FOOD AND NUTRITION IN COLLECTIVE HEALTH

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Food environment on a university campus: development and analysis of an instrument for the evaluation of commercial foodservices

Ambiente alimentar em um campus universitário: desenvolvimento e análise de instrumento para avaliação de estabelecimentos comerciais

Abstract

Introduction: Consumer food environments have characteristics that can influence food choices, favoring or limiting the promotion of healthy eating. To identify these characteristics, specific, appropriate and reliable instruments are necessary. ***Objective:*** To assess the reproducibility of the Questionnaire for Assessment of Food Environment in Establishments that Sell Ready-to-eat Meals and Snacks (QFE), which was built to identify barriers to and facilitators of healthy food choices on a university campus. ***Methods:*** The QFE comprises 86 questions on the description of the service, availability of foods items, and barriers to and facilitators of healthy diets. Reproducibility was assessed using the kappa coefficient, $p<0.05$. The score scale was estimated based on the QFE, with a maximum 36 points. The final internal consistency was determined by the Cronbach's alpha, adopting the value of 0.70 as the minimum acceptable. *Results*: Reproducibility was almost perfect or substancial for 64% of the questions, with a mean kappa of 0.72. The mean score of the QFE was 15.4 (SD=4.4), and the restaurants had higher scores (mean=18.8) when compared with the other types of foodservices (p-value<0.01). It was found that 67% of the restaurants and 13% of kiosks/trailers fell into the 3rd tertile of the QFE score. ***Conclusion:*** The questionnaire was considered appropriate to assess food environment of commercial foodservices, allowing to discriminate the establishments with potential to promote healthy eating.

Keywords: Collective Feeding. University. Questionnaires.

Resumo

Introdução: O ambiente alimentar do consumidor apresenta características que podem interferir nas escolhas alimentares, favorecendo ou limitando a promoção da alimentação saudável. Para identificar essas características, são necessários instrumentos específicos, apropriados e testados. ***Objetivo:*** Avaliar a reprodutibilidade do Questionário para Avaliação do Ambiente Alimentar em Estabelecimentos que Comercializam Refeições e Lanches Prontos para Consumo (QAA), desenvolvido com o intuito de identificar as barreiras e os facilitadores para escolhas alimentares saudáveis em campus universitário. ***Métodos:*** O QAA contém 86 questões divididas em descrição do serviço, disponibilidade de itens e barreiras e facilitadores para a alimentação saudável. A reprodutibilidade foi avaliada usando coeficiente kappa, $p<0,05$. Estimou-se escore baseado no QAA, com pontuação máxima de 36 pontos. A consistência interna do instrumento final foi verificada por meio do alfa de Cronbach, adotando $\alpha= 0,70$ como o mínimo aceitável. Resultados: A reprodutibilidade foi elevada ou boa para 64% das questões, com média do kappa=0,72. A média do escore do QAA foi de 15,4 (DP=4,4), destacando-se que os restaurantes (escore médio=18,8) apresentaram pontuações mais elevadas quando comparados aos outros tipos de estabelecimentos (p-valor<0,01). Observou-se que 67% dos restaurantes e 13% dos

quiosques/trailer estavam no tercil 3 do escore do QAA. *Conclusão:* O questionário foi considerado adequado para avaliar ambiente alimentar de serviços de alimentação comerciais, com capacidade de discriminação para inferir sobre o potencial para a promoção da alimentação saudável.

Palavras-chave: Alimentação Coletiva. Universidade. Questionários.

INTRODUCTION

Food environments comprise environmental, social, individual and political variables that directly or indirectly influence eating patterns.[1-3] According to the model proposed by Glanz et al.,[1] food environments are affected by governmental or organizational policies and can be classified as follows: community food environment (inside a community or region such as neighborhoods and cities); organizational food environment (inside or around an institution such as schools); information food environment (media and advertising); consumer food environment (in general, establishments that sell or distribute foods).

The consumer food environment encompasses the internal characteristics and the surroundings of establishments that sell or distribute foods, such as restaurants, cafeterias, snack bars, caffes, bakeries, markets, etc. These characteristics involve aspects such as the nutritional quality of foods, price, promotions, variety of food choices, advertising and nutritional information.[1] These characteristics have been the focus of researches[4-11] as they can act as barriers to or facilitators of healthy food choices[2,12-16] with impact on health.[17-24]

Barriers to and facilitators of healthy eating include the conditions that influence food choices, which have been important predictors of behavioral changes.[12,13] Barriers are conditions that prevent healthy food choices or discourage behaviors considered favorable to a healthy diet. In foodservices that sell ready-to-eat meals and/or snacks, the most common barriers to healthy eating are: (a) price advantages that might induce consumption of larger sizes of food portions or the purchase of combined items or with food additions; (b) large availability of foods, usually found in all-you-can-eat self-service or buffet type restaurants (c) advertisements or signs (product highlighted on the menu, name, or picture of the dish/food) which encourage consumption of unhealthy items; (d) food servings previously portioned or portioned by the foodservice staff; (e) difficulties to choose smaller portions or to share meals.[1,5,25,26]

Measures that would favor healthy eating in commercial foodservices that serve ready-to-eat meals and/or snacks are: availability of nutritional information on the foods and dishes; availability of healthy items with attractive prices; small-sized portions at low cost; and facilitating the sharing of dishes.[1,12,16,17]

Favoring or hindering healthy eating has been assessed by instruments proposed for different types of commercial establishments with the purpose of measuring and identifying the attributes that encourage or discourage choices for healthier foods, among them the Nutrition Environment Measures Study in Restaurants (NEMS-R),[27] which was administered to assess restaurants in Australia[28] and several cities in the United States such as Atlanta, in Georgia;[27] New Ulm, in Minnesota;[29] West Virginia;[30] New York City, in the state of New York;[31] and Wisconsin.[32] Adapted versions of NEMS-R were administered in Canada [33] and Brazil.[25]

A similar instrument was developed in Brasil,[25] but is not suitable to assess mixed establishments, that is, those which sell snacks (sandwiches, baked/fried pastry foods, pizza, etc.) and meals simultaneously, which was a characteristic of many establishments on the university campus investigated. Therefore, it was necessary to develop an instrument that would fit the particularities of the of the specific consumer food environment to ensure an appropriate assessment of facilitators and barriers in different types of foodservices. This tool can be a useful support for the development of actions to improve food environment in universities, meeting the local specificities.

The proposal of this study was to assess the reproducibility of the Questionnaire for Assessment of Food Environment in Establishments that Sell Ready-to-eat Meals and Snacks (QFE), developed with the purpose of identifying barriers to and facilitators for healthy food choices in a university campus.

METHODS

Study location and assessed establishments

The project was approved by the Human Research Ethics Committee of the Clementino Fraga Filho University Hospital, Project no. 062/2011. The research was carried out on a university campus in the city of Rio de Janeiro, Brazil, in 2014, where the food system included 59 university-licensed foodservices, which sell ready-to-eat meals and/or snacks; four establishments which did not give permission for conducting the survey, and one that was shut down during the period of survey and data collection; thus, 54 establishments were investigated.

According to the characteristics of the establishments, they were classified into: (a) restaurants (located inside the buildings with permission to sell ready-to-eat meals and/or snacks; (b) snack bars or cafes (located inside the buildings with permission to sell snacks); and (c) kiosks and trailers (located outside the buildings with cement or steel structures with license/permit to sell snacks and/or meals).

Questionnaire development

A search was conducted on Pubmed, SciELO and Science Direct databases to find out instruments for assessment of food environments, and the NEMS-R[27] was chosen and used as the basis for the development of the Questionnaire for Assessment of the Food Environment in Establishments that Sell Ready-to-eat Meals and Snacks (QFE). In the QFE design, the local particularities were considered, such as the self-service system, foodservices selling both meals and snacks, and the universe of foods and dishes sold. Thus, the QFE maintains specificities in relation to the original questionaire[27] and similar ones.[25] Therefore, this is not a translation or adaptation of these instruments.

The QFE is divided into three major sections, as follows: "description of the service", "evaluation of the foods/dishes served (organized in subsections)", and "evaluation of facilitators of and barriers to healthy eating", with a total of 86 questions. The description of services used information obtained from six closed-ended questions: type of foodservice (restaurant, snack bar, kiosk/trailer); kind of service (all-can-eat buffet, buffet kilo style, *a la carte*, meal on a plate, snacks); availability of menu and prices; advertisements, displays or posters highlighting the foods and products offered. This characterization was complemented with two open-ended questions about opening hours and service capacity.

In the second section, the foods/dishes were grouped into eight subsections based on the menu design commonly found in foodservices (appetizers, salads, rice and bean, protein dishes, desserts, breads and savory snacks, products that are commonly added to ready meals, like sauces, oil, etc, and beverages). This section includes 61 closed-ended questions. The last section includes 17 closed-ended questions aiming to for evaluate of facilitators of and barriers to healthy eating.

To identify the products and meals sold in the establishments, we used the menus or any list that described the drinks and food items served, as printed in boards, posters or paper. The foods considered healthy were those based on whole grains (e.g., wholewheat bread, brown rice, granola, etc.), fruits, vegetables, beans, sugar-free foods or with few sugars and with low/reduced contents of fat and sodium.[31,34]

In the QFE, the following facilitators of healthy eating were considered: (a) availability of healthy foods in daily menus; (b) availability of nutritional information; (c) advertisement/displays encouraging consumption of healthy foods; (d) availability of small-size portions of the foods sold with proportional prices; (e) possibility for the customer to serve his own meal; (f) similar prices for traditional versions and those that include healthier food options (e.g., white bread vs. whole bread); and (g) possibility of sharing the meal without additional cost.[1,12,16,17]

The barriers to healthy eating included in the QFE were the following: (a) monetary advantage when ordering larger portions, addition or combination of items; (b) signs/displays encouraging the consumption of unhealthy items; (c) foodservice attendant serves the meal; (d) smaller portions with price proportionally higher than that of regular portions; (e) restrictions to substitution of meal components for others.[1,5,25,26]

A pre-testing of the questionnaire was carried out in commercial foodservices on an university campus different from the one selected for the study. Some terms used in the first version of the questionnaire were redefined and the questionnaire modified in order to make it clearer and easier to complete.

Scoring

To assess the foodservices, a score scale ranging from 0 to 36 points was developed, the higher the score, the greater the stimulus to healthy choices. The score was estimated by attributing one point for each healthy option available, for healthy consumption facilitators and absence of items considered less healthy and barriers to healthy consumption (Table 1).

Table 1. Scores of the Questionnaire for Assessment of Food Environment in Establishments that Sell Ready-to-eat Meals and Snacks (QFE). Rio de Janeiro-RJ, 2014.

Items assessed	Score	Observed frequency of the variable (%)
Availability of healthy and unhealthy options		
Salads	Yes = 1	70
Salad with no dressing	Yes = 1	70
Olive oil	Yes = 1	65
Non-fried meats / chicken / fish	Yes = 1	65
Soybean or soybean protein	Yes = 1	11
Brown rice	Yes = 1	15
Water and/or fresh squeezed fruit or pulp juices	Yes = 1	98
Whole milk	Yes = 1	52
Skimmed and/or semi-skimmed milk	Yes = 1	15
Fruits	Yes = 1	48
Wholewheat bread and/or toast	Yes = 1	52
Rice with sauce or additions	No = 1	5
Bean with meats	No = 1	18
Sugar-sweetened beverages	No = 1	100
Alcoholic drinks	No = 1	20
Sweets and/or confectionery	No = 1	78
Baked/fried pastry snacks and/or cheese bread	No = 1	63
Facilitators for healthy food promotion		
Nutritional information	Yes = 1	0
Nutritional information printed on leaflets	Yes = 1	0
Advertisements or posters/boards/displays highlighting healthy consumption	Yes = 1	22
Small-size portions	Yes = 1	13
Foods served by the customer himself	Yes = 1	11
Combo meals cost the same	Yes = 1	2
Healthier items cost the same	Yes = 1	44
Sharing the meal costs the same	Yes = 1	76
Other incentives to healthy consumption	Yes = 1	0
Barriers to the promotion of healthy eating		
Advertisements or posters marketing unhealthy foods	No = 1	61
Monetary advantage for larger portions	No = 1	61
Any sign/display encouraging addition of items	No = 1	78
Any sign/display discouraging special orders	No = 1	100
Food served by the foodservice staff	No = 1	85
Combos cost less	No = 1	39
Healthier items cost more	No = 1	17
Sharing the dish costs more	No = 1	0
Small-size portions cost more	No = 1	7
Other sign/display discouraging healthy eating	No = 1	15
Variation of final scores	0 to 36	

To estimate the scores, the questions contained in the section "description of the service" (type of establishment, opening hours, number of customers served, type of service, availability of items such as menu,

nutritional information and prices of food items), and in the subsection "finger foods/appetizers" were not considered – the latter because of its low frequency in the studied location. The subsection "salad" included in the section about availability of foods and dishes was grouped into "salads" (when the foodservice offered different kinds of salad, fresh or cooked) and "salad without dressing" (when the foodservice offered options of salad with no dressing, either raw/fresh or cooked). In the other subsections, the following items were maintained: (a) foods with low fat and/or calorie contents; (b) products with high fiber content; (c) skimmed, semi-skimmed and whole milk; (d) rice with addition of fatty sauces, cured meats or sausages; (e) beans with addition of cured meats or sausages; (f) sugar sweetened beverages; (g) sweets and confectionery; (h) alcoholic beverages.

Data collection

Data were collected by six trained evaluators (4 graduate students and 2 undergraduate students, all from the Nutrition area) from March to April 2014, from 11 a.m. to 2 p.m. (lunch time). To assess the questionnaire reproducibility, the evaluators visited the same site twice, within an interval of two weeks between the visits. In addition to on-site observations, data were also collected from the websites of the foodservices studied.

To train the evaluators, theoretical-practical training sessions were conducted, which consisted of a lecture on the purposes of the survey, the questionnaire characteristics, instructions on how to complete it, reading of the field manual (which contains full details of the instrument, description of the objectives of each section, definition of the terms and examples). Finally, the training included a guided practice, that is, the questionnaire was administered on a campus other than the one where the survey was carried out.

Data analysis

The questionnaire reproducibility was assessed by the Kappa statistic, estimated for 75 of 86 questions. Interpretation of the coefficient followed the criteria proposed by Landis & Koch,[35] which suggests the following scale: >0.81 indicates almost perfect agreement; between 0.61 and 0.80, substancial agreement; between 0.41 and 0.59, moderate agreement; from 0.21 to 0.40, fair agreement; and <0.20, poor agreement. Kappa estimates with p-values<0.05 were considered statistically significant. The internal consistency of the instrument was measured by Cronbach's alpha, adopting the limit of 0.70 as the minimum acceptable value.[36]

All analyses were processed by the SPSS program, version 17.0 (SPSS Inc., Chicago, US), considering 5% as statistical significance. The means, standard deviations, minimum and maximum score values based on the QFE were estimated. The score was also categorized into tertiles, and the chi-square test was used to compare the foodservice characteristics across the tertiles.

RESULTS

The foodservices studied serve on average 245 customers per day (varying from 30 to 900 customers); 58% of these services were in trailers/kiosks; 33% were restaurants and 9% snack bars. The foods and dishes available were described in menus or posters/boards in 81.5% of the services (data not shown).

The healthy foods most frequently found in the foodservices studied were water and/or fresh squeezed juices (98%) and salads (70%). The unhealthy items most frequently found in the sites assessed were sugar-added beverages (100%) and sweets/candies/confectionery (78%). As a form of incentive to healthy eating, in 76% of the

establishments studied, customers could share the dish portion without additional cost. On the other hand, 100% of the sites discouraged special orders (such as replacing whole milk by semi-skimmed or skimmed milk (Table 1).

The average time for completion of the QFE was 14 minutes. Agreement between the two QFE administrations was almost perfect or perfect (kappa> 0.81) or substancial (kappa >0.61 and <0.80) for 60% of the questions (n=45). For 22 questions (29%), a moderate agreement was estimated (kappa between 0.41 and 0.60), and for eight questions (11%), agreement was fair (between 0.21 and 0.40). All estimated kappa values were significant, except for the option "salad with meat and sauce" (p=0.08). When considering the different sections of the questionnaire, almost perfect or perfect and substancial agreements (kappa>0.60) were observed for six of the seven items of sections "description of the services offered" and "availability of information to customers"; 62% of the questions in the section "availability of foods and dishes"; and 38% of the questions of the section "facilitators of and barriers to healthy consumption (Table 2).

Table 2. Reproducibility of the Questionnaire for Assessment of Food Environment in Establishments Selling Ready-to-eat Meals and Snacks (QFE). Rio de Janeiro-RJ, 2014.

Availability of facilitators of and barriers to healthy food choices	Kappa	p-value
Description of the service provided and information available to customers		
Foodservice characteristics	0.93	<0.01
Kind of service	0.96	<0.01
Menu available on site	0.68	<0.01
Menu available on website	1.00	<0.01
Price of the meals available on site	0.73	<0.01
On-site information on the food items offered	0.48	<0.01
On-website information of food items offered	1.00	<0.01
Availability of foods and meals		
Snacks	0.68	<0.01
Non-fried snacks	0.74	0.005
Salads	1.00	<0.01
Raw salads in separate	0.75	<0.01
Cooked salads in separate	0.73	<0.01
Cooked salads in separate with dressing	0.45	0.026
Mixed raw salads	0.60	<0.01
Mixed cooked salads	0.47	0.004
Mixed cooked salads with dressing	0.60	0.002
Mixed salads with meat	0.60	<0.01
Mixed salads with meat and dressing	0.37	0.080
Mixed salads with fish	0.45	0.004
Mixed salads with fish and dressing	1.00	<0.01
Salads with legumes	0.49	0.003
Salads with legumes and dressing	0.50	0.040
Other kinds of salads	0.48	0.002
Salt	0.62	<0.01
Sugar	0.62	<0.01
Oil	0.55	<0.01
Olive oil	0.92	<0.01
Light salad dressing	0.80	<0.01
Shoyo sauce	0.80	<0.01
Bottled/packaged ketchup/mustard/mayonnaise	0.77	<0.01
Other addition products	0.58	<0.01
Protein dish (meat)	0.90	<0.01
Non-fried meat dish	0.37	0.003

Table 2. Reproducibility of the Questionnaire for Assessment of Food Environment in Establishments Selling Ready-to-eat Meals and Snacks (QFE). Rio de Janeiro-RJ, 2014. (Continues).

Availability of facilitators of and barriers to healthy food choices	Kappa	p-value
Availability of foods and meals		
Soybean	0.54	<0.01
Rice	1.00	<0.01
Bean	0.96	<0.01
Brown rice	0.84	<0.01
Rice with meat	0.36	0.023
Rice with vegetables	0.72	<0.01
Rice with sauce	0.64	<0.01
Bean with no meat	0.48	0.002
Bean with meat	0.37	0.023
Dessert (cakes, pies...)	0.82	<0.01
Confectionery	0.65	<0.01
Fruits with no sugar	0.78	<0.01
Options of diet deserts/candies	0.80	<0.01
Other desserts/candies	0.37	0.014
Bread	0.88	<0.01
Wholewheat bread	0.89	<0.01
Cracker or toast	0.78	<0.01
Wholewheat cracker or toast	0.62	<0.01
Baked or fried pastries/snacks	1.00	<0.01
Cheese bread	0.84	<0.01
Other kinds of breads or crackers	0.49	<0.01
Water	1.00	<0.01
Fruit juice	0.79	<0.01
Processed light/diet/zero drinks	0.84	<0.01
Whole milk	0.69	<0.01
Skimmed/semi-skimmed milk	0.53	<0.01
Alcoholic beverage	0.77	<0.01
Energy drinks	0.57	<0.01
Isotonic drinks	0.62	<0.01
Facilitators of and barriers to healthy eating		
Advertising/Posters highlighting the options offered	0.43	0.001
Advertising/Posters highlighting healthy options offered	0.46	0.001
Advertising/Posters highlighting unhealthy foods	0.58	<0.01
Advertising/Posters indicating price attractiveness	0.61	<0.01
Advertising/Posters stimulating food additions	0.66	<0.01
Small-sized options	0.3	0.022
Who serves the meals/snacks	0.87	<0.01
Combos cost more/less/same/NA	0.70	<0.01
Healthy items cost more/less/same/NA	0.42	<0.01
Sharing the dish portion costs more/less/same/NA	0.53	0.000
Smaller portions cost more/less/same/NA	0.38	<0.01
Other attractive sign/display for overconsumption	0.31	0.002
Other attractive sign/display for healthy consumption	1.00	<0.01

*Menu means any list containing a description of the beverages and food items available at the foodservice (poster, board, panel, or menu).

The Cronbach's alpha estimated for the questionnaire was 0.72; therefore, the QFE score presented a satisfactory internal consistency. Furthermore, there would be no favorable changes in the Cronbach's alpha if any item were excluded from the questionnaire (data not shown).

None of the services described had more than 27 points in the QFE score. Among the services assessed, the restaurants had higher scores then compared to the other types of foodservices (mean = 18.8; SD=3.7; p-value <0.01). Trailers/kiosks and snack bars had similar mean scores but with a greater variation for trailers/kiosks (Table 3).

Table 3. Mean score, standard deviation, minimum and maximum values of the Questionnaire for Assessment of Food Services in Establishments that Sell Ready-to-eat Meals and Snacks (QFE), according to the type of establishment (n=54). Rio de Janeiro-RJ, 2014.

	Mean*	Standard-deviation	Minimum -Maximum
Total	15.4	4.4	5-27
Trailers/kiosks	13.8	3.7	5-21
Restaurants	18.8	3.7	12-27
Snack bars	13.4	3.1	10-18

*P-value <0.01

The mean QFE score in the 1st tertile was 11 points (SD=2.3); 2nd tertile, 15 points (SD=0.9); and 3rd tertile, 21 points DP=2.3). The establishments classified into the 2nd and 3rd tertiles had a greater availability of healthy items, such as salads with no dressing, non-fried meats, olive oil and brown rice. On the other hand, the foodservices in the 1st tertile offered more unhealthy items. Water and sugar-sweetened beverages were present in all establishments, irrespective of the tertile (table 4).

Table 4. Characterization of the commercial foodservices assessed (n=54) according to the tertiles of the scores of the Questionnaire for Assessment of Food Environment in Establishments that Sell Ready-to-eat Meals and Snacks (QFE). Rio de Janeiro-RJ, 2014.

Item assessed	QFE score			P-value*
	Tertile 1 (<13 points) (n=18) %	Tertile 2 (13-15 points) (n= 19) %	Tertile 3 (>15 points) (n=17) %	
Mean score	11	15	21	<0.01
Availability of food items				
Salads with no dressing	22	90	100	<0.01
Non-fried beef, poultry, fish	22	95	100	<0.01
Olive oil	11	90	94	<0.01
Light salad dressing	0	0	12	0.10
Soybean	0	0	35	<0.01
Water	100	100	100	-
Whole milk	67	16	77	<0.01
Skimmed milk	11	0	35	0.01
Brown rice	0	5	41	0.02
Fruit and/or dessert with no sugar addition	22	11	58	<0.01
Wholewheat bread/toast	78	11	71	<0.01
Alcoholic beverage	17	32	12	0.30
Rice with sauce	78	11	12	<0.01
Bean with meat	78	42	24	<0.01
Cheese bread/pastries/snacks	100	37	53	<0.01
Sweets/ confectionery	72	58	77	0.45
Sugar-sweetened beverages	100	100	100	-

Table 4. Characterization of the commercial foodservices assessed (n=54) according to the tertiles of the scores of the Questionnaire for Assessment of Food Environment in Establishments that Sell Ready-to-eat Meals and Snacks (QFE). Rio de Janeiro-RJ, 2014.(Continues)

Item assessed	QFE score			P-value*
	Tertile 1 (<13 points) (n=18) %	Tertile 2 (13-15 points) (n= 19) %	Tertile 3 (>15 points) (n=17) %	
Mean score	11	15	21	<0.01
Facilitators of healthy food choices				
Nutritional information printed on the menu	0	5	0	0.39
Nutritional information printed on leaflet	0	0	0	-
Advertising/Informational sign/displays stimulating heathy eating	17	16	35	0.29
Availability of smaller portion size	28	0	12	0.04
Customers serve themselves	0	11	35	<0.01
Combos cost the same as separate products	0	0	6	<0.01
Healthier items cost less or the same as other foods	50	21	65	0.01
Sharing the dish costs the same as the regular dish	17	26	29	0.06
Barriers to healthy food choices				
Advertising/informational sign/displays stimulating healthy eating	61	26	29	0.06
Monetary advantages for larger portions	67	16	35	<0.01
Staff serves customers	100	68	35	<0.01
Stimulating addition of items	39	16	12	0.11
Combos cost less than separate products	72	32	18	<0.01
Healthier foods cost more than other items	17	11	24	0.01
Smaller portions cost more or the same as regular portions	17	21	12	0.21
Signs/display discouraging special orders	0	0	0	-
Sharing meals cost more	83	74	71	0.65
Type of foodservice				*<0.01*
Trailers/kiosks	42	45	13	
Restaurants	11	22	67	
Snack bars	33	35	32	

* Chi-square

With respect to the facilitators for healthy eating, the foodservices in the highest tertiles were those where the customers portioned their own meals, and combos were sold at the same price as of products sold individually. With regard to the barriers to healthy eating, the "monetary advantages for larger portions", "attendant serves customers" and "combos cost less that separate products" were the main barriers shown by the establishments of the 1st tertile (Table 4).

It was found that 67% of the restaurants and 13% of trailers/kiosks were classified into the 3rd tertile; but snack bars were distributed equally into the tertiles (Table 4).

DISCUSSION

The QFE was considered reliable for assessing commercial establishments with regard to their potential for promoting healthy eating, and the estimated score exhibited internal consistency and capacity to discriminate the establishments according to facilitators of and barriers to healthy food consumption.

In the assessment of reproducibility, the mean Kappa coefficients estimated for the QFE were comparable to the ones calculated for NEMS-R[27] in the US (mean=0.79) and NEMS-TCS[37] (k>0.61) and higher than the ones estimated by Hua et al.[38] who tested a tool developed for assessment of restaurants in China, which ranged from 0.4 to 0.6.

Still regarding reproducibility, substancial and almost perfect or perfect agreements were observed for most of the questions of the questionnaire. According to Glanz et al.,[39] in questionnaires similar to the one used in the present study, the agreement between questions that assess more subjective aspects is usually lower than those that quantify items. For example, the question "Are there signs/displays discouraging special orders?", the response requires special attention of the observers and standardized concepts of what to consider as "sign/displays". To minimize biases arising from questions that involved subjectivity, included in the present questionnaire, strategies were adopted, such as consistent training and availability of a detailed manual to instruct field researchers to ensure a conceptual standardization of the diverse items contained in the instrument. Furthermore, characteristics such as availability, quality, quantity, variety and price of the meals may vary over the course of a week, between the two questionnaire applications, compromising the evaluation of the instrument reproducibility.

The score proved to be adequate for discriminating foodservices with favorable or unfavorable characteristics for a healthy diet, considering that the services classified in the 3rd tertile of the score indicated a greater availability of healthy foods and facilitators and those in the 1st tertile had more barriers to healthy eating.

In general, there were few facilitators for a healthy food choices in the investigated sample, which corroborates other surveys carried out on university campuses, which pointed to limitations in the availability and accessibility of healthy foods.[25,40,41] Yet, there was a greater number of facilitators in the 3rd tertile of the QFE score, but for the item "availability of small-sized portions", it was higher in the 1st tertile. This result can be related to the fact that the majority of the establishments in the 3rd tertile were self-service restaurants, where customers serve their own plate with the desired amount of food, and there is not a standardized portion size nor the need for availability of smaller portions.

The 3rd tertile of the QFE score had a greater proportion of restaurants , which offer a larger variety of foods and meals and give more autonomy to the consumer while choosing foods,[42] which allow that customers can decide for healthier food alternatives.[43]

The subjectivity of some questions of the questionnaire could be considered a limitation of this study. However, an effort was made to minimize the likelihood of subjective interpretation of facilitators of and barriers to healthy diet during the training of the evaluators, which included in-depth studies of scientific literature on this topic. In addition, a detailed manual was developed, and supervised practical training was conducted.

The seasonality of foods supply and variability of products offered could also be considered limiting factors for the assessment of the instrument's reproducibility. But the QFE is based on a list of foods and meals categorized into generic groups that allow inferring about the nutritional quality. In addition, the estimated Kappa scores showed good reproducibility for most of the items assessed.

The QFE proved to be a practical questionnaire, which requires a reasonable time to fill (average of 42 minutes) when compared to NEMS-S,[39] (average of 46 minutes) to the NEMS-TCS,[37] (46 minutes) and the NEMS-R,[27] (administered in 28 minutes on average). Other positive aspect of the QFE is that it does not require observers with

specialized knowledge. To administer it, a detailed manual with all concepts and instructions for completion is provided.

It is worth emphasizing that differently from similar instruments,[27] the QFE does not require that the establishments have a structured menu nor the nutritional information on the list of the ingredients of the meals and dishes and can be used in different types of foodservices (conventional restaurants, self-service cafeterias, snack bars, kiosks, trailers) usually found in Brazilian cities.[42]

To design the instrument, specific aspects of the Brazilian scenarios were considered, e.g., items considered healthy are in accordance with the recommendations of the Dietary Guidelines of the Ministry of Health.[34] Furthermore, low-fat, low-sugar and low-calorie options were considered positive because they meet the special needs of individuals who have restrictions for consumption of regular food versions (e.g., diabetics). Other positive aspect of this questionnaire is that it enables to assess establishments that do not have a fixed menu, such as the kilo-buffet type of service, very common in Brazil.

In recent decades, there has been a growing interest in understanding how the food environment is associated with dietary patterns, chronic diseases, obesity and other factors that affect people's health.[44-46] Thus, to assess the effects of a food environment on diet quality requires measurements of the exposure to this environment, including specific and appropriate measures capable of discriminating the level of exposure, especially in groups considered privileged targets of nutritional interventions.[47] The QFE is a tool that allows to measure the exposure to factors that favor or prevent adequate eating habits and can be an effective support in the development and monitoring of actions aiming at promoting healthy eating.

CONCLUSION

The QFE is a practical and reliable instrument for measuring food services in Brazil. The developed scoring system also proved to be suitable and showed high internal consistency. As studies on food environments advance, the need for tools that qualify food marketing spaces according to their potential to promote or hinder healthy consumption increases

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Contributors

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