Price and convenience: The influence of supermarkets on consumption of ultra-processed foods and beverages in Brazil

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ARTICLE INFO

ABSTRACT

Objective: To evaluate the influence of convenience and price of ultra-processed foods and beverages on purchases at supermarkets.
Methods: The study used data on food and beverage acquisition for household consumption from the Brazilian Household Budget Survey, performed in a random sample of 55,970 households between 2008 and 2009. Foods and beverages were categorized into four groups, according to characteristics of food processing. Retail stores were grouped into supermarkets and other food stores. Proportion of calories from foods and beverages purchased at supermarkets and other food stores, and respective mean prices (R$/1000 kcal), were calculated according to households' geographical and socioeconomic characteristics. Effect of convenience in household purchases at retail stores was expressed by the acquisition of several food items at the same store. The influence of convenience and prices of ultra-processed products on purchases at supermarkets was analyzed using log-log regression model with estimation of elasticity coefficients.
Results: The mean prices of foods and beverages purchased at supermarkets were 37% lower in comparison to other food stores. The share of ultra-processed foods and beverages in purchases made at supermarkets was 25% higher than at other food stores. An increase of 1% in prices of ultra-processed food items led to a 0.59% reduction in calorie acquisition at supermarkets ($R^2 = 0.75$; $p < 0.001$). On the other hand, an increase of 1% in the number of food items purchased at supermarkets resulted in 1.83% increase in calorie acquisition of ultra-processed foods and beverages ($p < 0.001$).
Conclusion: Convenience and lower relative prices of food items purchased at supermarkets, in comparison to other food stores, are relevant to explain higher share of purchases of ultra-processed foods and beverages at supermarkets.

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1. Introduction

The expansion of marketing and consumption of ultra-processed foods and beverages proceeds jointly with the increase in prevalence of overweight, obesity and other chronic diseases related to improper nutrition and insufficient physical activity in almost every country (Swinburn et al., 2011; Monteiro et al., 2013). Several studies point to potential connections between the current pandemic in noncommunicable diseases related to obesity and the recent changes in food production and distribution structures worldwide, especially due to intrinsic characteristics of ultra-processed food and beverage products that favor over-consumption: convenience, price and flavor. However, ultra-processed foods and beverages are also marked by low nutritional quality (Monteiro et al., 2013; Louzada et al., 2015a,b,c).

Changes in food supply systems are related to greater

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availability of ultra-processed food products in populations' diets, especially considering the rise of large supermarket chains and the concentration of household food acquisition at supermarket retail stores (Swinburn et al., 2011; Reardon & Timmer, 2012; Monteiro et al., 2013; Costa, Claro, Martins, & Levy, 2013; Gómez and Ricketts, 2013; Popkin, 2014; Stanton, 2015; Taillie, Ng, & Popkin, 2016). Besides the aggressive massive advertisement for ultra-processed products on the TV, magazines and other media platforms, consumers are constantly induced to purchase large volumes of ultra-processed foods and beverages at supermarkets through pricing policies, constant introduction of new products, promotions and elaborate marketing strategies involving priority placement that allows more exposure of those products on shelves, among other things (Hawkes, 2008; Reardon & Timmer, 2012; Stanton, 2015; Stern; Ng, & Popkin, 2015).

Price is considered a primary determinant of food demand (Andreyeva, Long, & Brownell, 2010) and a core factor leading consumers to replace traditional food retail stores with supermarket' (Hawkes, 2008; Caspi, Sorensen, Subramanian, & Kawachi, 2012; Gómez and Ricketts, 2013). Therefore, supermarket managers have pricing policies as one of the main strategies to influence consumers' decisions on what and how much to buy (Hawkes, 2008; Reardon & Timmer, 2012).

Technological improvements, increasing returns of scale in food industry production, and use of low-cost ingredients and food additives allowed reduction in prices per calorie of ultra-processed products (Moubarac et al., 2013; Popkin; Adair, & Ng, 2012; Ricardo & Claro, 2012; Wiggins et al., 2015), reinforced by longer shelflife and lower production losses due to high levels of sugars, refined starches, fats, salt and various additives (Monteiro et al., 2013; Popkin; Adair, & Ng, 2012).

In Brazil, ultra-processed foods and beverages are still expensive in comparison to unprocessed or minimally processed foods and processed culinary ingredients (Moubarac et al., 2013; Claro, Maia, Costa, & Diniz, 2016); however, the magnitude of price differences is dependent of the place of purchase (Farina; Nunes, & Monteiro, 2005; Hawkes, 2008). Moreover, relative prices of ultra-processed foods and beverages have been decreasing during the past 30 years compared to other food items in the Brazilian diet (Yuba, Sarti, Campino, & Carmo, 2013), an increase in relative prices of healthy foods that suggests the encouragement of obesogenic eating patterns (Wiggins et al., 2015).

Evidence shows that supermarket chains play an important role in the food retail scenario due to large-scale acquisition contracts negotiated with special conditions by using market power to drive prices of ultra-processed foods and beverages below prices usually charged by traditional retail outlets (Hawkes, 2008; Stanton, 2015; Taillie et al., 2016). A similar strategy is also applied to fresh foods; however, results for the latter are systematically inferior than for ultra-processed foods because of inherent characteristics of the products. Therefore, it supports the hypothesis that supermarkets have encouraged use of many ultra-processed foods by making them more purchases than fresh foods (Hawkes, 2008), especially in emerging countries (Gómez and Ricketts, 2013; Popkin, 2014).

Results from previous studies, using data from the Brazilian Household Budget Survey carried out between 2002-2003 and 2009–2009, showed that supermarkets have made major contributions to the household foods and drinks purchased in Brazil, especially those commonly described as ultra-processed (Costa et al., 2013; Machado, 2016). More widespread patronage of supermarkets is directly associated with greater use of ultra-processed foods, suggesting that convenience and price of ultra-processed foods and drinks at supermarkets explain their greater place in households. Thus, the study aims to evaluate the influence of convenience and prices of ultra-processed foods and beverages on the choice of foods purchased from supermarkets.

2. Material and methods

2.1. Database

Data on characteristics of household food purchases were gathered from the nationally representative 2008–2009 Household Budget Survey conducted by the Brazilian Institute of Geography and Statistics (IBGE) on a probabilistic sample of 55,970 Brazilian households. The survey used a complex clustered sampling procedure, with geographical and socioeconomic stratification of census tracts in the country, followed by two stage sample selection based on tracts and households.

In the sample selection, tracts of the 2000 Demographic Census were selected to obtain household strata with geographic and socioeconomic homogeneity, considering geographic location of the tracts (region, state, capital or other city, geographic locus, urban or rural setting) and spectrum of socioeconomic variation of households, based on educational attainment of the household head, resulting in formation of 550 household strata (IBGE, 2010).

2.2. Data collection

Household interviews were performed during one year period, in order to provide information on household budgets in different situations, including seasonal variations of food acquisitions, prices and income (IBGE, 2010). Data analyzed in the study includes records of foods and beverages bought for household consumption, during seven consecutive days for each household, registered by household members or trained interviewers (if necessary), including characteristics of food items purchased, the amount (in kilograms or liters), prices (in Brazilian currency, Reais, R$) and type of food retail stores visited (e.g. supermarket, small market, other food stores). Considering the short reference period used for recording household expenditures on food, the survey does not allow to identify usual patterns of food acquisition for each household interviewed. Therefore, the unit of analysis in the study are household strata, according to the survey sample design (IBGE, 2010).

2.3. Variables

Using food composition tables, the energy content (kcal) was calculated from the amount of foods and beverages bought by each household, excluding non-edible items (UNICAMP, 2004; USDA, 2009). Items consumed were categorized according to the new food classification system, which considers the extent and the purpose of industrial food processing into four groups (Monteiro et al., 2016):

1. Unprocessed or minimally processed foods (e.g. rice, beans, meat, milk, eggs, fruit, roots and tubers, vegetables, and flour);
2. Processed culinary ingredients (e.g. sugar, oils and fats, culinary products used to cook foods from the previous group);
3. Processed foods (e.g. processed breads and cheese, canned fruit and fish, and salted and smoked meats);
4. Ultra-processed foods and beverages (e.g. cookies, snacks, candy, frozen and ready meals and soft drinks).

The fourth group, which is focus of interest in the study, includes industrial formulations of substances extracted from foods or synthesized based on food substrates or other organic sources (Monteiro et al., 2016; Monteiro et al., 2017). Food items included within the four groups previously described referred to 35