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Potential for healthy eating in a Brazilian public university food environment

Potencial para alimentação saudável no ambiente alimentar de uma universidade pública brasileira

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ABSTRACT

Objective

To identify the food environment healthy eating potential in the authorized food services on the campus of a Brazilian university.

Methods

This is an observational study carried out between March and April 2014 on a campus of a public university in Rio de Janeiro, Brazil. The elements of the food environment were evaluated using an audit instrument, containing 86 questions: availability (amount of food services and types of food offered), convenience (days and hours of operation), incentives and barriers to healthy eating (nutrition information, payment strategies and food advertisements). Preparations based on whole grains and fresh or minimally processed products were considered healthy foods; and, preparations with high caloric density, sugar-sweetened beverages, sweets, desserts, cookies, and savory snacks were considered unhealthy food. The questionnaire allowed us to calculate a score for each service, which could range from 0 to 36 points, and indicates the potential for promoting healthy eating in the establishment, with higher scores indicating a greater presence of elements that contribute to healthy eating. The different types of food service facilities were compared based on the scores ($p < 0.05$ for statistical significance).

Results

Among the establishments evaluated, 24% were snack bars/cafeterias, 26%, restaurants, and 50% offered mixed services. Healthy food items were scarcely available in the establishments

(fruits: 24%; vegetables: 20%; brown rice: 15%); while added-sugar beverages (98%), sweets and treats (76%) were widely offered. There was a higher frequency of advertising encouraging consumption of unhealthy items than that aimed at healthy foods (44% vs 30%). In general, the score was 13,2 points (SD=3.3) and the mean score for snack bars/cafeterias (9.3 points) was lower ($p<0,05$) than that of restaurants and mixed establishments (14,4 points).

Conclusion

On the campus assessed, the food environment had limited potential for healthy eating, since elements that did not favor healthy food choices were more frequent.

Keywords: Collective feeding. Feeding behavior. Food services. Universities.

RESUMO

Objetivo

Identificar o potencial do ambiente alimentar para alimentação saudável em serviços permissionários no campus de uma universidade brasileira.

Métodos

Realizou-se um estudo observacional entre março e abril de 2014, em 54 serviços de alimentação permissionários de um campus de uma universidade pública do Rio de Janeiro, Brasil. Os elementos do ambiente alimentar foram avaliados por meio de instrumento de auditoria contendo 86 questões: disponibilidade (quantidade de serviços de alimentação e tipos de alimentos comercializados), conveniência (dias e horários de funcionamento), estímulos e barreiras para a alimentação saudável (informação nutricional, estratégias de pagamento e propagandas de alimentos). As preparações à base de cereais integrais e produtos frescos ou minimamente processados foram considerados alimentos saudáveis e aquelas com elevada densidade calórica, bebidas com adição de açúcar, doces, sobremesas, guloseimas, biscoitos e lanches salgados foram considerados não saudáveis. O questionário permitiu calcular um escore, para cada serviço, que poderia variar entre 0 a 36 pontos, e indica o potencial para promoção da alimentação saudável no estabelecimento, sendo que escores mais elevados indicam maior presença de elementos que favorecem a alimentação saudável. Os diferentes tipos de serviços de alimentação permissionários foram comparados segundo os escores ($p<0,05$ para significância estatística).

Resultados

Dos estabelecimentos avaliados, 24% eram lanchonetes/cafeterias, 26%, restaurantes e 50%, mistos. Itens saudáveis eram disponibilizados de forma incipiente nos estabelecimentos (frutas: 24%; hortaliças: 20%; arroz integral: 15%), enquanto bebidas com adição de açúcar (98%) e doces e guloseimas (76%) eram amplamente ofertados. Havia maior frequência de propagandas incentivando o consumo de itens não saudáveis do que aquelas voltadas para alimentos saudáveis (44% vs 30%). De modo geral, o escore foi de 13,2 pontos (DP=3,3) e a média do escore de lanchonetes/cafeterias (9,3 pontos) era menor ($p<0,05$) do que a de restaurantes e estabelecimentos mistos (14,4 pontos).

Conclusão

O ambiente alimentar do campus avaliado apresentou potencial limitado para a alimentação saudável, uma vez que eram mais frequentes os elementos que não favoreciam escolhas alimentares saudáveis.

Palavras-chave: Alimentação coletiva. Comportamento alimentar. Serviços de alimentação. Universidades.

INTRODUCTION

The food environment is the area of interaction between individuals and the food system, in the acquisition or consumption of food [1]. It is made up of physical [accessibility, availability, quality, and promotion], economic [price], sociocultural [norms and behavior] and political [government policies] elements [2]. When these spaces are located in institutions such as schools, colleges and hospitals, they are called organizational food environments [3,4]. Institutions can act by modifying the organizational food environment through internal policies to regulate food services (authorized or own), in order to encourage the availability of healthy foods and reduce the availability of those

considered to be a risk to health. They can also encourage the development of continued actions to promote healthy eating [5,6].

Healthy eating, according to the Dietary Guidelines for the Brazilian Population, is understood as a diet based on the consumption of fresh or minimally processed foods, which contain fats and sugars in small amounts and limited proportions of ultra-processed foods, which are products formulated by the industry, generally, with high levels of sugars, fats, and sodium and high energy density [7].

Studies indicate that the diet quality is related to the food environment, whose characteristics can create barriers or incentives to the adoption of healthy food choices [3,4,8,9]. In food environments, the barriers to healthy eating are, mainly, the poor supply of healthy items and the encouragement of the consumption of large portions or the consumption of items with high energy density, while among the incentives for healthy food consumption, the following should be considered: availability of healthy items at affordable prices, nutritional information about foods and preparations, visual highlights of healthy options, availability of reduced portions at low cost and possibility of sharing portions with no change in meal price [9-12].

The university food environment can be considered a privileged space to promote healthy eating [13,14]; it can significantly influence the eating habits of students, professors, technicians and other professionals, who, for a long period, regularly eat several meals a day at the university.

College students are considered a vulnerable group in the adoption of risky behaviors, including food choices [15-17]. Young university students have autonomy for food selection decisions, which, however, are constrained by their limited budget and exposure to food environments with reduced potential for the promotion of healthy eating [18]. Unfavorable changes in lifestyle are observed in university students since entering college, which can have important health consequences, such as excessive weight gain [14,19,20], which is recognized as an important public health problem in Brazil [21]. Studies in Brazil have shown that food consumption of college students is characterized by high intake of foods such as snacks, sweets, and soft drinks and low consumption of fruits, vegetables, fish and grains [16,22,23] and that the dietary patterns of university professors and technicians are characterized by low consumption of fruits, legumes and vegetables, dairy products, water and high meat consumption [24-26].

Despite the previous observations, few Brazilian studies have evaluated the food environments in universities [9,11,27,28]. In a study carried out in the city of Rio de Janeiro, Franco et al. [27] estimated changes over five years in the availability, price, and advertising of food in authorized food services in a public university and observed unfavorable changes in food availability. Tavares et al. [28] proposed the healthiness index for commercial establishments to be used in the evaluation of the authorized food services in universities. This index is based on the ratio between the proportion of unprocessed or minimally processed foods and ultra-processed foods available in each establishment. For its calculation, an inventory of beverages, food, preparations and convenience items offered for sale in these establishments was carried out. The authors assessed the proposed indicator in two public universities in Rio de Janeiro, having verified its good discriminatory power and its ease of application and interpretation, and the ability to provide a concise diagnosis of commercial establishments on university campuses.

Since the food environment is multidimensional, it is important that its assessment considers these different dimensions [2,3,29]. Therefore, the purpose of this study was to identify the potential of the university food environment for healthy eating in the authorized food services on the campus of a public university in Rio de Janeiro.

METHODS

This is an observational study carried out at a public university located in the city of Rio de Janeiro, Brazil, during the period from March to April 2014. Approximately 100 thousand people, including students, professors, technicians, outsourced workers and visitors circulated daily on the campus where the survey took place [30]. In 2014, there were 59 authorized food services that operated under a contract and/or bidding modality and sold meals (preparations that are usually consumed at lunch or dinner) and/or snacks (preparations that are usually consumed at breakfast or consumed occasionally between the main meals). Four establishments did not allow the survey to be carried out and one was closed between the period of mapping and data collection, so 54 establishments were assessed.

Data were collected by six trained evaluators, always between 11 am and 2 pm (lunch time). The raters filled out the questionnaire based on direct observation and questions asked to the person in charge of the service. For a standardized performance of the raters, a careful training was developed based on a field manual, which details are presented in Rodrigues et al. [31].

The following elements of the food environment of each establishment were evaluated: availability (offer of food services; types of food sold), convenience (opening hours consistent with those of the university), incentives and barriers to healthy choices (nutritional information and advertisements encouraging food consumption).

For this evaluation, the *Questionário para Avaliação do Ambiente Alimentar em Estabelecimentos que Comercializam Refeições e Lanches Prontos para Consumo* (QAA, Questionnaire for Assessment of the Food Environments in Establishments that Market Ready-to-Eat Meals and Snacks) was used [31]. The questionnaire includes three sections: service description, assessment of the availability of food/preparations (organized into subsections) and assessment of incentives and barriers to healthy eating, totaling 86 questions. For the last two sections, the questions deal with the presence of specific items and the answer options are yes, no and not applicable, for an item present, absent or when the item is not consistent with the type of establishment being evaluated.

The instrument QAA was considered reliable to assess commercial food services in relation to their potential for healthy eating. The test-retest reliability tested in a previous study was considered high ($\kappa > 0.81$), good ($\kappa > 0.61$ and < 0.80) or moderate (κ between 0.41 and 0.60) for 89% of the questions. In addition, it demonstrated satisfactory internal consistency with 0.72 Cronbach alpha [31].

A score, taking into account 36 items of the questionnaire, was estimated to assess the potential for healthy eating in the university food environment. The score ranges from 0 to 36 points, with no cut-off point for classifying establishments, with higher scores indicating a greater presence of elements that favor healthy eating and the interpretation of the score must be performed by comparing the estimated values for the different establishments. More details on the methodological bases and on the process of elaboration of the score are found in Rodrigues et al. [31] paper.

The menu or any list that described the beverages and the food items presented on a board, poster, panel, or paper was used to identify the products and preparations sold in the establishments. Whole grain-based preparations (e.g., bread or brown rice and granola) and fresh or minimally processed food (e.g., fruits, vegetables, and beans) were considered healthy foods. In contrast, mixed preparations with high caloric density (e.g. *feijoada*, piamontese rice), drinks with added sugar, sweets, desserts, treats, cookies and savory snacks were considered unhealthy [7].

The project was approved by the Human Research Ethics Committee of the Hospital Universitário Clementino Fraga Filho, from the Federal University of Rio de Janeiro, Project n°. 062/11.

The services were classified according to the products sold, as follows: snack bars/cafeterias (fast foods, salty and sweet snacks, treats, non-alcoholic beverages, coffee, tea), restaurants (items consumed in meals such as lunch and dinner) and mixed (items relating to snacks and meals).

The absolute and relative frequencies were estimated for the categorical variables and, for the QAA score [continuous variable], the means, standard deviations and minimum and maximum values were estimated according to the type of establishment. The score distribution was asymmetrical (Shapiro-Wilk test p -value=0.043) and the Kruskal-Wallis test was used to assess the differences in the distribution of scores for snack bars/cafeterias, restaurants and mixed establishments. The chi-square test was applied to evaluate the categorical variables analyzed, according to the type of food service. Statistical significance of 5% was considered. For the analyses, the SPSS version 19 (SPSS Inc., Chicago, United States) software was used.

RESULTS

Table 1 presents the characterization of the 54 services evaluated, with half of these establishments classified as mixed services and approximately 1/3 operating the night shift. Among the food outlets that operated at night, 58% were snack bars/cafeterias and 42% had mixed services (data not shown).

Table 1 – Characterization of authorized food services (n=54) located on university campus. Rio de Janeiro (RJ), Brazil, 2014.

Food services characteristics	n	%
Type of establishment ^a		
Snack bar/cafeterias	13	24
Restaurants	14	26
Mixed	27	50
Hours of operation		
Lunch time	6	11
Mornings and afternoons	29	54
Mornings, afternoons and evenings	19	35
Opening on Saturdays	16	30
Menu available	45	83
Visible prices	41	76

Note: ^aSnack bar/cafeterias (fast foods, snacks, treats, non-alcoholic beverages, coffee, tea); restaurants (items consumed in meals such as lunch and dinner); and mixed (items relating to snacks and meals).

Table 2 shows the frequencies of healthy and unhealthy items available by type of establishment. In general, items considered healthy were little offered, such as vegetables without the addition of sauce (20%), vegetarian options (9%), brown rice (15%), milk (50%), fruits (24%) and whole grain bread option (48%). On the other hand, drinks with added sugar, sweets or treats, and savory snacks or cheese breads were widely marketed. It should be noted that alcoholic beverages were present in 20% of the establishments, and energy drinks in 9% of them.

Table 3 shows data on incentives and barriers related to the promotion and information release on food and preparations. Among the food outlets assessed, 70% displayed advertisements or signs that promoted both healthy and unhealthy menu items (data not shown).

Table 2 – Availability of healthy and unhealthy items in authorized food services, according to the type of establishment. Rio de Janeiro (RJ), Brazil, 2014.

Availability of food items	Total (n=54)		Type of establishment			p-value ^b
			Snack bar/cafeterias ^a (n=13)	Restaurants ^a (n=14)	Mixed ^a (n=27)	
	n	%	%			
Healthy items						
Salads (raw and/or cooked)	38	70	0	100	89	<0.01
Salads without sauce (raw and/or cooked)	38	70	0	100	89	<0.01
Vegetables without sauce	11	20	0	80	22	0.06
Olive oil	37	68	0	100	85	<0.01
Beef/poultry/fish not fried	40	74	0	100	96	<0.01
Vegetarian options	5	9	0	14	11	0.39
Brown rice	8	15	0	21	18	0.22
Water	53	98	100	100	100	0.23
Fresh squeezed fruit juice	36	67	85	36	74	0.01
Whole milk	27	50	61	14	63	<0.01
Skimmed/semi-skimmed milk	5	9	0	0	18	0.07
Whole wheat bread	26	48	69	7	59	<0.01
Fruits	11	24	15	21	22	0.79
Unhealthy items						
Rice dishes with sauce	3	5	NA	14	4	0.23
Beans with meats	9	17	NA	29	18	0.13
Sugar-sweetened beverages	53	98	100	100	96	0.60
Alcoholic beverages	11	20	15	29	18	0.66
Energy drinks	5	9	15	0	11	0.24
Sweets and/or treats	41	76	85	64	78	0.44
Fried or baked pastry and cheese rolls	33	61	100	0	74	<0.01
Cookies and crackers	16	30	31	0	44	0.01

Note: ^aSnack bar/cafeterias (fast foods, snacks, treats, non-alcoholic beverages, coffee, tea); restaurants (items consumed in meals such as lunch and dinner); and mixed (items relating to snacks and meals); ^bChi-square test. NA: Not Applicable.

However, there was more encouragement to consume unhealthy than healthy foods (44% vs. 30%) ($p < 0.01$). Incentives to healthy eating such as “drink more juices” messages, photos of fruit juices, fruit juices and salads were more present in mixed (33%) establishments and snack bars/cafeteria (54%) than in restaurants, where no advertising of healthy items was observed. Incentives to the consumption of foods considered to be a risk to health, such as soft drinks, hamburgers and savory snacks pictures and images were found more frequently in mixed establishments (48%) and in snack bars/cafeterias (69%) than in restaurants (14%) (Table 3).

Likewise, offers that provided price reductions for the combined purchase of fast foods and beverages with added sugar (for example, purchasing a salty snack and a soft drink simultaneously would cost less than the two items purchased separately), were identified more frequently in mixed establishments (37%) and snack bars/cafeterias (77%). In contrast, no establishment charged additional amounts if one or more customers wanted to share a single meal. Restaurants allowed diners to serve their own food more often (43%) than snack bars and mixed-type establishments. No food outlet exhibited nutritional information on the sold preparations (Table 3).

The mean scores for all establishments and for the establishment categories type are shown in Table 4. The overall average score was 13.2 points (SD=3.3 points). The average score of snack bars/cafeterias (9.3) was lower ($p < 0.01$) than those of mixed services and restaurants which average scores were similar (14.4) ($p > 0.05$; Kruskal-Wallis test). However, the variation in the restaurants scores (minimum and maximum: 12 to 17; SD: 1.5) was smaller than that of the mixed services (minimum and maximum: 6 to 19; SD: 3.1) (Table 4).

Table 3 – Incentives and barriers for healthy eating promotion in authorized food services, according to the type of establishment, Rio de Janeiro (RJ), Brazil, 2014.

Incentives and barriers for healthy eating	Total (n=54)		Type of establishment			p-value ^b
	n	%	Snack bar/cafeterias ^a (n=13)	Restaurants ^a (n=14)	Mixed ^a (n=27)	
			%			
Incentives for healthy eating						
Advertisements or signs that incentives healthy eating	16	30	54	0	33	<0.01
Smaller portions cost proportionally less than the whole portion	11	20	23	7	26	0.12
Healthier items cost the same as traditional versions	22	41	54	21	44	0.18
Sharing the dish portion does not cost more	12	22	0	21	33	0.06
Reduced portion size option available	4	7	15	0	7	0.31
Food served by the diner	7	13	0	43	4	<0.01
Barriers for healthy eating						
Advertisements or signs that incentives unhealthy eating	24	44	69	14	48	0.01
Financial advantage in larger portions	21	39	69	14	37	0.01
Incentives to add items	10	18	31	7	18	0.29
Combination of items costs less than the sum of individual items	21	39	77	7	37	<0.01
Healthier items cost more than traditional versions	8	15	8	7	22	0.20
Smaller portions cost proportionately more than the whole portion	3	6	15	0	4	0.12
Food served by the employee	38	70	100	50	67	<0.01

Note: ^aSnack bar/cafeterias (fast foods, snacks, treats, non-alcoholic beverages, coffee, tea), restaurants (items consumed in meals such as lunch and dinner) and mixed (items relating to snacks and meals); ^bChi-square test.

Table 4 – Score^a means (standard deviations) of the Questionnaire for Assessment of the Food Environment of the authorized food services on a university campus (n=54). Rio de Janeiro (RJ), Brazil, 2014.

Type of establishments	Mean of the score ^a	Standard deviation	Minimum-Maximum
All establishments	13.2	3.3	6-19
Mixed ^b	14.4	3.1	6-19
Snack bars/cafeterias ^b	9.3	1.7	6-12
Restaurants ^b	14.4	1.5	12-17

Note: ^aKruskal-Wallis test to compare the distribution, according to the type of establishment; Mixed and Restaurants vs. Snack bars/cafeterias: $p < 0.01$. ^aThe QAA score can range from 0 to 36 points. The higher the greater the incentives to healthy eating in the evaluated food environment; ^bSnack bar/cafeterias (fast snacks, snacks, treats, non-alcoholic beverages, coffee, tea), restaurants (items consumed in meals such as lunch and dinner) and mixed (items relating to snacks and meals).

DISCUSSION

The campus food environments assessed had several barriers to healthy choices [7], such as lack of nutritional information on preparations, and low availability and few visual incentives of healthy items. In general, the highest score of the QAA score for the establishments assessed was half of the maximum score in the questionnaire, reiterating that the university food environments investigated had reduced potential to encourage healthy eating. In general, the QAA scores attributed to the assessed authorized food services were low, and the lowest average was estimated for snack bars/cafeterias, establishments that provided few opportunities for healthy choices.

When compared to snack bars/cafeteria, restaurants and mixed services had greater availability of vegetables, fruits and whole grains. Roy et al. [13] evaluated seven university campuses in Australia and they also found that establishments with higher average scores offered healthier products such as salads or salad preparations. The global mean score presented in the Australian study reached half of all possible scores. Studies that assessed food environments have recognized that establishments such as snack bars, cafeterias, convenience stores and food vending machines are not very supportive of healthy eating, as they offer many ultra-processed products and few healthy options [9,28].

On the campus where the survey was carried out there are day and evening classes including on Saturdays. However, only one third of the food establishments remained open at night and on Saturdays, most of which were snack bars/cafeterias. Therefore, the campus assessed in our study presented an even lower potential of offering healthy food at night and on Saturdays, impacting even more on the healthy choices of customers who would go there at such time. Access to food services at these times was different from other universities in the same area, which varied from 60% to 93% [9,27].

Food availability, affordability and advertising are key elements of the food environment and influence the diet; thus, these elements may represent incentives or barriers to promoting healthier food choices. As an example, the limited supply and high prices of healthy foods or the expanded supply, advertising and economical advantages of risk foods are barriers to healthy eating [32]. Such elements have been described in the university food environment [9,11,14,17,27,33-36]. Franco et al. [27] identified a weak potential for healthy eating on a campus in Rio de Janeiro, where fresh foods and dishes prepared on site were sparingly offered; there was a lack of nutritional information, prices were higher for healthier options and there was a greater presence of unhealthy food advertisements. Tam et al. [14] interviewed university campus students in Australia and asked about suggestions for improvements in food services and identified similar elements to those mentioned above. The students suggested an increase in the availability of fresh and unprocessed foods, a greater variety of offered foods and beverages, more affordable prices for healthy products, and access to nutritional information on preparations.

The exposure of nutritional information on commercialized foods and preparations is a strategy that can contribute to the improvement of eating habits of organizational food environments users [14,36]. However, both in this and similar studies, this information was not available to consumers [9,27,36].

A study that evaluated the faculty eating patterns on the same campus where this study was carried out pointed out that the patterns identified were related to the food environment of the campus, especially with the predominant type of service, snack bars/cafeterias and mixed establishments. Among the investigated professors, the dietary patterns called "snack" and "fast food" constituted most of the variance in food consumption. Both patterns presented typical foods from snack bars and cafeterias, the first one was composed of items such as bread, butter/margarine, fruit juice, dairy products and caffeinated beverages; and in the second pattern, cold cuts, savory snacks, soft drinks, sweets and meats were included [26]. The low nutritional quality of these patterns corroborates the observations that the campus assessed offered few opportunities for healthy food consumption.

It is important to consider that this study has limitations. The sample consisted of the services available on a given campus, so the data may not be generalized to other university campuses. In addition, other factors of interest about the organizational environment such as food policies, spaces and time made available to the community that attends the campus to have their meals, water supply, informal market, virtual context, among others [4,37] were not evaluated in this study.

The instrument used in this study evaluates different domains of the food environment, although an assessment of the construct validity has not been made, a limitation of the questionnaire that can be the target of future assessments in order to evidence the discriminatory capacity of the instrument. However, it is important to point out that the results obtained were consistent with similar studies and with the characteristics of the establishments assessed.

A strong point of this study is the use of a reliable questionnaire, which showed good internal consistency and adequate test-retest reliability to assess the potential for healthy eating in commercial authorized services [31]. This instrument was considered appropriate for evaluating food services in universities, as it does not require establishments to have a structured menu or a list of ingredients used in the preparation, and its main advantage is the fact that it is appropriate for different types of food services (restaurants, snack bars, cafeterias, among others), as is the case of the campus that was assessed. In addition, it is noteworthy that the score was estimated in a way adapted to the type of establishment assessed, since the food items that were not expected in a certain type of establishment were not included in the score (for which the option “not applicable” was ticked). Such items did not imply an advantage or disadvantage for the establishment, not being scored either positively or negatively (for example, the question about the availability of brown rice, a healthy item, was not applied to snack bars/cafeterias and this item was not computed in these establishments).

Our evaluation highlights the paradox of the universities that apply incipiently the precepts that are addressed in teaching and research, especially those in the health area. Health promotion is a recurring subject in courses such as Medicine, Nursing and Nutrition; however, the food environment in universities does not reflect the recommendations indicated by the health area in encouraging healthy eating, as shown by the results presented in this study [38].

Analyses that address the food environment in universities are relevant, given the recent increase in the Brazilian higher education network [39,40]. Universities have the potential to contribute to improving the health of individuals who attend their spaces through discussions and development of policies that encourage healthier habits. Hence, the university food environment is considered an opportune space to encourage the purchase and consumption of healthy foods, as interventions mediated by institutional policies seem to be easier to implement [13]. These policies could encourage the availability and accessibility of healthy foods on campus, control their prices and create more social spaces equipped with appliances, aiming to increase food choices [41]. However, similar to what was found in this study, the authorized food services located within the universities have been characterized by the wide commercialization of beverages with added sugar, sweets, desserts or other treats, quick snacks and scarcity in the supply of fresh or minimally processed products [14,27].

The evaluation of spaces geared to eating is an essential step to direct potential targets for intervention with a view to promoting health in universities. Research has contributed significantly to the literature on university food environments, a topic that is still little explored in low- and middle-income countries [42]. In addition, the instrument and the score used allowed a more comprehensive assessment since the instrument considered three different dimensions of the food environment for the classification of healthy eating potentials.

The study points out the need for changes to improve the incentive for healthy consumption in the food services of the university campus assessed, especially in commercial authorized restaurants. The university restaurant policy proves to be very effective in improving students' eating habits, as it makes healthy food available and accessible [11]. However, institutional policies that rule the authorized food services are necessary and should include, limitation or prohibition of unhealthy products marketed within these organizations, requirement for training of the food handling teams, incentives for the adoption of more affordable prices, among others.

CONCLUSION

The instrument applied allowed us to conclude that the campus evaluated has a food environment with limited potential for the fostering of healthy eating, as it has reduced availability of fresh and minimally processed foods and high availability of ultra-processed items. In addition, there was a preponderance of incentives for the consumption of unhealthy foods compared to incentives for the acquisition of healthy foods. Future research intended to deepen the knowledge on the topic addressed could explore other important elements for understanding how food environments can be modified to favor healthy food consumption. Works that address institutional policies for authorized food services, the college management perception on the subject and the perception of the university community about the food environment could provide important information to support future interventions.

REFERENCES

1. Turner C, Aggarwal A, Walls H, Herforth A, Drewnowski A, Coates J, et al. Concepts and critical perspectives for food environment research: a global framework with implications for action in low - and middle-income countries. *Glob Food Sec*. 2018;18:93-101. <https://doi.org/10.1016/j.gfs.2018.08.003>
2. Swinburn B, Sacks G, Vandevijvere S, Kumanyika S, Lobstein T, Neal B, et al. INFORMAS [International Network for Food and Obesity/non-communicable diseases Research, Monitoring and Action Support]: Overview and key principles. *Obes Rev*. 2013;14(1):1-12. <https://doi.org/10.1111/obr.12087>
3. Glanz K, Sallis JF, Saelens BE, Frank LD. Healthy nutrition environments: concepts and measures. *Am J Heal Promot*. 2005;19(5):330-3. <https://doi.org/10.4278/0890-1171-19.5.330>
4. Gálvez Espinoza P, Egaña D, Masferrer D, Cerda R. Propuesta de un modelo conceptual para el estudio de los ambientes alimentarios en Chile. *Rev Panam Salud Publica*. 2017;41:1-9. <https://doi.org/10.26633/rpsp.2017.169>
5. Food and Agriculture Organization. School Food and Nutrition Framework. Rome: Organization; 2019 [cited 2021 Aug 17]. Available from: <http://www.fao.org/3/ca4091en/ca4091en.pdf>
6. Franco ADS, De Castro IRR, Wolkoff DB. Impact of the promotion of fruit and vegetables on their consumption in the workplace. *Rev Saude Publica*. 2013;47(1):29-36. <https://doi.org/10.1590/S0034-89102013000100005>
7. Ministério da Saúde (Brasil). Guia Alimentar para a População Brasileira. 2nd ed. Brasília: Ministério; 2014 [cited 2021 Aug 17]. Available from: https://bvsms.saude.gov.br/bvs/publicacoes/guia_alimentar_populacao_brasileira_2ed.pdf
8. Roy R, Rangan A, Hebden L, Yu Louie JC, Tang LM, Kay J, et al. Dietary contribution of foods and beverages sold within a university campus and its effect on diet quality of young adults. *Nutrition*. 2017;34:118-23. <http://dx.doi.org/10.1016/j.nut.2016.09.013>
9. Barbosa RMS, Henriques P, Guerra H, Emerentino J, Soares D, Dias P, et al. Food environment of a Brazilian public university: challenges to promote healthy eating. *Rev Chil Nutr*. 2020;47(3):443-8. <http://dx.doi.org/10.4067/S0717-75182020000300443>
10. Roy R, Soo D, Conroy D, Wall CR, Swinburn B. Exploring university food environment and on-campus food purchasing behaviors, preferences, and opinions. *J Nutr Educ Behav*. 2019;51(7):865-75. <https://doi.org/10.1016/j.jneb.2019.03.003>
11. Pulz IS, Martins PA, Feldman C, Veiros MB. Are campus food environments healthy? A novel perspective for qualitatively evaluating the nutritional quality of food sold at food service facilities at a Brazilian university. *Perspect Public Health*. 2017;137(2):122-35. <https://doi.org/10.1177/1757913916636414>
12. Saelens BE, Glanz K, Sallis JF, Frank LD. Nutrition Environment Measures Study in Restaurants [NEMS-R]. Development and evaluation. *Am J Prev Med*. 2007;32(4):273-81. <https://doi.org/10.1016/j.amepre.2006.12.022>
13. Roy R, Hebden L, Kelly B, De Gois T, Ferrone EM, Samrout M, et al. Description, measurement and evaluation of tertiary-education food environments. *Br J Nutr*. 2016;115(9):1598-606. <https://doi.org/10.1017/S0007114516000568>

14. Tam R, Yassa B, Parker H, O'Connor H, Allman-Farinelli M. University students' on-campus food purchasing behaviors, preferences, and opinions on food availability. *Nutrition*. 2017;37:7-13.
15. Bárbara R, Ferreira-Pêgo C. Changes in Eating Habits among Displaced and Non-Displaced University Students. *Int J Environ Res Public Heal*. 2020;17(15):5369. <https://doi.org/10.3390/IJERPH17155369>
16. Sok S, Pal K, Tuot S, Yi R, Chhoun P, Yi S. Health behaviors among male and female university students in Cambodia: a cross-sectional survey. *J Environ Public Health*. 2020;2020:1-10. <https://doi.org/10.1155/2020/6740236>
17. Abdelhafez AI, Akhter F, Alsultan AA, Jalal SM, Ali A. Dietary practices and barriers to adherence to healthy eating among King Faisal University students. *Int J Environ Res Public Heal*. 2020;17(23):8945. <https://doi.org/10.3390/IJERPH17238945>
18. Sprake EF, Russell JM, Cecil JE, Cooper RJ, Grabowski P, Pourshahidi LK, et al. Dietary patterns of university students in the UK: a cross-sectional study. *Nutr J*. 2018;17(90):1-18. <https://doi.org/10.1186/s12937-018-0398-y>
19. Horacek T, Yildirim ED, Kattelman K, Byrd-Bredbenner C, Brown O, Colby S, et al. Multilevel structural equation modeling of students' dietary intentions/behaviors, BMI, and the healthfulness of convenience stores. *Nutrients*. 2018;10(11):1-16. <https://doi.org/10.3390/nu10111569>
20. Oliveira AS, Rezende AAA, Calábria LK. Sobrepeso e seus fatores de risco em estudantes universitários durante o curso de graduação. *RBONE*. 2020;14(85):207-15.
21. Ministério da Saúde (Brasil). *Vigitel Brasil 2018 – vigilância de fatores de risco e proteção para doenças crônicas por inquérito telefônico: estimativas sobre frequência e distribuição sociodemográfica de fatores de risco e proteção para doenças crônicas nas capitais dos 26 estados brasileiros e no distrito Federal em 2018*. Brasília: Ministério; 2019 [cited 2021 Aug 17]. Available from: <https://www.gov.br/saude/pt-br/centrais-de-conteudo/publicacoes/publicacoes-svs/vigitel/vigitel-brasil-2018.pdf/view>
22. Bernardo GL, Jomori MM, Fernandes AC, Proença RPC. Consumo alimentar de estudantes universitários. *Rev Nutr*. 2017;30(6):847-65. <https://doi.org/10.1590/1678-98652017000600016>
23. Perez PMP, Castro IRR, Franco AS, Bandoni DH, Wolkoff DB. Práticas alimentares de estudantes cotistas e não cotistas de uma universidade pública Brasileira. *Cienc Saude Coletiva*. 2016;21(2):531-42. <https://doi.org/10.1590/1413-81232015212.01732015>
24. Alves ALS, Bombarda TM, Graeff DB, Bervian J, Doring M, Gonçalves CBC, et al. Características do consumo alimentar de funcionários e professores de uma universidade comunitária. *Arq Cienc Saude*. 2017;24(4):42-6. <https://doi.org/10.17696/2318-3691.24.4.2017.761>
25. Pinotti SCS, Mezadri T, Lacerda LLV, Grillo LP. Fatores de risco e proteção para doenças crônicas não transmissíveis em professores universitários. *RBONE*. 2019;13(79):426-33.
26. Alves IA, Lomiento RM, Lopes TS, Carvalho DA, Rego ALV, Monteiro LS, et al. Padrões alimentares e qualidade de vida de docentes universitários. *Cad Saude Colet*. [in press].
27. Franco AS, Canella DS, Perez PMP, Bandoni DH, Castro IRR. University food environment: characterization and changes from 2011 to 2016 in a Brazilian public university. *Rev Nutr*. 2020;33:1-9. <https://doi.org/10.1590/1678-9865202033e200058>
28. Tavares L, Perez P, Passos M, Castro Junior P, Silva Franco A, Oliveira Cardoso L, et al. Development and Application of healthiness indicators for commercial establishments that sell foods for immediate consumption. *Foods*. 2021;10(6):1434. <https://doi.org/10.3390/foods10061434>
29. Story M, Kaphingst KM, Robinson-O'Brien R, Glanz K. Creating healthy food and eating environments: policy and environmental approaches. *Annu Rev Public Health*. 2008;29:253-72. <https://doi.org/10.1146/annurev.publhealth.29.020907.090926>
30. Universidade Federal do Rio de Janeiro [Internet]. Rio de Janeiro: UFRJ; c2023 [cited 2021 Mar 2]. Available from: <https://ufrj.br/aceso-a-informacao/institucional/fatos-e-numeros/#:~:text=100milpessoascircul,amdiariamente,emengenhariadaAméricaLatina>.
31. Rodrigues CB, Monteiro LS, Paula NM, Pereira RA. Ambiente alimentar em um campus universitário: desenvolvimento e análise de instrumento para avaliação de estabelecimentos comerciais. *Demetra*. 2021;16:51139. <https://doi.org/10.12957/demetra.2021.51139>
32. Downs S, Demmler KM. Food environment interventions targeting children and adolescents: a scoping review. *Glob Food Sec*. 2020;27:100403. <https://doi.org/10.1016/j.gfs.2020.100403>

33. Martinez-Perez N, Torheim LE, Castro-Díaz N, Arroyo-Izaga M. On-campus food environment, purchase behaviours, preferences and opinions in a Norwegian university community. *Public Health Nutr.* 2021;1-12. <https://doi.org/10.1017/S136898002100272X>
34. Cardozo M, Santos CRB, Nascimento HS, Santos IPG. Ambientes alimentares universitários: percepções de estudantes de nutrição de uma instituição de ensino superior. *Demetra.* 2017;12(2):431-45. <https://doi.org/10.12957/DEMETRA.2017.26799>
35. Dhillon J, Diaz Rios LK, Aldaz KJ, De La Cruz N, Vu E, Asad Asghar S, et al. We don't have a lot of healthy options: food environment perceptions of first-year, minority college students attending a food desert campus. *Nutrients.* 2019;11(4):816. <https://doi.org/10.3390/nu11040816>
36. Lima JPM, Costa SA, Brandão TRS, Rocha A. Food consumption determinants and barriers for healthy eating at the Workplace-A University Setting. *Foods.* 2021;10(695):1-13. <https://doi.org/10.3390/foods10040695>
37. Castro IRR, Canella DS. Organizational food environments: advancing their conceptual model. *Foods.* 2022;11(7):993. <https://doi.org/10.3390/foods11070993>
38. Shi Y, Wang Q, Norman C, Allman-Farinelli M, Colagiuri S. It is time to make policy for healthier food environments in Australian universities. *Nutrients.* 2018;10(12). <https://doi.org/10.3390/nu10121909>
39. Instituto Nacional de Estudos e Pesquisas Educacionais Anísio Teixeira. Censo da Educação Superior: 2010 - resumo técnico. Brasília: Instituto; 2012 [cited 2021 Aug 15]. Available from: https://download.inep.gov.br/download/superior/censo/2010/resumo_tecnico_censo_educacao_superior_2010.pdf
40. Instituto Nacional de Estudos e Pesquisas Educacionais Anísio. Resumo técnico do Censo da Educação Superior 2019. Brasília: Instituto; 2021 [cited 2021 Aug 15]. Available from: https://download.inep.gov.br/publicacoes/institucionais/estatisticas_e_indicadores/resumo_tecnico_censo_da_educacao_superior_2019.pdf
41. Fonseca LB, Pereira LP, Rodrigues PRM, Andrade ACS, Muraro AP, Gorgulho BM, et al. Food consumption on campus is associated with meal eating patterns among college students. *Br J Nutr.* 2021;126(1):53-65. <https://doi.org/10.1017/S0007114520003761>
42. Turner C, Kadiyala S, Aggarwal A, Coates J, Drewnowski A, Hawkes C, et al. Concepts and methods for food environment research in low and middle income countries. London: Agriculture, Nutrition and Health Academy Food Environments Working Group; 2017.

CONTRIBUTORS

CB RODRIGUES contributed to the conception and design of the study, collection, analysis, and interpretation of data, writing of the manuscript and final version approval. LS MONTEIRO, NM de PAULA and RA PEREIRA contributed to the conception and design of the study, analysis and interpretation of data, review and approval of the final version of the article.