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Review

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Prevalence of preterm birth according to birth weight group: a systematic review

ABSTRACT

OBJECTIVE: To estimate the prevalence of preterm birth by categories of birth weight, and to obtain an equation to correct the estimates.

METHODS: Systematic review of the Brazilian literature published from 1990 to 2012, to identify studies with primary collection of data on birth weight and gestational age. Twelve studies were selected and contributed for tabulations of preterm prevalence according to 100 g birth weight categories. These results were combined using sex-specific fractional polynomial equations and the resulting curves were compared with results from the Live Birth Information System for the years 2000, 2005, 2010 and 2011.

RESULTS: For all birth weight categories, preterm prevalence estimates based on primary studies had a higher prevalence than those of the the Live Birth Information System. The prevalence reported by the Live Birth Information System was of 7.2% in 2010, about 38.0% lower than the estimated prevalence of 11.7% obtained with the correctional equation.

CONCLUSIONS: Information reported by the Live Birth Information System on preterm prevalence does not reflect the true magnitude of the problem in Brazil, and should not be used without the correction factors proposed in the present analyses.

DESCRIPTORS: Infant, Premature. Infant, Low Birth Weight. Prevalence. Birth Certificates. Review

INTRODUCTION

In many countries, the prevalence of preterm births, occurring before the 37th week of pregnancy,[a] shows a tendency to increase, even in high-income countries such as the United States, Australia, Japan and Canada.[13] A World Health Organization Report,[28] based on estimates made through statistical modelling, estimates that in the world, every year, there are 15 million preterm births, more than 10.0% of the total.[a]

This high prevalence represents complications related to prematurity, the most common cause of neonatal and infant death in middle- and high-income countries[13] including Brazil.[4,8,27] The high prevalence of prematurity has significant social and economic repercussions: in the short term, increasing demand for neonatal intensive care units and the costs of the care needed, in the long term, for individuals suffering from permanent health conditions with irreparable damage to their physical and mental health.[13]

The WHO report places Brazil as the country with the tenth highest number of preterm births in absolute terms,[a] with an estimated prevalence of 9.2%. Official data collected by the *Sistema de Informações sobre Nascidos Vivos* (SINASC – Live Birth Information System) between 2000 and 2010 indicate that there has been a slight increase in the prevalence of preterm births in the country (from 6.8% to 7.1%).

Data collected in Brazilian studies[26] using primary data suggest that the prevalence of preterm births is higher than the level estimated by the SINASC and that the increase in prematurity appears to be higher in recent decades. A systematic review (2008)[26] showed an evolution in the prevalence of prematurity from around 4.0% at the beginning of the 1980s to over 10.0% after 2000. Reliable, validated SINASC studies indicate low concordance with the rate of preterm births obtained based on rates calculated in population based research.[19] This poor concordance may be partly explained by the fact that until 2011, data on gestational age (GA) was collected in class intervals and not in complete weeks.[19]

The aim of this study was to estimate the prevalence of preterm births according to birth weight and to obtain an equation to correct the estimates.

METHODS

A systematic review of Brazilian population based publications from 2008, containing information on the prevalence of preterm births from 1970 to 2004.[26] The search included articles published in journals, dissertations and theses. This review was updated in 2012 for the 1990-2012 period, using the Medline and Lilacs databases, using the search terms: (premature/preterm and Brazil); (premature/preterm delivery and Brazil); (premature/preterm infant and Brazil); (premature/preterm labor and Brazil); (risk factors and premature/preterm delivery and Brazil); (risk factors and premature/preterm labor and Brazil); (associated factors and premature/preterm labor and Brazil); (associated factors and premature/preterm delivery and Brazil); (incidence and premature/preterm labor and Brazil); (prevalence and premature/preterm labor and Brazil); (incidence and premature/preterm delivery and Brazil); (prevalence and premature/preterm delivery and Brazil).

Articles concerning clinical topics, such as complications of prematurity and pregnancy, or health care for premature newborns were excluded. Inclusion criteria were: studies on the prevalence of prematurity in Brazil carried out after 1990. Studies deemed to have representative samples were those which included all births taking place in a specific location, in a specific period or which used some kind of probabilistic process to select a sample of newborns. In the case of more than one article based on the same database, the first to be published was included.

Forty-nine references were identified in the Medline database in the 2008 review,[26] of which 42 were excluded and ten included. In the Lilacs database, 46 references were identified, with three being included (two articles and one thesis) and 43 excluded as they did not meet the inclusion criteria. The references of all the articles were examined, although no further articles were identified. Finally, 11 texts were identified using primary data on the Northeast, South and Southeast of the country: nine articles published in journals,[1,5,7,9,11,15,17,21,23] one doctoral thesis[b] and one Master's dissertation.[c]

The bibliographical research was widened to include publications from after 2004 and to exclude those published before 1990. The bibliographical research used the same methodology described in the previous study.[26] This procedure identified two new publications[2,10] and four articles were excluded.[5,7,9,22]

The authors of these nine publications were contacted and invited to participate. They were asked to provide the following information on the database used in the

[a] March of Dimes; The Partnership for Maternal Newborn and Child Health; Save the Children; World Health Organization. Born too soon: the global action report on preterm birth. Geneva: WHO; 2012.
[b] Rumel D. Acurácia dos critérios de risco do Programa de Defesa da Vida dos Lactentes do Município de Bauru entre 1986 e 1988 [Tese]: Universidade de São Paulo; 1989.
[c] Oliveira MT. A saúde da mulher trabalhadora: estudo da relação entre trabalho na gestação e a ocorrência de doenças, complicação do parto e recém-nascidos prematuros na cidade do Recife, Pernambuco [Dissertação]: Universidade Federal da Bahia; 1992.

publication: the total number of newborns and preterm newborns for each birth weight group, divided per 100 g, starting at 400 g. This data was to be reported separately, according to sex.

For four studies identified in the review,[1,2,17,c] the authors reported that the original database no longer existed, and the article could therefore not be included in the analyses, leaving seven studies.

The authors of the articles and other Brazilian researchers in this field were asked whether they were aware of any other Brazilian databases, published or not, the authors of which could provide the data presented. At the end of this process, another five databases were identified. Four of them concerned original, unpublished studies: BRISA – cohorts in Ribeirao Preto, SP, and Sao Luís, MA, both from 2010; Rio de Janeiro, RJ, 2010; Pelotas, RS, Intergrowth 2010,[25] and the fifth was a collaborative nationwide study.[14] At the end of the search, twelve databases were available for the research.

A linear regression model based on fractional polynomials was constructed to estimate the expected

Table. Characteristics of the studies included in the analysis, 1990-2012.

Author, year and place of publication	Description of the sample	Number of births	Method used to estimate gestational age[a]	% preterm births	% low birth weight
Horta et al,[11] 1993, Pelotas, RS	Study of all births in all maternity hospitals in the city throughout the year	5,249	LMP	7.5	9.6
Bettiol et al,[7] 1994, Ribeirao Preto, SP	Study of all births in all maternity hospitals in the city for five months	2,846	LMP, regression model used to impute GA for unknown values	13.3	12.3
Silva et al,[23] 1997-1998, Sao Luís, MA	Study of a systematic sample of hospital births throughout the year	2,487	LMP, regression model used to impute GA for unknown values	13.9	9.6
Rondo et al,[21] 1997-2000, Jundiaí, SP	Study of newborns in a cohort of pregnant women attending antenatal care	865	LMP, US, Capurro	4.2	6.5
Lunardelli et al,[15] 2003, Itajaí, SC	Study of newborns from a group of women selected after exclusion criteria (age, disease, number of teeth) for five months in maternity hospitals	449	LMP	7.1	5.5
Barros et al,[3] 2004, Pelotas, RS	Study of all births in all maternity hospitals in the city throughout the year	4,231	LMP, US	15	10
Gurgel et al,[10] 2005, Aracaju, SE	Study of all births in all maternity hospitals in the city in four consecutive months	4,746	LMP, Capurro	7.7	7.2
Silva et al, [24] 2010, Sao Luís, MA	Study of a systematic sample of hospital births throughout the year	5,149	LMP, regression model used to impute GA for unknown values	12.9	8.6
Bettiol et al,[7] 2010, Ribeirao Preto, SP	Study of all births in all maternity hospitals in the city throughout the year	7,716	LMP regression model used to impute GA for unknown values	14.0	9.5
Ledo et al,[b] 2010, Rio de Janeiro, RJ	Study of births in maternity school for a year	2,716	LMP	11.3	10.0
Intergrowth,[25] 2011-2012, Pelotas, RS	Study of all births in all maternity hospitals in the city over 15 months	6,109	LMP, US, physical examination	14.8	12.4
Leal et al,[14] 2011-2012, Nascer no Brasil, Brazil	National study in 191 cities over 18 months	23,940	LMP	12.5	8.5

LMP: last menstruation period; US: ultrasound ; GA: gestational age

[a] Several studies used more than one method of assessing gestational age, but the results discussed here are based primarily on the date of last menstruation, complementary methods being used when this information was not available or was inaccurate.

[b] Data not published.

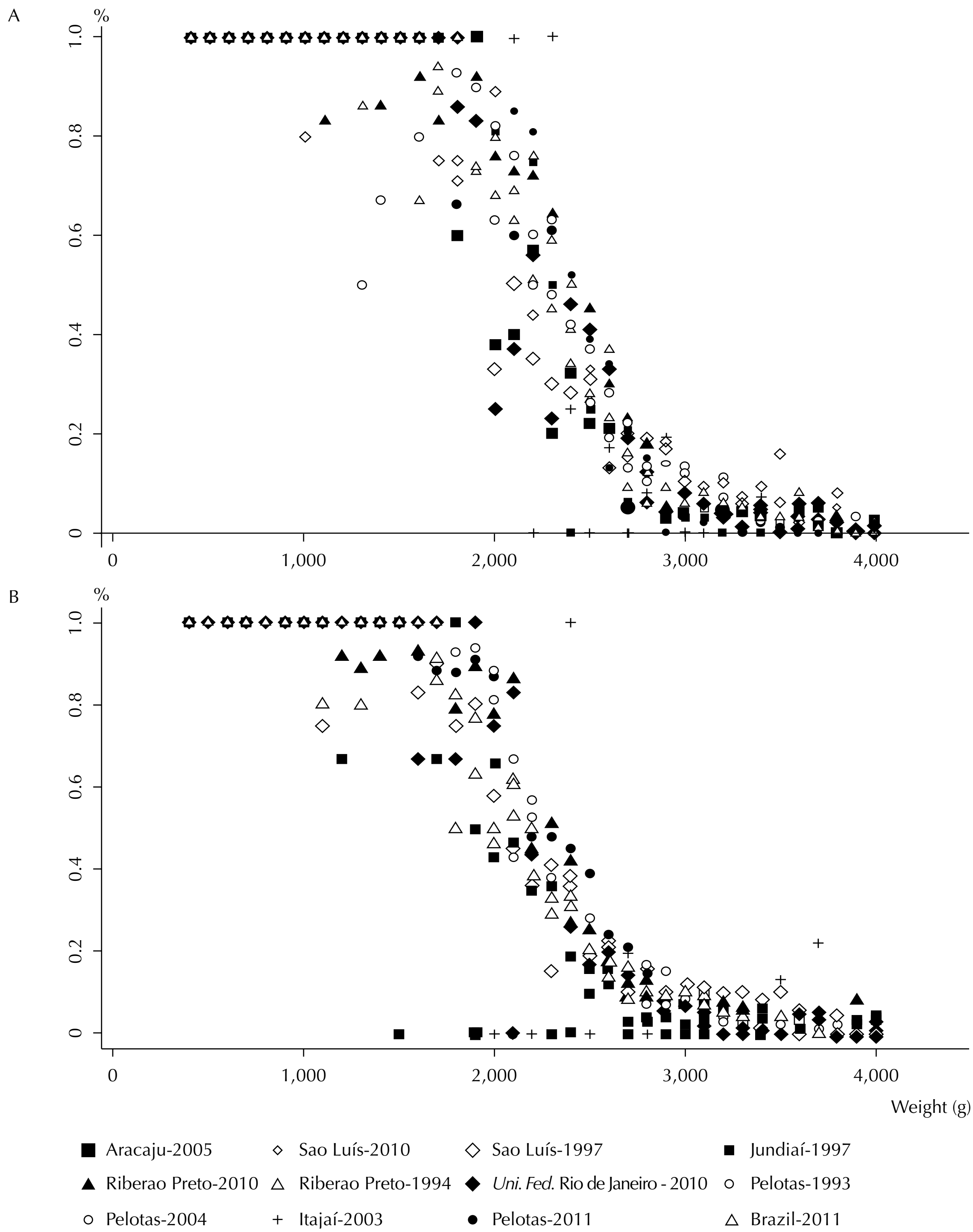

Figure 1. Prevalence of preterm birth in males (A) and female (B) according to categories of birth weight (each dot represents the result of a study). Brazil, 1993-2011.

proportion of premature births for each birth weight group. Modelling using fractional polynomials is ideal in this situation in which the study was not linear, as it allows a high degree of flexibility in the adjusted curves. This approach is superior to the traditional way of adding quadratic, cubic and other terms to the model.[22] This strategy of selecting curves uses a set of pre0defined exponents (-2, -1, -0.5, 0, 0.5, 1, 2, 3), where zero equals the natural logarithm. The independent variable may appear more than once in the regression equation; therefore, a model with two terms is selected. Of the 44 possible models (eight with only one term, and another 36 combinations of the eight exponents in pairs), the best was chosen. The

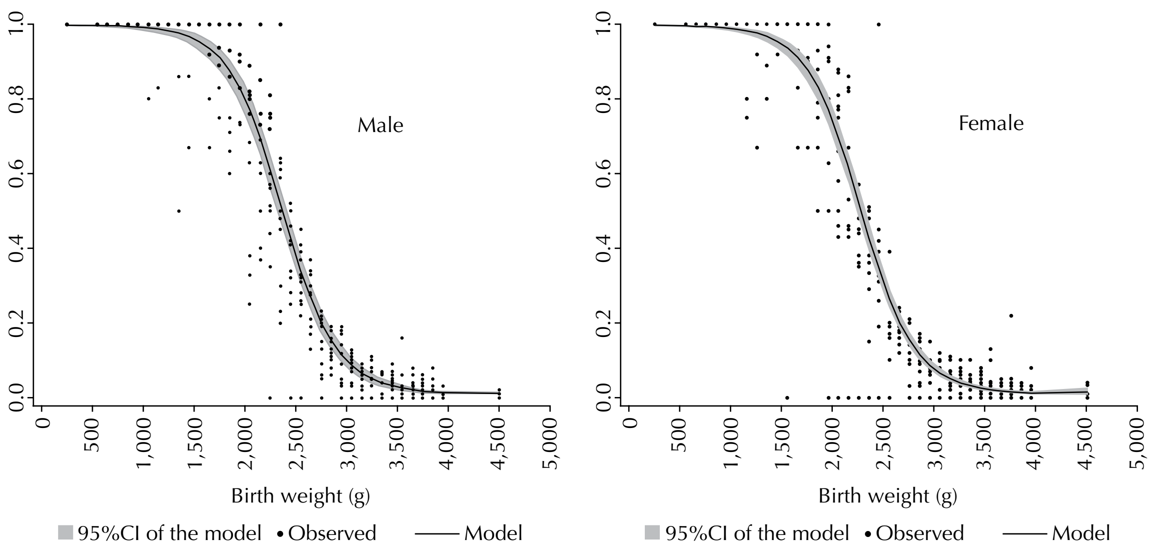

Figure 2. Fractional polynomials and 95% confidence interval for the probability of preterm birth in male and female categories according to birth weight, obtained by weighted analysis of the 12 studies. Brazil, 1993-2011.

proportion of premature births varied between 0 and 1 and the outcome underwent a logistic transformation before the model was adjusted. In order to avoid infinites in the result of the transformation in cases where the proportion was zero or one, 0.01 was added or subtracted. The mean value of the birth weight for each interval was used as a predictor. After adjusting the models, separate estimates for males and females, the adjusted values and their respective confidence intervals were transformed again to the original scale. The models were adjusted to give proportional weighting to the number in each birth weight group for each study. Each of these studies was treated as one conglomerate in calculating the standard error of the coefficients.[22]

Data referring to 2000, 2005 and 2010 from the SINASC 2000-2011 database, when the data on gestational age were collected in categories (0-21, 22-27, 28-36, 37-41, 42 weeks and over, or unknown) were analyzed. From 2011 onwards, this data started to be collected as a continuous variable, measured in weeks. The same analyses carried out in the studies of primary data were repeated with the SINASC data.

RESULTS

Table shows the data concerning the databases, authors, year, location of the study, number of children taking part, method for determining gestational age and prevalence of preterm births and of newborns with low birth weight.

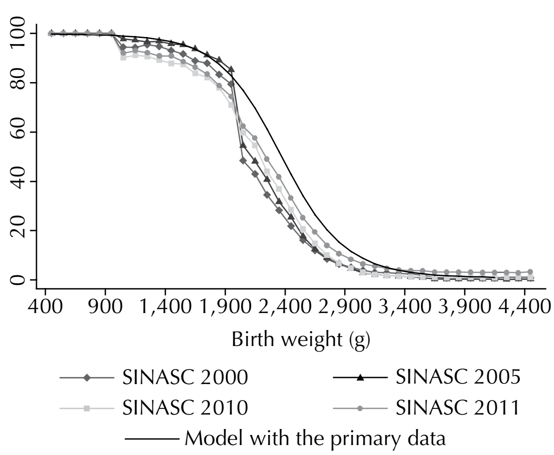

Figure 3. Prevalence of preterm births in males according to categories of birth weight, comparing the results of the current study with data from the Information System on Live Births (SINASC) in different years. Brazil, 2000, 2005, 2010, 2011.

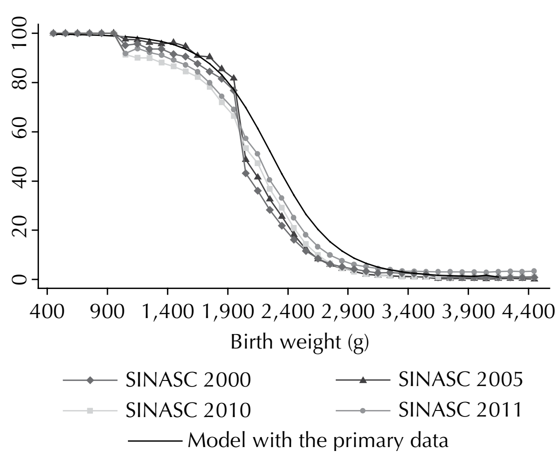

Figure 4. Prevalence of preterm births in females according to categories of birth weight, comparing the results of the current study with data from the Information System on Live Births (SINASC) in different years. Brazil, 2000, 2005, 2010, 2011.

Six of the databases concern repeated studies conducted in Sao Luís, MA (1997-1998 and 2010, the latter as yet unpublished),[23] Ribeirao Preto, SP (1994 and 2010, the latter also unpublished)[7] and Pelotas, RS (1993, 2004, 2011).[3,11] These studies are population based, including birth occurring in these municipalities (generally over the period of one year) or systematic samples of all newborns. In the Ribeirao Preto and Sao Luís cohorts in the 2010-BRISA, births in households resident in the municipalities were included. Pelotas, RS, contributed with a perinatal study carried out over a 15-month period between 2011 and 2012, evaluating all births in the municipality. This study was part of a multi-center international project – Intergrowth-21.[25] The perinatal study in Aracaju, SE, in 2005,[10] assessed births in the four largest maternity wards in the municipality over four months. Births occurring in 2010 in the maternity school of the *Universidade Federal do Rio de Janeiro* were studied by Cunha (data not published). Two other studies included in the sample had some type of selection of the population studied: one in Itajaí, SC,[15] on periodontal disease and preterm births, with data collected daily for five months in the city's only maternity ward, the sample including data on pregnant women aged 18 to 40, without significant health problems, and with at least 18 natural teeth. The other cohort study, in Rondó,[21] Jundiaí, SP, on stress during pregnancy and perinatal results, included women receiving full pre-natal care in health care units and hospitals in the municipality.

This review included unpublished data regarding the *Nascer no Brasil* study,[14] which is a multi-centric hospital based cohort that included a post-natal visit and a telephone interview between 45 and 60 days postpartum. The sample was stratified by geographical macro-region, type of municipality and type of hospital. The data were collecetd between February 2011 and October 2012 in hospitals with at least 500 births per year, and data on hospital births, all live births and still births weighing at least 500g and/or with a gestational age of > 22 weeks were included. In this study, newborns with birth weights incompatible with GA (< -3 SD or > 3 SD in the weight curve for WHO GA) were excluded from the analysis.[16]

In all of the studies, the data of the last menstrual period (LMP) was the method used to calculate gestational age, sometimes complemented by ultrasound (US) or physical examination of the newborn. In the studies in Ribeirao Preto and Sao Luís, unknown gestational ages were imputed using a multiple regression model. Even those studies which used several sources of gestational age (such as Intergrowth,[25] in Pelotas, or *Nascer no Brasil*[14]), the date of the last menstruation was used to increase comparability with the SINASC.

Lower prevalence was observed in the studies in Jundiaí and Itajaí. The prevalence of preterm births in the studies conducted after 2000 was higher than 10.0%, except the study in Aracaju, in 2005, in which the prevalence was 7.7% and the study in Itajaí, in 2003, with a prevalence of 7.1%. The lowest rates of prevalence of low birth weight among recent studies were observed in municipalities in the Northeast – Aracaju (7.2%) and Sao Luís (8.6%) –, whereas studies in the South and Southeast had rates of prevalence between 9.5% (Ribeirao Preto, 2010) and 12.4% (Pelotas, 2011). The national study *Nascer no Brasil*[14] had an estimate of 8.5% (Table).

The number of births in each 100 g category was small in some of the studies. Variability was observed, especially up to a weight of 2,000 g, which included relatively few children (Figure 1).

Fractional polynomials were calculated based on these data (Figure 2). For males and females, the model selected was to the power of 2 and 3, using the logit outcome of the proportion of premature births in each birth weight group. The mean value of birth weight in each interval was used as a predictor, giving the following equation for males:

$$\text{Logit (proportion of premature births)} = -0.06 - 1.77.\text{weight}^2 + 0.28.\text{weight}^3$$

And for females the equation was:

$$\text{Logit (proportion of premature births)} = -0.47 - 1.84.\ \text{weight}^2 + 0.30.\ \text{weight}^3$$

The resulting curves remained practically unchanged when the analysis was repeated without weighting, i.e., with the same weight on each of the studies (Annexes 1 and 2).

The primary studies indicated higher rates of prevalence of preterm births than the SINASC in practically all birth weight groups between 1,000 g and 3,200 g (Figures 3 and 4). The change in the mode of SINASC data collection in 2011, when gestational age began to be collected as a continuous variables, resulted in greater concordance with the results of the primary studies in birth weight groups of 2,000g and upwards.

Applying correction factors to the SINASC database for 2010 indicated a national prevalence of 11.7%, higher than the SINASC figure of 7.1% (Annex 3).[d]

DISCUSSION

The studies included represent practically all of the existing research on the epidemiology of premature birth in the period in question. With the exception of

[d] Matijasevich A et al, unpublished data.

the nationwide *Nascer no Brasil* study,[14] the studies were carried out in the Southeast, South and Northeast.

Different methods can be used for assessing gestational age in epidemiological studies. High quality US examinations in the first 14 weeks represent the gold standard.[18] However, the majority of epidemiological studies are based on LMP data, even in countries such as the United States and the United Kingdom, where the difference between the two methods is between two and three days.[12] Two Brazilian studies present conflicting visions of this topic. A prospective study in two cities in the Southeast of public health care system – *Sistema Único de Saúde* (SUS) users[20] showed that, compared with results obtained by ultrasound (US) up to 20 weeks, the date of the last menstrual period (after excluding outliers) had a sensitivity of 71.0% and accuracy of 94.0%, estimating the prevalence at 14.0% compared with 12.5% according to US. The authors considered the US as the gold standard, without discussing the quality of the examination and mentioned that in one of the two municipalities, they were performed by a health care professional connected to the research team. The 2004 cohort study in Pelotas,[6] uses LMP as the gold standard. It shows that, for infants born between 32 and 36 weeks, US carried out before 20 weeks overestimated gestational age by 1.8 weeks for pregnant women cared for by the SUS, although this figure was only five days in the private sector. This difference is attributed to the poor quality of the exams carried out on SUS patients. LMP was used as the gold standard in this study, in contrast with the previous study.

Although early US is the gold standard when performed properly by a trained professional, there are many Brazilian women for whom this data is not available. The mean age of the first US exam available was 20.0 weeks, with a standard deviation of 7.6 in the study in Pelotas (2004).[6] As the main objective of this study was to compare data with that of the SINASC, where gestational age is usually measured using hospital charts and based on LMP, it was decided to use data based on LMP of the various primary studies, although some provided data based on US or physical examination of the newborn.

The underlying assumption of combining the data of the studies in diverse regions, specifically, that the prevalence of intrauterine growth restriction would be relatively constant throughout the country, justified combining data from different regions in one single estimate. Although, historically, the North and Northeast have worse health indicators for mother and baby health, this differential is being rapidly reduced.[27] The prevalence of low weight/height and height/age ratios in children under five was practically the same for the whole country in 2006-07.[27] Low birth weight, paradoxically, is slightly more prevalent in richer regions than in poorer regions,[23] and the same is true of the prevalence of preterm births estimated by SINASC.[d] The current analyses show that the confidence intervals of the estimates obtained using fractional polynomials are narrow (Figures 3 and 4), with the exception of birth weight groups < 2,000 g, in which the number of births in the studies is very small. However, the results of these studies appear to be homogenous and there is no evidence of differences between regions that impede national estimates being obtained, which justifies the approach used.

All births with birth weight < 1,000 g were preterm, prevalence > 90.0% in infants between 1,000 g and 1,800 g. From 3,000 g and upwards, the prevalence of preterm births was low. As in many studies, the numbers of births in each 100 g group were small, there is considerable variation between the studies, but the mean curves follow the expected pattern. The relatively low rates of prevalence observed in Jundiaí and Itajaí are probably due to the fact that these studies included samples of pregnant women who probably had lower risk pregnancies.

Comparing the curve based on the primary data and the SINASC results suggests that the SINASC underestimates the prevalence of premature births in Brazil. The situation appears to have changed for the better in 2011 compared with the previous decade. This is possibly due to the fact that gestational age began to be collected in exact weeks, and not grouped into categories. Even in 2011, many maternity wards used the previous version of the Statement of Live Birth, which is being gradually replaced by the updated version. A more exact evaluation of the impact of the change in the document may be able to be carried out from 2012 onwards. The differences between the SINASC data and the primary data occur mainly up to 3,000 g. Above this weight, they are lower and not significant.

These analyses suggest that the SINASC data underestimated the prevalence of preterm births at least until 2010. In this year, the estimate of 7.1% reported by the SINASC was 385 lower than the corrected prevalence of 11.7%. Preliminary results of the *Nascer no Brasil* study,[14] based on ultrasounds, indicate that national prevalence of 11.4%, close to the estimate presented here.

We suggest that the non-corrected rates of prevalence based on SINASC data not be used. The curves shown here can be used to correct the SINASC results and obtain more precise estimates of the prevalence of preterm births for different geographic areas and risk groups.

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The authors declare that there are no conflict of interests.

Annex 1. Prevalence of preterm births by birth weight groups in Brazilian studies. Male. Brazil, 1993-2011.

Lower limit (g)	Upper limit (g)	Sao Luís	Sao Luís	Jundiaí	Ribeirao Preto	Ribeirao Preto	Rio de Janeiro	Pelotas	Pelotas	Itajaí	Pelotas	Aracaju	Mean
		2010	1997	1997	2010	1994	2010	1993	2004	2003	2011	2005	
0	499						1.00				1.00	1.00	1.00
500	599	1.00			1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
600	699	1.00	1.00		1.00	1.00	1.00		1.00		1.00	1.00	1.00
700	799		1.00				1.00		1.00		1.00	1.00	1.00
800	899	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
900	999	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
1,000	1,099	0.80	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.98
1,100	1,199	1.00	1.00	1.00	0.83	1.00	1.00	1.00	1.00		1.00	1.00	0.98
1,200	1,299	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1,300	1,399	0.50	1.00	1.00	1.00	0.86	1.00	1.00	1.00	1.00	1.00		0.94
1,400	1,499	0.86	1.00		0.86	1.00	1.00	0.67	1.00	1.00	1.00	1.00	0.94
1,500	1,599	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00		1.00
1,600	1,699				0.92	0.67	1.00	0.80	1.00		1.00	1.00	0.91
1,700	1,799	0.75	0.75		0.83	0.89	1.00	1.00	1.00		1.00	1.00	0.91
1,800	1,899	0.71	0.75	0.66	0.86	1.00	0.86	0.93	1.00	1.00	0.86	0.60	0.84
1,900	1,999	0.90	0.83	1.00	0.92	0.73	0.83	0.90	1.00		1.00	1.00	0.91
2,000	2,099	0.89	0.33		0.76	0.80	0.25	0.82	0.63		0.81	0.38	0.63
2,100	2,199	0.60	0.50	0.60	0.73	0.69	0.37	0.76	0.69	1.00	0.85	0.40	0.65
2,200	2,299	0.44	0.35	0.75	0.72	0.76	0.56	0.50	0.60	0.00	0.81	0.57	0.55
2,300	2,399	0.63	0.30	0.50	0.64	0.59	0.23	0.48	0.61	1.00	0.61	0.20	0.53
2,400	2,499	0.50	0.28	0.00	0.46	0.41	0.46	0.42	0.34	0.25	0.52	0.32	0.36
2,500	2,599	0.33	0.31	0.25	0.45	0.28	0.41	0.26	0.37	0.00	0.39	0.22	0.30
2,600	2,699	0.19	0.13	0.13	0.30	0.37	0.33	0.19	0.28	0.17	0.34	0.21	0.24
2,700	2,799	0.15	0.20	0.06	0.23	0.09	0.19	0.13	0.22	0.00	0.21	0.05	0.14
2,800	2,899	0.19	0.06	0.11	0.18	0.06	0.12	0.10	0.13	0.08	0.15	0.12	0.12
2,900	2,999	0.14	0.17	0.00	0.09	0.05	0.04	0.09	0.18	0.19	0.09	0.03	0.10
3,000	3,099	0.07	0.10	0.03	0.08	0.11	0.08	0.12	0.13	0.00	0.04	0.04	0.07
3,100	3,199	0.07	0.09	0.03	0.06	0.06	0.06	0.05	0.08	0.00	0.02	0.05	0.05
3,200	3,299	0.10	0.10	0.00	0.05	0.10	0.03	0.07	0.11	0.05	0.03	0.05	0.06
3,300	3,399	0.06	0.07	0.00	0.06	0.04	0.01	0.06	0.07	0.00	0.01	0.04	0.04
3,400	3,499	0.09	0.05	0.00	0.06	0.05	0.04	0.02	0.03	0.07	0.00	0.04	0.04
3,500	3,599	0.06	0.16	0.00	0.02	0.00	0.00	0.02	0.01	0.00	0.00	0.02	0.03
3,600	3,699	0.03	0.03	0.00	0.06	0.08	0.01	0.02	0.01	0.00	0.01	0.04	0.03
3,700	3,799	0.04	0.02	0.00	0.01	0.03	0.06	0.00	0.01	0.00	0.00	0.05	0.02
3,800	3,899	0.05	0.08	0.00	0.03	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.02
3,900	3,999	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.03	0.00	0.01	0.00	0.00
4,000+		0.01	0.00	0.00	0.00	0.00	0.01	0.02	0.00	0.00	0.01	0.02	0.01

Blank cells indicate no data.

Annex 2. Prevalence of preterm births by birth weight groups in Brazilian studies. Female. Brazil, 1993-2011.

Lower limit (g)	Upper limit (g)	Sao Luís	Sao Luís	Jundiaí	Ribeirao Preto	Ribeirao Preto	Rio de Janeiro	Pelotas	Pelotas	Itajaí	Pelotas	Aracaju	Mean
		2010	1997	1997	2010	1994	2010	1993	2004	2003	2011	2005	
0	499	1.00					1.00		1.00		1.00	1.00	1.00
500	599	1.00			1.00				1.00		1.00		1.00
600	699	1.00	1.00		1.00	1.00	1.00		1.00		1.00	1.00	1.00
700	799	1.00			1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
800	899	1.00	1.00		1.00		100	1.00	1.00		1.00		1.00
900	999	1.00	1.00		1.00	1.00			1.00		1.00	1.00	1.00
1,000	1,099	1.00	1.00		1.00	1.00	1.00	1.00			1.00	1.00	1.00
1,100	1,199	0.75	1.00		1.00	0.80		1.00	1.00		1.00	1.00	0.94
1,200	1,299	1.00	1.00		0.92	1.00	1.00	1.00	1.00	1.00	1.00	0.67	0.87
1,300	1,399	1.00	1.00		0.89	0.80	1.00	1.00	1.00		1.00	1.00	0.97
1,400	1,499	1.00	1.00	1.00	0.92	1.00	100	1.00	1.00	1.00	1.00	1.00	0.99
1,500	1,599	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.91
1,600	1,699	0.83			0.93	1.00	0.67	1.00	1.00		0.92		0.91
1,700	1,799	0.90	1.00	1.00	1.00	0.86	1.00	1.00	1.00		0.88	0.67	0.93
1,800	1,899	0.82	0.75		0.79	0.50	0.67	0.82	0.93	1.00	0.88	1.00	0.82
1,900	1,999	1.00	0.80	0.50	0.90	0.77	1.00	0.94	1.00		0.91	0.00	0.78
2,000	2,099	0.58	0.77	0.66	0.78	0.46	0.75	0.81	0.88	0.00	0.87	0.43	0.63
2,100	2,199	0.62	0.45	0.00	0.86	0.61	0.83	0.43	0.67	0.00	0.82	0.46	0.52
2,200	2,299	0.44	0.36	0.50	0.45	0.38	0..44	0.57	0.53	0.00	0.48	0.35	0.41
2,300	2,399	0.51	0.15	000	0.51	0.29	0.41	0.41	0.38	0.50	0.48	0.36	0.36
2,400	2,499	0.39	0.36	0.00	0.42	0.31	0.26	0.33	0.42	1.00	0.45	0.19	0.38
2,500	2,599	0.17	0.19	0.10	0.25	0.20	0.17	0.19	0.28	0.00	0.39	0.16	0.19
2,600	2,699	0.16	0.21	0.12	0.18	0.14	0.20	0.23	0.19	0.22	0.24	0.16	0.18
2,700	2,799	0.10	0.16	0.00	0.12	0.09	0.14	0.10	0.21	0.20	0.21	0.03	0.12
2,800	2,899	0.07	0.16	0.03	0.13	0.09	0.09	0.07	0.17	0.00	0.15	0.04	0.09
2,900	2,999	0.10	0.10	0.00	0.07	0.09	0.08	0.07	0.15	0.08	0.06	0.04	0.07
3,000	3,099	0.12	0.10	0.00	0.08	0.07	0.07	0.08	0.07	0.00	0.02	0.02	0.06
3,100	3,199	0.05	0.11	0.00	0.06	0.10	0.02	0.07	0.07	0.00	0.03	0.04	0.05
3,200	3,299	0.10	0.07	0.00	0.08	0.06	0.00	0.04	0.03	0.00	0.01	0.06	0.04
3,300	3,399	0.04	0.10	0.02	0.06	0.03	0.05	0.03	0.05	0.00	0.00	0.03	0.04
3,400	3,499	0.07	0.08	0.00	0.04	0.05	0.01	0.01	0.06	0.00	0.01	0.03	0.03
3,500	3,599	0.04	0.10	0.00	0.01	0.04	0.00	0.02	0.02	0.13	0.00	0.03	0.03
3,600	3,699	0.03	0.05	0.00	0.05	0.05	0.00	0.03	0.04	0.00	0.01	0.01	0.02
3,700	3,799	0.00	0.03	0.00	0.04	0.02	0.05	0.01	0.03	0.22	0.00	0.03	0.04
3,800	3,899	0.03	0.04	0.00	0.02	0.00	0.00	0.02	0.00	0.00	0.00	0.04	0.01
3,900	3,999	0.00	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.02	0.03	0.01
4,000+		0.01	0.00	0.00	0.03	0.00	0.00	0.01	0.00	0.00	0.00	0.04	0.01

Blank cells indicate no data.

Annex 3. Correction factors for the prevalence of preterm births by birth weight groups. Brazil, 1993-2011.

Birth weight group (g)		Male		Female	
		Prevalence (%)	95%CI	Prevalence (%)	95%CI
0	499	99.8	99.6;99.9	99.7	99.5;99.9
500	599	99.7	99.4;99.8	99.6	99.3;99.8
600	699	99.6	99.3;99.8	99.5	99.1;99.7
700	799	99.5	99.1;99.8	99.4	99.0;99.6
800	899	99.4	98.9;99.7	99.2	98.7;99.5
900	999	99.3	98.7;99.6	99.0	98.4;99.4
1,000	1,099	99.0	98.3;99.4	98.7	97.9;99.2
1,100	1,199	98.7	97.8;99.2	98.2	97.3;98.9
1,200	1,299	98.3	97.2;98.9	97.6	96.5;98.4
1,300	1,399	97.6	96.3;98.5	96.7	95.3;97.7
1,400	1,499	96.7	95.1;97.8	95.5	93.7;96.8
1,500	1,599	95.4	93.4;96.9	93.7	91.5;95.3
1,600	1,699	93.6	91.2;95.4	91.2	88.5;93.3
1,700	1,799	91.1	88.2;93.3	87.7	84.6;90.3
1,800	1,899	87.6	84.3;90.3	83.2	79.5;86.2
1,900	1,999	83.0	79.2;86.2	77.2	73.2;80.7
2,000	2,099	77.0	73.0;80.5	69.9	65.7;73.7
2,100	2,199	69.7	65.6;73.4	61.4	57.3;65.3
2,200	2,299	61.2	57.3;64.9	52.2	48.4;55.9
2,300	2,399	52.0	48.4;55.6	42.9	39.5;46.3
2,400	2,499	42.8	39.5;46.1	34.2	31.3;37.2
2,500	2,599	34.1	31.2;37.2	26.5	24.1;29.2
2,600	2,699	26.5	23.9;29.4	20.3	18.2;22.5
2,700	2,799	20.3	17.9;22.9	15.3	13.5;17.2
2,800	2,899	15.3	13.3;17.6	11.5	10.0;13.1
2,900	2,999	11.5	9.8;13.5	8.6	7.4;10.0
3,000	3,099	8.7	7.2;10.4	6.5	5.5;7.7
3,100	3,199	6.6	5.4;8.0	5.0	4.2;6.0
3,200	3,299	5.0	4.1;6.2	3.9	3.2;4.7
3,300	3,399	3.9	3.1;4.9	3.1	2.5;3.8
3,400	3,499	3.1	2.5;3.9	2.5	2.0;3.1
3,500	3,599	2.5	2.0;3.1	2.1	1.6;2.6
3,600	3,699	2.0	1.6;2.6	1.7	1.4;2.2
3,700	3,799	1.7	1.4;2.2	1.5	1.2;2.0
3,800	3,899	1.5	1.2;1.9	1.4	1.0;1.8
3,900	3,999	1.3	1.1;1.6	1.3	0.9;1.7
4,000	5,000	1.2	1.0;1.5	1.6	0.9;2.6