Does the circulation of people influence the availability of restaurants, bars and snack bars? Findings from the city of São Paulo

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Abstract

Objective: To describe the distribution of restaurants, bars and snack bars in the city of São Paulo-SP, Brazil; and to evaluate the correlation between the density of these establishments and the public transport network, used as a proxy of circulation of people. *Methods*: Cross-sectional study in which were audited all restaurants, bars and snack bars and the like, found in 52 census tracts assessed, belonging to 13 different administrative districts of São Paulo. Descriptive analysis was performed on data and correlation between the density of establishments and public transportation network, adjusted for family income in the administrative district where each establishment was located. *Results and Discussion*: A total of 472 restaurants, bars and snack bars, mostly found in intermediate income areas. The total density of establishments was positively correlated with the public transport network density, adjusted for family income. Similar results were found when only snack bars were included in the analysis. In other countries, the relationship between public transport and food environment has been explored only in relation to access to supermarkets and hypermarkets and the resulting improved access to healthy foods. *Conclusion*: A higher density of restaurants, bars and coffee shops in areas with greater coverage of the public transport network and focused interventions in the food environment should prioritize areas with the highest density of public transport in order to reach a large number of people and properties, ensuring the applicability of resources.

Key words: Public Health Nutrition. Food. Fast Foods. Environment. Restaurants. Transportation. Socioeconomic Factors.

Introduction

Eating outside the home has become more and more common.[1,2] According to data on Brazilians' eating habits, 40% of the individuals reported eating out of home, being pizza, sodas, sandwiches and fried or baked snacks, typical foods of fast food restaurants and snack bars, the most consumed dishes.[3] High income and proximity to the capitals of state are associated with more spending on eating out of home.[2]

Evidences show that in some eating-out-of-home settings, such as fast food restaurants, the nutritional quality of the meal is poor, containing large amounts of sugars, oils and fats,[4-6] and may be associated with weight gain and other health outcomes.[7,8] Furthermore, there is a direct relationship between the availability of fast food restaurants and the frequency at which people have meals in this kind of service.[9]

Over the past years, national and international studies have explored the impact of foods availability not only around households, but also, although to a lesser degree, around the workplace[10] and on the way between home and work.[11] Therefore, the home-eating environment characteristics alone cannot reflect properly all foods to which people are exposed, once an important part of the meals is eaten at the workplace or school or even at some point between home and work/school.[11] There have been evidences, for example, of the relationship between the availability of public transit services and the access to supermarkets or hypermarkets.[12,13] So, it is necessary to explore other environment components that may influence the availability of restaurants, bars and snack bars and, consequently, the habit of eating outside the home, such as public transportation network, a key proxy of the flow of people at the site.

Given the growing habit of eating out of home in Brazil, there are few studies conducted in large urban centers that characterize the distribution of the diverse food service stores and their relation with the local public transportation network. Thus, this study aimed to describe the distribution of restaurants, bars and snack bars in the city of São Paulo and assess the relationship between the food services density and public transit density in the areas studied.

Methodology

Cross-sectional study, as part of the Study of Obesogenic Environment (SOE) in the city of São Paulo, Brazil, from November 2010 to February 2011. Data was collected *in loco*, recorded and assessed, encompassing all restaurants, bars and snack bars found by trained personnel, located in 52 randomly selected census tracts and equally distributed in 13 administrative districts. The districts were selected previously from 96 administrative districts existing in the city of São Paulo, considering the plurality of relations between the environmental and individual characteristics.

For the sampling of the 13 administrative districts included in this study, socioeconomic measures were used (City Human Development Index – C-HDI, developed from data on education and income from the 2000 Census for each administrative district of the city of São Paulo)[14] and indicators of urban food environment, previously associated with the prevalence of obesity and food consumption, as described in international studies.[15,16] They are: density of hypermarkets, supermarkets, small groceries and outdoor markets, collected from secondary databases available by the Secretary of Urban Development of the City of São Paulo;[17] and density of four large national and international chains of fast food restaurants, added to information on the shopping malls location in the city, used as proxy of the number of food courts. Such food courts usually concentrate a large number of national and international chains of fast food restaurants. The density values were used to control the number of food services in relation to the resident population of each administrative center, using the population from the 2010 Census.[18]

The restaurants, bars and snack bars that were found and assessed were classified as follows: *à la carte* restaurants, per kilo and self-service restaurants, bars, bakeries, cafés, ice cream stands, convenience stores, fast-food restaurants of small and large chains, and others. The present study considered the total number of the food service stores which were grouped into "restaurants, bars and snack bars", and "fast food restaurants" (small and large national and international fast food chains).

The variables studied were the density of restaurants, bars and snack bars (n/10,000 inhabitants of the administrative district) and the density of public transportation services (n/10,000 inhabitants of the administrative district), which was calculated using the number of subway, train and urban bus stations in the city of São Paulo, as existing in the administrative district in 2011.[17,19,20] To calculate the densities of both variables of this study, the number of residents of each administrative district, according to the 2010 Census, was used.[18]

Due to the nonparametric distribution of the density of restaurants, bars and snack bars and of the public transport network, the Kruskal-Wallis' test was used to verify the distribution of the density of restaurants, bars and snack bars altogether, of the fast food restaurants separately, and of the public transportation network according to tertiles of the household income of the administrative district. To describe income, it was used the percentage of low income households, between half and one minimum wage, of each of the 13 administrative districts, according to data from the 2010 Census.[18]

Subsequently, the correlations between the densities of the public transportation services and of the group of restaurants, bars, snack bars, and fast food restaurants were assessed using the Spearman's rank correlation coefficient. The correlation adjusted by the income of the administrative district was evaluated using partial correlation coefficient.

The questionnaires used to assess the food service stores were input twice, and data were analyzed by the software *Statistical Package for Social Sciences* 17.0 (SPSS Inc., Chicago, IL, USA).

This study did not involve humans; still, it was submitted to the Research Ethics Committee of the Faculty of Public Health of the University of São Paulo in 2009 (protocol no. 2.034).

Results

A total of 472 restaurants, bars and snack bars were found and assessed, distributed in the 13 audited districts (mean of 36 and variation of 5 to 85 food service stores per district).

The largest number of restaurants, bars and snack bars (median = 5.05 food services/10,000 inhabitants) was found in district located in middle-income locations (2nd tertile). The density of the public transportation services ranged from 0.000 to 1.07/10,000 inhabitants, and no difference was found between the districts in the three income levels (Table 1).

Table 1. Availability of restaurants, bars and snack bars and public transportation services, according to household income. São Paulo-SP, 2011.

Tertiles of percentage of households with family income between 0.5 and 1.0 minimum wages[1]	Density of restaurants bars and snack bars	Density of Public Transportation
	Median (minimum - maximum)	Median (minimum - maximum)
1st tertile (the wealthiest)	1.72 (1.17 – 2.71)	0.25 (0.09 - 0.70)
2nd tertile	5.05 (3.14 – 2.62)	0.23 (0.00 – 0.93)
3rd tertile (the poorest)	1.47 (1.27 – 2.08)*	0.06 (0.00 - 0.15)

[1] Brazilian monthly minimum wage in June 2010 = R$ 510.00

* p-value < 0.05, according to the Kruskal-Wallis' test

When the raw correlation was analyzed, obtained by the Spearman's rank correlation coefficient, no association was observed between the availability of public transportation and of restaurants, bars and snack bars. However, it was found a strong and positive correlation between the density of food services and the density of public transportation services (r=0.745; p=0.005), when the partial correlation was analyzed, adjusted by the percentage of low income households. Similar result was found for fast food restaurants (r=0.750; p=0.005), according to Table 2.

Table 2. Association between the density of public transportation and the density of all types of restaurants, bars and snack bars assessed and the density of fast food restaurants. São Paulo-SP, 2011.

Density of food services	Density of public transportation	
	Raw correlation[1] (r)	Partial correlation[2] (r)
All kinds of restaurants, bars and snack bars	0.047	0.745*
Fast food restaurants	0.298	0.750*

[1] Spearman's rank correlation coefficient

[2] Partial correlation coefficients, controlled by the percentage of households with family income between half and one minimum wage.

* p-value <0.05

Discussion

The present study showed that the largest number of restaurants, bars and snack bar was in the administrative districts with middle household income level, and also showed a positive correlation between the availability of such foods services and a higher density of public transit services and, consequently, high people flows, regardless of the local socioeconomic level.

Regarding the distribution of restaurants, bars and snack bars, according to the socioeconomic level, similar results were found in Los Angeles, California, USA, with higher density of fast food restaurants in middle-income neighborhoods. The same, although in lesser magnitude, was found for other kinds of restaurant.[21] On the other hand, also in the United States, in the states of Mississippi, North Carolina, Maryland and Minnesota, it was found that full service restaurants were distributed equitably in neighborhoods with different socioeconomic levels, but fast food restaurants were more common in locations with low- and middle-income socioeconomic level.[22]

In the developing countries, especially those that have experienced quick and recent epidemiological and nutritional transitions, few evidences are available in the literature on the space distribution of restaurants and its association with socioeconomic variables and health outcomes. In a study conducted with secondary data relating to 31 sub-municipalities (administrative districts) of the city of São Paulo, high density of fast food

restaurants of large chains and public transportation was found in the areas of higher socioeconomic level.[23] In the present study, where not only fast food restaurants of top chains were included, higher density of restaurants, bars and snack bars was found in the middle-income administrative districts.

The association between the availability of public transportation services and food environment has not been much explored, with studies examining only its relationship with access to supermarkets and hypermarkets and consequent greater access to healthy foods.[13,24] No studies relating public transportation density with the availability of restaurants, bars and snack bars were found. However, a study conducted in the United States reported that fast food restaurants were mostly located in areas of high people density.[25]

Still regarding public transit, in Australia bus stops and train stations were assessed regarding the availability of foods advertisements. It was found that advertising in these locations might have a significant impact on food choices, because a large number of people pass through public transit stations every day.[26]

Our findings point to the need for better insights on the relationship between the access to restaurants, bars and snack bars and the characteristics of the neighborhoods, which are still little explored, such as the density of public transportation. We found that, in a big Brazilian city, neighborhoods where people flows are greater, such as those that concentrate larger public transportation services, also concentrate restaurants, bars and snack bars, especially fast food restaurants. Considering the health impact caused by the frequent intake of the foods usually provided by these establishments, such as sugary beverages and other ultra-processed products,[27-29] further studies are necessary to better understand the business practices that make such restaurants cluster around train, subway and bus stations, and which may contribute to the development, implementation and assessment of public health interventions, policies and programs.[30,31]

Conclusion

Conclusion is that there is a relationship between the density of restaurants, bars and snack bars with areas of great people flows, determined by the density of public transit networks.

Thus, in a scenario where eating outside the home is increasing, with a significant offer of ultra-processed, high calorie foods – in view of the relationship found in this study – actions focused on food environment, mainly in areas with higher public transportation density, may potentially reach a large portion of the population and food services, ensuring the good applicability of the resources invested.

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