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RESEARCH ARTICLE

Over half of South African beverages will require warning labels for high sugar and/or artificial sweeteners

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Objective: To determine the proportion of commercially available beverages that may require warning labels for high sugar content and the presence of artificial sweeteners in South Africa.
Methods: This cross-sectional study analysed 603 non-alcoholic beverages (juices, soft drinks and energy drinks), identified from the top South African supermarkets (based on market share) with shopping websites. Data were collected from May to July 2024, and included ingredient lists and nutritional information per 100 ml. Products requiring warning labels for high sugar content and artificial sweeteners were identified based on the recently proposed labelling regulations (R. 3337).
Results: 21.4% of all beverages required a warning label for high sugar content, 49.8% for artificial sweeteners, and 58.7% for at least one of these criteria. Juices, despite having the highest energy (160 kJ/100 ml), glycaemic carbohydrates (9%) and sugar content (8.4%) compared with soft and energy drinks, were least likely to need warning labels for high sugar or artificial sweeteners (30% vs. 94.1% for soft drinks and 96.9% for energy drinks).
Conclusions: More than half of South African beverages are expected to require warning labels due to high sugar content and/or artificial sweeteners. The proposed regulations are likely to favour juices, which, despite their high sugar content, are less likely to require warning labels because the sugar is naturally occurring rather than added.
Recommendations: The South African government should include beverages with high natural sugar levels, like juices, in warning label criteria. This would ensure that consumers are adequately informed about the sugar content in all types of beverages.

Keywords: artificial sweeteners, energy drinks, front-of-pack labelling, juices, soft drinks, South Africa, sugar-sweetened beverages, sugar, warning labels

Introduction

Nutrition-related chronic diseases are an increasing concern in developing countries such as South Africa, where the prevalence of diseases like diabetes nearly tripled from 4.5% in 2010 to 12.7% in 2019.[1] To reduce the impact of nutrition-related chronic diseases, the South African government has implemented various public health interventions targeting key lifestyle risk factors, such as unhealthy diets.[2] These interventions include public policies designed to reduce excessive sugar consumption.[2,3] For instance, in 2018, a tax on sugar-sweetened beverages was implemented in South Africa.[4] The primary aim of this tax system was to encourage manufacturers to reformulate commercially available beverages by lowering the sugar content, thereby reducing their tax liability/burden.

Nutritional labelling is also crucial, as it allows consumers to make informed and healthier dietary choices. Although the Department of Health (DOH) issued regulations on labelling and advertising of foodstuffs in 2010 (R. 146), South Africa currently has no policy or law mandating the nutritional labelling of any food product, unless a specific claim is made.[5] This is one of the reasons why, in April 2023, the DOH proposed amendments to the existing food labelling regulations (R.146) in the form of the Draft Regulations relating to the labelling and advertising of foodstuffs (R. 3337).[6] These proposed changes included the introduction of a mandatory front-of-package labelling (FOPL) system for unhealthy pre-packaged foodstuffs. While various FOPL systems exist, the DOH proposed nutrient-specific warning labels, as recommended by the World Health Organization (WHO).[6] This warning label system has been shown to be the most effective in helping consumers identify unhealthy products and make healthier choices.[7]

If the proposed labelling policy is implemented in its current form, all prepacked foods containing added saturated fat, added sugar or added sodium, and exceeding specified cutoff values, would be required to display nutrient-specific warning labels in South Africa.[6] The proposed regulations also suggested including warning labels for the presence of any artificial sweetener. In South Africa, the use of artificial sweeteners in beverages has likely become increasingly popular as a way to lower the overall sugar content of commercial products and reduce the impact of the sugar tax.[8] A warning label for artificial sweeteners is necessary because accumulating evidence suggests that artificial sweeteners may negatively impact nutrition-related disease risk through their influence on gut health.[9]

Given the lack of studies investigating the nutritional composition of commercially available beverages, the proportion of these products that are likely to require warning labels in South Africa remains unknown. Therefore, the primary aim of this study was to determine the proportion of commercially available beverages that are likely to require warning labels for high sugar content and the presence of artificial sweeteners

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once the proposed regulations are implemented. This assessment has the potential to serve as a baseline for monitoring changes over time and evaluating the effectiveness of the proposed labelling policy.

Methods

Study design and identification of leading supermarkets

This study was a cross-sectional analysis that included a diverse range of 603 beverages from 86 different brands, all of which were identified from online shopping websites. All data extraction was conducted between May and July 2024. The selection of beverages was designed to include popular products, and these were identified from the top-performing supermarkets in South Africa, as outlined in the 2023 Deloitte financial performance report.[10] Briefly, Deloitte – a globally recognised consulting firm – identifies leading supermarkets globally, based on their financial performance, market share, and overall influence.[10] According to their 2023 report, the top supermarkets in South Africa were Shoprite and Checkers, Pick n Pay, Spar, and Woolworths. In the present study, Spar was not included due to the absence of an online shopping platform from which products could be identified.

Identification of commercially available beverages

Figure 1 summarises the selection process for the beverages analysed in this study. We extracted data from the online shopping websites of the four identified supermarkets, resulting in a comprehensive list of 1 853 beverages: 670 products from Shoprite, 666 from Checkers, 383 from Pick n Pay, and 143 from Woolworths. The selection included juices, soft (carbonated) drinks and energy drinks, while excluding concentrated juices, iced teas, drinking yogurts, shots, smoothies and alcoholic beverages. Many products were available in more than one supermarket, leading to the removal of 929 duplicates. As a result, the final list comprised 924 unique products, as shown in Figure 1.

Extraction of ingredient and nutritional information

The lists of ingredients were extracted for identification of added sugar and artificial sweeteners. The nutritional information (per 100 ml only) extracted included total energy (kJ), protein (g), glycaemic carbohydrates (g), of which is sugar (g), total fat (g), of which is saturated (g), dietary fibre (g), and total sodium (mg), as suggested in the DOH labelling guidelines (R.146).[5] Of the 924 unique beverages, 328 products provided both the list of ingredients and the nutritional information on their brand websites. For the remaining 596 products, these data were unavailable online (Figure 1). To address this gap, we conducted field visits to the relevant supermarkets. Of these 596 products, 321 were out of stock, but we successfully collected data for 275 products directly from the stores. Thus, the final analysis included data from 603 beverages: 337 juices, 169 soft drinks and 197 energy drinks (Figure 1).

Ethics

This study used only publicly available data, with no involvement of human or animal subjects. Prior to collecting the data, an ethics waiver was obtained from the University of the Witwatersrand Human Ethics Research Committee (Medical), Johannesburg, South Africa (Ref: W-PR-240527-04).

Evaluating warning label requirements

The criteria used to identify products that require warning labels for high sugar content and presence of artificial sweeteners were based on the newly proposed DOH regulations (R. 3337).[6] Beverages that had added sugar (as identified from the list of ingredients) and a total sugar content of ≥ 5.0 g per 100 ml were classified as requiring a warning label for high sugar content. Additionally, products indicating a non-nutritive sweetener in their ingredients list were classified as requiring a warning label for artificial sweeteners. In this study, warning labels related to sodium and saturated fat were excluded as these nutrients are typically not present in high amounts in commercially available beverages.[11]

Data analysis

All data analyses were conducted using R version 4.2.3 (R Foundation for Statistical Computing, Vienna, Austria). The normality of the continuous variables (nutritional values) was assessed using a Shapiro–Wilk test, which indicated that the data were not normally distributed. As a result, the data were presented as medians and interquartile ranges (IQRs). Accordingly, a Wilcoxon rank-sum test was used when statistically comparing two groups (juices versus soft drinks or energy drinks, and soft drinks versus energy drinks). Categorical variables were presented as percentages (%), and a chi-square test was used to assess statistical differences between the three beverage groups. A p-value < 0.05 was considered sufficient evidence of a difference (statistically significant) in all statistical tests.

Results

Table S1 of the supplementary data compares nutritional composition by presenting the medians (IQRs) for the total energy, protein, glycaemic carbohydrates (including total sugar), total fat (including saturated fat), dietary fibre and sodium content per 100 ml for each beverage type. Statistical comparison between groups was selectively performed for four key nutrients most relevant to beverages: total energy, glycaemic carbohydrates, total sugar and total sodium (Figure 2 a–d, respectively). Juices had higher energy content (median = 160.0 kJ) compared with soft drinks (65.0 kJ) and energy drinks (72.5 kJ). Similarly, glycaemic carbohydrates were higher in juices (9.0 g) than in both soft drinks and energy drinks (both 4.0 g). The total sugar content followed the same trend, with juices containing 8.4 g, while soft drinks and energy drinks contained 3.7 and 3.9 g, respectively. Notably, although energy drinks had higher total energy than soft drinks, there was no significant difference in glycaemic carbohydrates and total sugar between these two groups (both p > 0.05). Total sodium content differed, such that energy drinks had the highest total sodium content (35 mg), while juices had the lowest (6.0 mg), and soft drinks fell in between (9.0 mg).

Figure 3 compares the nutrient content of beverages with and without artificial sweeteners. Total energy, glycaemic carbohydrates and total sugar were lower in beverages containing artificial sweeteners compared with beverages without artificial sweeteners (median = 70.5 versus 167.0 kJ, 4.0 versus 9.0 g and 3.8 versus 8.7 g, respectively; all p < 0.0001). Conversely, total sodium was higher in beverages with artificial sweeteners (12.0 mg) compared with those without artificial sweeteners (5.0 mg) (p < 0.0001).

Figure 4 summarises the proportion of beverages with added sugar and those that require warning labels for high sugar content and presence of artificial sweeteners, and compares the three groups. Approximately 50.6% of the beverages had added sugar, with soft drinks contributing the most (n = 135, 79.9%) followed by energy drinks (n = 75, 77.3%) and juices (n =

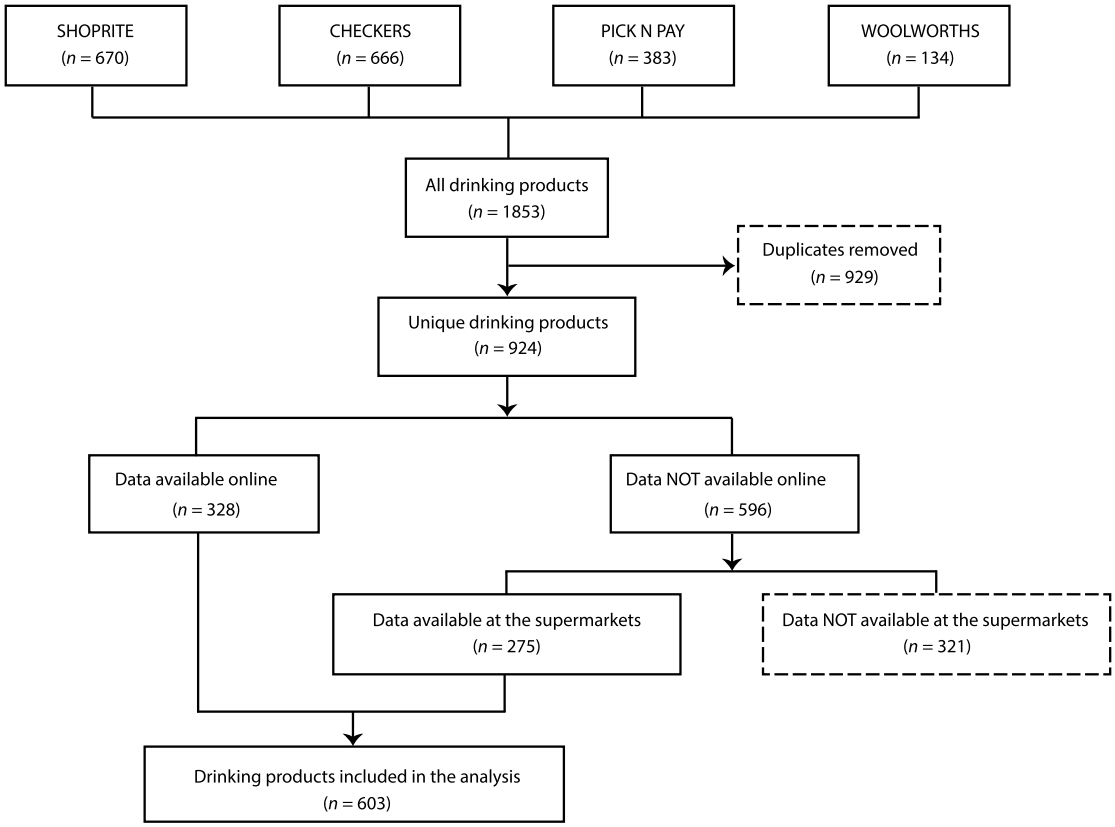

Figure 1: Selection process of beverages included in the present study. Initially, a total of 1853 beverages were considered (as identified from online stores), including 953 juices, 517 soft drinks and 383 energy drinks. From this sampling frame, 929 products were removed as duplicates, and 321 were removed because the nutritional information and/or list of ingredients were not available online or at the supermarkets. Consequently, 603 beverages (337 juices, 169 soft drinks and 97 energy drinks) were included in the final analysis.

95, 28.2%). In contrast, 53.1% of all beverages had high total sugar content (≥ 5.0 g per 100 ml), with the highest proportion found in juices ($n = 248$, 73.6%) compared with soft drinks ($n = 47$, 27.8%), and energy drinks ($n = 25$, 25.8%).

The same figure also indicates that 21.4% of all the beverages required a warning label for high sugar content, while 49.8% required a warning label for artificial sweeteners. Notably, the smallest proportion of beverages requiring a warning label for higher sugar content were juices ($n = 58$, 17.2%) compared with soft drinks ($n = 46$, 27.2%) and energy drinks ($n = 25$, 25.8%). Likewise, juices also had the smallest proportion of drinks requiring warning label for artificial sweeteners (89 juices, 26.4%; 131 soft drinks, 77.5%; 80 energy drinks, 82.5%). Overall, 58.7% of all beverages required at least one warning label (either for high sugar content or presence of artificial sweeteners), with juices having the smallest proportion ($n = 101$, 30.0%) in contrast to soft drinks ($n = 159$, 94.1%) and energy drinks ($n = 94$, 96.9%). Lastly, 12.4% of all beverages required two warning labels (for high sugar content and presence of artificial sweeteners), but there was no significant difference between the three groups ($p > 0.05$).

Discussion

Following WHO's recommendation to use warning labels in combating nutrition-related diseases, the South Africa government recently proposed the introduction of warning labels on prepackaged foods that exceed specified amounts of sugar, sodium and saturated fats, as well as those containing any artificial sweeteners.[6] This is the first study to examine the proportion of commercially available beverages in South Africa that will require warning labels for high sugar and artificial sweetener content, setting a baseline for monitoring changes over time and evaluating the effectiveness of the warning labels. We found that while only 21.4% of all beverages required a warning label for high sugar content, almost half (49.8%) of the beverages required a warning label for the presence of artificial sweeteners. About 58.7% of all beverages required at least one warning label, either for the presence of high sugar content and/or presence of artificial sweeteners.

Juices, especially 100% fruit juices, are often perceived as healthier alternatives to soft drinks and energy drinks.[12] However, our observation that these beverages contain higher concentrations of sugar and overall glycaemic carbohydrates was anticipated in the South African context. This is because, in South Africa and other countries like the United Kingdom, Mexico, Chile and France, current regulations aimed at reducing the unhealthy effects of sugar-containing beverages focus on added sugar rather than total sugar content.[13–15] Specifically, the South African sugar tax (Health Promotion Levy: HPL) targets beverages with added nutritive sweeteners, including soft drinks and energy drinks, imposing a tax rate of 2.3 cents per gram of sugar content exceeding 4 grams per 100 ml.[4] After the implementation of the HPL in South Africa, both the sugar content in taxable beverages (those taxed due to high sugar content) and the purchase of these beverages significantly decreased.[16] Another study reported a similar trend, showing a notable reduction in the intake of sugar-sweetened beverages post-HPL, assuming no reformulation to reduce sugar content.[3] However, this reduction was offset by an increase in the consumption of untaxed beverages.[3]

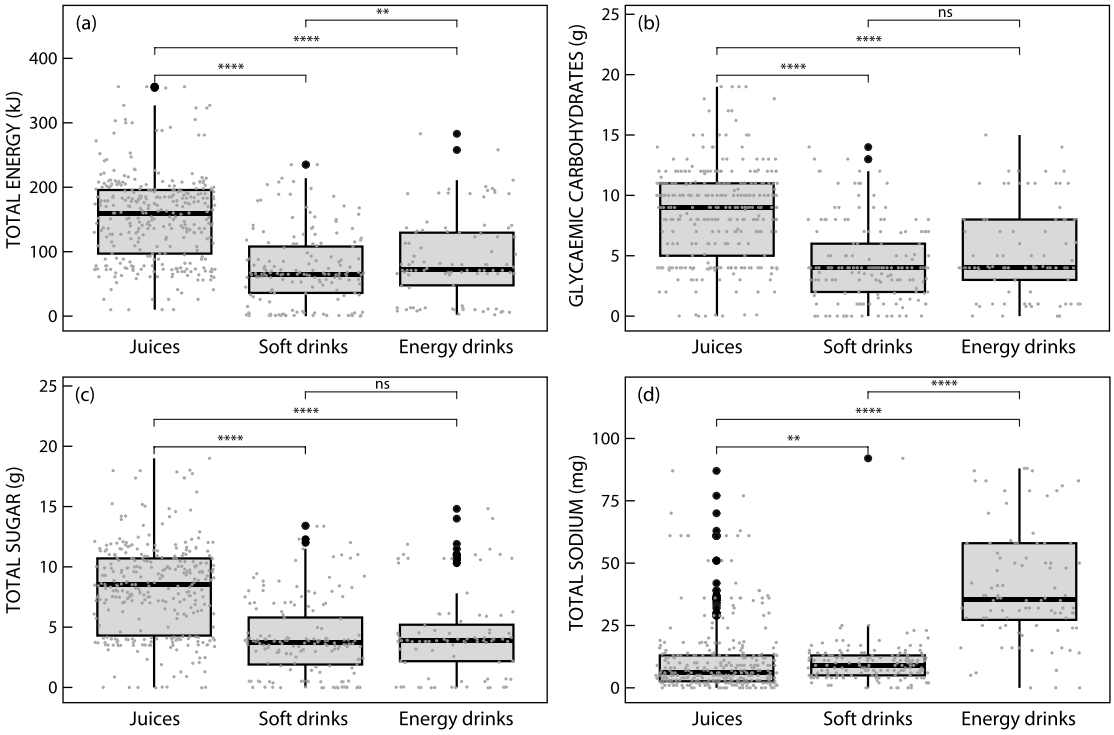

Figure 2: A comparison of (A) total energy, (B) glycaemic carbohydrates, (C) total sugar and (D) total sodium between juices, soft drinks and energy drinks. A Wilcoxon rank-sum test was used to assess statistical differences between two groups. ns: insufficient evidence of a difference ($p > 0.050$); *$p < 0.050$; **$p < 0.010$; ***$p < 0.001$; ****$p < 0.0001$.

Juices are often exempt from the HPL as they contain natural sugars, such as fructose and sucrose, derived from the fruit itself, rather than added sugars.[17] Consequently, while the sugar tax has effectively reduced sugar content in soft drinks and energy drinks, the exemption for fruit juices means these beverages still have high sugar content.[18] Given that the newly proposed South African regulations (R. 3337) also target added sugars, the adverse effects of high sugar content in fruit juices are likely to persist.[6] The exemption of juices from the sugar tax was based on the misconception that sugars from fruits and vegetables are less harmful than added sugars.[19] Yet, regardless of dietary source, excess sugar consumption increases the risk of many nutrition-related diseases including obesity, type 2 diabetes mellitus, dyslipidaemia, cardiovascular diseases and many types of cancers.[19,20]

Exempting beverages with high natural sugar content is likely to have led to our observation of fewer artificial sweeteners in juices compared with soft drinks and energy drinks. Likewise, our observation that beverages with artificial sweeteners had lower sugar and glycaemic carbohydrate content was anticipated within the South African context. This is because artificial sweeteners are used as substitutes for sugar to provide sweetness without the associated glycaemic load.[21] In South Africa,

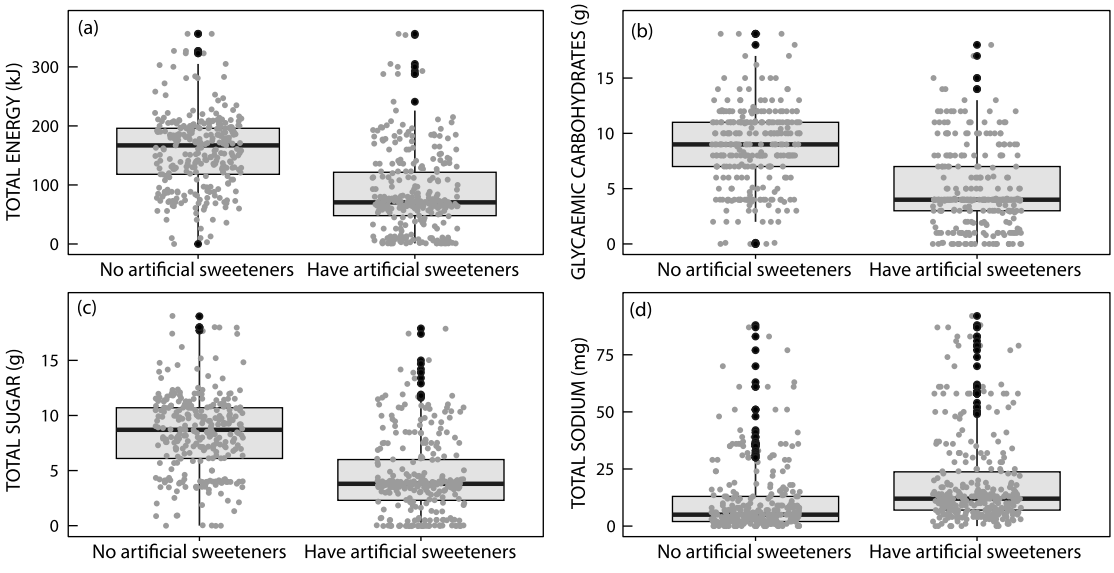

Figure 3: A comparison of (A) total energy, (B) glycaemic carbohydrates, (C) total sugar and (D) total sodium between all beverages with and without artificial sweeteners. A Wilcoxon rank-sum test was used to assess statistical differences between two groups. All p-values were < 0.0001.

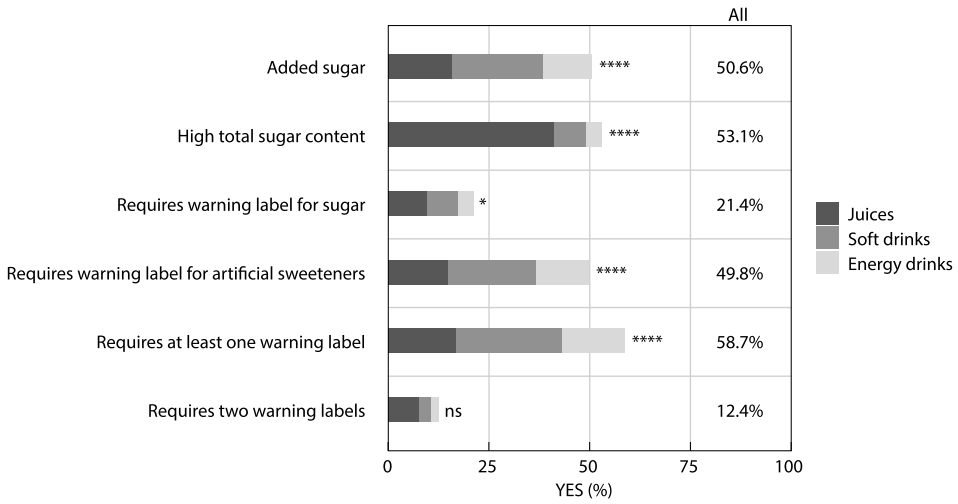

Figure 4: Proportion of beverages that require warning labels for high sugar content and the presence of artificial sweeteners. A chi-square test was conducted to compare the statistical differences among the three drinking product groups (juices, soft drinks, and energy drinks). ns: insufficient evidence of a difference ($p > 0.050$); *$p < 0.050$; ***$p < 0.001$; ****$p < 0.0001$.

the implementation of the sugar tax has incentivised manufacturers to reduce the sugar content in their products to avoid the tax.[3]

However, evidence from this study suggests that, although juices have higher sugar and glycaemic carbohydrate content compared with both soft drinks and energy drinks in South Africa, the newly proposed regulations are unlikely to incentivise juice manufacturers to reformulate their products. Our findings indicated that, while approximately 73.6% of juices were high in sugar content (≥5 g/100 ml), only 17.2% of these beverages would require a warning label for high sugar content. Consequently, the proposed warning labels may mislead consumers into perceiving juices as healthier options, potentially leading to their excessive consumption.[22] Excessive consumption of fruit juices is a great concern for the prevention and management of diabetes mellitus. For example, a study in the United States that followed up 71 346 female nurses over 18 years reported that while increased consumption of whole fruits was associated with a lower risk of developing type 2 diabetes mellitus, increased consumption of fruit juices was associated with a higher risk.[23]

Juices are often seen as healthy, partly due to their low sodium content, a mineral that can raise blood pressure, and their high potassium content, which can lower it. Accordingly, it was expected that juices would have the lowest sodium content in our study. The slightly elevated sodium levels in beverages with artificial sweeteners was also anticipated, as some sweeteners used in South Africa, such as sodium saccharin and sodium cyclamate, contain sodium in their chemical structure. However, the sodium content in beverages that contain artificial sweeteners was minimal (median = 12.0 mg/100 ml).

Overall, potential reformulation by industries is anticipated due to the introduction of warning labels in South Africa, which is expected to have a significant impact on the beverage industry, encouraging manufacturers to reformulate their products to meet new health standards. South African manufacturers are likely to reformulate their products to avoid negative labelling, thereby decreasing the availability of high-sugar beverages. Such a pattern has been observed in countries like Chile and the United States, where similar measures have been implemented.[24,25] This could improve the overall nutritional quality of beverages, as seen in other countries. Warning labels may also increase consumer awareness and drive market competition, resulting in healthier product options and improved public health outcomes.

Study limitations

This study had some limitations. The cross-sectional study design does not allow for the inference of causality. For instance, it cannot be determined whether the inclusion of artificial sweeteners directly results in a reduction of sugar content in beverages. Despite its limitations, the cross-sectional study design offers an opportunity to monitor beverage reformulations through repeated cross-sectional analyses. This approach can provide valuable insights into whether warning labels positively impact public health in South Africa. However, the interpretation of the findings is limited to specific types of beverages: juices, soft drinks and energy drinks. It remains uncertain whether similar trends would be observed for excluded beverages such as iced tea, drinking yogurt, smoothies, shots and alcoholic beverages. These excluded categories might exhibit significantly different patterns in terms of sugar content and artificial sweeteners, which could impact the overall assessment of the beverage market.

Inclusion of only the leading retailers in South Africa has both limitations and strengths. The findings may not be representative of all retail environments in South Africa, particularly smaller or independent stores, which might have different product offerings. However, the included retailers hold a significant market share and influence consumer purchasing behaviour, offering insights into trends that impact a large portion of the South African population.[10]

While the cross-sectional design limits the ability to infer causality, future longitudinal or experimental studies could build on these findings. Longitudinal studies could track changes in beverage formulations and consumer health outcomes over time, providing valuable insights into trends and associations. Experimental studies could test the direct impact of warning labels on consumer choices and health metrics, offering more definitive insights into the effectiveness of such regulations.

Additionally, relying solely on major supermarkets may have introduced bias and limits the study's generalisability, as smaller, independent stores and convenience outlets may offer different beverages not captured in this study.

Conclusions and recommendations

The present study demonstrated that the introduction of warning labels in South Africa is likely to result in more than half of the beverages requiring such labels due to high sugar content and/or the presence of artificial sweeteners. The proposed regulations are likely to favour juices, which, despite their high sugar content, are less likely to require warning labels because the sugar is naturally occurring rather than added. The South African government should consider revising the criteria for warning labels to include beverages with high levels of naturally occurring sugars, such as juices. The government should also consider juices in the sugar tax, as this could prompt manufacturers to reduce the sugar content in their products. These approaches would ensure that consumers are fully informed about the sugar content of all beverages, regardless of whether the sugars are added or naturally occurring.

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