

Criteria used by nutritionists for menu planning in early childhood education in the municipal education network of the state of Rio Grande do Sul

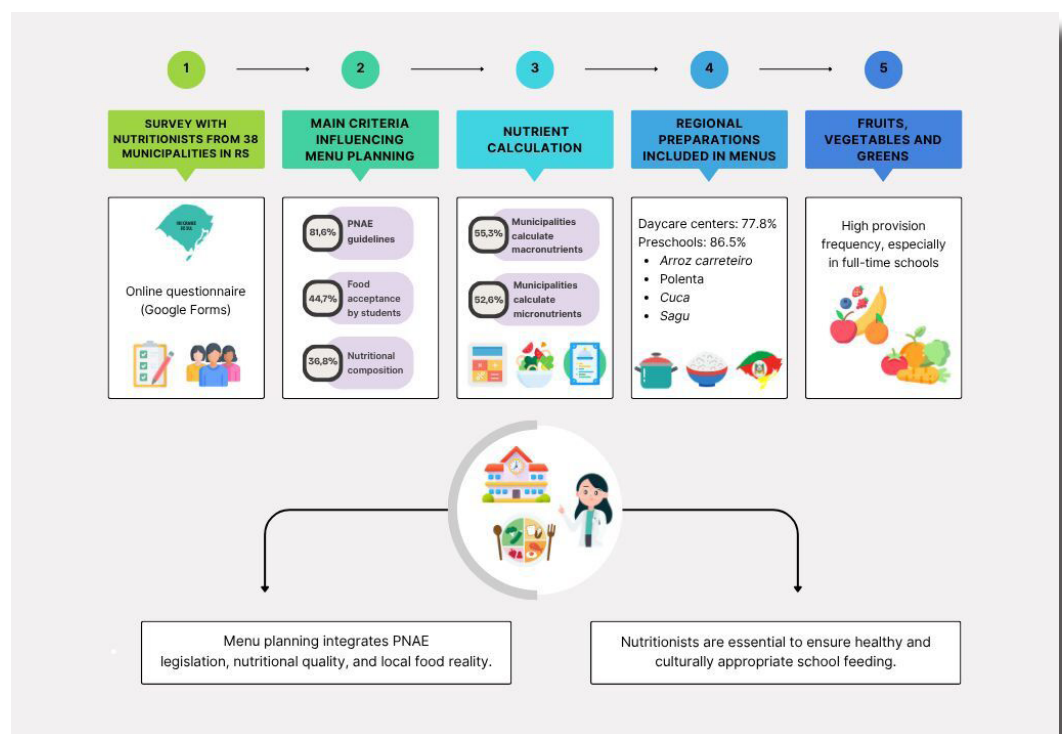
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Graphical Abstract

Highlights

- The PNAE guidelines are the main criterion in early childhood education menu planning.
- Food acceptance and nutritional composition directly influence meal preparation.
- More than half of the municipalities perform nutritional calculations, although with weaknesses in standardization.
- There is broad incorporation of regional preparations, but inequalities persist in the provision of special menus.



Abstract

This study aimed to analyze the criteria used by nutritionists in menu planning for daycare centers and preschools in the municipal education network of Rio Grande do Sul. Thirty-eight municipalities participated, with 84% of respondents being nutritionists serving as technical managers for the PNAE. The most influential planning criteria were: PNAE guidelines (81.6%), food acceptance by students (44.7%), and nutritional composition of foods (36.8%). It was observed that more than half of the municipalities calculate macronutrients and micronutrients, and there is broad inclusion of regional preparations and family-farm produce, promoting healthy eating habits and cultural valorization. However, only half of the municipalities offer special menus for specific dietary needs, revealing inequalities in policy implementation. The results reinforce the importance of the nutritionist's role in integrating legislation, food practices, and school reality, ensuring healthy, safe, and culturally appropriate meals.

Keywords: School Feeding. Food Services. Health. Menu. Nutritionist.

Associate Editor: Edison Barbieri
Mundo Saúde. 2026,50:e19792026
O Mundo da Saúde, São Paulo, SP, Brasil.
<https://revistamundodasaude.emnuvens.com.br>

Received: 24 february 2026.

Accepted: 23 april 2026.

Published: 04 may 2026.

INTRODUCTION

School feeding in Brazil has undergone significant advances in recent decades, particularly regarding the nutritional quality of meals provided to basic education students. The *Programa Nacional de Alimentação Escolar* (PNAE) has been continuously improved, incorporating guidelines that prioritize the provision of fresh and minimally processed foods, the valorization of regional food culture, and the promotion of healthy eating habits^{1,2}.

The *Programa Nacional de Alimentação Escolar* (PNAE) is an instrument for promoting Food and Nutritional Security (FNS) and guaranteeing the Human Right to Food, serving approximately 39.8 million students in Brazil's public basic education system¹. Created in 1955 as the "School Lunch Campaign" and established as the PNAE in 1979, the policy was consolidated by Brazil's Federal Constitution in 1988, which recognized the right to school feeding as a State responsibility. Currently, the PNAE has been strengthened by Law No. 11,947/2009, which incorporated food and nutrition education into the school curriculum and stimulated the direct purchase of food from family farms, with the mandatory use of at least 30% of financial resources allocated to municipalities².

The PNAE establishes guidelines and standards for the provision of adequate and healthy food to students, aiming to ensure meals that meet nutritional needs during the school period, promoting healthy eating habits, recovering local foods and preparations in accordance with regional food culture, and contributing to growth, development, and learning³. To this end, menus must be planned by technical manager nutritionists, considering nutritional, social, cultural, economic, and operational aspects. Furthermore, the program encourages the use of regional foods, prioritizing *in natura* or minimally processed products and restricting the consumption of ultra-processed foods, such as soft drinks, snacks, crackers, and sweets⁴.

School menu planning is therefore a central stage of the policy, particularly in early childhood education, where adequate nutrition directly influences children's nutritional and health status. According to FNDE Resolution No. 6/2020, menus must meet 20% to 70% of daily nutritional needs, depending

on the child's time at school, and ensure variety of legumes, fruits, vegetables, and cereals, with controlled use of sugar, salt, and oils/fats⁵.

Childhood constitutes a critical period for the formation of eating habits and behaviors, which tend to persist throughout life. At this stage, appropriate food experiences directly contribute to the acceptance of healthy foods and the prevention of nutritional disorders^{6,7}. In this regard, the PNAE assumes a strategic role by promoting not only the fulfillment of nutritional needs, but also the formation of healthy eating practices through the provision of balanced meals and food and nutrition education actions integrated into the school environment.

Menu planning must respect local production and food culture, considering elements ranging from food production to meal distribution⁸. In this context, it is essential to understand the criteria adopted by nutritionists in menu planning for daycare centers and preschools, including the valorization of local food culture and the promotion of healthy habits from the earliest years of life.

Among the indicators of school feeding quality, the regular provision of fruits, vegetables, and greens (FVG) stands out, considered essential foods for health promotion and prevention of chronic non-communicable diseases. These foods are important sources of fiber, vitamins, and minerals, being fundamental in children's diet. Resolution No. 6, of May 8, 2020⁵, establishes quantitative parameters for the minimum weekly frequency of provision of these foods in school menus, according to students' time at school. In this context, the analysis of FVG provision constitutes an important indicator of the nutritional quality of school menus, allowing assessment of compliance with the *Programa Nacional de Alimentação Escolar* guidelines.

Given this, the present study aims to analyze the criteria used by nutritionists in menu planning for early childhood education (daycare centers and preschools) in the municipal education network of the state of Rio Grande do Sul, as well as to describe the adequacy of fruit, vegetable, and green provision in light of the guidelines established by Resolution CD/FNDE No. 6/2020 of the *Programa Nacional de Alimentação Escolar*⁵.

METHODOLOGY

This is a descriptive, quantitative study conducted with municipalities of the state of Rio Grande

do Sul. The state has 497 municipalities, a territorial area of 281,707.151 km², a population density

of 38.63 inhabitants/km², and a Human Development Index (HDI) of 0.77⁴. All municipalities in the state were invited to participate in the study. Early childhood education schools were defined as those enrolling preschool and daycare students. Daycare centers serve children aged 7 months to 3 years, and preschools serve children aged 4 to 5 years.

This study is part of the research project “Are the menus offered for early childhood education in the municipal network of Rio Grande do Sul adequate to the new recommendations of the School Feeding Program and aligned with dietary guidelines?”, approved by the Research Ethics Committee of the Universidade Federal do Pampa under Opinion No. 7,702,572. Participation by nutritionists was conditioned on signing the Informed Consent Form (ICF).

The study logistics were carried out as follows: three identical emails were sent to the education departments of each municipality and to the nutritionist serving as technical manager for school feeding, as a means of ensuring three attempts at acceptance for municipal participation. Those who accepted received the questionnaire link after signing the participation letter and were included in the study.

Data collection was carried out between August and October 2025, using an electronic questionnaire developed in Google Forms, sent to the technical manager nutritionist. The instrument was sent by email, requesting that the nutritionist indicate which three main criteria most influenced early childhood education school menu planning from a pre-defined list. In addition to this information, the instrument included the following variables: nutritional composition of foods, seasonality, availability of locally grown products, students’ eating habits, cost, school kitchen infrastructure, ease/complexity of preparation, number of team members, food acceptance by students, National School Feeding Program guidelines, and delivery schedule.

RESULTS

Of the 497 municipalities in the state of Rio Grande do Sul, 38 participated in the study (7.6%), with one formal refusal and no response from the remaining invited municipalities. Among the respondents, 84% were PNAE technical managers and the remainder were technical staff.

The criteria most influencing school menu planning were the *Programa Nacional de Alimentação Escolar*

Additionally, questions were included regarding the calculation of the nutritional composition of menus, specifically concerning the practice of calculating macronutrients and micronutrients, without collecting the nutritional values of the preparations. Complementary aspects related to the nutritional assessment of menus were analyzed, with emphasis on the calculation of macronutrients (carbohydrates, proteins, and lipids) and micronutrients (vitamins and minerals) of preparations offered in daycare centers and preschools. This information was obtained from the nutritionists’ responses regarding the routine of calculating and monitoring the nutritional composition of meals, making it possible to verify the degree of technical control over the nutritional value of food offerings.

The inclusion of these variables allowed analysis of whether municipalities ensure the regular provision of foods that are sources of fiber, vitamins, and essential minerals, in addition to assessing menu compliance with the nutritional targets and principles of the PNAE, aimed at promoting balanced and healthy nutrition in early childhood education.

The adequacy of FVG provision was assessed based on the recommendations of Resolution No. 6, of May 8, 20205, considering partial-time and full-time attendance modalities. For daycare and preschool students in schools offering partial-time feeding, menus must provide at least 2 days per week of fresh fruit and at least 3 days per week of vegetables and greens. For daycare and preschool students in schools offering full-time feeding, menus must provide at least 4 days per week of fresh fruit, vegetables, and greens, and at least 5 days per week of vegetables and greens.

Data were analyzed using descriptive statistics, with calculation of absolute and relative frequencies. Results were organized in tables and compared to recommendations established by current legislation.

guidelines (81.6%), followed by student food acceptance (44.7%) and nutritional composition of foods (36.8%) (Table 1). Other criteria mentioned included availability of locally grown products (31.6%), school kitchen infrastructure (28.9%), seasonality (26.3%), students’ eating habits (23.7%), cost (18.4%), ease or complexity of preparation (18.4%), delivery schedule (5.3%), and number of team members (2.6%).

Table 1 - Criteria influencing early childhood education menu planning in the municipal education networks of the State of Rio Grande do Sul, 2025.

Criteria indicated	N	P (%)
Nutritional composition of foods	14	36.8
Seasonality	10	26.3
Availability of locally grown products	12	31.6
Students' eating habits	9	23.7
Cost	7	18.4
School kitchen infrastructure	11	28.9
Ease/complexity of preparation	7	18.4
Number of team members	1	2.6
Food acceptance by students	17	44.7
Guidelines of the Brazilian <i>Programa Nacional de Alimentação Escolar</i>	31	81.6
Delivery schedule	2	5.3

More than half of the nutritionists in this study (55.3%) reported performing macronutrient calculations for daycare and preschool menus in their municipalities, while 36.8% reported not having performed this calculation in the month prior to data collection. Regarding micronutrients, 52.6% calculate the micronutrients of meals offered to daycare centers and preschools in the municipal network, 10.5% reported not having calculated them in the past month but habitually doing so, and 36.8% reported not performing this calculation.

It was observed that 52.6% of municipalities reported offering special menus for early childhood education. Among the types of menus planned, the most prevalent was for lactose intolerance (31.3%), followed by menus for cow's milk protein allergy (22.9%), gluten-related disorders (14.5%), egg allergy (12.5%), food selectivity (8.3%), and diabetes or glucose intolerance (6.3%).

Table 2 demonstrates the high frequency of fresh fruit, vegetable, and green provision for daycare centers, especially in full-time units. In full-time daycare centers, 97.2% of municipalities reported offering fresh fruit five days per week, while 94.4% offered vegetables and greens at the same frequency. In partial-time daycare centers, 75.0% reported offering fruit five days per week, while 19.4% did not offer fruit on any day of the previous week. For vegetables and greens, 63.9% reported provision five days per week and 19.4% did not offer them.

In preschools, the frequency of fresh fruit, vegetable, and green provision was also high, although with lower percentages compared to full-time daycare centers. In full-time units, 81.1% reported offering fresh fruit five days per week, while 73.0% reported offering vegetables and greens at the same frequency. In comparison, in full-time daycare centers these percentages were 97.2% and 94.4%, respectively. In partial-time preschools, 51.4% of municipalities reported offering fresh fruit five days per week, while 13.5% did not offer fruit on any day. For vegetables and greens, 35.1% reported provision five days per week, with distribution across two (10.8%), three (32.4%), and four days (8.1%) per week, in addition to 13.5% who did not offer these foods.

Another relevant finding concerns the presence of regional preparations in school menus, observed in 77.8% of daycare centers and 86.5% of preschools. These data highlight the valorization of local food culture and the incorporation of family-farm produce, including typical preparations such as *arroz carreteiro*, *galinhada*, *polenta*, *cuca*, *sagu*, and *canjica*, as well as the use of products from family agro-industries such as juices and frozen pulps.

Food and Nutrition Education actions are still predominantly developed through traditional strategies, such as lectures, suggesting the need to expand more participatory, continuous, and school-integrated approaches.

Table 2 - Weekly provision of fresh fruit, vegetables, and greens in daycare and preschool menus in the municipal education networks of the State of Rio Grande do Sul, 2025.

School Period	Food Type	Minimum weekly provision	Provision on 5 days/ week (%)	No weekly provision (%)	Adequacy (5 Days)
Partial Daycare	Fruit <i>in natura</i>	2 days	75,0	19,4	Adequate
	Vegetables e Greens	3 days	63,9	19,4	Adequate
Full-time Daycare	Fruit <i>in natura</i>	4 days	97,2	0,0	Adequate
	Vegetables e Greens	5 days	94,4	0,0	Adequate
Partial Preschool	Fruit <i>in natura</i>	2 days	51,4	13,5	Adequate
	Vegetables e Greens	3 days	35,1	13,5	Adequate
Full-time Preschool	Fruit <i>in natura</i>	4 days	81,1	10,8	Adequate
	Vegetables e Greens	5 days	73,0	10,8	Adequate

DISCUSSION

The main finding of this study is that the PNAE guidelines constitute the most influential criterion in early childhood education menu planning. This finding reinforces the centrality of public policy as a normative basis for nutritionists' work, while also indicating the need to adapt these guidelines to local specificities and students' preferences. Previous studies identify that dimensions such as legal guidelines, food acceptance, and nutritional composition are fundamental to this process, corroborating the findings of the present study^{9,10}. This demonstrates that professionals use the PNAE as a normative basis while making adaptations according to local reality and students' preferences.

Similar results were observed in a study conducted in the southern region of Brazil, highlighting the importance of nutritional calculation of menus as a tool to ensure compliance with program recommendations⁹. The absence or irregularity of this practice in some municipalities may be related to structural limitations, such as work overload, insufficient number of professionals, and lack of tools to support menu planning — factors already described in the literature as challenges to the full implementation of PNAE guidelines^{10,11}. Furthermore, studies indicate that nutritional inadequacies in school menus can negatively impact students' growth, development, and academic performance^{12,13}.

Although the majority of nutritionists are involved in menu planning and monitoring, not all technical criteria established by legislation are fully incorporated in practice. The literature indicates that aspects such as nutritional diagnosis and epidemiological profile are still underutilized in food planning, while factors such as eating habits and local culture tend to be more frequently considered^{8,9}.

The predominant participation of PNAE technical managers among respondents contributes to the reliability of the information obtained. Regarding special menus, it was observed that some municipalities reported offering them, particularly for food intolerances and allergies. However, this study did not investigate the existence of demand for specific dietary needs in the assessed municipalities, which limits inferences about the adequacy of such provision. Therefore, the absence of special menus cannot be interpreted in isolation as an inadequacy in food care. As such, it is not possible to assert that the absence of these menus necessarily represents an inadequacy in food care. A study conducted in southern Brazil reports that menus for Lactose Intolerance are the most commonly planned among special menus⁸. This finding suggests advances, but also indicates challenges in implementing these diets, frequently related to human and structural resource limitations^{14,15,16}.

Recent evidence indicates that the minimum numerical parameters regarding the number of nutritionists working in school feeding have not been fully met in municipalities of southern Brazil, with non-compliance observed in 71.6% of localities assessed in the states of Paraná, Santa Catarina, and Rio Grande do Sul, including the lack of specific menu planning⁹. This shortage of professionals, associated with structural and human resource limitations, can directly impact compliance with the nutritionist's technical attributions within the scope of the *Programa Nacional de Alimentação Escolar* (PNAE), reflected, among other aspects, in the limited development of menus for students with special dietary needs.

These findings indicate that, despite advances in the inclusion of special diets, challenges related to

their implementation remain. National studies indicate that structural difficulties and technical training limitations may compromise the development of specific menus for students with dietary restrictions^{14,17}.

Recent studies have highlighted that the effectiveness of the PNAE depends not only on financial transfers, but also on municipalities' technical capacity to plan nutritionally adequate and culturally relevant menus¹⁴. In this regard, the participation of technical managers, as observed in this study, is essential to ensure compliance with program guidelines and the fulfillment of students' nutritional needs.

Given this, the PNAE has undergone constant improvements, seeking to raise the quality of school feeding. Current guidelines emphasize the need to respect eating habits, local culture, sustainability, and food diversity, promoting healthier food choices⁵. The present study indicates that menu planning involves a balance between technical criteria and contextual factors, such as food acceptance and local food availability. These results highlight the complexity of the food planning process in the school environment, which requires articulation between normative recommendations and operational aspects^{10,17}.

The results demonstrate that PNAE purchases are at a significant level, promoting regional development and family farming^{18,19}, although it is necessary to organize producers and educational institutions so that both can benefit fully. The integration between schools and local producers not only stimulates the regional economy, but also expands the provision of fresh and seasonal foods, promoting healthier and more sustainable eating practices²⁰.

Accordingly, the study showed that municipalities follow most of the standards established by the PNAE, with technical managers overseeing the organization and administration of functions, purchasing family-farm products, and ensuring the inclusion of cultural preparations in the menus offered. Good management of macronutrient and micronutrient calculations for preparations is observed, although a significant proportion of municipalities still faces difficulties in this regard. Therefore, the results presented here reinforce that, although the PNAE has advanced significantly in its guidelines, inequalities in implementation among municipalities persist, particularly in the provision of special menus and the standardization of nutritional analysis. This scenario is corroborated by studies highlighting the importance of continuous technical training and systematic program evaluation to ensure PNAE effectiveness^{17,10,11}.

The presence of regional preparations in school menus, observed in this study, highlights the valorization of local food culture and integration with family farming. The most frequent ones include *arroz carreteiro*, *galinhada*, *vaca atolada*, *polenta*, *cuca*, *sagu*, and *canjica*, as well as whole grape juice from family agro-industries, reinforcing the incorporation of local and seasonal foods in menu planning. Evidence indicates that purchasing food from family farms strengthens the provision of typical preparations and the bond between school and local community¹⁸, although its effectiveness depends on institutional and structural mediations, which may explain the absence of these preparations in some municipalities¹⁹. In general, the predominance of regional typical cuisine is observed in both daycare centers and preschools, reinforcing the promotion of adequate and healthy eating and the valorization of cultural identity. These results converge with a study conducted in state schools, which also identified broad regional presence in preparations, including indigenous, Germanic, and Italian influences, contributing to strengthening cultural identity and the quality of school feeding¹³.

Nutritionists' working conditions constitute a relevant factor for the execution of PNAE actions, as limitations related to team sizing and workload can compromise the quality of activities performed. Although the majority of professionals have stable employment through public examinations — a factor that theoretically favors continuity and long-term action planning — a significant portion has been working in the municipality for less than two years, indicating possible turnover that may compromise the consolidation of continuous work. This is compounded by the finding that most municipalities (71.6%) do not meet the minimum numerical parameter of nutritionists per student. This inadequacy of technical staff suggests work overload that directly impacts the depth and detail of technical actions performed.

The use of management tools, such as technical data sheets and systematic acceptability assessment, is not yet fully consolidated in all municipalities, which may impact meal quality control and contribute to food waste, being a reality for only one-third of professionals. Likewise, acceptability tests are applied only to new preparations and not systematically to evaluate the menu as a whole. This practice may lead to the maintenance of preparations with low student adherence, increasing food waste and compromising the program's central objective of ensuring the consumption of adequate and healthy food.

Studies indicate that continuous technical mon-

itoring is essential to ensure that nutritional goals are met, especially in early childhood education^{10,15}. However, small municipalities frequently face limitations that hinder the full implementation of PNAE guidelines^{9,21}.

In the field of Food and Nutrition Education, the predominance of traditional strategies such as lectures is observed, which may have limited reach, making it necessary to expand participato-

ry, continuous, and school-integrated approaches. This methodology, although valid, distances itself from participatory, playful, and continuous methodologies integrated into the school curriculum. Contrasting with this finding, a study conducted in 18 public schools in the urban area of Campina Grande, Paraíba, found that only five institutions (27.77%) carried out health and nutrition activities for students²².

CONCLUSION

Overall, the results demonstrate advances in the implementation of the *Programa Nacional de Alimentação Escolar* guidelines, particularly regarding the incorporation of nutritional and cultural criteria in early childhood education menu planning. The program guidelines, food acceptance, and nutritional composition of foods are identified as central elements in this process, reflecting the need for integration between legislation, food practice, and technical aspects. However, challenges persist regarding the standardization of practices, nutritional monitoring, and the organization of special menu provision, indicating the need for continuous improvement of program management strategies.

Despite the consolidated presence of nutritionists in municipalities, the full execution of their attributions still faces limitations related to human resource infrastructure and the full adoption of technical instruments. In this context, it is essential to strengthen dialogue between nutritionists, municipal managers, and School Feeding Councils, as well as ensure adequate working conditions that enable qualified technical performance. Thus, the role of the nutritionist as mediator between public policies and school reality is reinforced, contributing to the promotion of food and nutritional security and the provision of healthy, safe, and culturally appropriate meals for students.

CRedit author statement

Conceptualization: Ulguim ACB; Galarça, WMS; Souza, ALS. Methodology: Ulguim ACB; Galarça, WMS; Souza, ALS. Formal analysis and Validation: Soares, CG. Investigation: Ulguim ACB; Monckes, LS; Almeida, NL. Resources and writing-original draft preparation: Monckes, LS; Almeida, NL. Writing-review and editing: Soares, CG; Raphaelli, CO. Visualization, supervision: Soares, CG; Raphaelli, CO. Project administration: Raphaelli, CO.

All authors have read and agreed to the published version of the manuscript.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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How to cite this article: Ulguim, A.C.B., Galarça, W.M.S., Souza, A.L.S., Monckes, L.S., Almeida, N.L., Soares, C.G., Raphaelli, C.O. (2026). Criteria used by nutritionists for menu planning in early childhood education in the municipal education network of the state of Rio Grande do Sul. *O Mundo Da Saúde*, 50. <https://doi.org/10.15343/0104-7809.202650e19792026>. *Mundo Saúde*. 2026,50:e19792026.