DOI: 10.1590/1980-5497201600040013

ORIGINAL ARTICLE / *ARTIGO ORIGINAL*

Regional differences and factors associated with the number of prenatal visits in Brazil: analysis of the Information System on Live Births in 2013

Diferenças regionais e fatores associados ao número de consultas de pré-natal no Brasil: análise do Sistema de Informações sobre Nascidos Vivos em 2013

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ABSTRACT: ***Objective:*** To investigate factors associated with seven or more prenatal visits, in Brazil, in 2013. ***Methods:*** Cross-sectional study from the database of Information System on Live Births. The association of explanatory variables was tested with prenatal visits by means of the analysis of single and multiple multinomial regressions. The spatial distribution of prenatal visits according to the Brazilian municipalities was also analyzed. ***Results:*** It was found that 2.7% of pregnant women attended no prenatal visit and 63.1% attended 7 or more. The chance to attend 7 or more prenatal visits was higher among pregnant women aged 40 years or more, with 12 years or more of schooling, living with a roommate, living in the South and Southeast regions, who had a triplet or more pregnancy, with gestational age of 42 weeks or more, and who had children with normal birth weight. Significant regional disparities were identified in the prevalence of women with seven or more prenatal visits. ***Conclusion:*** Although Brazil has a Unified Health System that provides universal prenatal care, the use of this service is uneven according to geographic, demographic, and socioeconomic characteristics.

Keywords: Prenatal care. Information systems. Unified Health System. Risk factors. Health inequalities. Brazil.

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Conflict of interests: nothing to declare – **Financial support:** none.

RESUMO: ***Objetivo:*** Investigar os fatores associados à realização de sete ou mais consultas pré-natal, no Brasil, no ano de 2013. ***Métodos:*** Realizou-se estudo transversal com base no banco de dados do Sistema de Informações sobre Nascidos Vivos. Testou-se a associação de variáveis exploratórias com a realização de consultas pré-natal por meio da análise de regressão multinomial simples e múltipla. Também foi analisada a distribuição espacial da realização de consultas pré-natal segundo os municípios brasileiros. ***Resultados:*** Verificou-se que 2,7% das gestantes não realizaram consulta pré-natal e 63,1% realizaram 7 ou mais consultas. A chance de realizar 7 ou mais consultas pré-natal foi maior entre as gestantes com 40 anos ou mais, com 12 anos ou mais de escolaridade, que viviam com um companheiro, que residiam nas regiões Sul e Sudeste, que tinham gestação tripla ou mais, com idade gestacional de 42 semanas ou mais e que tiveram filhos com peso normal ao nascer. Identificou-se expressiva desigualdade regional na prevalência de gestantes com sete ou mais consultas pré-natal. ***Conclusão:*** Apesar de o Brasil possuir um Sistema Único de Saúde que oferece assistência pré-natal universal, o uso desse serviço é desigual segundo características geográficas, demográficas e socioeconômicas das gestantes.

Palavras-chave: Cuidado pré-natal. Sistemas de informação. Sistema Único de Saúde. Fatores de risco. Desigualdades em saúde. Brasil.

INTRODUCTION

Access to prenatal care is associated with better health outcomes for pregnant women and newborns. This care is essential to prevent and/or early detect maternal and fetal pathologies, promoting the healthy development of the baby and reducing the risk to the pregnant women[1]. By monitoring the pregnancy since the first quarter there is greater possibility of the mother undergo laboratory tests, reducing maternal and child morbidity and mortality. Consequently, the results are better intrauterine growth, higher birth weight, fewer occurrences of prematurity and neonatal mortality, and, for the mother, lower rate of complications during pregnancy and at delivery[1].

Studies show that the higher the number of prenatal visits, the lower the neonatal[2] and maternal[3,4] mortality rates, the prevalence of prematurity[3], the low birth weight[5,6], and the hypertension during pregnancy[3,4]. In this scenario, the anti-tetanus vaccination coverage[7] and supplementation with ferrous sulfate[7] are also greater.

Owing to these benefits indicated by the literature and in order to improve access, coverage, and quality of prenatal care in Brazil, the Ministry of Health launched, in 2000, the Program of Humanization in Prenatal and Birth (PHPN). Among other guidelines, the document recommends that pregnant women attend at least six prenatal visits during pregnancy: one in the first quarter, two in the second, and three in the third[1].

Studies that analyzed the factors associated with low number of prenatal care visits found that this negative outcome is more common among women with low education[8], pregnant adolescents[2,8], with high parity[6,8], and living without a partner[6]. However, in Brazil,

published studies refer to municipal and/or regional data[2,6,8], and the national data are essentially descriptive[9].

To increase knowledge on attending prenatal visits in a country marked by social and economic inequalities and differences in the access to health services — despite the assistance to pregnant women be offered free under a public and universal health system — is essential to support health policies and actions in the area. Therefore, the present study aimed at investigating the factors associated with conducting prenatal visits in Brazil in 2013.

METHODS

We conducted a cross-sectional study based on microdata coming from Information System on the Live Births (SINASC). Implemented by the Ministry of Health in 1990 to gather epidemiological information concerning births throughout the national territory, SINASC is based on the Declaration of Live Birth (DNV), which includes an extensive set of data on the mother, prenatal care, childbirth, and newborn[10].

The population of this study consisted of all live births in 2013 in Brazil. We opted for the year 2013 because it was the last period with complete data available in the system when this research was carried out. The information was obtained in October 2015, based on SINASC microdata, which was made available by the Department of Technology of the Unified Health System (SUS), and on those of public domain. Initially available in DBC format (database container), the data were expanded to DBF (database files) and then converted to DTA (data).

The outcome analyzed was the number of prenatal visit attended by the pregnant women, categorized into four groups by SINASC "no prenatal visit," "1–3 prenatal visits," "4–6 prenatal visits," and "7 or more prenatal visits." The independent variables were mother's age ("40 years or more," "30–39 years," "20–29 years," and "up to 19 years"); schooling in years ("illiterate," "1–3 years", "4–7 years", "8–11 years," and "12 or more"); living with partner ("no," "yes"); skin color/race of the newborn ("yellow," "indigenous," "black," "white," and "brown"); region of residence ("Midwest," "North," "South," "Northeast," and "Southeast"); type of pregnancy ("single," "twin," and "triplet or more"); gestational age ("up to 36 weeks," "37–41 weeks," "42 weeks or more"); and low birth weight ("yes," "no").

Initially, the prevalence of the variable of interest with the respective confidence intervals of 95% (95%CI) for the total sample and for each exploratory variable was calculated. Then, analysis of single and multiple multinomial regressions were carried out to test the association of the factors studied with the occurrence of prenatal care visits. All variables with p-value ≤ 0.20 in the simple regression analysis were selected for the multivariate model. Multiple regression followed the step-by-step model, and the input of the variables was performed according to the p-value. Those variables that remained with p-value ≤ 0.05 were kept in the multiple regression model. In both analyses, the crude and adjusted odds ratios (OR) were estimated as well as the respective CIs. In addition, the spatial distribution of the occurrence of prenatal visits in the country was analyzed. The values of the outcome

variable were obtained for all Brazilian municipalities and plotted on a map. The construction and analysis of the database were carried out by means of software TabWin32 (Ministry of Health, Brazil) and Stata 13.1 (Stata Corporation, College Station, USA).

RESULTS

In 2013, 2,904,027 births were registered in Brazil. The average age of pregnant women was 26.0 years (standard deviation of 6.6 years), 55.2% were brown, and 73.4% had eight years or more of schooling. Nearly two in three (63.1%) pregnant women had seven or more prenatal visits. The highest prevalence of occurrence of 7 or more prenatal visits was observed among women who lived in the South Region (74.7%), were aged between 30 and 39 years (71.7%), had 12 years or more of schooling (82.8%), lived with a partner (67.9%), had babies classified as white (75.9%), had three pregnancies or more (65.4%), had between 37 and 41 weeks of gestation (66.9%), and had children with normal birth weight (64.7%) (Table 1).

In the crude analysis, all the investigated variables were statistically associated with the prenatal visits attendance (Table 2). Women aged 30–39 years were 1.31 times more likely to have 7 or more prenatal visits in relation to have none when compared to women aged 40 years or more. Pregnant women living with a partner, who had more years of schooling, who had 42 weeks or more of gestation, and had children with normal birth weight showed greater chances to attend seven or more prenatal doctor visits in relation to the reference group.

Table 3 shows the variables that remained associated with prenatal visits attendance after the adjusted analysis. The association between the occurrence of seven or more prenatal visits and women aged 30–39 years was not maintained. It is worth noting that women with 12 or more years of schooling were 9.82 times more likely to have 7 or more prenatal visits in relation to do not have any visit, when compared to illiterate women. Women who had babies classified as indigenou and black were less likely to have seven or more prenatal visits in relation to no prenatal visit when compared to women who had babies classified as yellow. In addition, residents in the South and Southeast regions also showed greater chances to perform seven or more visits compared to the reference category.

As for the spatial analysis, there were wide regional differences in the occurrence of prenatal visits. In the North region, there is greater proportion of municipalities with low prevalence of occurrence of seven or more prenatal visits and high prevalence of zero to three prenatal visits, whereas in South and Southeast there is greater proportion of municipalities with high percentages of seven or more prenatal visits (Figures 1A and 1B).

DISCUSSION

The results of this research showed that in Brazil in 2013 the proportion of pregnant women who attended seven or more prenatal visits was 63.1%. Among the variables

Table 1. Distribution of risk factors associated with prenatal visits attendance, according to demographic and socioeconomic variables. Brazil, 2013.

Variables	Number of prenatal visits				
	Total sample n (%)	No visit %(95%CI)	1–3 visits %(95%CI)	4–6 visits %(95%CI)	7 or more visits %(95%CI)
Age (years)					
40 or more	69,655 (2.4)	3.1 (2.9 – 3.2)	6.6 (6.4 – 6.7)	23.3 (23.0 – 23.6)	67.1 (66.7 – 67.4)
30 – 39	831,542 (28.6)	2.5 (2.4 – 2.5)	4.9 (4.8 – 4.9)	20.9 (20.8 – 21.0)	71.7 (71.6 – 71.8)
20 – 29	1,442,798 (49.7)	2.7 (2.7 – 2.7)	7.4 (7.3 – 7.4)	27.2 (27.1 – 27.2)	62.8 (62.7 – 62.8)
Up to 19	559,991 (19.3)	3.0 (3.0 – 3.1)	11.3 (11.2 – 11.4)	35.0 (34.8 – 35.1)	50.7 (50.6 – 50.9)
Schooling (years)					
Illiterate	21,638 (0.8)	11.9 (11.4 – 12.3)	23.4 (22.8 – 24.0)	34.6 (34.0 – 35.3)	30.1 (29.5 – 30.7)
1 – 3	110,812 (3.9)	5.7 (5.5 – 5.8)	15.7 (15.5 – 16.0)	34.9 (34.6 – 35.2)	43.7 (43.4 – 44.0)
4 – 7	622,922 (21.9)	3.7 (3.6 – 3.7)	12.4 (12.3 – 12.5)	34.1 (34.0 – 34.2)	49.9 (49.7 – 50.0)
8 – 11	1,621,872 (56.9)	2.0 (2.0 – 2.0)	6.2 (6.2 – 6.3)	27.1 (27.0 – 27.1)	64.6 (64.6 – 64.7)
12 or more	469,132 (16.5)	1.7 (1.6 – 1.7)	2.0 (1.9 – 2.0)	13.5 (13.4 – 13.6)	82.8 (82.7 – 82.9)
Lives with partner					
No	1,194,855 (41.7)	3.4 (3.3 – 3.4)	9.4 (9.4 – 9.5)	30.4 (30.3 – 30.5)	56.7 (56.7 – 56.8)
Yes	1,672,383 (58.3)	2.1 (2.1 – 2.1)	5.9 (5.8 – 5.9)	24.1 (24.1 – 24.2)	67.9 (67.8 – 67.9)
Color of skin/ race					
Yellow	11,555 (0.4)	2.3 (2.0 – 2.6)	6.4 (5.9 – 6.8)	23.6 (22.8 – 24.4)	67.7 (66.8 – 68.6)
Indigenous	21,749 (0.8)	8.5 (8.1 – 8.9)	24.6 (24.1 – 25.2)	40.0 (39.3 – 40.6)	26.9 (26.3 – 27.5)
Black	155,131 (5.6)	3.2 (3.1 – 3.3)	9.6 (9.5 – 9.8)	29.6 (29.4 – 29.8)	57.6 (57.3 – 57.8)
White	1,051,251 (38.0)	1.5 (1.5 – 1.5)	3.9 (3.9 – 4.0)	18.6 (18.5 – 18.7)	75.9 (75.9 – 76.0)
Brown	1,529,021 (55.2)	3.1 (3.0 – 3.1)	9.3 (9.2 – 9.3)	31.8 (31.7 – 31.9)	55.8 (55.7 – 55.9)

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Table 1. Continuation.

Variables	Number of prenatal visits				
	Total sample n (%)	No visit %(95%CI)	1–3 visits %(95%CI)	4–6 visits %(95%CI)	7 or more visits %(95%CI)
Region of residence					
Midwest	234,687 (8.1)	3.1 (3.0 – 3.2)	6.4 (6.3 – 6.5)	25.6 (25.4 – 25.7)	64.9 (64.7 – 65.1)
North	313,272 (10.8)	5.1 (5.0 – 5.1)	14.5 (14.4 – 14.7)	38.1 (37.9 – 38.3)	42.3 (42.1 – 42.4)
South	386,983 (13.3)	1.3 (1.2 – 1.3)	4.7 (4.6 – 4.7)	19.3 (19.2 – 19.5)	74.7 (74.6 – 74.8)
Northeast	821,458 (28.3)	3.9 (3.9 – 4.0)	9.9 (9.8 – 10.0)	34.9 (34.8 – 35.0)	51.2 (51.1 – 51.3)
Southeast	1,147,627 (39.5)	1.6 (1.6 – 1.6)	4.8 (4.7 – 4.8)	20.6 (20.6 – 20.7)	73.0 (72.9 – 73.0)
Type of pregnancy					
Single	2,839,254 (97.9)	2.6 (2.6 – 2.7)	7.4 (7.4 – 7.4)	26.8 (26.7 – 26.8)	63.2 (63.1 – 63.2)
Twin	57,956 (2.0)	2.8 (2.7 – 3.0)	7.3 (7.1 – 7.5)	26.5 (26.1 – 26.9)	63.3 (62.9 – 63.7)
Triplet or more	1.466 (0.1)	3.2 (2.3 – 4.1)	7.8 (6.4 – 9.2)	23.5 (21.3 – 25.7)	65.4 (63.0 – 67.9)
Gestational age (weeks)					
Up to 36	333,452 (11.9)	3.0 (3.0 – 3.1)	14.1 (14.0 – 14.3)	37.7 (37.5 – 37.8)	45.1 (45.0 – 45.3)
37 – 41	2,354,242 (84.4)	1.8 (1.8 – 1.8)	6.2 (6.2 – 6.2)	25.1 (25.1 – 25.2)	66.9 (66.8 – 66.9)
42 or more	102,825 (3.7)	1.5 (1.5–1.6)	8.2 (8.0–8.4)	28.5 (28.2–28.7)	61.8 (61.5–62.1)
Low birth weight					
Yes	247,126 (8.5)	5.0 (4.9 – 5.1)	13.6 (13.5 – 13.8)	35.1 (35.0 – 35.3)	46.2 (46.0 – 46.4)
No	2,654,890 (91.5)	2.5 (2.4 – 2.5)	6.8 (6.8 – 6.8)	26.0 (26.0 – 26.1)	64.7 (64.7 – 64.8)
Total	2,904,027 (100.0)	2.7 (2.7 – 2.7)	7.4 (7.4 – 7.4)	26.8 (26.7 – 26.8)	63.1 (63.1 – 63.2)

95%CI: 95% confidence interval.

Table 2. Crude analysis of the risk factors associated with prenatal visits attendance according to demographic and socioeconomic variables. Brazil, 2013.

Variables	Number of prenatal visits		
	1–3 visits OR (95%CI)	4–6 visits OR (95%CI)	7 or more visits OR (95%CI)
Age (years)			
40 or more	1.00	1.00	1.00
30 – 39	0.91 (0.87 – 0.97)	1.10 (1.05 – 1.16)	1.31 (1.26 – 1.38)
20 – 29	1.27 (1.21 – 1.34)	1.32 (1.26 – 1.38)	1.06 (1.01 – 1.11)
Up to 19	1.74 (1.65 – 1.84)	1.52 (1.45 – 1.59)	0.76 (0.73 – 0.80)
p-value	≤ 0.001	≤ 0.001	≤ 0.001
Schooling (years)			
Illiterate	1.00	1.00	1.00
1 – 3	1.41 (1.33 – 1.49)	2.11 (2.00 – 2.22)	3.04 (2.88 – 3.20)
4 – 7	1.72 (1.63 – 1.80)	3.19 (3.05 – 3.35)	5.38 (5.12 – 5.64)
8 – 11	1.56 (1.48 – 1.64)	4.58 (4.37 – 4.80)	12.58 (12.00 – 13.19)
12 or more	0.60 (0.57 – 0.64)	2.80 (2.66 – 2.95)	19.71 (18.72 – 20.75)
p-value	≤ 0.001	≤ 0.001	≤ 0.001
Lives with partner			
No	1.00	1.00	1.00
Yes	0.99 (0.97 – 1.00)	1.26 (1.24 – 1.28)	1.89 (1.87 – 1.92)
p-value	0.136	≤ 0.001	≤ 0.001
Color of skin/race			
Yellow	1.00	1.00	1.00
Indigenous	1.04 (0.90 – 1.21)	0.46 (0.40 – 0.52)	0.11 (0.09 – 0.12)
Black	1.08 (0.93 – 1.25)	0.90 (0.79 – 1.02)	0.61 (0.54 – 0.69)
White	0.94 (0.81 – 1.08)	1.20 (1.06 – 1.36)	1.71 (1.51 – 1.93)
Brown	1.09 (0.95 – 1.06)	1.01 (0.89 – 1.15)	0.62 (0.55 – 0.70)
p-value	≤ 0.001	≤ 0.001	≤ 0.001

Continue...

Table 2. Continuation.

Variables	Number of prenatal visits		
	1–3 visits OR (95%CI)	4–6 visits OR (95%CI)	7 or more visits OR (95%CI)
Region of residence			
Midwest	1.00	1.00	1,00
North	1.38 (1.33 – 1.43)	0.91 (0.88 – 0.94)	0,40 (0,39 – 0,41)
South	1.74 (1.66 – 1.81)	1.81 (1.75 – 1.88)	2,76 (2,66 – 2,87)
Northeast	1.21 (1.18 – 1.25)	1.08 (1.05 – 1.11)	0,62 (0,61 – 0,64)
Southeast	1.42 (1.37 – 1.46)	1.55 (1.50 – 1.59)	2,15 (2,09 – 2,21)
p-value	≤ 0.001	≤ 0.001	≤ 0.001
Type of pregnancy			
Single	1.00	1.00	1,00
Twin	0.92 (0.87 – 0.98)	0.92 (0.87 – 0.97)	0,93 (0,89 – 0,98)
Triplet or more	0.88 (0.62 – 1.24)	0.73 (0.54 – 0.99)	0,86 (0,64 – 1,16)
p-value	0.005	≤ 0.001	0.004
Gestational age (weeks)			
Up to 36	1.00	1.00	1,00
37 – 41	0.74 (0.72 – 0.76)	1.12 (1.10 – 1.15)	2,50 (2,44 – 2,55)
42 or more	1.14 (1.07 – 1.20)	1.48 (1.40 – 1.56)	2,68 (2,54 – 2,83)
p-value	≤ 0.001	≤ 0.001	≤ 0.001
Low birth weight			
Yes	1.00	1.00	1,00
No	1.01 (0.99 – 1.04)	1.50 (1.47 – 1.54)	2,85 (2,79 – 2,91)
p-value	0.183	≤ 0.001	≤ 0.001

OR: odds ratio; 95%CI: 95% confidence interval.

Table 3. Adjusted analysis of risk factors associated with prenatal visits attendance according to demographic and socioeconomic variables. Brazil, 2013.

Variables	Number of prenatal visits		
	1–3 visits OR (95%CI)	4–6 visits OR (95%CI)	7 or more visits OR (95%CI)
Age (years)			
40 or more	1.00	1.00	1.00
30 – 39	0.92 (0.86 – 0.99)	0.98 (0.92 – 1.04)	1.03 (0.97 – 1.09)
20 – 29	1.19 (1.11 – 1.27)	1.08 (1.02 – 1.15)	0.91 (0.85 – 0.96)
Up to 19	1.57 (1.46 – 1.68)	1.38 (1.29 – 1.47)	0.93 (0.87 – 0.98)
p-value	≤ 0,001	≤ 0.001	≤ 0.001
Schooling (in years)			
Illiterate	1.00	1.00	1.00
1 – 3	1.30 (1.21 – 1.40)	1.86 (1.73 – 1.99)	2.41 (2.25 – 2.59)
4 – 7	1.35 (1.26 – 1.44)	2.39 (2.24 – 2.55)	3.51 (3.29 – 3.75)
8 – 11	1.33 (1.24 – 1.42)	3.52 (3.30 – 3.75)	7.31 (6.85 – 7.79)
12 or more	0.66 (0.61 – 0.71)	2.44 (2.27 – 2.61)	9.82 (9.16 – 10.52)
p-value	≤ 0,001	≤ 0.001	≤ 0.001
Lives with partner			
No	1.00	1.00	1.00
Yes	1.11 (1.09 – 1.14)	1.39 (1.37 – 1.42)	1.91 (1.88 – 1.95)
p-value	≤ 0,001	≤ 0.001	≤ 0.001
Color of skin/ race			
Yellow	1.00	1.00	1.00
Indigenous	0.96 (0.79 – 1.15)	0.72 (0.61 – 0.86)	0.35 (0.29 – 0.41)
Black	0.82 (0.68 – 0.98)	0.76 (0.64 – 0.89)	0.62 (0.53 – 0.73)
White	0.77 (0.65 – 0.92)	0.93 (0.79 – 1.10)	1.15 (0.98 – 1.35)
Brown	0.91 (0.77 – 1.09)	0.97 (0.83 – 1.14)	0.87 (0.75 – 1.02)
p-value	≤ 0,001	≤ 0.001	≤ 0.001

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Table 3. Continuation.

Variables	Number of prenatal visits		
	1–3 visits OR (95%CI)	4–6 visits OR (95%CI)	7 or more visits OR (95%CI)
Region of residence			
Midwest	1.00	1.00	1.00
North	1.37 (1.31 – 1.43)	1.00 (0.96 – 1.04)	0.52 (0.50 – 0.54)
South	1.72 (1.64 – 1.81)	1.75 (1.67 – 1.83)	2.35 (2.25 – 2.46)
Northeast	1.53 (1.47 – 1.59)	1.52 (1.47 – 1.57)	1.03 (1.00 – 1.07)
Southeast	1.38 (1.33 – 1.44)	1.53 (1.48 – 1.59)	2.12 (2.04 – 2.19)
p-value	≤ 0,001	≤ 0.001	≤ 0.001
Type of pregnancy			
Single	1.00	1.00	1.00
Twin	1.02 (0.95 – 1.10)	1.31 (1.23 – 1.40)	1.93 (1.81 – 2.06)
Triplet or more	1.11 (0.72 – 1.72)	1.27 (0.85 – 1.89)	2.46 (1.66 – 3.64)
p-value	0,392	≤ 0.001	≤ 0.001
Gestational age (weeks)			
Up to 36	1.00	1.00	1.00
37 – 41	0.65 (0.63 – 0.67)	0.91 (0.88 – 0.94)	1.87 (1.82 – 1.92)
42 or more	0.93 (0.87 – 0.99)	1.25 (1.18 – 1.33)	2.87 (2.70 – 3.04)
p-value	≤ 0,001	0.827	≤ 0.001
Low birth weight			
Yes	1.00	1.00	1.00
No	1.37 (1.33 – 1.41)	1.84 (1.78 – 1.89)	2.92 (2.84 – 3.01)
p-value	≤ 0.001	≤ 0.001	≤ 0.001

OR: odds ratio; 95%CI: 95% confidence interval.

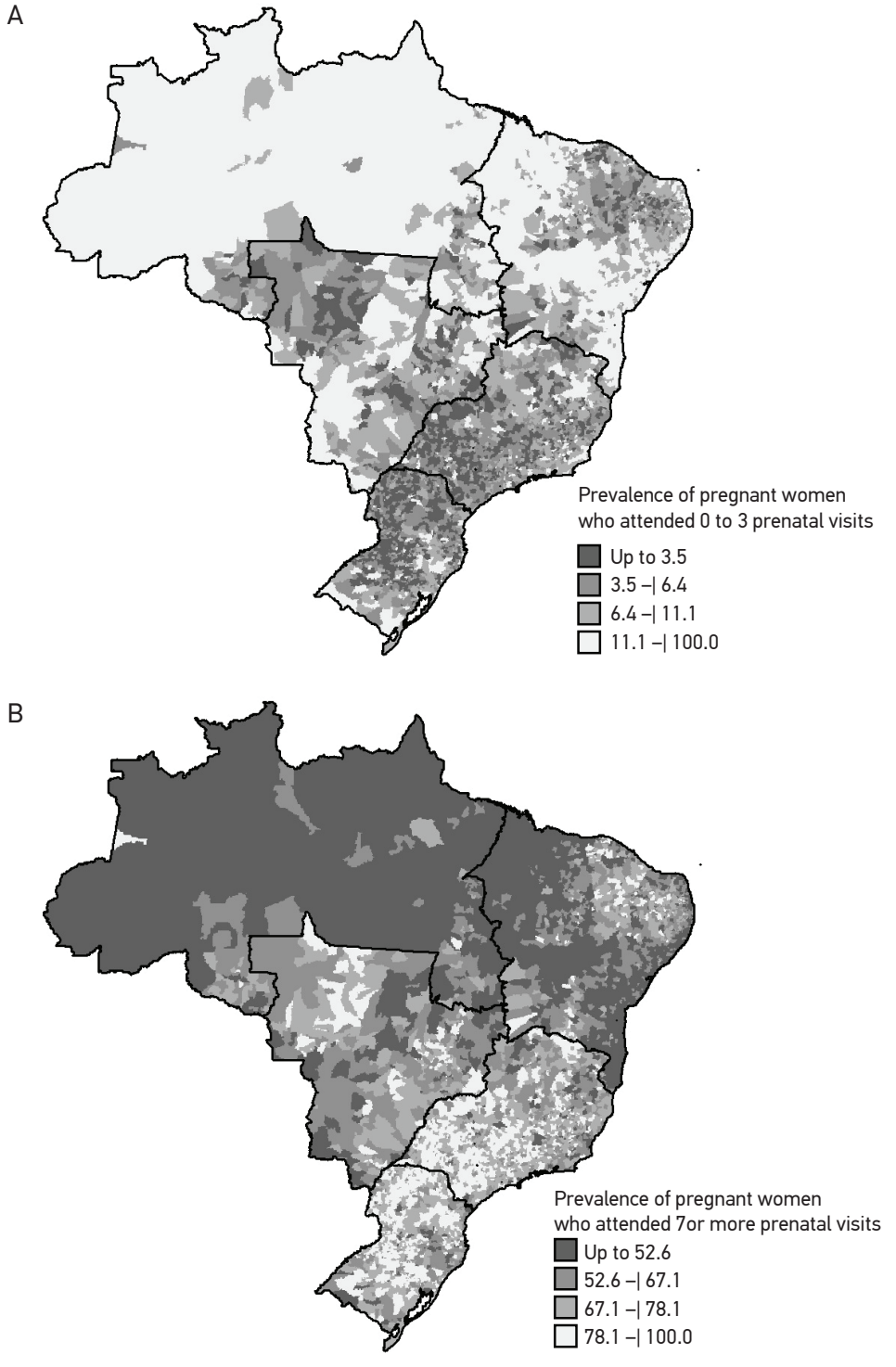

Figure 1. Spatial distribution of the municipalities of Brazil according to the attendance at (A) 0 to 3 prenatal visits and (B) 7 or more prenatal visits. Brazil, 2013.'

associated with higher prevalence of seven or more prenatal visits, greater schooling, living with partner, residing in the Southeast and South, having at least three pregnancies, having gestational age of 42 weeks or more, and having children with normal birth weight stood out.

Older women (aged 40 years or older) were more likely to attend seven or more prenatal visits. However, the data available in the literature are controversial. Whereas research indicates greater adherence to prenatal care among women aged 40 years or more, owing to the higher prevalence of maternal and fetal complications[11,12], especially preeclampsia, gestational diabetes, miscarriage, chromosomal abnormalities, maternal mortality, intrapartum meconium, low birth weight, fetal growth restriction, and macrosomia[11,12], other studies suggest that pregnant women in older ages tend to perform less than seven prenatal visits because they are multiparous, they became pregnant long after the last pregnancy, and they also justify not attending prenatal visits owing to the existence of priority events[13].

The level of education was another factor significantly associated with the occurrence of seven or more prenatal visits. Joshi et al. [14], in a study carried out in Nepal, found that the chances of attending four or more prenatal visits grew with better educational level of the pregnant women analyzed, being seven times higher when extreme groups of schooling were compared to each other. Similarly, in Colombia, Osorio et al.[15] found that higher levels of education (higher education) led to greater access and attendance of at least four prenatal visits during pregnancy.

The socioeconomic status of the individuals influences on their access to the childcare services[16]. Mothers with higher levels of education better understand the information and the actions that occur around, and are more capable of pursuing, processing, and applying the knowledge they acquired[16,17]. The level of education influences the attitude of women toward the information they receive, and the most educated have greater autonomy, ask more questions, and are more likely to be heard by the health professionals[18]. In addition, women with better education are more worried with the signs of complications in pregnancy, better understand the need for spacing births, and tend to adopt healthy eating habits, in order to avoid risks for them and for the baby[17].

The association between living with partner and higher prevalence of seven or more prenatal visits is similar to the findings of other authors[19,20]. Family, friends, and husband/partner seem to play an important role during pregnancy, which is a period that demands a lot of emotional stability[21,22]. The partner is the leading provider of social support in caring for the mother and baby[23], and their presence, support, and protection during pregnancy provide greater environmental control and autonomy for the pregnant women. In addition, they contribute to the maintenance of mental health, to coping with stressful times[21,22], and consequently to greater adherence to prenatal care[19,20].

Women with gestational age of 42 weeks or more showed greater chance of attending 7 or more prenatal visits in relation to those with up to 36 weeks of gestation. Aragon et al.[24], in a study carried out in São Luís, Maranhão, found prevalence of premature births

(up to 36 weeks of gestation) of 23.3% among mothers who did not have access to prenatal visits, whereas those who attend 7 or more prenatal visits showed prevalence of only 4% ($p < 0.001$). Bezerra et al.[25], in a research conducted at the University Hospital of the *Universidade de São Paulo* (HU/USP), found that to attend up to three prenatal visits was associated with the occurrence of preterm birth (OR 4.26), compared with seven or more visits. However, it is worth noting that women with premature births probably attended less prenatal consultations, which may overvalue the association of the number of prenatal visits with gestational age.

Having children with normal birth weight was associated with the attendance at seven or more prenatal visits. Research conducted in Campinas, São Paulo, based on data from 14,444 declarations of live births found that women who had less than seven prenatal visits were more likely to have children with low birth weight, both among women with preterm labor and those with gestational age greater than or equal to 37 weeks[26]. Similarly, a study developed in São Paulo found relative risk of 2.0 for low weight among women who had 0–3 prenatal visits and 1.4 for those who attended 4–6 visits, compared to women who attended 7 or more prenatal visits[5].

The occurrence of seven or more prenatal visits proved to be significantly associated with twin, triplet, or more pregnancies. In multiple pregnancies, perinatal mortality tends to be higher than in single pregnancies and increases with the number of fetuses. Moreover, prematurity, fetal growth retardation, occurrence of fetal malformations, and incidence of disease such as preeclampsia, occur more frequently. With regard to the mother, the development of hypertensive disorders, anemia, and bleeding appear as the most common among various complications[27]. Therefore, the establishment of an appropriate prenatal care can prevent and/or minimize the problems arising from multiple pregnancies, leading to increased number of prenatal visits, as observed in this study.

Residing in the South and Southeast regions was statistically associated with the occurrence of seven or more prenatal visits. According to data from the Brazilian Institute of Geography and Statistics (IBGE), since 2000, after the implementation by the Ministry of Health of the rules that defined six or more visits to the doctor as an adequate prenatal care, the prevalence of attendance at 7 or more prenatal visits has increased from 43.7% in 2000 to 54.5% in 2006 and 61.1% in 2010[28]. The prevalence found in this study (63.1%) corroborates this evolution; however, the significant interregional inequalities that were observed in this study with regard to the attendance of prenatal visits in Brazil should be highlighted. Whereas the South and Southeast regions had 74.7 and 73.0%, respectively, of pregnant women with 7 or more prenatal visits, in the North and Northeast these ratios were 42.3 and 51.2%, respectively.

Studies carried out in different countries show the occurrence of inadequate prenatal care in less favored regions[29,30]. Heaman et al.[29], in a research developed in Manitoba, Canada, found prenatal inadequacy rates ranging between 1.1 and 21.5%, and the highest concentrations of inadequate rates of prenatal care were observed in less favored areas. At the same time, a global study found that the number of prenatal visits decreased according to the reduction

of income quintile in all analyzed regions (East Asia and Pacific, Europe and Central Asia, Latin America and Caribbean, Middle East and North Africa, South Asia and Sub-Saharan Africa). In South Asia, for example, only 27% of the poorest women attended at least one prenatal visit, as opposed to 82% of the richest pregnant women[30].

As this is a cross-sectional study, this research presents some limitations, such as the inability to establish causal and/or temporal relationships. Moreover, the information obtained by means of secondary data always requires caution. Their quality can be hindered by underreporting, by the lack of standardization and/or errors in data collection, and may vary according to regions and demographic characteristics, which may create or reinforce artificial differences between groups. However, SINASC is a fundamental tool for the understanding of the epidemiological profile, for planning and evaluating the health action plan for the mother and for the baby — its quality has been greatly improved and now configures as a reliable information system[10].

It is worth noting that this study examined the number of prenatal visits only. Studies that also incorporate in their analysis the quality of the health care provided are essential to supply a broader picture of the prenatal care in the country.

CONCLUSION

The results of this study show that although Brazil has a public health system that provides universal prenatal care, the use of this service is uneven according to the demographic, socioeconomic, and geographical characteristics. Among them, mainly the lower level of education of the pregnant women, not living with a partner, and living in the North and Northeast regions stood out for the lower prevalence of prenatal visits.

Within this context, to promote actions that intend to eliminate these inequities, especially by strengthening the actions of primary health care, should be an ethical commitment of the Unified Health System (SUS). It is worth mentioning the importance of ensuring the early identification of the pregnant women to classify the pregnancy as high or low risk according to the SUS protocols, and of facilitating pregnant women's commute to prenatal visits as well as ensuring the link between pregnant women and health teams with the proper care of all the needs that arise during pregnancy.

CONTRIBUTORS

J. C. Anjos was responsible for the study design, the construction of the database, the data analysis and the drafting of manuscript. A. F. Boing planned the study, contributed to the writing of the article and led the article critical review.

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Received on: 10/29/2015
Final version presented on: 05/10/2016
Accepted on: 05/31/2016