



ASSESSMENT OF THE SCHOOL FOOD ENVIRONMENT: WHAT IS THERE TO EAT IN THE SURROUNDING AREA?

AVALIAÇÃO DO AMBIENTE ALIMENTAR ESCOLAR: O QUE HÁ PARA COMER NO ENTORNO?

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ABSTRACT: The objective of this study was to evaluate the food environment by identifying and characterizing food retail establishments located in the surroundings of a public school. Mapping was conducted using Google Maps to locate food-selling establishments in the school's vicinity, and a questionnaire was applied to identify and physically characterize the establishments, as well as the typology of available products. Most establishments (83.3%) were located more than 451 meters from the school, approximately 47.2% were snack bars, 97.2% were fixed points of sale, and 91.7% displayed menus and prices that were easily accessible. No open-air markets were identified in the surrounding area. Regarding food availability, there was a predominance of soft drinks (91.7%), natural juices (80.6%), savory snacks (50%), and sweet desserts (44.4%). It is concluded that most establishments around the school prioritize the commercialization of ultra-processed foods, highlighting the need for measures that promote a healthier food supply in this food environment.

KEYWORDS: Healthy eating. Ultra-processed foods. Health Promotion.

RESUMO: O objetivo foi avaliar o ambiente alimentar a partir da identificação e caracterização dos estabelecimentos de venda de alimentos no entorno de uma escola pública. Foi realizado mapeamento através do Google Maps, a fim de localizar estabelecimentos de venda de alimentos no entorno da escola. Utilizou-se questionário para identificar e caracterizar fisicamente os estabelecimentos, além da tipologia dos produtos disponíveis. A maioria dos estabelecimentos (83,3%) estavam situados a mais de 451 metros da escola. Cerca de 47,2% eram lanchonetes, 97,2% pontos fixos, apresentando cardápios e preços facilmente disponíveis (91,7%). Não foram identificadas feiras livres nas proximidades. Quanto à disponibilidade de alimentos vendidos, houve predominância de refrigerantes (91,7%), sucos naturais (80,6%), salgados (50%) e sobremesas doces (44,4%). Conclui-se que a maioria dos estabelecimentos no entorno da escola prioriza a comercialização de alimentos ultraprocessados. São necessárias medidas que promovam uma oferta mais saudável nesse ambiente alimentar.

PALAVRAS-CHAVE: Alimentação saudável. Alimentos ultraprocessados. Promoção da saúde.

INTRODUCTION

Adequate nutrition in the initial phases of life contributes to growth and development and assists in the formation of healthy eating habits in adulthood.¹ However, external factors in the physical and social environment affect food choices, with negative consequences for health.² Such factors included income, family influence, food advertising, cultural aspects, sensory characteristics, and the food environment.³

The food environment is defined as the interaction between the consumer and food system, encompassing the availability, accessibility, convenience, and desirability of foods.⁴ Thus, it is considered a multifactorial phenomenon formed by political, social, environmental, physical, and individual variables that directly or indirectly influence the food choices of each individual.⁵ One of the most widely studied types is the organizational environment, which consists of the places where foods are sold to specific groups, such as students, workers, and hospital patients, and specific locations, such as prisons and schools.⁶

Rugani and Canella⁷ subdivide the food environment into four levels, highlighting the institutional level, which addresses the aspects of the physical environment of organizations that exert an influence on food choices and eating practices. The school institutional environment regards the spaces, infrastructure, and conditions both within and surrounding schools – the places where foods and beverages are available for purchase and/or consumption.⁸

Concerns with regards to the school food environment have increased throughout the world due to changes in the eating patterns of the population, with the replacement of raw and minimally processed foods for low-cost ultra-processed products with high energy density.⁹ Countries such as the United States, United Kingdom, and Canada have implemented rigorous policies to regulate the sale of foods in the school environment. In the USA, guidelines are in place to improve the nutritional quality of school meals and restrict the offer of unhealthy foods.¹⁰ In the United Kingdom, the School Food Standards define nutritional parameters for meals offered at schools and limit the sale of sugar-sweetened beverages and ultra-processed snacks.¹¹ Some provinces in Canada have adopted the regulation of food within schools and the proximity of fast food establishments.¹² Despite these measures, studies indicate that the presence of environments with a high offer of ultra-processed food near schools continues to be a global challenge, requiring the development of more effective strategies to mitigate the impacts on the health of children.¹³

In Brazil, the National School Meal Program plays a fundamental role in the promotion of a healthy diet at public schools, ensuring balanced meals and establishing food and nutrition education guidelines.¹⁴ However, the external food environment constitutes an important influential factor, as many students have autonomy to acquire foods outside school. Studies report that the proximity of establishments that mainly sell ultra-processed foods can stimulate the consumption of these products, increasing the risk of excess weight, obesity, and other chronic noncommunicable diseases.^{15,16}

In this scenario, investigating the food environment in and around schools is essential to understanding the availability of foods to students and contributing to the establishment of policies that favor access to healthy foods. Therefore, the aim of the present study was to assess the school food environment through the identification and characterization of food sales establishments in the area surrounding a public school. By understanding the impact of these establishments on the food choices of students, this study can contribute to the development of strategies directed at health promotion and improvements in food quality in the school context.

METHODOLOGY

A descriptive cross-sectional study was conducted with a quantitative approach involving the analysis of food sales establishments in the area surrounding a public school in the state of Rio Grande do Norte, Brazil, situated in the west Potiguar meso-region, approximately 222.2 km from the state capital, Natal.

Data collection took place in 2023. The mapping of the food sales establishments was performed with the aid of *Google Maps*, using an 800-meter radius,¹⁷ which corresponds to a ten-minute walk, on average, using the distance from the school to the sales point as reference. Thirty-six food sales establishments were identified, which operated at least from Monday to Friday during school hours (6 am to 6 pm). Observations *in loco* were subsequently performed to verify whether the establishments were indeed operating and possibly identify other establishments.

A checklist adapted from Moraes¹⁸ was then applied to the establishment, addressing the type of service, structure and characteristics of the establishment, the availability of beverages, snacks, and meals, and the availability of nearby open markets. A spreadsheet was created in Microsoft Excel Office 2016 for the tabulation of the data, followed by descriptive analysis, with the calculation of absolute and relative frequencies.

As an observational study without the involvement of humans or animals, there was no need for approval from an ethics committee.

RESULTS

Among the 36 commercial establishments identified, 83.3% (n = 30) were located more than 451 meters from the school. With regards to type, 47.2% (n = 17) were snack bars and 22.2% (n = 8) were restaurants, five (13.9%) of which were buffet style and three (8.3%) served plates off the menu. A total of 97.2% (n = 35) were fixed establishments (Table 1). No open markets were found in the area surrounding the school.

Table 1. Characterization of establishments in the food environment surrounding a public school in the western portion of the state of Rio Grande do Norte, Brazil, 2023.

	% (n)
Distance from school	
Up to 450 m	16.7 (6)
451 m to 800 m	83.3 (30)
Type of establishment	
Snack bar	47.2 (17)
Mixed establishment*	8.3 (3)
Standard restaurant	8.3 (3)
Buffet-style restaurant (single price)	13.9 (5)
Bakery + meals sold by kilogram	8.3 (3)
Trailer	2.8 (1)
Bar	2.8 (1)
Market	5.6 (2)
Beverage distributor	2.8 (1)

	% (n)
Structure of establishment	
Mobile	2.8 (1)
Fixed	97.2 (35)

*(Snack bar/cafeteria + meals sold by kilogram or à la carte/full meals served on plate).

A total of 91.7% (n = 33) of the establishments had accessible menus and prices within physical reach so that consumers could view and place their orders. The dining places were clean and organized, and all establishments had clean, organized places for displaying and handling the food (Table 2).

Table 2. Environment observed in establishments surrounding a public school in the western portion of the state of Rio Grande do Norte, Brazil, 2023.

	Yes % (n)	No % (n)
Establishment with:		
Menu and prices available	91.7 (33)	8.3 (3)
Clean, organized display and handling area	100 (36)	0 (0)
Clean, organized dining area	91.7 (33)	8.3 (3)

Table 3 displays data on the availability of beverages, denoting a greater frequency of non-carbonated water (94.4%; n = 34), carbonated soft drinks (91.7%; n = 33), and natural juices (80.6%; n = 29).

Table 3. Availability of beverages at establishments surrounding a public school in the western portion of the state of Rio Grande do Norte, Brazil, 2023.

	Yes % (n)	No % (n)
Carbonated water	77.8 (28)	22.2 (8)
Non-carbonated water	94.4 (34)	5.6 (2)
Coffee	44.4 (16)	55.6 (20)
Coffee with milk	30.6 (11)	69.4 (25)
<i>Cappuccino</i>	13.9 (5)	86.1 (31)
Chocolate milk	11.1 (4)	88.9 (32)
Fruit smoothy	38.9 (14)	61.1 (22)
Natural yogurt	8.3 (3)	91.7 (33)
Sugar-sweetened yogurt	30.6 (11)	69.4 (25)
Natural juices/fruit pulp	80.6 (29)	19.4 (7)
Industrialized juices	36.1 (13)	63.9 (23)
Ice teas	8.3 (3)	91.7 (33)
Soft drinks	91.7 (33)	8.3 (3)
Energy drinks	30.6 (11)	69.4 (25)
Milk	11.1 (4)	88.9 (32)
Milk shake	2.8 (1)	97.2 (35)
Alcoholic beverages	27.8 (10)	72.2 (26)

Table 4 displays the results of the survey of the food sales establishments. The most frequent items were baked savory snacks (50%; n = 18), popsicles/ice cream (50%; n = 18), hamburgers (47.2%; n = 17), sweets (44.4%; n = 16), and savory tapioca (41.7%; n = 15). In contrast, raw fruits (16.7%; n = 6) and fruit salads (8.3%; n = 3) were less frequent.

Table 4. Availability of snack foods at establishments surrounding a public school in the western portion of the state of Rio Grande do Norte, Brazil, 2023.

	Yes % (n)	No % (n)
Baked savory snacks	50 (18)	50 (18)
Fried savory snacks	13.9 (5)	86.1 (31)
Cheese bread / cheese cracker	13.9 (5)	86.1 (31)
Sandwich with natural ingredients	38.9 (14)	61.1 (22)
Warm ham and cheese sandwich	38.9 (14)	61.1 (22)
Packaged chips	30.6 (11)	59.4 (19)
Packaged sweeten popcorn	19.4 (7)	80.6 (29)
Savory tapioca	41.7 (15)	58.3 (21)
Cornmeal cous-cous	30.6 (11)	69.4 (25)
Cereal bars	13.9 (5)	86.1 (31)
Highly processed cookies with filling	30.6 (11)	69.4 (25)
Highly processed cookies without filling	30.6 (11)	69.4 (25)
Homemade cookies	8.3 (3)	91.7 (33)
Instant pasta	19.4 (7)	80.6 (29)
Hamburger	47.2 (17)	52.8 (19)
Hamburger + French fries	16.7 (6)	83.3 (30)
Popsicle / Ice cream	50 (18)	50 (18)
Açaí	13.9 (5)	86.1 (31)
Pizza	22.2 (8)	77.8 (28)
Simple cake	38.9 (14)	61.1 (22)
Cake with icing and filling	13.9 (5)	86.1 (31)
Fruit salad	8.3 (3)	91.7 (33)
Raw fruits (whole or cut portions)	16.7 (6)	83.3 (30)
Candy and sweets in general	44.4 (16)	55.6 (20)

In terms of meals (Table 5), dessert foods (44.4%; n = 16) were the most frequent, followed by green salad, meats (beef/poultry/pork) and rice, each with a frequency of 38.9% (n = 14), pasta (33.3%; n = 12), and sausage (33.3%; n = 12). In contrast, lower offers were found for vegetarian meals and shrimp, with a frequency of 2.8% (n = 1) each, fruit desserts (8.3%; n = 3), and soups (11.1%; n = 4).

Table 5. Availability of meals at establishments surrounding a public school in the western portion of the state of Rio Grande do Norte, Brazil, 2023.

	Yes % (n)	No % (n)
Green salad	38.9 (14)	61.1 (22)
Cooked vegetables	30.6 (11)	69.4 (25)
Cassava flour	27.8 (10)	72.2 (26)
Pasta	33.3 (12)	66.7 (24)
Minced vegetables in vinaigrette	38.9 (14)	61.1 (22)
Shoestring potatoes	13.9 (5)	86.1 (31)
Beef	38.9 (14)	61.1 (22)
Pork	38.9 (14)	61.1 (22)
Poultry	38.9 (14)	61.1 (22)
Shrimp	2.8 (1)	97.2 (35)

	Yes % (n)	No % (n)
Sausage	33.3 (12)	66.7 (24)
Meal with eggs	16.7 (6)	83.3 (30)
Vegetarian meal	2.8 (1)	97.2 (35)
Rice	38.9 (14)	61.1 (22)
Beans	30.6 (11)	69.4 (25)
Dessert foods	44.4 (16)	55.6 (20)
Fruit dessert	8.3 (3)	91.7 (33)
Soup/broth	11.1 (4)	88.9 (32)

DISCUSSION

In the present study, 83.3% (n = 30) of the food establishments in the area surrounding the school were at a distance of more than 451 meters, which is equivalent to a six-to-ten-minute walk. As the school in question is a public school that provides meals through the National School Meal Program, the distance to the establishment likely contributes to maintaining the students in the school. If more establishments were found closer to the school, the enticement for students to seek food in the surrounding area would be greater.

The school is one of the main components of the food environment and is where children remain for long periods, making it a privileged setting for the development of healthy eating habits.¹⁹ In Brazil, food at public schools is regulated by the National School Meal Program, which ensures the offer of healthy meals and establishes food and nutrition education guidelines at schools.²⁰ Several norms have been established to promote healthy eating in the school environment. Interministerial Ordinance n° 1010, from May 8th, 2006, instituted guidelines for the promotion of a healthy diet at preschools, primary schools, and high schools of the public and private education systems on the national scale.²¹ Moreover, Resolution n° 6, from May 8th, 2020, of the National Education Development Fund reinforces these guidelines by establishing norms for the execution of the National School Meal Program, determining that the foods offered at schools should prioritize whole foods and minimally processed foods, restricting the offer of ultra-processed foods.¹⁴ Another relevant initiative is the Manual of Healthy School Canteens, which offers orientation to owners to transform their cafeterias into spaces for the promotion of a balanced diet.²² Moreover, Law n° 13.666/2018 determines the inclusion of food and nutrition education guidelines in the school curriculum, thus contributing to the formation of healthier eating habits beginning in childhood.²³

Analyzing the types of establishments in the area surrounding the school, a predominance of snack bars was found, which are places that frequently offer a greater variety of ultra-processed foods. In a study conducted in the city of Niterói, RJ, Henriques et al.²⁴ analyzed establishments in the proximity of public and private schools and also found a significant quantity of snack bars. This type of establishment facilitates access to foods with high energy density, such as ultra-processed products, resulting in areas characterized by a lack of adequate options for healthier food choices.

A total of 97.2% (n = 35) of the food sales establishments adopted the fixed-point model. This format is benefited by a more robust physical structure, enabling vendors to offer a wide variety of product to customers. According to Leite²⁵, this type of sales point has advantages, increasing the likelihood of loyalty on the part of customers and making the acquisition of products more accessible.

Moreover, the presence of a clean, organized environment transmits greater credibility and the availability of tables and chairs provides greater comfort, attracting customers. In the present study, 91.7% of the establishments had these characteristics, which can encourage the presence of students in these places. According to Moraes,¹⁸ the presence of tables and chairs in clean, organized environments contributes to the increase in the frequency of individuals at establishments that sell food.

The absence of open markets in the proximities of the school limits options for the acquisition of fresh foods. Areas with a greater presence of markets and produce stores constitute a food environment less prone to obesity.²⁶ The presence of such places could contribute to an increase in the daily consumption of fruits, promoting a healthier diet. As indicated by the Dietary Guide for the Brazilian Population,²⁷ prioritizing the consumption of fresh and minimally processed foods while also reducing the intake of ultra-processed foods constitutes a significant step toward achieving an adequate, healthy diet.

The area analyzed has an insufficiency of establishments suitable for healthier food choices, considering the greater presence of snack bars and the absence of open markets. Besides the types and characteristics of the establishments, the availability of beverages, snack foods, and meals was also analyzed. Sugar-sweetened carbonated soft drinks (91.7%; n = 33) were the most frequent option after non-carbonated bottled water. This situation is worrisome due to the presence of chemical additives and the high sugar content, which are factors associated with the development of chronic noncommunicable diseases, including obesity and diabetes.²⁸ In a study involving students on the way to or returning from school, Almeida²⁹ attributed the preference for soft drinks to the flavor, quickness, and practicality in comparison to juices.

With regards to other beverages, natural juices were quite frequent (80.6%; n = 29). This differs from data described by Buanango et al.²⁸, who, despite the diversity of fruits in Mozambique, found a low frequency of natural juices due to the inadequate distribution of fruits. The contrast underscores the importance of logistics in the offer of healthy options at establishments.

Examining the types of snacks available at the establishments in the area surrounding the school, baked savory snacks (50%; n = 18), popsicles/ice cream (50%; n = 18), hamburgers (47.2%; n = 17), and sweets (44.4%; n = 16) predominated. Moreover, the frequency of fresh fruits and fruit salads was low, possibly due to the more restricted offer at restaurants and establishments that offer buffets, thus limiting the availability of these items.

According to data from the Family Budget Survey,³⁰ the high consumption of ultra-process foods, which are rich in sugars and fats, has the potential to reduce or replace the intake of fresh and minimally processed foods, contributing to excessive calorie intake and exerting negative impacts on culture, social life, and the environment. It is necessary to remember the main recommendations for an adequate, healthy diet described in the Dietary Guide for the Brazilian Population²⁷: make fresh foods the basis of the diet; use oils, fats, salt, and sugar with moderation; limit and avoid the consumption of ultra-processed foods. In summary, always prefer fresh or minimally processed foods and cooked meals over ultra-processed products.

With regards to the offer of meals, dessert foods there the most frequent (44.4%; n = 16) due to the fact that such foods are present in several types of establishments. Restaurants offered a variety of meals, which is a positive points, as the frequency of availability of green salads, meats, and rice was close to 40%, which provides more options.

Austin et al.³¹ analyzed the types of products sold in the area surrounding a university and found that more distant restaurants had a more varied menus, which was also found in the present investigation, as such establishments offer healthier options, such as salads and sandwiches with natural

ingredients. A study conducted around 14 public schools in Rio de Janeiro found a predominance of the sale of ultra-processed foods, even at produce stores.³²

The area surrounding schools is recognized as a place for the sale of foods that interest children and adolescents (candy, chocolate, and snack foods), which exerts a negative impact on the promotion of a healthy diet even at schools in which school meal programs are implemented or those that have cafeterias with healthy choices.³³

Despite the advancement in the free offer of adequate, healthy food, the sale of foods that are generally unhealthy still occurs at public schools in some states and municipalities, and many students bring in unhealthy snack foods from home.³⁴ It is also important to promote dialog in the school setting and discuss food and nutrition education guidelines with students and their families, considering the vast social and commercial influence in this phase of life on the formation of healthy habits.

The findings of the present study underscore the need for measures to promote healthier food environments in areas surrounding schools, given the predominance of establishments that sell ultra-processed foods. Stricter regulations, incentives for the offer of fresh foods, the certification of healthy establishments, and food and nutrition education actions are strategies that can mitigate this influence and stimulate balanced food choices among students. Moreover, partnerships between schools and local merchants could contribute to the diversification of the foods offered and educational campaigns can strengthen awareness with regards to healthy habits. Thus, the present results underscore the importance of effective public policies to ensure a school food environment that is more favorable to health. Future studies will be needed to assess the impact of such interventions.

CONCLUSION

The analysis of the food environment in the area surrounding a public school revealed a predominance of food sales establishments at a distance of more than 451 meters, corresponding to an approximately six-to-ten-minute walk. The establishments were mainly classified as suppliers of ultra-processed foods, with high frequencies of sugar-sweetened soft drinks, dessert foods, and salty snack foods, contrasting the small quantity of establishments that offer raw or cooked vegetables, fresh fruits, and fruit salads, thus characterizing a potentially obesogenic environment.

Although we recognize that obesity and other chronic noncommunicable diseases are the result of multiple factors, with eating habits constituting a significant component, it is imperative to establish public policies directed at the school food environment to promote and preserve health.

On the local level, the present data can stimulate discussions on improving the availability of healthy foods at establishments in areas surrounding schools, enabling greater access to fresh foods over ultra-processed products. These considerations are essential to the creation of a healthier food environment for the prevention of diet-borne adverse health conditions.

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