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Prevalence of preconception health indicators among Brazilian women of reproductive age

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Abstract *This article aims to evaluate the performance of preconception health indicators according to sociodemographic characteristics among Brazilian women of reproductive age. We conducted a descriptive epidemiological study using data from 21,645 and 25,228 women, respectively, who responded the 2013 and 2019 national health surveys, and data for the period 2010 to 2020 derived from the national health system's Department of Informatics (DATASUS). We calculated the prevalence of indicators according to sociodemographic characteristics and statistical significance of differences was measured using Pearson's chi-squared test. Syphilis and HIV incidence rates were also calculated. There was an increase in the prevalence of access to health service indicators (medical and dental consultations and recent Pap smear). However, there was an increase in the prevalence of hypertension, alcohol use, and obesity. The prevalence of use of contraceptive methods and fertility treatment remained stable. Syphilis incidence increased sevenfold between 2010 and 2020. Black/brown women with a low level of education, higher parity, and living in the North or Northeast performed worse for preconception health indicators. Despite the increase in access to health services, performance on preconception health indicators declined and health inequities continued.*

Key words *Preconception health, Women, Health inequities, Epidemiological studies, Nursing*

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Introduction

Preconception care aims to identify and reduce health risks and adverse pregnancy outcomes through interventions for women of reproductive age, thereby promoting the prevention and control of health complications before and between pregnancies[1]. This type of care provides health benefits by promoting healthy lifestyles – especially in relation to the prevention of noncommunicable diseases (NCDs), the leading cause of morbidity and mortality among women worldwide[2] – and is fundamental to ensure a healthy pregnancy with positive outcomes[3].

International randomized studies evaluating the effects of preconception care have highlighted several benefits, including a reduction in smoking and drinking[4], increased folic acid use[4,5], healthier lifestyles during follow-up[4], and longer inter-pregnancy intervals[5]. However, women's level of knowledge of preconception care remains low, being higher among those with a higher level of education[6]. Furthermore, a high prevalence of modifiable risk factors and conditions such as hypertension, diabetes, and depression[7] was found in American women of reproductive age and in Australian women planning a pregnancy[8].

Despite maternal and infant health policies, mortality among this group remains high in Brazil[9] and half of all pregnancies are not planned[10]. Preconception care can therefore facilitate reproductive planning and reduce the risk of health complications, considering that most women are unaware of this type of care[11,12], even those who have a serious condition such as diabetes[12]. Studies show that awareness is related to information, which is one of the dimensions of access to health services and a reflection of the level of communication between the health system and individuals[13,14]. Health professionals have also been shown to have low awareness of the need for this type of care[15], which can contribute to the neglect of preconception care and undermine sexual and reproductive rights.

A study in São Paulo showed that only 15.9% of women received preconception care[14]. Furthermore, women who received this type of care still showed a high prevalence of modifiable risk factors[15]. However, these studies were limited to women who planned their pregnancy, reinforcing that women's preconception health has received little attention and that existing studies in the country on the topic are limited to aspects related to preconception[11,16]. Other studies have evaluated specific aspects such as inadequate intake of fruit and vegetables, insufficient physical activity[17], and NCDs[17,18]. The findings show that the prevalence of these factors was higher among black and brown women with a low level of education living in the country's North and Northeast regions[17,18].

Given the situation revealed by research and seeking to gain a more in-depth understanding of women's health conditions, international studies have proposed a set of preconception health indicators that can be measured using existing public health surveillance systems to provide a more comprehensive evaluation of women's health[1,19]. These indicators can help improve both women's health and reproductive health[20]. In addition, women are increasingly having children later in life, when they may exhibit risk factors and disease[6], which can influence both general health status and maternal and infant health.

The analysis of preconception health indicators enables the comprehensive monitoring of women's health at national level, providing benefits beyond reproductive health. Population surveys such as the *Pesquisa Nacional de Saúde* (PNS), or National Health Survey, enable the evaluation of aspects that extend beyond women's sexual and reproductive health, including chronic diseases and lifestyle habits. Unlike existing studies, which are conducted mostly at local level[16,21] and/or limited to specific indicators[12,18], national surveys permit the assessment and diagnosis of women's health conditions at country level, providing a broader picture of indicators, as proposed by international guidelines[1,19]. In addition, they allow researchers to identify preconception health inequalities among women.

The aim of this study was therefore to evaluate performance on preconception health indicators among Brazilian women of reproductive age according to sociodemographic characteristics and compare preconception health indicators between 2013 and 2019.

Methods

Study design, data source and population

We conducted a descriptive population-based epidemiological study consisting of two components: a cross-sectional component, using representative secondary data from the 2013 and 2019 PNS (https://www.pns.icict.fiocruz.br/bases-de-dados/); and an ecological time-series component, using data for the period 2010 to

2020 derived from the national health system's Department of Informatics (DATASUS) (http://indicatorssifilis.aids.gov.br/ and http://indicators.aids.gov.br/). All data used in the study are publicly available.

The PNS is a nationwide household survey and its sampling design has been described by previous studies[22,23]. In the 2013 edition, 64,348 household interviews and 60,202 individual interviews with residents aged 18 years and over were conducted[22,23]. In 2019, 94,114 household interviews and 90,846 individual interviews with a resident aged 15 years and over were conducted[23].

The present study included women of reproductive age based on the definition proposed by the World Health Organization[24]. Since the 2013 PNS only interviewed people aged 18 and over, 21,645 women aged 18-49 years were included in the sample. Men, women outside this age group, women who were unaware they were pregnant (n = 176), and pregnant women (n = 800) were excluded. A total of 25,228 women aged 18-49 years were included from the 2019 PNS to permit comparison with previous editions. Men, women outside the age group, women who were unaware they were pregnant (n = 108), and pregnant women (n = 735) were excluded. In the 2019 PNS, anthropometric measurements were taken of a subsample, providing body mass index (BMI) estimates for a subpopulation of 1,772 women of reproductive age.

DATASUS compiles epidemiological, morbidity, mortality, service access, and other data derived from the country's health information systems, such as the national notifiable diseases information system (SINAN). We extracted aggregate data on HIV and syphilis among women aged 15-49 years during the period 2010 to 2020.

Indicators and variables

The preconception health indicators used in this study are based on previous studies that aimed to identify a comprehensive set of indicators to assess women's health. Available national data sources were a key factor in indicator selection and evaluation[1,19].

The following indicators were analyzed based on the available data sources: self-rated health status; education level; access to health insurance; medical and dental consultations during the last 12 months; Pap smear in the last three years among women in the target age group; use of contraceptive methods (CM); CM use up to two years after postpartum; fertility treatment; smoking and passive smoking; alcohol use; fruit and vegetable intake (where adequate intake is at least five portions a day)[25]; nutritional status based on BMI (malnutrition < 18.5 kg/m^2, normal weight 18.5-25.0 kg/m^2, overweight 25.0-29.9 kg/m^2, and obese ≥ 30 kg/m^2)[26]; physical activity (where adequate activity is defined as ≥ 150 minutes of moderate-intensity or ≥ 75 minutes of vigorous activity per week)[27]; violence committed by someone known to the victim during the last 12 months (2013 PNS), violence suffered during the last 12 months (2019 PNS), intimate partner violence committed during the last 12 months; self-reported depression, diabetes, hypertension (except diabetes and hypertension during pregnancy), and asthma. The above indicators were derived from the 2013 and 2019 PNS. The following indicators were also examined: HIV incidence rate in women of reproductive age; and syphilis incidence rate in pregnant women, both based on the number of cases (taken from DATASUS) and estimated population of women of reproductive age in Brazil during the period 2010 to 2020.

In addition to preconception health indicators, we also considered the following sociodemographic variables: education level (2013 PNS: 0-8, 9-11, or 12 or more years of completed education; 2019 PNS: 0-9, 10-12, or 13 or more years of completed education, both categorized as low, medium, and high education level); self-declared skin color/race (white, black/brown, yellow/indigenous); region of residence (North, Northeast, Southeast, South, Midwest); and parity (none, 1 birth, 2 or 3 births, or 4 or more births).

Data analysis

We characterized Brazilian women of reproductive age according to sociodemographic characteristics using data from the 2013 and 2019 PNS, calculating prevalence and adopting 95% confidence interval (95%CI). We then calculated prevalence and corresponding 95%CI in 2013 and 2019 for each preconception health indicator and according to sociodemographic characteristics. Pearson's chi-squared test was used to analyze group differences, adopting a 5% significance level. Stata 14 (Survey module) was used to obtain the population estimates, using the complex sample design function. We also performed a subpopulation analysis, which is the indicated method for analyzing complex-sample survey data[28].

We calculated the proportion of HIV cases (cases among women of reproductive age/cases

in Brazil x 100), HIV incidence rates (new cases in women of reproductive age/estimated population of women of reproductive age x 100,000), and syphilis incidence rates (cases of syphilis in pregnant women of reproductive age/live births x 1,000).

Ethical aspects

The aggregate data used in this study are available in the public domain and do not identify the subjects. This study was therefore conducted in accordance with the ethical norms and standards set out in National Health Council Resolution 466 (12 December 2012).

Results

Brazilian women of reproductive age showed the following age distribution in 2013 and 2019: 18-29 years (37.6% and 34.2%); 30-39 years (32.9% and 34.0%); 40-49 years (29.5% and 31.8%). In 2013, 42.2% of these women lived in the Southeast, 28.0% in the Northeast, and 14.1% in the Sul, with a similar distribution being found in 2019 (42.2%, 27.3%, and 13.9%, respectively). Most of the women self-declared black or brown (53.0% in 2013 and 58.1% in 2019). Regarding parity, 35.7% of women had had two or three births in 2013, compared to 35.8% in 2019, and 31.7% had had no births in 2013, compared to 31.2% in 2019 (data not presented).

In both editions of the PNS more than 70% of the women self-reported good/very good health (Table 1). Only 22.3% of the women had studied beyond high school in 2013, rising to 27.1% in 2019. In both editions of the PNS, three in every ten women had health insurance, eight in every ten had visited the doctor during the last 12 months, and five in every ten had visited the dentist during the last 12 months. At least 80% of the women had done a Pap smear in the last three years. The prevalence of CM use was over 80% in both editions. The most common methods were the pill (38.8% in 2013 and 34.1% in 2019), followed by surgical (22.2% in 2013 and 19.8% in 2019), condoms (13.4% in 2013 and 16.9% in 2019), injection (6.4% in 2013 and 7.8% in 2019), and IUD (1.8% in 2013 and 3.8% in 2019) (data not presented). In both editions of the PNS over 3% of women underwent fertility treatment.

In 2013, only 2.7% of women reported having diabetes, 11.7% reported hypertension, and 5.4% reported asthma, compared to 3.4%, 14.0%, and 6.3%, respectively, in 2019 (Table 1). Regarding risk factors, in 2013 and 2019, respectively, 9.7% and 8.4% of women reported smoking, 17.9% and 15.3% reported passive smoking, and 33.7% and 39.4% reported using alcohol, with the latter showing a considerable rise in prevalence. In both editions of the PNS, only two in every 10 women reported adequate daily fruit and vegetable intake. Only two in every 10 women reported practicing enough physical activity in 2013, rising to three in every ten in 2019. In 2013, five in every 10 women were overweight or obese, rising to six in every ten in 2019 (Table 1).

In 2013, 9.5% of women reported having had depression, increasing to 13.4% in 2019. In 2013, 3.9% of women reported having suffered violence during the last 12 months, rising to 2019 in 23.7%. Physical or sexual violence accounted for most cases of violence in 2013 (47.4%), followed by psychological violence (43.9%). In 2019, psychological violence accounted for almost three times as many cases than physical or sexual violence (72.3% and 27.7%, respectively) (data not presented). In 2013, 23.5% of women reported suffering intimate partner violence, compared to 18.7% in 2019. The rate of physical or sexual partner violence was more than twice that of psychological partner violence in 2013 (35.1% and 14.1% respectively). In contrast, in 2019 the prevalence of psychological partner violence was higher than that of physical or sexual violence (15.8% and 25.5%, respectively) (Table 1).

The prevalence of preconception health indicators varied according to education level (Table 2), skin color/race (Table 3), parity, and region of residence (data not presented). Women with a low level of education, who had had more births, and who self-declared black or brown performed worse for preconception health indicators (p-value < 0.05). Women from the North, Northeast, and Midwest performed worse in half of the indicators. Significant differences between regions were not found for prevalence of physical activity, violence, and diabetes (p-value > 0.05).

The HIV incidence rate among women of reproductive age rose between 2010 and 2017, falling thereafter until the end of the period (Figure 1), even though the number of cases in this group as a proportion of overall cases in the general population decreased by 10.0% over the period (Table 4). The syphilis incidence rate in pregnant women rose throughout the period, with a sharper rise from 2013 (Figure 1), increasing seven-fold over the period.

Table 1. Prevalence of preconception health indicators among Brazilian women of reproductive age according to the 2013 and 2019 PNS.

Domains	Indicators	2013 PNS			2019 PNS		
		N*	%**	95%CI	N*	%**	95%CI
1, General health status and life satisfaction	Self-reported health status	21,645			25,228		
	Very good/good		71.2	70.0-72.3		71.4	70.4-72.4
	Fair		24.8	23.7-25.8		24.7	23.8-25.7
	Bad/very bad		4.1	3.6-4.6		3.9	3.5-4.3
2, Social determinants of health	Education level	21,645			25,228		
	Low		35.5	34.3-36.7		26.7	27.4-29.5
	Medium		42.2	41.0-43.5		46.2	45.6-47.8
	High		22.3	21.1-23.5		27.1	23.9-25.9
3, Health care	Health insurance	21,645			25,228		
	Yes		30.3	29.0-31.6		26.6	25.5-27.7
	Medical consultations	21,645			25,228		
	Less than 1 per year		79.1	78.1-80.1		84.1	83.2-84.9
	More than 1 per year		20.5	19.5-21.5		15.5	14.7-16.4
	Never		0.4	0.2-0.7		0.4	0.2-0.7
	Dental consultations	21,645	55.4	54.2-56.6	25,228	59.8	58.7-60.9
	Cleaning, control, and maintenance	11,436	54.4	52.6-56.2	14,695	49.5	48.1-51.0
	Normal treatment		34.7	33.0-36.4		38.0	36.6-39.4
	Specialist treatment		10.9	9.9-12.0		12.5	11.5-13.5
	Pap smear	17,625			21,196		
	Up to 3 years		80.6	79.5-81.7		83.4	82.5-84.2
	More than 3 years		9.3	8.6-10.0		9.8	9.2-10.5
	Never		10.1	9.3-11.0		6.8	6.3-7.4
4, Reproductive health and family planning	Use of contraceptive methods	16,879			19,594		
	Yes		85.6	84.6-86.6		84.1	83.2-85.0
	CM use up to 2 years after post-partum	1,962			2,208		
	Yes		84.8	81.9-87.3		83.5	80.3-86.2
	Fertility treatment	16,879			19,594		
	Yes		3.3	2.9-3.9		3.6	3.2-4.1
	No		96.7	96.1-97.1		96.4	95.9-96.8
5, Tobacco, alcohol, and substance use	Smoking	21,645			25,228		
	Yes		9.7	9.0-10.3		8.4	7.9-9.0
	Passive smoking	21,645			25,228		
	Yes		17.9	16.9-18.9		15.3	14.6-16.2
	Alcohol use	21,645			25,228		
	Yes		33.7	32.5-35.0		39.4	38.2-40.6
6, Nutrition and physical activity	Daily fruit and vegetable intake	21,645			25,228		
	Adequate		19.5	18.4-20.6		8.2	7.6-8.8
	Inadequate		80.5	79.4-81.6		91.8	91.2-92.4
	Malnutrition (BMI)	21,645	3.2	2.8-3.6	1,772	4.8	-
	Normal weight	21,645	44.1	42.9-45.4	1,772	36.6	-
	Overweight	21,645	31.3	30.2-32.4	1,772	30.4	-
	Obese	21,645	21.4	20.4-22.5	1,772	28.2	-
	Physical activity	21,645			25,228		
	Adequate		20.3	19.3-21.4		29.3	28.3-30.3
	Inadequate		79.7	78.6-80.7		70.7	69.7-71.7

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Table 1. Prevalence of preconception health indicators among Brazilian women of reproductive age according to the 2013 and 2019 PNS.

Domains	Indicators	2013 PNS			2019 PNS		
		N*	%**	95%CI	N*	%**	95%CI
7, Mental health	Self-reported depression	21,645			25,228		
	Yes		9.5	8.7-10.3		13.4	12.6-14.3
8, Emotional and social support	Violence suffered during last 12 months	21,645	3.9	3.4-4.3	25,228	23.7	22.8-24.8
	Intimate partner violence during the last 12 months	879	23.5	19.1-28.4	5,386	18.7	16.2-21.3
	Physical or sexual intimate partner violence during last 12 months		35.1	27.1-44.0		15.8	13.9-17.8
	Psychological intimate partner violence during last 12 months		14.1	10.2-19.1		25.5	19.2-32.9
9, Chronic conditions	Self-reported diabetes	19,505			23,777		
	Yes		2.7	2.3-3.1		3.4	3.0-3.8
	Self-reported hypertension	21,176			24,851		
	Yes		11.7	10.9-12.4		14.0	13.2-14.8
	Self-reported asthma	21,645			25,228		
	Yes		5.4	4.8-6.0		6.3	5.8-6.9

N*: sample number. %**: population prevalence. 95%CI: 95% confidence interval. BMI: Body Mass Index.

Source: Authors.

Discussion

The findings of this study show that there was an increase in the prevalence of indicators of health service access and utilization, such as consultations during the last 12 months and having done the Pap smear in the last three years. However, there was also an increase in prevalence of NCDs, such as hypertension, and their risk factors, including alcohol use and obesity. The results also show a rise in the prevalence of depression. The prevalence of other indicators remained stable, notably those related to reproductive health, such as CM use, with the maintenance of an obsolete mix of methods[29], and fertility treatment. The results also reveal that there was a rise in the syphilis incidence rate over the last decade. Finally, black or brown women living in the North and Northeast with a low level of education and higher number of births had a worse health status.

Our findings reveal that the health of Brazilian women of reproductive age is compromised across various indicators, including NCDs and their risk factors, sexually transmitted infections, and violence, corroborating the results of other national[12,18,30] and international studies[7,31,32]. It is worth noting that our sample is a group of relatively young women who already exhibit important health problems that extend beyond sexual and reproductive health. Moreover, women's health status has declined over the years, reaffirming the need to promote health across the life course, implementing wide-ranging policies to encourage the adoption of healthy lifestyle habits, prevent and control disease, and provide psychosocial support, thereby ensuring the effective delivery of comprehensive women's health care. Despite these findings, most women self-reported good health, revealing a lack of awareness of lifestyle risk factors. The prevalence of other indicators, such as smoking and diabetes, remained stable, indicating lack of progress on the promotion of women's health.

Our findings also show that women from vulnerable groups have poorer health status and self-reported health, which has been observed by previous studies7,18,33. Our results show that women with a low level of education, black or brown skin color, and who had a higher number of births showed worse health status across various indicators, including diet, physical activity and nutritional status, revealing social inequalities between different groups of Brazilian women. Disparities in preconception health indicators were also observed by a similar study undertaken in the United States[7]. The findings indicate that to a certain extent these women are aware of their vulnerability insofar as they were more likely to

Table 2. Prevalence of preconception health indicators among Brazilian women of reproductive age by education level, 2013 PNS.

Domains	Indicators	Education level (completed years of study)			P-value
		0 to 8 % (95%CI)	9 to 11 % (95%CI)	12 or more % (95%CI)	
1. General health status and life satisfaction	Self-reported health status				< 0.0001
	Very good/good	58.0 (56.1-59.9)	75.4 (73.7 -77.1)	84.2 (82.4-85.8)	
	Fair	34.2 (32.4-36.0)	22.3 (20.6-24.0)	14.5 (12.9-16.2)	
	Bad/very bad	7.8 (6.8-9.0)	2.3 (1.9-2.9)	1.4 (1-1.9)	
3. Health care	Health insurance				< 0.0001
	Yes	11.2 (9.9-12.7)	29.1 (27.1-31.1)	63.1 (60.6-65.6)	
	Medical consultations				< 0.0001
	Less than 1 per year	76.9 (75.3-78.4)	77.6 (75.8-79.3)	85.5 (83.6-87.1)	
	More than 1 per year	22.5 (21.0-24.0)	22.3 (20.5-24.1)	14.0 (12.5-15.8)	
	Never	0.6 (0.3-1.3)	0.1 (5.4e-04-0.3)	0.5 (0.2-1.4)	
	Dental consultations				< 0.0001
	Cleaning, control and maintenance	43.7 (40.8-46.6)	53.3 (50.6-55.9)	67.1 (64.0-70.0)	
	Normal treatment	47.3 (44.4-50.3)	33.6 (31.1-36.2)	23.5 (20.9-26.3)	
	Specialist treatment	9.0 (7.6-10.7)	13.2 (11.5-15.0)	9.4 (7.8-11.4)	
	Pap smear				< 0.0001
	Up to 3 years	75.2 (73.4-77.0)	81.8 (80.0-83.5)	87.9 (85.9-89.6)	
	More than 3 years	12.3 (11.1-13.6)	8.1 (7.0-9.3)	6.1 (4.9-7.6)	
	Never	12.5 (11.2-13.9)	10.2 (8.8-11.7)	6.0 (4.9-7.5)	
4. Reproductive health and family planning	Use of contraceptive methods				0.2470
	Yes	84.5 (82.9-86.1)	86.1 (84.6-87.6)	86.4 (84.3-88.3)	
	CM use up to 2 years after post-partum				0.0001
	Yes	77.6 (71.4-82.7)	90.5 (87.2-93.0)	83.7 (76.7-88.9)	
	Fertility treatment				0.5977
	Yes	3.0 (2.4-3.8)	3.4 (2.7-4.4)	3.7 (2.8-4.9)	
	No	97.0 (96.2-97.6)	96.6 (95.7-97.4)	96.3 (95.1-97.2)	
5. Tobacco, alcohol, and substance use	Smoking				< 0.0001
	Yes	16.2 (15.1-17.5)	6.6 (5.7-7.6)	5.0 (4.1-6.1)	
	Passive smoking				< 0.0001
	Yes	24.4 (22.8-26.1)	15.7 (14.2-17.3)	11.7 (10.1-13.6)	
	Alcohol use				< 0.0001
	Yes	27.5 (25.9-29.1)	33.8 (31.8-35.9)	43.4 (40.8-46.0)	

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rate their health negatively than other women. This reinforces the need to continue the pursuit of equity, recognizing differences and guaranteeing rights and access to health services.

Another study in São Paulo reported that women with more children and a lower level of education participated less frequently in preconception care[34], reinforcing the need for reproductive health and family planning for women. Despite the high prevalence of CM use, unplanned pregnancies are still common and can have several implications for women, including changes to routine, emotional problems, and abandonment of studies. Changes to life plans and their consequences can be even more drastic in the case of teenage pregnancy[35]. In addition, these factors can prevent women from attaining better jobs and improving their income, often perpetuating the cycle of poverty[35].

The results also highlight regional health disparities, with women from the North, Northeast, and Midwest performing more poorly than those from the South and Southeast across preconception health indicators. These findings illustrate

Table 2. Prevalence of preconception health indicators among Brazilian women of reproductive age by education level, 2013 PNS.

Domains	Indicators	Education level (completed years of study)			P-value
		0 to 8 % (95%CI)	9 to 11 % (95%CI)	12 or more % (95%CI)	
6. Nutrition and physical activity	Daily fruit and vegetable intake				< 0.0001
	Adequate	15.1 (13.6-16.6)	19.7 (18.0-21.4)	26.3 (24.1-28.6)	
	Inadequate	84.9 (83.4-86.4)	80.3 (78.6-82.0)	73.7 (71.4-75.9)	
	Malnutrition (BMI)	2.6 (2.1-3.2)	3.6 (3.0-4.3)	3.3 (2.5-4.3)	< 0.0001
	Normal weight	35.9 (34.1-37.7)	47.1 (45.1-49.2)	51.5 (50.0-54.1)	
	Overweight	35.6 (33.8-37.5)	29.3 (27.6-31.1)	28.2 (26.1-30.4)	
	Obese	25.9 (24.4-27.6)	20.0 (18.5-21.6)	17.0 (15.1-19.1)	
	Physical activity				< 0.0001
	Adequate	11.1 (9.9-12.5)	21.4 (19.8-23.1)	32.9 (30.4-35.6)	
	Inadequate	88.9 (87.6-90.1)	78.6 (76.9-80.2)	67.1 (64.4-69.6)	
7. Mental health	Self-reported depression				< 0.0001
	Yes	11.9 (10.6-13.3)	7.6 (6.7-8.7)	9.1 (7.8-10.7)	
8. Emotional and social support	Intimate partner violence during the last 12 months				0.0007
	Current partner	29.4 (22.2-37.8)	26.1 (18.4-35.5)	6.8 (3.6-12.3)	
	Ex-partner	18.7 (11.1-29.8)	13.8 (9.4-19.8)	11.5 (6.5-19.5)	
9. Chronic conditions	Self-reported diabetes				< 0.0001
	Yes	4.2 (3.5-5.1)	2.1 (1.6-2.8)	1.4 (1.0-2.1)	
	Self-reported hypertension				< 0.0001
	Yes	17.8 (16.4-19.3)	8.6 (7.7 9.6)	7.7 (6.4-9.3)	
	Self-reported asthma				0.5346
	Yes	5.1 (4.3-6.0)	5.3 (4.5-6.2)	5.9 (4.8-7.2)	

%: population prevalence. 95%CI: 95% confidence interval. BMI: Body Mass Index.

Source: Authors.

that, despite the social and economic development witnessed in the country over recent years, regional inequalities in access to health services persist, both in terms of care complexity[36] and quality[37].

The prevalence of risk factors and NCDs among women of reproductive age remain high, corroborating the data from another study with a sample of women in São Paulo[34]. In addition, our findings show that performance on these indicators declined in 2019, indicating that women's health status across these dimensions has not improved over the years. NCDs account for 44% of deaths among Brazilian women[38] and around half of the female population have metabolic syndrome[30], a group of conditions that can lead to heart disease. A study with diabetic women showed that participants had limited knowledge of potential maternal and fetal health complications caused by chronic diseases and that only one-third of pregnancies were planned. Despite this, only 5% of the women who planned their pregnancy sought antenatal care[12].

Other studies have reported an upward trend in the prevalence of NCDs and their risk factors among women of reproductive age, including obesity[18,31], hypertension[39], and alcohol use[40,41]. The high prevalence of hypertension is alarming, given that this condition increases the risk of heart disease among young women[32]. These findings are a warning sign for preconception health, given the risk of cardiovascular diseases, poor general health status, and potential complications in future pregnancies among this relatively young group of women.

Increased alcohol consumption has been related to changing gender roles and greater participation of women in social settings and activities previously considered to be male[41]. Our results also show an improvement in the physical activity indicator, corroborating the findings of a

Table 3. Prevalence of preconception health indicators among Brazilian women of reproductive age by skin color/race, 2013 PNS.

Domains	Indicators	Skin color/race			P-value
		White	Black/brown	Yellow/ indigenous	
		%(IC95%)	%(IC95%)	%(IC95%)	
1. General health status and life satisfaction	Self-reported health status				<0.0001
	Very good/good	77.2 (75.6-78.8)	66.0 (64.5-67.5)	71.4 (62.7-78.9)	
	Fair	19.2 (17.7-20.7)	29.5 (28.1-31.0)	25.7 18.6-34.4)	
	Bad/very bad	3.6 (2.9-4.5)	4.5 (3.9-5.1)	2.9 (1.5-5.4)	
2. Social determinants of health	Education level (years of study)				<0.0001
	0-8	27.5 (25.9-29.2)	42.5 (40.9-44.1)	29.4 (22.0-38.0)	
	9-11	41.9 (39.9-44.0)	42.4 (41.0-43.9)	44.9 (35.0-55.2)	
	12 or more	30.5 (28.6-32.6)	15.1 (14.0-16.2)	25.7 (16.3-38.1)	
3. Health care	Health insurance				<0.0001
	Yes	41.1 (39.1-43.1)	21.0 (19.6-22.4)	33.9 (24.6-44.5)	
	Medical consultations				0.0014
	Less than 1 per year	81.4 (80.0-82.8)	77.1 (75.7-78.4)	80.4 (73.4-85.9)	
	More than 1 per year	18.2 (16.9-19.7)	22.5 (21.2-23.9)	18.7 (13.4-25.4)	
	Never	0.3 (0.2-0.8)	0.4 (0.2-0.8)	1.0 (0.2-3.9)	
	Dental consultations				<0.0001
	Cleaning, control, and maintenance	59.0 (56.5-61.5)	49.8 (47.5-52.0)	46.5 (33.0-60.5)	
	Normal treatment	30.1 (27.9-32.5)	39.1 (36.8-41.4)	47.3 (33.4-61.6)	
	Specialist treatment	10.9 (9.5-12.4)	11.2 (9.7-12.9)	6.2 (3.2-11.8)	
	Pap smear				<0.0001
	Up to 3 years	84.2 (82.6-85.6)	77.3 (75.7-78.9)	87.3 (81.8-91.4)	
	More than 3 years	8.0 (7.1-9.1)	10.4 (9.4-11.6)	7.3 (4.4-11.7)	
	Never	7.8 (6.7-9.1)	12.2 (11.0-13.6)	5.4 (3.0-9.4)	
4. Reproductive health and family planning	Use of contraceptive methods				0.0158
	Yes	86.9 (85.5-88.2)	84.5 (83.1-85.8)	87.9 (81.6-92.2)	
	CU use up to 2 years after post-partum				0.7127
	Yes	85.1 (79.9-89.1)	84.5 (80.8-87.6)	92.4 (70.9-98.4)	
	Fertility treatment				0.1875
	Yes	3.8 (3.1-4.6)	2.9 (2.3-3.7)	3.7 (1.3-9.7)	
	No	96.2 (95.5-96.9)	97.1 (96.3-97.7)	96.3 (90.3-98.7)	
5. Tobacco, alcohol, and substance use	Smoking				0.0350
	Yes	8.8 (7.9-9.8)	10.4 (9.5-11.3)	8.0 (4.9-13.0)	
	Passive smoking				0.0006
	Yes	16.1 (14.6-17.7)	19.5 (18.3-20.8)	14.0 (9.2-20.7)	
	Alcohol use				0.0015
	Yes	36.0 (34.2-37.9)	31.7 (30.2-33.4)	31.7 (23.1-41.7)	

it continues

previous study[42]. This improvement may be related to behavioral changes and the promotion of healthier lifestyle habits by public health programs[42].

The data presented show a considerable rise in the prevalence of sexually transmitted infections over the last decade, which have been shown to be persistently endemic worldwide[43]. Increased syphilis incidence has been observed in the general population. It is important to note that the exponential increase in cases of syphilis may be related to the fact that the condition was made a notifiable disease in 2010[44]. Preconception care for women with STIs is essential for both maternal and infant health, since it enables the detection and treatment of infections and prevents

Table 3. Prevalence of preconception health indicators among Brazilian women of reproductive age by skin color/race, 2013 PNS.

Domains	Indicators	Skin color/race			P-value
		White	Black/brown	Yellow/ indigenous	
		%(IC95%)	%(IC95%)	%(IC95%)	
6. Nutrition and physical activity	Daily fruit and vegetable intake				<0,0001
	Adequate	23.2 (21.5-24.9)	16.3 (15.1-17.6)	21.5 (13.8-32.0)	
	Inadequate	76.8 (75.1-78.5)	83.7 (82.4-84.9)	78.5 (68.0-86.3)	
	Malnutrition (BMI)	3.0 (2.4-3.6)	3.4 (2.9-4.0)	2.2 (1.1-4.2)	0.0571
	Normal weight	45.3 (43.4-47.2)	42.9 (41.4-44.4)	53.4 (43.4-63.2)	
	Overweight	30.3 (28.6-32.0)	32.2 (30.8-33.6)	31.0 (22.9-40.5)	
	Obese	21.5 (20.0-23.1)	21.6 (20.3-22.9)	13.4 (8.8-20.1)	
	Physical activity				0.0002
	Adequate	22.7 (21.1-24.4)	18.2 (17.0-19.5)	24.3 (15.7-35.7)	
	Inadequate	77.3 (75.6-78.9)	81.8 (80.5-83.0)	75.7 (64.3-84.3)	
7. Mental health	Self-reported depression				0.0002
	Yes	10.9 (9.8-12.1)	8.3 (7.4-9.3)	5.9 (3.0-11.5)	
8. Emotional and social support	Intimate partner violence during the last 12 months				0.0886
	Current partner	17.0 (11.0-25.2)	27.0 (21.3-33.5)	10.1 (2.7-31.1)	
	Ex-partner	12.7 (7.5-20.7)	16.7 (11.2-24.1)	28.7 (4.6-77.0)	
9. Chronic conditions	Self-reported diabetes				0.2395
	Yes	2.4 (1.9-3.2)	2.9 (2.4-3.5)	1.4 (0.6-3.1)	
	Self-reported hypertension				0.0090
	Yes	10.5 (9.5-11.7)	12.7 (11.7-13.9)	8.3 (4.4-15.0)	
	Self-reported asthma				0.1378
	Yes	5.8 (5.0-6.7)	5.1 (4.4-5.9)	2.6 (1.2-5.6)	

%: population prevalence. 95%CI: 95% confidence interval. BMI: Body Mass Index.

Source: Authors.

vertical transmission. Syphilis is detected using a rapid test and treatment is available on the country's national health service, the *Sistema* Único *de Saúde* (SUS) or Unified Health System[44]. All women, regardless of whether they plan to get pregnant or not, can benefit from the prevention and early detection and treatment of STIs.

The present study also showed that violence against women is prevalent. Violence has been shown to be a risk factor for other diseases and adverse health outcomes worldwide[45] and in Brazil[46]. Aside from being a major human rights violation, violence against women can lead to death and illness[45]. The problem is deeply rooted in gender inequality[47] and aggravated by conservatism[48]. It is important to note that this study's results relating to violence, particularly the increase between the two surveys, should be interpreted with caution due to changes made to the questionnaire, meaning that the 2019 survey better captured cases of violence.

Our findings underline a real and urgent need for a comprehensive approach to women's health in the country, that goes beyond established interventions such as the Pap smear and antenatal and postpartum care. Adopting a comprehensive approach could reduce maternal mortality by around by 28%, given that a large proportion of maternal deaths are attributable to indirect causes, notably pre-existing conditions[49]. While our results show high Pap smear coverage and prevalence of CM use, suggesting women have wide access to specific health services[14], women's care tends to be fragmented rather than comprehensive, resulting in lost opportunities and a reductionist view of young women's health. Our study is therefore a step forward as our results provide new insights into young women's health in the country.

Finally, for decades, public policies and programs have focused on maternal and infant health. However, mortality rates are still a cause

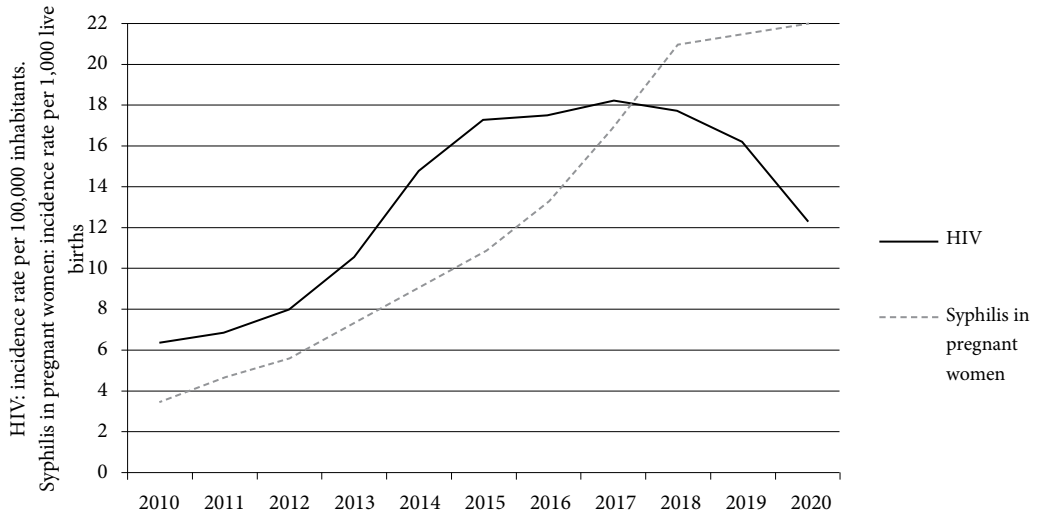

Figure 1. Annual HIV incidence rate in Brazilian women of reproductive age and Syphilis incidence rate in Pregnant women. Brazil, 2010-2020.

Source: Authors.

Table 4. Number of cases and incidence of HIV in women of reproductive age and of syphilis among pregnant women reported to the SINAN according to age group and year of diagnosis. Brazil, 2010-2020.

Domain 10. Infections	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total
HIV												
15-19 years	319	329	385	526	709	813	824	833	766	645	537	6,686
20-29 years	1,303	1,433	1,602	2,145	2,879	3,344	3,213	3,398	3,259	2,944	2,209	27,729
30-39 years	1,164	1,241	1,476	1,980	2,885	3,362	3,448	3,556	3,496	3,224	2,380	28,212
40-49 years	684	759	941	1,282	1,837	2,248	2,411	2,561	2,565	2,436	1,906	19,630
Total	3,470	3,762	4,404	5,933	8,310	9,767	9,896	15,184	10,086	9,249	7,032	87,093
Incidence*	6.4	6.9	8.0	10.6	14.8	17.3	17.5	18.2	17.7	16.2	12.3	
Proportion**	31.8	29.0	29.7	28.6	26.6	25.1	23.8	23.0	22.4	22.1	21.8	
Syphilis												
15-19 years	2,117	3,094	3,970	5,341	6,991	8,535	9,934	12,936	15,728	14,667	14,329	97,642
20-29 years	5,232	6,987	8,275	10,547	13,400	16,856	20,079	26,265	33,017	34,016	34,636	209,310
30-39 years	2,274	3,057	3,522	4,257	5,290	6,264	6,987	8,968	11,493	10,644	10,650	73,406
40 and over	274	402	398	427	553	669	734	985	1,213	1,155	1,188	7,998
Total	9,897	13,540	16,165	20,572	26,234	32,324	37,734	49,154	61,451	60,482	60,803	388,356
Incidence***	3.5	4.7	5.6	7.2	8.9	10.8	13.3	16.9	21.0	21.4	22.3	

N: number of cases. * HIV incidence rate per 100,000 population. ** Number of cases in women of reproductive age as a proportion of overall HIV cases among the general population. *** Syphilis incidence rate in pregnant women per 1,000 live births.

Source: Authors.

for concern[9] and it is known that effective preconception care and women's health care as a whole can improve pregnancy outcomes and reduce health inequities between women. It is worth highlighting that one of the strengths of this study was the fact that the sample was not restricted women who plan to get pregnant and the importance of surveys for assessing women's health and monitoring indicators among the young female population over the last decade.

Limitations

The study sample did not include adolescents aged 15-17 years. Despite the importance of assessing the health status of this group and the fact that women of reproductive age include these ages, the 2013 PNS only interviewed individuals aged 18 years and over. In contrast, the 2019 PNS included adolescents aged 15-17 years in all modules except violence. A sensitivity analysis of this sample of adolescents showed that the prevalence of the indicators overweight, obese, and alcohol use were underestimated (data not presented) and that the prevalence of the remaining indicators was very similar to those of the present study. Another limitation was that the questionnaire used in the 2019 PNS did not contain a question about salad consumption and changes were made to the questions regarding violence suffered during the last 12 months, meaning it was not possible to compare the two editions.

Another important consideration is that access indicators were restricted to service utilization (consultations, tests, materials) and therefore limited for measuring access across all dimensions[14].

In addition, DATASUS does not stratify new cases of syphilis by age, meaning that it was not possible to analyze the data for non-pregnant women of reproductive age. We therefore analyzed syphilis among pregnant women, given that they account for more than half of the cases of disease reported among women in Brazil and cases are identified in the first trimester of pregnancy. Finally, we did not investigate indicators such as vaccination and stillborn children, among others, due to the lack or unavailability of data.

Conclusion

This study showed that the general health status of Brazilian women of reproductive age is fragile. This is demonstrated by the poor performance of preconception health indicators, notably risk factors, STIs, NCDs, and violence, despite the relatively young age of the sample. The findings reveal an increase in the prevalence of health service access and utilization indicators and a decline in performance on indicators of NCDs and their risk factors, and STIs over time. More socially vulnerable women, such as black and brown women with a low level of education and higher number of births performed worse than other groups, revealing the need to promote health equity and improve health policies and services.

Collaborations

BNS Santos supported the conception and design of the study, conducted the analysis and interpretation of data, participated in the writing of the article, critical review and approval of the version to be published. FG Araújo, TF Paula and FP Matozinhos supported data interpretation, critical review and approval of the version to be published. MS Felisbino-Mendes carried out the conception and design of the study, supervised the analysis and interpretation of data, participated in writing the article, editing and preparing the final version.

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