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Covid-19 pandemic: effects on the retail food environment in three different cities belonging to the metropolitan region of Belo Horizonte

Pandemia de Covid-19: efeitos no ambiente alimentar de varejo em três cidades da região metropolitana de Belo Horizonte

Abstract

Objective: Describing the retail food environment in the first year of Covid-19 pandemic. *Method*: Ecological study carried out in three different cities belonging to the metropolitan region of Belo Horizonte (MRBH). Data about retail food environment and Covid-19 pandemic were collected from secondary databases. The following variables were evaluated: establishments' opening and closing based on their type and category. Descriptive analysis (relative frequency) was performed in Stata 14.0 software; maps were plotted in QGIS 2.10.1 software. *Results*: Immediate-consumption food retailers were among establishments that have closed during the first year of the pandemic (Belo Horizonte, 76.53%; Betim, 69.95%; and Contagem, 70.87%). Nevertheless, the overall features of the retail food environment remained unchanged in all three investigated cities, which mostly presented high availability of ultra-processed food retailers. *Conclusion*: The Covid-19 pandemic had significant impact on immediate-consumption food retailers. However, it is still not possible measuring the long-term impact generated by it because this follow-up type requires identifying whether the food environment was remodeled, or not.

Keywords: Covid-19. Public health. Food. Food system

Resumo

Objetivo: Descrever o ambiente alimentar de varejo no primeiro ano da pandemia de Covid-19. *Método:* Estudo ecológico realizado em três cidades da região metropolitana de Belo Horizonte. Foram utilizados dados secundários, da Secretaria Estadual da Fazenda de 2020, do Instituto Brasileiro de Geografia e Estatística e da Secretaria Estadual de Saúde do Estado de Minas Gerais. Avaliaram-se as seguintes variáveis: abertura e fechamento de estabelecimentos que comercializavam alimentos segundo o tipo e categorias de estabelecimentos. Foi realizada análise descritiva (frequência relativa) com o auxílio do *software* Stata 14.0 e mapas com o uso do *software* QGIS 2.10.1. *Resultados:* Dentre os estabelecimentos que fecharam durante o primeiro ano de pandemia, a maioria comercializa alimentos para consumo imediato (Belo Horizonte 76,53%; Betim 69,95% e Contagem 70,87). Apesar disso, as características gerais do ambiente alimentar de varejo se mantiveram inalteradas nas três cidades, com alta disponibilidade dos estabelecimentos que comercializavam predominantemente alimentos ultraprocessados. *Conclusão:* A pandemia de Covid-19 impactou mais os estabelecimentos que comercializam alimentos para consumo

imediato. Contudo, ainda não é possível afirmar a dimensão do impacto gerado pela pandemia, para isso é necessário um acompanhamento a longo prazo para identificar se ocorre remodelação do ambiente alimentar.

Palavras-chave: Covid-19. Saúde pública. Alimentação. Sistemas Alimentares.

INTRODUCTION

Food environment is one of the components belonging to the food system.[1] It is integrated to the supply chain of different cities, given the way public policies are developed and influence retail food trading by shaping the food environment where consumers make purchasing-related decisions.[2] Furthermore, food environment is defined as the point of food acquisition by consumers.

Different factors can influence food environment, such as issues external to consumers and personal issues. Among external issues, one finds establishments/food availability, food price, regulatory and marketing measures, establishments' opening hours and product quality. On the other hand, personal issues are associated with establishments' accessibility, purchasing power, convenience and desirability of offered products.[1]

Small businesses and retail food trading stand out among the economic sectors mostly affected by the Covid-19 pandemic.[3] Some restrictive measures have been implemented to help reducing people's movement and crowding and, consequently, the outspread of the virus. These measures have led to the closure of, or have limited physical access to, the so-called nonessential establishments like some food retailers, mainly the ones accounting for selling food for immediate consumption, such as restaurants, cafeterias and pubs.[4-7]

Several uncertainties about the effects of, and impacts caused by, this global health emergency remain unsolved, even two years after the Covid-19 pandemic onset in many countries. Studies focused on investigating food environment have shown that fast changes have taken place at external retail-food environment dimensions, such as food availability, prices and suppliers, as well as at personal dimensions, like geographic access, affordability and convenience.[4-6]

Therefore, there is already scientific evidence warning about potentially negative changes associated with individuals' diet during the pandemic.[8-11] It is worth emphasizing that the Covid-19 health crisis has worsened the food and nutrition insecurity condition experienced by the population.[9] Moreover, restrictive measures imposed in the first pandemic year led to increased use of digital means for food purchasing purposes. These websites are known for having higher availability of unhealthy foods, and it can lead to increased consumption of such food types.[11]

Studies focused on investigating changes in the retail food environment in middle- and low-income countries - where the Covid-19 pandemic led to damages such as worsened health conditions, income losses, unemployment, interrupted education, and food and nutrition insecurity[12-20] - remain scarce.

Thus, the aim of the present study was to describe the retail food environment in the metropolitan region of Belo Horizonte City, Minas Gerais State, during the first year of Covid-19 pandemic.

METHODS

Study design and site

Ecological study conducted in the metropolitan region of Belo Horizonte, which comprises 34 municipalities. Belo Horizonte, Betim and Contagem (Figure 1) are the three largest cities in the region selected in the current study; altogether, they account for more than 50% of the RMBH population.

Figure 1. Investigated region

Subtitle
☐ Betim
☐ Contagem
☐ Belo Horizonte
☐ Belo Horizonte metropolitan region
☐ Minas Gerais
☐ Brazil
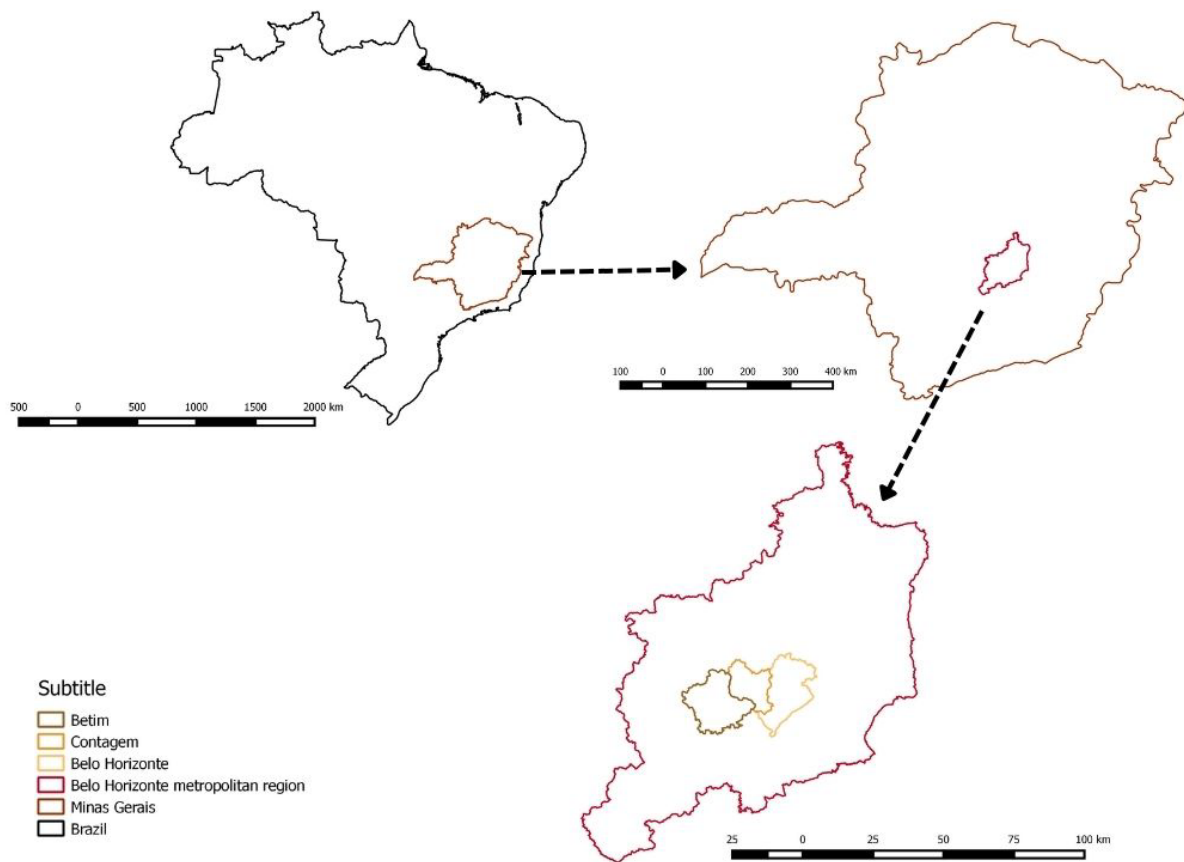
Source: elaborated by the authors

Cities' featuring

The herein investigated cities were described by taking into account their socio-demographic features, based on data provided by the Brazilian Institute of Geography and Statistics (IBGE - https://cidades.ibge.gov.br/). Variables used to feature these cities comprised city size, total population, population density, mean monthly income, employed population rate, and rate of population whose income reached up to half a minimum wage. In addition, information extracted from two indices, namely: Municipal Human Development Index (HDI) and Gini Index, was used in the current study.

HDI is an adaptation of the Global Human Development Index; it was calculated based on Demographic Census data. This indicator encompasses three different dimensions: longevity, education and income.[21] Gini Index accounts for assessing inequality in income distribution; this indicator ranges from 0 to 1. Values close to zero represent equality, whereas values close to one represent higher inequality.[22]

The investigated cities were also described by taking into account features of the Covid-19 pandemic, based on data made available by both State and Municipal Health Secretariats. The following data were used to describe the Covid-19 pandemic in these cities: quarters of 2020 recording the highest Covid-19 incidence; the quarter of 2020 when the largest number of Covid-19-related deaths was recorded; mean monthly number of Covid-19 cases, and the quarter of 2020 recording the highest incidence of trade-restrictive measures.

Retail Food Environment

Data about 2020 - made available by Minas Gerais State Department of Finance - were used to assess retail food environment features. The database comprised the following information about food-selling establishments: company's name, address, establishment status, opening date and establishment type. Establishments' status was classified as active or inactive; information about inactive establishments' inactivity date was also provided.

Information about establishment type was collected based on the purpose activity the establishment was registered for. It was done by following the classification set by the National Classification of Economic Activities (CNAE). The current study included the CNAE referring to the following establishments: non-stationary food vendors; butcher stores; pubs; beverage retailers; delivery, hypermarkets; fruit and vegetable stores; snack bars, dairy retailers; candy retailers; convenience stores; mini-markets; general food retailers; bakeries; fishmongers; restaurants, and supermarkets.

Food-selling establishments were classified based on the Mapping of Food Deserts set for Brazil: (1) establishments mostly trading fresh food (butcher stores, fishmongers and horticultural outlets), (2) establishments mostly trading ultra-processed food (snack bars, candy retailers, convenience stores and pubs); (3) mixed establishments (hypermarkets, restaurants, bakeries, dairies, food retailers in general, delivery, mini-markets, supermarkets and street vendors).[23]

In addition, establishments were analyzed based on their food acquisition and consumption profile; they were classified into establishments for immediate food acquisition and consumption (street vendors, pubs, delivery, snack bars, candy stores, convenience stores, bakeries, and restaurants) and establishments for food acquisition and consumption at home (butcher stores, beverage distributors, hypermarkets, grocery stores, dairies, mini-markets, overall food retailers, fishmongers and supermarkets). This categorization process was based on the description of each CNAE category and on previous studies.[24,25]

Data analysis

Descriptive analysis of retail food environment was conducted by taking into consideration food-selling establishments that opened and closed in 2020, in the three analyzed cities belonging to the metropolitan region of Belo Horizonte. Data about establishment type and categories were expressed as relative frequency.

Chi-square test was applied to compare differences in establishments' opening and closing rates. P value < 0.05 was adopted as significance level. Data analyses were conducted in QGis 2.14.9 and SPSS 19.0 software.

RESULTS

The three herein investigated cities have high HDI (> 0.700) and different population sizes: one of them is a metropolis (Belo Horizonte), one is a large city (Contagem), and one is a medium-sized city (Betim). Socioeconomic data have evidenced that among all three cities, Belo Horizonte accounts for the largest share of employed population (56.2%). Moreover, Contagem is the city presenting the lowest mean income, since its population earns 2.6 minimum wages, on average (Table 1).

Table 1. General features of the investigated cities. Minas Gerais State, Brazil, 2020.

	BELO HORIZONTE	BETIM	CONTAGEM
Size	Metropolis	Medium	Large
IDHM	0.810	0.749	0.756
Population (inhab.)	2,521,564	444,784	668,949
Population density (inhab./Km^2)	7,167	1,102.8	3,090.33
Average income(in minimum wages)	3..60	3.40	2.60
% employed population	58.2	26.3	32.1
% Population 1/2 wages	27.8	33.7	30.5
Gini index	0.42	0.36	0.37
Covid-19 pandemic			
Incidence rate (%)			
1st quarter	0.01	0.00	0.00
2nd quarter	0.21	0.16	0.12
3rd quarter	**1.41**	1.10	**1.18**
4th quarter	0.81	**1.12**	0.68
Total	2.44	2.38	1.98
Mortality rate (%)			
1st quarter	1.23	0.00	0.00
2nd quarter	2.57	**4.49**	**4.53**
3rd quarter	3.11	3.43	4.21
4th quarter	**3.17**	2.25	3.47
Total	3.08	2.94	3.97

Source: elaborated by the authors

Table 2 compares the distribution of establishments opened in 2020 to that of establishments closed in that year. Delivery-type establishments, snack bars and restaurants were the types that mostly opened and closed in that year, although the number of opened delivery-type establishments was larger than that of closed establishments in all three cities (p<0.05).

Betim was the only city showing difference in the proportion of establishments mainly selling fresh food (p = 0.0129). There was difference in the rate of opened mixed establishments between Belo Horizonte (p<0.0001) and Betim (p = 0.0364) cities. Finally, Belo Horizonte (p<0.0001) and Contagem (p=0.0005) cities recorded higher rate of closed establishments that mainly sold ultra-processed foods than Betim City (Table 2).

The comparison of establishments selling food for immediate consumption to those selling food for consumption at home has evidenced difference in the rate of opened and closed establishments in Belo Horizonte (p = 0.0035) and Contagem cities (p=0.0140) (Table 2)

Table 2. Featuring the community food environment during the first year of Covid-19 pandemic. Minas Gerais State, Brazil, 2020.

	BELO HORIZONTE			BETIM			CONTAGEM		
	Open	Closed	p	Open	Closed	p	Open	Closed	p
Ambulant	5.27	4.48	**0.0430**	5.12	4.49	0.5510	5.93	5.01	0.2641
Butcher shop	1.70	2.65	**0.0001**	1.95	3.45	0.0394	1.94	3.80	**0.0008**
Pub	5.58	7.70	**<0.0001**	5.36	5.70	0.7565	5.12	5.47	0.6569
Beverage retailer	5.77	5.05	0.0804	7.00	6.22	0.5182	7.88	4.82	**0.0008**
Delivery	24.28	15.41	**<0.0001**	21.07	15.20	**0.0022**	22.82	16.05	**<0.0001**
Hypermarket	0.00	0.07	**0.0068**	0.06	0.00	0.5525	0.07	0.09	0.8234
Horticultural products	3.97	3.45	0.1157	5.12	5.87	0.4853	5.72	4.92	0.3233
Snack bars	14.45	19.34	**<0.0001**	14.56	15.89	0.4383	13.10	17.25	**0.0009**
Dairy products	1.23	1.55	0.1083	0.85	1.73	**0.0143**	1.52	1.76	0.5859
Candy retailers	0.63	1.17	**0.0007**	0.18	1.55	**0.0001**	0.71	1.21	0.1272
Convenience store	0.12	0.02	0.0710	0.00	0.00		0.00	0.00	
Minimarkets	3.20	4.09	**0.0065**	5.05	5.35	0.7790	2.40	5.19	**<0.0001**
Food retailer in general	5.00	5.94	0.0193	5.24	5.53	0.7896	5.09	7.05	**0.0173**
Bakeries	10.41	8.89	**0.0047**	9.44	10.54	0.4442	10.24	10.20	0.9708
Fish market	0.18	0.27	0.2350	0.37	0.69	0.3146	0.35	0.37	0.9336
Restaurant	17.95	19.52	**0.0238**	18.27	16.58	0.3610	16.81	15.68	0.3922
Supermarket	0.26	0.39	0.1958	0.37	1.21	**0.0221**	0.28	1.11	**0.0011**
Establishments prevalently trading fresh food	6.20	6.72	0.2123	7.99	10.68	**0.0129**	8.70	9.55	0.2777
Mixed establishments	71.74	63.57	**<0.0001**	70.40	64.64	**0.0364**	70.74	65.30	0.0782
Establishments prevalently trading ultra-processed food	22.05	29.71	**<0.0001**	21.61	24.68	0.1211	20.55	25.15	**0.0005**
Immediate consumption	78.69	76.53	**0.0035**	74.00	69.95	0.0595	74.74	70.87	**0.0140**
Home consumption	21.31	23.47	**0.0035**	26.00	30.05	0.0595	25.26	29.13	**0.0140**

Source: elaborated by the authors

DISCUSSION

Establishments mainly selling fresh food, and those mainly selling ultra-processed food, were the types that have closed the most in the first year of Covid-19 pandemic. Moreover, all three investigated cities recorded a larger number of opened establishments aimed at selling ready-to-eat products to be consumed at home, such as delivery services.

Other studies conducted before the pandemic onset have evidenced prevalence of both mixed establishments and establishments that mainly sell ultra-processed food;[2,23,26] this finding was similar to that observed in 2020 (data not shown). These national scope studies[23] were conducted in metropolises such as Rio de Janeiro[2] and Belo Horizonte.[26] Moreover, another study conducted before the pandemic onset in Belo Horizonte City has shown increased number of establishments mostly selling ultra-processed food within a decade;[27] this finding may justify the maintenance of the overall features of the retail food environment, namely: high availability of unhealthy food establishments.

These changes in the retail food environment may have been intensified by strategies adopted to control the Covid-19 pandemic. Public food outlets were closed and physical access to establishments selling food for immediate consumption, such as restaurants and cafeterias, was restricted;[4,7] this process was identified in all three herein investigated cities.

Outlets selling ready-to-eat food were the ones mostly affected by restrictions put in place during the first year of Covid-19 pandemic. This outcome was expected since the pandemic affected urban population's mobility due to social distancing and isolation measures.[28,29]

On the other hand, supermarkets and hypermarkets were little affected by this pandemic. According to the Brazilian Supermarket Association, these establishments recorded significant increase in sales during the pandemic. This category has also intensified its online commerce; according to estimates, food purchase through digital platforms has increased by 900%. Fruits and vegetables stood out among the most purchased food types; they were followed by vegetables and chicken meat.[30]

Another factor that may have contributed for supermarkets to be little affected by the Covid-19 pandemic lies on the inclusion of these establishments in programs to combat Food and Nutrition Insecurity in several municipalities, as well as in the essential service category. For example, two supermarket chains in Belo Horizonte City delivered food baskets to students enrolled in public schools - this strategy was based on using resources from the National School Lunch Program.[31]

On the other hand, small businesses were significantly affected during the Covid-19 pandemic, mainly due to the economic crisis. A study focused on investigating food services has shown that most assessed outlets recorded sales' reduction by more than 50% in the second quarter of the Covid-19 pandemic (June-August 2020),[32] when restrictive measures were intensified. In addition, approximately 58% of the evaluated establishments applied for credit from financial institutions at different governmental levels. Yet, 64% of businesses have laid off employees - 37% of their staff was dismissed, on average.[32]

Moreover, the delivery category in all three investigated cities was the one recording the highest opening frequency. Previous studies have pointed out that retailers have made changes in the way they sell food to reduce the impact of restrictive measures associated with the Covid-19 pandemic.[11,33,34] Food purchase through delivery services was intensified.[35,36]

It is also noteworthy that the use of food delivery in Brazilian metropolises was already booming before the pandemic onset, since business owners were investing both in the use of food delivery apps (UberEats, IFood, Rappi) and in e-commerce.[35,36]

Thus, projections for food trading in the post-pandemic world point towards increase in the use of alternative food delivery means (drones and autonomous cars), as well as in the number of establishments only focused on producing food to be consumed at home.[37]

The present study has shown some limitations, such as using secondary data, which refer to cadastral update; therefore, temporality may have influenced the herein reported results. Data referring to neighborhoods' features were

extracted from the 2010 census, which was the latest one available. Nevertheless, the current research was the first one focused on investigating the immediate effect of the Covid-19 pandemic on the retail food environment in a middle- and low-income country. Another strength of it lies on the fact that it was conducted in three large cities, with different sociodemographic features, which adopted different Covid-19 pandemic control measures.

Therefore, it is possible concluding that the health crisis caused by the Covid-19 pandemic played important role in enhancing changes observed in the retail food environment. Furthermore, longitudinal studies are necessary to help tracking changes caused by, and the effects of, the Covid-19 pandemic, both during and after it..

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Contributors

Honório OS, Mendes LL, Holanda HSB, and Araújo ML have contributed to the drafting, planning and writing stages, as well as to data interpretation, critical review of the content, and approval of the final version of this manuscript. Honório OS, Araújo ML and Holanda HSB have contributed to data analysis and to the critical revision of the manuscript. Pessoa MC and Mendes LL have contributed to the critical revision of the manuscript

Conflict of Interest: The authors declare no conflict of interest.