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Prevalence of low-calorie sweeteners and related front-of-package claims in the Brazilian packaged food supply

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Abstract

Background—Low-calorie sweeteners (LCS) are increasingly being used worldwide, including in foods and beverages commonly consumed by children.

Objective—To examine the prevalence of LCS in packaged foods and beverages sold in Brazil, whether LCS are added to products with advertising directed to children, and whether foods and beverages with LCS include front-of-package (FoP) LCS-related health and nutrition claims.

Design—Cross-sectional study.

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Authors' contribution

Conceptualization, A.C.D., M.F.G., C.Z.R., L.S.T.; Methods, A.C.D., M.F.G., C.Z.R.; Formal Analysis, M.F.G., C.Z.R., A.C.D.; Writing – Original Draft Preparation, M.F.G. and A.C.D.; Writing – Review & Editing, A.C.D., C.Z.R., L.S.T., L.A.M.; Funding acquisition: A.C.D., L.S.T., A.P.B.M.

Conflict of interest disclosures

The authors declare that they have no competing interests.

Setting—A sample (n = 11,434) of packaged foods and beverages sold by the top five largest Brazilian food retailers was examined to identify LCS and added sugars and a subsample (n = 3,491) was used to determine the presence of advertising directed to children and FoP LCS-related claims in foods and beverages with LCS.

Main outcome and measures—The prevalence of foods and beverages with different types of LCS in the Brazilian food supply, among ultra-processed foods and beverages and among foods and beverages with added sugars were measured. Foods and beverages with advertising directed to children were checked to see if these products had LCS, and how many products with LCS had FoP labels with LCS-related claims.

Statistical analyses—Mean and 95% confidence intervals were used to determine the overall prevalence of foods and beverages with LCS and in the different assessed stratifications.

Results—The prevalence of LCS was 9.3% (95% CI 8.8, 9.9) in Brazilian packaged foods and beverages, 14.6% (95% CI 13.8, 15.4) in ultra-processed products alone, and 5.7% (95% CI 4.2, 7.7) in foods and beverages with advertising directed to children. About 83% of food and beverage with LCS were also sweetened with added sugars. LCS were most frequently added to nonalcoholic sweetened beverages, breakfast cereals, and granola bars. Forty percent of foods and beverages with LCS did not present any front-of-package LCS-related claim.

Conclusion—This study shows that LCS are present in 15% of ultra-processed foods and beverages in Brazil, largely used in combination with added sugars, and are found in foods and beverages with advertising directed to children. Clearer FoP information on the presence of LCS, in particular in products with advertising directed to children, can help consumers make more informed choices regarding LCS consumption.

Keywords

Low-calorie sweeteners; Food marketing; Children; Claims; Labeling; Packages; Advertising

1. Introduction

Low-calorie sweeteners (LCS) are substances that give foods a sweet taste. They can be classified into artificial or natural according to the origin of the molecule.^{1,2} However, this classification is used only for comparative purposes. Both artificial and natural LCS are obtained through biotechnological processes on a commercial scale³. LCS often replace added sugars to reduce the calorie and/or sugar content of foods or beverages.^{1,3}

Despite their increased and widespread use,⁴⁻⁶ whether LCS consumption is associated with better health outcomes is yet to be entirely understood.^{7,8} Among children, some studies show no association between LCS consumption and health effects⁷, while others show that the consumption of foods and beverages with LCS may decrease their risk of developing communicable diseases as adults.⁹ During childhood, consuming foods and beverages with LCS can also shape taste preferences for sweetened foods that persist through adulthood.¹⁰

To help reduce obesity and other diet-related diseases, many governments, both local and federal, have implemented policies, such as sugar-sweetened beverage (SSB) taxes,¹¹⁻¹³ taxes on selected ultra-processed foods¹⁴ (defined as formulated products that experience

food processing such as fractioning of whole foods into substances, chemical modifications of these substances, and with frequent use of cosmetic additives¹⁵), front-of-package (FoP) warning labels and marketing restrictions.^{16,17}

These policies are associated with reductions in sales or consumption of SSB and/or product reformulation to decrease the content of added sugars in packaged foods and beverages.¹⁸ However, such potential reformulation practices can lead to an unwanted increased use of LCS. ¹⁹ Found in packaged foods and beverages sold worldwide, LCS seem to be more frequently used in foods and beverages sold in low- and middle-income countries, such as Brazil,⁶ Mexico,⁵ and Chile.²⁰ Moreover, despite the little information available in the literature on the presence of LCS in foods and beverages directed to children, LCS can be found in products such as nectars and juice drinks, flavored milks, and dairy deserts²⁰ that are advertised to and consumed by children.²¹

Clear information on the nutrient content and ingredients of packaged foods and beverages can help consumers make more informed choices.²² In Brazil, evidence shows the importance of regulating foods and beverages with advertising directed to children as industry self-regulation strategies have not resolved ethical transgressions on that matter.²³ Similar to US regulations,¹ in Brazil, the upper threshold levels are established for each LCS even though different types of LCS can be combined in the same product.²

In addition, the information on the presence of LCS in Brazil and many other countries is only mandatory in the list of ingredients, which is usually found in the back or the side of a package in technical terms.²⁴ In the absence of effective FoP regulations, health and nutrition claims for reduced added sugars or calorie content can mislead consumers to believe the products are healthy.²⁵ These claims are found on foods and beverages with high contents of added sugars, saturated fat, and sodium.²⁵

Because LCS consumption is increasing in the general population, including among children,^{26,27} along with the lack of an easy-to-understand FoP nutritional labeling for LCS that help consumers make more informed choices at the point of purchase,²⁸ a better understanding of the distribution of LCS in the food supply, particularly in foods and beverages with advertising directed to children, can inform policies that mitigate a potential increase in LCS use.

This study examined the prevalence of LCS in a large sample of packaged foods and beverages sold in Brazil, including in foods and beverages with advertising directed to children. The prevalence of FoP LCS-related health and nutrition claims on foods and beverages with LCS was also assessed.

2. Materials and methods

Database of Brazilian foods and beverages

This cross-sectional study used information from the 2017 Brazilian Food Labels Database concerning 11,434 foods and beverages that the five largest food retailers in Brazil sold.⁶ Annual food retail sales were used to identify the five supermarket chains with the largest

market shares.²⁹ The largest city in Brazil, São Paulo in the Southeast region of the country, was chosen as the primary study area. Because one of the top five retailers was only present in the Northeast of the country, data collection was held in Salvador, their largest market.

Information on the locations of all the stores of the selected retailers was collected from companies' websites and/or customer service sites, and then geocoded. Stores' locations were classified in low, middle, and high income using their neighborhood income. For that, firstly a one-kilometer buffer (Euclidean distance) was chosen to determine the neighborhood of each store. Information from the mean household top earner income from the 2010 Brazilian Population Census³⁰ in each buffer was used and stores were classified into tertiles of mean neighborhood income. The largest stores (in square meters) of each one of the top five retailers in the country were selected in the bottom and top tertiles of neighborhood income. One of the retailers' chains, however, only allowed data collection in its distribution center.

Between April and July 2017, trained fieldworkers collected data using the methods Kanter et al. (2017)³¹ proposed. All packaged foods and beverages were included, except alcoholic beverages, nutrition supplements, and infant formulas or breast milk substitutes, yielding a total of around 13,000 items. The fieldworkers photographed all sides of the packages.

Trained nutritionists then entered food composition information available in the nutrition facts panel, package size, list of ingredients, and instructions for reconstitution in the online platform website "Research Electronic Data Capture" (Redcap)³² using a previously tested template.³¹ Items available in more than one package size, products without the nutrition facts panel, multipacks with different items, products without a list of ingredients, and products with missing values for portion sizes and/or calories were excluded, resulting in a sample of 11,434 foods and beverages.

Low-calorie sweeteners and added sugars

Low-calorie sweeteners and added sugars in foods and beverages were identified with a keywords-based search of the lists of ingredients and LCS that the US Food and Drug Administration and the Brazilian Health Regulatory Agency (*Agência Nacional de Vigilância Sanitária*) had approved for consumption^{1,2} were classified into three types¹⁻³: natural nonnutritive sweeteners (NNS), artificial NNS, and sugar alcohols. Natural NNS included thaumatin and steviol. Artificial NNS included acesulfame potassium, aspartame, cyclamate, saccharin, sucralose, and neotame. Sugar alcohols, a class of polyols, included sorbitol, mannitol, isomalt, maltitol, lactitol, xylitol, and erythritol. Added sugar, honey, syrups, molasses, maltodextrin, glucose, fructose, and concentrated fruit and vegetable juices were considered added sugars along with ingredients such as chocolate and '*dulce de leite*'.

Advertising directed to children and front-of-package low-calorie sweeteners-related claims

Information on advertising directed to children and FoP LCS-related claims were gathered from a random subsample of approximately 30% of the 11,434 products. The subsample was proportionally drawn from each of the 128 food and beverage groups, yielding 3,491 products. No statistical difference was found for food composition when comparing the

subsample from which advertising directed to children and FoP claims were gathered with the overall sample of foods and beverages.⁶

The taxonomy of claims and packaging advertising proposed by the International Network for Food and Obesity/Non-communicable Diseases Research, Monitoring, and Action Support (INFORMAS) were employed for advertising directed to children and FoP health and nutrition LCS-related claims. The INFORMAS framework help researchers to monitor food environments in a standardized way over time and make cross-country comparisons.³³

A food or beverage was considered as directed to children if the label included at least one of the following marketing strategies: cartoon characters, amateur or famous sportspersons or teams, celebrity figures, movie tie-ins, events or festivals, words and phrases such as “for kids” or “great for school lunches,” awards such as toys and prizes, and sports events.³⁴

As in Brazil information on the presence of LCS is only mandated in the list of ingredients,²⁵ which is usually found on the sides or the back of the package, information on the presence of FoP health and nutrition claims that could help consumers recognize that a given product has LCS were coded. These included claims signaling the presence of natural and artificial sweeteners and those declaring reduced added sugars or calorie content, such as ‘low sugar’, ‘sugar free’, ‘light’, ‘diet’, among others.³³ All information (text, number, and images) on the front label were coded as a nutrition claim except for the lists of ingredients and the nutrition facts panel.³³

Food and beverage categories

From the 128 food and beverage groups used to draw the subsample, products were classified into 22 categories: bakery products; breakfast cereals and granola bars; canned vegetables; convenience foods; candies and desserts; cereals, beans, and other grain products; cookies; cheeses; fruit preserves; meats, poultry, seafood, and eggs; nuts and seeds; oils and fats; packaged fruits and vegetables; processed meats; salty snacks; sauces and salad dressings; fruit-flavored drinks (industrialized juices, powdered juices); juices (natural juices); nectars (fruit juices with 20–30% pulp); sodas (carbonated drinks); dairy beverages (sweetened yogurt, fermented drinks, milk, powdered milk); and other beverages (sports drinks, plant-based beverages, etc.).

Reliability analysis

Information on 10% of the overall sample was entered twice for test-retest and inter-rater reliability analyses.³⁵ Data were double entered for the entire subsample (n = 3,491) and Cohen’s kappa coefficient was used to assess inter-rater and test-retest reliability of FoP LCS-related claims and advertising directed to children information.^{36,37} Strong reliability was found for claims for reduced added sugars and reduced calorie content (Cohen’s kappa coefficient = 0.93 and 0.92 for inter-rater and test-retest reliability, respectively). Claims for the presence of LCS also had good reliability (Cohen’s kappa coefficient = 0.80). For advertising directed to children, inter-rater reliability was 0.87, and test-retest was 0.78.

Analysis

Descriptive statistics with 95% confidence intervals (CIs) were used to assess the prevalence of LCS in the overall Brazilian packaged food and beverage supply by LCS type, among ultra-processed products, and among foods and beverages with added sugars. Then, the prevalence of foods and beverages with LCS or with a combination of LCS and added sugars were depicted in the total sample and in the subsample of products with advertising directed to children. Finally, still using the subsample, products with LCS that had any LCS-related claims on the FoP were identified. Analyses were performed with Stata/MP 16.1, College Station, TX: StataCorp LLC.

Ethics

This study does not meet the criteria for human subject research and was exempt from institutional board review.

3. Results

In this sample of 11,434 packaged foods and beverages sold in Brazil, 9.3% (95% CI 8.8, 9.9) had at least one type of LCS (Table 1). Of the 7,309 ultra-processed products available (63.9% of the sample), 1,023 (14.6%; 95% CI 13.8, 15.4) were sweetened with LCS. Added sugars were found in half of the sample (n=5,774). Of those, 847 (15.0%; 95% CI 14.1, 15.9) also had LCS (Table 2).

NNS were found in 7.7% (95% CI 7.2, 8.2) and sugar alcohols in 3.4% (95% CI 3.1, 3.7) of the overall sample. Table 1 shows that the most prevalent type of LCS was sucralose (4.2%), followed by acesulfame potassium (4.0%). Among the products with LCS, 15.3% (95% CI 13.2, 17.5) had a combination of artificial NNS and sugar alcohols, 4.3% (95% CI 3.2, 5.7) had a combination of natural NNS and sugar alcohols, 1.1% (95% CI 0.6, 2.0) had a combination of natural and artificial NNS, and 0.9% (95% CI 0.5, 1.7) had a combination of the three types of LCS.

Fifteen of the food and beverage categories had LCS or a combination of LCS and added sugars in their ingredients list. The prevalence of LCS and the combination of LCS with added sugars in foods and beverages by food category are shown in Table 3. In the overall sample, LCS were found in 30.1% (95% CI 27.9, 32.3) of nonalcoholic beverages and 5.4% (95% CI 4.9, 5.8) of foods (Table 3). These numbers corresponded to 10.1% (95% CI 5.8, 16.9) and 4.8% (95% CI 3.4, 7.0) of nonalcoholic beverages and foods, respectively, with advertising directed to children.

In the overall sample, almost 70.0% (95% CI 62.7, 74.8) of fruit-flavored drinks had LCS. LCS were also present in 44.3% (95% CI 35.2, 53.9) of sodas, 27.1% of dairy beverages (95% CI 23.3, 31.3), and 32.5% (95% CI 27.5, 37.9) of breakfast cereals and granola bars (Table 3). Among foods and beverages with advertising directed to children, 5.7% (95% CI 4.2, 7.7) had LCS. The prevalence of LCS in dairy beverages (13.8%, 95% CI 6.4, 27.8), candies and desserts (20.4%; 95% CI 13.6, 29.5), and bakery products (16.1%; 95% CI 6.9, 33.4) with advertising directed to children was similar to the prevalence rates found in the overall sample of products.

The combination of LCS and added sugars was found in 7.5% (95% CI 7.1, 8.1) of the overall sample and 5.3% (95% CI 3.8, 7.2) of the products available in the subsample of products in which information on advertising to children was coded (Table 3). In fact, of all the foods and beverages with LCS, 82.8% also had added sugars.

Figure 1 shows the prevalence of foods and beverages with advertising directed to children with LCS compared to those without LCS. Although most foods and beverages with advertising directed to children were not sweetened with LCS, the proportion of LCS is close to 30% in some categories such as fruit-flavored drinks (28.6%; 95% CI 7.2, 67.4) and other beverages (26.7%; 95% CI 10.4, 53.4).

Of the products with LCS in the subsample (n = 310), 43.2% (95% CI 37.8, 48.8) did not have a claim for the presence of natural or artificial sweeteners or a nutrition claim for reduced sugar and/or calorie content. In addition, 78.3% of bakery products, 68.6% of dairy beverages, and 46.0% of fruit-flavored drinks did not have any FoP LCS-related claims (Figure 2).

4. Discussion

Using a large sample of packaged foods and beverages sold in Brazil's top five largest food retailers, LCS were found in 9% of the total sample, and in 15% of ultra-processed foods. More than 80% of foods and beverages with LCS also had added sugars, and 40% of all foods and beverages with LCS did not have any FoP LCS-related claim, such as 'presence of natural sweeteners' or claims for reduced content of added sugars and/or calories. In addition, LCS were found in 6% of foods and beverages with advertising directed to children.

These results are consistent with those reported in Mexico where 11% of foods and beverages had LCS but are greater than that reported in the US (4%), New Zealand (1%), and Australia (< 1%).⁵ About 15% of foods and beverages with added sugars in Brazil had LCS. In Chile, 55% of foods likely to have a high content of total sugars were also sweetened with LCS.²¹ Additionally, Brazilian foods and beverages were found to have more than one type of LCS, which are combined to achieve greater sweetness.³ Sucralose and acesulfame potassium were the most prevalent LCS found in the Brazilian food supply. A survey conducted in a single supermarket in Florianopolis, Brazil in 2013 showed that 13.0% of the 4,539 surveyed foods and beverages had one or more types of LCS³⁸, with acesulfame potassium, sucralose, and aspartame most often used.³⁸ In Chile, sucralose and steviol are more commonly found.²⁰

As observed elsewhere^{39,40}, LCS were more often found in beverages (30%) than in foods (5%). Most fruit-flavored drinks (69%), almost half of all sodas (44%), and over a quarter of dairy beverages (27%) sold in Brazil had LCS. Breakfast cereals, granola bars, candies and desserts had the greatest proportions of LCS in foods. Beverages and candies account for a great percentage of the total energy consumption from ultra-processed foods among Brazilians.⁴¹

Despite been originally developed to replace added sugars in foods and beverages,⁴² many of the assessed sweetened dairy and non-dairy beverages and breakfast cereals were sweetened with both LCS and added sugars, including in those items with advertising directed to children. In Mexico, 57% of SSB with advertising directed to children were sweetened with LCS.⁴³ Advertising to children on food labels can lure adults and children⁴⁴ and is associated with the consumption of these foods.⁴⁵ Consumption of LCS by children is discouraged by experts.¹⁰ Parents also agree that LCS may not be safe for children but are often unable to identify which foods and beverages are sweetened with LCS.⁴⁶

Mandated information on the presence of LCS with technical terms²⁵ in the list of ingredients, usually found on the back or the side of a food or beverage package, may be inadequate to explicitly inform consumers that LCS are one of the additives used. Because FoP information regarding LCS is not mandated in Brazil, products with LCS were checked for the presence of LCS-related nutrition and health claims. About 40% of foods and beverages with LCS in the Brazilian food supply did not present any information to help cue consumers to their presence.

Countries where nutrition labeling regulations are under scrutiny should extend the implementation of FoP nutritional labeling to include warning signs for LCS²⁸ following the recently approved labeling regulation in Mexico.²⁸ Aware of the unintended increase in LCS use that can result from reformulating ultra-processed foods to replace or reduce added sugars,⁴⁷ Mexican authorities approved a FoP warning label that signals consumers that LCS have been added to a given product. In Chile, the implementation of FoP warning labels for total sugars and calories, but not for LCS, has been associated with a reduction in the added sugar content in labeled products,¹⁸ and increased use of LCS from 37.9 to 43.6%, driven mostly by increases in sucralose and stevia use.⁴⁸ Unsurprisingly, such increase was more likely to happen in foods and beverages that had their sugar content reduced to below the law's cutoff points.⁴⁸ In Chile, consumption of foods and beverages with LCS was frequent among children before FoP warning labels were first adopted, and is expected to rise.⁴⁷

Furthermore, adding a FoP warning label for the presence of LCS to foods and beverages can contribute to the development of public policies targeting ultra-processed foods with LCS, such as regulation of health and nutrition claims,⁴⁹ ban on the sales of those products in schools and nurseries, and advertising restrictions.⁵⁰ Prioritizing policies that target children's food environments is supported by a recent body of evidence that shows that LCS consumption is associated with adverse health outcomes in children^{51,52} and that concentrations associated with changes in gut microbiota⁵³ may be lower for children than the recommended values enacted by regulatory bodies.

Findings of this study are also relevant to dietitians when providing nutrition education and helping clients become aware of the availability of LCS in foods and beverages that are not easily identified as 'light', 'diet' or 'with reduced sugar or caloric content' and often advertised to children. The results highlight the need for dietitians and other health professionals to educate consumers on how to best use food labels to make informed choices at the point of purchase and advocate for clearer FoP LCS information.

This study has limitations. First, the reported prevalence of LCS in foods was not weighed by the extent to which different food categories contribute to the overall dietary intake in Brazil. However, a sample of over 10,000 items from the five top selling grocery retailers in the country allowed us to estimate the prevalence of LCS in the national packaged food supply.

Second, the prevalence of advertising directed to children and FoP LCS-related claims was only assessed in a random subsample of products with similar nutritional composition to the overall sample. Finally, because food companies are not required to report the quantity of LCS in most categories of packaged foods and beverages sold in Brazil, this information could not be assessed.

The strengths of this study include the sample that incorporated foods and beverages sold in the top-selling retailers of the country and found in low- and high-income neighborhoods. It is also the first study to examine the presence of LCS in such a large sample of packaged foods sold in Brazil. Last, previously tested methods to identify foods and beverages with advertising directed to children were employed.²⁹

5. Conclusion

In conclusion, LCS were found in almost 10% of a large sample of packaged foods and beverages sold in Brazilian top grocery food retailers. Among ultra-processed products alone, 15% had LCS as one of their additives and many of them also had added sugars and/or advertised to children. Moreover, 43% of these did not have any FoP LCS-related claims that could help consumers pinpoint that LCS were added to a given food or beverage. Efforts to improve nutritional labeling across the world should require easy-to-understand LCS FoP information to help consumers make more informed decisions of their own as well as their children's LCS consumption. Such measures to prevent unintended long-term health consequences related to LCS consumption are particularly important for foods and beverages commonly consumed by and with advertising directed to children and adolescents.

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Research snapshot

Research Question:

What is the prevalence of low-calorie sweeteners (LCS) in the Brazilian packaged food supply, and how is this information communicated to consumers on food package labels?

Key Findings:

In this sample of over 11,000 packaged foods and beverages sold in Brazil, 9.3% of all products and 14.6% of the ultra-processed products had LCS. LCS were also present in 5.7% of products with advertising directed to children, and 40% of foods and beverages with LCS did not present any front-of-package LCS-related claim.

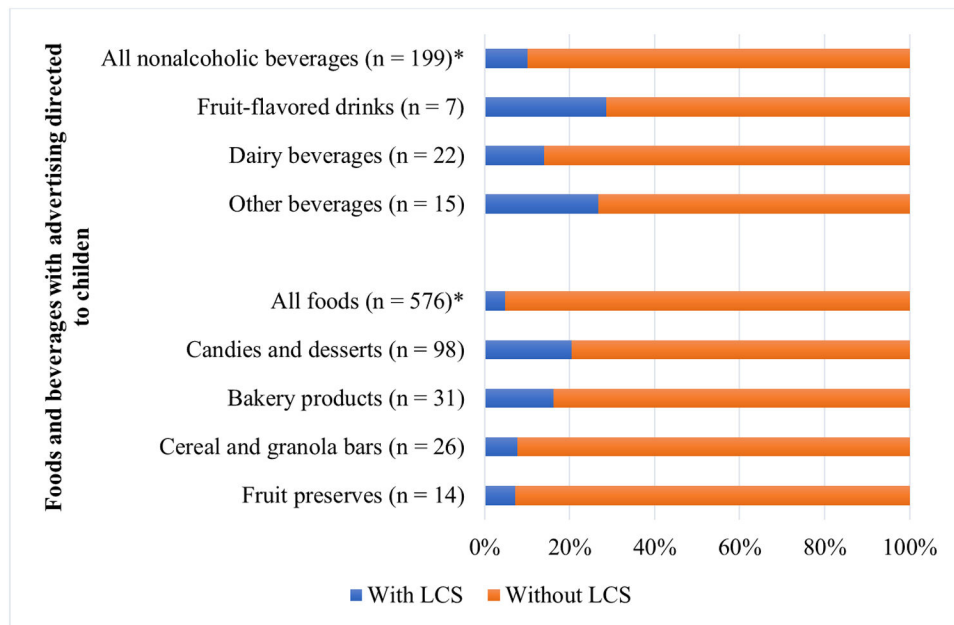


Figure 1. Prevalence of low-calorie sweeteners (LCS) in Brazilian packaged foods and beverages with advertising directed to children (n = 699), 2017
Abbreviations: LCS, low-calorie sweeteners.
* Food and beverage categories with no products containing LCS are not included in the figure.

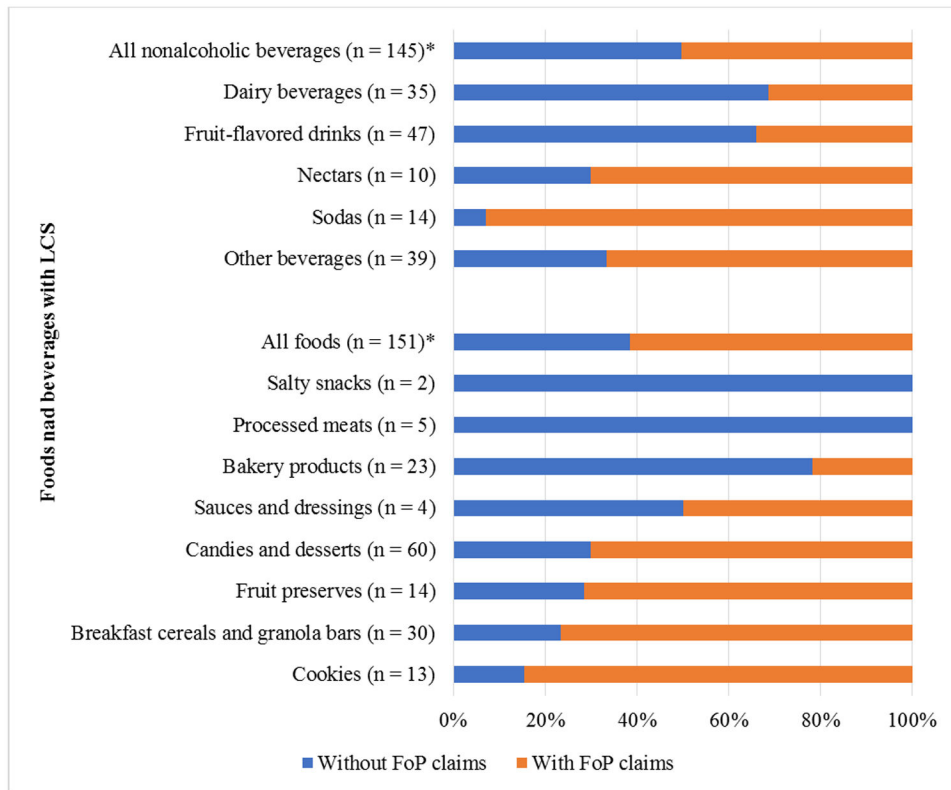


Figure 2. Prevalence of FoP low-calorie sweeteners (LCS)-related health and nutrition claims on Brazilian foods and beverages containing LCS in the subsample (n = 310), 2017. Abbreviations: LCS, low-calorie sweeteners; FoP, front-of-package. *Food and beverage categories with no products containing FoP claims are not included in the figure.

Table 1.

Prevalence of low-calorie sweeteners (LCS) in Brazilian packaged foods and beverages (n = 11,434), 2017

LCS	N	%	95% CI	
Natural NNS	82	0.7	0.6	0.9
Steviol	70	0.6	0.5	0.8
Thaumatococin	12	0.1	0.1	0.2
Artificial NNS	821	7.2	6.7	7.7
Sucralose	484	4.2	3.9	4.6
Acesulfame potassium	455	4.0	3.6	4.4
Cyclamate	301	2.6	2.4	2.9
Aspartame	275	2.4	2.1	2.7
Saccharin	264	2.3	2.1	2.6
Neotame	10	0.1	0.1	0.2
Sugar alcohols	386	3.4	3.1	3.7
Sorbitol	282	2.5	2.2	2.8
Maltitol	138	1.2	1.0	1.4
Isomalt	17	0.2	0.1	0.2
Mannitol	12	0.1	0.1	0.2
Erythritol	10	0.1	0.1	0.2
Xylitol	9	0.1	0.0	0.2
Lactitol	3	0.0	0.0	0.1
Total LCS	1,068	9.3	8.8	9.9

Abbreviations: LCS, low-calorie sweeteners; CI, confidence interval; NNS, nonnutritive sweeteners.

Table 2.

Prevalence of low-calorie sweeteners (LCS) in ultra-processed foods (n = 7,309) and in foods and beverages with added sugars (n = 5,774) sold in the largest Brazilian supermarket chains, 2017.

	Ultra-processed foods and beverages			Foods and beverages with added sugars		
	N (%)	95% CI		N (%)	95% CI	
Nonalcoholic beverages	505 (38.5)	36.0	41.2	415 (35.7)	33.0	38.5
Fruit-flavored drinks	152 (69.7)	63.3	75.5	152 (72.0)	65.6	77.7
Other beverages	138 (53.1)	47.0	59.1	101 (48.7)	42.1	55.6
Sodas	47 (44.8)	35.6	54.4	31 (36.4)	27.0	47.2
Dairy beverages	131 (27.5)	23.7	31.7	101 (22.3)	18.7	26.4
Nectars	37 (25.5)	19.1	33.2	30 (20.4)	14.7	27.7
Foods	518 (8.7)	8.0	9.5	432 (9.4)	8.6	10.3
Breakfast cereals and granola bars	100 (35.6)	30.2	41.4	97 (33.8)	28.6	39.5
Candies and desserts	226 (19.2)	17.1	21.6	182 (15.7)	13.7	17.9
Fruit preserve	43 (17.2)	13.0	22.4	20 (6.3)	4.1	9.6
Bakery products	77 (14.4)	11.7	17.7	74 (14.7)	11.9	18.1
Nuts and seeds	1 (6.2)	0.9	33.6	1 (6.7)	0.9	35.2
Cookies	41 (5.5)	4.2	7.6	36 (5.1)	3.7	7.0
Sauces and salad dressings	12 (2.0)	1.2	3.5	6 (1.2)	0.6	2.8
Processed meats	8 (1.3)	0.7	2.6	6 (1.3)	0.6	3.0
Convenience foods	8 (1.2)	0.6	2.3	8 (2.1)	1.1	4.2
Salty snacks	2 (0.6)	0.2	2.6	2 (1.1)	0.3	4.4
Total	1023 (14.61)	13.8	15.4	847 (15.0)	14.1	15.9

Table 3. Brazilian packaged foods and beverages with low-calorie sweeteners (LCS) or a combination of LCS and added sugars in the overall sample and in products with advertising directed to children, 2017

	Overall sample (n = 11,434)						Products with child-directed advertising (n = 699)					
	LCS		LCS + added sugars		LCS		LCS + added sugars		LCS		LCS + added sugars	
	N (%)	95% CI	N (%)	95% CI	N (%)	95% CI	N (%)	95% CI	N (%)	95% CI	N (%)	95% CI
Nonalcoholic beverages	505 (30.1)	(27.9, 32.3)	415 (24.7)	(22.7, 26.8)	12 (10.1)	(5.8, 16.9)	11 (9.2)	(5.2, 15.9)	11 (9.2)	(5.2, 15.9)	2 (28.6)	(7.2, 67.4)
Fruit-flavored drinks	152 (69.1)	(62.7, 74.8)	152 (69.1)	(62.7, 74.8)	2 (28.6)	(7.2, 67.4)	2 (28.6)	(7.2, 67.4)	2 (28.6)	(7.2, 67.4)	0 (0.0)	(0.0, 0.0)
Sodas	47 (44.3)	(35.2, 53.9)	31 (29.2)	(21.4, 38.6)	0 (0.0)	(0.0, 0.0)	0 (0.0)	(0.0, 0.0)	0 (0.0)	(0.0, 0.0)	5 (11.6)	(4.9, 25.1)
Dairy beverages	131 (27.1)	(23.3, 31.3)	101 (20.9)	(17.5, 24.8)	6 (13.8)	(6.4, 27.8)	5 (11.6)	(4.9, 25.1)	5 (11.6)	(4.9, 25.1)	0 (0.0)	(0.0, 0.0)
Nectars	37 (23.1)	(17.2, 30.3)	30 (18.8)	(13.4, 25.6)	0 (0.0)	(0.0, 0.0)	0 (0.0)	(0.0, 0.0)	0 (0.0)	(0.0, 0.0)	4 (26.7)	(10.4, 53.4)
Other beverages	138 (48.3)	(42.5, 54.0)	101 (35.3)	(30.0, 41.0)	4 (26.7)	(10.1, 53.4)	4 (26.7)	(10.1, 53.4)	4 (26.7)	(10.1, 53.4)	26 (4.5)	(3.1, 6.5)
Foods	518 (5.4)	(4.9, 5.8)	432 (4.5)	(4.1, 4.9)	28 (4.8)	(3.4, 7.0)	26 (4.5)	(3.1, 6.5)	26 (4.5)	(3.1, 6.5)	2 (7.7)	(1.9, 26.1)
Breakfast cereals and granola bars	100 (32.5)	(27.5, 37.9)	97 (31.5)	(26.5, 36.9)	2 (7.7)	(1.9, 26.1)	2 (7.7)	(1.9, 26.1)	2 (7.7)	(1.9, 26.1)	20 (20.4)	(13.5, 29.5)
Candies and desserts	226 (18.5)	(16.4, 20.8)	182 (14.9)	(13.0, 17.0)	20 (20.4)	(13.6, 29.5)	20 (20.4)	(13.6, 29.5)	4 (12.9)	(4.9, 29.8)	0 (0.0)	(0.0, 0.0)
Bakery products	77 (12.9)	(10.5, 15.9)	74 (12.4)	(10.0, 15.3)	5 (16.1)	(6.9, 33.4)	4 (12.9)	(4.9, 29.8)	4 (12.9)	(4.9, 29.8)	0 (0.0)	(0.0, 0.0)
Cookies	41 (5.5)	(4.1, 7.4)	36 (4.8)	(3.5, 6.6)	0 (0.0)	(0.0, 0.0)	0 (0.0)	(0.0, 0.0)	0 (0.0)	(0.0, 0.0)	0 (0.0)	(0.0, 0.0)
Fruit preserves	43 (10.4)	(7.8, 13.7)	20 (4.8)	(3.1, 7.4)	1 (17.1)	(1.0, 37.1)	0 (0.0)	(0.0, 0.0)	0 (0.0)	(0.0, 0.0)	0 (0.0)	(0.0, 0.0)
Nuts and seeds	1 (1.3)	(0.2, 8.3)	1 (1.3)	(0.2, 8.3)	0 (0.0)	(0.0, 0.0)	0 (0.0)	(0.0, 0.0)	0 (0.0)	(0.0, 0.0)	0 (0.0)	(0.0, 0.0)
Convenience foods	8 (1.0)	(0.5, 2.0)	8 (1.0)	(0.5, 2.0)	0 (0.0)	(0.0, 0.0)	0 (0.0)	(0.0, 0.0)	0 (0.0)	(0.0, 0.0)	0 (0.0)	(0.0, 0.0)
Processed meats	8 (1.0)	(0.5, 2.0)	6 (0.7)	(0.3, 1.6)	0 (0.0)	(0.0, 0.0)	0 (0.0)	(0.0, 0.0)	0 (0.0)	(0.0, 0.0)	0 (0.0)	(0.0, 0.0)
Sauces and salad dressings	12 (1.5)	(0.9, 2.6)	6 (0.7)	(0.3, 1.7)	0 (0.0)	(0.0, 0.0)	0 (0.0)	(0.0, 0.0)	0 (0.0)	(0.0, 0.0)	0 (0.0)	(0.0, 0.0)
Salty snacks	2 (0.6)	(0.1, 2.2)	2 (0.6)	(0.1, 2.2)	0 (0.0)	(0.0, 0.0)	0 (0.0)	(0.0, 0.0)	0 (0.0)	(0.0, 0.0)	0 (0.0)	(0.0, 0.0)
Total	1,023 (9.3)	(8.8, 9.9)	847 (7.5)	(7.1, 8.1)	40 (5.7)	(4.2, 7.7)	37 (5.3)	(3.8, 7.2)	37 (5.3)	(4.2, 7.7)	37 (5.3)	(3.8, 7.2)

Abbreviations: LCS, low-calorie sweeteners; CI, confidence interval.