Trends in the quality of child health care in the first week of life in primary care services in Brazil

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Abstract *The aim of this study was to assess temporal trends in the quality of health care during the first-week child check-up in primary care services stratified by municipal, health team and maternal characteristics. We conducted a cross-sectional study using data from the three cycles of the National Program for the Improvement of Access and Quality (PMAQ) (2012, 2014 and 2018). Adult service users with children aged up to 2 were interviewed. The outcome was "good quality health care in the first week of life". Descriptive and time trend analyses were performed using variance-weighted least squares regression. The frequency of good quality care during the first-week check-up was 47.9% (95%CI 46.6-49.3) in 2012, 52.5% (95%CI 51.3-53.7) in 2014 and 53.3% (95%CI 52.2-54.4) in 2018, with an annual increase of 0.73 pp (p<0.001). The annual increase was greater in the Northeast (2.06 pp) and in municipalities with very low/low HDI (1.48 pp) and 100% family health strategy coverage (0.98 pp). Trends in the frequency of good quality health care during the first-week child check-up were favorable.*

Key words *Health care quality assessment, Primary Health Care, Trends, Child Health*

Introduction

Primary Health Care (PHC) is first-contact, continuous comprehensive, and coordinated care provided to populations[1] and recognized as the backbone of health systems in low- and middle-income countries[2]. Quality of health care can be defined as the degree to which health resources or services are consistent with specific standards[3] and is a key component of the right to health with dignity and equity for all, especially among women and children[4]. Quality also refers to compliance with all actions envisaged in official documents for each health condition[5].

Isolated indicators of coverage and health status (up-to-date vaccination, malnutrition, infant mortality) have been used to monitor progress in child health to the detriment of quality of care, in part due to the challenges of defining and capturing quality indicators[6]. Insufficient quality of care received by mothers and newborns can contribute to low use of services and high rates of morbidity and mortality[7].

A study in Kenya and Uganda showed that quality improvement was an effective strategy to reduce rates of mortality and morbidity related to prematurity[8], while a study in Brazil concluded that quality of PHC measured using health team work process variables played a key role in decreasing mortality among children under one[9].

Harzheim *et al.*[10] validated the Brazilian version of the Primary Care Assessment Tool (PCAT)[11] for children, developed based on the Donabedian model, which assesses quality of care considering the following components: i) structure (material and human resources); ii) process (health care practitioner activities); and iii) outcome (the effect of health care actions and procedures on individual health care)[12]. Studies conducted at municipal level in Brazil using this tool have identified that some PHC attributes have yet to reach a satisfactory level, which can result in negative consequences for care and child health[13-16].

Studies investigating temporal trends in the quality of child health care in PHC services at local, regional or national level in Brazil were not found. In addition, gaps have been identified in care in the first week of life. This study assessed temporal trends in the quality of health care during the first-week child check-up in PHC services, stratified by municipal, health team and maternal characteristics using data from the Na-tional Program for the Improvement of Primary Care Access and Quality (PMAQ-AB, acronym in Portuguese).

Methods

Study design and data sources

We performed a cross-sectional analysis using data from the three cycles of the PMAQ-AB, developed in 2012, 2014 and 2018. Each cycle comprised four phases: i) adherence and contractualization; ii) development; iii) external assessment; and iv) recontractualization. For the purposes of this study, we used the data from the external assessment conducted by higher education institutions (IES) under the leadership of the Ministry of Health's Department of Primary Care. We used data from the following components of the PMAQ evaluation instrument applied in the external assessment: Module II - characterization of the organization of services and health team work processes; and Module III - interviews with PHC facility users. The evaluation instrument and logistics of the external assessment were developed by the higher education institutions and standardized across the country under the coordination of the Ministry of Health's Department of Primary Care.

Study population

Interviews were conducted with service users aged 18 years and over who had used PHC services during the 12 months prior to the interview and were waiting to be seen on the day of the external assessment. The interviewers randomly selected at least four service users per family health team. Cycle I included 65,410 service users, 50,808 (77.7%) of whom were women. A little under 90% (45,560) of the women had been pregnant at least once in their life and 8,777 (19.3%) had children aged up to 2. Cycle II included 114,615 service users, 91,203 (79.6%) of whom were women. A little over 90% of these women (82,935) had been pregnant at least once in their life. Of these, 12,787 (15.4%) had children aged up to 2. In cycle III, 140,444 service users were interviewed, including 110,145 (78.4%) women, 21,110 (19.2%) of whom had been pregnant during the two years prior to the interview. Of these, 14,276 (67.6%) had children aged up to 2 (Table 1).

Table 1. Study population. Service users interviewed during the external assessment of each cycle. PMAQ, Brazil.

	Cycle I (2012)	Cycle II (2014)	Cycle III (2018)
	N	N	N
Total number of service users ≥18 years interviewed	65,410	114,615	140,444
Women	50,808	91,203	110,145
Women who were pregnant	45,560	82,935	21,110
Women with children up to 2 years	8,777	12,787	14,276

Source: Authors.

Outcome

The outcome "*good quality health care during the first week of life*" was defined according to the score obtained for the following six questions: i) "Was the child weighed?"; ii) "Was the child measured?"; iii) "Was your baby put to the breast?"; iv) "Was the child's navel examined?"; v) "Did you receive counselling on the best sleeping position for the child?"; and vi) "Was the heel prick test performed on the child?". Each "no" answer was scored as 0 and each "yes" answer was scored as 1. The outcome was dichotomized, with "yes" answers to all six questions indicating good quality care during the first week of life.

Exposure variables

Municipal characteristics: region (North, Northeast, Midwest, Southeast and South); estimated population size in 2014 (up to 10,000; 10.001-30.000; 30,001-100,000; 100.001-300,000; more than 300,000); municipal human development index (MHDI 2010), according to the classification of the United Nations Development Program (very low/low: ≤0.599; medium: 0.600-0.699; high: 0.700-0.799; very high: 0.800-1.000); and Family Health Strategy (FHS) population coverage in 2014 (up to 50%; 50.1 to 75.0%; 75.1 to 99.9%; 100%).

Team characteristics: 1) actions undertaken to ensure a child check-up – the health team performed at least two of the following three actions within 10 days after birth: community health worker (CHW) visit to locate the mother; home visit by a member of the health team, out-of-hours appointment on any day of the week (yes, no); 2) tracking of all premature babies, low birth weight babies, overdue child check-ups and overdue vaccinations (yes, no); 3) Recording of

follow-up of children in the catchment area covering all the following indicators: up-to-date vaccination, growth and development, nutritional status and heel prick test (yes, no).

Maternal characteristics: home visit by a CHW during the first week after birth (yes, no) and had a postnatal check-up (yes, no).

Statistical analysis

Descriptive and trend analysis. Municipal, health team and maternal characteristics were described using absolute and relative frequencies. Temporal trends in the frequencies of good quality care throughout the PMAQ cycles were assessed using variance-weighted least squares regression, which shows annual average changes considering different time intervals. A significance level of 0.05 was adopted for all analyses. The independent variable was year of study and absolute annual change was expressed using percentage points (pp). The analyses were conducted using Stata (StataCorp, 2015 Stata Statistical Software: Release 15. College Station, TX: StataCorp LP).

Ethical aspects

The study protocols were approved by the following research ethics committees: Cycle I, Federal University of Pelotas, code 38/2012; Cycle II, Federal University of Goiás, code 487055; Cycle III, Federal University of Pelotas, code 2.453.320. All interviewees signed an informed consent form confirming they had been fully informed as to the nature of study, understood that any information provided would remain confidential and that they were free to withdraw from the study at any time.

Results

Of the service users who had a child aged up to 2, 5,636 (64.2%) reported having done a first-week child check-up in 2012, 7,151 (55.9%) in 2014 and 8,888 (62.3%) in 2018.

More than two-thirds of the interviewees lived in the Southeast and Northeast (78% in 2012, 73% in 2014 and 72% in 2018) and around half lived in municipalities with between 10,001 and 100,000 inhabitants (50% in 2012, 52% in 2014 and 53% in 2018). Most service users lived in municipalities with a high HDI throughout the three cycles (40%, 40% and 39%, respectively). In 2012, around one-third of service users (31%) lived in municipalities where FHS coverage was up to 50%, while in 2014 and 2018 most lived in municipalities where coverage was 100% (43% and 45%, respectively).

The frequency of carrying out at least two of the three actions performed by the health team to ensure a child check-up was 75% in 2012, 77% in 2014 and 78% in 2018. The frequency of tracking of children was 68% in the first cycle, 57% in the second cycle and 90% in the third cycle. The frequency of recording of follow-up of children was 71%, 80% and 92%, respectively, while the frequency of home visits by a CHW during the first week after birth was 71% in 2012, 72% in 2014, and 67% in 2018. The frequency of having a postnatal check-up was 66% in 2012 and 2014, and 76% in 2018 (Table 2).

The most commonly performed procedures during the three cycles were measurement of weight and length, reaching up to 94% in 2012, while the least performed procedures were putting the baby to the breast and counselling on the best sleeping position for the child (72% and 76%, respectively). Performing the heel prick test within the first seven days of life showed the highest annual change (0.69 pp, p<0.001), followed by putting the baby to the breast during the check-up (0.56% pp, p<0.001) and examination of the child's navel (0.30 pp, p <0.001). Measurement of length showed the lowest annual change (0.19 pp, p=0.018), while measurement of weight showed a negative annual change (-0.17 pp, p=0.043). There was no statistically significant annual change in counselling on the best sleeping position for the child (p=0.831) (Table 3).

The frequency of good quality health care during the first-week child check-up was 47.9% in 2012 (95%CI 46.6-49.3), 52.5% in 2014 (95%CI 51.3-53.7) and 53.3% in 2018 (95%CI 52.2-54.4). The annual increase in frequency was 0.73 pp (p<0.001) (Table 3).

The region with the highest average annual increase in frequency of good quality care between 2012 and 2018 was the Northeast (2.06 pp, p<0.001), followed by the Midwest and North (1.54 pp, p=0.002 and 1.28 pp, p=0.022, respectively). Municipalities with between 30,001 and 100,000 inhabitants showed the highest average annual change (1.12 pp, p<0.001). The change in the frequency of good quality care was not statistically significant in municipalities with up to 10,000 and more than 300,000 inhabitants (Table 4). Municipalities with very low/low and medium HDI showed statistically significant annual changes in frequencies (1.48 pp and 1.24 pp, respectively; p<0.001). Municipalities where FHS coverage was 100% showed the highest annual change in frequency (0.98 pp, p<0.001) (Table 4).

Frequency of good quality care was higher than 50% across the three cycles when health teams performed at least two actions to ensure a child check-up within 10 days after birth. However, the increase in frequency over the study period was not statistically significant (p=0.230). The average annual increase in frequency of good quality care was 0.68 pp (p<0.001) when health teams performed tracking of children. Where teams recorded follow-up of children, the frequency of good quality care was 53% in 2014 and 2018, and the average annual increase was 0.69 pp (p<0.001) (Table 4).

Average annual increase was 0.44 pp among mothers who reported having received a home visit from a CHW during the first week after birth and those who had a postnatal child check-up (p=0.026 and p=0.007, respectively) (Table 4).

Discussion

Our findings show that while there was an increase in the frequency of good quality care during the first-week child check-up throughout the PMAQ cycles, only half of the children received good quality care. Significant increases were observed in the Northeast and in municipalities with between 30,001 and 100,000 inhabitants, very low/low and medium HDI, and 100% FHS coverage. Increases were observed over the period when health teams performed tracking and adequately recorded the follow-up of children and when mothers received home visits from a CHW and had had a postnatal check-up.

The heel prick test within the first seven days of life, as recommended by the Ministry of Health, showed the highest annual change[17,18]. However, other studies have reported lower fre-

Table 2. Children receiving health care during the first week of life in primary care services according to municipal, health team and maternal characteristics in each cycle. PMAQ, Brazil.

Variable	Cycle I		Cycle II		Cycle III	
	N	%	N	%	N	%
Brazil	5,636		7,151		8,888	
Municipal characteristics						
Region						
North	220	4.0	466	6.5	782	8.8
Northeast	1,450	26.3	2,448	34.2	3,211	36.1
Southeast	2,844	51.5	2,790	39.1	3,215	36.2
South	573	10.4	882	12.3	1,032	11.6
Midwest	429	7.8	565	7.9	648	7.3
Population size						
Up to 10,000	814	14.8	958	13.6	1,029	11.6
10,001 to 30,000	1,542	27.9	1,954	27.7	2,428	27.3
30,001 to 100,000	1,200	21.7	1,711	24.3	2,264	25.5
100,001 to 300,000	704	12.8	954	13.5	1,168	13.1
More than 300,000	1,256	22.8	1,469	20.9	1,999	22.5
HDI						
Very low/low	369	6.7	281	15.8	1,695	19.0
Medium	1,236	22.4	2,463	35.0	2,893	32.6
High	2,218	40.2	2,786	39.5	3,433	38.6
Very high	1,693	30.7	683	9.7	867	9.8
Family health coverage %						
Up to 50	1,699	30.8	1,363	19.3	1,406	15.8
50.1 to 75.0	1,331	24.1	1,230	17.5	1,734	19.5
75.1 to 99.9	1,075	19.5	1,428	20.3	1,776	20.0
100	1,411	25.6	3,025	42.9	3,972	44.7
Health team characteristics						
Actions to ensure child check-up						
No	519	25.0	1,437	22.6	1,832	21.8
Yes	1,560	75.0	4,919	77.4	6,557	78.2
Tracking of children						
No	1,781	32.2	3,053	43.3	919	10.4
Yes	3,752	67.8	3,933	56.7	7,955	89.6
Recording of follow-up of children						
No	1,587	28.7	1,418	20.1	696	7.8
Yes	3,946	71.3	5,628	79.9	8,178	92.2
Maternal characteristics						
Received a CHW visit						
No	621	29.2	1,945	27.6	2,779	32.7
Yes	1,507	70.8	5,101	72.4	5,715	67.3
Had a postnatal check-up						
No	1,877	33.6	2,354	33.6	2,019	23.7
Yes	3,718	66.4	4,654	66.4	6,492	76.3

Source: Authors.

quencies of performing this test during the first week of life (ranging from 60% to 84%)[19,20].

While there was significant improvement in putting the baby to the breast during the check-up, frequency remained below 80% in 2018.

While breastfeeding is natural, it is also a learned skill[21]. Using the proper technique, including positioning the baby and effective latching on and suckling, is key to the success of breastfeeding[22], and health professionals should provide counsel-

Table 3. Frequency and trends in actions performed during the first-week child check-up. PMAQ, Brazil.

Variable	Cycle I	Cycle II	Cycle III	Annual change*	P-value#
	%	%	%		
Baby's weight was measured	88.3	94.3	90.1	-0.17	0.043
Baby's length was measured	88.3	94.0	91.9	0.19	0.018
Baby put to the breast	71.5	75.5	75.8	0.56	<0.001
Baby's navel was examined	88.9	89.9	90.8	0.30	<0.001
Counselling on best sleeping position received	72.4	71.7	72.0	-0.03	0,831
Heel prick test	90.2	91.1	94.2	0.69	<0.001
Good quality care	47.9	52.5	53.3	0.73	<0.001

*Average absolute annual change (pp) in frequency of good quality care. #Variance-weighted least squares regression.

Source: Authors.

Table 4. Frequency of and trends in good quality care during the first week of life according to municipal, health team and maternal characteristics. PMAQ, Brazil.

Variable	Cycle I	Cycle II	Cycle III	Annual change*	P-value#
	%	%	%		
Brazil	47.9	52.5	53.3	0.73	<0.001
Municipal characteristics					
Region					
North	42.2	49.5	52.3	1.28	0.022
Northeast	44.3	50.6	57.6	2.06	<0.001
Southeast	51.3	55.9	50.1	-0.39	0.072
South	44.5	51.1	50.0	0.59	0.161
Midwest	44.3	48.2	53.8	1.54	0.002
Population size					
Up to 10,000	50.6	53.8	53.8	0.44	0.261
10,001 to 30,000	48.4	53.3	54.2	0.79	0.003
30,001 to 100,000	46.7	52.8	54.8	1.12	<0.001
100,001 to 300,000	45.3	50.4	52.9	1.11	0.004
More than 300,000	48.2	52.3	50.4	0.19	0.520
HDI					
Very low/low	44.0	50.4	55.0	1.48	<0.001
Medium	46.6	53.4	56.0	1.24	<0.001
High	48.1	52.3	51.0	0.31	0.170
Very high	49.3	55.2	49.7	0.07	0.849
Family health coverage %					
Up to 50	48.1	52.5	50.9	0.38	0.216
50.1 to 75.0	47.3	51.6	50.6	0.42	0.169
75.1 to 99.9	47.8	51.4	52.0	0.56	0.072
100	48.3	53.7	55.9	0.98	<0.001
Team characteristics					
Tracking of children	48.2	54.3	53.8	0.68	<0.001
Recording of follow-up of children	48.0	53.3	53.6	0.69	<0.001
Maternal characteristics					
Received a CHW visit	55.2	57.2	58.5	0.44	0.026
Had a postnatal check-up	52.6	57.9	56.7	0.44	0.007

*Average absolute annual change (pp) in frequency of good quality care. #Variance-weighted least squares regression.

Source: Authors.

ling as early as possible[23,24]. Alves *et al.*[25] found that around only 63% of mothers of children under six months reported receiving counselling on latching on/breastfeeding positions in PHC services[25].

Despite Ministry of Health guidance recommending the supine position for sleeping[17], this advice is not being universally passed on to mothers. The probability of sleeping in the supine position increased 43% and 49%, respectively, among mothers who received counselling from doctors or other health professionals[26]. However, another study showed that only 20% of mothers were aware of the correct position for sleeping and only 29% had received this information from doctors[27].

Our findings show that quality of care improved over the study period. This is probably the result of a series of actions undertaken over the course of the PMAQ focusing mainly on service structure and staff training. In low- and middle-income countries, a mix of multiple interventions such as financial incentives, continuous training, the use of guidance documents and norms and standards, audits and feedback, as well as improvements in the organization of work processes, has helped enhance the quality of maternal and infant health care[28].

Frequencies and annual change were highest in the Northeast, which has stood out in previous studies for the better quality of care delivered in child health services[29-32]. It is believed that these improvements will continue to have an impact on maternal and infant health indicators[33,34] and also lead to improvements in infra-structure and enhance service and health team work processes[35-38]. It is also worth highlighting the synergy between the beneficial effects of initiatives such as the Community Health Worker Program (PCHW, acronym in Portuguese), the FHS, the cash transfer program *o Programa Bolsa Família*, and the More Doctors Program (PMMB, acronym in Portuguese).

There is still no consensus about the association between municipality population size and trends in health indicators in PHC services. While some studies show that the organization of health teams, service structure and work processes in large municipalities were adequate for service users[39-41], others found that smaller[30,32,39,42] and medium-sized[34,43] municipalities performed better against indicators. Our study shows that the annual change in the frequency of good quality care was greater in municipalities with between 30,001 and 100,000 inhabitants. Similar findings

were reported in a study in Ceará using data from the first two cycles of the PMAQ by Vieira-Meyer *et al.*[44], who reported that health promotion, school health, planning and welcoming indicators, and overall quality of work processes were better in municipalities with between 50,000 and 100,000 inhabitants[44]. In contrast, in larger municipalities, service structure tends to be better, health staff have better training opportunities and service users have better access to a broader range of services. However, in smaller municipalities with higher primary care or FHS coverage, services are able to work closer with the community, which in turn affects the quality of care.

In the present study, the MHDI was used as a proxy for socioeconomic status because the indicator combines health, education and income. Our findings show that the frequency of good quality care was higher in municipalities with a very high MHDI in 2012. In contrast, in 2018, municipalities with very low/low and medium MHDI showed higher frequencies. Similar patterns were reported in a study of the performance of PHC teams by Kovacs *et al.*[45], who found that scores were higher in census tracts with higher mean income but lower in the same areas in 2018, and that the largest increase in scores over the period were found in these areas[45].

Studies using data from cycles I and II of the PMAQ on quality of antenatal care[32,42], women's health[41] and care of service users with diabetes[40] also showed higher frequencies for quality indicators in municipalities with high HDI, while a study using data from the Department of Informatics (DATASUS) for the period 2008 to 2015 reported that annual increases in oral health service coverage were higher in municipalities with low HDI[46]. The factors mentioned above related to municipality size also apply here: municipalities with high HDI tend to have better health services, while those with lower HDI benefit from the advantages of small municipalities.

FHS coverage has expanded considerably across Brazil, standing at more than 60% in 2016, with higher rates in the Northeast[38,47]. Our findings show that the proportion of municipalities with 100% coverage increased from 26% in 2012 to 45% in 2018, and that annual change in good quality care was higher in these municipalities. Studies show that rates of hospitalization due to ambulatory care sensitive conditions among children aged under 5 declined in municipalities in the Northeast where FHS coverage was consolidated[48,49]. Generally, small- or medium-sized municipalities have higher FHS coverage. In ad-

dition, part of these municipalities are economically disadvantaged and located in the North and Northeast. Postneonatal mortality rates tend to be lower in municipalities with high FHS coverage and high coverage by the *Programa Bolsa Família*[33], revealing that improvements in child health indicators also require the implementation of public policies in synergy with the FHS. Despite evidence of the positive effect of the FHS on child health indicators, health teams show limitations in practice, including gaps in actions and practices recommended in official guidance and protocolos[5].

With regard to health surveillance, the aim of tracking is to access the catchment area and establish or restore therapeutic bonds[50]. According to the National Primary Health Care Policy, this task should be assigned to all FHS professionals[51]. However, compliance remains unsatisfactory, especially in traditional primary care facilities. The adequate registration of the target population is essential for the success of tracking, and this registration needs to be improved to ensure greater coverage for this action. Regarding comprehensiveness of care, our results reveal not only an increase in the proportion of health teams carrying out tracking of children throughout the cycles, but also a strong association between this activity and quality of care, as is the case with adequate registration, thus corroborating the positive effects of these actions.

The report of home visits by a CHW and having a postnatal check-up, used in this study as a proxy for health team work processes, may indicate closer affiliation between these mothers and health services. This relationship may positively affect mothers' perceptions of the care received, which in turn may explain the relationship observed between these variables and quality of care during the first week of life[52,53].

Home visits in the early period after the birth of a baby can increase neonatal survival[54] and is a task attributed to the PHC team to strengthen affiliation between neonates and the clinic[18].

A study undertaken in the North and Northeast reported that the frequency of visits by a CHW or other health professional during the first week of life was only 57%[18]. The proportion in our study was around 70%, which should increase, given that the health teams included in the external assessment of the PMAQ worked almost entirely in the FHS. This situation may have been aggravated by the 2017 the National Primary Health Care Policy, which envisaged a reduction in the number of CHWs in family health teams.

Our findings show a slight reduction in the frequency of these visits, from 71% in 2012 to 67% in 2018, when the effects of the new policy may be considered to be limited. While home visits are one of the main activities of CHWs, health teams tend to assign other functions to these workers, including administrative tasks[36]. PHC is essential for reducing maternal and infant morbidity and mortality[55], playing a key role in the improvement of newborn health through a range of interventions and the provision of support to pregnant and postpartum women[56]. Our findings show that the proportion of mothers who had a postnatal check-up in clinics increased between 2012 and 2018. In addition, there was a significant increase in the frequency of good quality health care during the first week of life when mothers had a check-up.

One of the limitations of this study is the possibility of selection bias, given that the participation of health teams was voluntary. In cycle I, it is assumed that only the best teams were included, while in the following cycles the total number of teams was close to 100%. This limitation may result in the overestimation of the outcome in the first cycle, meaning that increases in the frequency of good quality care may have been even more pronounced. In addition, the interviewees were different in each cycle, which may affect the accuracy of the interpretation of trends in indicators. However, the analysis of the sociodemographic profile of the mothers from the three cycles suggest minimal differences. Recall bias may also affect the results, given that the interviewees may not remember all the recommendations received during the check-up. However, no significant differences were found when the outcome was stratified by child's age, minimizing the likelihood of recall bias. Another limitation is the use of a restrictive set of questions to define quality of care during the first week of life. However, the items considered are recommended in documents and reports produced by the World Health Organization, United Nations Children's Fund and Ministry of Health. One of the study strengths is the use of a large national sample including 42% of the country's FHS teams in 2012 (cycle I), 73% in 2014 (cycle II) and 92% in 2018 (cycle III).

Conclusions

Good quality of care in the child check-up during the first week of life – for the purposes of this study based on the completeness of the actions

mentioned in the PMAQ evaluation instrument – is of vital importance to ensure better follow-up of child development and survival, as recommended by the Ministry of Health. Strengthening health team work processes through permanent training and the provision of adequate infrastructure and equipment in primary health care facilities should be a priority in the conception and formulation of maternal and infant health policies.

Collaborations

All authors participated in preparing the manuscript and approved the final version to be published. MP Flores-Quispe and E Tomasi conceived the research question. MP Flores-Quispe, E Tomasi and SMS Duro carried out data analysis and interpretation. MP Flores-Quispe, E Tomasi, SMS Duro, LA Facchini and NR Barros drafted the manuscript.

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