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Trends of breastfeeding indicators in Brazil from 1996 to 2019 and the gaps to achieve the WHO/UNICEF 2030 targets

Cristiano Siqueira Boccolini,[1] Elisa Maria de Aquino Lacerda,[2] Neilane Bertoni,[3] Natália Oliveira,[4] Nadya Helena Alves-Santos,[5] Dayana Rodrigues Farias,[4] Sandra Patricia Crispim,[6] Leticia Barroso Vertulli Carneiro,[7] Raquel Machado Schincaglia,[4] Elsa Regina Justo Giugliani,[8] Inês Rugani Ribeiro de Castro,[9] Gilberto Kac [4]

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For numbered affiliations see end of article.

Correspondence to
Dr Gilberto Kac;
gilberto.kac@gmail.com

ABSTRACT

Background The comprehension of breastfeeding patterns and trends through comparable indicators is essential to plan and implement public health policies.

Objective To evaluate the trends of breastfeeding indicators in Brazil from 1996 to 2019 and estimate the gap to achieve the WHO/UNICEF 2030 targets in children under 5 years.

Methods Microdata from two National Surveys on Demography and Health of Women and Children (PNDS-1996 and PNDS-2006) and the Brazilian National Survey on Child Nutrition-2019 were used. The indicators of early initiation of breastfeeding (EIBF), exclusive breastfeeding of infants 0–5 months of age (EBF<6 mo), continued breastfeeding at 1 year of age (CBF1yr) and CBF at 2 years of age (CBF2yr) were analysed using prevalence and 95% CI. The average annual variation and years to achieve the WHO/UNICEF 2030 targets were calculated for Brazil and the macroregions. Statistical analyses considered the survey's complex sample design for each database.

Results EIBF increased from 36.3% (95% CI 33.6% to 39.0%) in 1996 to 60.9% (95% CI 56.5% to 65.3%) in 2006 (statistically significant) and 62.5% (95% CI 58.3% to 66.6%) in 2019. EBF<6 mo increased from 26.9% (95% CI 21.3% to 31.9%) in 1996 to 39.0% (95% CI 31.0% to 47.1%) in 2006 and 45.8% (95% CI 40.9% to 50.7%) in 2019 (significant increases for 1996–2019 for Brazil, Northeast and Midwest regions). CBF1yr rose from 36.6% (95% CI 30.8% to 42.4%) in 1996 to 48.7% (95% CI 38.3% to 59.0%) in 2006, and 52.1% (95% CI 45.4% to 58.9%) in 2019. CBF2yr increased from 24.7% (95% CI 19.5% to 29.9%) in 1996 to 24.6% (95% CI 15.7% to 33.5%) in 2006 and 35.5% (95% CI 30.4% to 40.6%) in 2019 (significant increase for 1996–2019). The South and Southeast regions need to double the 2019 prevalence to reach the target for the CBF1yr and CBF2yr; the Northeast and North need to increase 60% the current prevalence for the indicator of EBF<6 mo.

Conclusion A substantial improvement in breastfeeding indicators occurred in Brazil from 1996 to 2019, although at an insufficient rate to achieve the WHO/UNICEF 2030 targets.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Policies to encourage breastfeeding (BF) have been in place in Brazil since 1981. Despite this, data from the last three national surveys conducted in 1996, 2006 and 2019 indicated a low prevalence for BF indicators such as early initiation of BF (EIBF), exclusive BF under 6 months of age (EBF<6 mo) and continued BF at 1 and 2 years of age (CBF1yr and CBF2yr, respectively).

WHAT THIS STUDY ADDS

⇒ An increase in BF indicators has been observed between the 2006 and 2019 national surveys. Despite this, the more developed South and Southeast regions still need to double the 2019 prevalence to reach the WHO/UNICEF 2030 target for the CBF1yr and CBF2yr, and the less developed Northeast and North regions need to increase 60% the current prevalence for the EBF<6 mo indicator.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ To enhance equity in BF practices, policies and actions to improve those rates should differ according to the region's development. The data presented here will substantially contribute to global health research worldwide, considering the inequality pattern observed between more developed and less developed regions.

INTRODUCTION

Breastfeeding is a human right[1] that brings lifelong benefits to children by providing optimal nutrition. Exclusive breastfeeding (EBF) may protect low-income children against stunting,[2 3] a global public health challenge in the 21st century.[4] It also prevents infectious diseases, infant deaths and chronic diseases in the life cycle.[5] The longer the mother breastfeeds their children, the lower the chances of type 2 diabetes and breast,

ovarian, and endometrial[6] cancer occurrence.[5 7] The comprehension of breastfeeding patterns and trends through comparable indicators is essential to plan and implement public health programmes and strategies targeted at the most vulnerable populations and regions.[8]

In Brazil, throughout the 1970s, a 'weaning epidemic' was precipitated by increased urbanisation, women's broadening engagement in the labour market, and unregulated global marketing of industrialised milk products.[9] In the 1980s, to counteract this public health crisis, the Brazilian Ministry of Health (MoH) launched policy interventions to promote, protect, and support breastfeeding, as recommended worldwide by the Global Breastfeeding Collective (GBC), a WHO and UNICEF initiative.[4 10]

The National Breastfeeding Programme was implemented in Brazil in 1981, along with several breastfeeding-promotion initiatives: maternity leave extension,[11] the Human Milk Banks network,[12] the Kangaroo Method[13] and the regulation of infant food marketing.[11] Subsequently, the Brazilian MoH implemented the Baby Friendly Hospital Initiative in 1992,[14] the Breastfeeding and Feeding Brazil Strategy in 2012,[15] the enactment of the National Policy for Comprehensive Child Health Care in 2015 and the update of the Dietary Guidelines for Brazilian Children under 2 years of age[16] in 2019. These interventions increased EBF in infants aged 0–6 months and longer breastfeeding duration.[17]

The GBC chose four key breastfeeding indicators to track the progress and impact of these priorities: early initiation of breastfeeding (EIBF), EBF under 6 months of age (EBF<6 mo), continued breastfeeding (CBF) at 1 year (CBF1yr) and at 2 years of age (CBF2yr). For EBF<6 mo, based on evidence of improving EBF rates in many countries, it was determined that a goal of 70% by 2030 could be achieved.[18 19] An identical target was set for EIBF. Global rates of CBF1yr and CBF2yr were higher and considered more difficult to change. Targets established for 2030 were 80% and 60% for CBF1yr and CBF2yr, respectively.[18]

The National Survey of Child Nutrition (ENANI-2019) produced updated data on breastfeeding[20] after the gap since the former editions of the National Survey on Demography and Health of Women and Children (PNDS-1996 and PNDS-2006).[17 21] Both surveys evaluated breastfeeding practices of children under 5 years of age. Therefore, we aimed to assess the trend of breastfeeding indicators in Brazil from 1996 to 2019, comparing the evolution of their prevalence with the achievement of the WHO/UNICEF 2030 target.[18]

METHODS

Study design, population and database

This study used microdata from three national population-based surveys with children under 5 years of age to assess breastfeeding indicators' trends with data from 1996, 2006 and 2019.

The PNDS-1996 was a subsample of the National Household Sample Survey (PNAD) and was designed to obtain representative results from the seven PNAD regions at that time: Southeast (Rio de Janeiro and São Paulo), South, Centre-East (Espírito Santo and Minas Gerais), Northeast, North (urban area) and Midwest (urban area). The rural area of the North region (except the state of Tocantins) was excluded. The sample studied represented approximately 97% of the country's total population in 1996. In the PNDS-1996, a probabilistic sample with two stages of selection was carried out. In the first stage, the census sectors were selected, with probability proportional to the number of households in the sector. In the second stage, households were selected considering the representativeness within each sector. In the selected households, all women aged 15–49 years were interviewed face to face, resulting in 12 612 interviews with women and information on 4782 children under 5 years of age (1941 under 2 years of age).[22]

The PNDS-2006 had a target population of women aged 15–49 years and their children under 5 years of age (born from January 2001 on). A complex probabilistic sampling was carried out, and the sampling units were selected in two stages: census tracts and households, using the inverse sampling method. Ten selection strata were specified based on the combination of the five Brazilian macroregions (North, Northeast, Southeast, South and Midwest) and the area of residence (urban and rural). In PNDS-2006, 15 575 women were interviewed face to face, of which 4122 were mothers of 5056 children under 5 years of age (1902 under 2 years of age), who comprised the final sample of the survey.[21] Neither of the PNDS datasets included imputed data to account for missing values for breastfeeding and child feeding and missing data were excluded from the analyses.

The ENANI-2019 was a household survey of national coverage and representativeness of children under 5 years of age, considering urban and rural areas of all Brazilian macroregions. The study population was children under 5 years of age residing in permanent private households with at least one child in this age group on the interview date. More detailed information about eligibility criteria can be found elsewhere.[20] The study used complex sampling, with geographical stratification clustered by municipalities or census sectors, with households being the elementary sampling units selected by inverse sampling. In the selected households, the presence of children under 5 years of age was investigated, with the mothers (preferably) or caregivers of each child being interviewed face to -face. Thus, 193 212 households were visited, of which 19 540 were eligible, and 12 524 were included in the study, obtaining data on 14 558 children and 12 155 biological mothers. The missing data were imputed using the automatic hot deck method. This was performed by obtaining data from participants who shared similar socioeconomic characteristics to those with missing data. We can guarantee that the population estimates remain unchanged through the imputation

Table 1 Trends of breastfeeding indicators in Brazil, according to Brazilian regions, from 1996 to 2019

	PNDS-1996		PNDS-2006		ENANI-2019	
Region	Prevalence (%)	95% CI	Prevalence (%)	95% CI	Prevalence (%)	95% CI
Early initiation of breastfeeding (EIBF)						
Brazil	36.3*‡	33.6 to 39.0	60.9*	56.5 to 65.3	62.5†	58.3 to 66.6
North	46.3*‡	37.9 to 54.6	68.3*	63.1 to 73.5	73.6†	67.7 to 79.5
Northeast	42.4*‡	38.2 to 46.6	69.6*	63.9 to 75.3	63.2†	57.1 to 69.3
Southeast	30.8*‡	26.0 to 35.5	56.3*	46.9 to 65.7	58.7†	49.4 to 68.0
South	33.1*‡	26.2 to 40.1	52.7*	43.5 to 61.9	61.8†	57.1 to 66.5
Midwest	35.4*‡	26.3 to 44.4	59.0*	52.1 to 65.9	64.0†	57.6 to 70.5
Exclusive breastfeeding under 6 months of age (0–5 months of age) (EBF<6 mo)						
Brazil	26.9†	21.3 to 31.9	39.0	31.0 to 47.1	45.8†	40.9 to 50.7
North	24.8	12.8 to 36.9	39.0	26.0 to 52.0	40.3	26.9 to 53.7
Northeast	20.4†	14.5 to 26.4	26.9	16.8 to 37.1	39.0†	27.9 to 50.1
Southeast	30.8	20.4 to 41.2	50.4	34.0 to 66.8	49.1	40.6 to 57.7
South	37.2	23.4 to 51.0	28.4‡	15.6 to 41.1	54.3‡	47.7 to 60.9
Midwest	18.4†	6.0 to 30.8	45.2	31.6 to 58.7	46.5†	39.7 to 53.4
Continued breastfeeding at 1 year of age (12–15 months of age) (CBF1yr)						
Brazil	36.6†	30.8 to 42.4	48.7	38.3 to 59.0	52.1†	45.4 to 58.9
North	46.3	33.9 to 58.7	62.3	47.4 to 77.3	56.4	33.5 to 79.2
Northeast	34.7†	26.4 to 43.0	54.6	38.8 to 70.3	58.6†	51.6 to 65.5
Southeast	35.3	24.2 to 46.4	39.9	17.6 to 62.1	51.4	36.2 to 66.7
South	41.9	24.3 to 59.5	52.1	35.0 to 69.2	34.9	24.9 to 44.8
Midwest	33.9	18.8 to 49.0	46.6	30.0 to 63.2	54.4	44.7 to 64.0
Continued breastfeeding at 2 years of age (20–23 months) (CBF2yr)						
Brazil	24.7†	19.5 to 29.9	24.6	15.7 to 33.5	35.5†	30.4 to 40.6
North	14.3†	3.2 to 25.3	28.3	14.7 to 41.8	39.0†	26.2 to 51.7
Northeast	30.6	22.7 to 38.5	43.5	20.8 to 66.2	48.0	37.1 to 58.9
Southeast	25.4	15.6 to 35.3	19.8	4.3 to 35.4	23.4	16.4 to 30.4
South	14.0†	1.3 to 26.7	14.9‡	1.8 to 27.9	42.7†‡	31.8 to 53.5
Midwest	21.1	7.8 to 34.4	14.2	2.8 to 25.5	32.3	24.3 to 40.3

*Significant difference between PNDS-1996 and PNDS-2006.
†Significant difference between PNDS-1996 and ENANI-2019.
‡Significant difference between PNDS-2006 and ENANI-2019.
ENANI-2019, Brazilian National Survey of Child Nutrition; PNDS-2006, 2006 Demographic Health Survey of Women and Children.

process, ensuring that the data remains comparable across periods. The EIBF indicator was the only one that was not inputted. The final sample comprised 6322 children under 2 years old.[20 23 24]

The questionnaires were administered in Portuguese, the unified language of the country. Regional differences regarding the terminology for foods were considered.

Breastfeeding indicators

We evaluated the following key breastfeeding indicators in 1996, 2006 and 2019: EIBF, EBF<6 mo, CBF1yr and CBF2yr.[25] These indicators were calculated according to the WHO and UNICEF 2021's 'Indicators for assessing infant and young child feeding practices'.[8]

The PNDS-1996 collected the child's age in months. For the PNDS-2006, it was calculated considering the difference between the date of birth and the day of the interview. The age variable was already classified in months in the datasets for both surveys. In ENANI-2019, age in days was calculated as the difference between the birthdate and the interview date, which will be exemplified according to each indicator.

EIBF is defined as the 'percentage of children born in the last 24 months put to the breast within 1 hour of birth'.[8] To calculate this indicator, we considered the question of each survey about how long after birth the child had been placed on the breast to breastfeed.

Children breastfed immediately or for ≤1 hour after birth and those breastfed for >1 hour after delivery were considered breastfed and non-breastfed in the first hour, respectively. If the child had never been breastfed or the respondents answered that they did not know or did not want to answer, or even if the variable was absent, the child was classified as not having been breastfed in the first hour.[8] In the ENANI-2019, being breastfed immediately after birth was asked only for the youngest child in the household. The decision to focus solely on the youngest child in each household was strategic in limiting the potential for codependency of variables. Therefore, we avoided situations where shared maternal and household characteristics might artificially inflate correlations among variables related to multiple children in the same family. EIBF included children <24 months (or <730 days, in the case of ENANI-2019), comprising 1837 in PNDS-1996, 1900 in PNDS-2006 and 6019 in ENANI-2019.

EBF<6 mo was considered when children received only breast milk 24 hours before the survey and did not receive any other solid or liquid food.[8] Children who had never been breastfed or did not have information about breastfeeding or consumption of the foods under analysis were considered not exclusively breastfed. All surveys included specific questions about food and drink consumption, including water, water with sugar, tea, and juice. The analysis of this indicator considered only children <6 months and, in ENANI-2019, <183 days. The sample size for EBF<6 mo calculation was 447 children in PNDS-1996, 486 in PNDS-2006 and 1968 in ENANI-2019.

The core indicator for assessing breastfeeding is 'CBF 12–23 months', but the WHO recommends disaggregating it when the sample size is large enough.[8] Consequently, we reported this indicator separately for the 12–15 and 20–23 months age groups. To calculate the CBF1yr, the numerator was children aged 12–15 months (or ≥365 and <487 days, in ENANI-2019) who received breast milk on the day before the interview, and the denominator was all children in this age group.[8] The analysed sample comprised 358 children in PNDS-1996, 291 in PNDS-2006 and 966 in ENANI-2019.

CBF2yr had as its numerator children aged 20–23 months (for ENANI-2019, children aged 609 to less than 730 days) who received breast milk on the day before the interview, and the denominator was all children in this age group.[8] The total number of children considered for the indicator calculation was 316, 294 and 982, respectively, in the PNDS-1996, PNDS-2006 and ENANI-2019.

Statistical analyses

The indicators' point prevalence and 95% CIs were estimated for Brazil and each macroregion for the three surveys independently. The lack of overlap between the 95% CI for the prevalence of the indicators was assumed as a statistically significant difference.

The absolute difference between prevalence's was calculated to assess changes in indicators between periods (ie, PNDS-1996 vs PNDS-2006; PNDS-2006 vs ENANI-2019; PNDS-1996 vs ENANI-2019), and the results were expressed in percentage points (pp). The average variation (%) of all indicators was calculated as the ratio between two prevalences (ie, PNDS-1996 vs PNDS-2006; PNDS-2006 vs ENANI-2019; PNDS-1996 vs ENANI-2019) minus 1 and multiplied by 100. The average annual variation (%AAV) was calculated as the average variation between periods divided by the total years in the period analysed [(((prev-X/prev-Y)−1)×100)/years].[26] 95% CI could not be estimated, because the prevalence was calculated for each dataset separately.[27 28]

We compared the indicators' prevalence in ENANI-2019 with the breastfeeding targets established for 2030: 70% for EIBF and EBF<6 mo, 80% for CBF1yr and 60% for CBF2yr.[18] Subsequently, we calculated the relative percentage increase of each indicator to reach the target, that is, [(WHO target−BF indicator)/BF indicator]×100.

Statistical analyses were performed using R programming language with srvyr and survey packages and considering the survey sample design (strata and clusters). For the PNDS-1996, we used the basic sample weights; for PNDS-2006, the calibrated weights according to the guidelines presented in the research reports (https://bvsms.saude.gov.br/bvs/publicacoes/pnds_crianca_mulher.pdf and for ENANI-2019 we used the design object as described elsewhere.[23]

Patient and public involvement

Patients or the public were not involved in the design, conduct, reporting or dissemination plans of our research.

RESULTS

The EIBF in Brazil increased from 36.3% in 1996 to 60.9% in 2006 and 62.5% in 2019. Statistically significant increases occurred only between 1996 and 2006 for Brazil and all macroregions (table 1). The EBF<6 mo in Brazil rose from 26.9% in 1996 to 39.0% in 2006 and 45.8% in 2019, with statistically significant increases only between 1996 and 2019 for Brazil and the Northeast, and Midwest regions. Only for the South region, there was a significant increase in the prevalence of EBF<6 mo between 2006 and 2019 (28.4% to 54.3%, respectively). There was a non-significant decrease in EBF<6 mo between 1996 and 2006 in the South (37.2% to 28.4%) and between 2006 and 2019 in the Southeast region (50.4% to 49.1%) (table 1).

The prevalence of CBF1yr increased from 36.6% in 1996 to 48.7% in 2006 and 52.1% in 2019, and the differences were statistically significant only between 1996 and 2019. In the Northeast region, the prevalence of CBF1yr increased throughout the period (34.7% in 1996 to 58.6% in 2019). In contrast, the CBF1yr prevalence in the North and South regions had a non-significant decrease in 2019 compared with 2006 (62.3% to 56.4% and 52.1% to 34.9%, respectively) (table 1).

Although there was a significant increase in CBF2yr between 1996 and 2019, the prevalence remained stable (24.7% in 1996 and 24.6% in 2006) and then increased to 35.5% in 2019. A significant increase in the same period was found only in the North and South regions. In contrast, CBF2yr prevalence decreased in the Southeast and Midwest in 2006, compared with 1996, with a subsequent increase in 2019. A significant increase was observed in the South region between 2006 and 2019 (table 1).

EIBF increased by 20–30 pp from 1996 to 2019 in all macroregions. Considering the AAV% results, there was a relative increase between 1996–2006 compared with 2006–2019 (6.8% vs 0.2% per year). The EBF<6 mo had the highest absolute increase from 1996 to 2019 in the Midwest region (28.1 pp); this increase was less than 20 pp from 1996 to 2019 in all other regions. The higher AAV% was in the Midwest, comparing 1996–2006 (14.6%) (table 2).

The CBF1yr indicator did not show a consistent trend; in the South region, the relative increase was 2.4% between 1996 and 2006 (10.2 pp), but with a reduction by 0.7% between 1996 and 2019 (–7.0 pp) and by 2.5% from 2006 to 2019 (–17.2 pp). The Northeast had the largest AAV% of this indicator compared with all regions in 1996–2006 (5.7%; 19.9 pp) and 1996–2019 (3.0%; 23.9 pp). The CBF2yr indicator decreased by 2.2% in the Southeast (–5.6 pp). In the South region, there was a relative increase of 8.9% (28.7 pp) from 1996 to 2019. Considering this period, only the Southeast had a negative AAV% (–0.3%) (table 2).

Table 2 Differences (in percentage point (pp)) and average annual variation (%) in the prevalence of breastfeeding indicators over time, according to Brazilian regions, from 1996 to 2019

	PNDS-1996 to PNDS-2006		PNDS-2006 to ENANI-2019		PNDS-1996 to ENANI-2019	
Region	**Difference (pp)**	**AAV%**	**Difference (pp)**	**AAV%**	**Difference (pp)**	**AAV%**
Early initiation of breastfeeding (EIBF)						
Brazil	24.6	6.8	1.6	0.2	26.2	3.1
North	22.0	4.8	5.3	0.6	27.3	2.6
Northeast	27.2	6.4	- 6.4	- 0.7	20.8	2.1
Southeast	25.5	8.3	2.4	0.3	27.9	3.9
South	19.6	5.9	9.1	1.3	28.7	3.8
Midwest	23.6	6.7	5.0	0.7	28.6	3.5
Exclusive breastfeeding under 6 months of age (0–5 months of age) (EBF<6mo)						
Brazil	12.1	4.5	6.8	1.3	18.9	3.1
North	14.2	5.7	1.3	0.3	15.5	2.7
Northeast	6.5	3.2	12.1	3.5	18.6	4.0
Southeast	19.6	6.4	- 1.3	- 0.2	18.3	2.6
South	- 8.8	- 2.4	25.9	7.0	17.1	2.0
Midwest	26.8	14.6	1.3	0.2	28.1	6.6
Continued breastfeeding at 1 year of age (12–15 months of age) (CBF1yr)						
Brazil	12.1	3.3	3.4	0.5	15.5	1.8
North	16.0	3.5	- 5.9	- 0.7	10.1	1.0
Northeast	19.9	5.7	4.0	0.6	23.9	3.0
Southeast	4.6	1.3	11.5	2.2	16.1	2.0
South	10.2	2.4	- 17.2	- 2.5	- 7.0	- 0.7
Midwest	12.7	3.7	7.8	1.3	20.5	2.6
Continued breastfeeding at 2 years of age (20–23 months) (CBF2yr)						
Brazil	- 0.1	0.0	10.9	3.4	10.8	1.9
North	14.0	9.8	10.7	2.9	24.7	7.5
Northeast	12.9	4.2	4.5	0.8	17.4	2.5
Southeast	- 5.6	- 2.2	3.6	1.4	- 2.0	- 0.3
South	- 0.9	- 0.6	27.8	14.4	28.7	8.9
Midwest	6.9	3.3	18.1	9.8	11.2	2.3

AAV, average annual variation; ENANI-2019, Brazilian National Survey of Child Nutrition; PNDS-1996, 1996 Demographic Health Survey of Women and Children; PNDS-2006, 2006 Demographic Health Survey of Women and Children; pp, percentage point.

Considering the 2019 results, the EIBF prevalence in Brazil and regions needs a ~10% increase to achieve the target of 70% for almost all regions. An exception is noted in the North, where it has already been reached, and in the Southeast, where the increase needed is about 20%. The improvement required for EBF<6 mo to achieve the target of 70% is 52.8% for Brazil and varies across regions: from 28.9% in the South region to 79.5% in the Northeast region. CBF indicators need to increase by 53.6% (CBF1yr) and 69% (CBF2yr) for Brazil to reach the respective targets of 80% and 60%. This figure varies among the regions: from 36.5% (Northeast region) to 129.2% (South region) for CBR1yr, and from 25% (Northeast region) to 156.4% (Southeast region) for CBF2yr (figure 1).

DISCUSSION

We found a substantial improvement in breastfeeding rates for four key indicators in Brazil, with EIBF having significant increases between 1996 and 2006, and EBF<6 mo, CBF1yr and CBF2yr with significant increases between 1996 and 2019. Considering the Brazilian regions, there was a significant increase between 1996 and 2019 in the Northeast for EBF<6 mo and CBF1yr; Midwest for EBF<6 mo and South for CBF2yr. The AAVs were heterogeneous, with non-significant decreases in the South (CBF1yr) and the Southeast (CBF2yr). Despite the significant increase observed in some regions, the slow growth in these indicators' prevalence in Brazil will likely result in a non-achievement of the WHO/UNICEF 2030 target for three of the four indicators. The poorest regions (Northeast and North) need to increase more than 70% the current prevalence for EBF<6 mo and the wealthiest regions of Brazil (South and Southeast) need to more than double the 2019 prevalence to reach the target for CBF1yr and CBF2yr.

The success of breastfeeding depends on the woman's conditions (eg, intention to breastfeed, family support, physical, emotional and socioeconomic conditions) and the structural context, including public policies to promote, support and protect this practice, which has been implemented successfully in Brazil. The Brazilian MoH, WHO and UNICEF recommend EIBF after birth, EBF until 6 months, and CBF with complementary foods up to 2 years of age or beyond.[16 29] The regulation and monitoring of the commercialisation of breast milk substitutes in Brazil, associated with primary and hospital care programmes and laws ensuring paid maternity leave, contributed to the upward trend.[17] In Brazil, 32.8% of births occur in hospitals certified by the Baby Friendly Hospital Initiative (BFHI).[30] In these hospitals, breastfeeding rates are higher compared with non-certified hospitals, which can be attributed to the efforts of the health team during the mother's hospitalisation.[14 31]

EIBF had a higher increase rate between 1996 and 2019 in Brazil, compared with the other breastfeeding indicators, and needs to increase by 12.2% to reach the WHO/UNICEF 2030 target. This indicator is most likely to reach the target the WHO/UNICEF stipulated for 2030, considering the annual increase of the evaluated period (3.5%). An annual growth of 1.1% would be necessary to achieve the target (assuming that the latest data were collected in 2019, with 11 years remaining for the date stipulated for the target reach). Nonetheless, considering only the AAV between the two most recent surveys (0.2%), it would take 61 years for the target to be reached, starting from 2020. EIBF is a recommended immediate newborn care practice that could reduce the risk of neonatal deaths[32] and is essential to the establishment of breastfeeding in the long term.[33] A meta-analysis with 136 047 infants found that, compared with infants who initiated breastfeeding ≤1 hour after birth, those who started 2–23 hours and ≥24 hours after birth had a 33% greater risk and 2.19-fold greater risk of neonatal mortality, respectively.[34] Indeed, neonatal and infant mortality rates are declining in Brazil, and timely breastfeeding initiation could be one of the variables responsible for this reduction.[35]

Maternal complications during pregnancy, caesarean delivery and the absence of postnatal/neonatal appropriate care may affect EIBF.[36] Among the various recommended postnatal practices, women exposed to immediate skin-to-skin contact (≤30 min) in different modes of birth were more likely to initiate breastfeeding early.[37] Data from 11 Demographic and Health Surveys in Africa, Southeast Asia, the Americas and Europe found that early postnatal breastfeeding support, adjusted for sociodemographic characteristics and birth-related factors, was associated with a significant 24% increase in the odds of initiating breastfeeding within 1 hour of birth.[38] A study of 319 nationally representative surveys from 81 countries between 2000 and 2019 observed significant increases in the prevalence of EIBF and EBF<6 mo in all education levels (none, primary, secondary or higher). For EIBF, higher prevalence rates occurred for women without formal education, attributed to increased births in facilities where early initiation has been promoted rather than at home.[39]

A study with 113 countries from 2000 to 2019 found a mean EBF<6 mo prevalence of 48.6% in 2019,[40] placing Brazil (EBF<6 mo=45.8% in 2019) near the global average. The same study found increases in EBF<6 mo rates of 0.70 pp per year (pp/yr),[40] and Brazil, again, follows the average increase rate of this indicator (7.2 pp from 2006 to 2019~0.6 pp/yr). Despite positive trends in EIBF globally, the improvement rate in Brazil seems insufficient to reach the target of at least 70% of EBF<6 mo by 2030. Keeping the AAV of the studied period at 3.3%, the target would be reached in 16 years, or 37.7 years if only the variation between the two most recent surveys were considered.

The reduction in EBF<6 mo between 2006 and 2019 in the Southeast region, although not significant, requires attention. It is also essential to understand why this region did not follow the same upward trend observed in other

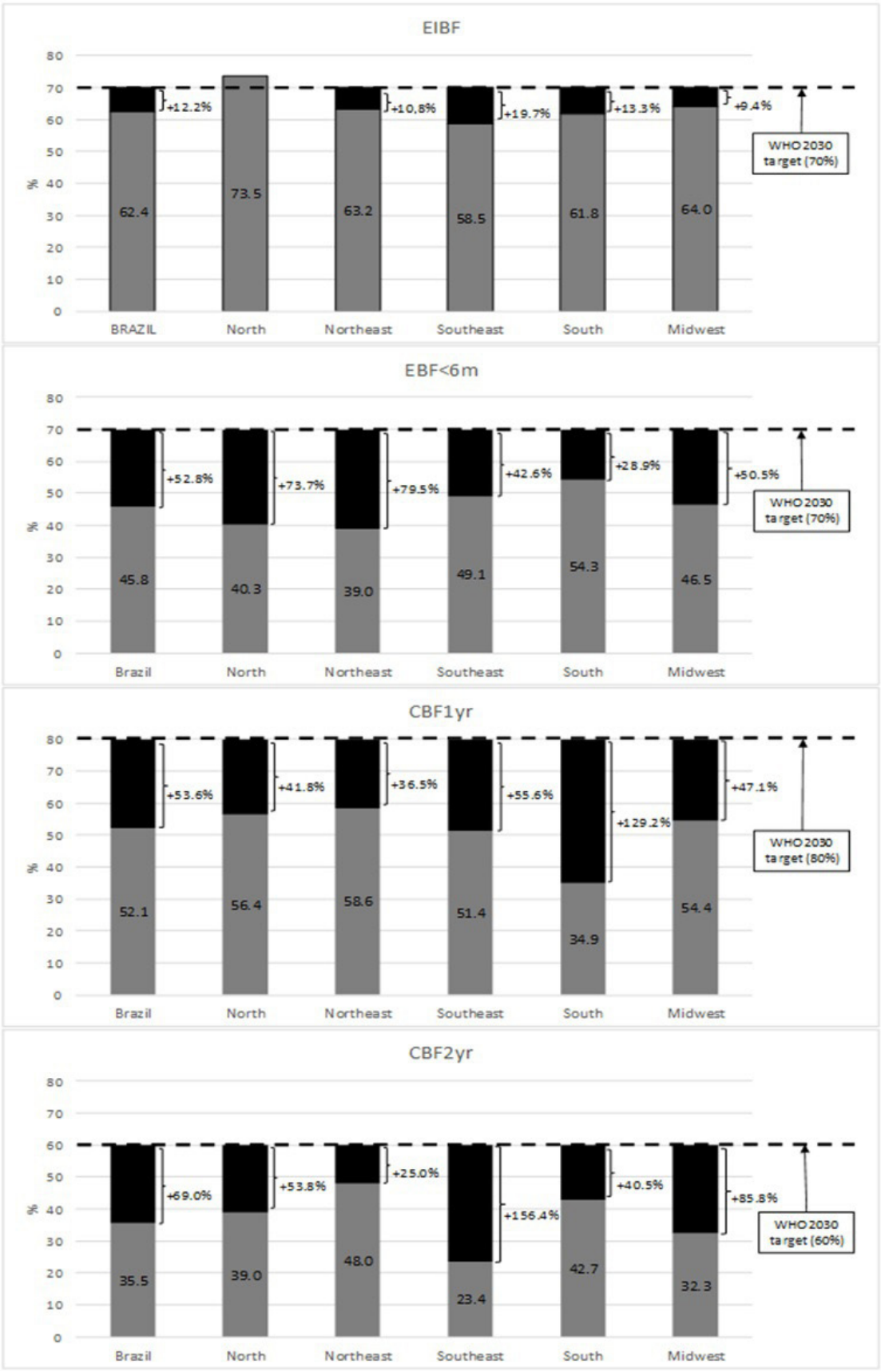

Figure 1 Prevalence of breastfeeding indicators in ENANI-2019, according to Brazilian regions, and the percentage increase needed to achieve WHO/UNICEF 2030 target. CBF1yr, continued breastfeeding at 1 year old (12–15 months old); CBF2yr, continued breastfeeding at 2 years old (20–23 months old); EBF<6 mo, exclusive breastfeeding under 6 months (0-5 months of age); EIBF, early initiation of breastfeeding; ENANI, Brazilian National Survey of Child Nutrition.

macroregions of the country through the investigation of risk factors associated with indicators found in other studies, such as delivery mode, birth weight, and social, cultural and family characteristics.[41 42]

EBF<6 mo is intrinsically associated with the mother's occupational characteristics.[43] The risk of quitting breastfeeding in the first month of life is higher than in any month thereafter.[44] Mothers who are not employed or work part time are more likely to breastfeed exclusively when compared with women who work full-time.[45] For the latter, extended maternity leave is an important protective policy to stimulate and promote EBF<6 mo.[46] In Brazil, the extended maternity leave of 6 months is accessible only for part of all working women, which should be a challenge to overcome to increase EBF and consequently improve child and women's health. Other workplace interventions include having a lactation space, breast milk extraction breaks and organisational policies to create a supportive environment promoting the efficacy of breastfeeding mothers.[47 48]

Breastfeeding support to women during antenatal and postnatal care provided by professionals or peers supporters is associated with increased duration and exclusivity of breastfeeding.[49] The support must include knowledge about women's rights to breastfeeding and instrumental aspects of breastfeeding, such as extraction and storage of breast milk.[48] Additional educational efforts to reduce the unnecessary introduction of infant formula are needed for health workers and families to inform them about normal early infant growth and behaviour, like crying patterns, regurgitation and short night-time sleep, behaviours which the infant formula industries reinforce that are signs of feeding problems.[47]

Despite the WHO's recommendation for breastfeeding to 2 years and beyond, and even with the recognised benefits for infants and mothers, only about one-third of mothers practised it in 2019 in Brazil. However, this prevalence is lower than 20% in most upper-middle-income countries; in low-income and lower-middle-income countries, this rate is about 60%.[5] In Brazil, a similar scenario occurs—the prevalence of CBF in 2019 is lower in the more affluent regions (for CBF1yr, in the South; for CBF2yr, in the Southeast). It is a challenge to understand the reason for these differences. High-income regions have greater insertion of women in the labour market,[50] and in the wealthiest countries, there are claims that breastfeeding is antiwork and antifeminist, and that infant formula is associated with modernity and women's liberation.[51] It can be assumed that working women may be more affected by this type of infant formula marketing argument, which exploits the emotions, anxieties and aspirations of parents and reinforces, among other myths, that the quality of breast milk decreases with age, undermining women's self-confidence. These violations of the International Code of Marketing of Breast-milk Substitutes still occur despite the efforts of member states of the World Health Assembly and the international community.[52]

The improvement observed in the South region from 2006 to 2019 is remarkable. We hypothesise that in 1996, the North and South regions exhibited the lowest incidence of CBF2yr, indicating a significant opportunity for enhancement. Nevertheless, each of them experienced these advancements at different times. Positive improvements in CBF2yr were detected earlier in the North region, dating back to the 2000s. The South region experienced a delayed improvement for reasons that should be investigated.

It is a challenge for Brazil to reach the target set for 2030 for CBF1yr, as the gap between the 2019 values and the targets is significant (53.6%), and the AAV is low. However, although the gap to achieve the target is even more for the CBF2yr (69,0%), this target will likely be achieved sooner because there has been an important advance in this indicator in Brazil. For three decades, the CBF2yr indicator had been stagnant,[17] but in the last survey, it showed a significant increase, with an average annual growth of 3.9. Maintaining this average would take 17.7 years to reach the target (counting from 2020). The strategies implemented in Brazil since the 1980s were certainly responsible for this increase.

To achieve the WHO/UNICEF 2030 breastfeeding objectives, Brazil must consider the status and progress of all indicators throughout the country. Priority should be given to the Southeast region, as it has the lowest EIBF and CBF2yr indicators and has receded in the EBF indicator, and the Northeast region, for presenting the lowest performance in the EBF indicator and having regressed in the EIBF indicator. Reinforcing the Baby-Friendly Hospital Initiative can improve EIBF.[53] Supporting working women who breastfeed[54] and promoting the Breastfeeding and Feeding Brazil Strategy[55] could increase EBF<6 mo. The first approach is to advocate for breastfeeding in public and private work environments, while the second is to enhance the capacity of primary healthcare professionals to promote breastfeeding and healthy complementary feeding. To increase the duration of any breastfeeding, it is also necessary to strengthen strategies such as the Human Milk Bank Network and the regulation and monitoring of the commercialisation of breast milk substitutes.[56] Education and awareness campaigns, a supportive environment for breastfeeding mothers, and close monitoring of their practices are essential to reinforce and sustain this trend.

The main strength of this study is the use of relevant nationally representative surveys from the last 25 years with large sample sizes that ensure high precision of the estimates. Another positive aspect is that the analyses used the most recently published breastfeeding indicators recommended by WHO.[8] An additional strength is that this is the first article in Brazil and Latin America to investigate trends toward WHO/UNICEF 2030 targets. The limitations of this study include the differences inherent to each questionnaire that could impact the prevalence presented, such as the measurement of the age (in months or days) and the fact that EIBF information in

ENANI-2019 was collected only for the youngest child of the household. Also, exclusive and CBF indicators considered these practices the day before the interview across a structured questionnaire (online supplemental figure 1). Some studies expect different estimates if obtained using a 24h-recall method.[57] In addition, the methodologies used to collect sociodemographic and economic variables varied substantially across the different surveys included in our research. However, further analyses (not shown) were conducted considering adjusted prevalences for maternal education and age, which did not reveal any significant changes. The comparability of estimates across the surveys may raise concerns due to using different sampling weights and the potential lack of adjustments for these changes over the 23 years between surveys. We are confident it is unnecessary to adjust the data for the population changes that occurred over the years because each survey's construction and calibration methodology to determine the weights accurately reflects the population characteristics of the year the survey was conducted. Furthermore, the weights were carefully calibrated using population data evaluated or estimated by the IBGE specifically for each study year accounting for population changes over time, that is, using weights does not underestimate or overestimate our population. Considering that we used the most recent WHO recommendations to calculate the indicators, some prevalence presented here could differ slightly from previous publications.

CONCLUSION

A substantial improvement in breastfeeding rates for EIBF, EBF<6 mo, CBF1yr and CBF2yr occurred in Brazil from 1996 to 2019. The significant changes occurred mainly from 1996 to 2006. The slow increase in the prevalence of these indicators between 2006 and 2019 could indicate a non-achievement of the WHO/UNICEF 2030 target. The increase in breastfeeding indicators over the past decades in Brazil is consistent with pro-breastfeeding public policies implemented to protect, promote, and support breastfeeding. However, considering the differences found among Brazilian macroregions and to enhance equity in breastfeeding practices, policies and actions to improve those rates should not be the same for all regions.

Author affiliations
[1]Laboratório de Informática em Saúde, Instituto de Comunicação e Informação Científica e Tecnológica em Saúde, Fundação Oswaldo Cruz, Rio de Janeiro, Brazil
[2]Departamento de Nutrição e Dietética, Instituto de Nutrição Josué de Castro, Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil
[3]Divisão de Pesquisa Populacional, Instituto Nacional de Cancer, Rio de Janeiro, Brazil
[4]Observatório de Epidemiologia Nutricional, Instituto de Nutrição Josué de Castro, Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil
[5]Instituto de Estudos em Saúde e Biológicas, Universidade Federal do Sul e Sudeste do Pará, Maraba, Brazil
[6]Departamento de Nutrição, Universidade Federal do Paraná, Curitiba, Brazil
[7]Instituto de Estudos em Saúde Coletiva, Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil
[8]Departamento de Pediatria, Faculdade de Medicina, Universidade Federal do Rio Grande do Sul, Porto Alegre, Brazil
[9]Departamento de Nutrição Social, Instituto de Nutrição, Universidade do Estado do Rio de Janeiro, Rio de Janeiro, Brazil

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Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

Ethics approval This study involves human participants and ENANI-2019 was approved by the Institutional Review Board of the Clementino Fraga Filho University Hospital of the Federal University of Rio de Janeiro (UFRJ) and was registered under the number CAAE 89798718.7.0000.5257. The study complied with the ethical principles established by Resolution n. 466/2012 of the Brazilian National Health Council. The parents or caregivers of the children who agreed to participate in the survey signed two copies of the informed consent form, freely and spontaneously, after hearing an explanation of all the ethical issues of the study. Participants gave informed consent to participate in the study before taking part.

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Data availability statement Data are available in a public, open access repository. Data are available on reasonable request. Publicly available datasets were analysed in this study. For PNDS 1996 and 2006, these data can be found here: https://microdata.worldbank.org/index.php/catalog/1346 and https://bvsms.saude.gov.br/bvs/pnds/banco_dados.php, respectively. For ENANI-2019, data are available on request. The data sets used and/or analysed during the current study are available from the corresponding author on reasonable request.

ORCID iD
Gilberto Kac http://orcid.org/0000-0001-8603-9077

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Supplementary figure 1. Example of part of the structured questionnaire of the Brazilian National Survey on Child Nutrition (ENANI-2019).

1. Was [NAME] breastfed yesterday?
2. Yesterday did [NAME] have plain water?
3. If YES, was the water that "NAME" drank yesterday filtered or boiled?
4. Yesterday did [NAME] drink water with sugar?
5. Yesterday did [NAME] drink tea?

The questionnaire also contained a further 36 questions about the previous day's consumption of:
(1) Powdered cow's milk; (2) Liquid cow's milk; (3) Powdered soy milk; (4) Liquid soy milk; (5) Infant formula; (6) Natural pressed juice without added sugar; (7) Whole fruit in pieces or mashed, frequency; (8) Mango, papaya, or guava (fruits high in vitamin A); (9) Other fruits; (10) Regular family foods (straight from the pan, puree, or soup); (11) Regular family foods and cereals; (12) Frequency, consistency; (13) Porridge or oatmeal with milk; (14) Yogurt; (15) Rice, potato, yam, water yam, cassava/manioc, flour, or pasta (except instant noodles); (16) Bread, rolls, homemade, industrialized; (17) Vegetables other than potato, yam, water yam, cassava/manioc; (18) Carrot, squash, pumpkin, or sweet potato (vegetables high in vitamin A); (19) Kale, spinach, taro, broccoli, purslane, portulaca, mustard greens (vegetables high in vitamin A or iron); (20) Greens other than kale, spinach, taro, broccoli, purslane, portulaca, mustard greens; (21) Beans and other grains, such as lentils, peas, or garbanzos (chickpeas); (22) Meat (beef, chicken, pork, fish, or other); (23) Liver; (24) Egg (fried, scrambled, omelet, boiled, or blended); (25) Ultra-processed meats (Hamburger, ham, baloney, salami, nuggets, sausage, hotdogs); (26) Packaged salty snacks such as chips, Fandangos, Cheetos etc. (27) Industrialized juices in cartons, coconut water in cartons, natural guarana or guarana syrup, currant drink, powdered fruit juice, natural fruit; (28) Soda; (29) Instant noodles; (30) Cookies, crackers; (31) Candy, lollipops, and other sweets; (32) Industrialized seasonings; (33) Instant rice flour, corn meal, wheat flour, or oatmeal; (34) Food consumed in baby bottles or small baby bottles; and (35) Food sweetened with sugar, honey, or molasses.

The complete questionnaires in Portuguese are available on the respective survey websites:

1. PNDS-1996: https://dhsprogram.com/pubs/pdf/fr77/fr77.pdf
2. PNDS-2006: https://bvsms.saude.gov.br/bvs/pnds/img/Questionario_Mulher.pdf
3. ENANI-2019: https://enani.nutricao.ufrj.br/