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Maternal near miss among women using the public health system in the Amazon and Northeast regions of Brazil

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ABSTRACT

Objective. *To assess the prevalence of pregnancy complications identified as maternal near miss (MNM) and associated factors among women using the public health care system in the Amazon and Northeast regions of Brazil.*

Methods. *A secondary analysis of a population-based survey conducted in 2010 was performed focusing on women self-reporting maternal complications. The main outcome was MNM, pragmatically defined as intensive care unit admission, eclampsia, hysterectomy, or blood transfusion. In addition, the risk of MNM was estimated for certain sociodemographics and characteristics of care received. Poisson regression was performed, generating adjusted prevalence ratios (PR_{adj}) with 95% confidence intervals (95%CI).*

Results. *A total of 13 044 women (77%) who had given birth during the prior year using the public health system were interviewed. At least one complication was reported by 37.5%, with hemorrhage (28.4%) and infection (8.3%) being the most frequent. The overall MNM ratio was 31.5 per 1 000 live births, higher for the Amazon region than for the Northeast. Factors with a higher risk for developing MNM were: indigenous ethnicity (PR_{adj} 2.77; 95% CI: 1.50–5.14), more than one hour to reach the hospital (PR_{adj} 1.55; 95%CI: 1.06–2.25), being refused by a full hospital and having to find another one (PR_{adj} 1.49; 95%CI: 1.03–2.16), cesarean section (PR_{adj} 2.56; 95%CI: 1.90–3.44), and public prenatal care (PR_{adj} 1.95; 95%CI: 1.06–3.61).*

Conclusions. *Users of public health system in the Amazon and Northeast regions of Brazil have high MNM rates. Some characteristics of the women and of the care they received represent inequalities associated with higher risk for MNM. Specific actions are required to improve maternal health programs in these expansive areas of the country.*

Key words Women's health; morbility; maternal and child health; obstetric labor complications; pregnancy complications; Millennium Development Goals; Brazil.

The most recent figures for maternal mortality in Brazil range from 58.7–64.8 per 100 000 live births (LB) (1, 2), a significant decrease from the more than 140 deaths per 100 000 LB recorded in 1990 (1). Despite this great improvement a positive trend has not been sustained during the last decade (3); therefore, Brazil is not expected to reach the fifth Millennium Development Goal (MDG) that calls for a 75% decrease in maternal mortality between 1990 and 2015 (2, 4). Unfortunately, estimates indicate this goal will be achieved in Brazil only after 2040 (5).

Improvements in maternal health care are absolutely necessary for preventing maternal morbidity and mortality (6, 7). For every maternal death, there are many women who experience morbidity

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that comes close to death. The related and numerous underlying conditions, possibly stemming from inequality in health care, warrant further investigation. Identifying the trigger factors for maternal death in different geographic areas and institutions (e.g., clinical and obstetric complications, sociodemographic factors, and lack of adequate assistance, among others) can help prevent more cases of severe morbidity and mortality (5, 8).

The importance of studying severe maternal morbidity has only recently been recognized (9). In 2009, the World Health Organization (WHO) first standardized the concept of "maternal near miss" (MNM) and defined its criteria (10). Subsequently, a more simple proxy was developed for use with routinely available data from large databases and for self-reported morbidity, e.g., admission by an intensive care unit (ICU), blood transfusion, hysterectomy, and eclampsia (11).

In terms of collecting data on maternal morbidity and mortality, population-based studies are reliable and provide indicators for monitoring trends, measuring quality of care, prioritizing strategies, and evaluating the health impact of interventions, especially in low- and middle-income countries with weak notification systems or for broad geographic areas (12–16). The 2006 Demographic Health Survey (DHS) of Brazil evaluated the occurrence of maternal complications and MNM throughout the country's five geographic areas (11). Almost one-quarter of the women interviewed reported at least one complication during pregnancy or the postpartum period, corresponding to a MNM ratio of 21.1 per 1 000 LB. Considering the recognized inequities in maternal health care among the different areas of Brazil and given the representativeness of the DHS sample population, a detailed inquiry into the available information is helpful for better understanding the differences between the more and less developed parts of the country. For some reason, implementation of health policies to reduce infant and maternal morbidity and mortality have been less successful in some areas than in others.

In 2010, a population-based survey called *Chamada Neonatal* ("Neonatal Call") was conducted to evaluate the quality of the public maternal and infant health care system in the Amazon and Northeast regions of Brazil—two expansive areas that previously lacked reliable maternal morbidity and mortality data (17). These survey results could be evaluated to determine the impact that the Brazilian National Pact for Reducing Maternal and Neonatal Mortality (18), a national program related to the fourth and fifth MDG, has had in these large, low-income regions.

The objectives of the present study were to assess the prevalence of pregnancy complications identified as MNM and associated factors among women served by the public health care system in the Amazon and Northeast regions of Brazil.

MATERIALS AND METHODS

A secondary analysis was performed of the *Chamada Neonatal*, a cross-sectional, population-based survey that was conducted in the Amazon and Northeast regions of Brazil during the 2010 national poliomyelitis vaccination campaign. Only cities that had signed the Brazilian National Pact for Reducing Maternal and Neonatal Mortality were eligible to participate in the study (18). In all, 252 cities from 17 states from the North and Midwest (what is known as the "Amazon region"), and Northeast regions of Brazil participated. These cities were chosen following a detailed sampling procedure that included all state capitals, plus municipalities contributing to the majority of live births and infant deaths within each region, thereby maintaining the representativeness of the whole target population.

The study protocol was approved by the Institutional Review Board of the Osvaldo Cruz Foundation (Rio de Janeiro, Brazil; FIOCRUZ) and by the National Council for Ethics in Research (Brasilia, Brazil; CONEP).

Participants

The inclusion criteria were mothers of children less than 1 year of age, who used the public health system, attended the vaccination campaign, and resided in the city in which the campaign was taking place. When a child less than 3 months of age was not accompanied by her/his mother, a home visit was scheduled to perform the interview. In cases where the mother had two children less than 1 year of age, the most recent pregnancy/youngest child was chosen for the study. Adopted children and twins were excluded.

Logistics

The study had two main coordinating centers (FIOCRUZ and the Department of Science and Technology of the Ministry of Health; DECIT), four regional coordinators, one research supervisor in each state, and data collection supervisors in each city. The coordinating centers and the supervisors were responsible for training interviewers. Training included a simulation for selecting participants and instructions on completing the forms.

Study instrument

A questionnaire containing all the items from the validated DHS study module on maternal morbidity was specifically designed to collect information on the prenatal, delivery, and postpartum periods for each mother and child who came to the primary health care unit for vaccination. A woman with pregnancy complication was defined as self-reporting any hospitalization due to complications during pregnancy or postpartum. Participants were specifically questioned on the occurrence of severe maternal complications and related procedures, including hospital transfer, admission to ICU, mechanical ventilation, eclampsia, hemorrhage, blood transfusion, infection, hysterectomy, prolonged hospital stay, and MNM. MNM was operationally and pragmatically defined as having occurred if a woman reported ICU admission, eclampsia, hysterectomy, or blood transfusion (11).

Completed questionnaires were sent for centralized scanning and were then saved in a database that included an image of each form. Consistency analyses of data were performed for each item in the questionnaire, and implausible values were checked with the recorded values using the saved images of the questionnaires.

Data analysis

First, the proportions of women reporting severe complication and/or related procedures during the index pregnancy were reported for the given region and for the total sample. An

adjustment was performed to represent the proportional participation of each child in the sample of each participating municipality according to the distribution of the 2010 demographic census (19) was performed. Then, the prevalence of each main complication, of any complication, and the MNM ratio were also calculated for each state and region in the survey. Finally, associations between the occurrence of MNM and some characteristics, such as maternal age, maternal schooling, ethnicity, head of household, place of residence, time receiving "Bolsa Família" (a grant program for low-income families), number of prenatal visits, mode of delivery, peregrination (finding another hospital for delivery after being refused by a full one), public prenatal care, time to reach hospital (> 1 hour), time to be admitted (> 1 hour), and time since delivery (until interview). The risk of developing MNM for each factor was evaluated using adjusted prevalence ratios and corresponding 95% confidence intervals (95%CI). Poisson regression was performed to exclude confounding variables and $P < 0.05$ was considered to be statistically significant. Statistical analysis was performed using Stata®/MP11.2 (StataCorp LP, College Station, Texas, United States).

RESULTS

The *Chamada Neonatal* survey interviewed 16 863 women in 17 states within the Northeast and Amazon regions; of these, 13 044 (77.3%) had delivered in the public health system. The Amazon region accounted for 4 922 women; the Northeast for 8 122. Table 1 shows the proportion of severe maternal complications and related procedures during pregnancy or in the postpartum period, reported up to 1 year after delivery, by region. At least one complication was reported by 37.5% of women, and hospitalization due to complications occurred in 16.5% of pregnancies. The most frequent complication reported was hemorrhage (28.4%), which occurred more often in the Amazon (32.3%) than in the Northeast region (26.8%). The second most frequent complication was infection (8.3%), without any difference among regions. Hysterectomy was rarely reported in either region.

Table 2 shows the proportion of women who reported severe complications defined as MNM, and the MNM ratio (per 1 000 LB) by region and by state. The overall prevalence of MNM was 31.5 per 1 000 LB. The Amazon presented higher MNM ratio (36.3/1 000 LB), including the three states with the highest prevalence of the 17 evaluated: Roraima, 57.9; Acre, 48.2; and Amazonas, 45.1. Similarly, the highest proportion of eclampsia (1.8), hysterectomy (0.4), blood transfusion (1.2), or any of the complications (41.1) also occurred in the Amazon region. Rondonia, an Amazon state, and Maranhão, a Northeast state, showed the lowest MNM ratios, 6.7 and 16.3, respectively.

TABLE 1. Proportion[a] of mothers with a child less than 1 year of age, who had used the public health system and reported severe maternal complications and related procedures during childbirth, by region, Brazil, 2010

Severe maternal complications and related procedures	Amazon region (No. = 4 922)		Northeast region (No. = 8 122)		Total (No. = 13 044)	
	%	95%CI[b]	%	95%CI	%	95%CI
Hospital admission due to complication	19.4	18.1–20.7	15.3	14.3–16.4	16.5	15.7–17.4
Hospital transfer	1.9	1.4–2.4	1.9	1.5–2.3	1.9	1.6–2.2
Admission to intensive care unit	0.6	0.4–0.9	0.7	0.4–0.9	0.7	0.5–0.9
Mechanical ventilation	1.7	1.3–2.1	1.0	0.7–1.3	1.2	0.9–1.4
Eclampsia	1.8	1.3–2.2	1.5	1.1–1.8	1.5	1.3–1.8
Hemorrhage	32.3	30.7–34.0	26.8	25.5–28.1	28.4	27.4–29.4
Blood transfusion	1.2	0.8–1.5	0.9	0.7–1.2	1.0	0.8–1.2
Infection	9.5	8.4–10.5	7.8	7.0–8.6	8.3	7.7–8.9
Hysterectomy	0.4	0.1–0.6	0.2	0.1–0.3	0.3	0.2–0.4
Prolonged hospital stay	4.4	3.7–5.1	5.2	4.6–5.9	5.0	4.5–5.5
Any	41.1	39.4–42.8	36.1	34.7–37.4	37.5	36.4–38.6

[a] Adjusted to represent the proportional participation of each child in the sample of each participating municipality, according to the distribution of the 2010 demographic census.
[b] Confidence interval.

TABLE 2. Proportion[a] of mothers with a child less than 1 year of age, who had used the public health system and had reported severe maternal complications, and maternal near miss ratio (MNMR/1 000 LB) by region and state, Brazil, 2010

Region/State	No.	Eclampsia	Hysterectomy	ICU[b] admission	Blood transfusion	Any[c]	MNMR[d]
Amazon	4 922	1.8	0.4	0.7	1.2	41.1	36.3
Acre	435	2.6	1.1	0.6	1.0	41.7	48.2
Amapá	420	2.7	0.0	0.6	1.0	48.8	36.4
Amazonas	1 005	2.0	0.4	1.2	1.5	40.0	45.1
Mato Grosso	699	1.8	0.0	0.4	0.8	41.6	30.5
Pará	815	1.5	0.4	0.4	1.2	40.3	33.1
Rondônia	323	0.5	0.0	0.2	0.0	43.5	6.7
Roraima	380	2.9	0.8	1.1	2.1	41.8	57.9
Tocantins	845	1.1	0.3	0.7	1.3	39.8	31.1
Northeast	8 122	1.5	0.2	0.7	0.9	36.1	29.6
Alagoas	503	1.5	0.5	0.3	1.8	38.5	40.8
Bahia	1 038	1.4	0.4	0.6	1.1	35.8	29.9
Ceara	1 030	2.0	0.0	0.8	0.9	35.4	34.1
Maranhão	878	1.2	0.2	0.4	0.3	34.0	16.3
Paraíba	1 491	0.8	0.2	0.7	1.1	40.8	26.7
Pernambuco	1 042	1.7	0.0	1.0	1.2	34.1	38.5
Piauí	823	1.0	0.2	1.1	0.9	39.5	26.0
Rio Grande Norte	672	1.7	0.5	0.5	0.5	37.3	25.8
Sergipe	645	1.7	0.3	0.3	0.6	36.5	26.0
Total	13 044	1.6	0.3	0.7	1.0	37.5	31.5

[a] Adjusted to represent the proportional participation of each child in the sample of each participating municipality, according to the distribution of the 2010 demographic census.
[b] Intensive care unit.
[c] Includes admission due to complication, hospital transfer, ICU admission, mechanical ventilation, eclampsia, hemorrhage, blood transfusion, infection, hysterectomy, and/or prolonged hospital stay.
[d] Includes ICU admission, eclampsia, blood transfusion, and/or hysterectomy.

The Roraima´s proportion of eclampsia (2.9), blood transfusion (2.1), and MNM ratio (57.9) were exceptionally high in comparison to the total or even to the Amazon region's rates.

Several sociodemographic traits and health care services received were assessed to explore the association with MNM (Table 3). An increased risk of MNM was found among women with indigenous ethnicity (PR_{adj} 2.77; 95%CI: 1.50–5.14), but no differences in maternal age, schooling, head of household, place of residence, time receiving "Bolsa Família," number of prenatal care visits,

TABLE 3. Prevalence crude and adjusted prevalence ratio (PR) for maternal near miss[a] among mothers with a child less than 1 year of age, who had used the public health system, by sociodemographic variables and characteristics of care received, Brazil, 2010

Sociodemographic variables and characteristics of care received	No.	*P*	PR	95%CI	PR_{adj}	95%CI
Maternal age (years)						
< 20	2 906	3.4	1.12	0.84–1.48	1.08	0.77–1.53
20–29	7 194	3.0	1.00		1.00	
30–39	2 502	3.4	1.12	0.79–1.60	0.92	0.59–1.42
≥ 40	252	0.6	0.19	0.05–0.79	0.00	0.00–0.00
Maternal schooling (years)						
≥ 11	5 102	2.8	1.00		1.00	
8–10	4 004	3.3	1.19	0.88–1.62	1.21	0.86–1.72
< 8	3 832	3.5	1.24	0.90–1.70	1.37	0.95–1.97
Ethnicity/skin color						
White	2 431	2.9	1.00		1.00	
Black	10 093	3.1	1.06	0.77–1.45	1.15	0.78–1.68
Indigenous	463	6.5	2.23	1.31–3.80	2.77	1.50–5.14
Head of the household						
Other	9 705	3.3	1.00		1.00	
Mother	3 235	2.9	0.89	0.67–1.18	0.89	0.63-1.24
Place of residence						
Capital	6 428	3.5	1.00		1.00	
Interior	6 616	2.9	0.85	0.67–1.08	0.90	0.67–1.20
Time receiving "Bolsa Familia" (years)						
≥ 3	1 551	3.3	1.00		1.00	
1–< 3	990	2.7	0.83	0.47–1.47	0.86	0.44–1.71
<1	1 090	3.2	0.97	0.56–1.66	1.10	0.58–2.07
None	8 583	3.2	0.98	0.66–1.46	1.03	0.65–1.66
Number of prenatal visits						
≥ 6	8 946	2.9	1.00		1.00	
3–5	2 503	3.7	1.27	0.93–1.72	1.32	0.90–1.92
< 3	210	7.2	2.46	0.97–6.27	2.55	0.89–7.28
Time since delivery (months)						
< 6	6 932	3.1	1.00		1.00	
6–<12	6 112	3.3	1.07	0.83–1.37	1.06	0.79–1.42
Mode of delivery						
vaginal	7 525	2.0	1.00		1.00	
cesarean	5 456	4.9	2.46	1.93–3.14	2.56	1.90–3.44
Peregrination						
No	10 549	2.8	1.00		1.00	
Yes	2 408	4.5	1.60	1.18–2.17	1.49	1.03–2.16
Public prenatal care						
No	1 121	2.3	1.00		1.00	
Yes	11 923	3.2	1.40	0.90–2.18	1.95	1.06–3.61
Time to reach hospital > 1 hour[b]						
No	9 757	2.6	1.00		1.00	
Yes	2 003	4.7	1.78	1.28–2.48	1.55	1.06–2.25
Time to be admitted > 1 hour[c]						
No	7 444	3.0	1.00		1.00	
Yes	4 335	3.4	1.12	0.85–1.48	0.94	0.69–1.30

[a] Adjusted to represent the proportional participation of each child in the sample of each participating municipality, according to the distribution of the 2010 demographic census. Includes ICU admission, eclampsia, blood transfusion and/or hysterectomy.

[b] Time to reach the maternity hospital for women with near miss was 79 minutes (95%CI: 60–98) and for those without near miss was 66 minutes (95%CI: 63–70).

[c] Time to be admitted for the group of women with near miss was 114 minutes (95%CI: 116–172) and for the group without near miss it was 132 minutes (95%CI: 127–137).

time since delivery, and time to hospital admission were detected. Time > 1 hour to reach the hospital (PR_{adj} 1.55; 95%CI: 1.06–2.25), peregrination (PR_{adj} 1.49; 95%CI: 1.03–2.16), cesarean section (PR_{adj} 2.56; 95%CI: 1.90–3.44), and public prenatal care (PR_{adj} 1.95; 95%CI: 1.06–3.61) were the main factors showing a higher risk for MNM.

DISCUSSION

At least two important national maternal and infant health programs were implemented during the most recent decade in Brazil. The National Pact for Reducing Maternal and Neonatal Mortality, instituted in 2004, and the Stork Network (*Rede Cegonha)*, launched in 2011, were designed to improve maternal and newborn health. The 17 states that make up the Amazon and the Northeast regions have the worst Human Development Index (HDI) rankings in Brazil; therefore, they require special attention, especially public health assistance (20). The indicators of severe maternal morbidity (prevalence of severe maternal complications and MNM ratio) can be helpful for achieving improvements (8).

Prevalence of severe maternal complications and MNM ratio had not been previously explored in such detail in the Amazon and the Northeast populations. The DHS study showed that the majority of disparities regarding the prevalence of maternal complications were between the North and Northeast regions and the other regions. These two regions had the highest proportion of eclampsia, hemorrhage, infection, blood transfusion, mechanical ventilation, postpartum prolonged hospital stay, and presence of any complications/interventions. A previous analysis of the same *Chamada Neonatal* survey, comprising all participating women, had already demonstrated higher proportions of eclampsia, hemorrhage, and infection in the North and Northeast regions compared to the DHS study data (21). Currently, an even higher proportions of those severe maternal complications were reported.

There are, however, some differences in the methodologies employed by each of the surveys that support the more dire results found by the *Chamada Neonatal*. The DHS used a household interviews to collect information, which may somehow underestimate the prevalence of complications in certain socially disadvantaged population groups (17). Moreover, the *Chamada Neonatal* survey obtained information on any pregnancy that had occurred up to 1 year prior to the interview, whereas the DHS surveys collected data on any pregnancy occurring up to 5 years prior. Therefore, recall bias may have played a more important role among DHS participants. Additionally, a worsening of health indicators during the 4 years between the DHS study and *Chamada Neonatal* could also be due to unequal or inadequate implementation of public health policies. This possibility should be further explored.

Two secondary analyses from the WHO Multicountry Survey on Maternal and Newborn Health assessed the relationship between eclampsia and postpartum hemorrhage with adverse maternal outcomes (22, 23). The overall incidence of eclampsia was 0.28%, ranging from 0.035%–0.78% for all countries evaluated (Brazil, 0.16%). However, the proportion of eclampsia in the *Chamada Neonatal* substantially exceeded these rates, ranging from 0.5%–2.9% of women using of the public health system (22).

The present study found a higher risk for MNM among indigenous women. Poor pregnancy outcomes have already been documented among indigenous populations (absence of prenatal care, higher rates of maternal and perinatal mortality, preterm birth, and low birth weight) (24, 25). One study alleges that indigenous populations have inadequate access to health prevention and promotion programs (vaccination campaigns, family planning programs, and maternal health care policies) (26). The same study also affirms that indigenous maternal mortality ratios could be 2–3 times higher than for the non-indigenous. Of course, the possibility of discrimination against indigenous people by the health care sector could not be excluded; however, there is no data available on this topic. A more in-depth qualitative analysis could evaluate this issue by focusing on areas along the Amazonian rivers where indigenous settlements are most common. Underlying conditions related to their higher risk for MNM should be carefully studied, taking into account the complex conditions surrounding such populations.

A higher risk of MNM was also found for women who had received public prenatal care, who had traveled more than 1 hour, or who had waited more than 1 hour to be admitted, which corroborates the findings of previous studies related to appropriate medical attention. The Brazilian Network for Surveillance of Severe Maternal Morbidity, a large, national, multicenter cross-sectional study, confirmed the importance of timing in obstetric care by demonstrating a close relationship between sub-standard care/delays and maternal death or MNM (27). The overall proportion of cases with identifiable, sub-standard care/delays in that study was 54.3%. Furthermore, the higher the prevalence of delays, the higher the severity of maternal outcomes (27). Delays can modify the conditions for adequate care, mainly in women who need it most. Peregrination also leads to delays in obtaining adequate care, also increasing the risk of a negative outcome.

The proportion of women who delivered within the public health system and who self-reported severe complications during the pregnancy, childbirth, or postpartum period is higher than the figure for all women included by the previous analyses of the *Chamada Neonatal* (21). The present study analysis showed that use of the public health system for either prenatal care and/or hospitalization was associated with risk of MNM. Although conditions in the North and Northeast have improved during the last few years, the gap in health care quality still exists when compared to other regions in Brazil (28).

Cesarean section was also associated with increased risk for MNM. However, cause and effect reasoning is not possible in cross-sectional study design, and regardless, the related underlying conditions should be identified first.

Study limitations

This study has many strengths, such as the sampling of nearly all Amazon and Northeast municipalities committed to the National Pact for Reducing Maternal and Neonatal Mortality, a response rate that exceeded 85% of eligible women, and the application of a validated questionnaire specifically developed for self-reported maternal complications/morbidity. These give a strong and accurate picture of the maternal health scenario (external validation) and enable monitoring of quality indicators regarding the public health system. How-

ever, the main limitation is the absence of information on women who had a pregnancy within 1 year of the interview, but did not attend the vaccination campaign. This may have happened because that specific day of the campaign was not the only day on which children could be vaccinated (though it was the day when most of the vaccinations occurred). Also, women with infants who died before 1 year of age were obviously not part of the sample. This may also have caused a loss in cases of maternal morbidity.

Conclusions

In conclusion, the Amazon and the Northeast regions of Brazil had a higher prevalence of severe maternal complications and maternal near miss than previously reported, and higher than other regions of Brazil. Some of the risk factors associated with maternal near miss (public prenatal care, peregrination, time to hospital or time to admission > 1 hour) are directly linked to the public health care system. This should lead to a focus on improving the monitoring and the quality of the public health system in those regions. In addition, the use of the pragmatic definition of maternal near miss can prove to be a useful tool for gathering information from population-based surveys.

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Conflict of interests. None.

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RESUMEN

Morbilidad materna extremadamente grave entre las usuarias del sistema de salud pública en las regiones amazónica y noreste del Brasil

Objetivo. Evaluar la prevalencia de las complicaciones del embarazo establecidas como morbilidad materna extremadamente grave (MMEG), y los factores asociados, entre las usuarias del sistema de atención de salud pública en las zonas amazónica y noreste del Brasil.

Métodos. Se realizó un análisis secundario de una encuesta poblacional llevada a cabo en el 2010 y centrado en las mujeres que autonotificaban complicaciones obstétricas. El principal resultado fue la MMEG, definida a efectos prácticos como ingreso en una unidad de cuidados intensivos, eclampsia, histerectomía o transfusión de sangre. Se calculó además el riesgo de MMEG para determinadas características sociodemográficas y de la atención recibida. Se llevó a cabo una regresión de Poisson y se generaron las razones de prevalencia ajustadas (RP_a) con intervalos de confianza de 95% (IC 95%).

Resultados. Se entrevistó a un total de 13 044 mujeres (77%) que habían dado a luz durante el año previo en el sistema de salud pública. Un 37,5% notificó como mínimo una complicación; la hemorragia (28,4%) y la infección (8,3%) fueron las más frecuentes. El índice general de MMEG fue de 31,5 por 1 000 nacidos vivos, más elevado en la región amazónica que en la noreste. Los factores que comportaron un riesgo mayor de MMEG fueron la etnicidad autóctona (RP_a 2,77; IC 95% = 1,50–5,14), precisar más de una hora para llegar al hospital (RP_a 1,55; IC 95% = 1,06–2,25), no ser admitida en un hospital por estar completo y tener que encontrar otro (RP_a 1,49; IC 95% = 1,03–2,16), la cesárea (RP_a 2,56; IC 95% = 1,90–3,44), y la asistencia prenatal pública (RP_a 1,95; IC 95% = 1,06–3,61).

Conclusiones. Las usuarias del sistema de salud pública en las regiones amazónica y noreste del Brasil muestran tasas elevadas de morbilidad materna extremadamente grave. Algunas características de las mujeres y de la atención recibida comportan desigualdades asociadas con un riesgo mayor de morbilidad materna extremadamente grave. Se requieren acciones específicas que mejoren los programas de salud materna en estas amplias zonas del país.

Palabras clave Salud de la mujer; morbilidad; salud materno-infantil; complicaciones del trabajo de parto; complicaciones del embarazo; Objetivos de Desarrollo del Milenio; Brasil.