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## Food pattern and perception of students about food served in municipal schools according to health vulnerability

### *Perfil alimentar e percepção de escolares sobre alimentação servida em escolas municipais segundo a vulnerabilidade à saúde*

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#### Abstract

**Objective:** analyze the dietary profile and perception of students about the food served in schools, according to health vulnerability. **Methods:** This is a cross-sectional study, carried out with a representative sample of Elementary School students from the Municipal Network of Belo Horizonte. Health vulnerability was determined by the Health Vulnerability Index (HVI) of the census sectors of schools. Eating habits and perceptions of meals served in the school were collected. Pearson's Chi-squared test was used to determine differences according to the Health Vulnerability Index. **Results:** 3,557 students were interviewed. Students from schools with less vulnerability had the habit of buying food in stores close to the school ( $p = 0.01$ ); a smaller proportion of the students perceived the school meals as varied ( $p < 0.001$ ), the eating time as sufficient ( $p < 0.001$ ), and the importance of food served in municipal schools ( $p = 0.02$ ). **Conclusion:** The food profile and perception of food varied according to the school's vulnerability. In schools with less vulnerability, students bought more food in the surroundings and showed less acceptance and appreciation of school food. The investigation of socio-economic and environmental factors is warranted to understand the conditions that may influence the adequate supply of school meals to all students.

**Keywords:** School Feeding. Menu Planning. Nutritional Policy. Food and Nutrition Security. Food, Feeding and Nutrition.

#### Resumo

**Objetivo:** Analisar o perfil alimentar e a percepção de escolares sobre a alimentação servida nas escolas, segundo a vulnerabilidade à saúde. **Métodos:** Trata-se de estudo transversal, realizado com uma amostra representativa de alunos do Ensino Fundamental da rede municipal de Belo Horizonte. A vulnerabilidade à saúde foi determinada pelo Índice de Vulnerabilidade à Saúde dos setores censitários das escolas. Foram coletadas informações referentes ao perfil alimentar e à percepção sobre a alimentação escolar. Foi utilizado o Teste Qui-quadrado de Pearson para determinar diferenças segundo o Índice de Vulnerabilidade à Saúde. **Resultados:** Foram entrevistados 3.557 alunos. Os alunos das escolas com menor vulnerabilidade apresentaram o hábito de comprar alimentos em estabelecimentos próximos à escola ( $p = 0,01$ ); perceberam em menor proporção a alimentação escolar como variada ( $p < 0,001$ ), o tempo para comer como suficiente ( $p < 0,001$ ) e a importância da alimentação escolar ( $p = 0,02$ ). **Conclusão:** O perfil alimentar e a percepção da

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alimentação variaram segundo a vulnerabilidade das escolas. Nas escolas de menor vulnerabilidade, os alunos compraram mais alimentos no entorno e apresentaram menor aceitação e valorização da alimentação escolar. Sugere-se a investigação de fatores associados (socioeconômicos e ambientais) para compreensão das condições que influenciam o adequado fornecimento da alimentação escolar a todos os estudantes.

**Palavras-chave:** Alimentação Escolar. Programas e Políticas de Nutrição e Alimentação. Segurança Alimentar e Nutricional.

## INTRODUCTION

According to the Survey of Family Budgets (SFB) 2018-2019, there are 84.9 million people in a situation of food and nutrition insecurity in Brazil, reporting the uncertainty of access to food in the future and even the occurrence of famine. This situation is more alarming, as the prevalence of food insecurity is higher in households where children and young people live compared to those where only adults live.<sup>1</sup>

The Brazilian legislation (Law nº 11.346, of September 15, 2006) defines that:

[...] food and nutrition security is the right of all people to regular and permanent access to sufficient, safe and nutritious food, without compromising access to other essential needs, based on health-promoting dietary practices that respect cultural diversity and that are environmentally, culturally, economically and socially sustainable.<sup>2</sup>

Public authorities must adopt policies and actions to ensure food security.<sup>2</sup> However, it was only in 2010 that, through Constitutional Amendment No. 64/2010, food was considered a social right in Brazil.<sup>3</sup>

The nutrition status is crucial to growth and development and it highlights the importance of food security in childhood.<sup>4</sup> School feeding allows the consumption of nutritionally adequate meals and contributes to healthy eating patterns, strengthening actions to ensure food security.<sup>4</sup>

The National School Feeding Program (PNAE) is the oldest food nutrition security policy in Brazil and one of the largest school-feeding programs in the world. With over 60 years of existence, it has undergone several legislative reforms.<sup>5</sup> Currently, it is regulated by Law No. 11,947 of 2009 and managed by the Fundo Nacional de Desenvolvimento da Educação (National Education Development Fund).<sup>5</sup> The Municipal Public School Feeding Program in Belo Horizonte offered 84.7 million meals in the municipal public educational system in 2019.<sup>6</sup>

Spite of the coverage of the PNAE, there is a low adherence (38.1%) to school feeding among students, with differences between the country regions (North: 32.3%; Northeast: 35.9%; Southeast: 37.2%, Midwest: 47.3%, and South: 43.9%).<sup>7</sup> In addition, there is less adherence among adolescents (25.6%) and students with high socioeconomic status (a difference of almost 20% between the lowest and highest socioeconomic strata).<sup>8</sup> These facts reinforce discourses and practices that place school feeding as charity and labels students who eat school meals as poor people.<sup>9</sup>

Furthermore, this low adherence may occur because of school meals characteristics (quantity, variety, temperature, how it is served, time to eat). This could imply different eating strategies among students, such as taking food from home or buying food in stores near the school.<sup>10</sup> In any case, the low adherence to school feeding certainly contributes to an unhealthy diet and related health complications.<sup>10</sup>

Nonetheless, little is known about the perception of the characteristics of school meals among students and the proportion of them who take food from home or buy food in stores near the school. Therefore, this study aims to analyze the food pattern and the perception of students about the food served in municipal schools, according to the health vulnerability of schools.

## METHODS

### Study design

It is an analytical observational cross-sectional study, with a representative sample of elementary school students from the municipal public educational system of Belo Horizonte, Minas Gerais. This study is part of the research project "Evaluation of school feeding and food and nutrition education in municipal public educational units: health promotion strategies and food and nutrition security." This project aims to support the development and evaluation of food and nutrition education in schools.

The study was approved by the Comitê de Ética em Pesquisa da Universidade Federal de Minas Gerais (Research Ethics Committee of the Federal University of Minas Gerais) (00734412.0.0000.5149) and the participants read and signed the Informed Consent Form.

### Study Scenario

Belo Horizonte is the sixth most populous city in the country and the eleventh most populated, with approximately 2,375,151 habitants.<sup>11</sup> In 2010, the Municipal Human Development Index (IDHM) was 0.810, considered very high, ranking the city in the twentieth position among Brazilian municipalities.<sup>11</sup> The IDHM considers three dimensions: longevity, education and, income.<sup>11</sup> In this same period, 97.6% of children aged 6 to 14 in the city was enrolled in school.<sup>11</sup>

The territory in Belo Horizonte is divided into nine health regions, that guide the planning and development of health strategies.<sup>12</sup> Additionally, the Secretaria Municipal de Saúde (Municipal Health Department) uses the Index of Vulnerability to Health (IVH). This index allows identifying regions where the most vulnerable populations live and characterize them, showing epidemiological inequalities.<sup>12</sup> The IVH is commonly used as an indicator of the social environment.<sup>13,14</sup> Social vulnerability is represented by multiple determinants and implies the idea that vulnerable citizens live in lack of basic rights (income, adequate housing, basic sanitation, food, among others).<sup>15</sup> The IVH is built from indicators that include socioeconomic and environmental variables related to sanitation, housing, education, income, and health.<sup>12</sup> The IVH varies from zero to one and higher values mean greater health vulnerability and low socioeconomic level of that region.<sup>12</sup> More information about IVH can be obtained in a publication from the Secretaria Municipal de Saúde (Municipal Health Department).

### Study Population and Sample

The study consisted of a representative sample of students enrolled in the municipal public elementary school network in Belo Horizonte in 2016 and 2017. The sample calculation was based on formulas for descriptive purposes, proposed by Hulley and Cummings<sup>16</sup> and Fonseca and Martins.<sup>17</sup> The total of students enrolled in the municipal public educational system was used as a base.<sup>18</sup> A test power of 95% was adopted, with an alpha error of 5% for the finite population, with a maximum proportion of 50% for multiple outcomes, which determines a larger sample size. A minimum required sample of 3,438 students, proportionally distributed in each health district, was determined.

The Subsecretaria de Segurança Alimentar e Nutricional (SUSAN) (Municipal Food and Nutritional Security Department) and the Secretaria Municipal de Educação (SMED) (Municipal Education Department) are responsible for the planning and implementation of the National School Feeding Program in Belo Horizonte.<sup>6</sup> The school feeding menus are carefully prepared by nutritionists, who consider the nutritional needs of the students and the period they stay in the institutions, always guided by the principles of variety

and balance.<sup>6</sup> There is a single menu for all municipal schools, variations in the meals offered between schools are uncommon.

After identifying all schools in each administrative region, they were randomly selected. The selected schools were contacted and informed about the research. All students enrolled in these schools were considered eligible and were randomly selected to join the research.

## Data collection and analysis

The data collection occurred between March 2016 and May 2017 through a semi-structured questionnaire applied through a face-to-face interview. The Nutrition students who conducted the interviews were previously trained and supervised during data collection. The questionnaire was based on similar research, which assessed adherence to school food, the socioeconomic and nutritional profile, and the student's perception of school meals.<sup>19</sup>

The questionnaire assessed sociodemographic information (gender - female, male; age - in years; education - elementary school 1, elementary school 2, and participation in full-time school); eating habits (consumption of school meals; who serves the food - student, school cook, and student and school cook); if students bring snacks to eat at school; if students bought food in stores near the school and the perception of school meals (quantity - sufficient, insufficient; variety and temperature of the food served - adequate, inadequate; time available for eating - sufficient, insufficient; acceptance and importance of school feeding).

The education variable was categorized into elementary school 1 (first to fifth grade) and elementary school 2 (sixth to ninth grade). Furthermore, based on the location of the selected schools within the census tracts, their respective IVH were identified.

Statistical analyzes were performed using the Statistical Package for the Social Sciences software (IBM Corp. Released 2010. IBM SPSS Statistics for Windows, Version 19.0. Armonk, NY: IBM Corp). Descriptive analyzes were performed using absolute and relative frequencies. Pearson's Chi-square test was used to assess the differences between the food patterns of students and their perception of the school feeding according to the health vulnerability of schools ( $p < 0.05$ ).

## RESULTS

The schools selected to participate in the study were located in regions of low (51%), medium (41.5%), and high vulnerability (7.5%), according to the IVH. There was no participation from schools classified with very high vulnerability. For comparison purposes, schools with a high IVH were excluded due to their low representativeness.

A total of 3,557 students were interviewed, with an average age of 11 years old (P25-P75:9.0-13.0). Approximately half of the interviewees were female (50.4%), and were enrolled in elementary school 1 (51.4%), and participated in full-time school (48.2%) (Table 1).

**Table 1.** Characterization and eating habits of Elementary School students from the Municipal Network of Belo Horizonte, Minas Gerais, 2016-2017.

		Frequency		Percent (%) (n)
<b>Variables</b>	Age <sup>a</sup>	11,0 years (9,0-13,0) <sup>a</sup>		
	Gender	Female	1791	50,4
		Male	1766	49,6
	Education	ES <sup>b</sup> 1	1830	51,4
		ES <sup>b</sup> 2	1727	48,6
	Full-time school	Yes	1713	48,2
No		1843	51,8	
<b>Eating habits</b>	Consumption of school meals	Yes	3098	82,7
		No	456	12,8
	Bring snacks from home to eat at school	Yes	2126	60,4
		No	1392	39,6
	Bought food in stores near the school	Yes	2032	57,7
		No	1492	42,3

<sup>a</sup> Continuous variable: median and interquartile range (P25-P75).

<sup>b</sup> Elementary school

Regarding eating habits, the vast majority (87.2%) reported consuming the food offered at the school. The habit of taking food from home was observed in 60.4% of the participants and 57.7% had the habit of buying food in stores near the school (Table 1).

The prevalence of students who consumed school meals and the habit of taking food from home was similar between schools with low and medium IVH. The habit of buying food in stores near the school was more frequent among students interviewed in schools with a low IVH than among students in schools with a medium IVH (59.6% vs. 55.3%,  $p=0.01$ ) (Table 2).

**Table 2.** Eating habits and perceptions of meals served in the school according to Health Vulnerability Index of schools from the Municipal Network of Belo Horizonte, Minas Gerais, 2016-2017.

	Low IVH <sup>a</sup> (%)	Medium IVH <sup>a</sup> (%)	p value
Consumption of school meals	87,4	86,8	0,598
Bring snacks from home to eat at school	60,4	60,4	0,999
Bought food in stores near the school	59,6	55,3	<b>0,010</b>
Meals served by school cooks	84,6	60,0	<b>&lt;0,001</b>
Meals served by student	1,4	6,7	<b>&lt;0,001</b>
Meal served by school cooks/student	14,0	33,3	<b>0,001</b>
Size of the meal sufficient	80,1	80,2	0,196
Variety of school meals	75,2	81,2	<b>&lt;0,001</b>
Temperature of the meal adequate	89,6	88,6	0,398
Sufficient time to eat	82,0	86,7	<b>&lt;0,001</b>
Acceptance of school feeding	76,5	83,3	<b>&lt;0,001</b>
Importance of school feeding	88,1	90,4	<b>0,028</b>

<sup>a</sup> IVH: Index of Vulnerability to Health

<sup>b</sup> Variables with significance level <5% are in bold.

When asked by whom the meal was served, it was observed that the proportion of students who reported that the meal was served by school cooks was higher in schools with a low IVH (84.6% vs. 60.0%;  $p < 0.001$ ). And the percentage of students who reported serving their food was higher in schools with a medium IVH (6.7% vs. 1.4%;  $p < 0.001$ ). The proportion of students who reported that school cooks and students served the meals simultaneously was higher in schools with a medium IVH (33.3% vs. 14%;  $p = 0.001$ ) (Table 2).

The proportion of students who considered the temperature and the size of the meal adequate/sufficient was similar between schools with different IVH. The proportion of students who classified school meals as varied ( $p < 0.001$ ), perceived the time to eat as sufficient ( $p < 0.001$ ), liked the food offered ( $p < 0.001$ ), and considered school feeding important ( $p = 0.02$ ) was lower in schools with low IVH (Table 2).

## DISCUSSION

The study revealed important differences between the eating habits and the perception of students about school meals, according to the vulnerability of the schools. Students enrolled in schools with a low IVH (less vulnerable) showed a greater prevalence of the habit of buying food in stores near the school. These students (low IVS) perceived, to a lesser extent, school feeding as varied and the time to eat as sufficient. In addition, fewer of these students reported they like school meals and considered school feeding important.

Several studies found adherence rates to school meals similar or lower than those observed in the present study (87.2%). The National Household Sample Survey (PNAD) found a percentage of adherence of 81.9%<sup>20</sup> and a report carried out in ten Brazilian cities found that 83.0% of students participated in the PNAE.<sup>21</sup> Lower adherence percentages to school feeding were identified in an integrative review (33.5% and 46.0%)<sup>4</sup> and another study with a sample of adolescents, based on the National Survey of School Health (PeNSE, 2015) (64.2%).<sup>22</sup> On the other hand, a higher percentage was found among elementary school students in Minas Gerais (92.5%)<sup>23</sup> and in municipal schools in Paraíba (90%).<sup>24</sup> Several factors influencing the adherence to school meals were identified, including age, food preferences, socioeconomic factors, and the presence of competitive foods in the school.<sup>2,4,21,23,24</sup>

Despite the adherence rate verified in this study, it is noteworthy that maintaining and increasing adherence to school meals, as well as increasing the frequency of consumption and acceptance among students, are still among the main challenges of the PNAE.<sup>8,21,23-25</sup> A systematic review that investigated whether students like school meals found acceptance rates above 50%, but below 85%, which implies inadequacy of the meals served.<sup>25</sup>

One way to improve the acceptance of school meals and, consequently, obtain greater adherence is self-service.<sup>26</sup> When well implemented and consciously executed, self-service promotes waste reduction and contributes to food and nutrition education, increasing students' autonomy. However, a national study showed that most schools do not adhere to self-service, and school meals are mostly served by school cooks,<sup>26</sup> which was confirmed by the report of the students interviewed in the study, especially in low IVH schools.

Characteristics such as the variety of food, enough time to eat, enjoying the school meals, and considering school feeding important were less prevalent among students in schools with low IVH (lower vulnerability), although the adherence to school feeding was similar between both schools. One study that assessed school feeding through its contribution to the constitution of students' identities highlights discourses between students and employees that expressed an understanding of school feeding programs as charity.<sup>9</sup> Consequently, school feeding is seen as a donation to needy students, affecting directly the participation and perception of students about school feeding and the recognition of its universal character.<sup>9</sup> Additionally, a survey that interviewed fourth-grade students in municipal schools found that 41% of students reported financial difficulties in the family and felt hungry at school, as justifications for considering school feeding important.<sup>24</sup>

A relevant aspect of the findings of this study is that a considerable portion of students from schools with low IVH bought food in stores near the school. It is urgent to question whether the higher prevalence of the habit of buying food in the surroundings of the school is due to the reported characteristics of school meals (less variety, insufficient time to eat, and acceptance) or due to the socioeconomic situation of the students. Therefore, future investigations on the quality of food served in schools are needed to answer these questions.

The purchase of food can be configured as a process of resistance to the consumption of school meals.<sup>9</sup> Also, it is known that when students have the resources to purchase food, they usually buy ultra-processed food.<sup>21</sup> It is noteworthy that the food environment in the school's surroundings is characterized by an agglomeration of stores that sells mainly ultra-processed food<sup>27</sup> which indicates that students buy mostly this type of food.<sup>28</sup>

The consequence of consuming ultra-processed foods and not consuming school meals is the increase in caloric intake with low nutritional value and the consequent increase in the occurrence of Chronic Non-Communicable Diseases (NCDs), such as obesity and diabetes.<sup>29</sup> Childhood obesity is a global epidemic and one of the nutritional pathologies with the fastest growing prevalence.<sup>30</sup> It is a health condition that predisposes to problems that can affect the child's development in the short and long term.<sup>30</sup> The main complications associated with obesity are cardiovascular, metabolic, orthopedic, respiratory, psychosocial, and growth disorders.<sup>30</sup> The last Household Budget Survey (POF) which collected anthropometric data, carried out in 2008-2009, revealed that 33.5% and 14.3% of children aged five to nine years were overweight and obese, respectively.<sup>31</sup> It is important to emphasize that as family income increases, the prevalence of overweight and obesity also increases for this age group.<sup>31</sup> According to the last National Survey of School Health (PeNSE), in 2015, the prevalence of overweight among children (13 to 17 years old) was 23.7%, an estimated total of 3 million students.<sup>7</sup> Furthermore, for the same year, it was estimated that 7.8% of students would be obese.<sup>7</sup>

It is noteworthy that the school environment is a privileged space for the development of actions to improve the nutritional status of children, because of its direct influence on the formation of lifestyle habits.<sup>4</sup> Several public policies and health promotion programs aimed at healthy eating habits and monitoring the nutritional status of students have been implemented in Brazil. In this context, the PNAE stands out. The program aims to contribute to the biopsychosocial development of the children, school performance, and the formation of healthy eating habits, through permanent access to quality food that is appropriate to local culture and traditions.<sup>32</sup> A program that reinforces the actions of the PNAE is the Health at School Program, established in 2007 by Decree No. 6,286, which monitors and analyzes the health parameters of students in public schools.<sup>33</sup>

The use of the IVH as a proxy for the socioeconomic status of the School's region can be seen as a limitation of the study. However, this indicator is widely used to identify the socioeconomic profile of the population in surveys.<sup>13,14</sup> In addition, the sample carried out by random drawing included schools in regions with low and medium IVH, and it was not possible to assess the most vulnerable schools (high IVH). However, the highest prevalence of schools with medium and low IVH in the study corresponds to the city scenario, which has a higher proportion of regions with low and medium IVH.<sup>12</sup>

Population studies such as this one are relevant, especially because the present research is representative of municipal public schools in a Brazilian capital. The results about the students' perception of school meals can guide the articulation of food and nutrition security policies.

## CONCLUSION

A significant portion of students from medium and low-vulnerability schools consume school meals. The food profile and perception of school feeding varied according to the vulnerability of the schools. Students in less

vulnerable schools showed less acceptance and appreciation of school meals and reported buying more food in stores near the schools. The investigation of associated factors (socioeconomic and environmental - school food environment and its surroundings) is warranted which can contribute to the full development of the National School Feeding Program, expanding the supply of healthy and adequate food to all students.

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#### **Contributors**

Paiva GG and Parreira LC participated in the collection, analysis and interpretation of the data and the writing of the manuscript; Costa EMV, Calazans RM, Silva, MC participated in the writing of the manuscript; Santos LC responsible for raising financial funds and participated in the writing of the manuscript; Pereira SCL and Costa BVL participated in the conception and design of the study, interpretation of the data and writing of the manuscript.

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