Quality of Prenatal Care in Brazil: National Health Research 2013

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Abstract *This study aimed to assess the adequacy of prenatal care in Brazil associated with socio-demographic determinants. The study included a data analysis from the National Health Research performed in Brazil in 2013. Two outcomes on the adequacy of prenatal care were assessed: the Kessner index modified by Takeda index that, in addition to the former, assessed whether blood pressure and weight were measured in all appointments, as well as the performance of blood and urine tests and ultrasound. Both quality indicators were assessed for Brazil and for its macro-regions. According to Outcome 1, 80.6% of women received adequate prenatal care. When adding the performance of tests (Outcome 2), the rate dropped to 71.4%. Adequate prenatal care was more frequent among white women who performed prenatal care in the private health sector. The northern region had the lowest rate of adequate prenatal care, while the southeast region showed the highest rates. Despite the extensive coverage, prenatal care in Brazil still presents inequities and low service quality, especially for women from the poorest regions of the country.*

Key words *Inequity, National health research, Quality of prenatal care*

Introduction

The early start of prenatal care and its adequate execution are important to ensure maternal and fetal health and reduce their morbidity and mortality[1-4].

Prenatal care coverage in Brazil was reinforced by government programs such as the Prenatal and Birth Humanization Program (*Programa de Humanização no Pré-Natal e Nascimento* - PHPN), established by the Ministry of Health in 2000, which aimed to improve the access, coverage, and quality of prenatal follow-up, assisted delivery, and postpartum and newborn care[5,6]. According to this program, an adequate prenatal care should start up to the fourth month of pregnancy and include at least six follow-up visits, as well as blood and urine tests. Additionally to this plan, the Brazilian government launched in 2011 the Stork Network (*Rede Cegonha*), aiming to improve even more the access and quality of assistance for pregnant women and reduce maternal mortality, especially in the north and northeast regions[7-9]. In 2013, the Brazilian Ministry of Health launched the Primary Care Register number 32, which relates to low-risk prenatal care and aims to support health teams involved in the Stork Network[3].

Systematic assessments have analyzed the adequacy of prenatal care according to criteria used by the PHPN and the Stork Network, such as number of prenatal visits and laboratory tests, and found inadequacies when the parameters used by such programs were analyzed in combination. Some factors are closely related to the adequacy of prenatal care, such as region of the country, location of residence (rural or urban area), and family income[10-12].

The information of the Brazilian National Health Research is used to support the formulation of public policies of the public health system of the country regarding health care, promotion, and surveillance, aligned with the strategies of the strategic action plan to combat chronic non-communicable diseases in Brazil[13]. The data collected on prenatal care in the National Health Research allows an overview of the quality of prenatal care in Brazil, so it may contribute to develop the assistance of pregnant women, improving the results and decreasing the rates of maternal and perinatal morbidity and mortality[14].

The government programs aforementioned have extended the access to prenatal care in Brazil almost universally, but the quality of such services still present inadequacies and inequities[10].

This study aimed to assess the adequacy of prenatal care in Brazil and its association with sociodemographic and health determinants, from data collected in the National Health Research of 2013.

Methodology

The data used in these analyses come from the National Health Research, which was a household survey performed in Brazil in 2013 by the Brazilian Institute of Geography and Statistics Foundation in partnership with the Ministry of Health and the Oswaldo Cruz Institute Foundation[13].

The population of the National Health Research included adults aged 18 years or older residing in private homes of the entire Brazilian territory. A cluster sample was used in three stages, in which census divisions were the primary units, households were secondary units, and the adult resident selected from each home was the tertiary unit to answer the questionnaire used in the research. The non-respondent rate of the National Health Research was 8.1%.

The sample used for the present analysis included all women aged 18 years or older who reported having received prenatal care during their last pregnancy, from July 28, 2011 to July 27, 2013, with a total of 1851 women.

The following information were used to assess the quality of prenatal care: "Did you have six or more prenatal visits?" (no/yes); "How far along in the pregnancy did you start prenatal care?"; "Was your blood pressure measured in all visits?" (no/yes); "Was your weight measured in all visits?" (no/yes); "Did you perform blood tests during prenatal care?" (no/yes); "Did you perform urine tests during prenatal care?" (no/yes); "Did you perform any ultrasound during prenatal care?" (no/yes). From these variables, the outcome of quality of prenatal care was constructed and assessed in two ways. The first was based on the Kessner index modified by Takeda[15], which defines that adequate prenatal care starts up to the 20th week of pregnancy and includes at least six prenatal visits[15] (Outcome 1). A second analysis was performed considering that adequate prenatal care should meet the criteria of Outcome 1 and include the measurement of blood pressure and weight in all visits, as well as the performance of blood and urine tests and some ultrasound during pregnancy. This was determined as Outcome 2.

Both quality indicators were assessed for Brazil and Brazilian macro-regions (north, northeast, southeast, south, and midwest) according to skin color (white, black, yellow, brown, indigenous), level of education (uneducated, elementary school, high school, higher education), age (18-19, 20-29, 30-39, 40 years or older), visits scheduled through the public health system (all or some, none), and professional assisting most visits (physician or not).

The bivariate analysis used Pearson's chi-square test and the multivariate analysis used crude and adjusted Poisson regression, with robust variance, obtaining prevalence ratios (PR) and respective 95% confidence intervals (95%CI). For the confounding adjustment, all exploratory variables entered the model, but only those with p-value <0.20 remained (backward stepwise). All analyses were performed in the Stata 12 software using the svy command, considering the complex sampling used in the National Health Research 2013.

The National Health Research received approval from the National Research Ethics Commission of the National Health Council - Ministry of Health - in June 26, 2013, under opinion no. 328,159. The respondents included in the sample agreed to participate in the research by signing the Informed Consent Form.

Results

Table 1 presents the sample characteristics. Most of the participating women had six or more prenatal visits (84.0%), through the Brazilian public health system (72.5%), starting with at least 20 weeks of pregnancy (92.6%), and they were mostly assisted by physicians (71.6%). Blood pressure and weight were verified in all visits for most women (92.2% and 92.0% respectively).

During prenatal care, most women performed (at least once) blood tests (97.3%), urine tests (98.1%), and ultrasound (99.7%). As for the sociodemographic variables, 50.6% of mothers is between 20 and 29 years old, 49.9% claims to be brown, and 47.2% has completed high school (Table 1).

Table 2 presents the prevalence of adequate prenatal care for Brazil and its distribution by Brazilian macro-regions. For Brazil, the prevalence of adequate prenatal care was 80.6% and 71.4% when analyzing Outcomes 1 and 2, respectively. There was a difference among macro-regions, and the highest prevalence of adequate

Table 1. Characterization of the sample of women who went into labor in the period from July 28, 2011 and July 27, 2013 (N=1851). National Health Research. Brazil, 2013.

Variables	N(%)
Had six or more visits	
No	357 (16.0)
Yes	1494 (84.0)
Started prenatal care with 20 weeks of pregnancy or less	
No	144 (7.4)
Yes	1707 (92.6)
Lives with a partner	
No	405 (19.0)
Yes	1446 (81.0)
Visits scheduled by the Brazilian public health system	
All or some of them	1389 (72.5)
None	462 (27.5)
Professional assisting most visits	
Non-physician	594 (28.3)
Physician	1257 (71.6)
Blood pressure measured in all visits	
No	188 (7.8)
Yes	1663 (92.2)
Weight measured in all visits	
No	174 (8.0)
Yes	1677 (92.0)
Blood test performed during prenatal care	
No	50 (2.7)
Yes	1801 (97.3)
Urine test performed during prenatal care	
No	52 (1.9)
Yes	1799 (98.1)
Ultrasound performed during prenatal care	
No	11 (0.3)
Yes	1793 (99.7)
Skin color	
White	593 (40.2)
Black	167 (8.6)
Yellow	24 (1.1)
Brown	1052 (49.9)
Indigenous	15 (0.2)
Level of education	
Uneducated	133 (0.6)
Elementary school	608 (30.2)
High school	852 (47.2)
Higher education	325 (16.8)
Age in years	
18 – 19	148 (9.2)
20 – 29	972 (50.6)
30 – 39	662 (36.2)
40 or older	69 (3.9)

prenatal care according to both quality criteria was found in the southeast region (Outcome 1 = 86.3%; Outcome 2 = 78.5%, respectively), while the lowest prevalence was found in the north re-

Table 2. Quality of prenatal care in Brazil and macro-regions. National Health Research (N = 1851), Brazil, 2013.

Prenatal assessment	Brazil % (95%CI)	North % (95%CI)	Northeast % (95%CI)	Southeast % (95%CI)	South % (95%CI)	Midwest % (95%CI)	p-value*
Outcome 1 (Starting up to 20 weeks and six visits or more)	80.6 (77.6; 83.6)	69.5 (62.5; 76.5)	76.1 (70.6; 81.6)	86.3 (80.8; 91.7)	82.7 (76.2; 90.2)	80.0 (73.1; 86.9)	0.005
Outcome 2 (Starting up to 20 weeks, six visits or more, blood pressure and weight measured in all visits, blood and urine tests performed, and at least one ultrasound)	71.4 (68.1; 74.7)	57.1 (49.7; 64.4)	64.8 (58.6; 70.9)	78.5 (72.7; 84.4)	76.0 (67.5; 84.4)	70.5 (63.0; 78.1)	<0.001

95%CI - 95% confidence interval. *Chi-square test.

gion (Outcome 1 = 69.5%; Outcome 2 = 57.1%, respectively).

Table 3 shows the prevalence of Outcome 1 according to the categories of the different exploratory variables and the crude and adjusted prevalence ratios (PR). As for skin color, the highest prevalence of adequate prenatal care was found for white women (87.8%). Regarding level of education, the highest prevalence of quality prenatal care was seen among women with medium level (86.8%). As for age, the highest prevalence of adequate prenatal care was described for women between 30 and 39 years old (87.5%). Higher prevalence was found among women whose visits were not scheduled through the public health system (92.7%) and among those who were assisted by a physician in most visits (92.7%).

The age of participants, level of education, and type of professional assisting the visits lost their association with the outcome after adjustments among themselves and for skin color (Table 3). The age and professional assisting most visits did not remain in the adjusted model. The likelihood of adequate prenatal care was lower among women reporting non-white skin color. Women who did not schedule any visits through the public health system were 1.14 times more likely to have received a quality prenatal care when compared to users of the public health system.

Table 4 presents the analyses of adequacy of prenatal care considering the performance of tests and procedures, as well as early start and having six prenatal visits or more (Outcome 2). The prevalence of adequate prenatal care was higher among white women (80.1%), with higher level of education (high school and higher education - 79.0% and 75.6%, respectively), aged between 30 and 39 years (79.1%), with no visits scheduled through the public health system (86.7%), and who were assisted by a physician (75.4%).

After the confounding adjustment, the association with the professional assisting prenatal care did not remain and this variable was removed from the model (p = 0.275) (Table 4). The likelihood of adequate prenatal care was lower among non-white women when compared with white ones, and brown women presented the lowest likelihood. When compared with uneducated women, those with some level of education presented higher likelihood of quality prenatal care, and the highest rates were among women who went to high school. After the adjustment, age was no longer associated with adequacy of prenatal care, but it was maintained in the mod-

Table 3. Prevalence (%) and crude and adjusted prevalence ratios (PR) of the quality of prenatal care (Outcome 1). National Health Research (N = 1851). Brazil, 2013.

Variables	Prevalence	p-value*	Crude PR (95%CI)	p-value**	Adjusted PR (95%CI)	p-value**
Lives with a partner		0.099		0.131		0.584
No	75.6		1.00		1.00	
Yes	81.8		1.08 (0.98; 1.20)		1.03 (0.93; 1.13)	
Skin color		<0.001		<0.001		0.010
White	87.8		1.00		1.00	
Black	76.9		0.88 (0.77; 1.00)		0.90 (0.80; 1.02)	
Yellow	75.2		0.86 (0.59; 1.24)		0.88 (0.61; 1.26)	
Brown	75.6		0.86 (0.80; 0.93)		0.90 (0.84; 0.97)	
Indigenous	77.3		0.88 (0.70; 1.10)		0.93 (0.78; 1.11)	
Level of education		<0.001		0.001		0.197
Uneducated	71.3		1.00		1.00	
Elementary school	70.9		0.99 (0.79; 1.25)		1.01 (0.81; 1.27)	
High school	86.8		1.22 (0.98; 1.51)		1.18 (0.96; 1.45)	
Higher education	83.9		1.18 (0.94; 1.47)		1.03 (0.82; 1.29)	
Age in years		0.006		0.013		0.151
18 – 19	72.6		1.00		1.00	
20 – 29	77.6		1.07 (0.90; 1.27)		1.03 (0.88; 1.21)	
30 – 39	87.5		1.20 (1.02; 1.42)		1.12 (0.96; 1.31)	
40 or older	75.0		1.03 (0.79; 1.34)		1.00 (0.79; 1.28)	
Visits scheduled by the Brazilian public health system		<0.001		<0.001		<0.001
All or some of them	76.1		1.00		1.00	
None	92.7		1.22 (1.14; 1.30)		1.14 (1.06; 1.23)	
Professional assisting most visits		<0.001		0.001		0.275
Non-physician	76.1		1.00		1.00	
Physician	92.7		1.16 (1.06; 1.27)		1.05 (0.96; 1.16)	

Outcome 1: starting up to 20 weeks and six visits or more.
*Chi-square test. **Wald test. PR - prevalence ratios; 95%CI - 95% confidence interval.

el for confounding control. The likelihood of adequate prenatal care among women who did not schedule visits through the public health system was 15% higher than for users of the public health system.

Discussion

The analyses hereby performed suggest a high rate of prenatal care coverage in Brazil. However, when including the measurement of blood pressure and weight, performance of blood and urine tests, and at least one ultrasound during pregnancy in the quality criteria, such rate decreases. Moreover, in spite of the high coverage, the findings indicate inequities in prenatal care mostly related to skin color and region of the country.

A recent study by Tomasi et al.[16] including all Basic Health Units (BHU) included in the Brazilian Registry of Health Facilities located in the urban and rural areas of the 5,565 cities of Brazil, as well as the Federal District, showed that 89% of women participating in BHU had six or more visits during prenatal care. However, when adding information on vaccine conditions, prescription of ferrous sulphate, physical examination procedures, instructions provided, and additional tests performed, the rate of adequate prenatal care dropped to 15%. This means that although the number of prenatal visits is adequate, the quality is far below ideal according to the procedures recommended by the Brazilian Ministry of Health. The authors also found worse quality indexes of prenatal care among the younger women (especially among adolescent mothers) and among those with lower income.

Our study used age, level of education, and skin color as markers for socioeconomic and demographic conditions. Although the crude analyses for level of education and skin color were associated with both outcomes of quality

Table 4. Prevalence (%) and crude and adjusted prevalence ratios (PR) of the quality of prenatal care (Outcome 2). National Health Research (N = 1851). Brazil, 2013.

Variables	Prevalence	p-value*	Crude PR (95%CI)	p-value**	Adjusted PR (95%CI)	p-value**
Lives with a partner		0.058		0.078		0.584
No	64.9		1.00		1.00	
Yes	72.9		1.12 (0.99; 1.28)		1.03 (0.93; 1.13)	
Skin color		<0.001		<0.001		0.011
White	80.1		1.00		1.00	
Black	71.5		0.89 (0.76; 1.04)		0.90 (0.80; 1.02)	
Yellow	63.7		0.79 (0.50; 1.26)		0.88 (0.61; 1.26)	
Brown	64.6		0.81 (0.73; 0.88)		0.91 (0.84; 0.97)	
Indigenous	66.2		0.83 (0.54; 1.26)		0.93 (0.78; 1.11)	
Level of education		<0.001		<0.001		0.263
Uneducated	54.9		1.00		1.00	
Elementary school	60.3		1.10 (0.81; 1.49)		1.00 (0.80; 1.26)	
High school	79.0		1.43 (1.08; 1.91)		1.16 (0.95; 1.43)	
Higher education	75.6		1.38 (1.02; 1.85)		1.02 (0.82; 1.27)	
Age in years						0.151
18 – 19	61.8	0.005	1.00	0.003	1.00	
20 – 29	67.8		1.10 (0.89; 1.35)		1.03 (0.88; 1.21)	
30 – 39	79.1		1.27 (1.04; 1.56)		1.12 (0.95; 1.31)	
40 or older	69.3		1.12 (0.83; 1.52)		1.00 (0.79; 1.28)	
Visits scheduled by the Brazilian public health system		<0.001		<0.001		<0.001
All or some of them	65.6		1.00		1.00	
None	86.7		1.32 (1.22; 1.43)		1.15 (1.06; 1.23)	
Professional assisting most visits		<0.001		0.001		0.275
Non-physician	61.4		1.00		1.00	
Physician	75.4		1.22 (1.09; 1.38)		1.05 (0.96; 1.16)	

Outcome 2: starting up to 20 weeks, six visits or more, blood pressure and weight measured in all visits, blood and urine tests performed, and at least one ultrasound.
*Chi-square test. **Wald test. PR - prevalence ratios; 95%CI - 95% confidence interval.

of prenatal care, the effect of level of education disappeared when they were mutually adjusted. Thus, it is understood that the variable of skin color is a better marker for socioeconomic and demographic positions when assessing quality of prenatal care, showing higher rates of inadequate prenatal care among women with brown and black skin color than those with white skin color. However, it is worth noting that cohort studies performed in Brazil indicate the association between low level of education and inadequacy of prenatal care[17,18].

The literature does not fully explain the relationship between color/race and quality of prenatal care. Some studies do not describe this association[16], while others highlight skin color (black or brown) as a risk factor for inadequate prenatal care[19,20]. These data agree with studies on racial discrimination by health professionals toward non-white women. Such studies found

lower access to the use of anesthetics in vaginal labor, regardless of the level of education, among black women[20]; less Pap smear tests performed in brown and black women than in white ones, in both public and private sectors, although the frequency of gynecological visits was the same[21]; and higher risk of sterilization surgery among brown women than among white ones, regardless of other sociodemographic characteristics[22]. Additionally, it could be verified that non-white women usually belong to a disadvantaged socioeconomic class and they are concentrated in underdeveloped regions of the country[19,23].

However, the residual confounding effect of socioeconomic position might also explain the worse prenatal care conditions among non-white women found in the present study, considering that markers of socioeconomic position that could help explaining the inequalities of skin color in the quality of prenatal care, such as in-

come and occupation, were not included in the analyses.

Besides the lower rates of adequate prenatal care among brown or black women, our results show that the rate of adequate prenatal care presented major differences according to Brazilian macro-regions, with the lowest prevalence found in the north and northeast.

Reinforcing other national studies[24,25], both outcomes hereby assessed showed that women in the north and northeast regions presented the lowest rates of adequate prenatal care, while the southeast region, followed by the south, presented the highest rates. Thus, it becomes evident that there is a regional inequity for the access to quality prenatal care and that the results of the programs of the Ministry of Health, such as the Prenatal and Birth Humanization Program (*Programa de Humanização no Pré-Natal e Nascimento* - PHPN), cannot be assessed for all of Brazil, but rather for each macro-region in isolation.

In poor cities of the north and northeast regions of Brazil, from 2002 to 2005, the frequency of six or more prenatal visits increased from 42% to 52% and pelvic ultrasounds increased from 44% to 64%[2]. A study performed in poor areas of such regions, assisted by the Pastoral Care of Children, showed that approximately 85% of the mothers of these children had at least one prenatal visit and two-thirds of them started in the first trimester of pregnancy. However, slightly over 40% had six or more visits during pregnancy. A significant rate of mothers was not subjected to basic laboratory and clinical tests during pregnancy[26]. This suggests that the expansion in health services is not being followed by quality improvements.

The mothers who scheduled visits through the Brazilian public health system also presented worse indexes. Thus, it seems evident that there are inequities in quality prenatal care despite the high coverage. The findings of the present study indicate the fact that, in Brazil, prenatal care in the public sector has lower quality than in the non-public sector (private and supplementary). Such differences were described previously by other studies[17,27,28]. This situation reflects inequities in the access to quality prenatal care, which would probably not fully represent a direct reflection of the lack of material and human resources for medical assistance, rather than the lack of engagement and training of teams for quality prenatal care. The Brazilian Ministry of Health has developed, over the last decades, actions and programs to improve the access and quality of prenatal care in the public health system. Thus, the PHPN appears as an initiative to improve the access and coverage of quality prenatal care, as well as labor assistance and neonatal care in Brazil, by recommending interventions that are known as beneficial for the mother-child binomial[29]. Hence, some advances may be observed, such as the reduction of child and maternal mortality over the last years[9]. The Stork Network program, launched in 2011 by the Ministry of Health, is another attempt to improve the quality of prenatal care in Brazil, as well as the access to family planning, especially in poorer areas. The program includes four components: 1) prenatal care; 2) labor and childbirth assistance; 3) puerperium care and integral child health care; and 4) logistic system related to sanitary transportation and regulation[30]. The data used in this analysis were collected in 2013. Although the present study does not aim to perform a formal assessment of the Stork Network, the data suggest that the goals of quality of prenatal care in the public health system were not reached yet, and efforts are required for such purpose.

When adding the measurement of blood pressure and weight, performance of blood and urine tests, and ultrasound to the Takeda index[15], we understand that these variables are classified as high level of recommendation for adequate prenatal care and belong to the recommendations of the Brazilian Ministry of Health by the Stork Network itself[7,8]. The Ministry recommends, in the Primary Care Register for low-risk prenatal care[6], the performance of laboratory tests that allow early interventions in the population of pregnant women. Such tests may detect infectious diseases such as syphilis, HIV, toxoplasmosis, and hepatitis B, as well as urinary infections, anemia, and diabetes, and prevent Rh conflict[6]. Performing urine tests also enters the list of highly recommended tests, because urinary infections are more recurring in pregnant women and promote premature birth or neonatal sepsis, as well as other changes such as microalbuminuria[31].

Hence, besides the tests hereby analyzed, the National Health Research collected information on syphilis and HIV tests, uterine fundus measurement, auscultation of fetal heart beats, and breast exams, which might enhance our quality indicator for prenatal care and show more strongly the level of adequacy in the several regions of the country. However, we chose not to include these data in the analyses because the rate of women that claimed not knowing whether a particular type of test was performed was rather high.

Other limitations of the study may come from the fact that some major variables of interest were not collected by the National Health Research, such as vaccination. Moreover, the National Health Research is a survey with cross-sectional data collection, which hinders the potential relationships of temporality, thus affecting the inference on cause and effect.

Although the coverage of prenatal visits is almost universal, a low quality is still observed for the assistance of pregnant women, with the non-compliance of the minimum recommended by the PHPN, especially in the poorest regions of Brazil. It is important, overall, to ensure training to the professionals involved in this process so that follow-up continuity is guaranteed and qualified.

Collaborations

DN Mario, LMM Malvestio and J Martínez-Mesa: conception and design of the study, analysis and interpretation of the results. DN Mario, L Rigo, D Anziliero and KLS Boclin: writing and critical review of content. BL Horta and FC Wehrmeister: critical review of the intellectual content and approval of the final version of the manuscript.

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