LUMEN ET VIRTUS

Adherence to the use of the NutriSUS strategy for child food fortification in municipalities of Goiás

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ABSTRACT

Introduction: The high demand for nutrients in children under five years of age, added to low nutritious diets, makes them vulnerable to micronutrient deficiencies. The NutriSUS Strategy, launched as part of the School Health Program (PSE) in 2014, aims to combat these deficiencies through the distribution of micronutrient sachets. The effectiveness of this strategy in Goiás, considering the weaknesses in the municipalities, needs to be evaluated. The objective of this study was to verify adherence to the NutriSUS Strategy in municipalities in the state of Goiás and the list of sachets used by agreed and added day care centers. Methods: A retrospective observational study analyzed data on micronutrient supplementation provided by the NutriSUS Strategy in the state of Goiás, between 2017 and 2019. The database available on the Ministry of Health website was used to identify adherence and coverage of the program in 10 regional health departments. The inclusion criteria were municipalities that implemented the strategy during the period studied, while those that did not adhere or did not show interest were excluded. The analysis was performed using absolute and relative frequencies in the EPI Info 7.2.6.0 program. Results: The NutriSUS Strategy was implemented in 35 (14.23%) of the total municipalities (n=246). Micronutrient supplementation targets were constant throughout the period from 2017 to 2019, with some cities, such as Araguapaz,

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Britânia, and Santa Helena de Goiás, exceeding their supplementation targets in some of the periods, while others, such as Aragarças, Hidrolândia, Piracanjuba, São Luís de Montes Belos, and Buriti Alegre, did not reach the expected targets. The analysis, by semester of supplementation coverage in daycare centers, showed significant fluctuations: a drop in 2017 from 45.44% to 32.60% from the first to the second semester. In 2018, the percentage was 34.43% in the first half of the year, but there was a significant increase to 52.37% in the second half of the year. In 2019, coverage rose to an average of 61.63% in the first half, followed by a drop to 35.74% in the second half. The data also revealed variations in standard deviation, reflecting fluctuations in program adherence. Conclusion: The NutriSUS Strategy showed a variable implementation in the municipalities of Goiás in the period studied, with fluctuations in supplementation coverage over time. The analysis highlighted both success in some locations and difficulties in others, highlighting the importance of continuously monitoring and adjusting supplementation strategies to ensure that all counties adequately benefit children from micronutrient supplementation.

Keywords: Public Policy, Nutritional Deficiencies, Nutritional Supplementation, Implementation.

INTRODUCTION

Changes in the dietary profile of the Brazilian population have been associated with worsening infant morbidity and mortality (STEVENS et al., 2013). The high demand for nutrients in the first years of a child's life, combined with monotonous diets, low availability and accessibility to nutritionally rich foods, make children under five years of age the most susceptible group to diseases and health problems (BRASIL, 2015; WHO, 2017). Among these problems, micronutrient deficiencies stand out, notably iron deficiency anemia, vitamin A and zinc deficiency as public health problems of high magnitude in Brazil (UFRJ, 2021; CASTRO et al., 2023).

The most relevant prevalences of micronutrient deficiencies were 17.8% for zinc, 14.2% for vitamin B12, 6.0% for vitamin A, and 3.5% for iron deficiency anemia. These nutritional problems are more recurrent among children from six to 23 months of age in Brazil (UFRJ, 2021). Such deficiencies affect the child population in a particularly significant way, with serious impairments in growth and development, cognitive deficit, reduced school performance, whose consequences will remain until adulthood (BRASIL, 2015; WHO, 2017).

The high prevalence of childhood anemia in Brazil (LEAL et al., 2011) points to a moderate public health problem, according to the classification of the World Health Organization (WHO) (2016), since 33.0% of children are exposed to its repercussions (NOGUEIRA-DE-ALMEIDA et al., 2021). This scenario justifies the adoption of prevention and control measures such as food education, compulsory fortification of wheat and corn flour since 2002, and preventive supplementation for vulnerable groups, through different programs (BRASIL, 2013a; BRAZIL, 2022).

In 2014, the Ministry of Health and the Ministry of Education released the NutriSUS strategy (BRASIL, 2015) as part of the actions of the School Health Program (PSE) (BRASIL, 2007). This strategy is based on the addition of a mixture of 15 micronutrients in the form of a sachet (1 gram) to one of the meals offered by the early childhood education institutions served by the PSE (BRASIL, 2007) and by the National School Feeding Program (PNAE) (BRASIL, 2006). The federal, state and municipal spheres, as well as primary care and education, such as nutritionists, teachers and lunch cooks, are directly involved in the correct implementation of NutriSUS (SOUSA et al., 2017).

NutriSUS is part of the strategies for the Promotion of Healthy Eating (PAS) planned as part of the actions of the PSE instituted in 2007 (Ministry of Health and Ministry of Education). This program provides for the articulation between the school network and the basic health network, in particular through the Family Health Strategy (ESF), and the other networks in the territory, for the development of prevention, care and health promotion actions (BRASIL, 2007; BRAZIL, 2015). The strategy was initially directed to educational institutions due to the time children stay in these places

(BRASIL, 2015) and, considering the increasing demand for this stage of basic education (IBGE, 2019).

The NutriSUS strategy is notable for its necessary and complex intersection with the National School Feeding Program (PNAE) (BRASIL, 2015). The operationalization of NutriSUS requires the construction of pacts between a diverse set of actors, which includes both central government managers and school units, in addition to the articulation of strategies between health and education agents, promoting effective collaboration in the school environment (BRASIL, 2015). The integration of these areas is essential to ensure the effectiveness of the proposed actions, as it involves continuous and aligned coordination between the various sectors involved in the program (DIAS et al., 2018).

In addition to NutriSUS, other initiatives such as the National Program for Vitamin A Supplementation (PNSVA) (BRASIL, 2013b) and the National Program for Iron Supplementation (PNSF) (BRASIL, 2013a) play essential roles in the prevention of specific nutritional deficiencies. These programs contribute significantly to the reduction of malnutrition and to the improvement of child health in Brazil (BRASIL, 2013a; BRAZIL, 2013b; BRAZIL, 2022). Together, these initiatives reinforce the country's commitment to eradicating hunger and promoting healthy eating. In addition, they exemplify integrated efforts aimed not only at preventing nutritional deficiencies, but also at strengthening health and education actions to improve child nutrition (CLARO et al., 2022). These efforts are key to achieving the third Sustainable Development Goal (SDG), which seeks to ensure healthy lives and promote well-being for all ages, with an emphasis on reducing child mortality and preventing diseases related to malnutrition (UNITED NATIONS, 2015).

Thus, it is necessary to evaluate the scope of the strategy in the state of Goiás and the weaknesses along the distribution of powdered micronutrient sachets and how these are solved within the fortification program, as well as to understand the logistics of micronutrient distribution and consider the vulnerabilities in some of its stages, in particular, with regard to parental adherence and the impossibility of distributing micronutrient sachets by agreed day care centers.

The present study is justified because reliable and up-to-date information, in addition to being essential, can support the planning and reorientation of programs and public policies in the area of food and nutrition. Thus, its objective was to verify adherence to the NutriSUS Strategy in municipalities in the state of Goiás and the list of sachets used by agreed and added daycare centers.

METHODS

TYPE OF STUDY

This is a retrospective observational study, with secondary database analysis.

STUDY LOCATION AND SAMPLE

The study was developed using information from the distribution of powdered micronutrient sachets of the NutriSUS strategy available on the aps.saude.gov.br/ website, during the first and second semester of the years 2017 to 2019. The state selected was the state of Goiás, within 10 health regions, those municipalities whose health managers adhered to and implemented the NutriSUS Strategy, namely: Central, Center-South, North Region, South Region, Railroad, North, West I, West II, Pirineus and Rio Vermelho.

INCLUSION AND EXCLUSION CRITERIA

The municipalities that implemented the NutriSUS Strategy in the state of Goiás, during the first and second semesters of the years 2017 to 2019, the last ones that had the strategy implemented before the pandemic, were included, as there was a suspension of the development of NUTRISUS, due to lack of acquisition of powdered micronutrient sachets, by the Ministry of Health. Those who did not sign the agreement and those who did not show interest in being added after the deadline provided for in the Ministry of Health's adhesion notices were excluded.

DATA COLLECTION AND VARIABLES OF INTEREST

Data collection was carried out through public consultation on the data of the strategy and adherence by municipality, made available by the Ministry of Health on the website aps.saude.gov.br/ with information from the agreed Municipal Centers for Early Childhood Education (CMEIs) and daycare centers added in the state of Goiás. In addition, through online consultation and telephone call to the nutritionist of the Superintendence of Food and Nutrition Surveillance of the Goiás State Department of Health (SUVISA/SES), in case of doubts.

The main variables analyzed were "annual supplementation targets" and "supplementation performed" of the agreed and added daycare centers. In the context of NutriSUS, the agreed daycare centers were the daycare centers or early childhood education institutions that established an agreement or pact through a public notice of the Strategy to receive micronutrient supplementation, as a way to combat the lack of these nutrients in young children (BRASIL, 2015).

This agreement usually involves the daycare center's commitment to comply with specific requirements, such as ensuring regularity in the administration of supplements, monitoring children's growth and development, and collaborating with data collection to evaluate the results (BRASIL, 2015).

On the other hand, the daycare centers added to NutriSUS were the daycare centers included after the establishment of the program. These daycare centers may have been identified as places

with a high prevalence of nutritional deficiencies or demand for nutritional interventions, and were incorporated into the program to receive micronutrient supplementation (BRASIL, 2015).

DATA ANALYSIS

The database was developed in Excel 2019, with manual typing checking. In the descriptive analysis, through the EPI Info 7.2.6.0 program. Absolute and relative frequencies were used from the public database available on the internet.

RESULTS

From the analysis of the database, it was found that the NutriSUS Strategy was implemented in a total of 35 (14.23%) of the total municipalities (n=246) in the state of Goiás, covering both those originally agreed upon and those added. These municipalities were: Alto Horizonte, Anápolis, Aragarças, Araguapaz, Bom Jesus de Goiás, Britânia, Buriti Alegre, Cachoeira Alta, Cachoeira Dourada, Caldas Novas, Corumbaíba, Firminópolis, Formosa, Goianira, Goianésia, Goiânia, Hidrolândia, Inhumas, Itaberaí, Jataí, Mara Rosa, Minaçu, Montividiu, Morrinhos, Ouvidor, Palestina de Goiás, Piracanjuba, Planaltina, Rio Verde, Rubiataba, Santa Bárbara de Goiás, Santa Helena de Goiás, Santo Antônio do Descoberto, São Luís de Montes Belos and Vianópolis.

When evaluating the data regarding the supplementation goal of the NutriSUS Strategy, it is observed that they remained constant in all municipalities throughout the period evaluated. Although some had higher goals than others, there were no variations in these in the different years. Among those with the highest supplementation goals, Jataí (n=1036) and Planaltina (n=1025) stand out. On the other hand, others presented more modest goals, such as Palestina de Goiás (n=21) and Araguapaz (n=43), conditions that can be related to the number of inhabitants of each location.

As the goals were constant, during the period evaluated, a comprehensive analysis of the adherence and coverage of the NutriSUS strategy was carried out, separately, in the years 2017, 2018 and 2019. Figures 1, 2 and 3 show the distribution of powdered micronutrient sachets and their coverage in each of the municipalities, by semester, allowing the identification of variations in supplementation rates in relation to the established annual goals.

In the first half of 2017, some cities demonstrated positive performance by exceeding the goals established for supplementation. For example, Araguapaz recorded a supplementation of sachets of (n=66), exceeding the goal of (n=43); Britânia reached (n=122) in relation to (n=71), while Santa Helena de Goiás reached (n=372) compared to (n=337). However, others did not meet expectations, such as Cachoeira Alta, which had a supplementation of (n=38) in relation to the goal of 212; Goiânia, (n=54) in relation to (n=219) and Inhumas supplemented (n=239) from (n=546). The first half of 2017 registered 14 municipalities without supplementation.

In the second half of 2017, some cities did not reach the supplementation target, such as Hidrolândia, which supplemented (n=180) (n=238); Piracanjuba, which reached (n=52) of (n=239); São Luís de Montes Belos, which recorded supplementation of (n=91) in relation to (n=343). On the other hand, others reached and exceeded the targets, such as Alto Horizonte, with a supplementation of (n=180) against the target of (n=142) and Anápolis, which supplemented (n=557) of (n=527). In the second half of 2017, it accounted for 15 municipalities without supplementation.

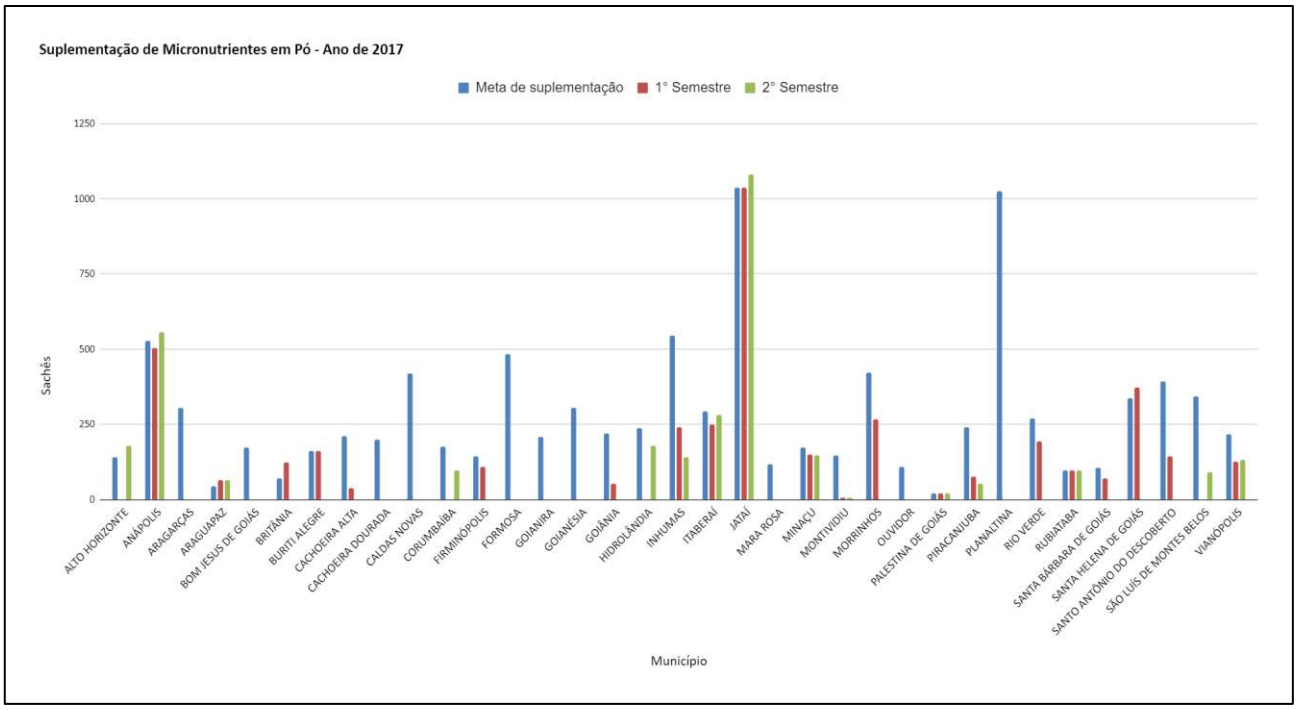
In the first half of 2018, Goianira (n=235) exceeded the goal of (n=208). However, 17 municipalities had supplementation below the target in this period, some of them were Aragarças with (n=130) of (n=306); Buriti Alegre with (n=56) of (n=161) and Inhumas with (n=161) of (n=546). In addition, 16 municipalities were not supplemented.

In relation to the second half of 2018, there was supplementation above the target compared to the first, such as Bom Jesus de Goiás with (n=262) of (n=172) and Itaberaí with (n=321) of (n=292). In this period, there were 16 municipalities with supplementation below the target. Some cities that did not reach the established level were Goianira with (n=117) of (n=208) and Minaçu with (n=139) of (n=174). In addition, 10 municipalities did not receive supplementation.

With regard to the first half of 2019, a total of 19 cities had supplementation below the established goal. Among these cities, the following stand out: Aragarças, which recorded an increase of (n=258) in relation to the target of (n=306); Formosa with (n=210) of (n=482) and Hidrolândia with (n=82) of (n=238). In the same period, seven cities did not receive supplementation.

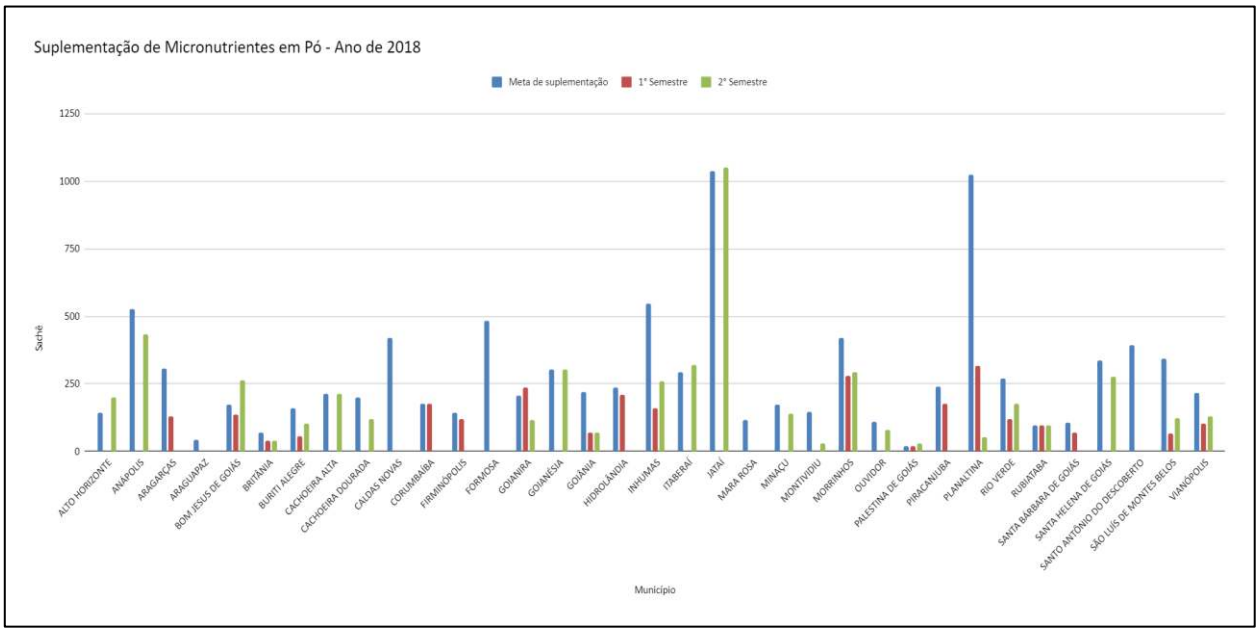
In the second half of 2019, a total of 10 municipalities were below the goals established for supplementation. Among them, Alto Horizonte stands out, which recorded a supplementation of (n=98) in relation to the target of (n=142); Corumbaíba with (n=101) of (n=177); Hidrolândia with (n=144) of (n=238). On the other hand, some achieved the goals established for supplementation, such as Araguapaz with (n=59) of (n=43) and Caldas Novas with (n=606) of (n=420), added to the fact that 19 municipalities did not receive supplementation in the period.

Figure 1. Comparison between Supplementation Target and Supplementation Achieved in the First and Second Semesters of 2017



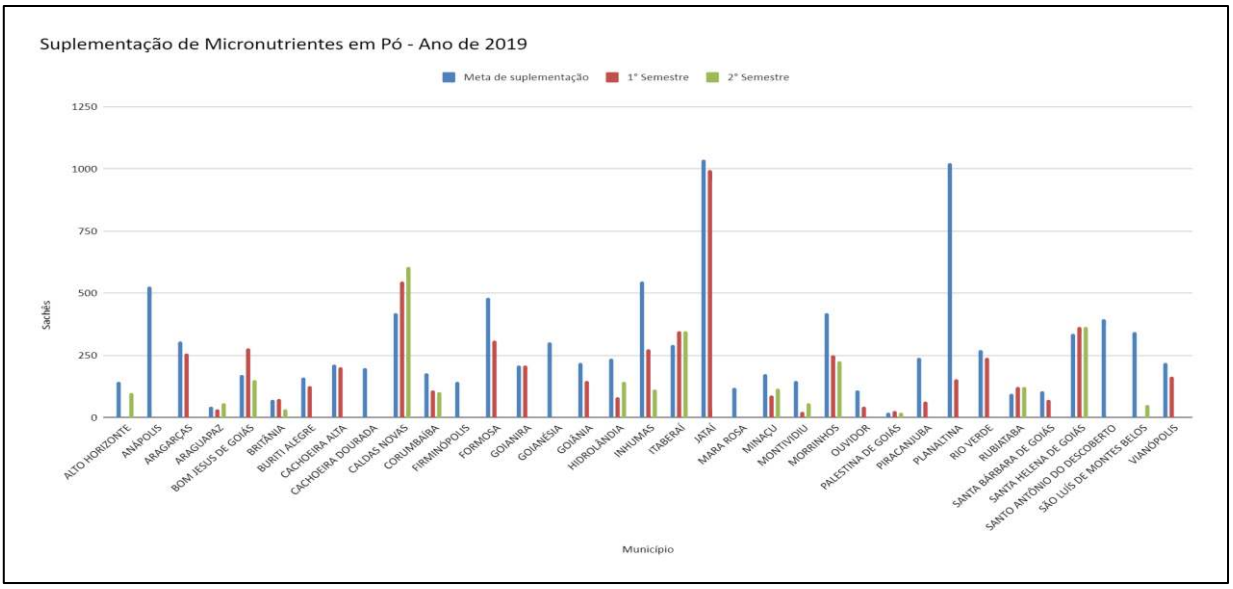
Source: Prepared by the authors themselves, 2024.

Figure 2 Comparison between Supplementation Target and Supplementation Achieved in the First and Second Semesters of 2018



Source: Prepared by the authors themselves, 2024.

Figure 3 Comparison between Supplementation Target and Supplementation Achieved in the First and Second Semesters of 2019



Source: Prepared by the authors themselves, 2024.

ANALYSIS REGARDING THE ADHERENCE OF THE SUPPLEMENTATION OF THE MUNICIPALITIES IN THE YEARS 2017 TO 2019

When we examined the semesters of supplementation coverage in daycare centers in the municipalities of the state of Goiás, during the years 2017 to 2019, there was an oscillating temporal variation. It was observed that there was a drop in the average percentage of supplementation from 45.44% to 32.60% from the first to the second semester of 2017. This pattern of decline continued in 2018, with an average percentage of 34.43% in the first half of the year, however, it was interrupted by a significant increase to 52.37% in the second. However, in 2019, there was a marked increase in the first half of the year, when it reached an average of 61.63%, followed by a drop to 35.74% in the second half of the same year. These sharp fluctuations in values highlight the considerable variations in supplementation in daycare centers in the period evaluated.

Therefore, the periods of higher and lower supplementation in daycare centers in the municipalities of Goiás between 2017 and 2019 can be identified in Table 1. Those with lower supplementation occurred in the second half of 2017, first of 2018 and second of 2019, while the peaks of higher supplementation were observed in the first half of 2019, second semesters of 2018 and 2019. It is noteworthy that the year with the highest average of supplementation was 2019, specifically in the first semester, while the year with the lowest average was 2017, in the second semester (Table 1).

Regarding the dispersion of the standard deviation values, a notable variation was observed in the means of supplementation. In the first half of 2017, the standard deviation was 49.58, which demonstrates a wide distribution of the data in relation to the percentage average of 45.44%. Similarly, in the second half of 2017, the standard deviation of 47.05 showed a considerable

dispersion around the percentage average of 32.6%. In the first half of 2018, the standard deviation was 38.33, indicating a relative heterogeneity of the values in relation to the mean of 34.43%. However, in the second half of 2018, the standard deviation of 47.31 again highlighted a dispersion of the data around the average of 52.37%. In 2019, it was observed that the first semester presented a standard deviation of 46.41 and an average of 61.63%, suggesting a narrower concentration of values around the mean. In the second half of 2019, the dispersion increased again, with a standard deviation of 47.91 and an average of 35.74% (Table 1).

Table 1. Supplementation Coverage with the NUTRISUS Strategy in Nurseries agreed and added in the state of Goiás, in the years 2017 to 2019

Year	Semester	Average	Median	Standard deviation	Minimum	Maximum
2017	First	45,44	32	49,58	0	172
	2nd	32,6	0	47,05	0	153
2018	First	34,43	29	38,33	0	113
	2nd	52,37	0	47,31	0	152
2019	First	61,63	66	46,41	0	162
	2nd	35,74	0	47,91	0	144

In addition, the variation in values in relation to the average was more evident in the first semesters of 2017, 2018 and 2019, indicated by the relatively low medians in relation to the averages in these periods. However, in the second semesters of 2017 and 2018, the medians were closer to the averages, suggesting a greater consistency in the data in relation to the mean. The median for the second half of 2019 also approached the average, indicating a greater homogeneity of the values. Taken together, the results of the standard deviation and variance analysis pointed to the presence of considerable variations in supplementation coverage between the municipalities and in the different semesters evaluated (Table 1).

DISCUSSION

The analysis of the data reveals a complex panorama in the implementation of the NutriSUS strategy in the municipalities of the state of Goiás. The variation in coverage ratios over the years and semesters points to an interdependence of several factors. This finding demonstrates an inefficient distribution of the strategy, which suggests that the scope of micronutrient supplementation in daycare centers that were agreed and/or added did not reach the supplementation goal.

In addition, the sensory acceptance of supplements, including taste and other organoleptic characteristics, is a determining factor for schoolchildren's adherence, and low acceptance may result in a lower frequency of consumption (VAN STUIJVENBERG et al., 2010). A study carried out in Porto Ferreira/SP revealed that the introduction of the micronutrient sachet in children's meals resulted in a variety of responses, highlighting the significant rejection by a considerable number of

children. This resistance, possibly influenced by the taste, texture, and aroma of the supplemented foods, resulted in changes in children's adherence to food consumption. The acceptance of NutriSUS also varied according to the consistency of the food, showing lower acceptability in dry foods. This finding emphasizes the need to consider sensory and textural aspects, in addition to nutritional ones, in order to promote children's adherence and optimize the benefits for their health (SILVA, 2021).

Similar results were also observed in micronutrient powder supplementation in Bangladesh. They highlighted the need for caregivers to use strategies to encourage children to consume the supplemented meal, such as: mixing the powder with small amounts of food; not letting the child see the addition of the powder and choosing the children's favorite foods, strategies that are in line with the guidelines of the NutriSUS strategy and that require special attention from those responsible for supplementation in the early childhood education environment, which is already full of demands (BRASIL, 2015; SARMA et al., 2016).

Other factors that can influence the adequate adherence to the NutriSUS Strategy would be to offer adequate training and training to all professionals involved in its implementation, including educators, health professionals, "cooks" (food handlers) and monitors. This should address not only the technical aspects of administering the supplements, but also the importance of the strategy and its impacts on children's health (TAM et al., 2020). Create awareness strategies aimed at parents and/or guardians, highlighting the relevance of micronutrient supplementation and clarifying doubts or concerns that may affect adherence. Open dialogue and transparency are key to building trust and greater acceptance of children (LONG et al., 2022).

The strategy may face low adherence for a variety of reasons, making it essential to implement effective approaches to scale it up. First, to reinforce effective communication between the health and education sectors, as well as greater dialogue between the federal, state and municipal levels. Collaboration strategies must be developed to ensure the integration of actions and the understanding of the goals and benefits of the strategy by all those involved, as well as financial resources to execute the strategy, as recommended in the NutriSUS Strategy Manual (BRASIL, 2015).

In addition, developing publicity and propaganda strategies is necessary to sustain the importance of the behavior of parents and/or guardians in the face of the intervention and to reduce or remove barriers and resistance to the use of NPM. Partnerships with social marketing companies or professional communication agencies can facilitate creative and consumer-centric communications (SUCHDEV et al., 2012; LIYANAGE et al., 2022).

It is observed that the more dissemination and marketing, such as pamphlets, flyers, television commercials, radio reminders, monitoring calendars, adherence worksheets, and even courses on the consequences of anemia and nutritional deficiencies, the greater the adherence of

parents to the use of sachets. In studies where neither of these strategies was used, long-term adherence to NPMs was lower than those that used them (SUN et al., 2022; YE et al., 2022).

In the present study, it was observed that the supplementation goals remained constant over the years, but with variations between municipalities with different populations. The sharp oscillations in supplementation rates between semesters may be the result of difficulties in implementing the strategy, among many factors that may be associated, and further studies on adherence, acceptance, and their limitations are needed. Therefore, creating mechanisms to ensure the continuity of actions, regardless of changes in municipal managers or eventual political changes, becomes crucial. This may involve incorporating the strategy into broader policies and promoting the commitment of different administrations (SILVA, 2021).

The strength of this study is the importance of disseminating information on the on-site implementation of this public policy, which is so essential and necessary to reduce these nutritional deficiencies that are so prevalent in childhood. And as a limiting factor, the period of realization, as it was the only one available, due to its suspension because of the pandemic.

CONCLUSION

By verifying adherence to the NutriSUS Strategy in municipalities in the state of Goiás and analyzing the ratio of sachets used by agreed and added daycare centers, it was observed that the NutriSUS Strategy was implemented in less than a fifth of the municipalities, in the period from 2017 to 2019, with variations in adherence between different locations. In addition, supplementation goals remained constant over the years, while supplementation coverage showed important temporal fluctuations, both between years and between semesters, which revealed low and even zero supplementation values.

This analysis contributes to understanding the challenges and variations in the implementation of the NutriSUS strategy and its adherence by the municipalities of Goiás in their agreed and added daycare centers, as recommended by the Ministry of Health. In addition, it offers valuable information for the improvement of supplementation approaches. There were important variations in the supplementation rates, indicating the need for more consistent health policies and a more effective distribution to achieve the goals.

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