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THEMATIC ARTICLE

Pregnancy in girls under 14 years old: Spatial analysis in Brazil, 2011-2021

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Abstract *The objective was to analyze the spatial distribution of pregnancy in children under 14 years and six months by Brazilian region and municipality and sociodemographic and health characteristics of pregnant women and live births. Ecological study analyzing the Live Birth Information System (SINASC) from 2011 to 2021 in three age groups (< 14 years and six months, 15-19 years, and 20 years and above) by demographic and birth variables. We applied the Global and Local Moran. A total of 127,022 live births to girls aged 10-14 years were identified during the period, most of whom were Black, 21.1% in common-law or married relationships, with a lower proportion of seven prenatal care appointments and enrollment in the first trimester, a higher proportion of low birth weight and low Apgar score, residing in the North and Northeast. The mean live birth rate for 10-to-14-year-old girls was significantly autocorrelated with space, especially in municipalities of the Midwest and North. Pregnancy from 10 to 14 years of age reveals several vulnerabilities suffered by these girls due to pregnancy at an early age, which is more common among Black women, with implications for morbimortality for them and their children and the presumed violence in these cases, including denied access to legal abortion.*

Key words *Live birth, Rape, Health information systems, Pregnancy in adolescence*

Introduction

Pregnancy in girls aged 10-14 has been raising significant concern in public health due to the risks to the pregnant woman, such as higher maternal mortality, and to the infants, who have increased chances of prematurity, low birth weight, and higher perinatal mortality[1-5]. Moreover, pregnancy in this age group can have social and economic consequences, limiting girls' access to education and deepening income inequality[1,3]. Studies have linked the event to the low economic development of countries, the prevalence of child marriage, low access to modern contraceptive methods, sexual and reproductive education[1], social and gender norms, and the high prevalence of sexual violence.

Although it occurs mainly in countries in sub-Saharan Africa, Latin America, and the Caribbean[1], its global importance was consolidated with the inclusion of indicators to monitor the number of live births among adolescents aged 10-14 and 15-19, within the scope of the 2030 Agenda[6]. Brazil witnessed a decline in the fertility rate of adolescents aged 15-19 between 2000 and 2015, calculated by dividing the number of live births of adolescents in this age group by the population of female residents in the same age group[7,8]. However, the fertility rate of girls aged 10-14 remained stable between 2000 and 2012, ranging from 3.38 per 1,000 to 3.29 per thousand[8]. Furthermore, there is evidence of rate heterogeneity between Brazilian regions and states, closely related to social, racial, and gender inequalities[8].

To offer greater protection to children and adolescents, the Brazilian State has established rules regarding marriage and the onset of sexual activity. The Civil Code provides a minimum age of 16 years for marriage, and authorization from parents or legal guardians is required between 16 and 18 years of age. Additionally, Law No. 12,015/2009, which amended the Penal Code, considered consent for sexual intercourse invalid in individuals under the age of 14 and defined rape of a vulnerable person as "Having carnal intercourse or practicing another lewd act with a person under 14", regardless of the age of the partner or the relationship established between them[9].

Data on violence show an alarming setting of rights violations of girls and women since they are the biggest victims of sexual violence and face the risk of unwanted pregnancy and sexually transmitted diseases. In 2022, 74,930 victims of rape were identified by public security in Brazil, 88.7% of whom were female[10]. Out of this total, 56,820 cases (75.8%) were categorized as rape of vulnerable people, with 71.6% of these occurring in the victims' residences and 64.4% perpetrated by family members[10].

However, studies indicate that sexual initiation can occur in early adolescence (10 to 14 years of age) and is not considered an absolute problem but rather a warning of possible vulnerabilities arising from and before the practice. A cross-sectional study of schoolchildren in Rio de Janeiro showed that sexual initiation during this phase of life occurred in 25.7% of boys and 12.2% of girls[4], while a cohort study in Pelotas estimated values of 20.9% for boys and 16.4% for girls[11].

Pregnancy in girls aged 10-14 is a complex issue and must involve discussion on sexuality, rights, inequalities, violence, and access to health and education. To this end, updated data on the occurrence of the event can contribute to addressing the problem considering the advances and setbacks in the political and institutional context of the State.

Therefore, this study aimed to analyze the spatial distribution of pregnancy in children under 14 years and six months by Brazilian region and municipality from 2011 to 2021 and the sociodemographic and health characteristics of parturients and live births during pregnancy, delivery, and birth.

Methods

This ecological, descriptive study used secondary data from the Brazilian Live Birth Information System (SINASC) from 2011 to 2021. This database was obtained from the Ministry of Health through a case deduplication assessment. This process identified girls and women with one or more live births in the period through the variables "mother's name" and "mother's date of birth". Therefore, this database included Live Birth Certificates with valid maternal and child birth dates, containing only the month and year.

The live births' characteristics were described according to three age groups of parturients (age on delivery): i. 10 to 14 years and six months; ii. 14 years and seven months to 19 years and 11 months; iii. 20 years and above. In the first group, we considered that the girls became pregnant before they were 14; that is, there is presumed sexual violence by the legal definition. The second group consisted of women up to 19 on delivery,

i.e., still adolescents, according to the United Nations definition[1]. Finally, in the third group, women were considered adults because they gave birth when they were 20 and above. The ages of girls and women were calculated using the variables "mother's date of birth" and live birth's "birth date". Females under 120 months (10 years old) were removed, keeping those aged 10 years and older but younger than 791 months (65 years and 11 months).

The following variables were used to characterize the girls and women: race/skin color (white, brown, black, yellow, indigenous); schooling (none, 1-3, 4-7, and 8 years and above); marital status (married, separated/divorced, single, common-law marriage, widow); Brazilian region (Midwest, Northeast, North, Southeast, and South); number of previous pregnancies (none, 1 and above); and number of live births (none, 1 and above). The following were investigated to describe the pregnancy: pregnancy type (single, twin, triplet, and above); delivery type (vaginal, cesarean); number of prenatal care visits (none, 1-3, 4-6, 7 and above); length of gestation (<37, 37 to 41, >41 weeks); and month in which prenatal care started (up to 3, 4-6, seven months and above). Live births were characterized per birth weight (≤2,500 and >2,500 g) and Apgar score at 5 minutes (0-3, 4-7, and 8-10).

The following proportion was calculated to compare live births resulting from pregnancies in children under 14 years and six months old in the Brazilian regions and federative units: number of live births to mothers aged 14 years and six months divided by the total number of live births, per year. The results were presented in a percentage. The percentage variation of this event from 2011 to 2021 was also calculated for the federative units (UF).

Within municipalities, the mean rate of live births was calculated in the age group of mothers aged 14 years and six months or less in the period, and 2016 was chosen as a reference due to its proximity to the population mean in the period evaluated, using the following formula:

[Mean number of life births in girls aged up to 14 years and six months from 2011 to 2021 ÷ population of girls aged 10 to 14 years residing in the municipality in the middle year of the period (2016)]*1,000.

This rate aimed to identify clusters of municipalities by situation of the neighborhood, classifying them into four statuses: a) municipality with a low rate of life births in girls aged up to 14 years and six months, neighboring a municipality with a low rate; b) municipality with a low rate, neighboring a municipality with a high rate; c) municipality with a high rate, neighboring a municipality with a low rate; d) municipality with a high rate, neighboring a municipality with a high rate. The municipalities with no event were excluded from the neighborhood matrix.

The Global Moran Index was applied for this classification. It assesses the spatial interdependence relationship between all polygons that make up the geographic area of Brazil and can express a single value for the entire country. Then, the Local Indicator of Spatial Autocorrelation (LISA) was used to detect clusters between Brazilian municipalities in high-high, low-low, and high-low and low-high outliers[12]. The analyses were developed in R Studio, using "dply", "ggplot2", "geobr" and "rgeoda" packages.

This study was developed under the "Global Burden of Violence Against Girls and Women" project, approved by the Federal University of Minas Gerais Research Ethics Committee and the National Research Ethics Commission under CAAE: 58431622.4.0000.5149.

Results

SINASC identified 30,086,780 live births in Brazil from 2011 to 2021. Of this total, 127,022 (0.4%) were live births to girls aged 10 to 14 years and six months; 4,863,105 (16.2%) to adolescents aged 14 years and seven months to 19 years and 11 months; and 25,096,653 (83.4%) to women aged 20 years and above (Table 1).

In all age groups, the majority of births occurred among brown and black women, with the highest proportion in the group aged 10 to 14 years and six months (73.6%) (Table 1). Among girls aged 10 to 14 years and six months, 6.3% had no education or up to three years of schooling; among adolescents aged 14 years and seven months to 19 years and 11 months, this value reached 2.4% and was 3.4% among adults aged 20 years and above. Regarding marital status, 21.1% of girls aged 10 to 14 years and six months were married or in common-law marriage. Among adolescents aged 14 years and seven months to 19 years and 11 months, this percentage was 34.9%, and the rate was 58.5% among women aged 20 years and above.

Table 1 also shows that the highest proportion of region of residence among girls aged 10 to 14 years and six months was the Northeast (39.8%). Among women aged 20 years and

Table 1. Characteristics of parturients by age group and live births. sociodemographic variables. type of pregnancy. prenatal care. length of gestation. and birth weight. SINASC. 2011-2021.

Characteristics	10 to 14 years and 06 months N=127,022		14 years and 07 months to 19 years and 11 months N=4,863,105		20 years and above N=25,096,653	
	N	%	N	%	N	%
Parturient's characteristics						
Race/Skin color						
White	23,287	18.3	1,200,154	24.7	9,192,096	36.6
Brown	87,379	68.8	3,160,945	65.0	13,279,834	52.9
Black	6,153	4.8	260,035	5.3	1,446,933	5.8
Yellow	292	0.2	14,871	0.3	106,918	0.4
Indigenous	5,611	4.4	66,833	1.4	181,945	0.7
Unknown	4,300	3.4	160,267	3.3	888,927	3.5
Schooling						
None	1,258	1.0	15,830	0.3	152,635	0.6
1-3 years	6,681	5.3	104,129	2.1	698,326	2.8
4-7 years	84,178	66.3	1,426,444	29.3	3,775,305	15.0
8 years and above	32,529	25.6	3,234,996	66.5	20,111,280	80.1
Unknown	2,376	1.9	81,706	1.7	359,107	1.4
Marital status						
Single	97,862	77.0	3,096,563	63.7	9,757,474	38.9
Married	1,437	1.1	382,995	7.9	9,360,962	37.3
Common Law Marriage	25,317	19.9	1,315,959	27.1	5,309,426	21.2
Separated/divorced	54	0.0	5,564	0.1	349,689	1.4
Widow	26	0.0	2,412	0.0	51,231	0.2
Unknown	2,326	1.8	59,612	1.2	267,871	1.1
Brazilian Region*						
Midwest	10,080	7.9	395,055	8.1	2,128,707	8.5
Northeast	50,568	39.8	1,666,156	34.3	7,003,463	27.9
North	26,339	20.7	754,306	15.5	2,500,881	10.0
Southeast	29,686	23.4	1,515,402	31.2	9,999,020	39.9
South	10,276	8.1	529,530	10.9	3,452,260	13.8
Previous pregnancies						
None	106,226	83.6	3,259,725	67.0	7,461,543	29.7
1 and above	6,430	5.1	1,211,831	24.9	16,824,722	67.0
Unknown	14,366	11.3	391,549	8.1	810,388	3.2
Live births						
None	106,875	84.1	3,442,428	70.8	8,559,083	34.1
1 and above	5,482	4.3	1,004,384	20.7	15,589,429	62.1
Unknown	14,665	11.5	416,293	8.6	948,141	3.8
Characteristics of pregnancy and birth						
Pregnancy type						
Single	125,572	98.9	4,800,317	98.7	24,490,378	97.6
Twin	1,186	0.9	55,117	1.1	560,636	2.2
Triplet and above	23	0.0	556	0.0	14,517	0.1
Unknown	241	0.2	7,115	0.1	31,122	0.1
Delivery type						
Cesarean section	48,796	38.4	1,924,626	39.6	14,873,828	59.3
Vaginal	78,022	61.4	2,931,457	60.3	10,193,592	40.6
Unknown	204	0.2	7,022	0.1	29,233	0.1

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Table 1. Characteristics of parturients by age group and live births, sociodemographic variables, type of pregnancy, prenatal care, length of gestation, and birth weight. SINASC, 2011-2021.

Characteristics	10 to 14 years and 06 months N=127,022		14 years and 07 months to 19 years and 11 months N=4,863,105		20 years and above N=25,096,653	
	N	%	N	%	N	%
Number of prenatal care appointments						
None	4,737	3.7	126,372	2.6	528,167	2.1
1-3	18,246	14.4	489,340	10.1	1,407,157	5.6
4-6	46,287	36.4	1,557,508	32.0	5,496,392	21.9
7 and above	56,669	44.6	2,656,841	54.6	17,502,661	69.7
Unknown	1,083	0.9	33,044	0.7	162,276	0.6
Gestation time						
Premature <37 weeks	23,993	18.9	620,973	12.8	2,747,327	10.9
Term 37<41 weeks	92,423	72.8	3,900,458	80.2	21,076,226	84.0
Post-term >41 weeks	4,739	3.7	188,685	3.9	688,089	2.7
Unknown	5,867	4.6	152,989	3.1	585,011	2.3
Start of prenatal care						
Up to 3 months	68,674	54.1	3,170,562	65.2	19,384,101	77.2
4-6 months	40,130	31.6	1,175,448	24.2	3,689,588	14.7
7 months and above	6,140	4.8	169,773	3.5	592,868	2.4
Unknown	12,078	9.5	347,322	7.1	1,430,096	5.7
Live birth characteristics						
Birth weight (grams)						
≤ 2,500	18,467	14.5	478,684	9.8	2,146,724	8.6
> 2,500	108,446	85.4	4,381,902	90.1	22,939,048	91.4
Unknown	109	0.1	2,519	0.1	10,881	0.0
Apgar 5th minute						
0-3	893	0.7	20,124	0.4	85,036	0.3
4-7	4,101	3.2	110,222	2.3	451,230	1.8
8-10	116,807	92.0	4,582,469	94.2	24,019,118	95.7
Unknown	5,221	4.1	150,290	3.1	541,269	2.2

Note: N = Absolute number; % = percentage of relative frequency. *To the Brazilian Region. the totals are 126.949 to the age group of 10 to 14 years and 06 months; 4.860.449 to the age group of 14 years and 07 months to 19 years and 11 months; and 25.084.331 to the age group of 20 years old or more.

Source: Authors.

above, the Southeast was the highest proportion by region of residence (39.9%). In the group up to 14 years and six months, 5.1% of the infants were not from the first pregnancy, 4.3% were not the first live birth, and 0.9% were a twin or triple pregnancy.

Regarding access to health services, 54.1% of girls aged 10 to 14 years and six months started prenatal care in the first trimester; 44.6% had 7 or more prenatal care appointments; and 38.4%, the delivery type was cesarean section. Among adolescents aged 14 years and seven months to 19 years and 11 months, 65.2% started prenatal care in the first trimester; 54.6% had 7 or more prenatal care appointments; and 39.6% delivered by cesarean section. Among women aged 20 years and above, 77.2% started prenatal care in the first trimester; 69.7% had 7 or more prenatal care appointments; and 59.3% of children were born by cesarean section.

Infants of girls aged 10 to 14 years and six months had the highest percentage of premature birth (18.9%), low birth weight (14.5%), and the lowest Apgar scores at 5 minutes (3.9% with a

score of 0-7) comparing with infants of girls in other age groups (Table 1). The proportion of live births resulting from pregnancies of girls aged 10 to 14 years and six months, calculated among the total number of live births, was higher in the North and Northeast throughout the period, reaching 0.70% and 0.48%, respectively, in 2021 (Figure 1). The Midwest showed a very similar pattern to that of Brazil. The South and Southeast had similar patterns and the lowest proportions in the period.

Among the ten UFs with the highest proportions of live births to girls aged 10 to 14 years and six months in 2021, six are in the North (Acre, Amazonas, Roraima, Pará, Amapá, and Tocantins), four in the Northeast (Maranhão, Alagoas, Bahia, and Sergipe) (Table 2). Comparing 2011 and 2021 showed that all states had a negative percentage variation (Table 2).

During the assessed period, a total of 533 municipalities were identified with no live births from girls aged 10 to 14 years and 6 months. Regarding the average rate of this event in the municipalities, the lowest value was 0.12/1000, the first quartile was 0.91/1000, the median was 1.48/1000, and the third quartile was 2.30/1000. The ten highest average rates in the period were found in the following North and Midwest municipalities: Jacareacanga/Pará (25.44/1000); Uiramuta/Roraima (20.79/1000); Nova Nazaré/Mato Grosso (20.491000); Itacajá/Tocantins (17.50/1000); Normandia/Roraima (15.44/1000); Assis Brasil/Acre (14.93/1000); General Carneiro/Mato Grosso (14.69/1000); Alto Alegre/Roraima (14.62/1000); Tocantínia/Tocantins (13.05/1000); e Japurá/Amazonas (12.93/1000). In general, spatial distribution analyses showed the North, Midwest, and Northeast regions with the highest number of municipalities with high rates of live births (≥2.31/1000) in the age group of girls from 10 to 14 years and six months (Figure 2).

The Global Moran Index was 0.47, which denotes that the municipalities have similar patterns as their neighborhood regarding the assessed rate, i.e., there is a positive spatial autocorrelation. The Moran index showed that 1,503 municipalities were significantly autocorrelated in assessing the mean birth rate of live births of these girls (Figure 3).

The dark red areas represent clusters in which municipalities with high rates are neighbors of municipalities with high rates. Noteworthy is the concentration of municipalities in the North, Midwest, and Northeast regions.

The dark blue areas represent clusters in which municipalities with low rates are neighbors of municipalities with low rates. Noteworthy is the concentration of municipalities in the Southeast and South regions.

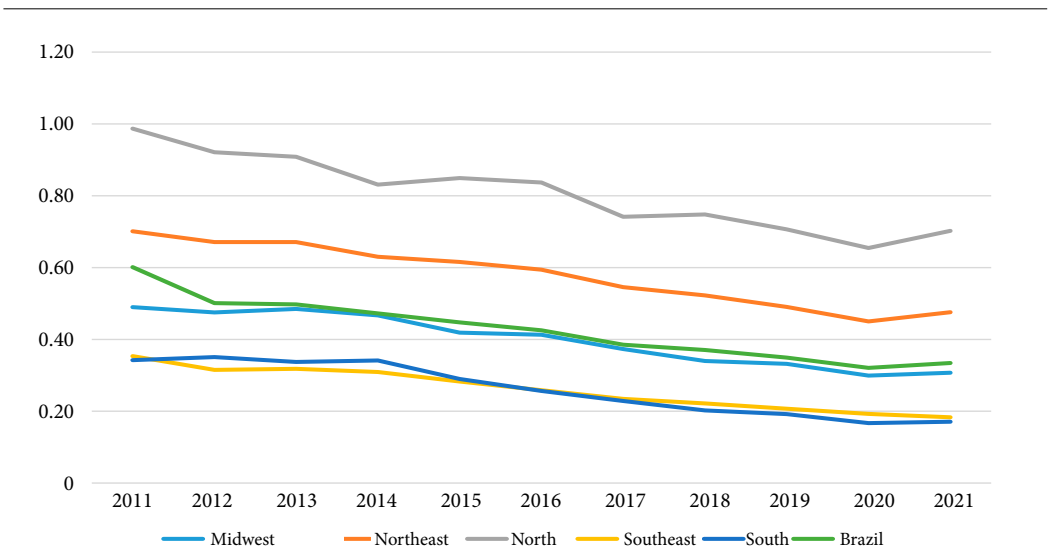

Figure 1. The proportion of live births of girls aged 10 to 14 years and six months, among the total number of live births, by region. SINASC, 2011-2021.

Source: Authors.

Table 2. The proportion of live births to girls aged 10 to 14 years and six months, in the federative units and Brazil, percentage variation and difference between 2011 and 2021, SINASC.

Federative Unit	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Percentage variation (2021-2011)	Difference 2021-2011
Rondônia	0.58	0.56	0.47	0.52	0.39	0.47	0.41	0.41	0.32	0.34	0.36	-61.17	-0.22
Acre	1.11	1.01	0.87	0.95	0.94	1.20	0.96	0.94	0.70	0.69	0.88	-25.98	-0.23
Amazonas	1.05	1.05	1.07	0.90	1.00	0.94	0.89	0.91	0.89	0.73	0.84	-24.75	-0.21
Roraima	0.96	1.19	1.24	1.04	1.17	1.10	0.91	1.02	0.75	0.76	0.80	-20.69	-0.17
Pará	1.06	0.91	0.91	0.85	0.85	0.84	0.70	0.71	0.71	0.66	0.70	-51.44	-0.36
Amapá	0.87	0.80	0.93	0.82	0.84	0.68	0.75	0.63	0.56	0.71	0.56	-55.17	-0.31
Tocantins	0.83	0.82	0.73	0.67	0.70	0.63	0.60	0.64	0.58	0.58	0.54	-54.45	-0.29
Maranhão	0.96	0.87	0.85	0.81	0.77	0.78	0.73	0.67	0.68	0.64	0.71	-34.53	-0.25
Piauí	0.66	0.61	0.64	0.59	0.63	0.64	0.62	0.51	0.49	0.53	0.45	-45.50	-0.20
Ceará	0.61	0.59	0.59	0.58	0.56	0.55	0.48	0.43	0.43	0.39	0.40	-50.51	-0.20
Rio Grande do Norte	0.70	0.62	0.63	0.51	0.64	0.55	0.45	0.49	0.42	0.38	0.41	-69.81	-0.29
Paraíba	0.56	0.55	0.51	0.51	0.56	0.50	0.48	0.43	0.44	0.37	0.37	-51.05	-0.19
Pernambuco	0.64	0.60	0.61	0.58	0.51	0.48	0.47	0.47	0.40	0.38	0.40	-57.52	-0.23
Alagoas	0.94	0.99	0.99	0.86	0.79	0.84	0.76	0.67	0.66	0.58	0.58	-61.46	-0.36
Sergipe	0.65	0.62	0.68	0.65	0.61	0.58	0.50	0.55	0.51	0.49	0.46	-40.04	-0.18
Bahia	0.67	0.64	0.64	0.61	0.60	0.56	0.52	0.53	0.48	0.41	0.46	-43.86	-0.20
Minas Gerais	0.35	0.32	0.31	0.28	0.28	0.26	0.25	0.21	0.22	0.19	0.18	-95.39	-0.17
Espírito Santo	0.37	0.34	0.45	0.41	0.39	0.40	0.32	0.29	0.26	0.30	0.28	-35.35	-0.10
Rio de Janeiro	0.44	0.42	0.42	0.42	0.39	0.36	0.32	0.31	0.30	0.28	0.25	-74.25	-0.19
São Paulo	0.27	0.27	0.27	0.27	0.24	0.21	0.19	0.18	0.16	0.15	0.15	-77.91	-0.12
Paraná*	0.00	0.42	0.41	0.39	0.35	0.28	0.28	0.23	0.23	0.19	0.20	-112.94	0.20
Santa Catarina	0.33	0.28	0.26	0.29	0.21	0.22	0.17	0.16	0.14	0.13	0.13	-161.96	-0.21
Rio Grande do Sul	0.35	0.31	0.31	0.32	0.28	0.26	0.21	0.21	0.18	0.16	0.17	-99.92	-0.17
Mato Grosso do Sul	0.73	0.66	0.64	0.68	0.58	0.58	0.58	0.47	0.47	0.46	0.40	-79.62	-0.32
Mato Grosso	0.57	0.60	0.65	0.63	0.51	0.52	0.48	0.44	0.44	0.39	0.45	-26.12	-0.12
Goiás	0.48	0.43	0.43	0.40	0.40	0.37	0.31	0.29	0.28	0.23	0.25	-94.06	-0.23
Distrito Federal	0.31	0.26	0.25	0.22	0.19	0.21	0.16	0.20	0.17	0.17	0.12	-159.86	-0.19
Brazil	0.60	0.50	0.50	0.47	0.45	0.43	0.39	0.37	0.35	0.32	0.33	-79.79	-0.27

Note: *The percentage variation of Paraná was calculated comparing 2021 and 2012.

Source: Authors.

Discussion

We identified 127,022 live births in girls aged 10 to 14 years and six months from 2011 to 2021, representing, on average, more than 31 daily births in the evaluated period. This group mainly had black and brown girls, more than a fifth part reported being in common-law marriage or married, and 5.1% of live births were not from the first pregnancy. Compared with women aged 20 years and above, women aged 10 to 14 years and six months had a lower proportion of prenatal care start in the first trimester, a lower proportion of attendance at the recommended seven prenatal care appointments, and their infants had a higher proportion of low birth weight and low Apgar scores, which highlights the vulnerabilities of pregnancy in this age group and the impact on their live-born infants.

The proportion of live births resulting from pregnancies of girls aged 10 to 14 years and six months was higher in the North and Northeast. The distribution of the mean rate of live births of girls aged 10 to 14 years and six months was significantly autocorrelated with space, allowing the identification of clusters of municipalities with high rates neighboring other municipalities with high rates, especially in the North, Midwest, and some federative units of the Northeast region.

The high percentage of girls up to 14 years and six months old who were in a common-law marriage or married was striking. Similar results

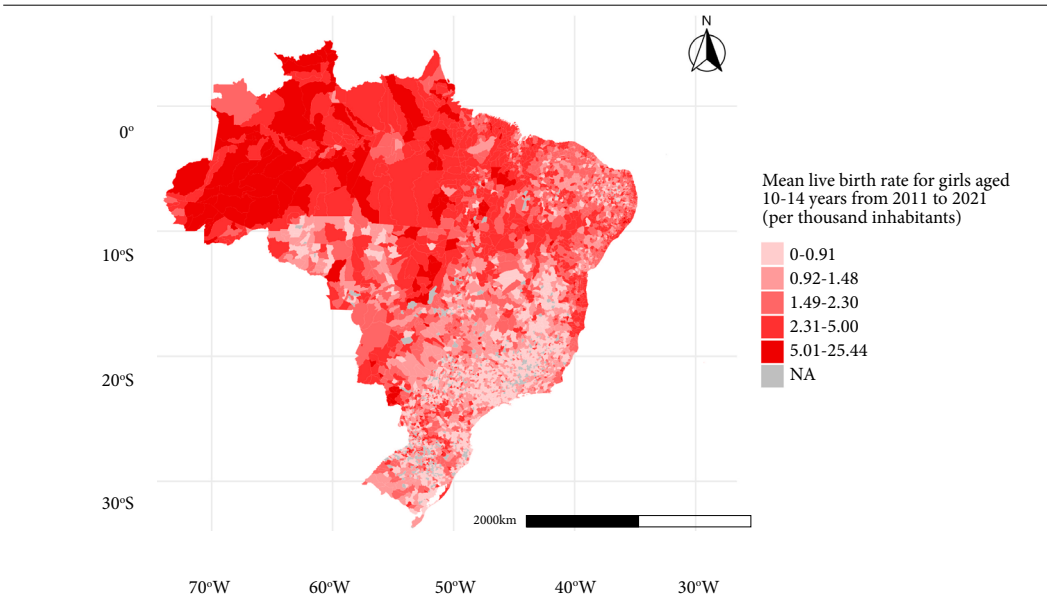

Figure 2. Mean live birth rate for girls aged 10 to 14 years and six months. SINASC, 2011-2021.

Note: NA = Not applicable. It occurred in municipalities without the event of interest in the period evaluated.

Source: Authors.

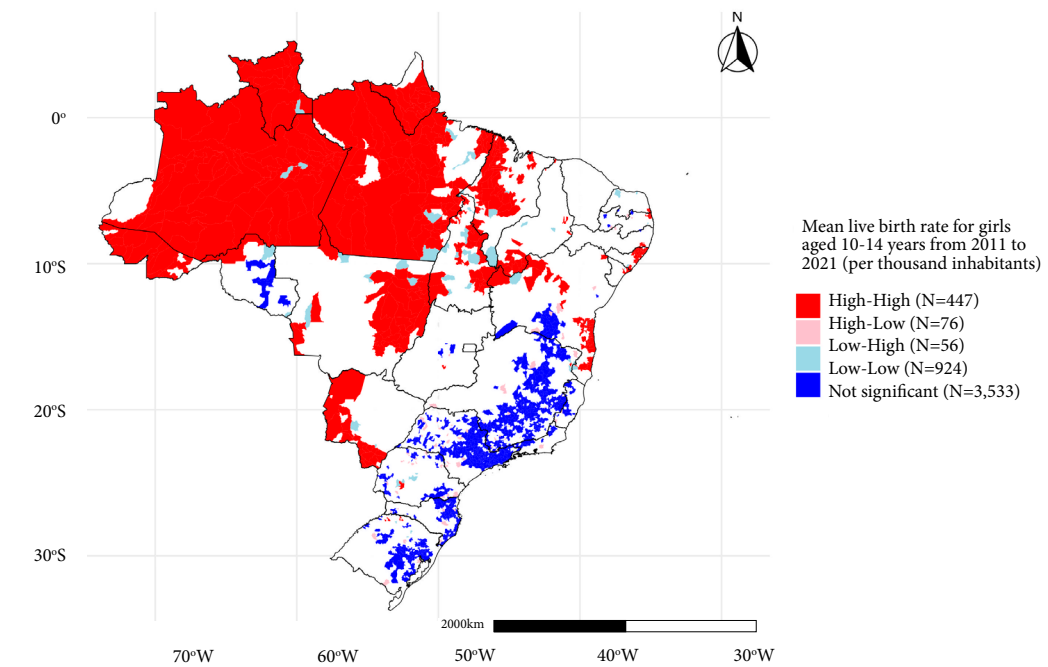

Figure 3. Clusters according to the spatial autocorrelation of the neighborhood regarding the mean birth rate of children of girls aged 10 to 14 years and six months. SINASC, 2011-2021.

Note: The municipalities with no event were excluded from the neighborhood matrix.

Source: Authors.

were also observed in Maceió, where more than 20% of girls under 14 with live births were married or in common-law marriage from 2009 to 2017[13]. Child marriage, defined as a formal or informal union with individuals under the age of 18, is considered a violation of human rights and is associated with low educational levels, pregnancy in early ages, intimate partner violence, maternal and child mortality, sexually transmitted infections, and intergenerational poverty[14,15].

A study using data from the 2013 National Health Survey showed a prevalence of 3.9% of child marriage among individuals under 18 in Brazil, with a higher prevalence among females with brown skin color, without educational ties, and residing in the Brazilian North[15]. In the country, until 2019, guardians could authorize marriages with minors under 16 through a particular court order in the case of pregnancy or to avoid the imposition of a criminal penalty[15], which revealed the contradictions of the State in addressing the presumed violence against girls and adolescents. On the one hand, sexual activity with girls under 14 has been considered rape of a vulnerable person since 2009. On the other hand, the State was conniving in pregnancy, absolving possible cases of rape through marriage.

Pregnancy and marriage or common-law marriage are not expected events during early adolescence and can lead to school dropout, generate biopsychosocial repercussions[16,17], and change life courses, especially for girls[18,19]. However, pregnancy in adolescence, especially among lower social classes, has been identified as a social phenomenon in which young women seek recognition, the realization of a life project, and even the affirmation of their female identity[4,5].

Approximately 6.3% of pregnant women aged 10 to 14 years and six months had no schooling or had only three years of schooling, which is incompatible even with the younger age of this group. Education is a known protective factor against child marriage and early pregnancy[2,14]. Furthermore, sexual education can provide adolescents with the tools and information they need to exercise their sexuality responsibly and recognize abuse situations.

The start of prenatal care is an important indicator related to access to health services and pregnancy awareness. Notably, 31.6% of girls aged 10 to 14 years and six months started prenatal care between four and six months (16 to 24 gestation weeks) and 4.8% over seven months (28 gestation weeks). This fact may be closely related to situations of sexual violence, as in most cases the perpetrator is usually someone close to the girl, such as fathers, stepfathers, older brothers, or uncles, who hinder the girls' access to health services in an attempt to delay the disclosure of the sexual abuse. This situation may lead to the search for legal termination of pregnancy at a more advanced gestational age, either due to the later perception of pregnancy or due to less social or family support in cases of domestic violence[20].

In Brazil, legal termination of pregnancy is permitted in cases of pregnancy resulting from rape, and the Penal Code does not impose any restrictions on gestational age or fetal weight[21]. However, access to this right is unequal and mediated by several factors. A survey conducted in 2019, using data from the National Registry of Health Establishments, identified that only 290 establishments offered legal abortion services, distributed across only 3.6% (N=200) of Brazilian municipalities, and approximately one-third of these services did not perform any procedures in the year[22]. Besides the geographical barrier, the study highlighted several hurdles to accessing legal abortion services, such as lack of knowledge of the services and legislation, fear of criminalization, shame due to the stigma of the procedure, organizational barriers, such as the requirement for a police report, a report from the Forensic Medical Institute (IML) or court order, refusal by health professionals to perform the procedure, and refusals due to suspicion of the statements of those seeking care[22].

Furthermore, Brazilian conservative movements have been working to limit women's rights, especially in reproductive and sexual health. Bill No. 1,904 of 2024 imposes a homicide penalty on abortions after 22 gestation weeks, which can be punished with up to 20 years in prison. This particularly penalizes girls aged 10 to 14, who are already vulnerable due to the double burden of sexual violence and unwanted pregnancy, besides difficulties in accessing services and exercising their rights. The World Health Organization considers that imposing a limit related to gestational age for abortion has adverse consequences for girls and women, increasing the risks to their health and generating social injustice[23].

Other relevant findings expose social and racial inequalities in Brazil, where the younger a person is, the higher the frequency of births among brown and black girls. Structural racism, patriarchal culture, income inequalities, and the higher prevalence of sexual violence contribute to the greater vulnerability of black and brown girls and women[24-26].

Additionally, the results of this study showed significant regional and municipal inequalities regarding live birth rates for girls aged 10 to 14 years and six months. The North and Midwest concentrate a large proportion of municipalities with high rates, which may be related to local gender norms and patterns, a greater presence of Indigenous populations, and very significant social inequalities. However, municipalities with high rates are found in all states, which poses a challenge to addressing the problem in the country. We should consider that teenage pregnancy can be a real plan in some social contexts, whether to obtain recognition and reaffirmation through motherhood, for the idea of building a family due to emotional deprivation, limited prospects for a life project[5], or even for ethnocultural reasons, as in the case of Indigenous women.

Regardless of whether or not it is the result of rape, pregnancy in girls aged 10 to 14 is a situation of vulnerability for the physical, psychological, and socioeconomic health of pregnant women and their children. Therefore, public health and education policies must promote access to information and means to exercise responsible and safe sexuality[27], guarantee the rights of girls and women, and act effectively in the prevention of violence.

Some of the main study's limitations were selecting the Live Birth Certificates with valid mother's and child's date of birth to allow the calculation of the age of girls and women at birth. However, this decision implied a loss of cases compared to the SINASC database available for public access. The authors opted not to use the SINASC variable "mother's age" due to the high percentage of disagreement regarding the calculation mentioned above and because it did not allow for identifying the months of life with greater precision to make the selection required for the study design.

Conclusion

SINASC data from 2011 to 2021 reveal the troubling situation of pregnancy in girls under 14 years of age in Brazil, which, within the bounds of the law, involves sexual violence. More than 127 thousand cases were recorded in eleven years, concentrated in black and brown girls in the North and Midwest regions, and with worse outcomes regarding access to prenatal care and live births. These findings reveal several vulnerabilities suffered by these girls, whether due to pregnancy at an early age, with high morbimortality implications for them and their infants, or due to the presumed violence in these cases. Public health and education policies must promote access to information, means, and comprehensive care to guarantee rights, prevent violence against girls and women, and facilitate access to legal abortion in applicable cases.

Collaborations

IV Pinto participated in the study conception, planning, design, interpretation of statistical analyses and results, drafting the first version, and critically reviewing the article. DC Malta participated in the study conception, planning, design, and interpretation of statistical analyses and results, supervised the work, and critically reviewed the article. JB Souza and RTI Bernal, participated in the statistical analyses, drafting of the results, and critically reviewed the article. GN Andrade, LF Araujo, MS Felisbino-Mendes, MFM Souza, MMS Montenegro and NM Vasconcelos participated in the analyses and interpretation of results and critically reviewed the article. All authors approved the final version of the article.

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References

1. United Nations (UN). Department of Economic and Social Affairs, Population Division. *Fertility among very young adolescents aged 10-14 years* [Internet]. 2020 [cited 2024 jun 15]. Available from: www.unpopulation.org.
2. World Health Assembly. *Early Marriages, Adolescent and Young Pregnancies: Report by the Secretariat* [Internet]. WHO; 2012 [cited 2024 jun 15]. Available from: https://iris.who.int/handle/10665/78901.
3. World Health Organization (WHO). *WHO guidelines on preventing early pregnancy and poor reproductive health outcomes among adolescents in developing countries* [Internet]. 2011 [cited 2024 jun 18]. Available from: https://iris.who.int/handle/10665/44691.
4. Costa SFD, Moraes CLD, Taquette SR, Marques ES. Vulnerabilidades sociais e iniciação sexual entre 10 e 14 anos em estudantes do município do Rio de Janeiro, Brasil. *Cien Saude Colet* 2022; 27(7):2763-2776.
5. Dias ACG, Teixeira MAP. Gravidez na adolescência: um olhar sobre um fenômeno complexo. *Paid Ribeirão Preto* 2010; 20(45):123-131.
6. Cruz DKA, Nóbrega AAD, Montenegro MDMS, Pereira VODM. Os Objetivos de Desenvolvimento Sustentável e as fontes de dados para o monitoramento das metas no Brasil. *Epidemiol Serv Saude* 2022; 31(n. esp. 1):e20211047.
7. Bicalho MLC, Araújo FG, Andrade GND, Martins EF, Felisbino-Mendes MS. Trends in fertility rates, proportion of antenatal consultations and caesarean sections among Brazilian adolescents. *Rev Bras Enferm* 2021; 74(Supl. 4):e20200884.
8. Borges ALV, Chofakian CBDN, Sato APS, Fujimori E, Duarte LS, Gomes MN. Fertility rates among very young adolescent women: temporal and spatial trends in Brazil. *BMC Pregnancy Childbirth* 2016; 16(1):57.
9. Freitas JW. Estupro de vulnerável: o ideal, o real e o pragmatismo jurídico. *Cad Jurídicos (São Paulo)* 2016; 17:53-67.
10. Anuário Brasileiro de Segurança Pública [Internet]. 2023 [cited 2024 jun 10]. Available from: https://publicacoes.forumseguranca.org.br/handle/fbsp/57.
11. Gonçalves H, Machado EC, Soares ALG, Camargo-Figuera FA, Seerig LM, Mesenburg MA, Guttier MC, Barcelos RS, Buffarini R, Assunção MCF, Hallal PC, Menezes AMB. Início da vida sexual entre adolescentes (10 a 14 anos) e comportamentos em saúde. *Rev Bras Epidemiol* 2015; 18(1):25-41.
12. Anselin L, Syabri I, Kho Y. GeoDa: An Introduction to Spatial Data Analysis. *Geogr Anal* 2006; 38(1):5-22.
13. Silva AJCD, Trindade RFCD, Oliveira LLFD. Presumption of sexual abuse in children and adolescents: vulnerability of pregnancy before 14 years. *Rev Bras Enferm* 2020; 73(Supl. 4):e20190143.
14. United Nations Children's Fund (Unicef). *Towards Ending Child Marriage: Global trends and profiles of progress* [Internet]. 2021 [cited 2024 jun 10]. Available from: https://data.unicef.org/resources/towards-ending-child-marriage/.
15. Cardoso AS, Valério ID, Ramos CI, Machado KP. Casamento infantil no Brasil: uma análise da Pesquisa Nacional de Saúde. *Cien Saude Colet* 2022; 27(2):417-426.

16. Assis TDSC, Martinelli KG, Gama SGND, Santos Neto ETD. Reincidência de gravidez na adolescência: fatores associados e desfechos maternos e neonatais. *Cien Saude Colet* 2022; 27(8):3261-3271.
17. Bezerra TDM, Matos CC. Impactos da gravidez na adolescência no Brasil. *Res Soc Dev* 2022; 11(5):e39111528381.
18. Vieira KJ, Barbosa NG, Dionízio LDA, Santarato N, Monteiro JCDS, Gomes-Sponholz FA. Início da atividade sexual e sexo protegido em adolescentes. *Esc Anna Nery* 2021; 25(3):e20200066.
19. Spinola MCR, Béria JU, Schermann LB. Fatores associados à iniciação sexual em mães de 14 a 16 anos em Porto Alegre/RS, Brasil. *Cien Saude Colet* 2017; 22(11):3755-3762.
20. Pedroso D, Juliano Y, Souza PC, Drezett J. Gravidez decorrente de violência sexual: Caracterização sociodemográfica das mulheres e desfechos do aborto em um serviço público de referência, São Paulo, Brasil. *Lat Am J Dev* 2021; 3(3):1455-1471.
21. Monteiro MCB. A política pública de aborto legal em decorrência de violência sexual e a inapropriada limitação à idade gestacional. *Rev Jur Esc Sup Minist Publico São Paulo* 2022; 21:52-79.
22. Jacobs MG, Boing AC. O que os dados nacionais indicam sobre a oferta e a realização de aborto previsto em lei no Brasil em 2019? *Cad Saude Publica* 2021; 37(12):e00085321.
23. Organização Mundial da Saúde (OMS). Abortamento seguro: Orientação técnica e de políticas para sistemas de saúde [Internet]. 2013 [cited 2024 jun 17]. Available from: https://iris.who.int/bitstream/handle/10665/70914/9789248548437_por.pdf?sequence=7.
24. Delziovo CR, Bolsoni CC, Nazário NO, Coelho EBS. Características dos casos de violência sexual contra mulheres adolescentes e adultas notificados pelos serviços públicos de saúde em Santa Catarina, Brasil. *Cad Saude Publica* 2017; 33(6):e00002716.
25. Deslandes SF, Vieira LJEDS, Cavalcanti LF, Silva RMD. Atendimento à saúde de crianças e adolescentes em situação de violência sexual, em quatro capitais brasileiras. *Interface (Botucatu)* 2016; 20(59):865-877.
26. Taquette SR, Monteiro DLM. Causes and consequences of adolescent dating violence: a systematic review. *J Inj Violence Res* 2019; 11(2):137-147.
27. Cabral CDS, Brandão ER. Gravidez na adolescência, iniciação sexual e gênero: perspectivas em disputa. *Cad Saude Publica* 2020; 36(8):e00029420.

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