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Evaluation of the availability of fruits and vegetables in establishments that sell meals of the Rio de Janeiro State University

Avaliação da disponibilidade de frutas e hortaliças nos estabelecimentos que comercializam refeições na Universidade do Estado do Rio de Janeiro

Abstract

Purpose: The purpose of this paper is to describe the availability of fruit and vegetables within the University food environment, and also to identify the presence of publicity, and the layout of fruit and vegetables on the counter where the food is distributed, and evaluate the quality and the physical and financial availability. ***Methods:*** This is a sectional study, carried out on all establishments that sold meals at the University, with the application of a checklist. ***Results:*** Eight establishments were studied, and 50% of these offered fruit, while all the establishments offered at least one type of vegetable. All the establishments offered raw fruit, either whole and/or in pieces, and, among these, 12.5% offered fried fruit. Vegetables were offered raw, cooked, or stewed. All the fruit was of good quality, while 25% of the establishments offered three varieties of poor quality. Concerning the price of the meals offered by the establishments in the study, we highlight the University Restaurant, which has the lowest meal

price and is subsidised by the University. Only one of the establishments showed publicity in favour of consumption of fruit juice. ***Conclusion:*** The universe of establishments as here evaluated, with regard to the supply of fruits and vegetables, can facilitate the selection of healthy foodstuffs; however, considering all the establishments on the campus analysed, we can infer that, on the whole, the environment that prevails does not promote healthy eating habits.

Keywords: Food environment. Universities. Fruits. Vegetables. Food Services.

Resumo

Objetivos: Descrever a oferta de frutas e hortaliças no ambiente alimentar universitário, além de identificar a presença de propagandas e a disposição das frutas e hortaliças no balcão de distribuição de refeições, e avaliar a qualidade e acessibilidade física e financeira. ***Métodos:*** Trata-se de um estudo seccional, conduzido em todos os estabelecimentos que comercializavam refeições na universidade, com aplicação de ***checklist***. ***Resultados:*** Foram estudados oito estabelecimentos, dos quais, 50% oferecem frutas e 100% pelo menos um tipo de verdura. 100% ofereciam as frutas ***in natura***, inteiras e/ou em pedaços, e dentre esses, apenas 12,5% a fruta frita. As hortaliças eram oferecidas ***in natura***, cozida e refogada. 100% das frutas apresentaram boa qualidade e 25% dos estabelecimentos apresentaram três variedades com qualidade ruim. Com relação ao preço das refeições ofertadas pelos estabelecimentos destaca-se o Restaurante Universitário por possuir o menor valor da refeição e subsidiado pela universidade. Somente um estabelecimento apresentou propaganda para suco de fruta. ***Conclusão:*** O universo de estabelecimentos aqui avaliados, no tocante a oferta de frutas e hortaliças pode facilitar escolhas alimentares saudáveis, porém, considerando todos os estabelecimentos que contemplam o campus analisado, infere-se a predominância de um ambiente não promotor da alimentação saudável.

Palavras-chave: Ambiente alimentar. Universidades. Frutas. Verduras. Serviços de alimentação.

INTRODUCTION

Many authors have conducted research studies about the issue of the environment and its relationship to nutritional practices and have proposed explanatory theoretical models.[1-3] Among these, Glanz et al.[2] proposed a conceptual model known as the ***Model of Community Nutrition Environments***, which brings together four different types of food environments: the Community, Organisations, the Consumer and Information, which are all influenced by Government policies and by the food industry.

The organisational food environment, which is the main point of interest for the current study, includes schools, universities, workplaces and churches, among others, and is considered as strategic for the promotion of healthy eating habits, as they have a strong influence upon the eating habits of the people who participate in such organisations.[2,4-7] Out of these, the food environment in University warrants special attention, as the eating habits that the students acquire are carried into adulthood. In addition, the University environment stands out as an important field of study, as the University environment also includes other publics apart from students: teachers, administration workers, and an external visiting public, meaning that the whole academic community is influenced by the food environment.[8]

Fruit and vegetables (F&V) are essential components for the definition of healthy eating, as they include high levels of fibre, vitamins and minerals, as well as having a low calorie content.[9] A sufficient consumption of foodstuffs from these groups helps the reduction of the risk of developing of chronic non-communicable chronic diseases (NCDs), such as obesity, diabetes mellitus, hypertension, cardiovascular disease, and cancer.[10]

The World Health Organization (WHO) recommends an individual daily intake of 400 grams of fruit, vegetables and greens per day, which corresponds to five daily portions of 80 grams each, which shall act towards the prevention of NCDs and for the prevention and control of several different nutritional shortages.[11]

Results of the System for Monitoring of Risk Factors and Protection of Chronic Diseases by Telephone Inquest (***Sistema de Vigilância de Fatores de Risco e Proteção para Doenças Crônicas por Inquérito Telefônico*** - Vigitel), aimed at adults (people aged 20 or over), resident in 20 of the capitals of the 26 Brazilian States and the Federal District., showed that only 35.2% of the adult population reported a regular consumption (at least five days a week) of fruit and vegetables, with consumption being lower among men (28.8%) than among women (40.7%).[12]

Linked to this context, even though the importance of regular consumption of fruit and vegetables for health has been proven, studies carried out on University populations suggest that people in a University environment have poor eating habits, with the consumption of

fruit and vegetables not being sufficient.[13-16] Several academic studies have shown that the Campus food environments discourage healthy eating.[6-8, 17-21]

Considering the relevance of the campus food environments for promoting adequate and healthy eating habits, and prevention of NCDs, the main purpose of this study is to describe the supply of fruit and vegetables in the food environment of a Brazilian state-run university. The study also identifies the variety, the preparation methods, the presentation and preparation of fruit and vegetables, as well as the presence of advertising for these food groups, and in addition check the availability of fruit and vegetables on the counter where food is served, also appraising the quality of such foodstuffs and the physical and financial accessibility to these.

METHODS

This is a sectional and descriptive study, being part of the larger study by the name of "campus food environments: characterisation, quality of measurement and changes over time" developed by Franco8 within the Collaborative Study Group on campus food environments (***Grupo Colaborativo de Estudos sobre o Ambiente Alimentar Universitário*** - CALU).

The present study took place on the main campus of the Universidade do Estado do Rio de Janeiro – UERJ (Rio de Janeiro State University), a campus that goes by the name of 'Francisco Negrão de Lima' but is commonly known as the Maracanã campus. This campus is characterised as vertical and stands in an urban location; the campus building has twelve floors and houses a population of some 35,000 people, including teaching staff, technical and administrative workers, students, and visiting population. The campus offers 31 undergraduate courses in many different areas (Biomedical Sciences, Education and Humanities, Social Sciences, and Technology and Science), distributed among 24 academic units on the premises. The population of this study was based on the universe of establishments (n = 8) that offered meals, including restaurants serving à la carte meals or ***pratos feitos*** and mixed establishments (those which were either restaurant/snack bar or restaurant/coffee shop); in these establishments, only preparations involving fruit and vegetables were considered. The study had the participation of the establishments that agreed to participate and authorised observation and data collection.

The data used in this study was collected in November 2016, by duly trained University students, under the supervision of the researchers responsible for the study. In order to evaluate the variables of this study, data collection occurred, as the priority option, between 11 am and 1.30 pm, in order to evaluate the fruit and vegetables (F&V) made available to the consumer at meal times. The data was collected with the application of a checklist, which was psychometrically tested for reliability and for validation of content by Franco[8] in partnership with CALU in 2016. This

checklist considers the evaluation of markers of healthy eating habits, which were selected based on current nutritional recommendations and on the foodstuffs normally found in Universities.[22,23] It consists of seven blocks, as follows: (block 1 – characterisation of the establishment, block 2 – observation of the environment, block 3 – information, block 4 – food, drink and preparations. Block 5 – convenience items, block 6 – prices and promotions, and block 7 – advertising).

For the construction of this study, several variables concerning fruit and vegetables were used. Apart from the original blocks as contained herein, in order to provide additional information that would achieve the purposes and goals of the research study, yet another block was created, this being known as "Supply of Fruit and Vegetables". This block was organised into three groups, namely: availability of F&V (which considered the method of presentation, quality – good; appearance and colour which is appropriate for the variety; apparently fresh, firm and clean; and poor: excessively soft, overripe, change from the characteristic colour, methods of preparation – raw, cooked and other methods: baked, grilled, stewed, and types of preparation – which refers to the way in which these appear as F&V); in other words, apart from the presence of these F&V, there was also consideration, with regard to supply, of how they were available for the users, as also the price and the advertising of the F&V. This checklist, comprising eight blocks, was first tested in advance at a commercial establishment near the campus, which had characteristics similar to those of the university focused in this work, meaning that there was no need to change content or form.

In Chart 1 we see a description of variables: method of presentation, method of preparation, and type of preparation as selected, for the classification of the fruit and vegetables offered.

For the group "availability of fruit and vegetables", we considered the tem types of fruit and vegetables most often bought in the Greater Rio de Janeiro metropolitan area, according to the Family Budget Survey (***Pesquisa de Orçamentos Familiares*** – POF) for the year 2008-2009.22 Apart from these, during data collection, we noted down all the F&V as found by the field observer that were not included in the questionnaire.

The variables studied were: 1) description of the establishments studied; 2) characterisation of the supply of F&V; 3) ways to prepare F&V; 4) methods of presentation of F&V; 5) type of preparation of F&V; 6) availability of F&V; 7) quality of F&V; 8) Price and advertising of F&V.

The absolute and relative frequencies were calculated for those establishments that traded F&V. The mean price of food and drink was also calculated, based on the ratio between the sum of prices related to all the establishments and the total number of establishments evaluated, so that these may be compared with the results as found here.

The data was keyed in twice and then analysed using the software package ***Statistical Package for the Social Sciences*** (SPSS) version 21.0 (SPSS Inc., Chicago, Illinois, USA).

Quadro 1. Description of the variables: method of presentation, method of preparation, and type of preparation selected for classification of the fruit and vegetables offered. Rio de Janeiro. Rio de Janeiro, RJ, Brazil, 2016.

Presentation				
Whole	Pieces	Round Slices	Strips	Diced
F&V that have not been cut in any way.	F&V that have been irregularly cut, in shapes that could be square, rounded or oval.	F&V cut in small wheels, in circular form.	Vegetables that have been knife-cut in strips, like toothpicks.	F&V cut into cubes, ranging from small (0.6cm x 0.6 cm x 0.6 cm), medium (1cm x 1cm x 1cm) and large (2cm x 2cm x 2cm).

Method of Preparation		
Raw/*In natura*	Cooked	Others
Vegetables, excluding potatoes, cassava and tropical yams (roots and tubercles) ***in natura*** (no change has been made after they leave nature).	F&V subjected to cooking process, under humid heat. Example: cooked vegetables, cooked banana.	Other types of preparations: fried, baked, stewed.

Type of Preparation		
S c/F/H[1]	CPP[2]	CPP c/ molho[3]
Examples of preparations: mixed greens; cubed squash with cherry tomatoes; mixed cabbage; aubergine caponata; julienne of vegetables; stewed vegetables and legumes; mixed fruit (melon and papays, strawberries and grapes...)	Examples of vegetables and legumes as part of mixed preparations: tabule, Cæsar Salad; Moroccan couscous; among others; soufflés and quiches, accompanying meats (diced chicken), aubergines parmigiana; aubergine lasagne; mayonnaise (do not include mayonnaise made with potatoes only), with eggs, olives and other items, Brazilian manioc flour - farofa (kale) and others.	Examples: salads with yoghurt sauce or other kinds of sauce; cauliflower cheese; mayonnaise (do not include mayonnaise made from potatoes only).

[1]S c/ H – Preparation with fruit only.

[2]CPP – As part of the preparation.

[3]CPP w/sauce – As part of a preparation with sauce.

This study was submitted to the Ethics Committee of the Pedro Ernesto Hospital of the Universidade do Estado do Rio de Janeiro – UERJ (Rio de Janeiro State University) and was approved under number 988015.6.0000.5259.

RESULTS

The campus food environments studied consist of 25 establishments, with a prevalence of snack bars (n = thirteen), followed by establishments of the mixed type, restaurant and snack bar; bar with meals or cafeteria (n = nine); of the confectionery shop variety (n = two) and à la carte or ***prato feito*** meal (n = one).

Due to the object of interest, we considered a criterion for inclusion for the present study that included only the eight establishments that offered meals with the offer of fruit and vegetables. Seven of these were classified as mixed establishments and the other was the University Restaurant (RU), specialised in à la carte meals and ***prato feito***. Two establishments out of the nine mixed establishments were excluded from the study as they offered meals (pasta, rice with stroganoff) without any fruit or vegetables available.

With regard to the offer of fruit and vegetables, it was observed that four of the establishments (50%) offered fruit, while eight (100%) provided at least one kind of vegetable.

Also, regarding the offer of fruit and vegetables, we observed variety, which is the number of different F&V available at these establishments. We observed the presence of seven fruits (70%), with bananas, pineapple and papaya being offered at two establishments (25%), while oranges, mangoes, grapes and guavas were made available at only one (12.5%). The other fruits (watermelons, apples and tangerines) were not found anywhere. Apart from these fruits, melons and strawberries, included by the field researcher, were also available, respectively in 25% and 12.5% of the establishments. (Figure 1).

With regard to vegetables, we observed the presence of the ten vegetables as listed by the POF[22] (100%), with beetroot and tomatoes being offered at all the establishments (n = eight); carrots and onions in seven of the establishments (87.5%); lettuce in six (75%); cabbage and green peppers in five (62.5%); cucumber in three (37.5%); chayote in two (25%); and pumpkin in one (12.5%). Apart from these, other vegetables made available included squash in four establishments (50%). Aubergines and cauliflower in three (37.5%); and runner beans, Dutch beans, okra, African aubergines (***jiló***), spinach, chicory, broccoli, celery and watercress in but one (12.5%), these having been included by the field researcher at the moment of data collection (Figure 2).

Figure 1. Frequency (%) of supply of fruits as available at the establishments that produce meals, on the main campus of a state-run University in the state of Rio de Janeiro, Brazil, 2016.

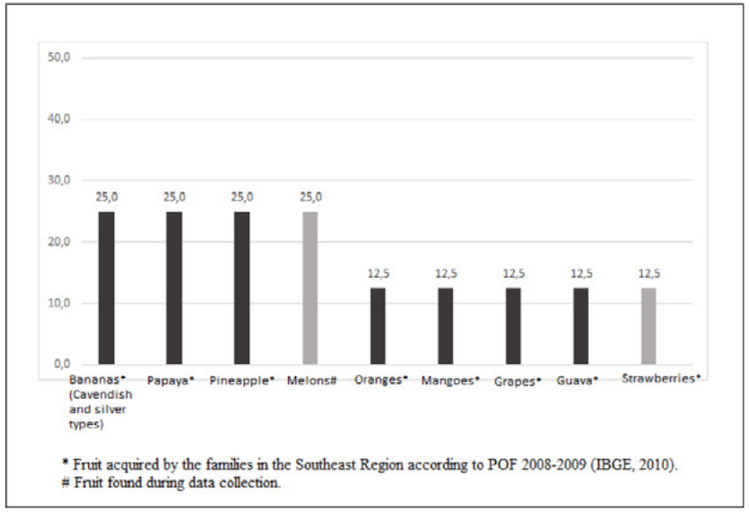
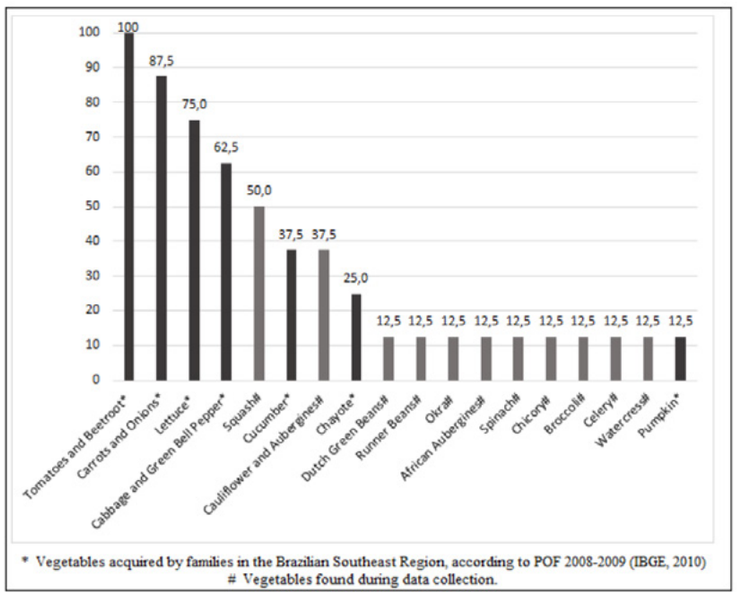


Figure 2. Frequency (%) of supply of vegetables, as available at the establishments that produce meals on the main campus of a state university in the state of Rio de Janeiro, Brazil, 2016.



With regard to the presentation of these fruit and vegetables to the restaurant users, we see that all the establishments offered fruit (n = four), such as oranges, bananas, papaya, pineapples, grapes, guavas, melons and strawberries, served raw; only two of these also offered fried bananas. There was great diversity in the manner of presentation in the four establishments that offered fruit; in three of the establishments fruit (pineapples, bananas, guava, oranges, papaya, mango and melon) were available French style/sliced; two offered whole fruit (bananas, strawberries and grapes); and one establishment also offered fruit in ring form (pineapples). In all the establishments, these preparations were made with fruit only, such as papayas and melons French style, without addition of sauce and/or as part of the preparation (for example: banana crunchy topping).

With regard to vegetables, considering the method of preparation, these were either raw, cooked, or stewed. All the establishments analysed (100%) provided at least one type of raw vegetable (such as beetroot), and most of the establishments (75%) offered a cooked vegetable (like aubergines) and something stewed (like cabbage).

There was great diversity in the ways in which these vegetables were presented, in the places that made them available. All eight establishments (100%) offered vegetables cut in slices, including ***chiffonade*** (cut in thin slices, specifically for vegetables) (such as lettuce and cabbage), and ***julienne*** and ***bâtonnet*** (cut as strips or like batons) (for example, bell peppers and carrots). Seven of the establishments (87.5%) offered them with a grated cut (carrots, beetroot) ***rondelle*** (a cut a bit like a coin – "rings"). Six (75%) served them diced (for example, tomatoes, onions, carrots, bell peppers, and squash); three (37.5%) made them available cut into "pieces" (broccoli and cauliflower); two (25%) offered them whole (such as flowers of cauliflower and broccoli); last but not least, only one served them in the 'half moon' cut (tomatoes) or 'cut into leaves' (watercress).

All eight establishments (100%) offered preparations made exclusively with vegetables, such as tomato salad; five (62.5%) as part of the preparation (for example, ricotta pancake with spinach; rice with carrots) and two (25%) as part of the preparation with sauce (for example, cooked meat with a sauce based on bell peppers, tomatoes and onions).

We also noticed that all four establishments that offered fruit (50%) had them placed at the start of the counter where the food was distributed. In the case of vegetables, we noticed that out of the eight establishments that provided some vegetables (100%), six of them (75%) has the vegetables placed at the start of the buffet flow.

With regard to the quality of the fruit and vegetables studied, it was observed that all the fruit (100%) was of good quality. However, for vegetables, we observed that two of the establishments (25%) showed three varieties of poor quality. Here we must point

out that the evaluation of quality was based exclusively on the visual appearance of fruit and vegetables.

In terms of physical accessibility, all the establishments analysed in this study are in one single building, and all having free access for students and staff (teachers, technical and administrative staff, and outsourced personnel), with the travel time to gain access to such locations being short.

Turning to the issue of price, we noticed that in the seven mixed establishments, two offered ***prato feito*** meals at prices ranging from BRL 15.00 (USD 3.98, lowest value) to BRL 16.00 (highest value). The other establishments of the mixed type (n = five), where by-weight meals were available, the price ranged from BRL 39.90 (USD 10.58, lowest value) to BRL 40.60 (USD 10.77, highest value).

The University Restaurant is considered to be an à la carte and/or ***prato feito*** restaurant, where the distribution of meals is like the mixed cafeteria model (where the protein dish, the side dish and the dessert are portioned and the rest, namely the core preparations on the menu (rice, beans and salads) are freely available) and the price varies from BRL 2.00 ((USD 0.53, lowest value, for quota-holding students) and BRL 3.00 (USD 0.80, got non-quota holding students) up to BRL 14.25 (USD 3.78, the highest value, for teaching, technical and administrative staff), with the meal price for students being subsidised by the University.

With regard to the evaluation of the presence of advertising for fruit and vegetables on campus, it was observed that no establishment showed any kind of advertising encouraging consumption of vegetables, and only one establishment showed publicity in favour of fruit juice, of the Detox variety. This advertising message had content associated to ideas such as health and nutrition, quality, flavour and novelty.

DISCUSSION

The results here shown refer to a sample universe of eight establishments, related to their restaurants (of the mixed kind and those serving à la carte and ***prato feito*** meals). According to the analysis of the food environment as here studied, we noticed that most establishments made vegetables available and, to a lesser extent, fruits. There was diversity in the presentation of vegetables, with different methods of preparation (raw, cooked, stewed) and presentation (whole, in round slices, diced, grated). In the case of fruit, they were normally offered raw, either whole or sliced. Most of the time, these preparations were part of dishes containing exclusively fruit or vegetables; in some cases vegetables were part of preparations or dishes with sauces.

There were differences between the different establishments with regard to the variety of fruit and vegetables; one establishment offered eight different fruits, while the other three establishments offering fruit had two different fruit options at most. In the case of vegetables, at least four (50%) of the locations surveyed had an array of ten different vegetables in each establishment.

Even though the main focus of this study was to only consider restaurants that offered meals, especially fruit and vegetables, we notice that many of the establishments that made up the food environment here was of the snack-bar variety, and most of these were characterised for offering foods marking unhealthy eating habits, including snacks, treats, and sugary deinks, with only a few providing fruit and vegetables.[8] These results agree with the findings of both international[17-21] and national studiess[6,8,23] which showed a University campus food environment made up of establishments that often offered markers of unhealthy eating habits, together with a reduced availability of healthy foodstuffs like fruit and vegetables, with these showing higher prices when offered.

There was a significant presence of restaurants with buffet or self-service models of operation, and some by-weight restaurants, in line with the trend currently witnessed in Brazil. Even though research studies on by-weight restaurants are few and far between, the fact is that this restaurant operating system has spread throughout the country, regardless of the region or of the type of restaurant.[24] Due to the characteristics of the by-weight system, these restaurants normally offer quick and practical service and the possibility of having a full meal, with variety and access to reasonable prices, when compared with some other options for eating out.[25] Studies show that this service allows healthy choices, as it allows the client to make up his or her plate according to personal preferences. This makes by-weight restaurants an interesting option for healthy eating outside the home.[24,26] Lassen, Hansen & Trolle[27] studies establishment selling buffet and à la carte meals at workplaces, and found that eating at by-weight restaurants was linked to a greater consumption of fruit.

It is important to stress that the variety of fruit and vegetables is influenced directly by seasonality, which is influenced by regional specificities,[28] and by regional food preferences, which changes the degree of access to such F&V at a certain moment in the study. This means that not all the F&V most often purchased by families in the Southeast, according to the research of POF 2008-2009, were necessarily available at all the establishments considered. For example, the vegetables (green beans, African aubergines (*jiló*) and watercress) were present, as they were in season during the collection of data. In contrast, fruit (strawberries and grapes), even though they were not in season, were still available, which makes us believe that they were provided as they were the favourites of the users of the respective establishments.

According to Caspi et al.,[29] access to food occurs based on five dimensions, as follows: 1) availability (adaptation in the supply of healthy foodstuffs); 2) physical availability (related to the location of the places of purchase of food, and how easily accessible these places are); 3) affordability (referring to the price of the food); 4) acceptability (related to whether the environment supplies products catering to their personal standards); 5) convenience (how well the food environment adapts to the needs of the people who eat at the establishments).

Comparing the establishments here analysed, we noticed that they cover most of the dimensions, meaning that: 1) there is availability of raw fruit and vegetables placed at the start of the counter where food is distributed, and far away from other preparations, and also fractioned fruit and vegetables, seeking to facilitate and encourage the consumption of these foodstuffs; 2) the physical access to the establishments may be considered easy, with only a short trip between them; 3) the price of the meals offered by the establishments, whether by-weight meals or those serving ***prato feito***, were in the same price range, with the University Restaurant (RU) standing out for having the lowest meal prices, with the meals being subsidised by the University (BRL 2.00 (USD 0.53) or BRL 3.00 (USD 0.80) and 5) with regard to the times and dates of operation, the establishments were open all day, Monday to Friday, thereby allowing access to all shifts of University students and staff. In addition, the establishments accepted a variety of means of payment (cash, credit cards, debit cards, and meal vouchers).

A characterisation of the method of preparation and presentation of fruit and vegetables is quite relevant, as it has a big influence upon acceptance and consumption by the public exposed to the food.[30,31] Most of the establishments makes fruit and vegetables available, these being prepared and presented in many different ways, so as to avoid monotony of food and helping to promote healthy eating to the users who eat at these establishments.

With regard to the price of fruit and vegetables, we made an effort to arrive at an estimate of such prices, with the simulation of three situations, namely: 1) Considering that the standard meal served by the University Restaurant (RU), namely a starter, a main protein dish, a garnish, a side dish, a dessert and a drink) consists, according to RU inspection, of: 100g of rice, 80g of beans, 100g of meat, 120g of garnish (normally vegetables), 80g of salad (leafy vegetables and legumes) and one dessert (100g of fruit), totalling 580g. As the RU has a fixed set price, the price paid by the student for consumption of F&V, regardless of the quantity consumed, is BRL 2.00 (USD 0.53) for quota-holding students and BRL 3.00 (USD 0.80) for non-subsidised students, and BRL 14.25 (USD 3.78) in the case of technical, administrative and teaching staff; 2) Considering that the Global Strategy for Diet, Physical Activity and Health (DPAS) recommends a daily intake of 400g of GV, which is equal to five 80-gram portions a day. If we consider the consumption of one portion of 80 grams of fruit and one portion of 80 grams of vegetables

(160g) at lunch, which is the most popular time, we can suggest, based on the mean unit price for a kilo of food (BRL 40.25, or USD 10.67) as defined by the establishments, that the price to consume such food comes to BRL 6.44 (USD 1.71); and 3) Considering the data of POF 2008-2009[22], which showed that the consumption of F&V is about 80g for men and women, one could suggest, based on the average price of a kilo of food (BRL 40.25, or USD 10.67), that the price for consumption of such food as above would come to BRL 3.22 (USD 0.85). The Government-run University where this study took place provides any students in situation of social vulnerability a special monthly grant of BRL 450.00 (USD 119.33) as a way to make sure that the special students remain at the University. Thus, within this context, considering the three situations as described above, and that the scholastic month has 22 days, we could assume, based on one meal a day, that the monthly cost would be respectively BRL 44.00 (USD 11.67), BRL 141.68 (USD 37.57) and BRL 70.84 (USD 18.79) respectively, just for consumption of F&V.

Considering also that the consumption of fruit and vegetables is part of a meal, the fact is that the person, when consuming fruit and vegetables, also adds other preparations. This means that the value mentioned above shall tend to triple or even quadruple, except for the value spent at the RU, whose subsidised values also includes the starter, a protein dish, a garnish, a side dish, a dessert and a drink. This means that, with the prices as previously estimated, it become quite expensive to bear the cost of ingestion of fruit and vegetables during the whole month, as the value of the ***bolsa permanência*** (grant to keep the student at the University) is also used for transport and for taking photocopies of academic work, for example. This may have a bearing on the common option made by students to eat snacks and sandwiches, as these tend to be cheaper.

Comparing with the lowest prices found for sandwiches (BRL 3.00 (USD 0.80)), fried and baked snacks (BRL 1.80 (USD 0.48)) and soft drinks (BRL 2.00 (USD 0.53), sold in establishments on the campus where this study took place, according to data released by Franco,[10] we see that it is more financially advantageous to consume such foodstuffs, rather than having a healthy meal. This encourages the replacement of meals by snacks.

One negative aspect with regard to the environment appraised refers to advertising of food, there being only one instance of publicity of fruit juice. Our findings match the results of other studies, and show that the campus food environments could make a healthy diet more difficult to achieve. A study carried out in 2014 at a Government university, also in Rio de Janeiro, showed the presence of advertising encouraging the consumption of non-healthy foodstuffs in over a third of the establishments.[23] Another research study in 2016, at the same campus where the present study took place, showed that most establishments did not provide healthy food (fruit and vegetables), there being a general lack of publicity to encourage consumption of such foods.[8]

Turning now to the methodological aspects of the study, we should mention the limitations of using a sample of convenience, restricted to one Brazilian state and to state-run universities, and also disregarding the evaluation, for this study, of establishments outside the university, which limits the study's external validity; in other words, it does not allow the generalisation of the results obtained to other populations and other contexts. In addition, the decision was made to evaluate availability of fruit and vegetables establishments selling meals. This choice meant that there was no evaluation of the availability of fruit and vegetables in snack bars, which, even though they did not comply with all aspects as researched in this study, were not compiled for the availability component, thereby limiting internal validity. Another limitation of the present study lies in the fact that the evaluation of the offering of fruit and vegetables took place in only one day. This means that, as menus normally vary, the results found could be different, which would, in turn, have an impact on the availability and the variety of the fruits and vegetables found, as also their comparison with PV as in POF 2008-2009[22] as delimited in this study.

On the other hand, we must highlight the use of a specific instrument to characterise the University meal environment, which was psychometrically tested for reliability and validity of content, and presented excellent performance in the context where it was applied. However, a new set of questions was added, involving details of the type of presentation and the quality of the fruit and vegetables, as yet not evaluated regarding reliability and validity. Finally, we mention that this study allowed a more detailed analysis of the availability of fruit and vegetables, as their characteristics and qualities may have an impact on the consumption of these foodstuffs.

CONCLUSION

The campus food environments as studied here addressed the study of restaurants that provided meals. On considering only the universe of the eight establishments as evaluated here, we can conclude that these, with regard to the provision of fruit and vegetables, could make healthy choice of food easier, as most of the establishments provided vegetables and also (albeit to a lesser extent) fruit, that were vary varied, there being diversity of fruit and vegetables, both with regard to the means of preparation and also the presentation, these being set at the beginning of the counter where food was handed out. In addition, all fruit, and most of the vegetables, were of good quality.

However, with regard to the absence of publicity to encourage the consumption of fruit and vegetables, we see a need for improvement in the University food environment, through changes that could ensure regulation of the sale and publicity of food, and intervention seeking to promote a healthy food environment within University.

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Collaborators

Bortolot BS, Perez PMP and Franco AS participated in all stages of this study, from its initial concept through to the review of the final version of the article.

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