, for the first time in Brazil, the number of cesarean sections surpassed that of vaginal deliveries, reaching 50.1%. In 2017, the national prevalence reached 55.7%[5]. This rate is nearly four times higher than the 15% recommended by the World Health Organization (WHO)[6], even though this reference was adjusted for the Brazilian population to 25-30% due to the characteristics of the population[7]. According to data from the Brazilian National Agency of Supplementary Health (Agência Nacional de Saúde Suplementar – ANS), in 2018, 83% of the deliveries in the private sector were performed abdominally[8].

Numerous maternal risk factors are associated with the prevalence of cesarean section, such as higher schooling level[9], age in the extremes[9,10], white skin[11], having a partner[12], more prenatal care consultations[13], multiple gestation[14] and less than 37 weeks of gestation[9].

For a long time the public health community shows concern with the unprecedented growth of cesarean sections and their consequences. The worldwide concern with this uncontrolled increase is not without reason[15]. Some studies associated the negative effects of the cesarean section[15] in the health of women and children in the short- and long-term[14,16–18]. These effects include higher prevalence of maternal death, puerperal infection, premature birth, increased probability for allergies and reduced diversity of the intestinal microbiome of

the infants[16,17].    In the long term there are associations with overweight, obesity and hypertension of the newborns from infancy to adulthood[14,18].

Historically, Brazil has been enforcing national policies related to mother-child health. However, as the availability of the assistance increased for the women, the rates of cesarean section increased as well. To restrain this growth, were created programs, protocols and campaigns (Rede Cegonha[19], Projeto Parto Adequado[20], Protocolo Clínico de Diretrizes Terapêuticas para Cesariana[21] e "Quem espera, espera"[22]). Despite the implementation of these public policies, the studies performed to this moment on the national data identified that the rates were still rising[23]. For this reason, this study aims to evaluate the temporal tendency and the factors associated with cesarean section between the years 2000 and 2017 in the Brazilian states and in the Federal District.

**METHODS**

Ecological time-series study. All live births in Brazil were included divided into two time periods, being the first one from 2000 to 2009 and the second from 2010 to 2017. The records on the prevalence of cesarean section were established from the Information System on Live Births (Sistema de Informações Sobre Nascidos Vivos – SINASC), available in the Department of Informatics of the Unified Health System (DATASUS).

The number of live births from cesarean sections from mothers residing in each unit were selected for the calculation of the prevalence of cesarean section. The prevalence of cesarean section for each geographic unit and year of study was calculated using the following formula:

Number of live births from cesarean sections in each federative unit,

macroregion or the whole country in a given year from 2000 to 2017          X 100

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Total number of live births in each federative unit, macroregion or the whole

country in each year from 2000 to 2017.

The maternal independent variables were: age (19 years or less, 20 to 34 years and 35 years or more), skin color (white and others – black, brown, yellow and amerindian), years of schooling (less than 8 years, 8 to 11 years and 12 and more years), marital status (with or without partner), type of pregnancy (single and twin or more), duration of the gestation (extremely preterm, moderately preterm and full term) and number of prenatal care consultations (none to 3, 4 to 6 and 7 or more) available on SINASC. "Ignored" or "Blank" data were not excluded to avoid superestimation of the data, thus being considered as an individual category in each variable.

The Prais-Winsten method of generalized linear regression was used for the time-trend analysis, where the regression parameters were estimated controlled by first-order autocorrelation with the Cochrane-Orcutt transformation, that is, the dependency of a serial measure with their own previous lower values[24]. The annual variation of the prevalence of cesarean section and the respective confidence intervals of 95% (CI 95%) were calculated as proposed by Antunes[24].

The significance level used was of 5%. Non-significant p-values ($\geq$ 0.05) were interpreted as tendency of stability (accepting the null hypothesis). Significant p-values ($<$ 0.05) were classified as tendency of growth (positive annual variation) and reduction (negative annual variation). The software used was Stata 15.0[®].

A hierarchical model was elaborated for the adjusted analysis[25], containing two entry levels. In the first level were included the maternal socioeconomic variables (schooling, age, skin color and marital status) and in the second were added assistance-related characteristics (prenatal care consultations, gestational age and type of gestation). In the regression model used (backwards), all variables were adjusted to to the ones in the same level and lower

(anteriores), with the p-value $\leq 0.20$.

This study follows the guidelines of the Resolution n. 466 of December 12, 2012. According to the National Committee of Ethics in Research (Conselho Nacional de Ética em Pesquisa – CONEP). SINASC is a database that is public-domain, open access and without the identification of the participants, so, in accordance to the Resolution 466/2012, this project does not require approval from the Ethics Committee.

**RESULTS**

The national prevalence for cesarean section in the 18 years studied was do 48.4%, being the lowest prevalence in the North (37.8%) and the highest in the Southeast (54.9%). The profile of the Brazilian mothers, in the studied period, included women with less than 11 years of schooling (82.3%), aging between 20 and 34 years (69.9%), non-white skin color (50.7%), 49.2% lived with a partner, 89.8% had full-term infants, 97.8% had a single pregnancy and 52.7% attended to 7 or more prenatal care consultations (Supplementary Table 1).

The proportion of cesarean sections varied from 37.8% in the year 2000 to 50.1% in 2009, showing a growing tendency in cesarean sections in the country with an annual variation of 1.7 p.p. ($CI_{95\%}$ 1.6; 1.8). All Brazilian regions showed an ascendant tendency in the prevalence of cesarean section. The Southeast had the lowest annual variation with an increas of 1.3 p.p. ($CI_{95\%}$ 1.2; 1.4) and among the other states Roraima showed the highest variation, of 3.4 p.p. ($CI_{95\%}$ 0.4; 6.5) (Table 2).

From 2000 to 2009 (Table 3) there was a reduction in the prevalence of cesarean section in the group of mothers with less than 8 years of schooling (the highest on in the Northeast $\beta$ -0.7 $CI_{95\%}$ -0.8; -0.7); in the group of mothers aged 19 or less, with non-white skin color ($\beta$ −3.9 $CI_{95\%}$ -5.4; -2.3), who lived with a partner ($\beta$ -0.1 $CI_{95\%}$ -0.3; -0.0) and that

attended to less than 3 prenatal care consultations (South region β -3.1 CI$_{95\%}$ -4.4; -1.9). On the other hand, there was an increase in the prevalence of cesarean deliveries (CD) in the group of mothers with 12 or more years of schooling (the highest one in the Northeast, β 3.1 CI$_{95\%}$ 2.7; 3.4), aging 35 years or more (β 12.4 CI$_{95\%}$ 9.2; 15.6), in the group of mothers with non-white skin color (β 1.4 CI$_{95\%}$ 0.7; 2.1), who had moderate preterm birth, of multiple pregnancy, in the mothers who lived without a partner (β 0.1 CI$_{95\%}$ 0.0; 0.3) and those who attended to 7 or more consultations (β 1.8 CI$_{95\%}$ 1.5; 2.0).

In 2010, the surgical delivery accounted for 52.3% of all births in Brazil. A stability is observed (β -0.4 CI$_{95\%}$ -1.3; 0.5) in the prevalence of cesarean section in the country between 2010 and 2017 (Table 4). Just the Southeast region showed a slight reduction in the realization of CD with an annual variation of -0.9 (CI$_{95\%}$ -1.5; 0.0), the states responsible by this reduction were Espírito Santo (-1.5 CI$_{95\%}$ -2.6; -0.5) and Rio de Janeiro (-1.8 CI$_{95\%}$ -2.6; -1.0). Even though the North and Northeast regions are stable, some states (Acre, Tocantins, Maranhão and Roraima) are still with a growing tendency of CD.

In the North and Center-West regions, the group of mothers who had 8 to 11 years of schooling had positive associations with cesarean section (β 0.3 CI$_{95\%}$ 0.0; 0.7 and β 0.7 CI$_{95\%}$ 0.4; 1.0, respectively). In the Southeast, the group of mothers with 12 years of schooling or more, CD was reduced in 0.5 p.p. (IC$_{95\%}$ -1.0; 0.0). Considering the age of the mothers, there was an increase of 1.0 p.p. in the realization of CD in the women aging 19 years or less in the Southeast region (CI$_{95\%}$ 0.2; 1.7). In the Northeast, there was a reduction of 4.4 p.p. in CP among mothers aging between 20 and 34 years (CI$_{95\%}$ -5.7; -3.2). The group of mothers with white skin had a negative association with the occurrence of cesarean sections in the North (β -0.8 CI$_{95\%}$ -1.2; -0.4) and Center-West (β -0.5 CI$_{95\%}$ -0.7; -0.3) regions, being the latter positively associated with CD in the group of mothers with non-white skin color (β 0.8 CI$_{95\%}$ 0.3; 1.2). Only Brazil as a whole and the North region showed a significant association with

the occurrence of CD, being positive in the group of mothers with a partner and negative in the group without a partner. Only extreme preterm birth was positively associated with CD, in the North and South regions and in Brazil as a whole. An increase in cesarean section was noted only in the Center-West region ($\beta$ 5.0 CI$_{95\%}$ 0.1; 9.9) in the group of women with single gestation. In the group of mothers who attended to 3 or less prenatal consultations, the occurrence of cesarean section increased 2.3 p.p. (CI$_{95\%}$ 0.8; 3.9) and among the ones who had 7 or more consultations, CD was reduced ($\beta$ -0.6 CI$_{95\%}$ -1.0; -0.2) in the Southeast region (Table 5).

The Brazilian average for cesarean sections went from 39.7% (SD±9.8) between 2000 and 2009 to 53% (SD±9.4) between 2010 and 2017 (Supplementary Table 6). Following adjustments, only the group of mothers with aging from 20 to 34 years maintained a positive association with cesarean section in the time-period. There was a reduction in CD in extreme preterm, moderate preterm and full-term births, as well as in the group of mothers that attended to less than 3 prenatal care consultations. A slight reduction for the prevalence of CD was observed starting from 2015 (Figure 1).

**DISCUSSION**

In the 18 years included in the analysis, the prevalence of cesarean section was of 48.4%, nearly three times higher than recommended by WHO, representing an absolute number of 25.804.402 surgical deliveries. The proportion of CD went from 37.8% in the year 2000 to 50.1% in 2009, an increase of 12.3%. Similar findings were observed in the time-trend analysis using data from SINASC, including nearly 36 million births, where the cesarean section rates in Brazil varied from 37.9% in 2000 to 53.9% in 2011[26]. In the first decade included in the study, the prevalence of CD increased in all Brazilian regions. Studies reported that the choice for the cesarean section is based in the fear of pain, death, lacerations

or even the sentiment of being unable to give birth[20,27]. The convenience of booking and planning the delivery is a factor involved in this choice, besides the medical influence and the high socioeconomic level[28]. For many women, the vaginal delivery (VD) is an experience that generates insecurity, while CD is perceived as a more effective and less painful alternative[27].

When analyzing the factors that were positively associated with CD, it is possible to confirm that women value and wish for this type of delivery as a consumer good. The group of mothers with 12 or more years of schooling, aging 35 years or more, with non-white skin color, that had a partner and attended to 7 or more prenatal care consultations, opted for cesarean section between 2000 and 2009. On the same hand, a cohort study that included 4,231 live births in Pelotas reported that pregnant women aging 35 years or more had 25% more cesarean sections in comparison to younger women, the likelihood of undergoing CD was 59% higher among women with more than 12 years of schooling, and black women were subjected to 18% more CD when compared to white women[9]. There are clinical explanations for the increased rate of cesarean section among older women, due to the higher occurrence of chronic diseases such as hypertension and diabetes[29]. However, since this group is older, it also has a better economic stability, which can exert influence in the power of choice for abdominal delivery.

This inequality becomes explicit when we observe the associated factors for the non-realization of cesarean section in the same time-period, where women with less than 8 years of schooling, aging 19 years or less, white-skinned and that attended to 3 prenatal consultations or less, were associated with a reduced occurrence of cesarean section. A time-series study in Niterói that included 62.449 births found a downward trend of 5.1% in women with less than 8 years of schooling, 2.3% among those aging less than 19 years, 0.7% among white-skinned and 15.6% for the ones that attended to less than 3 prenatal consultations[30]. When evaluating the profile of these women, it is possible to consider that they looked for the

health system only in the moment of delivery, not realizing the importance of prenatal care and more limited access to health services might influence negatively in the performance of cesarean section[9,11–13, 30].

Starting in 2015, an stabilization in the occurrence of cesarean section was observed in all regions of the country, with a slight tendency of reduction in the Southeast region. In the North and Northeast, despite the stability in the rate of CD, some states still show a tendency of increase. These findings can corroborate with the hypothesis that Brazil reached the plateau in the prevalence of cesarean section (60%) in most states, and that a reduction of these rates can be expected in the following years.

Another interesting finding is the inversion in the profile of the Brazilian women that underwent cesarean section between 2010 and 2017 when compared to the first period of the study, from 2000 to 2009. This change might have been influenced by the effort of public policies implemented since 2011 and the increased availability of informative material on the advantages and disadvantages of the two delivery routes. In this new scenario, the group of women with 12 years of schooling or more, aging between 20 and 34 years, white, without partner and that attended to 7 or more prenatal consultations are the ones that were associated with a reduction in cesarean deliveries. It is possible that they had more access to globalized information through the use of technology, became more well instructed and empowered making use of scientific knowledge to choose the most beneficial route to give birth.

Whereas CD rates are currently stable and even decreasing in the group of women with higher schooling level, non-teenagers and with better prenatal coverage, a tendency of increase is observed among women with 8 to 11 years of schooling, aging 19 years or less, non-whites and that attended to 3 or less prenatal care consultations. These findings are similar to the ones reported by an ecologic study performed in Belo Horizonte, with 36.127 live births, that showed a positive association between CD and adolescents with low

schooling level that attended to less than 3 prenatal consultations[10][10]. For many years CD was perceived as a consumer good and reason of ostentation, so it seems obvious that it would reach the lower classes.

It is likely that the Brazilian women with higher socioeconomic level living in states with higher Gross Domestic Product (GDP) and Human Development Index (HDI) are opting for more physiological delivery routes, based on scientific evidence. In contrast, women with lower socioeconomic level living in poorer states still choosing cesarean delivery as a consumer good. One proof of that is that in states of the Southeast region, where the GDP was the highest of the country in 2017, women with higher schooling level and higher prenatal coverage were the ones responsible for the reduction in the rates of cesarean section. In this sense, it is believed that people with lower socioeconomic status make choices based on the ones made by people with higher intellectual and economic level, thus being expected that the rates of cesarean section will remain stable or reduced in the next decade, since states with better socioeconomic indicators are perceived by the poorer women as models to be followed.

The actions taken so far to increase awareness about VD should be kept and reinforced in the South, Southeast and Center-West regions, where cesarean section rates were high, even though stable, in 2017. On the other hand, the increasing prevalence of cesarean section in the North and Northeast indicates a need of more interventions to increase the satisfaction of the pregnant women, training of health professionals, improvement of structures of the health systems and availability of on call teams to assist on physiological deliveries[30]. Even though in these regions the rates of CD, in 2017, were of 46.5% in the North and of 50.1% in the Northeast, it is imperative that the actions are quick and effective to avoid levels similar to what is observed in the country, which is close to 60%. It is believed that actions for a consistent reduction in the prevalence for cesarean sections represent a higher incentive to natural delivery, promotion of sustained education of health professionals, quality prenatal

care consultations with orientations on the benefits of VD, and continuation on the elaboration of public policies that are bringing positive results in the maternal fetal care.

Studies with ecologic design have limitations and need solid and valid indicators. Under reporting must be taken into consideration when using information systems. Another limiting factor is that the results found by this study cannot be assigned to the individual level (ecological fallacy). However, the study is relevant because it is the first one with a historical series of 18 years to include the Brazilian states with relevant information on cesarean section, its associated factors, and the first to show a reduction in CD nationwide and in some states since 2015.

## AUTHOR CONTRIBUTIONS

VB and SCD  participated in designing the project, collecting and analyzing the data, writing the article and approving the final version. CVG participated in the project design and data analysis, collaborated in the writing of the article and approved the final version.

## DISCLOSURE OF POTENTIAL CONFLICTS OF INTEREST

The authors declare no conflict of interest.

## FUNDING

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Supplementary Table 1. Description of parturients by macroregions and Brazil from the study of the temporal trend and factors associated with cesarean section between the years 2000 to 2017

| Maternal variable | BRAZIL | | NORTH | | NORTHEAST | | SOUTH | | SOUTHEAST | | CENTER-WEST | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Proportion | CI95% | Proportion | CI95% | Proportion | CI95% | Proportion | CI95% | Proportion | CI95% | Proportion | CI95% |
| **Years of schooling** | | | | | | | | | | | | |
| Less than 8 years | 37.9 | 31.3; 44.4 | 47.9 | 41.3; 54.5 | 47.9 | 40.6; 55.1 | 34.6 | 28.0; 41.2 | 29.6 | 23.6; 35.5 | 33.8 | 27.1; 40.6 |
| 8 to 11 years | 44.4 | 38.6; 50.2 | 39.8 | 33.8; 45.7 | 37.9 | 31.0; 44.9 | 45.5 | 40.5; 50.6 | 49.9 | 44.7; 55.2 | 45.3 | 40.1; 50.4 |
| 12 and more years | 15.1 | 13.8; 16.5 | 9.9 | 8.8; 11.0 | 10.4 | 9.3; 11.4 | 19.1 | 17.3; 20.9 | 18 | 16.6; 19.4 | 18.8 | 16.8; 20.9 |
| **Age** | | | | | | | | | | | | |
| 19 years or less | 20.3 | 19.3; 21.3 | 27.4 | 41.3; 54.5 | 23.4 | 22.4; 24.3 | 18 | 16.8; 19.1 | 16.9 | 16.0; 17.8 | 20.6 | 19.2; 22.1 |
| 20 to 34 years | 68.9 | 68.2; 69.3 | 65.6 | 65.2; 66.1 | 67.4 | 66.8; 68.0 | 69.2 | 68.7; 69.6 | 70.6 | 70.3; 70.9 | 70.5 | 70.0; 70.9 |
| 35 years or more | 10.5 | 9.6; 11.4 | 6.8 | 6.1; 7.4 | 9 | 8.3; 9.7 | 12.7 | 12.0; 13.4 | 12.3 | 11.2; 13.4 | 8.7 | 7.5; 9.9 |
| **Skin color** | | | | | | | | | | | | |
| Write | 42.3 | 39.9; 44.8 | 14.2 | 11.8; 16.6 | 17.8 | 15.1; 20.4 | 87.9 | 85.3; 90.6 | 53.9 | 51.2; 56.7 | 37.9 | 33.4; 42.5 |
| Others | 50.7 | 46.8; 54.6 | 84.3 | 82.0; 86.6 | 73.5 | 69.7; 77.3 | 11.1 | 8.7; 13.6 | 37.8 | 32.9; 42.7 | 51.1 | 45.6; 56.6 |
| **Marital status** | | | | | | | | | | | | |
| With partner | 49.2 | 44.2; 54.2 | 45 | 37.7; 52.3 | 46.3 | 40.0; 52.5 | 55 | 50.1; 60.0 | 50.3 | 46.5; 54.1 | 51.7 | 45.7; 57.8 |
| Without partner | 48.9 | 43.8; 54.0 | 53.2 | 46.0; 60.4 | 51.3 | 44.8; 57.8 | 44.2 | 39.2; 49.2 | 47.9 | 44.0; 51.8 | 46.8 | 40.7; 52.8 |
| **Duration of the gestation** | | | | | | | | | | | | |
| Extremely preterm | 1.2 | 1.1; 1.3 | 1.1 | 0.9; 1.2 | 1.22 | 1.1; 1.4 | 1.3 | 1.2; 1.3 | 1.4 | 1.3; 1.5 | 1.1 | 1.1; 1.2 |
| Moderately preterm | 7 | 6.0; 8.0 | 6.6 | 5.2; 8.0 | 6.5 | 5.3; 7.7 | 7.4 | 6.6; 8.2 | 7.4 | 6.6; 8.3 | 7.01 | 6.0; 7.9 |
| Full term | 89.8 | 88.1; 91.5 | 89.7 | 86.9; 92.6 | 89.3 | 86.7; 91.2 | 90.7 | 89.6; 91.8 | 89.7 | 88.7; 90.7 | 90.4 | 88.9; 91.9 |
| **Type of pregnancy** | | | | | | | | | | | | |
| Single | 97.8 | 97.8; 97.9 | 98.3 | 98.2; 98.3 | 97. 9 | 97.8; 98.0 | 97.8 | 97.7; 97.9 | 97.7 | 97.6; 97.8 | 97.9 | 97.8; 98.0 |
| Twin or more | 1.9 | 1.8; 1.9 | 1.5 | 1.4; 1.5 | 1.8 | 1.7; 1.8 | 2 | 2.0; 2.1 | 2.1 | 2.0; 2.2 | 1.8 | 1.8; 1.9 |
| **Prenatal care consultations** | | | | | | | | | | | | |
| None to 3 | 10.8 | 9.6; 12.0 | 21.2 | 19.5; 22.9 | 15 | 12.9; 17.1 | 6.6 | 5.7; 7.5 | 6.6 | 5.9; 7.2 | 8.9 | 8.1; 9.8 |
| 4 to 6 | 30.3 | 28.0; 32.5 | 42 | 39.4; 44.5 | 39.2 | 36.2; 42.1 | 22.7 | 19.9; 25.5 | 23.4 | 21.3; 25.5 | 28 | 26.2; 29.7 |
| 7 or more | 57.2 | 53.4; 61.0 | 35.2 | 31.1; 39.4 | 44 | 39.1; 48.8 | 70.1 | 66.2; 73.8 | 68.1 | 64.6; 71.5 | 61.6 | 58.9; 64.3 |
| **Cesarean section** | **48.4** | **44.8; 51.9** | **37.8** | **34.1; 41.5** | **39.4** | **34.7; 44.1** | **54.2** | **50.6; 57.7** | **54.9** | **52.2; 57.4** | **54.2** | **50.6; 57.8** |

95%CI: 95% confidence interval.

Table 2. Prevalence of cesarean delivery by macroregions. federative units and Brazil from the study of the temporal trend and factors associated with cesarean section between the years 2000-2009.

| Macroregion and Federative unit | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | Annual variation[a] %(CI95%)[b] | t escore[c] | p-value[d] | Trend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **North** | 27.4 | 27.3 | 28.1 | 29.3 | 30.68 | 32.4 | 33.8 | 35.3 | 37.6 | 39.6 | 1.9 (1.8; 2.1) | 27.5 | <0.001 | Crescent |
| **Acre** | 23.2 | 23.3 | 23.4 | 24.3 | 25.46 | 28.8 | 28.8 | 29.1 | 29.7 | 30.6 | 1.0 (0.7; 1.4) | 7.3 | <0.001 | Crescent |
| **Amapá** | 14.3 | 17.4 | 17.2 | 21.2 | 22.75 | 24.3 | 24.3 | 25.5 | 27.4 | 29 | 1.4 (1.1; 1.7) | 11.2 | <0.001 | Crescent |
| **Amazonas** | 25.2 | 23.5 | 23.3 | 24.6 | 27.92 | 29.6 | 32.1 | 33.6 | 34.8 | 35.5 | 1.8 (1.5; 2.1) | 13.3 | <0.001 | Crescent |
| **Pará** | 26.7 | 27.1 | 28.4 | 29.1 | 29.75 | 31.2 | 32.8 | 34.6 | 37.1 | 39.7 | 2.5 (1.8; 3.1) | 8.9 | <0.001 | Crescént |
| **Rondônia** | 43.5 | 45.5 | 46.6 | 49.5 | 51.47 | 53.8 | 55.3 | 55.9 | 59.3 | 61.2 | 1.9 (1.8; 2.1) | 29.6 | <0.001 | Crescent |
| **Roraima** | 22.3 | 25.1 | 22.6 | 23.4 | 21.6 | 22.3 | 25.1 | 28.5 | 34 | 36.2 | 3.4 (0.4; 6.5) | 2.6 | 0.033 | Crescent |
| **Tocantins** | 29.3 | 27.7 | 29.1 | 30 | 31.22 | 33.7 | 35.8 | 38.1 | 39.1 | 42 | 2.0 (1.7; 2.2) | 20.7 | <0.001 | Crescent |
| **Northeast** | 25.4 | 26.3 | 26.9 | 28.5 | 30.45 | 32 | 34.6 | 36.4 | 39 | 41.2 | 2.4 (2.0; 2.7) | 17.9 | <0.001 | Crescent |
| **Alagoas** | 22.2 | 22.9 | 26.4 | 28.8 | 31.16 | 34 | 36.2 | 39 | 42.1 | 47.7 | 2.9 (2.6; 3.2) | 19.7 | <0.001 | Crescent |
| **Bahia** | 21.2 | 22.4 | 22.8 | 23.9 | 25.78 | 27.3 | 30.2 | 32.1 | 34.3 | 35.7 | 2.0 (1.6; 2.4) | 12.2 | <0.001 | Crescent |
| **Ceará** | 27.2 | 28.7 | 29.8 | 32.2 | 34.43 | 35.2 | 37.4 | 39.9 | 42.6 | 44.7 | 2.1 (1.8; 2.4) | 17.5 | <0.001 | Crescent |
| **Maranhão** | 23.8 | 23.2 | 22.4 | 23.1 | 24.33 | 25.9 | 28.1 | 29.2 | 30.7 | 32.7 | 1.9 (1.5; 2.2) | 13 | <0.001 | Crescent |
| **Paraíba** | 33.1 | 32.2 | 32.9 | 35.1 | 37.81 | 39.1 | 42.5 | 45.2 | 46.6 | 48.9 | 2.3 (2.1; 2.5) | 25.2 | <0.001 | Crescent |
| **Pernambuco** | 29.4 | 30.5 | 31.1 | 33.2 | 34.19 | 35.6 | 38.9 | 40.6 | 45 | 47.1 | 2.7 (1.9; 3.6) | 7.7 | <0.001 | Crescent |
| **Piauí** | 29.2 | 28.8 | 29.2 | 31.7 | 34.6 | 36.9 | 39 | 40.3 | 41.1 | 43.7 | 2.0 (1.7; 2.3) | 16.4 | <0.001 | Crescent |
| **Rio Grande do Norte** | 27.6 | 28.4 | 28.6 | 29.9 | 34.36 | 36.2 | 39.1 | 40.4 | 44.2 | 47.1 | 2.6 (2.2; 3.1) | 13.8 | <0.001 | Crescent |
| **Sergipe** | 18.8 | 20.6 | 23 | 24.7 | 26 | 26.1 | 28.4 | 29.2 | 31.6 | 33 | 1.4 (1.2; 1.6) | 16.9 | <0.001 | Crescent |
| **Southeast** | 46.3 | 46.9 | 47.5 | 48.7 | 50.14 | 51.6 | 53.1 | 54.2 | 55.7 | 56.7 | 1.3 (1.2; 1.4) | 32.8 | <0.001 | Crescent |
| **Espírito Santo** | 43.5 | 44.2 | 44.5 | 45.2 | 46.07 | 48 | 50.8 | 53.7 | 57.5 | 58.2 | 2.6 (1.7; 3.5) | 6.7 | 0.001 | Crescent |
| **Minas Gerais** | 40.5 | 40.5 | 41.5 | 43.3 | 44.76 | 46.2 | 47.9 | 48.9 | 50.5 | 52 | 1.4 (1.4; 1.5) | 65.1 | <0.001 | Crescent |
| **Rio de Janeiro** | 49.1 | 50 | 48.7 | 49.9 | 50.98 | 53 | 54.5 | 55.1 | 56.8 | 58.3 | 1.4 (1.1; 1.8) | 10.1 | <0.001 | Crescent |
| **São Paulo** | 48 | 49.2 | 50 | 51 | 52.59 | 53.8 | 55.1 | 56.1 | 57.3 | 58 | 1.2 (1.1; 1.2) | 32.6 | <0.001 | Crescent |
| **South** | 42.1 | 43.2 | 44.1 | 46 | 48.15 | 49.8 | 51.3 | 52.8 | 54.5 | 56 | 1.7 (1.6; 187) | 38 | 0.001 | Crescent |
| **Paraná** | 43.6 | 44.9 | 45.1 | 46.9 | 49.02 | 50.2 | 51.8 | 53.5 | 55.2 | 56.5 | 1.6 (1.4; 1.7) | 25.4 | <0.001 | Crescent |
| **Rio Grande do Sul** | 41 | 42.1 | 43.2 | 44.8 | 47.15 | 49.1 | 50.5 | 51.9 | 53.7 | 55.6 | 1.7 (1.6; 1.9) | 35.3 | <0.001 | Crescent |
| **Santa Catarina** | 41.6 | 42.2 | 43.8 | 46.3 | 48.32 | 50.3 | 51.6 | 53 | 54.6 | 55.7 | 1.7 (1.5; 1.9) | 18.1 | <0.001 | Crescent |
| **Center-West** | 43.4 | 44.1 | 44.2 | 45.8 | 47.34 | 49.3 | 50.6 | 52.9 | 54.1 | 55.8 | 1.7 (1.5; 1.9) | 18.2 | <0.001 | Crescent |
| **Distrito Federal** | 39.6 | 41.5 | 42.8 | 44.2 | 46.03 | 47.6 | 48.1 | 51.7 | 51.4 | 51.8 | 1.4 (1.2; 1.6) | 17.6 | <0.001 | Crescent |
| **Goiás** | 44.9 | 45.4 | 44.6 | 45.6 | 47.45 | 50.2 | 51.8 | 54.6 | 56.7 | 59 | 2.5 (1.9; 3.1) | 9.9 | <0.001 | Crescent |
| **Mato Grosso** | 44.9 | 45.3 | 45.5 | 47 | 48.32 | 50.1 | 50.3 | 51.9 | 52.7 | 54.8 | 1.2 (1.0; 1.4) | 14.3 | <0.001 | Crescent |
| **Mato Grosso do Sul** | 42.8 | 42.6 | 43.5 | 46.5 | 47.34 | 48.5 | 51.1 | 52.7 | 53.5 | 54.1 | 1.5 (1.3; 1.7) | 19.3 | <0.001 | Crescent |
| **Brazil** | 37.8 | 38.1 | 38.6 | 39.9 | 41.75 | 43.2 | 45 | 46.5 | 48.4 | 50.1 | 1.7 (1.6; 1.8) | 36.2 | <0.001 | Crescent |

a) Annual variation in% and its 95% CI were the result of the Prais-Winsten regression; b)95%CI; 95% confidence interval;regression p-value

c) Prais-Winsten regression t-score;d)Prais-Winsten

Table 3. Prais-Winstein regression coefficient of factors associated with cesarean delivery in the macroregions and Brazil from the study of the temporal trend and factors associated with cesarean section between the years 2000-2009.

| Maternal variable | BRAZIL Beta[a] (CI95%)[b] | NORTH Beta[a] (CI95%)[b] | NORTHEAST Beta[a] (CI95%)[b] | SOUTH Beta[a] (CI95%)[b] | SOUTHEAST Beta[a] (CI95%)[b] | CENTER-WEST Beta[a] (CI95%)[b] |
|---|---|---|---|---|---|---|
| **Years of schooling** | | | | | | |
| Less than 8 years | **-0.6 (-0.7; -0.6)** | **-0.7 (-0.7; -0.6)** | **-0.7 (-0.8; -0.7)** | **-0.6 (-0.6; -0.5)** | **-0.5 (-0.5; -0.4)** | **-0.6 (-0.7; -0.5)** |
| 8 to 11 years | **0.9 (0.8; 1.0)** | **0.9 (0.8; 1.0)** | **1.0 (0.8; 1.1)** | **0.8 (0.7; 1.0)** | **0.6 (0.6; 0.7)** | **0.9 (0.7; 1.1)** |
| 12 and more years | **2.3 (2.1; 2.5)** | **2.2 (1.9; 2.5)** | **3.1 (2.7; 3.4)** | **1.1 (0.4; 1.9)** | **1.3 (0.3; 2.3)** | **1.6 (1.4; 1.8)** |
| **Age** | | | | | | |
| 19 years or less | **-3.9 (-5.1; -2.7)** | **-4.2 (-5.0; -3.4)** | **-2.6 (-4.3; -0.8)** | -1.0 (-3.5; 1.4) | -0.2 (-2.2; 1.9) | **-2.5 (-3.3; -1.8)** |
| 20 to 34 years | **5.5 (2.7; 8.2)** | **5.0 (2.9; 7.2)** | **4.3 (3.4; 5.2)** | 1.2 (-1.3; 3.7) | -0.4 (-2.5; 1.6) | **4.9 (2.3; 7.4)** |
| 35 years or more | **8.7 (7.7; 9.8)** | 4.0 (-0.7; 8.7) | 5.6 (-0.1; 11.2) | **12.4 (9.2; 15.6)** | **4.7 (4.1; 5.3)** | **4.5 (4.0; 4.5)** |
| **Skin color** | | | | | | |
| Write | **-3.9 (-5.4; -2.3)** | **-1.3 (-2.0; -0.7)** | **-1.6 (-1.9; -1.4)** | -1.2 (-2.8; 0.3) | **0.8 (0.1; 1.4)** | -0.3 (-0.9; 0.3) |
| Others | **1.1 (1.0; 1.3)** | **1.4 (0.7; 2.1)** | **1.0 (0.7; 1.2)** | 1.1 (-1.0; 3.3) | **1.2 (1.1; 1.3)** | **0.3 (0.0; 0.6)** |
| **Marital status** | | | | | | |
| With partner | -0.1 (-0.3; 0.1) | -0.2 (-0.2; 0.1) | -0.0 (-0.3; 0.3) | **-0.1 (-0.3; -0.0)** | -0.1 (-0.2; 0.1) | -0.1 (-0.2; 0.1) |
| Without partner | 0.1 (-0.1; 0.3) | 0.0 (-0.2; 0.2) | 0.0 (-0.2; 0.3) | **0.1 (0.0; 0.3)** | 0.1 (-0.10; 0.3) | 0.1 (-0.1; 0.2) |
| **Duration of the gestation** | | | | | | |
| Extremely preterm | **107.8 (82.9; 132.6)** | 3.1 (-8.7; 14.8) | **110.6 (76.4; 144.7)** | **73.8 (59.0; 88.6)** | 6.9 (-8.3; 22.2) | -6.0 (-15.7; 3.6) |
| Moderately preterm | **5.6 (2.6; 8.5)** | 2.5 (-0.3; 5.2) | **3.2 (0.2; 6.3)** | **12.7 (10.6; 14.8)** | **8.9 (7.8; 10.1)** | -0.3 (-2.5; 2.1) |
| Full term | -2.0 (-4.2; 0.2) | **-2.1 (-3.5; -0.8)** | **-2.7 (-5.2; -0.3)** | **-11.7 (-14.0; -9.4)** | -0.1 (-0.9; 0.6) | 0.7 (-1.0; 2.4) |
| **Type of pregnancy** | | | | | | |
| Single | -2.9 (-15.4; 9.6) | -1.8 (-9.6; 6.1) | -0.7 (-8.4; 7.0) | -6.5 (-16.3; 3.2) | -2.2 (-11.4; 7.0) | 1.1 (-2.8; 5.0) |
| Twin or more | **73.4 (54.3; 92.5)** | 7.5 (-10.1; 25.0) | -7.7 (-29.2; 13.7) | **44.0 (29.3; 58.7)** | **31.9 (26.2; 37.5)** | -0.3 (-15.8; 15.1) |
| **Prenatal care consultations** | | | | | | |
| None to 3 | **-2.1 (-2.9; -1.3)** | **-1.6 (-2.0; -1.2)** | **-1.5 (-2.2; -0.9)** | **-3.1 (-4.4; -1.9)** | -0.4 (-1.9; 1.1) | **-2.9 (-3.8; -2.1)** |
| 4 to 6 | **-3.3 (-3.5; -3.1)** | -0.3 (-1.2; 0.7) | **-1.0 (-1.9; -0.0)** | **-1.1 (-1.3; -0.9)** | **-1.3 (-1.8; -0.8)** | **-1.1 (-1.9; -0.2)** |
| 7 or more | **1.3 (1.0; 1.6)** | **1.8 (1.5; 2.0)** | **1.5 (1.2; 1.8)** | **0.8 (0.6; 1.0)** | **0.8 (0.4; 1.1)** | **1.2 (1.1; 1.4)** |

a) Annual variation in% and its 95% CI were the result of the Prais-Winsten regression; b) 95%CI: 95% confidence interval.

Table 4. Prevalence of cesarean delivery by macroregions. federative units and Brazil from the study of the temporal trend and factors associated with cesarean section between the years 2010-2017.

| Macroregion and Federative unit | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | Annual variation[a] %(CI95%)[b] | t escore[c] | p-value[d] | Trend |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **North** | 41.8 | 42.7 | 44.5 | 46 | 46.8 | 46.2 | 45.5 | 46.5 | 0.1 (-0.9; 1.1) | 0.2 | 0.828 | Stable |
| **Acre** | 32.5 | 29.2 | 33.3 | 37.7 | 37.9 | 39 | 42.5 | 41.3 | 2.0 (1.4; 2.6) | 8.9 | <0.001 | Crescent |
| **Amapá** | 29.8 | 31 | 31.6 | 33.9 | 35.6 | 34.8 | 34.5 | 34.9 | 0.3 (-0.8; 1.4) | 0.7 | 0.503 | Stable |
| **Amazonas** | 37.7 | 37.2 | 38 | 38.1 | 37.9 | 37.2 | 35.7 | 37.9 | -0.1 (-0.5; 0.2) | -1.1 | 0.324 | Stable |
| **Pará** | 42.2 | 45.2 | 47.5 | 49.3 | 50.4 | 48.9 | 48.1 | 48.7 | -0.6 (-1.8; 0.5) | -1.4 | 0.218 | Stable |
| **Rondônia** | 64 | 63.6 | 65.3 | 65.8 | 66.3 | 66.9 | 66.3 | 66.3 | 0.3 (-0.1; 0.8) | 1.8 | 0.127 | Stable |
| **Roraima** | 35.8 | 31.9 | 32.2 | 34 | 34.6 | 36.2 | 37.4 | 36.8 | 1.0 (0.7; 1.3) | 8.4 | <0.001 | Crescent |
| **Tocantins** | 44 | 42.8 | 47 | 50.1 | 52.1 | 53.2 | 51.8 | 54.8 | 1.7 (0.7; 2.7) | 4.4 | 0.007 | Crescent |
| **Northeast** | 44.3 | 46.1 | 48.4 | 49.7 | 50.9 | 49.6 | 49.8 | 50.1 | -0.2 (-1.3; 0.8) | -0.6 | 0.591 | Stable |
| **Alagoas** | 52.7 | 55.2 | 56.9 | 56.2 | 54.7 | 52.7 | 54 | 54.2 | -0.5 (-1.2; 0.1) | -2 | 0.098 | Stable |
| **Bahia** | 38.5 | 39.9 | 42 | 42.9 | 44.4 | 42.8 | 42.5 | 43 | -0.1 (-1.2; 0.9) | -0.3 | 0.745 | Stable |
| **Ceará** | 48.9 | 52 | 55.6 | 56.9 | 57.8 | 56.6 | 57.5 | 56.8 | -0.6 (-1.8; 0.6) | -1.3 | 0.251 | Stable |
| **Maranhão** | 34.3 | 36.4 | 38.6 | 40.7 | 42.5 | 43.3 | 44.8 | 46.2 | 1.3 (0.8; 1.8) | 6.4 | 0.001 | Crescent |
| **Paraíba** | 51.8 | 53 | 55.8 | 56.2 | 58 | 46.4 | 57.5 | 57.2 | 0.4 (-0.4; 1.2) | 1.4 | 0.228 | Stable |
| **Pernambuco** | 50 | 50.9 | 52.2 | 53.7 | 54.3 | 51.5 | 50.2 | 49.2 | -1.7 (-3.5; 0.2) | -2.3 | 0.067 | Stable |
| **Piauí** | 46.3 | 48 | 49.7 | 51.9 | 53.3 | 53.2 | 53.6 | 54.3 | 0.3 (-0.6; 1.3) | 0.9 | 0.425 | Stable |
| **Rio Grande do Norte** | 51.1 | 52.7 | 56 | 58 | 59.7 | 59.5 | 60.1 | 61.3 | 0.6 (-0.6; 1.) | 1.3 | 0.241 | Stable |
| **Sergipe** | 35.7 | 38.1 | 41 | 43.3 | 44.9 | 41.8 | 41.6 | 43.9 | 0.3 (-1.2; 1.7) | 0.4 | 0.674 | Stable |
| **Southeast** | 58.2 | 59.4 | 60.6 | 61.3 | 61 | 59.1 | 58.8 | 58.6 | -0.8 (-1.5; 0.0) | -2.6 | 0.05 | Decreasing |
| **Espírito Santo** | 60.8 | 64.3 | 66.7 | 66.8 | 66.7 | 63 | 62.3 | 61.7 | -1.5 (-2.6; -0.5) | -3.7 | 0.014 | Decreasing |
| **Minas Gerais** | 54.1 | 55.6 | 57.5 | 58 | 58.1 | 56.6 | 56.9 | 57.5 | -0.1 (-0.8; 0.6) | -0.4 | 0.688 | Stable |
| **Rio de Janeiro** | 60.6 | 61.2 | 62 | 62.1 | 62 | 60.7 | 59.4 | 57.8 | -1.8 (-2.6; -1.0) | -5.9 | 0.002 | Decreasing |
| **São Paulo** | 58.9 | 69 | 60.9 | 61.9 | 61.4 | 59.3 | 59 | 59.2 | -0.6 (-1.4; 0.1) | -2.1 | 0.094 | Stable |
| **South** | 58.1 | 60.1 | 61.7 | 62.7 | 62.4 | 60.5 | 60.7 | 61.4 | -0.3 (-1.0; 0.4) | -1 | 0.349 | Stable |
| **Paraná** | 58.4 | 60.6 | 61.9 | 63.5 | 63.1 | 61.4 | 61.4 | 62 | -0.3 (-1.1; 0.4) | -1 | 0.342 | Stable |
| **Rio Grande do Sul** | 58 | 60.3 | 62 | 62.6 | 62.9 | 61 | 62 | 62.8 | 0.1 (-0.5; 0.7) | 0.4 | 0.715 | Stable |
| **Santa Catarina** | 57.6 | 58.9 | 60.7 | 61.3 | 60.5 | 58.3 | 57.6 | 58.2 | -0.7 (-1.7; 0.2) | -2.1 | 0.09 | Stable |
| **Center-West** | 57.4 | 58.8 | 61.4 | 62.1 | 62.8 | 61.5 | 62 | 62.6 | 0.1 (-0.7; 0.9) | 0.4 | 0.703 | Stable |
| **Distrito Federal** | 51.9 | 52.5 | 53.7 | 54.4 | 55.1 | 54.8 | 55.1 | 54.7 | -0.2 (-0.9; 0.5) | -0.8 | 0.479 | Stable |
| **Goiás** | 61.6 | 63 | 66 | 66.8 | 67.4 | 65.7 | 66.4 | 67.2 | 0.2 (-0.7; 1.1) | 0.5 | 0.662 | Stable |
| **Mato Grosso** | 56.1 | 57.5 | 60.6 | 60.6 | 61.3 | 60.3 | 60.8 | 61.6 | 0.2 (-0.5; 1.0) | 0.9 | 0.41 | Stable |
| **Mato Grosso do Sul** | 55.8 | 57.8 | 60.1 | 61.4 | 62 | 60.6 | 60.6 | 62 | 0.1 (-0.7; 1.0) | 0.3 | 0.75 | Stable |
| **Brazil** | 52.3 | 53.7 | 55.6 | 56.6 | 57 | 55.5 | 55.4 | 55.7 | -0.4 (-1.3; 0.5) | -1.2 | 0.292 | Stable |

a) Annual variation in% and its 95% CI were the result of the Prais-Winsten regression; b)95%CI; 95% confidence interval; c) Prais-Winsten regression t-score; d)Prais-Winsten regression pvalue

Table 5. Prais-Winstein regression coefficient of factors associated with cesarean delivery in the macroregions and Brazil from the study of the temporal trend and factors associated with cesarean section between the years 2010-2017.

| Maternal variable | BRAZIL Beta[a] (CI95%)[b] | NORTH Beta[a] (CI95%)[b] | NORTHEAST Beta[a] (CI95%)[b] | SOUTH Beta[a] (CI95%)[b] | SOUTHEAST Beta[a] (CI95%)[b] | CENTER-WEST Beta[a] (CI95%)[b] |
|---|---|---|---|---|---|---|
| **Years of schooling** | | | | | | |
| Less than 8 years | 0.2 (-0.3; 0.6) | -0.2 (-0.5; 0.2) | -0.0 (-0.5; 0.4) | 0.2 (-0.2; 0.6) | 0.4 (-0.1; 0.8) | -0.0 (-0.7; 0.6) |
| 8 to 11 years | -0.3 (-1.3; 0.8) | **0.3 (0.0; 0.7)** | -0.9 (-2.3; 0.4) | -0.2 (-0.9; 0.5) | -0.5 (-1.3; 0.3) | **0.7 (0.4; 1.0)** |
| 12 and more years | -0.2 (-0.8; 0.4) | 0.2 (-0.6; 0.9) | 0.3 (-0.3; 0.8) | -0.2 (-0.7; 0.3) | **-0.5 (-1.0; -0.0)** | -0.3 (-0.9; 0.2) |
| **Age** | | | | | | |
| 19 years or less | 0.5 (-0.5; 1.6) | 0.1 (-1.1; 1.4) | 0.4 (-1.0; 1.9) | 0.3 (-0.4; 1.1) | **1.0 (0.2; 1.7)** | 0.2 (-0.8; 1.3) |
| 20 to 34 years | -4.5 (-9.0; 0.0) | -0.7 (-3.6; 2.2) | **-4.4 (-5.7; -3.2)** | -2.4 (-5.0; 0.2) | 1.0 (-2.5; 4.5) | -1.2 (-4.5; 2.0) |
| 35 years or more | -0.5 (-1.6; 0.7) | -0.0 (-2.0; 2.0) | -0.4 (-2.3; 1.5) | -0.3 (-1.3; 0.6) | -0.8 (-1.6; 0.0) | -0.1 (-1.3; 1.2) |
| **Skin color** | | | | | | |
| Write | -0.2 (-0.9; 0.4) | **-0.8 (-1.2; -0.4)** | 1.5 (-0.1; 3.1) | -0.1 (-0.5; 0.2) | 0.1 (-0.5; 0.6) | **-0.5 (-0.7; -0.3)** |
| Others | 0.3 (-0.5; 1.1) | 0.7 (-0.0; 1.5) | -0.3 (-1.8; 1.2) | 0.1 (-0.3; 0.6) | -0.1 (-0.6; 0.4) | **0.8 (0.3; 1.2)** |
| **Marital status** | | | | | | |
| With partner | **0.3 (0.1; 0.4)** | **0.2 (0.0; 0.4)** | -0.1 (-0.3; 0.1) | 0.1 (-0.0; 0.3) | 0.3 (-0.1; 0.6) | -0.0 (-0.2; 0.2) |
| Without partner | **-0.3 (-0.4; -0.1)** | **-0.2 (-0.4; -0.0)** | 0.1 (-0.1; 0.3) | 0.2 (-0.4; 0.0) | -0.3 (-0.6; 0.1) | 0.1 (-0.2; 0.2) |
| **Duration of the gestation** | | | | | | |
| Extremely preterm | **19.0 (4.8; 33.2)** | -0.5 (-7.9; 6.9) | **28.9 (18.6; 37.5)** | **19.5 (1.9; 37.1)** | 8.6 (-3.0; 20.2) | -9.6 (-20.0; 0.8) |
| Moderately preterm | 0.4 (-0.9; 1.7) | -0.3 (-1.2; 0.6) | -0.9 (-2.1; 0.4) | 0.4 (-0.9; 1.7) | 0.6 (-0.6; 1.8) | -0.2 (-1.7; 1.3) |
| Full term | -0.1 (-0.5; 0.4) | 0.1 (-0.2; 0.4) | 0.17 (-0.1; -0.4) | -0.3 (-1.1; 0.5) | -0.6 (-1.3; 0.2) | 0.1 (-0.4; 0.6) |
| **Type of pregnancy** | | | | | | |
| Single | 4.6 (-9.3; 18.6) | 6.2 (-4.6; 17.0) | 1.5 (-3.3; 6.3) | 5.4 (-7.9; 18.8) | -14.6 (-38.1; 8.8) | **5.0 (0.1; 9.9)** |
| Twin or more | -21.7 (-54.9; 11.5) | -21.2 (-44.7; 2.3) | -4.3 (-29.1; 20.5) | -7.0 (-20.6; 6.6) | -12.4 (-42.8; 18.0) | -9.3 (-20.3; 1.7) |
| **Prenatal care consultations** | | | | | | |
| None to 3 | 0.5 (-0.6; 1.6) | -0.0 (-0.9; 0.9) | -0.1 (-0.7; 0.5) | 0.9 (-1.0; 2.9) | **2.3 (0.8; 3.9)** | 0.1 (-1.4; 1.5) |
| 4 to 6 | 0.6 (-0.3; 1.5) | 0.5 (-0.5; 1.5) | 0.4 (-0.5; 1.3) | 0.3 (-0.4; 1.1) | **0.9 (0.1; 1.6)** | -0.2 (-1.0; 0.7) |
| 7 or more | -0.4 (-0.9; 0.1) | -0.3 (-0.9; 0.4) | -0.1 (-0.4; 0.3) | 0.2 (-0.7; 0.2) | **-0.6 (-1.0; -0.2)** | 0.1 (-0.5; 0.7) |

a) Annual variation in% and its 95% CI were the result of the Prais-Winsten regression; b) 95%CI: 95% confidence interval

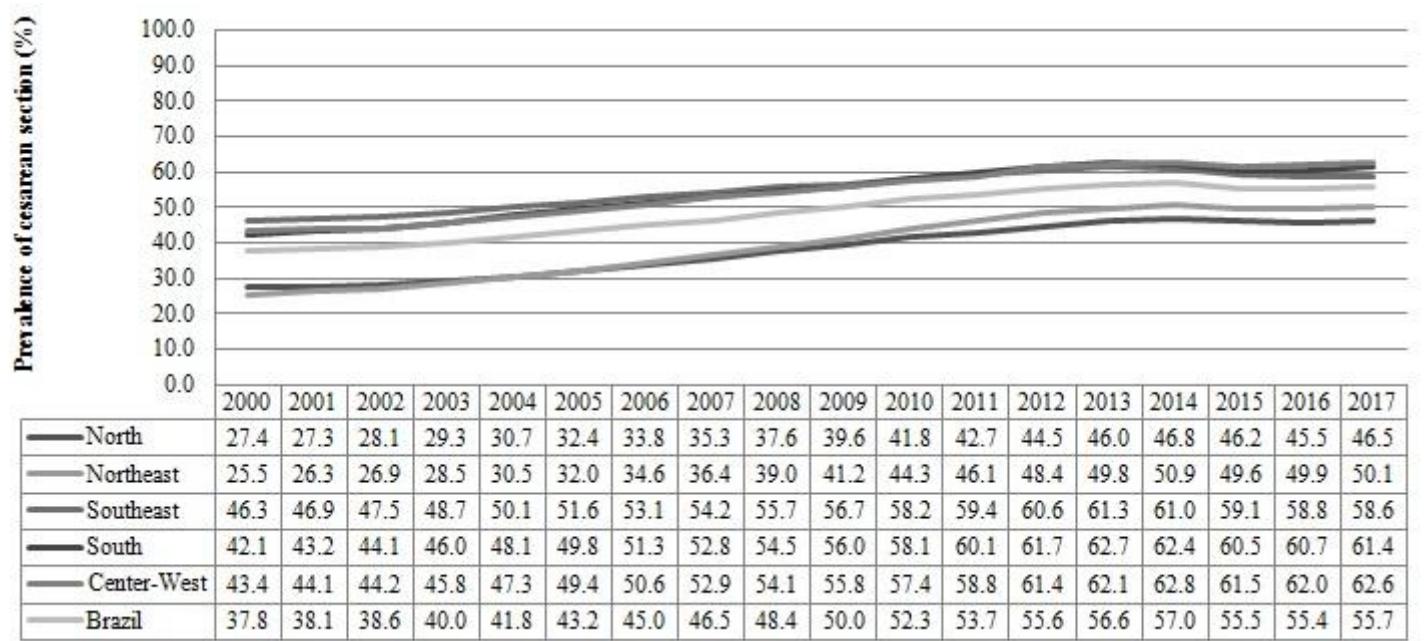| | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| North | 27.4 | 27.3 | 28.1 | 29.3 | 30.7 | 32.4 | 33.8 | 35.3 | 37.6 | 39.6 | 41.8 | 42.7 | 44.5 | 46.0 | 46.8 | 46.2 | 45.5 | 46.5 |
| Northeast | 25.5 | 26.3 | 26.9 | 28.5 | 30.5 | 32.0 | 34.6 | 36.4 | 39.0 | 41.2 | 44.3 | 46.1 | 48.4 | 49.8 | 50.9 | 49.6 | 49.9 | 50.1 |
| Southeast | 46.3 | 46.9 | 47.5 | 48.7 | 50.1 | 51.6 | 53.1 | 54.2 | 55.7 | 56.7 | 58.2 | 59.4 | 60.6 | 61.3 | 61.0 | 59.1 | 58.8 | 58.6 |
| South | 42.1 | 43.2 | 44.1 | 46.0 | 48.1 | 49.8 | 51.3 | 52.8 | 54.5 | 56.0 | 58.1 | 60.1 | 61.7 | 62.7 | 62.4 | 60.5 | 60.7 | 61.4 |
| Center-West | 43.4 | 44.1 | 44.2 | 45.8 | 47.3 | 49.4 | 50.6 | 52.9 | 54.1 | 55.8 | 57.4 | 58.8 | 61.4 | 62.1 | 62.8 | 61.5 | 62.0 | 62.6 |
| Brazil | 37.8 | 38.1 | 38.6 | 40.0 | 41.8 | 43.2 | 45.0 | 46.5 | 48.4 | 50.0 | 52.3 | 53.7 | 55.6 | 56.6 | 57.0 | 55.5 | 55.4 | 55.7 |

Figure 1. Time series of the prevalence of cesarean sections in Brazil from 2000 to 2017