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Sodium Levels in Pre-packaged Foods and Beverages Sold in Jamaica: A Label Analysis

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Abstract

Background: High salt intake is the main dietary risk factor for hypertension, one of the five leading causes of death, among Jamaicans. A large share of available pre-packaged products are ultra-processed, containing sodium well in excess of recommended healthy thresholds. Policymakers are advocating for reformulations and devising public education strategies to reduce sodium content which requires an understanding of the amount and variety of sodium compounds being used in products.

Procedures: This study describes the sodium content of 5,008 pre-packaged products using food label analysis. Products were divided into 15 foods and 4 beverage categories. Descriptive statistics were used to present sodium data. Additionally, a keyword search for the terms "salt" and "sodium" was done to identify the type and variety of sodium-containing ingredients in each product.

Findings: Approximately, 44% of products were high in sodium. In addition to salt (sodium chloride), other sources of sodium included 27 sodium-containing chemical additives identified from the ingredient listing. Ready-to-heat/eat foods, animal meat products, dry spices, seasoning, spreads and sauces contained the most sodium per serving. There was high variability in mean sodium levels within and across food and beverage categories.

Conclusions: Overall, a large share of pre-packaged products in Jamaica are ultra-processed emphasizing the urgency for product reformulations and policies towards healthier levels of sodium.

Keywords: Sodium; Food label; Blood pressure; Hypertension; Packaged foods; Beverages; Jamaica; Sodium reduction; Reformulation; Food policy

Introduction

Sodium is present in many foods in various chemical forms, the most common form is table salt or sodium chloride which contains 40% sodium and 60% chloride. In packaged foods, sodium may be present as indicated on the label as salt, various sodium compounds with sodium in the name, (e.g., sodium bicarbonate, monosodium glutamate and sodium benzoate)or other forms without the name sodium such as cellulose gum. Data across the globe indicate that the sodium levels in many processed foods and beverages exceed recommended levels. Consumers who regularly consume processed foods have little control over sodium intake as about 71% of sodium is added during processing and only about 15% is inherently present in food, the remainder (14%) is added during cooking or at the table[1, 2]. Therefore, processed foods are the major contributors to dietary sodium.

Sodium plays an essential role in human physiology. However, consuming excess dietary sodium has been associated with adverse health outcomes including hypertension, chronic kidney disease, some cancers, stroke and obesity [3]. Reducing sodium consumption has been identified as an intervention to help to reduce the burden of non-communicable diseases (NCDs), and the World Health Organization (WHO) and its member states have agreed to a global initiative for a 30% reduction in sodium or salt by 2025 [4]. In middle-income and developing countries, such as Jamaica, this is particularly important as socioeconomic status (SES) has been shown to be a determinant of sodium intake with people of lower SES consuming more sodium[5]. The recommended salt intake for adults is less than 5g per day and less for children, this equates to less than 2g per day of sodium. However, the average amount of sodium consumed globally is 3.95 g/day, and some 1.1 million to 2.22 million deaths are attributed to excessive sodium intake. To effectively stem the tide of deaths attributable to sodium, sodium reduction strategies must also consider the childhood years when taste perception is being developed. In fact, lowering sodium in children's diets today, reduces the risk of heart disease later in life, especially for those who are overweight [6].

High intake of sodium is a concern in Jamaica. Like many other small-island states, the prevalence of obesity and diet-related diseasesare at alarming levels [7] Hypertension is particularly problematic among adults and a recent national surveyin 2016/17 revealed that 35.8% of women and 31.7% of men are hypertensive [8]. Hypertension is deemed preventable and lowering sodium intake by way of reducing the sodium content in processed foods is considered an effective means to address the hypertension burden.

Nutrient profiling systems or models rank or classify foods based on their nutrient composition and can be incorporated into the

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framework of disease prevention and/or health promotion policies[9]. Such systems are therefore useful in classifying foods based on the sodium levels. The Pan American Health Organization (PAHO) nutrient profile model classifies sodium content of processed foods calculated as the ratio of sodium mg to energy content present in any given quantity of the product. A ratio that exceeds 1 is deemed to be excessive(i.e.,> 1mgsodium/1kcal)[10].

The WHO has recommended clear food labels in its Global Strategy on Diet, Physical Activity and Health to help consumers make informed decisions when purchasing food [11]. In Jamaica, the Bureau of Standards (BSJ) is the country's statutory body established by the Standards Act of 1969 to promote and encourage standardization and has outlined label recommendations in the Labelling of Foods – Pre-Packaged Foods – Specification Standard document [12]. However, while an update to the standard is underway, current mandatory requirements do not include a nutrition label. Furthermore, there is no national framework to monitor the sodium levels in packaged food and beverages in Jamaica.

An assessment of sodium levels in packaged foods in 14 Latin American and Caribbean countries (including 907 foods in Jamaica) were compared against regional sodium reduction targets and found that only 19% of products exceeded the sodium target[13]. However, this approach used category-based sodium levels rather than the PAHO nutrient profile model. More recently, Soares et al. examined 6291 foods on Jamaican retail shelves andfound a large proportion of products exceeding sodium thresholds in 14% of 'sodas and flavored drinks', 42% of 'dairy beverages', 80% of 'ready to heat/eat foods', 67% of 'fruits of vegetables', 78% of 'legumes', and 97% of 'fish and seafood'[14]. The current study undertakes a detailed assessment of this earlier dataset of 6291 foods and has a multi-pronged aim. First, to describe the sodium content ofpackaged foods and beverages sold in retail chains in Jamaica; second, to identify foods containing excess amounts of sodium and third, to identify the type of sodium-containing food additives present in foods. These findings will provide baseline values for the sodium content of packaged foods that are commonly consumed and thus will help to generate an estimate of sodium levels of Jamaican packaged food and beverage products. This is critical as the government continues its focus on non-communicable disease eduction strategies including implementation of front of package warning labels and encouraging manufacturers to reformulate to reduce sodium.

Materials and Methods

Study Design and Data Collection

This study describes secondary analyses of sodium content derived from food label information on pre-packaged foods and beverages sold in supermarkets in Kingston, Jamaica. A detailed description of the sampling procedure, the food-label data capture, and methods for determining nutrient content are published elsewhere[14]. Briefly, the total number of product labels used for these analyses comprised those labels with complete information on sodium or salt and sodium containing ingredients. A total of 5008 products from the original sample of 6261 products were used in these analyses. Products were divided into 15 foods and 4 beverage categories. There were 17 beverage subcategories described in the previous paper. However, these subcategories contained mostly absent or negligible amounts of sodium, and thus were compressed into one category for the purposes of this paper. Foods remained in the same 15 sub-categories from the original study listing. From the resulting sample, products were excluded if nutrient and product type information was unclear or missing during quality control screening.

Analysis of Sodium Levels and the occurrence of sodium in foods and beverages

The quantity of sodium (grams, 'g') and energy (kilocalories, 'kcal') per unit serving of product were taken from the nutrient fact panel information. Sodium amounts were converted and standardized to milligrams of sodium per 100 g and per kcal of product. From the ingredient listing, all sources of sodium and/or salt were collated. Initial processing of this qualitative data was done in Microsoft Excel, prior to content analysis being conducted.Initially, a keyword search for the terms "salt" and "sodium" was done to identify the type and variety of sodium-containing ingredients in each product. A string variable analysis was then done to quantify and describe each of the sodium-containing additives as they appeared on the ingredients listing for all the products analyzed.

In addition to the terms salt and table salt, the names of compound ingredients (examples: baking soda, soy sauce, brine, bouillon, stock, saline) were included. Forty other search terms were used to identify sodium-containing additives. This list was obtained from the Food and Agriculture Organization (FAO) and the WHO Codex Alimentarius[15]. Terms included sodium carboxymethyl cellulose (cellulose gum), sodium polyphosphate, sodium nitrite, sodium citrates, sodium metabisulfite, sodium benzoate, sodium stearoyl lactylate, sodium caseinate/sodium cyclamate, monosodium glutamate, carrageenan, sodium malate, sodium lactate, sodium ascorbate, sodium phosphates, sodium sulfates, disodium inosinate, sodium propionate, disodium 5′ -inosinate, sodium acetates, sodium erythorbate, calcium disodium ethylene diamine tetraacetate (calcium disodium EDTA), sodium saccharin, sodium hydroxide, sodium ferrocyanide, sodium alginate, sodium hydrogen sulfide, sodium gluconate, sodium ethyl p-hydroxybenzoate, sodium methyl p-hydroxybenzoate, sodium nitrate, sodium potassium tartrate, sodium adipate, sodium carbonates, disodium guanylate, sodium aluminum phosphate acidic, sodium aluminosilicate, sodium sulfite, sodium tetraborate, sodium tartrates, andaluminum sodium sulfate.

Statistical Analyses

All statistical analyses were performed using Statistical Package for the Social Sciences (SPSS) version 23. The data was first imported to SPSS to be cleaned, extreme outliers were removed after observing the labels and ingredient listing of the products. The normal distribution of the variables of interest was checked and calculated. Continuous variables are presented as means with standard deviation, and categorical variables are presented as frequency (percentage/proportions). Excess sodium was defined as amounts exceeding 1mg per kilocalorie of product [10]. This is in keeping with sodium thresholds in the PAHO nutrient profile model.

Results

Table 1 describes the mean sodium content per serving, per 100g, and per kcal of 5,008 pre-packaged food and beverage products. Among food sub-categories, generally the ready-to-heat/eat foods and animal-based products, such as meat, eggs, fish and seafood, contained the greatest amounts of sodium per serving.These products, in addition to cereals and grains, dairy, fruits and vegetables, sauces and spreads, and dry spices and seasonings, also contained the widest variability in sodium content. Overall, beverages, candy and desserts, fats and oils, and sweeteners contained the least amounts of sodium per serving or per unit energy.

Generally, beverages contained minimal amounts of sodium, except for the sports, energy, dairy and non-dairy milk subcategories. Dairy beverages had the widest variability in sodium content but sports, energy and non-dairy milk beverages contained excess amounts of sodium given that the mean sodium to kilocalorie ratios were above the threshold.

Approximately 44.5% of all products in this sample contained sodium over the PAHO nutrient profile threshold limit of 1g/kcal. Sub-categories with the largest share of products above the threshold limits included fish and seafood (97.2%), meats and eggs (91.7%), and dry spices and seasonings (80.4%). However, dry spices and seasonings had the mean highest sodium density (47.11 ± 58.25mg/kcal) among those with applicable data. Overall, ready-to- heat/eat foods, animal products, fruits and vegetables, sauces and spreads had the highest density of sodium. Sweeteners, candy and desserts had the lowest sodium densities.

There was a remarkable difference in the amounts of sodium found within, and across some sub-categories. Sweeteners and fats and oils had very little variation (0mg – 140mg) per serving. In contrast, sodium amounts varied widely for other types, ranging from little or no sodium being present, to having over 4900mg per serving or 262mg/kcal.

Table 1: Sodium Levels in packaged foods and beverages sold in Jamaica by selected categories

	Sodium (mg) per serving)			**Sodium mg/100g**			**Sodium mg/kcal**		
Food Categories	***n***	**Mean ± SD**	**Range**	***n***	**Mean ± SD**	**Range**	***n***	**Mean ± SD**	**Range**
All Beverages	1244	60.04 ± 101.87	0- 1444	1238	45.99 ± 107.54	0 - 1433.33	1234	0.63 ± 1.76	0. - 30.40
Sports Drinks	23	156.52±53.42	105 - 270	23	97.36 ±179.85	27.07 - 666.67	23	2.23 ±1.34	0.89 - 5.40
Energy Drinks	9	113.56 ±89.23	12 - 285	9	42.17 ±29.99	3.16 - 80.28	9	2.02 ±3.24	0.08 - 10.50
Dairy Drinks	44	119.65 ±215.34	10 - 1444	44	219.34 ±210.11	48 - 850	44	0.85 ±1.01	0 - 6.72
Non-DairyMilks/ Beverages	77	131.64 ±124.95	4 - 720	76	60.08 ±42.39	10 - 253.52	77	1.73 ± 1.79	0.04 - 6
Bread and Bakery Products	493	188.01 ± 143.13	0 - 980	490	499.86 ± 507.58	0 - 8333.33	493	1.31 ± 0.96	0 - 7.67
Cereal and Grain Products	254	138.28 ± 193.68	0 - 1150	249	289.97 ± 306.55	0 - 1196.43	254	0.76 ± 0.84	0 - 3.47
Candy and Desserts(non-grain)	347	49.34 ± 66.86	0 - 500	347	107.42 ± 209.37	0 - 2307.69	343	0.32 ± 0.59	0 - 6.44
Ready-to-heat/eat Foods	154	509.34 ± 320.84	0 - 1340	154	919.98 ± 1493.01	0 - 8750	154	5.04 ± 6.02	0 - 37.50
Meat and Eggs	110	487.34 ± 288.07	25 - 1760	110	711.03 ± 316.38	29.41 - 1466.67	110	4.09 ± 2.20	0.15 - 14.67
Fish and Seafood	107	360.96 ± 224.79	40 - 1380	107	1058.15 ± 3488.56	72.73 - 35000	107	4.96 ± 6.29	0.50 - 38
Dairy Products	252	150.91 ± 163.52	0 - 1660	249	528.14 ± 956.19	0 -13387.10	252	1.81 ± 1.77	0 - 9

Fruits and Vegetables	183	271.58 ± 477.25	0 - 4981	181	708.33 ± 2589.39	0 - 30200	170	10.71 ± 36.20	0 - 358.75
Sauces and Spreads	681	251.93 ± 277.29	0 - 1395	679	1529.63 ± 2253.99	0 - 19733.33	601	13.85 ± 23.30	0 - 126
Snack Foods	363	187.91 ± 116.30	0 - 630	363	616.72 ± 360.51	0 - 1750	363	1.23 ± 0.76	0 - 4.45
Legumes	95	307.57 ± 204.83	0 - 990	95	242.68 ± 143.49	0 - 438.46	95	2.62 ± 1.69	0 - 6.29
Dry Spices and Seasonings	151	234.75 ± 335.16	0 - 2400	151	10639.83 ± 9848.25	0 - 48000	54	47.11 ± 58.25	0 - 262
Fats and Oils	37	83.32 ± 46.03	0 - 140	37	593.50 ± 330.42	0 - 1000	37	1.18 ± 0.74	0.00 - 2.57
Meat Substitutes &Dairy Substitutes	33	211.36 ± 182.64	0 - 580	33	544.35 ± 705.10	0 - 3460	33	2.01 ± 1.72	0 - 5.22
Sweeteners	18	10.11 ± 21.33	0 - 80	18	35.94 ± 71.18	0 - 266.67	18	0.12 ± 0.25	0 - 1

Content analysis of ingredients

The terms “salt” or “sodium”were the most frequently used descriptors of sodium in ingredient listings with salt appearing 3555 times and sodium, 3223 times throughout the entire data set.Common terms included refined salt, sea salt, emulsifying salt, and sodium chloride (table salt). Relative to the number of products in each food sub-category, some products contained multiple sources of salt and/or sodium within the ingredient listings [Table 2]. Products listing 2 or more sodium derivatives within the ingredient list included the ready-to-heat/eat foods, snack foods, bread and bakery products, sauces and spreads, meat and eggs, and meat and dairy substitutes. Ready-to-heat/ready-to-eat foods listed the highest maximum number (*n=9*) of sodium-based ingredients.

Table 3 shows the proportion of products that contain sodium chemical additives and more common forms of sodium (e.g., table salt). Using string variable analysis of the ingredient listings, a total of 27 different sodium-containing chemical additives were found in this study sample.There were four additives used primarily in the majority of products (approximately 69%). Sodium benzoate was the most frequently occurring additive (36% of products) with other prominent ones including carrageenan (15.4%);“cellulose gum” or sodium

Table 2: The number of salt- or sodium sources present in ingredient listings

Categories	***n* Products**	**Salt sources**	**Sodium sources**	**Salt &/or Sodium sources**
Beverages	1244	0.13	0.85	0.98
Bread and Bakery Products	493	1.23	1.02	2.25
Cereal and Grain Products	254	0.76	0.27	1.03
Candy and Desserts (non-grain)	347	0.56	0.44	1.00
Ready-to-heat/eat Foods	154	1.75	1.78	3.53
Meat and Eggs	110	1.05	1.85	2.90
Fish and Seafood	107	0.98	0.24	1.22
Dairy Products	252	0.80	0.38	1.17
Fruits and Vegetables	183	0.75	0.14	0.90
Sauces and Spreads	681	1.14	0.48	1.62
Snack Foods	363	1.38	0.94	2.32
Legumes	95	0.98	0.23	1.21
Dry Spices and Seasonings	151	0.86	0.27	1.13
Fats and Oils	37	1.00	0.24	1.24
Meat Substitutes & Dairy Substitutes	33	0.73	1.58	2.30
Sweeteners	18	0.61	1.17	1.78
Calculated from the number of instances where the term salt and or sodium are found within an ingredient listing				

Table 3. Sodium Containing Additives and other Selected Sodium Containing Ingredients		
Sodium containing Food Additive or Ingredient	*n*	%
Salt (or sodium chloride)	2798	62.01
Sodium benzoate	516	11.44
Other*	275	6.09
Carrageenan	221	4.90
Sodium carboxymethyl cellulose (cellulose gum)	140	3.10
Sodium caseinate	111	2.46
Sodium stearoyl lactylate	64	1.42
Sodium nitrite	52	1.15
Sodium ascorbate	49	1.09
Sodium metabisulfite	44	0.98
Sodium alginate	37	0.82
Sodium carbonate	34	0.75
Sodium nitrate	26	0.58
Trisodium citrate	24	0.53
Sodium polyphosphate	21	0.47
Monosodium glutamate	17	0.38
Trisodium phosphate	16	0.35
Sodium hydrogen carbonate	13	0.29
Disodium diphosphate	10	0.22
Sodium diphosphate	10	0.22
Sodium lactate	7	0.16
Disodium 5′-inosinate	6	0.13
Disodium 5′-guanylate	6	0.13
Sodium aluminosilicate	5	0.11
Disodium hydrogen phosphate	4	0.09
Sodium acetate	2	0.04
Sodium sulfite	2	0.04
Sodium erythorbate (sodium is ascorbate)	1	0.02
Sodium saccharin	1	0.02
Total	**4512**	**100**
*Other includes compound ingredients that contain sodium; for example, baking soda, brine and/or Soy Sauce.		

carboxymethyl cellulose (9.7%) and sodium caseinate (7.7%). Sodium chloride/salt was the most frequently occurring sodium-based ingredient (2798 (62%) products). Several products (275, 6%) also listed compound ingredients characteristically high in sodium (for example baking soda, brine, soy sauce).

Discussion

Our findings provide an important baseline evaluation of the variety and amount of sodium-containing ingredients present in Jamaican food and beverage products. Almost half (44.3%) of the pre-packaged food and beverage products analyzed were high in sodium, with the highest share among the ready-to-heat/eat foods, animal products (meat, fish, eggs, seafood) andfood preparation and condiment-type products (dry spices, seasonings, sauces and spreads). In general, these food categories

also contained the greater density of sodium per unit calorie or gram weight of product, and also the greater variety of sodium chemical additives.

The high prevalence and economic impact of non-communicable diseases are major public health concerns in Jamaica. With hypertension affecting one in three adults, the high levels of salt and sodium additives in processed foods and beverages are key targets for public health policy and intervention.The wide variability in concentration and multiple sources of sodium in mostfood categories highlight the urgency for policies to both regulate product formulations and to urge manufacturers to improve processing practices. With few healthy pre-packaged options available, public education to increase consumer awareness about dietary sodium is also critical. Previous analyses from this group showed that themajority share of Jamaican products contain harmful amounts of several nutrients of concern. With such high concentrations of sodium, even in products that are often promoted as preferentially more nutritious, it is evident that significant reformulation and changes in processing practices are needed.

The data presented in this study provides some evidence of the increase in the proportion of ultra-processed products and also the sodium concentration. Several studies conducted in 14 countries across Latin America and the Caribbean (LAC), the United States of America (USA), and Canada [16-18]shows the wide variation in the type and quality processed foods. During 2015 and 2016, 81% of food products in Jamaica metthe regional category-specific targets for sodium levels. Products in the current study, which were sampled in 2018, showed 55.7% of products meeting targets [16]. One note of similarity, is that the highest levels of sodium are consistent among the same categories of products: including dry seasonings and spices, sauces and spreads/condiments, and animal or meat-based products [13,17].

While the share of products with excessive sodiummay differ, it is important to consider the density of sodium and the types of foods in relation to cultural preferences. The vast majority of pre-packaged products (84.4% of beverages and 93.6% of foods) in the original dataset are classified as "processed" with over 42% containing multiple nutrients of concern in excess [14]. Several studies show that pre-packaged foods are mostly ultra-processed containing multiple chemical ingredients and nutrients of concern such as sodium. In the UK for example the highest levels of sodium were found in sauces and broth (1090 mg/100 g) [18]. Sauces and spices were the groups to contain the second-highest levels of sodium. Similarly, one study conducted in Malaysia focusing only on sauces found that they contained considerably high levels of sodium [19]. These product categories have high sodium contents and comprise a large share of available products suggestive of a high consumer demand. Identifying the behaviors and practices related to these foods will be key components for consumer education.

This study has provided a detailed report on the types of salt- and sodium-containing ingredients and the amount of sodium contained in Jamaican pre-packaged products. This study's findings also suggest that the labeling of food products is an area that needs to be properly regulated by way of labeling standards. Currently, food labeling standards in Jamaica do not require mandatory nutrition facts panels. Also, the mandatory list of ingredients is often limited to common terms and names unless the ingredient is regulated. This poses a challenge as consumers is at risk of being misinformed or unaware of all the components within a product. Furthermore, some sodium-containing additives do not contain the word sodium in theirname and may lead to confusion among consumers. This underscores the urgent need for a robust government policy that supports Jamaicans in easily identifying the sodium content of foods. There is a high likelihood that consumers are being exposed to multiple sources of high sodium productsat various stages, from food preparation to consumption at the table. In many instances, these foods are used ad libitum and are not usually measured by the consumer making assessment of sodium intake a challenge. Understanding the knowledge, attitudes and practices related to ultra-processed foods will be integral to consumer interventions for reducing sodium in the diet.To reduce the health burden of hypertension [8, 20] will require robust and urgent government policies at the consumer, manufacturer and regulatory levels.

The debate concerning the safety of food additives and health effects continues. Studies have examined the consumption of sodium containing food additives in large amounts and the ill health effects caused, [21, 22]. In this study, 27 sodium chemical additives were found amongingredient listings, while the terms sodium and salt were most common. Salt and sodium are still used as synonyms but are not 100% factual, and some consumers may not readily acknowledge the similarities. The finding that some product categories use the term sodium and not salt (e.g., beverages), or compound ingredients containing high levels of sodium (e.g., soy sauce)may be misleading for some consumers. The use of sodium chemical additives must be recognized as having a potentially harmful impact. Sodium benzoate was the most frequently used sodium-containing additive, followed by carrageen and monosodium glutamate (MSG). The word "sodium" was also observed mostly in the beverage category of foods. Sodium benzoate is a popularly used preservative in Jamaica, especially in beverages. Carrageen for example may be present on an ingredient label and not as sodium/ salt, but is a sodium-containing additive, and is also shown to be harmful to health [23]. Monosodium Glutamate is also shown to have a positive association with obesity/overweight and BMI [24].

There are considerable global and regional efforts to improve the nutrient quality of the food supply. The UN General Assembly High Level Meeting held in September 2011 identified reformulation products to provide healthier and affordable options in tandem with providing nutritional facts and, "following labelling standards, including information on sugars, salt and fats and,

where appropriate, trans fat content" as critical to the framework for promoting healthy diets and creating a food environment which supports healthy eating [25]. The WHO also has focused efforts for the reduction of dietary sodium [26]. For the Caribbean region, point 4 of theCaribbean Public Health Research Agency 6 Point policy Package, speaks to regional standard and time-bound targets for salt, fat and sugar reduction for specific food product categories.

However, with all these efforts, many consumers remain largely unaware of the excessive amounts of nutrients of concern presents in popular foods. Front-of-package-label(FOPL) warningshave been shown to be effective in achieving behavior change [27-29] and has recently shown promise among Jamaican consumers[30]. The level of processing and salt use throughout all food and beverage categories requires multiple approaches. Manufacturers must be engaged to reformulate products with less sodium, consider using alternatives to sodium such as potassium which has proven to be a healthier substitute [31].

Our study is not without limitations. Firstly, the analyses done have relied on data from manufacturer printed labels on products, of which more than 12% were found to be either erroneous or contain misinformation[14]. Further, the amounts listed are approximated since chemical analyses are not required to confirm the nutrition information on labels in Jamaica. A major strength of this study was that a large number of packaged food products and beverages were analyzed, and the data provide information that will be useful for policymakers and health professions providing consumer education. Most significant is this is the largest study to analyze sodium levels and sodium containing additives in retail products available in Jamaica. For increased accuracy, assessment of sodium levels by chemical analyses would present a more accurate picture of the sodium content of foods.

A large share of pre-packaged products available in Jamaica are high in sodium and ultra-processed with various chemical additives containing sodium. The widespread and concentrated use of sodium among various food and beverage types will increase the likelihood of high consumption of dietary sodium. Sodium reduction strategies must take a multifaceted approach operating at the policy or governmental level. Secondly, at a manufacturer level these strategies should encourage reformulation and regulating labeling information. In addition, public education is required to support consumer behavior changes to reduce dietary sodium intake.

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