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Hygienic and sanitary conditions of "Units of food and nutrition" at schools participating in the Brazilian School Feeding Program: What is the reality in Goiás?

Condições higiênicossanitárias de unidades de alimentação e nutrição de escolas participantes do Programa Nacional de Alimentação Escolar: qual a realidade em Goiás?

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ABSTRACT

Introduction: In order to offer safe meals to students, as recommended by the Brazilian School Feeding Program (PNAE, in Portuguese), an adequate hygienic-sanitary condition of "Units of Food and Nutrition" is necessary. **Objective:** To evaluate the hygienic-sanitary conditions of the "Units of Food and Nutrition" at schools participating in the Brazilian School Feeding Program in municipalities in Goiás, as well as to verify possible associations with municipal indexes, school characteristics and supervision by a nutritionist. **Method:** Cross-sectional study, carried out between 2017 and 2019, with a sample of 395 schools, from 103 municipalities in Goiás. The hygienic-sanitary conditions were collected by nutritionists, through a checklist based on Anvisa's RDC nº 216/2004 and municipal indexes of human development and basic education in public databases. The school's characteristics and the existence of supervision by a nutritionist were asked to school directors. Descriptive analysis of the checklist items and hypothesis and correlation tests were performed. **Results:** Most units (69.4%) were classified as having regular health risk, according to the checklist. Significant differences were obtained between municipal and state schools (p = 0.02); difference of northern mesoregion from the others (p = 0.00) and low Human Development Index of the other categories (p = 0.02) were observed. Furthermore, the high Basic Education Development Index (5th grade) was associated with a very low health risk (p = 0.04). **Conclusions:** It is inferred that there is a need for corrective measures. Manuals of good practices should be implemented, along with training of handlers, ongoing supervision by the nutritionist and the School Feeding Council, and investment in management with a view to the Food and Nutritional Security of schoolchildren.

KEYWORDS: Health Risk; Food Security; School Feeding; Food Services; Food Handling

RESUMO

Introdução: Para a oferta de refeições seguras aos estudantes, preconizado pelo Programa Nacional de Alimentação Escolar, se faz necessária uma condição higiênicossanitária adequada da Unidade de Alimentação e Nutrição. **Objetivo:** Avaliar as condições higiênicossanitárias das Unidades de Alimentação e Nutrição de escolas participantes do Programa Nacional de Alimentação Escolar em municípios goianos, bem como verificar possíveis associações com: índices municipais, características da escola e supervisão de nutricionista. **Método:** Estudo transversal, realizado entre 2017 e 2019, com amostra de 395 escolas, de 103 municípios de Goiás. As condições higiênicossanitárias foram verificadas por nutricionistas, por meio de um *checklist* baseado na RDC nº 216, de 15 de setembro de 2004 da Agência Nacional de Vigilância Sanitária e nos índices municipais de desenvolvimento humano e da educação básica em base de dados públicas. As características da escola e o recebimento de supervisão

foram perguntados aos diretores escolares. Realizou-se uma análise descritiva dos itens do *checklist* e testes de hipóteses e correlação. **Resultados:** A maioria das unidades (69,4%) foi classificada como de risco sanitário regular, de acordo com o *checklist*. Obteve-se diferenças significativas entre: as escolas municipais e estaduais (p = 0,02); a mesorregião Norte das outras (p = 0,00) e o baixo Índice de Desenvolvimento Humano das demais categorias (p = 0,02). Ademais, o alto Índice de Desenvolvimento da Educação Básica (5º ano) apresentou uma associação com o muito baixo risco sanitário (p = 0,04). **Conclusões:** Infere-se que há necessidade de medidas corretivas. Sugere-se a implementação de manuais de boas práticas; a formação de manipuladores; a supervisão contínua do nutricionista e do Conselho de Alimentação Escolar; e o investimento da gestão com vistas à Segurança Alimentar e Nutricional dos escolares.

PALAVRAS-CHAVE: Risco Sanitário; Segurança Alimentar; Alimentação Escolar; Serviços de Alimentação; Manipulação de Alimentos

INTRODUCTION

The consumption of food or water contaminated by pathogenic microorganisms like fungi, bacteria, protozoa or viruses can cause foodborne diseases[1]. In Brazil, between 2007 and 2015, 123,455 outbreaks of foodborne diseases were recorded, with 140,223 people becoming ill and 108 deaths, an annual average of 725 outbreaks and 13,917 cases, 7.4% of which occurred in schools and daycare centers[2]. The contamination of food may occur throughout the production chain, and risk monitoring can enable greater hygienic and sanitary control, which is essential to prevent foodborne diseases[3].

To this end, in Brazil, the National Health Surveillance Agency (Anvisa), a autarchy of the Ministry of Health, acts in the regulation, supervision, monitoring and registration of products and in the health control of Food and Nutrition Units (UAN)[4]. Anvisa's joint board resolution (RDC) n. 216, of September 15, 2004[5], is a landmark in health control because it provides information on the procedures that should be adopted to ensure that food produced in Food and Nutrition Units is hygienic and that its quality is in accordance with the health legislation[5,6].

Another Brazilian action that has become a public policy of great strength and longevity in Brazil is the National School Feeding Program (PNAE in Portuguese), which seeks to ensure Food and Nutrition Security (SAN) and the Human Right to Adequate Food (DHAA) to all Brazilian schoolchildren enrolled in public school networks[7]. In 2020, the National School Feeding Program served 47.3 million students in 179.500 basic education schools in the nationwide[8]. Thus, most Brazilian public schools have Food and Nutrition Units for the production of safe and quality meals, monitored by a head nutritionist [9].

The Brazilian School Feeding Program serves many students who are vulnerable in nutritional and socioeconomic terms, and to whom the school meal may be their only meal of the day[9,10]. Therefore, the production of safe food both from a hygienic-sanitary and nutritional point of view is of the utmost importance in this setting. The lack of guaranteed Food and Nutrition Security may increase the risk of foodborne disease outbreaks resulting from the consumption of food contaminated by improper handling, a determining condition for schoolchildren to become ill[11].

In this sense, the objective of this study was to evaluate the hygiene and sanitary conditions of Food and Nutrition Units of schools participating in the Brazilian School Feeding Program in municipalities of the state of Goiás, as well as to check possible associations with municipal indexes (Human Development and Basic Education), school characteristics (administrative dependence, territorial division, educational level and location in the mesoregion) and supervision from a nutritionist and a School Feeding Council.

METHOD

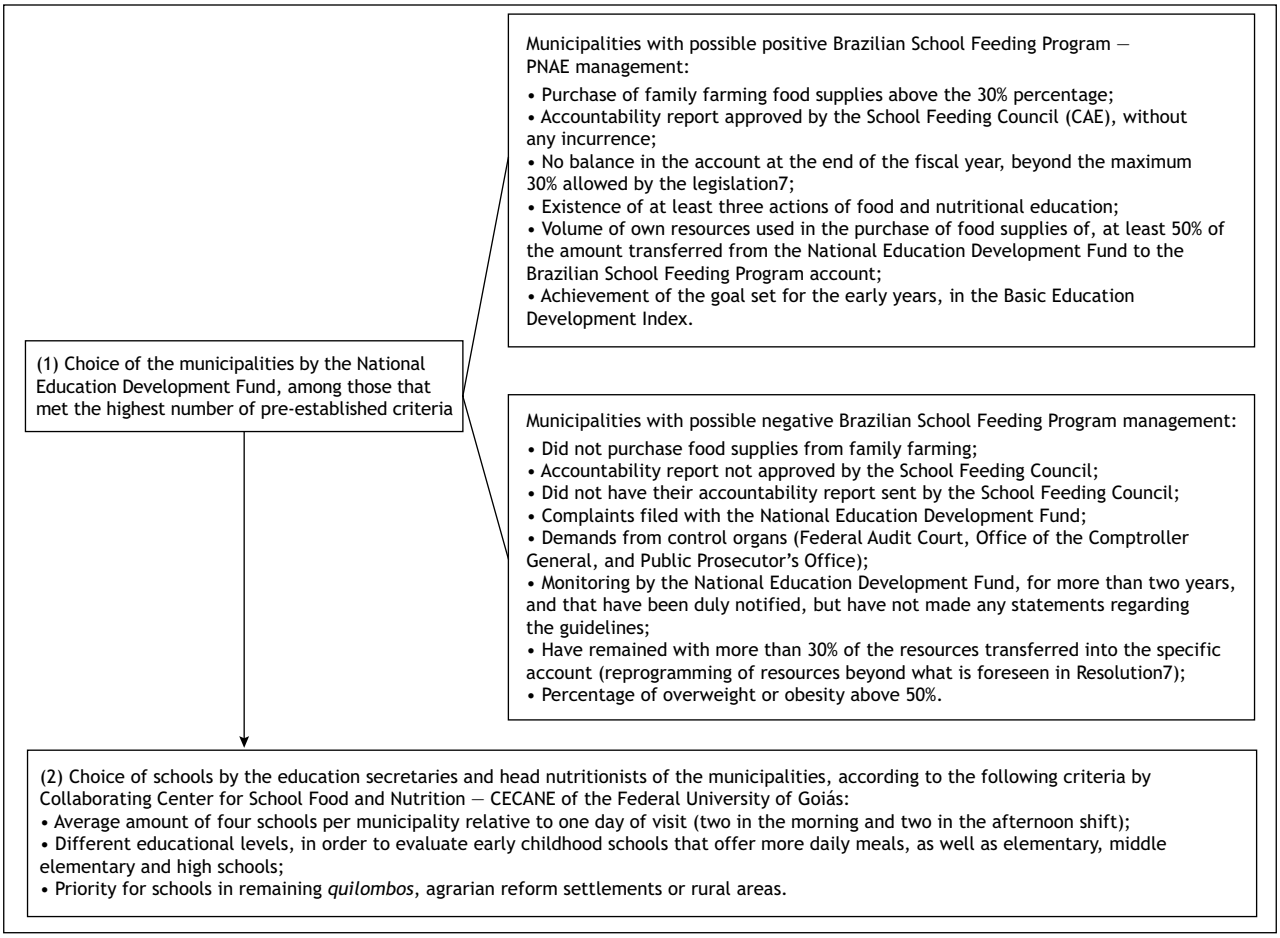
Type of study and ethical aspects

This is a cross-sectional study that is part of a project called "Evaluation of the National School Feeding Program in municipalities of Goiás", conducted by the Collaborating Center for School Food and Nutrition (CECANE) of the Federal University of Goiás (UFG), between the years 2017 and 2019, with funding from the National Education Development Fund (FNDE), the body responsible for managing the program in Brazil. The research was approved by the Ethics and Research Committee of the Federal University of Goiás, under opinion n. 2.616.421/2018.

Sample

The sample included 395 Food and Nutrition Units in schools chosen by convenience in a face-to-face meeting with education secretaries and head nutritionists of the Brazilian School Feeding Program in the municipalities selected by the National Education Development Fund.

To choose the schools, the Collaborating Center for School Food and Nutrition of the Federal University of Goiás set criteria based on the quantity possible for evaluation, educational level, and location. The selection of the municipalities was done by the National Education Development Fund and included executing entities with possible negative management of the Brazilian School Feeding Program, and a sub-sample of municipalities with possible positive management, according to data obtained from the Council Management System (SIGECON), Accountability Management System (SiGPC), Integrated School Meal Management System (SIGAE), Integrated Financial Management System (SIGEF) and Nutritional Food Surveillance System (SISVAN) (Image).



Source: Prepared by the authors, 2021.
FNDE: National Fund for Education Development; PNAE: National School Feeding Program; CAE: School Feeding Council; CECANE: Collaborating Center in School Food and Nutrition; UFG: Federal University of Goiás; RT: Head Technical Responsible.

Image. Criteria for the selection of municipalities and schools. CECANE UFG, 2020.

The 395 selected schools were distributed across a total of 103 municipalities of Goiás, and 32 municipalities were visited in 2017, 41 in 2018, and 30 in 2019. Of these, according to the classification prepared by the National Education Development Fund, 9 (three in each year evaluated) were considered to have possible positive management of the Brazilian School Feeding Program, whereas 95 (29 in 2017, 38 in 2018, and 27 in 2019) were considered to have possible negative management.

Collection instrument and variables

The instrument adopted to evaluate the hygienic and sanitary conditions was the "Checklist of Good Practices for Food and Nutrition Units", prepared by the Collaborating Center for School Food and Nutrition of the Federal University of Rio Grande do Sul[12,13]. It is a checklist that has been validated and adapted for schools based on Anvisa's joint board resolution — RDC n. 216/2004[5]. The list is divided into six overarching topics, namely: buildings and facilities in the food preparation area (36 items), temperature-controlled equipment (nine items), food handlers (eight items), receipt of goods (four items), food processes and production (35 items), and environmental hygiene (20 items)[12,13].

Additionally, a questionnaire prepared by the researchers themselves was applied to school principals to garner data on school characteristics, such as: administrative dependence, territorial division, educational level, location in the mesoregion, and availability of supervision from a nutritionist and from the School Feeding Council.

Furthermore, the Municipal Human Development Index and the Basic Education Development Index were collected by documentary research in public databases. The municipal Basic Education Development Index was obtained from the official website of the Anísio Teixeira National Institute of Educational Studies and Research (Inep)[14], and the Municipal Human Development Index, from the Human Development Atlas in Brazil[15].

The variables studied were qualitative and quantitative. The qualitative variables were administrative dependence (municipal or state), territorial division (urban or rural), mesoregions

of Goiás (North, South, Central, East or Northwest), educational level (daycare or not daycare), supervision of a nutritionist at school (yes, partially, or no) and School Feeding Council visits at the school (yes, partially, or no), categorization of health risk (very high, high, regular, low or very low), and Municipal Human Development Index (very high, high, medium, low or very low). The quantitative variables analyzed were the Municipal Human Development Index, the Basic Education Development Index, and the checklist's health risk scores.

Data collection

The nutritionists of the Collaborating Center for School Food and Nutrition of the Federal University of Goiás were previously trained to standardize the collection instrument and conducted a pilot test at a school in Goiânia, which was not part of the sample. Then, telephone contact was made, and a letter to schedule visits was emailed from both the National Education Development Fund and the Collaborating Center for School Food and Nutrition of the Federal University of Goiás to the Brazilian School Feeding Program managers (mayors and education secretaries) of the selected municipalities.

After that, on a scheduled date, nutritionists from the Federal University of Goiás Collaborating Center visited the municipalities and their respective schools. In those schools, the researchers first met with the school principals to collect their signatures on the Free and Informed Consent Form and apply the school's general data questionnaire.

Also, Food and Nutrition Units were inspected, and the checklists of hygienic-sanitary conditions were completed[12,13]. A response option was checked, according to what was observed in the Food and Nutrition Units, and the item description on the list was computed as: YES, when the observations were in agreement with the item description, and NO, when they were not, and those not relevant to the establishment evaluation were not applicable (NA).

Data analysis

The checklist items were entered into the program "*Boas Práticas na Alimentação Escolar* — Good Practices in School Meals", developed by the Collaborating Center for School Food and Nutrition of the Federal University of Rio Grande do Sul — UFRGS, and the Federal University of São Paulo — Unifesp, in partnership with the National Education Development Fund. It is an application that contains a checklist of good practices and classifies health risks in levels, according to the score established by the collection instrument: very high health risk level, from 0 to 25 points; high, from 26 to 50; medium, from 51 to 75; low, from 76 to 90; and very low health risk, from 90 to 10[12,13]. To analyze the sanitary situation, the evaluations of each topic were considered referring to: the category classification related to the level of compliance with sanitary requirements (ranging from very high to very low health risk) and the score related to the level of risk (ranging from 0 to 100)[13].

Additionally, the program calculated the classification and the overall score of the Food and Nutrition Unit based on the sum of the points found per topic and multiplied by the weights assigned to the topic[12,13]. The checklist scores and the health risk categorization of each topic and the Food and Nutrition Unit's overall health risk, along with the municipal indexes and the school's general data, were computed in Excel.

We performed a descriptive analysis in which both the absolute and the relative simple frequencies were presented for category data, while the median and the interquartile deviation were presented for numerical data, since they presented asymmetry.

Subsequently, data distribution was assessed by the Kolmogorov-Smirnof normality test. Since the data presented a non-normal distribution, the Mann-Whitney non-parametric tests were applied for variables with two categories of responses, whereas the Kruskal-Wallis test was applied for more than two categories, and in the latter, when there was statistical significance, Dunn's post-hoc test was performed. The Spearman correlation was also calculated between the raw value of the general scores of hygienic-sanitary conditions and the municipal indexes (Municipal Human Development Index and Basic Education Development Index). The correlations were classified into very low (0.01 to 0.09), low (0.10 to 0.29), moderate (0.30 to 0.49), substantial (0.5 to 0.69), and very strong categories (greater than 0.70), suggested by Davis[16]. Data were analyzed in SPSS Statistics® version 23 software, considering a significance level of $p < 0.05$ and 95% confidence interval.

RESULTS

A total of 103 municipalities in the state of Goiás were evaluated, distributed in the following mesoregions: 34.0% (n = 35) in the South; 26.2% (n = 27) in the Center; 16.5% (n = 17) in the East; 13.6% (n = 14) in the Northwest; and 9.7% (n = 10) in the North.

Regarding the Basic Education Development Index, the municipalities presented an average of 5.90 ± 0.67 for the 4th grade/5th grade of elementary school; 5.10 ± 0.49 for the 8th grade/9th grade of middle school; and 4.20 ± 0.44 for the 3rd grade of high school. Considering the Municipal Human Development Index, 2.0% of them (n = 2) had a low index; 50.0% (n = 51), a medium index; and 49.0% (n = 50), a high index, with an average of 0.698 ± 0.040, within the average range of human development in Brazil[15].

Regarding the presence of traditional communities in the jurisdiction of the municipalities, it was found that none comprised indigenous communities, but 13 presented *quilombola* communities registered by the Palmares Cultural Foundation (six municipalities visited in 2017, six in 2018, and one in 2019), and 34 counted on agrarian reform settlements (11 in 2017, 10 in 2018, and 13 in 2019).

A total of 395 schools were evaluated, mostly of municipal administrative dependence (72.4%, n = 286), located in urban

Table 1. Frequency of the health risk situation of Food and Nutrition Units according to the Good Practices Checklist in 395 schools in Goiás, Brazil.

Item	Frequency n (%)				
	Very high	High	Regular	Low	Very low
Food preparation area buildings and facilities	7 (1.8)	54 (13.7)	239 (60.5)	81 (20.5)	14 (3.5)
Temperature-controlled equipment	16 (4.1)	32 (8.1)	92 (23.3)	237 (60.0)	18 (4.6)
Food handlers	6 (1.5)	68 (17.2)	171 (43.3)	78 (19.7)	72 (18.2)
Receipt of good	6 (1.5)	9 (2.3)	14 (3.5)	6 (1.5)	360 (91.1)
Food production and processes	6 (1.5)	130 (32.9)	212 (53.7)	40 (10.1)	7 (1.8)
Environmental hygiene	3 (0.8)	84 (21.3)	233 (59.0)	52 (13.2)	23 (5.8)
Overall score	5 (1.2)	23 (5.8)	274 (69.4)	82 (20.8)	11 (2.8)

Source: Checklist of Good Practices for School Food and Nutrition Units (Collaborating Center for School Food and Nutrition — CECANE Federal University of Rio Grande do Sul)[12,13].

areas (83.8%, n = 331), and of primary and/or secondary education (76.7%, n = 303). No school was located in indigenous areas, but 4.3% (n = 17) were in remaining *quilombola* communities, and 1.5% (n = 6) in agrarian reform settlements.

It is noteworthy that nine municipalities did not have a Brazilian School Feeding Program head nutritionist, which meant that 20 schools (5.0% of the sample) did not have a professional to control good health practices. However, we did not assess whether the number of nutritionists was appropriate for the number of students according to the minimum reference parameters of Resolution n. 465 of 23 August 2010[17], of the Federal Council of Nutritionists. Among those who had a nutritionist, the school principal and/or the pedagogical coordinator were asked whether the nutritionist visits the school, and a large portion answered yes (64.6%; n = 255). As for the supervision of the School Feeding Council, we observed that most did not visit the schools (65.8%, n = 260).

The overall health risk score of the Food and Nutrition Units was regular for 69.4% (n = 274) of the sample. However, it is noteworthy that 7.0% (n = 28) showed very high and high health risks. The categories with the highest average scores for very low or low health risk were: "receipt" and "temperature-controlled equipment", respectively. The other categories were classified with higher score in "regular" health risk (Table 1).

Additionally, the hygienic-sanitary conditions among the municipal and state schools, the mesoregions of Goiás and the Municipal Human Development Index showed statistical differences (Table 2). We observed that, in the variables of mesoregions of Goiás and Municipal Human Development Index, the northern mesoregion and the low Municipal Human Development Index differ from other categories, respectively.

We also observed that there is a strong positive correlation between the general hygienic-sanitary conditions and the 4th grade/5th grade Basic Education Development Index ($p < 0.05$), that is, the highest value of the 4th grade/5th grade Basic Education Development Index was associated with a higher health risk score (very low health risk classification) (Table 3).

Table 2. Overall score of hygienic-sanitary risk conditions of School Food and Nutrition Units, by hypothesis tests (n = 395).

Variable	Median (Interquartile deviation)	p value
Administrative dependence[1]		
Municipal	67.87 (14.69)	0.022*
State	70.93 (11.38)	
Territorial division[1]		
Urban	69.89 (13.97)	0.075
Rural	66.01 (13.56)	
Educational level[1]		
Nursery/ daycare	71.25 (12.37)	0.209
Pre-school, elementary, middle, and high school	68.56 (14.54)	
Location in a differentiated area (*quilombola* or agrarian reform settlement)[1]		
Yes	65.36 (22.02)	0.938
No	69.42 (13.78)	
Mesoregions of Goiás[2]		
North	61.45 (18.54)	0.000*
Northwest	70.58 (10.07)	
Center	72.13 (14.75)	
South	67.61 (12.87)	
East	67.36 (16.23)	
Municipal Human Development Index[2]		
Low	56.85 (7.33)	0.020*
Medium	69.83 (14.73)	
High	69.39 (12.80)	
Nutritionist's supervision[2]		
Yes	69.83 (13.87)	0.383
No	69.56 (17.38)	
Partially	70.08 (12.96)	
School Feeding Council Supervision[2]		
Yes	70.59 (13.20)	0.349
No	68.56 (14.53)	
Partially	67.96 (9.76)	

Source: prepared by the authors, 2020.
[1]Mann-Whitney test; [2]Kruskal-Wallis test and Dunn's post-hoc; *$p < 0.05$.

Table 3. Correlation between the overall score of hygienic-sanitary conditions and municipal indexes.

Variable	Median (Interquartile deviation)	Spearman correlation	
		Coefficient r	p Value
IDMH	0.698 (0.04)	0.041	0.422
IDEB 4th grade/5th grade of elementary school	5.900 (1.10)	0.101	*0.045
IDEB 8th grade/9th grade of middle school	5.200 (0.70)	0.074	0.144
IDEB 3rd grade of high school	4.200 (0.60)	0.059	0.244

Source: prepared by the authors, 2020.
*p < 0.05.
IDHM: Municipal Human Development Index; IDEB: Basic Education Development Index.1

DISCUSSION

Several studies have evaluated the hygienic-sanitary conditions of Food and Nutrition Units [6,9,10,11,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36]. However, this one is a pioneer because it investigates schools participating in the Brazilian School Feeding Program in the state of Goiás, which represent approximately 42.0% of the municipalities in all the mesoregions of Goiás, and relates data on hygienic-sanitary conditions with the main municipal indexes of social and educational development, a pioneering initiative in this type of association.

Statistically significant differences in the hygienic-sanitary conditions among the municipal and state schools, of the North mesoregion versus the other regions of Goiás, and of the "low" classification of the Municipal Human Development Index in relation to the other classifications (medium and high) stood out. Additionally, the increased value of the 4th grade/5th grade Basic Education Development Index showed a correlation with very low health risk of the Food and Nutrition Units.

The Basic Education Development Index was designed to measure the quality of learning in Brazil and to set goals for the improvement of education. This index allows monitoring by means of concrete data, calculated from the school performance rate (students' success) and the averages of student performance in examinations applied by the National Institute of Educational Studies and Research — Inep, indexes that are obtained from the School Census every year[37].

In the context of the state of Goiás, the Basic Education Development Index score for 2019 for the early years of elementary school (public system) is 6.0 points and for the final years of elementary school (public system) is 5.1 points[38]. This study identified that a higher Basic Education Development Index score is related to a lower health risk, a result corroborated by the study of Gomes et al.[39], which showed that municipalities that complied with the Brazilian School Feeding Program legislation, which also includes hygienic-sanitary conditions, achieved a higher score in the Basic Education Development Index.

Studies that evaluated the good sanitary practices of the Food and Nutrition Units served by the Brazilian School Feeding Program in several Brazilian settings found that a significant part does not properly meet the regulatory requirements[6,9,11,18,19,20,21,22,23,24,25]. This corroborates this study, which found that 69.4% of the schools analyzed had regular health risk, that is, they met the health standards in a regular way.

Other studies, however, found indexes of high and very high health risk situation, which are higher than the results found in schools in Goiás, indicating that the Food and Nutrition Units in Goiás presented better sanitary conditions compared to municipalities in the states of Paraíba[11], Alagoas[19], São Paulo[20] and Rio Grande do Sul[21]. Even though this study did not assess whether the number of nutritionists in the municipalities matched the number of students, we believe that the presence of a nutritionist in 95.0% of the Food and Nutrition Units evaluated in this study may have favored better sanitary conditions when compared to other studies, since the nutritionists are responsible for guiding and supervising the actions of hygienic-sanitary control under the Brazilian School Feeding Program[17].

The presence of a nutritionist in the food handling areas is intrinsically related to the high adequacy of food handling areas[23] and a more effective hygienic-sanitary control of the meal production process[9]. Therefore, a greater insertion of nutritionists as management and health education agents is fundamental, with the appropriate quantity to the students served, aiming to meet the sanitary requirements in force and become effective partners in the promotion of appropriate and healthy nutrition[31].

It is believed that, to improve the health risk of schools, the following are necessary: more investments in structural renovation, installation of millimeter screens in windows, installation of light fixtures with acrylic protection grids, purchase of thermometers and thermal counters, and purchase of individual protection equipment[11,19,20,21]. There is also the need for immediate intervention of the competent sectors to mediate actions that minimize, in the medium/short term, the damage to the quality of the meals produced, such as: continuing training of food handlers, implementation of a manual of good practices with standard operating procedures, standardization of service, reduction in waiting time for the distribution of meals exposed to room temperature, and monitoring of food production[9,19,20,21].

Between municipal and state schools, hygienic-sanitary conditions showed statistically significant differences. State schools

achieved a higher median, that is, low health risk compared to municipal schools, with regular risk. The researchers of this study observed that the Food and Nutrition Units of state schools have better infrastructure when compared to the municipal schools, which may have favored a better score on health risk.

The Education Department of the State of Goiás (SEDUC-GO), in its State Education Plan (2015-2025)[40], provides for the planning of the infrastructure of state schools and necessary improvements for their proper functioning. Thus, schools with planned kitchens were found. In municipal schools, however, we observed that, in general, there is no planning for the construction of kitchens. They are mostly adapted from existing spaces and, apparently, most Food and Nutrition Units have the physical structure of a household kitchen[9,21,23].

By contrast, at schools in Viçosa (Minas Gerais), no statistical difference was found when comparing the infrastructure of municipal and state schools, but inadequate infrastructure was observed in the areas of food preparation and distribution. Also, state schools showed more irregularities in the implementation of the Brazilian School Feeding Program than municipal schools[10].

In relation to schools in rural and urban areas, no statistically significant differences in health risk were found, although schools in rural areas have a lower median value in the score of health risk situation, that is, a higher health risk.

Food and Nutrition Units in the Northern region had a lower median, in other words, a higher health risk. This region is bordered by the Southern portion of the state of Tocantins, in the East, by the Northeast region of the state of Goiás, and in the West, by the state of Mato Grosso, and is composed of 26 municipalities. Compared to the others, the North region has less economic dynamism, which can cause lower employment and income generation, lower self-generated revenue in the form of collection of taxes, fees, and contributions[41]. It is believed that this economic situation in the region may have influenced a greater health risk in schools, with a possible reduction in the budget allocated to the structure and organization of school meals.

It is important to highlight that the study had some limitations, among which the selection of the municipalities by the National Education Development Fund, since most municipalities already had some irregularities with the Brazilian School Feeding Program and portray the reality of a state. Also, during the on-site visits, it was not possible to observe all stages of food production, so some items were marked according to the accounts of the food handlers.

CONCLUSIONS

The regular health risk classification was observed in a significant part of the evaluated Food and Nutrition Units, even in schools that were selected by the Brazilian School Feeding Program managers in the municipalities. It is noteworthy that the items that contributed to the high health risk were “processes and food production” and “environment hygiene”, which can be solved by training of the food handlers, continuous supervision by nutritionists and investment in the infrastructure of Food and Nutrition Units.

Additionally, significant differences in hygienic-sanitary conditions were found between municipal and state schools, which have different forms of management of the Brazilian School Feeding Program; the Northern mesoregion and the other regions, which can be affected by low government visibility; and the low Municipal Human Development Index, which may be related to the revenue of the cities. The association between high Basic Education Development Index and very low health risk reinforces the idea of the association between food safety and its influence on learning and school performance.

It is observed that the structure of Food and Nutrition Units is still far below the provisions of Anvisa’s joint board resolution — RDC n. 216/20045. In this case, although the technical regulation of good practices of Anvisa includes institutional kitchens, it should be noted that school kitchens have particularities that require specific regulatory technical notes. More dialogue and partnerships between municipal health surveillance teams and Brazilian School Feeding Program managers are also recommended, since the public policies for school meals and health surveillance are aligned with regard to the control of hygienic-sanitary quality. Thus, the actions of health surveillance may be decisive to ensure the quality of school meals.

Furthermore, the importance of inspection and greater attention from managers to hygienic-sanitary conditions stands out. Physical adequacy of Food and Nutrition Units is suggested; higher qualification of food handlers on a permanent basis; preparation and implementation of manuals of good practices with details of standard operating procedures; supervision and continuous guidance of a nutritionist and by the School Feeding Council; and investment by the municipal and school management, in order to provide a safer environment and consequently greater food safety for schoolchildren.

The implementation of good practices aims to provide safe food to students, which is essential to the access by all to quality food in an attempt to ensure Food and Nutrition Security (SAN) and promote the health of schoolchildren.

REFERENCES

1. Silveira DS, Kaefer K, Porto RC, Lima HG, Timm CD, Cereser ND. Qualidade microbiológica de produtos de origem animal encaminhados para alimentação escolar. Cienc Anim Bras. 2019;20:1-8. https://doi.org/10.1590/1089-6891v20e-43226
2. Ministério da Saúde (BR). Boletim epidemiológico: número especial. Brasília: Ministério da Saúde; 2019[acesso 9 abr 2020]. Disponível em: https://portalarquivos2.saude.gov.br/images/pdf/2019/setembro/25/boletim-especial-21ago19-web.pdf

3. Viterbo LMFV, Dinis MAPD, Sá KN, Marques CASC, Navarro MVT, Leite HJD. Desenvolvimento de um instrumento quantitativo para inspeção sanitária em serviços de alimentação e nutrição, Brasil. Cienc Saúde Coletiva. 2020;25(3):805-16. https://doi.org/10.1590/1413-81232020253.16372018
4. Brasil. Lei N° 9.782, de 26 de janeiro de 1999. Define o Sistema Nacional de Vigilância Sanitária, cria a Agência Nacional de Vigilância Sanitária, e dá outras providências. Diário Oficial União. 27 jan 1999.
5. Agência Nacional de Vigilância Sanitária – Anvisa. Resolução RDG N° 216, de 15 de setembro de 2004. Dispõe sobre regulamento técnico de boas práticas para serviços de alimentação. Diário Oficial União. 16 set 2004.
6. Vitória AG, Oliveira JSC, Faria CP, São José JFB. Good practices and microbiological quality of food contact surfaces in public school kitchens. J Food Saf. 2018;38(5):1-10. https://doi.org/10.1111/jfs.12486
7. Ministério da Saúde (BR). Resolução Nº 6, de 8 de maio de 2020. Dispõe sobre o atendimento da alimentação escolar aos alunos da educação básica no âmbito do Programa Nacional de Alimentação Escolar – PNAE. Diário Oficial União. 12 maio 2020.
8. Instituto Nacional de Estudos e Pesquisas Educacionais Anísio Teixeira - INEP. Resumo técnico: censo da educação básica 2020: notas estatísticas. Brasília: Instituto Nacional de Estudos e Pesquisas Educacionais Anísio Teixeira; 2021[acesso 7 dez 2021]. Disponível em: https://www.gov.br/inep/pt-br/areas-de-atuacao/pesquisas-estatisticas-e-indicadores/censo-escolar/resultados
9. Soares DSB, Henriques P, Ferreira DM, Dias PC, Pereira S, Barbosa RMS. Boas práticas em unidades de alimentação e nutrição escolares de um município do estado do Rio de Janeiro, Brasil. Cienc Saúde Coletiva. 2018;23(12):4077-83. https://doi.org/10.1590/1413-812320182312.23992016
10. Rocha NP, Filgueiras MS, Albuquerque FM, Milagres LC, Castro APP, Costa GD et al. Análise do programa nacional de alimentação escolar no município de Viçosa, MG, Brasil. Rev Saúde Pública. 2018;52(16):1-10. https://doi.org/10.11606/S1518-8787.2018052007090
11. Lopes ACC, Pinto HRF, Costa DCIO, Mascarenhas RJ, Aquino JS. Avaliação das boas práticas em unidades de alimentação e nutrição de escolas públicas do município de Bayeux, PB, Brasil. Cienc Saúde Coletiva. 2015;20(7):2267-75. https://doi.org/10.1590/1413-81232015207.15162014
12. Stedefeldt E, Cunha DT, Silva Júnior EA, Silva SM, Oliveira ABA. Instrumento de avaliação das boas práticas em unidades de alimentação e nutrição escolar: da concepção à validação. Cienc Saude Coletiva. 2013;18(4):947-53. https://doi.org/10.1590/S1413-81232013000400006
13. Fundo Nacional de Desenvolvimento da Educação – FNDE. Guia de instruções: ferramentas para as boas práticas na alimentação escolar. Brasília: Ministério da Educação; 2013[acesso 7 ago 2021]. Disponível em: https://www.fnde.gov.br/index.php/programas/pnae/pnae-area-gestores/pnae-manuais-cartilhas/item/5320-ferramenta-de-boas-pr%C3%A1ticas-de-fabrica%C3%A7%C3%A3o-de-alimentos
14. Instituto Nacional de Estudos e Pesquisas Educacionais Anísio Teixeira - INEP. Índice de desenvolvimento da educação básica: resultados e metas. Brasília: Ministério de Educação; 2020[acesso 7 ago 2020]. Disponível em: http://ideb.inep.gov.br/resultado/home.seam?cid=3902027
15. Instituto Nacional de Estudos e Pesquisas Educacionais Anísio Teixeira - INEP. Atlas do desenvolvimento humano no Brasil. Brasília: Ministério da Educação; 2020[acesso 7 ago 2020]. Disponível em: http://atlasbrasil.org.br/2013/
16. Davis JA. Levantamentos de dados em sociologia: uma análise estatística elementar. Rio de Janeiro: Zahar; 1976.
17. Conselho Federal de Nutricionistas – CFN. Resolução CFN Nº 465, de 23 de agosto de 2010. Dispõe sobre as atribuições do nutricionista, estabelece parâmetros numéricos mínimos de referência no âmbito do Programa de Alimentação Escolar (PAE) e dá outras providências. Diário Oficial União. 25 ago 2010.
18. Rudakoff LCS, Mouchreck AN, Frota MTBA, Bastos LSB. Qualidade e segurança alimentar em unidades de alimentação e nutrição escolares da rede municipal de educação de São Luís, Maranhão. Vigil Sanit Debate. 2018;6(3):46-53. https://doi.org/10.22239/2317-269x.01094
19. Albuquerque ERN, Santos ACCL, Gusmão BMT. Classificação do risco sanitário em unidades de alimentação e nutrição escolar. Rev Saúde Desenv. 2018;12(11):265-76.
20. Ribeiro JA, Damaceno KJL, Moura KDL, Salvador AA, Rosseti FX, Tamasia GA et al. Análise das condições higiênico sanitárias das unidades de alimentação e nutrição das escolas de um município no Vale do Ribeira, SP. Res Soc Develop. 2018;7(8):1-15. https://doi.org/10.17648/rsd-v7i8.327
21. Fortes KSB, Brasil CCB, Silva JP, Pontes BD, Graupe ML. Condições higiênico-sanitárias de unidades de alimentação e nutrição de escolas de educação infantil de Palmeira das Missões, RS. Vigil Sanit Debate. 2017;5(3):37-43. https://doi.org/10.22239/2317-269x.00959
22. Mendes TIL, Monteiro MLS, Carvalho LMF, Bezerra KCB. Condições higiênicas e sanitárias de unidades de alimentação e nutrição de escolas em tempo integral. Rev Eletron Acervo Saúde. 2019;31:1-10. https://doi.org/10.25248/reas.e1150.2019
23. Silva GA, Gomes CC, Coelho MS. Avaliação das qualidades higiênicossanitárias das unidades de alimentação das escolas municipais e Cemei do Carmo do Rio Verde, GO. Rev Eletron Fac Ceres. 2018;7(1):87-95. https://doi.org/10.36607/refacer.v7i1.3324
24. Oliveira ASSS, Soares ELP, Macedo JL, Pereira IC, Gomes FO, Assunção MJSM. Condições higiênico-sanitárias em unidades de alimentação de escolas públicas. Rev Cienc Saberes. 2017;3(3):585-93.
25. Rasquinha BS, Nunes GQ, Adami FS, Fassina P. Avaliação das condições higiênicos-sanitárias em unidades de alimentação escolar da rede municipal de um município do Vale do Rio Pardo, Rio Grande do Sul. Cad Pedag. 2017;14(2):45-55. https://doi.org/10.22410/issn.1983-0882.v14i2a2017.1451

26. Bigson K, Essuman EK, Lotse CW. Food hygiene practices at the Ghana school feeding programme in Wa and Cape Coast cities. Int J Environ Res Public Health. 2020;1-7. https://doi.org/10.1155/2020/9083716

27. Madeira CMC, Sousa ACP, Sousa PAB, Oliveira AMC, Menezes CC, Medeiros SRA. Condições higiênico-sanitárias das creches públicas municipais de Picos, Piauí. Rev Univ Vale Rio Verde. 2014;12(2):990-1000. https://doi.org/10.5892/ruvrd.v12i2.1820

28. Ramos CI, Valença MS, Peter NB, Muniz LC. Avaliação das boas práticas em unidades de alimentação escolar da zona rural do município de Pelotas, RS. Semina Cienc Biol Saúde. 2020;41(1):67-74. https://doi.org/10.5433/1679-0367.2020v41n1p67

29. Macêdo MJR, Lopes JNS. Avaliação das boas práticas de fabricação em uma cantina escolar do município de Missão Velha-CE. Rev e-Cienc. 2018;6(1):49-53. https://doi.org/10.19095/rec.v6i1.369

30. Silva LHM, Brasil CCB, Silveira ACM, Silveira JT, Moura FA, Martini CS et al. Avaliação das condições higiênicas de escolas de ensino infantil e fundamental por meio da aplicação de listas de verificação. Segur Aliment Nutr. 2016;23(1):837-48. https://doi.org/10.20396/san.v23i1.8642256

31. Ruwer CM, Mainbourg EMT. Condições higiênico-sanitárias de cantinas escolares da rede privada, antes e depois do licenciamento sanitário. Vigil Sanit Debate. 2015;3(2):85-93. https://doi.org/10.3395/2317-269x.00479

32. Araújo PD, Sisti E, Manske MLDL, Bastos B, Silva DM, Richte CRP. Condições microbiológicas de cozinhas e manipuladores de merenda escolar em município do sul do Brasil. Cad Escola Saúde. 2018;17(2):79-90.

33. Schimer M, Picanço NFM, Faria RAPG. Importance of training in ensuring the hygiene-sanitary quality of lettuce salads served in nursery schools. Braz J Food Technol. 2019;22:1-19. https://doi.org/10.1590/1981-6723.28218

34. Santos JM, Ferreira LC. Condições higiênico-sanitárias em uma escola pública do município de Januária-MG antes e após o treinamento dos manipuladores de alimentos. Cad Cienc Agrária. 2019;11:1-7. https://doi.org/10.35699/2447-6218.2019.12285

35. Pereira WBB, Zanardo VPS. Gestão de boas práticas em uma cantina escolar. Rev Vivências. 2020;16(30):193-200. https://doi.org/10.31512/vivencias.v16i30.152

36. Gomes NAAA, Campos MRH, Monego ET. Aspectos higiênico-sanitários no processo produtivo dos alimentos em escolas públicas do estado de Goiás, Brasil. Rev Nutr. 2012;25(4):473-85. https://doi.org/10.1590/S1415-52732012000400005

37. Ministério da Educação (BR). IDEB: apresentação. Brasília: Ministério da Educação; 2021[acesso 7 dez 2021]. Disponível em: http://portal.mec.gov.br/conheca-o-ideb

38. Instituto Nacional de Geografia e Estatística – IBGE. Panorama: Goiás. Rio de Janeiro: Instituto Nacional de Geografia e Estatística; 2021[acesso 7 dez 2021]. https://cidades.ibge.gov.br/brasil/go/panorama

39. Gomes LS, Nunes EM, Rodrigues FL, Ramalho, SM. Impactos do programa nacional de alimentação escolar (PNAE) sobre as escolas públicas no nordeste brasileiro. Rev Econ NE. 2021;52:103-20.

40. Governo do Estado de Goiás. Lei Nº 18.969, de 22 de julho de 2015. Aprova o Plano Estadual de Educação, para o decênio 2015/2025 e dá outras providências. Diário Oficial do Estado. 27 jul 2015.

41. Pasqualetto A, Ferreira UL, Matsuura, F. Matriz de dependência dos municípios da região norte de Goiás. Mercator. 2020;19(1):1-14. https://doi.org/10.4215/rm2020.e19028

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Authors' Contributions

Oliveira GAL, Marques TP, Marchewicz TAS, Borges LJ, Martins KA, Souza TAC, Alexandre-Weiss VP – Conception, planning (study design), analysis, data interpretation and writing of the manuscript. All authors approved the final draft of the manuscript.

Disclosures

The authors report that there is no potential conflict of interest with peers and institutions, nor political or financial conflicts in this study.

Conflict of Interest

Authors have no potential conflict of interest to declare, related to this study's political or financial peers and institutions.