Outlets source of foods in Montevideo: Implications for retail food environment research in emerging countries

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Conflict of interest statement

The authors declare no conflicting interests.

Ethical statement

The full protocol was approved by the Ethics committee of the School of Chemistry of Universidad de la República (Protocol No 101900-000043-22). No human subjects were involved in the research.

ABSTRACT

Objective: To identify outlets source of foods in Montevideo, the capital city of Uruguay.

Design: Cross-sectional field survey of food outlets selling foods and beverages.

Setting: 106 census tracts differing in geographical location and socio-economic characteristics.

Participants: Outlets selling foods and beverages within the census tracts.

Main Outcome Measure: Number, density, and distribution of food outlets selling different food groups, regarded as healthy and unhealthy by the Uruguayan dietary guideline.

Analysis: Inferential statistics to compare the measures in census tracts of different socio-economic status.

Results: A total of 1,217 food outlets were identified, corresponding to a wide range of different types. Small stores had a highly relevant contribution to the availability of unprocessed foods, whereas ultra-processed products were ubiquitous. The proportion and density of food outlets selling fruits and vegetables and fresh meat was higher in low socio-economic status than in medium/high socio-economic tracts. The distribution of outlets selling different food groups significantly differed across census tracts.

Conclusions and Implications: Results highlight the importance of capturing the local food sources that shape the availability of healthy and unhealthy foods. Context-specific definitions of food deserts and food swamps acknowledging the complexity of the retail food environment are needed.

Keywords: *food environment; food availability; food outlets; ultraprocessed products.*

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INTRODUCTION

Creating supportive environments is paramount for promoting healthy and sustainable eating patterns.[1] In particular, increasing the availability of healthy foods and limiting the availability of unhealthy foods have been identified as potential strategies to improve nutrition and health.[2–4]

The availability of healthy and unhealthy foods is shaped by the retail food sources, i.e., the outlets where people can purchase foods and beverages.[5] There is a wide range of different food sources, including other storefront businesses and stores (e.g., laundromats, beauty salons), that substantially differ in the healthfulness of the foods they sell.[5–8] However, most studies do not acknowledge this complexity. Supermarkets have been regarded as the key source of healthy foods, whereas convenience stores and fast-food restaurants have been regarded as the key source of unhealthy foods.[9] This simplified approach to characterizing the retail environment may

lead to inaccurate conclusions on food availability and to misguided recommendations for policy action.

Sources of healthy and unhealthy foods may largely differ across contexts.[10] Research conducted in emerging countries has shown that small stores, street vendors, and farmers' market can be a key source of healthy foods, [11–14] whereas the rise of supermarkets has been associated with increased consumption of ultra-processed products.[15,16] In addition, the contribution of different types of outlets to the availability of healthy and unhealthy foods may vary between areas with different socio-economic characteristics. Previous studies conducted in developed countries have reported that convenience stores and fast-food restaurants are disproportionately located in lower-income neighborhoods, whereas supermarkets and produce markets tend to be more prevalent in wealthier areas.[17–21]

In this context, the aim of the present work was to identify outlets source of foods in Montevideo, the capital city of Uruguay, an emerging Latin American country. A specific objective of the study was to compare sources of foods in areas of the city with different socio-economic status. Results are expected to contribute to advance retail food environment research in emerging countries, where studies are still scarce.[9,22]

METHODS

The current study relied on a cross-sectional field survey of food outlets in Montevideo, the capital of Uruguay. Montevideo is located in the central southern region of the country, with an area of 526 km^2 and a population of 1,670,545 inhabitants distributed in 487,098 private households.[23] According to latest available data, 61% of the total area is rural and 34% corresponds to urban zones.[23] A considerable proportion of households (7%) is located in informal settlements, whereas almost all dwellings (99.9%) are connected to electric power and to the drinking water network.[24] The mean years of schooling for individuals aged 25 or more within the households is 11.4. In addition, 47.1% of the households own a car, pick-up or van.[24] The study was part of a larger project aimed at characterizing the retail food environment, which received full approval by the ethics committee of (blinded for review) (Protocol No 101900-000043-22).

Sample

A sample of 106 census tracts was obtained using probability proportional to size sampling, considering the number of tracts in each of the eight municipalities in which the city is administratively divided. The sample corresponded to 10% of all the census tracts in the city and covered approximately 62 km^2 (12% of total area) (Figure 1). The census tracts largely differed in their sociodemographic characteristics (Supplementary material Table 1).

Data Collection

Field work was conducted to survey all the food outlets located within each census tract. Six teams of observers walked all the streets within census tracts, registering all the outlets selling foods and beverages, located on both sides of the streets except for the boundaries of the tract. For each outlet, they registered the name, address, and type of store. The following types of outlets were considered: behind-the-counter grocery stores, self-service grocery stores (1 or 2 cash registers); supermarkets (3 or more cash registers); butchers'; poultry store; fishmongers'; fruit and vegetable stores; bakeries; bars, restaurants, or takeaways; pharmacies; farmers' markets; specialty stores (i.e., specialized stores selling cheeses, delicatessen, honey, among other products); kiosks; candy shops; ice cream stores; street vendors; other types of stores selling foods and/or beverages (e.g, gym, stationery stores).

Observers entered all the outlets to register the types of foods sold, number of cash registers for supermarkets, and where customers ordered food in bars, restaurants and cafés. The list of food groups was developed based on the recommendations of the Uruguayan dietary guideline[25]: fruits and vegetables, pasteurized or powdered milk, fresh meat (beef, chicken, pork, or lamb), fresh or frozen fish, culinary ingredients (e.g., flour, rice, oil), processed foods (e.g., bread, cheese, canned vegetable products, dried pasta), ultra-processed products (e.g., sweetened beverages, cold cuts, sausages, cookies, crackers, savory snacks, ice-cream), and prepared meals. A field for open comments was available at the end of the form. Data were registered on a web form using Compusense Cloud (Compusense Inc., Guelph, Canada).

Observers received training on how to use the form and the maps of the census tracts for data collection. The form was pilot tested in 2 census tracts and only minor changes were introduced to facilitate data collection. Field work was conducted on weekdays, from 9AM to 1 PM or from 3 PM to 5 PM, between September 2023 and February 2024. For farmers' markets, field work was conducted according to their opening days and times.

Data Analysis

All data analyses were performed using R software [26] version 4.2.0.

Cluster analysis of the census tracts.

Hierarchical cluster analysis was used to identify groups of census tracts with similar socio-economic status. The analysis was used considering a series of variables describing the geographic area where the census tract was located: percentage of rural area, socio-economic status index of the neighborhood, per capita household income, mean years of schooling of household members aged 25 years or more, households under the poverty line, households in informal settlements, car ownership, motorcycle ownership, connection to sewerage system, connection to drinking water network, connection to electric power, private cooking space, and dwellings with a wood stove (Supplementary Material Table 1). Euclidean distances and Wards' criterion were considered. The dendrogram suggested that the 106 census tracts could be sorted into 2 main groups of similar size, composed of 50 and 56 tracts (Supplementary Material

Figure 1). Table 1 shows the average characteristics of the census tracts in each of the groups: medium/high and low socio-economic status. The geographical distribution of tracts in each of the 2 groups is shown in Figure 1.

Outcome measures.

The number of outlets identified in the field survey was counted for each type of outlet and for outlets selling each of the food groups. Calculations were performed at the aggregate level and separately for each group of census tracts (medium/high vs. low socio-economic status). The distribution of stores selling each of the food groups by type of outlet was calculated and expressed using percentages.

For each census tract the density of each type of outlet (i.e., number of stores per square kilometer) was calculated by dividing the number of outlets by the area of the tract. Average values were calculated across all tracts and across tracts in each of the groups.

Inferential statistics.

Kruskal-Wallis test was used to compare the density of different types of stores between tracts with low and medium/high socio-economic status, whereas Fisher's exact tests were used to compare the proportion of outlets selling different food groups between tracts with low and medium/high socio-economic status. Finally, chi-square tests were used to compare the distribution of different types of stores between the two groups of census tracts. Types of stores with zero-counts for both groups were not included in the analysis. A significance level of 5% was considered for all tests.

RESULTS

Outlets Identified In The Field Survey

A total of 1,217 food outlets were identified in the 106 census tracts, including 301 bars, restaurants or take-aways (24.7%), 209 behind-the-counter grocery stores (17. 2%), 147 kiosks or candy shops (12.1%), 126 self-service grocery stores (10.4%), and 108 bakeries (8.9%). The density of the different types of food outlets ranged between 23.4 and 0.4 establishments per square kilometer, for bars, restaurants, and takeaways and fishmonger's, respectively. As shown in Table 2, street vendors were not prevalent; only 31 street vendors were found in the 106 census tracts, corresponding to a density of 2.3 outlets per square kilometer.

The proportions of all the stores identified on the field that corresponded to behind-the counter grocery stores and fruit and vegetable stores were significantly larger in census tracts of low socio-economic level compared to those with medium/high socio-economic level. Conversely, self-service grocery stores, bakeries and bars, restaurants and takeaways represented a significantly higher proportion of the outlets in medium/high socio-economic status tracts. Regarding density, Kruskal-Wallis test showed significant differences ($p<0.05$) between census tracts for four types of outlets. Behind-the counter grocery stores and fruit and vegetable stores had higher density in low socio-economic status tracts, whereas the opposite trend was found for self-service

grocery stores and bars, restaurants and takeaways (Table 2). No significant differences were found for the rest of the food outlets (all p-values >0.08).

Outlets Source of Different Food Groups

The density of outlets selling different food groups ranged between 92.6 and 3.4 establishments per square kilometer (Table 2). Ultra-processed were the food group sold by the largest number of outlets, which led to the largest density. As shown in Table 2, 91.4% (n=1,112) of the outlets identified in the field work sold ultra-processed foods. Meanwhile, approximately 1 quarter of the outlets sold fruits and vegetables, pasteurized or powdered milk, or eggs. Fresh meat was sold in 10.4% of the outlets, whereas only 3.4% of the stores sold fresh fish.

Significant differences ($p<0.05$) in the proportion and density of outlets selling different food groups between areas with different socio-economic status were found. As shown in Table 2, the proportions of outlets selling fruits and vegetables, pasteurized or powdered milk, fresh meat and eggs were significantly higher for low socio-economic status census tracts compared to medium/high socio-economic status tracts. The opposite trend was found for outlets selling prepared meals. Meanwhile, the density of outlets selling fruits and vegetables, pasteurized or powdered milk, fresh meat, and eggs, was higher in low socio-economic status tracts.

Table 3 shows the distribution of types of outlets selling different food groups. At the aggregate level, grocery stores, supermarkets, farmers' markets, and specialized stores (e.g, butchers', fishmongers', fruit and vegetable stores) were the most relevant

types of outlets selling the foods recommended by the Uruguayan dietary guidelines. In particular, behind-the counter grocery stores, self-service grocery stores and fruit and vegetable stores were the types of outlets that contributed the most to the availability of fruits and vegetables.

Statistically significant differences between tracts with different socio-economic status were found for all food groups (p-values<0.01). Behind-the-counter grocery stores had a larger contribution to the availability of all the food groups in low socio-economic status tracts compared to medium/high socio-economic status tracts. Meanwhile, bars, restaurants and takeaways had a larger contribution to the availability of ultra-processed products and prepared meals in medium/high socio-economic status tracts.

DISCUSSION

The current study contributed to the literature by examining the sources of foods in a sample of census tracts in a city located in an emerging Latin American country. Small neighborhood stores, such as behind-the-counter grocery stores, butchers', and fruit and vegetable stores, were identified as a highly relevant source of healthy unprocessed foods (i.e., fruits, vegetables, meat, and eggs) in Montevideo. Similar results have been reported in other Latin American countries, such as Mexico and Guatemala.[13,27]

The types of food outlets identified in the current study evidenced a series of differences with research conducted in both emerging and developed countries. Street vendors represented only 2.5% of the food outlets identified on the ground. This result contradicts previous studies reporting the relevant contribution of ambulatory vendors to the retail food environment of emerging countries in Latin America and Africa.[11–14,27] Furthermore, non-storefront stores (i.e., stores not typically thought as sources of food) did not emerge as a relevant contributor to food availability in Montevideo, representing only 2.7% of all outlets. This result differs from studies conducted in the USA reporting that non-storefront business account for nearly a third of all food outlets.[7,8]

Ultra-processed products were the most predominant type of food, being sold by 91.4% of all the identified outlets. These products are being increasingly associated with negative health outcomes,[28] and their consumption is not recommended by the Uruguayan dietary guidelines.[28] Conversely, the recommended food groups, culinary ingredients and unprocessed foods were sold by approximately 45% and 25% of the outlets. The ubiquity of ultra-processed products has been reported by studies conducted in both emerging and developed countries.[8,29–32]

Sources of food differed with the socio-economic status of the census tracts. The density of small stores, such as behind-the counter grocery stores, kiosks, and fruit and vegetable stores, was larger in low socio-economic status tracts, whereas the density of bars, restaurants and takeaways was larger in medium/high socio-economic status tracts. In addition, the density of outlets selling unprocessed foods recommended by the Uruguayan dietary guidelines (fruits and vegetables, fresh meat, and eggs) was higher in low socio-economic status tracts. These results hold similarities and differences with

studies conducted in developed countries.[17–21] The larger prevalence of small stores in areas of low socio-economic status has been reported in developed countries. However, such studies have also reported lower availability of healthy foods and larger availability of fast-food outlets in those areas. Differences in the results may be explained by contextual factors related to the culture, purchasing power, and the relative price of healthy and unhealthy foods. In this sense, citizens experiencing food insecurity in Uruguayan tend to prioritize satiating carbohydrate-based foods, such as rice and pasta, over fruits, vegetables, meat and ultra-processed products. [33]

The analysis of limited access to healthy foods in developed countries has been mostly restricted to socioeconomic vulnerable areas.[9] However, results from the present work showed that medium/high socio-economic status areas in Montevideo tend to have lower density of stores selling healthy foods compared to low socio-economic status areas. This suggests that current approaches focused exclusively on low socio-economic areas may underestimate the impact of physical access to healthy food on the eating patterns of a relevant proportion of the Uruguayan population. This effect may be particularly relevant for low-income populations living in medium-income areas, as previously discussed in the literature for emerging countries.[34]

Small stores were the most relevant contributors to the availability of foods recommended by the Uruguayan dietary guidelines (e.g., fruits and vegetables, fresh meat, eggs, pasteurized or powdered milk, culinary ingredients) in low socio-economic status areas, whereas supermarkets and farmers' markets tended to have a larger contribution in medium/high socio-economic status areas. Small stores were also the most prevalent source of ultra-processed products in low socio-economic status areas.

These results highlight the complexity of categorizing food outlets as a proxy of the availability of healthy or unhealthy foods. Considering supermarkets as the key source of healthy foods and convenience stores and fast-food restaurants as the key source of unhealthy foods, as it is currently done in most retail food environment research, [9] does not seem appropriate in the context of Montevideo. This stresses the need to develop context-appropriate criteria for analyzing food availability and accessibility.

Strengths And Limitations

The present study is one of the first to perform a comprehensive analysis of the sources of healthy and unhealthy foods in an emerging country based on ground truthing. It makes a relevant and novel contribution to the literature by highlighting the need to incorporate context-specific aspects of the retail food environment.

The study also has several limitations. First of all, field work was restricted to 12% of the city's census tracts and conducted mainly during weekdays. Despite being selected using random sampling, the sample size is not sufficient to make precise and accurate estimates of the main sources of foods in the city. Particularly, these methodological decisions may lead to an underestimation of street vendors. Therefore, generalizations of the results must be taken with care. In addition, like the majority of retail food environment research, the study did not evaluate the variety, nutritional composition, and price of the foods sold by the different outlets. Future research should analyze these variables and how they are affected by the socio-economic status of the area. These specific issues are particularly relevant given that prices are the main factor underlying the food purchase decisions of vulnerable populations.

IMPLICATIONS FOR RESEARCH AND PRACTICE

The present study has relevant implications for food environment research in emerging countries by highlighting the importance of capturing the local food sources that shape the availability of healthy and unhealthy foods. Current definitions of food deserts and food swamps may lead to inaccurate conclusions on the influence of physical access to food in the eating patterns of citizens residing in Montevideo. This conclusion may be applicable to other emerging countries, given the relevance of informal stores and street vendors. [11–14,27] Retail food environment research in emerging countries is needed to develop context-specific criteria for the identification of areas with limited access to healthy foods (food deserts) and excessive access to unhealthy foods (food swamps) and move the field forward.

Results from the present work highlight the wide diversity of food outlets offering both healthy and healthy foods, stressing the complexity of classifying outlets as healthy/unhealthy. Restricting the analysis of food availability to a handful of outlets may lead to misguided policy recommendations, in both emerging and developed countries. [5–8,27] Acknowledging the complexity of the current retail food environment seems a necessary step for the development of effective strategies to equitably increase access to healthy foods. In this sense, food retail environment research based on all types of outlets selling specific food groups could lead to more accurate and reliable conclusions to inform policy making. [35]

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TABLES

Table 1. Average characteristics of the 2 groups of census tracts, identified using hierarchical cluster analysis.

Characteristic	Medium/high socio-economic status (n=50)	Low socio-economic status (n=56)
Rural area of the census tracts (%)	0.0	17.6
Socio-economic status index of the census tracts (0-14)	11.0	5.2
Per capita household income (USD)	1429.5	744.9
Mean years of schooling of adults of the household	13.6	9.5
Households under the poverty line (%)	1.8	14.4
Households in informal settlements (%)	0.1	11.6
Car in the household (%)	55.2	40.3
Motorcycle in the household (%)	3.8	11.4
Dwellings with adequate sewerage system (%)	100.0	98.1
Dwellings connected to the drinking water network (%)	100.0	99.9
Dwellings connected to energy power (%)	100.0	100.0
Dwellings with private space for cooking (%)	97.8	98.3
Dwellings with wood stove used for cooking (%)*	0.0	0.3

Table 2. Number of food outlets selling foods and beverages identified in the field survey across all census tracts and separate for tracts with different socio-economic status.

	All census tracts (n=106)		Medium/high socio-economic status tracts (n=50)		Low socio-economic status tracts (n=56)	
	Number (percentage) of stores	Average density (stores per km^2)	Number (percentage) of stores	Average density (stores per km^2)	Number (percentage) of stores	Average density (stores per km^2)
Type of outlet						
Behind-the-counter grocery stores	209 (17.2)	19.8	23 (4.0b)	3.6b	186 (28.9a)	34.4a
Self-service grocery stores	126 (10.4)	11.1	72 (12.5b)	14.4a	54 (8.4a)	8.1b
Supermarkets	31 (2.5)	2.4	19 (3.3)	3.3	12 (1.9)	1.6
Kiosks or candy shops	147 (12.1)	12.3	61 (10.6)	10.9	86 (13.4)	13.5
Bakeries	108 (8.9)	9.0	62 (10.8a)	10.8	46 (7.2b)	7.3
Fruit and vegetable stores	73 (6.0)	6.3	21 (3.7b)	4.1b	52 (8.1a)	8.2a
Butchers' or poultry stores	35 (2.9)	3.6	11 (1.9)	2.1	24 (3.7)	5.0
Farmers' markets	20 (1.6)	1.4	12 (2.1)	2.0	8 (1.2)	0.8
Street vendors	31 (2.5)	2.3	12 (2.1)	2.7	19 (3.0)	1.9
Pharmacies	46 (3.8)	3.2	28 (4.9)	4.2	18 (2.8)	2.3
Ice cream stores	21 (1.7)	1.4	9 (1.6)	0.8	12 (1.9)	2.0
Other speciality stores	31 (2.5)	2.2	16 (2.8)	2.2	15 (2.3)	2.1
Fishmonger's	5 (0.4)	0.4	1 (0.2)	0.2	4 (0.6)	0.6
Bars, restaurants or takeaways	301 (24.7)	23.4	210 (36.6a)	35.7a	91 (14.2b)	12.4b
Other types of stores	33 (2.7)	2.6	17 (3.0)	2.8	16 (2.5)	2.3
Outlets selling different food groups						
Fruits and vegetables	269 (22.1)	23.1	86 (15.0b)	14.9b	183 (28.5a)	30.5a
Pasteurized or powdered milk	338 (27.8)	30.1	111 (19.3b)	20.4b	227 (35.3a)	38.7a
Fresh meat	118 (9.7)	10.4	39 (6.8b)	6.6b	79 (12.3a)	13.8a
Fish	41 (3.4)	3.4	21 (3.7)	3.5	20 (3.1)	3.2
Eggs	283 (23.3)	24.8	79 (13.8b)	14.0b	204 (31.7a)	34.3a
Culinary ingredients	374 (30.7)	33.4	119 (20.7)	22.4	255 (39.7)	43.1
Processed foods	506 (41.6)	44.9	198 (34.5)	35.2	308 (47.9)	53.5
Ultra-processed products	1,112 (91.4)	92.6	518 (90.2)	89.2	594 (92.4)	95.6
Prepared meals	594 (48.8)	47.2	338 (58.9a)	58.6	256 (39.8b)	37.0

Note. Densities or percentages with different letters are significantly different between tracts with different socio-economic status for a significance level of 0.05.

450 **Table 3.** Distribution (percentage) of types of outlets selling different food groups, across all census tracts and separate

451 for tracts with different socio-economic status (SES).

Food group	Census tracts	Behind-the-counter grocery stores	Self-service grocery stores	Super-markets	Butchers' or poultry stores	Fish mon gers	Bars, restaurants or takeaways	Fruit and vegetable stores	Farmers' markets	Pharma-cies	Kiosks or candy shops	Bakeries	Street vendors	Ice cream stores	Other speciality stores	Other types of stores
Fruits and vegetables	All (n=106)	33.1	20.8	10.4	0.0	0.0	0.0	27.1	6.7	0.0	1.1	0.0	0.7	0.0	0.0	0.0
	Medium/high SES (n=50)	4.7	37.2	19.8	0.0	0.0	0.0	24.4	12.8	0.0	0.0	0.0	1.2	0.0	0.0	0.0
	Low SES (n=56)	46.4	13.1	6.0	0.0	0.0	0.0	28.4	3.8	0.0	1.6	0.0	0.5	0.0	0.0	0.0
Fresh meat	All (n=106)	21.2	19.5	20.3	29.7	0.0	0.0	0.0	9.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Medium/high SES (n=50)	2.6	15.4	33.3	28.2	0.0	0.0	0.0	20.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Low SES (n=56)	30.4	21.5	13.9	30.4	0.0	0.0	0.0	3.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pasteurized or powdered milk	All (n=106)	46.7	27.8	8.9	0.0	0.0	0.0	0.0	0.0	0.0	5.0	11.5	0.0	0.0	0.0	0.0
	Medium/high SES (n=50)	14.4	48.6	16.2	0.0	0.0	0.0	0.0	0.0	0.0	3.6	17.1	0.0	0.0	0.0	0.0
	Low SES (n=56)	62.6	17.6	5.3	0.0	0.0	0.0	0.0	0.0	0.0	5.7	8.8	0.0	0.0	0.0	0.0
Fish	All (n=106)	7.3	19.5	39.0	0.0	12.2	0.0	0.0	22.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Medium/high SES (n=50)	0.0	9.5	47.6	0.0	4.8	0.0	0.0	38.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Low SES (n=56)	15.0	30.0	30.0	0.0	20.0	0.0	0.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Eggs	All (n=106)	44.9	19.8	10.6	0.7	0.0	0.0	11.0	5.7	0.0	4.9	0.0	0.7	0.0	1.8	0.0
	Medium/high SES (n=50)	12.7	30.4	22.8	1.3	0.0	0.0	16.5	15.2	0.0	1.3	0.0	0.0	0.0	0.0	0.0
	Low SES (n=56)	57.4	15.7	5.9	0.5	0.0	0.0	8.8	2.0	0.0	6.4	0.0	1.0	0.0	2.5	0.0
Culinary ingredients	All (n=106)	50.3	30.2	8.3	0.0	0.0	0.0	0.0	4.8	0.0	6.1	0.0	0.3	0.0	0.0	0.0
	Medium/high SES (n=50)	17.6	53.8	16.0	0.0	0.0	0.0	0.0	10.1	0.0	2.5	0.0	0.0	0.0	0.0	0.0
	Low SES (n=56)	65.5	19.2	4.7	0.0	0.0	0.0	0.0	2.4	0.0	7.8	0.0	0.4	0.0	0.0	0.0
Processed products	All (n=106)	37.7	23.1	5.9	0.0	0.0	0.0	0.0	3.4	0.0	7.9	21.3	0.6	0.0	0.0	0.0
	Medium/high SES (n=50)	11.1	34.8	9.6	0.0	0.0	0.0	0.0	5.6	0.0	7.1	31.3	0.5	0.0	0.0	0.0
	Low SES (n=56)	54.9	15.6	3.6	0.0	0.0	0.0	0.0	1.9	0.0	8.4	14.9	0.6	0.0	0.0	0.0
Ultra-processed products	All (n=106)	18.3	11.0	2.8	2.9	0.4	27.1	5.6	1.6	3.6	12.2	7.2	0.8	1.8	2.2	2.5
	Medium/high SES (n=50)	4.2	13.9	3.7	1.7	0.2	40.5	2.1	2.3	4.2	10.8	8.9	0.6	1.5	2.7	2.5

	Low SES (n=56)	30.5	8.4	2.0	3.9	0.7	15.3	8.6	1.0	3.0	13.5	5.7	1.0	2.0	1.9	2.5
Prepared Meals	All (n=106)	11.1	10.1	5.1	0.0	0.0	50.7	0.0	1.2	0.0	2.4	16.7	1.9	0.0	1.0	0.0
	Medium/high SES (n=50)	1.8	10.7	5.3	0.0	0.0	62.1	0.0	0.6	0.0	1.5	16.6	0.3	0.0	1.2	0.0
	Low SES (n=56)	23.4	9.4	4.7	0.0	0.0	35.5	0.0	2.0	0.0	3.5	16.8	3.9	0.0	0.8	0.0

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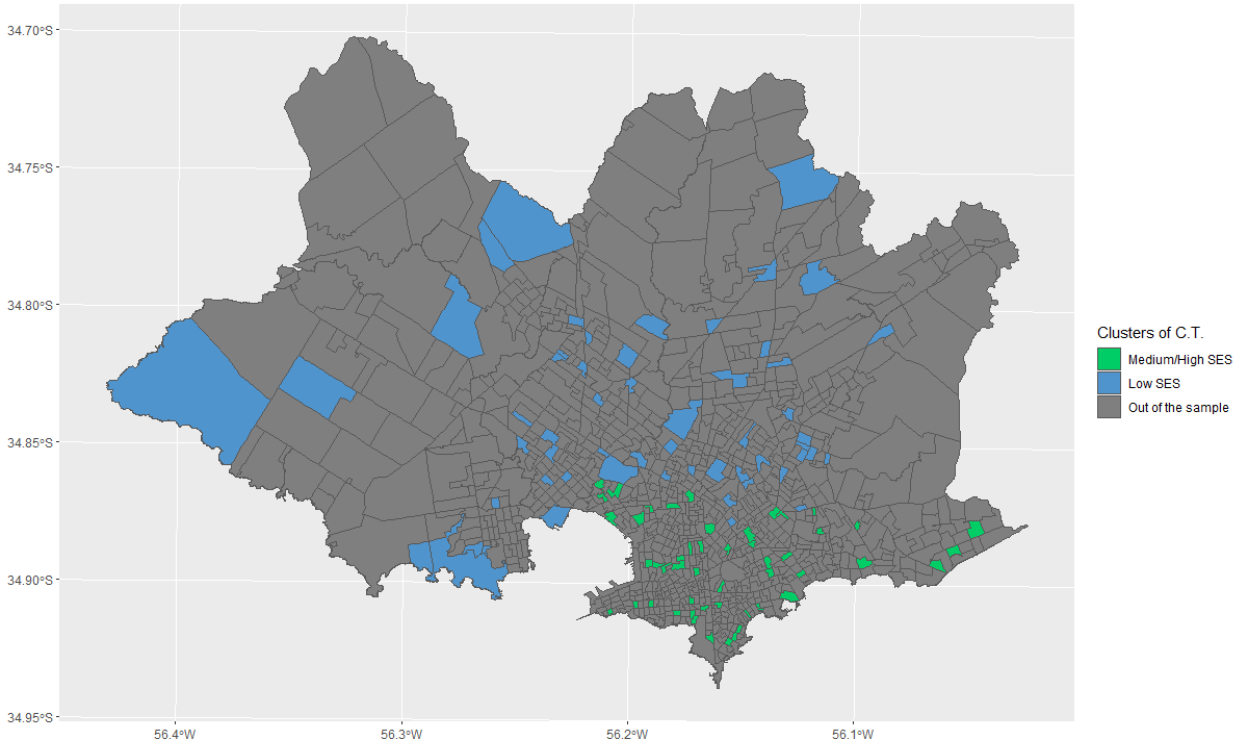
Figure 1. Location of the census tracts included in each of the clusters: Medium/high socio-economic status (n=50) and Low socio-economic status (n=56).



Supplementary Material

Table 1. Socio-economic characteristics of the census tracts of the sample (n=106).

Characteristic	Minimum	Mean	Maximum
Total area of the census tract (km^2)	0.0	0.6	18.8
Percentage of rural area in the census tract (%)	0.0	9.3	100.0
Number of private households in the census tract	0.0	470.1	2052.0
Total population in private households of the census tract	0.0	1220.3	5719.0
SES index of the census tract*	1.5	7.9	14.0
Mean years of schooling of adults of the household**	8.2	11.4	15.1
Per capita household income (USD)**	589.6	1067.8	1948.7
Car in the household (%)**	32.0	47.3	75.4
Motorcycle in the household (%)**	0.0	7.8	15.4
Households under the poverty line (%)**	0.0	8.5	24.5
Households in informal settlements (%)**	0.0	6.1	43.8
Dwellings connected to the drinking water network (%)**	99.4	99.9	100.0
Dwellings connected to energy power (%)**	99.9	100.0	100.0
Dwellings with adequate sewerage system (%)**	93.4	99.0	100.0
Dwellings with private space for cooking (%)**	88.7	98.1	100.0
Dwellings with wood stove used for cooking (%)**	0.0	0.2	0.9

* SES indexes of the census tracts were imputed from values of SES indexes for neighborhoods. In cases where one census tract was included in two or more neighborhoods, a simple average of the indexes was calculated.

** Statistics calculated for larger census areas (census sections), where census tracts are located.

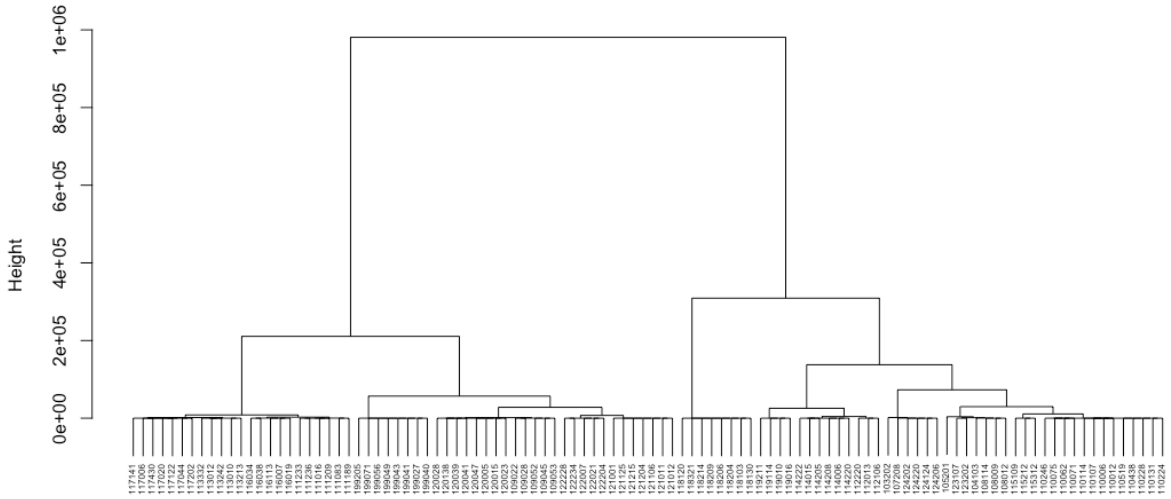



Figure 1. Dendrogram from the hierarchical cluster analysis of census tracts based on the characteristics presented in Table 1.