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Unplanned pregnancy in the extreme South of Brazil: prevalence, trends, and associated factors

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Abstract *The study aims to estimate the proportion of puerperae with an unplanned pregnancy, evaluate trends and identify factors associated with its occurrence in Rio Grande-RS, Brazil. Trained interviewers applied a single, standardized questionnaire to all puerperae residing in the municipality in 2007, 2010, 2013, 2016 and 2019. The chi-square test compared proportions and the Poisson regression with robust variance adjustment in the multivariate analysis. The prevalence ratio (PR) was the effect measure employed. The study includes 12,415 puerperae (98% of the total). The unplanned pregnancy rate was 63.3% (95%CI: 62.5%-64.1%). After adjusting, the highest PR for not planning pregnancy were observed among younger, black women, living without a partner, with more significant household agglomeration, lower schooling, and household income, multiparous and smokers. The rate of unplanned pregnancy is high and stable, with a higher propensity among women those with the highest risk of unfavorable events during pregnancy and childbirth. Reaching these women in high schools, companies, services and health professionals, in addition to the mass media, can be strategies to prevent unplanned pregnancy.*

Key words *Unplanned pregnancy, Unwanted pregnancy, Risk factors, Reproductive health, Fertile period*

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Introduction

Approximately 85 million of the 213 million pregnancies that occurred in 2012, the most recent estimate available, were unplanned[1]. This type of pregnancy is associated with late initiation of appointments, inadequate prenatal care, and adverse outcomes such as low birth weight, prematurity, need for induced labor, and longer hospitalization time[2-5]. Furthermore, these women are generally younger, single or without a partner, of low socioeconomic status, and very often victims of intimate partner violence[6,7]. For these reasons, not planning a pregnancy is a global public health issue[8].

Approximately 55% of births are unplanned in Brazil, representing about 1.4 million births/year[9]. Among Brazilian women, besides the factors already mentioned, also identified as significantly associated with this outcome are Brown, Yellow, and Black people, household crowding, unemployment, multiparity, alcohol consumption, and tobacco use[9-12]. The most recent of these studies dates from 2020 and included only one hospital in eight Brazilian capitals[12]. The only one to consider trends was conducted in Pelotas-RS, finding an unplanned pregnancy rate of 62.7% in 1993, 65.9% in 2004, and 52.2% in 2015[11]. Since then, no other study evaluating trends in Brazil has been published on this topic.

The Rio Grande Perinatal Studies, conducted every three years since 2007, collected a range of information from the six months before pregnancy to the immediate postpartum period. Among this information is one addressing pregnancy planning. Five census surveys were conducted over 13 years[12].

This article aims to measure prevalence, assess trends, and identify factors associated with unplanned pregnancy in a medium-sized municipality in the Extreme South of Brazil from 2007 to 2019.

Methods

The present study was conducted in Rio Grande-RS, Brazil, from 2007 to 2019. This municipality is located on the south coastline, about 300 km from Porto Alegre and 250 km from the border with Uruguay. Its population increased from 195 thousand to 212 thousand during this period. Its economy is based on trade and agribusiness, mainly rice production and extensive livestock, fertilizer industries, and fishing and port activities.

The public health network has changed little over these 13 years, with 36 PHC units, four specialty centers, and two general hospitals, one with mixed care and the other exclusively dedicated to the Unified Health System (SUS). The Human Development Index (HDI) reached 0.744, while infant mortality increased from 9.3 to 11/1000 births[13].

The data presented in this article are nested in the Rio Grande Perinatal Studies, surveys conducted in 2007, 2010, 2013, 2016, and 2019 to monitor the care offered during pregnancy and childbirth in the municipality. The inclusion criteria were having had a child between January 1 and December 31 in those years and having reached at least 20 weeks of gestational age or 500 g of birth weight.

The design is cross-sectional, and the respondents were approached only once, within 48 hours after delivery while still in the hospital. Moreover, it is a census study because it includes all puerperae living in urban and rural areas[14].

Data were collected through a single, standardized, pre-coded questionnaire divided into blocks, which sought information from pregnancy planning to the immediate postpartum period. Most of the questions and variables originated from blocks D, E, and F for this study. These blocks investigated reproductive health (number of pregnancies, abortions, children born alive or dead, age at first pregnancy, and first delivery), maternal lifestyle and behavior (tobacco use and alcohol/coffee/mate consumption, and physical activity), and maternal demographic and household sociodemographic characteristics (number of residents in the household, degree of kinship, age, schooling, occupation, and individual income in the month immediately preceding the interview). Further details on the methodology used in these surveys can be obtained in a specific publication[15].

The questionnaires were applied by four interviewers trained for 40 hours, who underwent a pilot study in the month immediately before the beginning of data collection. Daily, they visited the maternity ward and all the wards of each hospital in search of births whose mothers resided in Rio Grande. When meeting a puerperae, the interviewer explained that the study invited her to participate. She signed two copies of the Informed Consent Form (ICF) if accepted. One copy was delivered to the mother, while the other was filed at the Faculty of Medicine of the Federal University of Rio Grande (FURG) project headquarters. The interview was started only after this step.

The 2007, 2010, and 2013 surveys were based on physical questionnaires, in which the interviewers coded and revised the closed-ended questions at the end of each working day. The following day, the questionnaires were delivered to the project headquarters, where they were revised and entered twice by different professionals and in the reverse order of the first. Entries were compared at each block of 100 questionnaires and, if necessary, corrected. All these steps were performed using the free software Epi Data[16] and Epi Info[17].

In the 2016 and 2019 surveys, data were entered simultaneously with the interview using tablets and the REDCap (Research Electronic Data Capture) application[18]. At the end of each day, these questionnaires were downloaded to the FURG server and revised.

The outcome of this study was defined based on the negative response to the following question: "Did you plan to have this child, or did you accidentally become pregnant?". All puerperae who answered "not having planned" or "having become pregnant unintentionally" were considered unplanned pregnancies, thus constituting the outcome of this study.

The initial analysis consisted of listing the frequency of the variables of interest. Then, a bivariate analysis was performed to verify the distribution of the outcome concerning different exposures, which was evaluated using Pearson's chi-square test. Subsequently, multivariable analysis was performed using Poisson Regression with robust variance adjustment[19,20]. This last stage obeyed a previously defined hierarchical model with the independent variables allocated in three levels: distal (demographic and socioeconomic), intermediate (reproductive and pregnancy care), and proximal (behavioral and lifestyle). The variables located at a hierarchically higher level than the variable in question were considered potential confounders vis-à-vis the outcome, in this case, not planning the pregnancy (Chart 1). The p-value associated with the outcome should be ≤0.20[21] to be maintained in the model in the adjusted analysis. The effect measure was the prevalence ratio for a 95% confidence interval (95%CI). Wald tests for heterogeneity and linear trends were used for ordinal exposures[19]. All these analyses were performed using the statistical package Stata 11.0[22].

Approximately 10% of the interviews were partially repeated within 15 days after the initial interview to evaluate the agreement of the answers provided by the mothers shortly after birth. The Kappa index of agreement ranged from 0.61 to 0.99, with most values ranging from 0.72 to 0.91, a satisfactory level[23].

FURG's Health Research Ethics Committee (CEPAS) approved all research protocols under the following numbers: 2007 (Opinion No. 05369/2006); 2010 (Opinion No. 06258/2009); 2013 (Opinion No. 02623/2012); 2016 (Opinion No. 0030-2015) and 2019 (Opinion No. 278/2018).

Results

A total of 12,663 puerperae were identified in the five surveys conducted in Rio Grande. We successfully interviewed 12,415 of them, representing a 98% response rate.

Table 1 shows the proportional distribution of mothers who did not plan the pregnancy according to the main variables studied. We observed an increase in the proportion of this condition among younger mothers (≤19 years old), less educated (≤8 study years), and belonging to the first and second quartile of household income. Furthermore, we identified a growing proportion between those with a higher number of residents in the household, higher parity, and smokers. The penultimate column on the right of this same table shows the variation between the extremes (2007 and 2019). The highest percentage elevation for non-planning occurred among mothers living in households with up to two occupants, reaching 23.2%. In contrast, the smallest decline occurred among those with 12 or more schooling years, reaching 8.1%. The last column shows the linear trend test. Only one of the categories of

Chart 1. Hierarchical model of analysis for unplanned pregnancy among puerperae. Rio Grande-RS, Brazil, 2007-2019.

Level	Characteristics (variables)	
I	Demographic: (Age, skin color, and living with a partner)	Socioeconomic: (Household income, schooling, working outside the home during pregnancy, and family crowding)
II	Reproductive and pregnancy care: (Parity and previous abortions)	
III	Behavior and lifestyle: (Tobacco use before or during pregnancy)	
Outcome	Unplanned pregnancy	

Source: Authors.

Table 1. Distribution of puerperae for some of their characteristics by unplanned pregnancy. Rio Grande-RS, Brazil, 2007-2019.

Characteristics	Survey year						p-tend
	2007 (%)	2010 (%)	2013 (%)	2016 (%)	2019 (%)	2007-19 (%)	
Maternal age							
11 - 19	72.6 (374)	74.2 (327)	75.9 (346)	73.0 (327)	82.6 (247)	+13.8	<0,001
20 - 29	61.5 (816)	63.4 (785)	62.4 (826)	61.1 (808)	68.6 (787)	+11.5	0,163
30 - 47	59.9 (407)	57.9 (391)	56.0 (470)	52.5 (461)	59.0 (486)	-1.5	<0,001
Skin color							
White	60.2 (1059)	62.4 (1022)	59.3 (1025)	58.5 (1042)	64.6 (1121)	+7.3	<0,001
Brown	68.8 (318)	65.8 (320)	67.1 (393)	61.5 (368)	74.2 (256)	+7.8	<0,001
Black	73.1 (220)	70.0 (161)	73.4 (224)	68.9 (186)	75.3 (143)	+3.0	<0,001
Living with partner	58.7 (1224)	59.3 (1162)	58.7 (1318)	55.6 (1231)	63.0 (1218)	+7.3	<0.001
Schooling (years)							
0 - 8	67.7 (833)	71.7 (764)	71.4 (745)	66.6 (647)	78.1 (554)	+15.4	<0,001
9 - 11	60.5 (638)	59.5 (624)	59.0 (691)	63.3 (665)	67.5 (723)	+11.6	<0,001
12+	53.2 (126)	47.5 (115)	51.0 (206)	45.4 (284)	49.6 (243)	-6.8	<0,001
Household monthly income (quartiles)							
1º (worst)	69.7 (428)	72.8 (399)	71.8 (535)	69.8 (467)	78.9 (448)	+13.2	<0,001
2º	63.9 (419)	64.9 (351)	62.4 (339)	65.5 (431)	70.8 (408)	+10.8	<0,001
3º	64.7 (372)	61.7 (322)	61.8 (400)	57.2 (419)	66.8 (356)	+3.2	<0,001
4º (best)	54.0 (329)	53.6 (281)	51.7 (325)	40.9 (174)	49.6 (265)	-8.1	<0,001
Mothers who worked during pregnancy	60,6 (572)	59.0 (595)	58.5 (670)	55.2 (667)	61.2 (591)	+1.0	<0.001
Unemployed partner	61.7 (1275)	61.7 (1240)	61.2 (1436)	56.7 (1187)	63.5 (1162)	+2.9	<0.001
Household residents							
2	47.8 (354)	47.8 (385)	50.2 (455)	47.9 (487)	58.9 (352)	+23.2	<0,001
3	58.3 (398)	62.7 (421)	60.3 (476)	59.1 (481)	61.0 (487)	+4.6	<0,001
4+	76.9 (845)	79.4 (697)	77.0 (711)	76.9 (628)	78.0 (681)	+1.4	<0,001
Parity							
1	58.3 (581)	55.6 (569)	56.1 (694)	55.3 (634)	62.1 (533)	+6.5	<0,001
2	58.0 (505)	63.5 (544)	64.5 (702)	56.2 (532)	62.4 (526)	+7.6	<0,001
3+	78.0 (511)	82.1 (390)	84.0 (246)	77.5 (430)	81.2 (461)	+4.1	<0,001
Previous abortions	58,1 (281)	57.7 (184)	60.1 (236)	56.9 (230)	59.5 (213)	+2.4	<0.001
Tobacco use before or during pregnancy	73.8 (428)	73.9 (362)	74.4 (360)	70.2 (236)	81.7 (228)	+10.7	<0.001
Unplanned pregnancy prevalence	63.3 (1597)	63.8 (1503)	62.7 (1642)	60.3 (1596)	67.0 (1520)	+5.8	<0.001
Total (n)	2,523	2,355	2,619	2,648	2,270	12,415	

Note: Mean prevalence (and 95%CI) from 2007 to 2019: 63.3% (95%CI: 62.5%-64.1%).

Source: Authors.

variables included in this table (age 20-29 years) was not statistically significant (p_{tend}=0.163). The overall prevalence of unplanned pregnancy in the period was 63.3% (95%CI: 62.5%-64.1%).

Table 2 shows that only the "unemployed partner" and "previous abortions" variables lost statistical significance after controlling for confounders among all the variables in the Chart 1. All other variables had an independent effect on the outcome. Thus, puerperae aged 11-19, Black, who lived with a partner, with up to eight schooling years, and belonging to the worst quartile of income showed a higher PR of not having family planning than those aged 30 years or more, White, living with a partner, with 12+ schooling years, and belonging to the best income quartile, respectively. Mothers who did not engage in paid work during pregnancy, had two or more chil-

Table 2. Crude and adjusted analyses for factors associated with unplanned pregnancy in Rio Grande-RS, Brazil, 2007-2019.

Level	Characteristics	Prevalence Ratio (95%CI)	
		Crude	Adjusted
I	Maternal age	<0.001	<0.001**
	11-19	1.32 (1.27-1.37)	1.23 (1.18-1.28)
	20-29	1.11 (1.08-1.15)	1.12 (1.09-1.16)
	30-47	1.00	1.00
	Skin color	<0.001	0.021*
	White	1.00	1.00
	Brown	1.10 (1.06-1.13)	1.02 (0.98-1.05)
	Black	1.18 (1.14-1.23)	1.06 (1.01-1.10)
	Living with partner	<0.001	<0.001*
	Yes	1.00	1.00
	No	1.46 (1.43-1.50)	1.27 (1.23-1.30)
	Schooling (years)	<0.001	0.003**
	0-8	1.45 (1.38-1.52)	1.09 (1.04-1.15)
	9-11	1.27 (1.21-1.34)	1.07 (1.02-1.13)
	12+	1.00	1.00
	Household monthly income (quartiles)	<0.001	<0.001**
	1º (worst)	1.43 (1.37-1.50)	1.25 (1.19-1.31)
	2º	1.30 (1.24-1.36)	1.18 (1.13-1.24)
	3º	1.23 (1.17-1.29)	1.16 (1.11-1.22)
	4º (best)	1.00	1.00
	Performed paid work during pregnancy	<0.001	0.021*
	Yes	1.00	1.00
	No	1.14 (1.10-1.17)	1.04 (1.01-1.07)
	Employed partner	<0.001	0.723*
	Yes	1.00	1.00
	No	1.20 (1.16-1.24)	1.01 (0.97-1.04)
	Household residents	<0.001	<0.001**
	2	1.00	1.00
	3	1.21 (1.16-1.25)	1.23 (1.18-1.28)
	4	1.47 (1.41-1.52)	1.46 (1.40-1.53)
	5+	1.63 (1.57-1.69)	1.57 (1.50-1.63)
II	Parity	<0.001	<0.001
	1	1.00	1.00
	2	1.02 (1.01-1.04)	1.06 (1.05-1.07)
	3+	11.5 (1.13-1.16)	1.16 (1.14-1.18)
	Previous abortions	<0.001	p=0.667*
	Yes	1.10 (1.06-1.44)	0.99 (0.93-1.05)
	No	1.00	1.00
III	Tobacco use before or during pregnancy	<0.001	<0.001*
	Yes	1.00	1.00
	No	1.21 (1.17-1.24)	1.13 (1.08-1.19)
Total		n=12,415	

Note: Adjusted variables in each level: Level I - maternal age, skin color, living with a partner, residents per household, maternal schooling, household income, worked during pregnancy, and employed partner; Level II - maternal age, skin color, living with partner, residents per household, maternal schooling, household income, worked during pregnancy, parity, and previous abortions; Level III - maternal age, skin color, living with a partner, residents per household, maternal schooling, household income, mother worked during pregnancy, parity, and maternal tobacco use before pregnancy. *Wald's test for heterogeneity; **Wald's test for linear trend.

Source: Authors.

dren, and smoked before or during pregnancy showed a higher PR than the others for not planning the pregnancy. Finally, the greater the number of residents in the household, the greater the PR for non-planning with a clear dose-response effect.

Discussion

Practically two out of three Rio Grande women did not plan the pregnancy, and this rate was high at the end of the period, especially among those at greater risk for unfavorable events during pregnancy and childbirth. The adjusted analysis showed that younger puerperae, Black, living without a partner, with more significant household crowding, lower schooling and household income, higher parity, and smokers had the highest PR for not planning the pregnancy.

The mean prevalence of 63.3% of non-planning observed in these surveys is similar to that observed in the baseline of the 1993 Pelotas cohort (62.7%), slightly lower than in 2004 (65.9%), but higher than the 2015 rate (52.2%)[10]. In São Luís, Maranhão, this prevalence reached 68.1% in 2010[24], while it was 53.8% in Ribeirão Preto, São Paulo[25]. In Brazil, a hospital-based study conducted between 2011-12 found a prevalence of non-pregnancy planning of 55.4%[9], while a survey conducted in 2020 in eight university hospitals identified 67.5%[12]. This high level in different locations indicates that this problem requires actions at different levels of public service management. Besides the health sector, education should also be included since most of them are still in high school.

The younger the age, the greater the proportion of parturients who did not plan the pregnancy in Rio Grande. This pattern was also identified in other studies. It can be attributed to a lack of knowledge about effective pregnancy prevention methods, immaturity, difficulty accessing safe contraceptive methods, concern about the side effects of their use, carelessness, or disinterest[9-12,15,24-27].

Black mothers also showed a higher PR for not planning the pregnancy, confirming a similar finding in other studies[9,15,24,28,29]. Besides the factors already mentioned, Black mothers struggle more in accessing health services that are often insufficient and have inadequate quality[28-31]. This situation indicates structural discrimination; it is part of the Brazilian social organization, has multiple determinants, is not recent, and is not easily perceived by clients. However, it will require efforts from civil society and, above all, the Federal Government through policies and programs[28,30,31].

The lower the level of education and the worse the income, the greater the PR for not planning the pregnancy. No single factor has as many benefits to maternal and child health as schooling[26]. By improving schooling, women gain access to essential information to care for their health and their children's, acquire argumentative skills, become better aware of their rights, and start to participate more effectively in social life, including holding positions in the labor market[4,27]. By doing so, they increase household income, improve purchasing power, and their living conditions and their family's. These advances undoubtedly contribute to better planning of their lives, which includes choosing the most appropriate moment to become a mother[27,31], which helps explain the higher PR observed for not planning a pregnancy among those with the lowest socioeconomic status compared to the others.

Not having a partner was a risk factor for unplanned pregnancy. Unstable relationships, even with the same partner, hinder the continued use of contraceptive methods, which increases exposure to pregnancy[5,24]. In Ribeirão Preto, São Paulo, the odds ratio for not planning a pregnancy among women without a partner was 7.56 (95%CI: 5.98-9.56) times higher than the others[25]. In Rio Grande perinatal surveys, the presence of a partner positively affected and had an independent effect on different outcomes[11,15]. This analysis reinforces the importance of a partner, often the biological father, as a protective factor for mother and child health.

The possibility of not planning the pregnancy also increases with a higher number of residents in the household. The dose-response effect was evident, even more so than the values observed for other variables, such as household income and maternal education. In environments with many people, as they are responsible for most household chores, women often neglect their health care[27]. This situation may lead to the irregular use of contraceptive methods, especially when used daily, such as oral contraceptives, which are widely adopted[23]. The incorrect use of contraceptives can result in pregnancy prevention failures, leading to unplanned pregnancies[9,11,24-26].

Smoking was an independent risk factor for not planning pregnancy. The Birth in Brazil Study also identified an odds ratio of 1.23 (95%CI: 1.06-1.43) for not planning a pregnancy among

puerperal smokers[9]. Few studies have shown this association. Considering that it is widely known that smoking is harmful to the health of both the mother and the fetus and even so some women continue to smoke, the lack of family planning may indicate a lack of concern for their health. It would be interesting to evaluate this finding in other studies. In any case, in Rio Grande, tobacco use appeared as an independent determinant of unplanned pregnancy, and this needs to be considered by health teams.

When interpreting these results, we should consider that data were collected over 13 years, during which essential changes occurred in the local economic setting, from full employment driven by the shipbuilding activity of oil platforms to high unemployment rates after shipyards' decommission. These factors certainly impacted the results presented, at least until 2013. However, these changes do not change the direction or eliminate the results found. It is essential to highlight that this work has the shortest interval between data collection ever carried out in Brazil. It included all puerperae in a medium-sized municipality with a response rate of at least 96% in the five surveys, a rare finding in Brazil.

This study showed a high prevalence of unplanned pregnancies, especially among those at greater risk of adverse events during pregnancy and childbirth. We observed an evident overload among the most vulnerable, further increasing this group's morbimortality risk. It would be appropriate to reach these women through sensitization campaigns and the availability of safe, reversible contraceptive methods, with adequate guidance from public health services to prevent unplanned pregnancies, which would bring countless benefits to mother and child health in Rio Grande.

Collaborations

CF Lelis was responsible for the preparation of variables, data analysis, and preliminary and final writing of the article. SOM Prietsch assisted with data analysis and the final draft of the article. JA Cesar outlined the study, obtained funding for its implementation, coordinated data collection and assisted with data analysis and the final draft of the article. All the authors approved the final version submitted to RC&SC.

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