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Compliance of the food industry with mandated salt target levels in South Africa: Towards development of a monitoring and surveillance framework

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ABSTRACT

This study evaluated the compliance of the food industry with mandated sodium target levels in South Africa for 13 categories of processed foods included in the sodium regulation R.214, and assessed whether there were differences between the sodium content provided on the product and the chemically analysed values. An in-store survey was done (February-June 2021) to collect sodium content data on the nutrition information panels of packaged foods (n = 1103). Commonly consumed brands for nine of the food categories, were physically sampled (n = 198) for sodium content analysis using Inductively Coupled Plasma-Optical Emission Spectroscopy (ICP-OES). Analysed sodium and food label values were compared with maximum permitted targets. According to food labels, 75% of food products had sodium levels at or below targeted limits. For the categories of bread, dry gravy powders and savoury sauce powders, and processed meat (uncured), > 30% of products had sodium levels above legislated targets. The least compliant food category was uncured processed meat which exceeded targets. Sodium levels declared on the packaging were similar to or higher than analytical sodium values, except for uncured processed meat ($P < 0.05$). According to food labelling and chemical analytical data, 70 – 75% of food products were compliant with the legislated sodium targets.

1. Introduction

Salt reduction efforts globally have been gaining momentum in recent years as health authorities recognize the negative impacts of excessive salt consumption on public health. High salt intake has been linked to hypertension, cardiovascular diseases, stroke and other health problems (He et al., 2020). To address this issue, governments, non-governmental organizations and industry have been working to reduce population-level salt intake through various strategies, including food reformulation, improved food labelling and public education. In the case of reformulation of processed foods, whether mandatory or not, it is important to monitor their salt content to ensure that these efforts are effective. Many countries have adopted sodium (Na) targets for food reformulation, with 19 having mandatory maximum Na limits for foods (Santos et al., 2021). However, only in about half of these countries do the regulations cover a wide range of processed foods. South Africa was one of the first countries to adopt such an approach through its government-enforced regulation R.214 (South African National Department of Health, 2013). This regulation aimed to decrease nationwide Na intake by a predicted 0.85 g/day and thereby reduce annual cardiovascular deaths (CVD) by 11% (Bertram et al., 2012). A stepwise approach was adopted (interim targets by June 2016 and stricter targets by June 2019, with further amendments to some meat categories to be enacted by 30th April 2020 (South African National Department of Health, 2019) to allow the food industry to achieve the final recommended Na levels. This legislation forms part of a multi-pronged approach by the government to reduce population-level salt intake, in order to reduce the burden of non-communicable diseases (NCDs), notably hypertension, stroke, heart disease and other circulatory conditions.

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A key component to demonstrating the success of the sodium reduction legislation is systematic monitoring and surveillance of the sodium content of packaged foods, however, there is no formal system in place for this to occur. An analysis of food labelling information indicates compliance with 2016 targets (Peters et al., 2017), but with wide variations in Na content among different brands of the same product. A study conducted by Swanepoel et al. (2017) immediately prior to the implementation of the 2016 targets measured the sodium content of ten food products, randomly selected from each of the 13 targeted food categories using atomic absorption spectrometry. It was found that the majority of the food products tested complied with the targets for 2016 (72%) and almost half of the products with the 2019 targets (42%). The highest variation was observed in the “all fat and butter spread” category (20%), as well as the “raw-processed meat sausages” (32%). “Flavoured potato crisp, excluding salt-and-vinegar” and “flavoured ready-to-eat savoury snack and potato crisp, salt-and-vinegar only” had the weakest compliance of 30% and 25%, respectively. At that time, in most of the food products, the Na content reported on the label over-reported the measured Na in the food product, with differences of more than 20% seen across food categories. The authors noted that a possible reason for this could be that re-printing of labels can take time, and that product development and adaptation may not have been finalised at the time of the food sampling (March to May 2016). In contrast, a study by Pretorius & Schönfeldt (2018) found that, in the case of processed meats, the amount stated on the label tended to under-estimate the analysed sodium content by over 20%. These two studies by Pretorius & Schönfeldt (2018) and Swanepoel et al. (2017) demonstrate that, in the absence of routinely collected laboratory analytical data, Na content data displayed on food labels cannot be validated. An earlier study on retail cheeses in the United States (Agarwal et al., 2011) also concluded that label declarations rarely reflected analytical Na content, with analytical levels most commonly below label declarations.

Regarding the impact evaluation of South Africa’s Na regulations, two studies have demonstrated reductions in population salt intake since the legislation was introduced. Both used the gold standard 24 hr urinary Na measurements. In a nested cohort of the World Health Organization (WHO) Study on global AGEing and adult health (WHO-SAGE) nationwide study, overall salt intake dropped by 1.15 g/day ($P = 0.028$) in participants of median age (54 years) between 2015 and early 2019 (Charlton et al., 2021). A similar magnitude of reduction (–1.2 g/day; $P = 0.007$) was reported in a sample of younger adults aged 20–30 years in the African-PREDICT study, whose data was collected between baseline (2013–2016) and follow-up data (2018-ongoing). Given the probability that a greater portion of the diet of young adults, individuals of black ethnicity, and those with lower socio-economic status consists of the staple foods targeted by salt reduction legislation, the mandatory salt reduction in certain processed foods may have a more pronounced effect (Strauss-Kruger et al., 2023).

While such data is promising, it is necessary to monitor the food supply in order to determine whether compliance with the mandated Na targets is consistent across all food categories included in the legislation, as well as to identify the degree to which adherence to the stricter maximum Na levels in foods, enforced from June 2019, has impacted product reformulation.

This study aimed to evaluate the compliance of the South African food industry with the regulations relating to the reduction of Na in certain foodstuffs as regulated (R.214), using both food labelling information and laboratory analysis of Na content in key foods and to assess whether Na content data provided on food labels is consistent with the actual chemical composition.

2. Methods

2.1. Evaluation of food labelling information

2.1.1. Data sources

Nutrition information of packaged foods from the 13 food categories targeted by the Na legislation in South Africa was obtained from The Content Management System (CMS) South African database of nutrition composition of packaged foods (Dunford et al., 2014). Data was collected through in-store surveys conducted between February and June 2021, in collaboration with The George Institute of Global Public Health (TGI) and through their South African licensed user of the FoodSwitch database and TGI Data Collector smartphone applications. Researchers visited two major supermarket chains, which together serve middle- and high-income consumers in Johannesburg. In addition to the two partner supermarkets, samples were also taken from an additional two retailers that cater to the lower socioeconomic market and were couriered to the researchers for Nutrition Information Panel (NIP) data to be captured into the TGI CMS South African database of nutrition composition of packaged foods. Images of the product information including barcodes, nutrition information panel, product name and ingredients list were captured using the data collector smartphone application and then captured into the database using protocols for data entry and data quality checks. The George Institute Food Data Collector Application, available for download from the Apple App Store (Itunes), enables users to scan barcodes of food items and capture images of the nutritional details from the packaging. These images are sent to The George Institute for data entry and processing. The data collection takes place within a specific work program aimed at conducting research to enhance the health of millions (Apple, 2016).

2.1.2. Food categorisation

Food products were categorised in accordance with the categorisation system of the Global Food Monitoring Group (GFMG), a standardised system which methodically assesses the nutrient content of processed foods worldwide and systematically classifies them (Dunford et al., 2012). An example of a food group is ‘meat and meat products’, food category is ‘processed meat’, level 1 sub-category is ‘sliced meat’, and level 2 sub-category is ‘sliced ham’. The food categories targeted by the South African Na legislation were identified and they were matched with the sub-categories in the GFMG database.

2.2. Determination of sodium content in selected food categories using chemical Analysis

2.2.1. Sampling and sample preparation

Key foods in nine of the 13 food categories included in the mandatory Na reduction legislation were sampled. Budgetary constraints of the project grant prevented all 13 categories of foods from being included. To remain in line with International Network of Food Data Systems (INFOODS) guidelines (Murphy et al., 2016) to ensure the validity of the data obtained, the following considerations were made when selecting products to analyse: A range of brands were selected, with different sampling units and batch numbers; manufacturing date (to ensure that a sampled food product is not manufactured only once); and use of different retailer outlets.

Five samples of each of the brands of 17 different food products (key foods) with different manufacturing dates were obtained between January and June 2021 from six different retail outlets in Tshwane, Gauteng. Products sampled were: White bread [5 brands], Brown bread [5 brands], Medium fat spread (margarine) [5 brands], Red viennas [4 brands], Chicken viennas [3 brands], French polony [4 brands], Chicken polony [5 brands], Russian sausages [3 brands], Bangers/pork sausages [3 brands], Beef sausages [1 brand], Chicken burger patties [3 brands], Beef burger patties [1 brand], Chicken nuggets [3 brands], Dry soup powder (Brown onion flavour) [3 brands], Gravy powder (Brown onion flavour) [3 brands], Dry instant noodles (beef flavour) [3 brands] and Stock cubes (beef flavour) [2 brands] resulting in 280 data points (Na results). Samples were re-packaged and coded to ensure anonymity and sent to the laboratory for Na analyses.

2.2.2. Chemical analysis of sodium content

Upon arrival at the laboratory, the whole sample (except for powders and margarine) was freeze-dried and milled to ensure homogeneity of the samples. All analyses were completed in duplicate.

Sodium was determined using the Association of Official Analytical Chemists (AOAC) Official Method 984.27 and AOAC Official Method 942.05 and optimised and validated by the laboratory (Poitevin, 2012). Two (2) g of dried and milled samples were weighed in an ash crucible. Samples were ashed for at least three hours at 550 °C. After cooling, samples were taken up in concentrated hydrochloric acid to convert salts to chlorides – 2 aliquots of 5 ml were used and after every addition, the samples were evaporated to dryness, after which 5 ml concentrated nitric acid was added to dissolve the salts. Samples were heated until salts dissolved, except for silica which was not dissolved in the acid and remained in the crucible. Samples were then quantitatively washed over into 100 ml volumetric flasks with distilled water. All samples were filtered to ensure the removal of particulates. Filter papers were washed with distilled water and flasks were made up to the mark. Samples were analysed on an ICP-OES using an acidified calibration range to determine the Na concentration.

Method validations were done by the laboratory according to the accreditation requirements of the South African National Accreditation System (SANAS). To monitor the analytical performance of the laboratory and to ensure reliability and accuracy, the laboratory takes part in the Agri-Laboratory Association of Southern Africa (AgriLASA) test scheme for proficiency testing and inter-laboratory studies were done with three different laboratories in South Africa.

2.3. Statistical analyses

Descriptive statistics (mean, medians, minimum and maximum) of Na levels per 100 g were obtained for each of the food categories targeted by Na legislation. Products with missing Na values were excluded from the analysis, for example, those with no NIP. Paired sample t-tests were used to compare the Na levels declared on the NIP with analytical Na data obtained through chemical analysis in a sub-set of the total sample. All statistical analyses were conducted using IBM SPSS version 26.

3. Results

3.1. Sodium content obtained from Nutrition Information Panels (NIP)

A total number of 2089 food products were available from the TGI CMS database. The total products available for analysis were 1103; 986 products were excluded from analysis since they were either not part of the food categories targeted for sodium legislation (n = 566), had missing Na values (n = 412) or were variety packs (n = 8).

The median Na level in food categories targeted for legislation ranged from 174 mg/100 g in breakfast cereals and porridges to 14 860 mg/100 g in stock cubes, powders, granules, emulsions, pastes or jellies (Table 1). Most of the food categories had Na levels below the respective maximum allowed limits except for uncured processed meat. The median Na content, as presented on the products' NIP, exceeded the allowable limit by 267 mg/100 g. Overall, 75% of the food products had Na levels at or below the targeted limit (Fig. 1). Sodium levels above the legislated targets were recorded in more than 30% of the products in the food categories: 'Bread', 'Dry savoury powders with dry instant noodles' and 'Processed meat (uncured)'.

3.2. Sodium content assessed through chemical analysis

Analysis of Na through chemical analysis was undertaken for 198 products. Of the 258 products that were received by the laboratory, the following were excluded: n = 35 not in the Foodswitch database; n = 21 no NIP in the Foodswitch database; and 4 with no barcodes and thus could not be matched. The amount of Na was analysed in duplicate for each product. Chemical analysis confirmed that the following food categories did not meet the targets: processed meat sausages; and processed meat (uncured) and bread. In accordance with the R.214 regulation, products that do not carry a nutrient content claim can have a 20% margin above the maximum Na target in order to account for variation. If this is taken into account, the bread samples that were analysed would be compliant with the regulations, however, the foods in the processed meat uncured and processed meat sausages categories remain non-compliant. There were significant differences in Na levels declared on the NIP compared to analytical Na in the following food categories: "Bread", "Dry soup powders", "Fat and butter spreads", "Processed meat cured", "Processed meat uncured", and "Stock cubes, powders, granules, emulsions, pastes or jellies" (Table 2). In all cases except bread and processed meat uncured, the analytical values were lower than those shown on the food labels.

Table 1
Sodium levels of food categories targeted by sodium legislation in mg per 100 g according to nutrition information panels on food packaging.

Food category	No. products (n = 1103)	Sodium reformulation targets 30 June 2019 / 30 April 2020†	Median	Minimum	Maximum	Mean	Standard deviation
Bread	103	380	359	122	865	379	109
Breakfast cereals and porridges	199	400	174	0	807	187	138
Fat and butter spreads	76	450	450	0	809	396	197
Ready to eat savoury snacks	261	700	596	0	1792	544	272
Flavoured potato crisps	34	550	507.5	339	2471	636	484
Salt and vinegar flavoured savoury snacks	11	850	528	348	1236	611	249
Processed meat, cured	29	1150†	814	483	2756	994	509
Processed meat, uncured	101	650†	917	300	1498	879	229
Processed meat, sausages	134	600†	573	434	1090	589	114
Dry soup powders	59	3500	3449	2192	6385	3513	696
Dry gravy powders and savoury sauce powders	20	2000*	1993	1559	6625	2750	1425
Dry savoury powders with dry instant noodles	47	800	783	319	1348	730	164
Stock cubes, powders, granules, emulsions, pastes or jellies	29	15000*	14860	2313	17968	12997	427

†Targets for processed meat were amended and date for implementation set as 30th April 2020.
* Sodium reformulation targets were lower in earlier version of the legislation dated 20th March 2013 as follows: Stock cubes, powders, granules, emulsions, pastes or jellies - 13000 mg, Dry gravy powders and dry savoury sauce powders - 1500 mg.

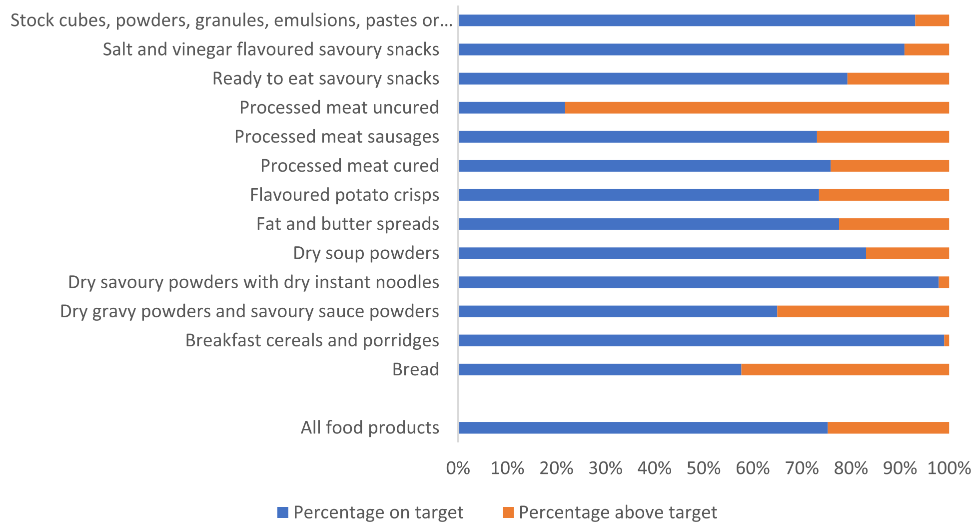

Fig. 1. Percentage of foods on target and above the target of the sodium legislation according to Nutrition Information Panels. The regions shaded blue indicate foods with sodium levels at or below the sodium limit. Regions shaded in orange indicate foods with sodium levels above the target.

Table 2
Comparison of mean sodium levels in mg per 100 g declared on the Nutrition Information Panel (NIP) with analytical sodium values.

Food category	Number of products (n = 198)	Sodium reformulation targets 30th June 2019 (mg Na/100 g product)	As declared on NIP, mean (SD) (mg Na/100 g product)	Meeting targets according to NIP	Based on analytical results, mean (SD) (mg Na/100 g product)	Difference between target and analytical value (%)	Meeting targets according to analytical results	Difference between NIP and analytical value (mg Na/100 g product)	P value
Bread	35	380	366.5 (33.3)	Yes	387.7 (33.3)	2.03	No	21.2	< 0.001
Fat and butter spreads	20	450	526.3 (135.5)	No	415.0 (44.5)	-8.4	Yes	-111.3	0.001
Processed meat, cured	10	1150	1181 (49.5)	No	1102 (50)	-4.2	Yes	-79	0.021
Processed meat, uncured	63	650	897.8 (238.7)	No	956.6 (254.1)	47.2	No	58.8	0.009
Processed meat, sausages	25	600	730 (178.4)	No	758.2 (223.3)	26.4	No	28.2	0.269
Dry soup powders	14	3500	3413.5 (73)	Yes	3143.6 (372.2)	-10.2	Yes	-269.9	0.011
Dry gravy powders and savoury sauce powders	21	2000	1565.6 (556.4)	Yes	1522.1 (527.8)	-24	Yes	-43.5	0.247
Stock cubes, powders, granules, emulsions, pastes or jellies	10	15000	14926.5 (70.1)	Yes	14407.0 (654.1)	-4	Yes	-519.5	0.034

4. Discussion

This study reports that the Na content as declared on the Nutrition Information Panels (NIP) of the 13 categories of foods that are targeted under the South African Government's regulation R.214 for maximum Na levels permitted in processed foods are mostly compliant with targets identified in the second and more stringent phase of the legislation that came into effect in June 2019 (with amendments in 2020), except for uncured processed meats. Food purchasing data from 344,161 high-income South African households collected for a whole year between January and December 2018 reported that meat and meat products were one of the main contributors to salt purchases (19%), second only to bread and bakery products (23.3%), while other important sources included dairy (12.2%), sauces, dressings, spreads and dips (11.8%), and convenience foods (8.7%) (Ndanuko, Shahid, et al., 2021). Our data provides an update of previous, similar analyses (Peters et al., 2017; Swanepoel et al., 2017) that were conducted in the introductory phase of the legislation and is consistent with a similar, recent evaluation of the Na content reported on packaged foods that were sampled between February 2019 and September 2020 (Van der Westhuizen et al., 2023), whereby nine of the 13 food categories included in the Na regulations were considered to be compliant (i.e. ≥70% of products meet compliance).

According to laboratory analytical values, bread had marginally higher Na values than the maximum permitted limits (2%), while raw processed sausages and uncured processed meat had excessive levels, of 26% and 47% above the limits. This is in contrast to analyses from a study conducted in 2016 (Swanepoel et al., 2017) which reported that, at that time, both of these meat categories complied with the 2016 and the 2019 Na targets. It is possible that the 2017/2018 outbreak of listeriosis in South Africa that was associated with processed meat and resulted in the subsequent recall of products from retail shelves (Thomas et al., 2020) may have had an effect on the compliance of the processed meat industry to the regulations and led to additional salt included in these products as a food safety precautionary measure.

Our study also provides a comparison between labelling information provided on food packaging and objective chemical analysis of Na content in nine of the 13 mandated categories of processed foods. When comparing the NIP values with the analytical data, the results provide confidence that information on the Na content of foods that are provided on food packaging is accurate and, in many cases, may overestimate, rather than underestimate actual Na content. The exception to this was the case of uncured processed meat which not only exceeded the allowable limit by 267 mg/100 g, but also displayed lower Na content on food labels than found in the actual products. The other food group that had significantly higher Na content than displayed on the packaging was bread, but the average difference was minimal at 21 mg/100 g. The accuracy of labelling information is relevant to the proposed front-of-pack labelling warning system that will be implemented in South Africa by 2025. The proposed new labelling regulations (open for public comment) introduce a mandatory black-and-white warning-label system for pre-packaged foods that are high in sugar, salt and unhealthy fats (South African National Department of Health, 2023). Foods that contain ≥ 400 mg Na per 100 g for solids or ≥ 100 mg Na per 100 ml for liquids will be required to carry a salt warning (South African National Department of Health, 2013). A study of adult South African consumers identified a positive attitude toward warning labels on ultra-processed foods and drinks as they were perceived to be easy to understand, provide important nutrition information, and could save shopping time (Bopape et al., 2021).

South Africa is now one of a number of countries with mandatory Na targets for food reformulation, which forms the backbone of a suite of salt reduction strategies, including consumer education, underpinned by food based dietary guidelines. A review of national salt reduction initiatives around the world in 2019 identified a 28% increase in the number of all initiatives since 2014, to number 96 countries (Santos et al., 2021). Of the 57 countries with Na targets for food reformulation, 19 have mandatory maximum Na limits for foods. Half of these countries set mandatory targets for bread alone (Bahrain, Belgium, Hungary, Netherlands, Palestine, Paraguay, Portugal, Qatar, Spain, and Turkmenistan), whereas the other half, including South Africa, covered a wider range of foods, including processed meats, cheeses, crisps and snacks, soups and stocks, canned fish, tomato products, and fruit and vegetables (Argentina, Belarus, Bulgaria, Finland, Greece, Iran, Slovakia, and Uzbekistan). This is promising, however, mechanisms to monitor and enforce Na reduction legislation through food reformulation remain challenging (Cappuccio et al., 2022). In Argentina, it was found that more than 90% of foods were compliant, as reported on the nutrition information panels, four years after implementation of the legislation (Allemandi et al., 2015). This high compliance may be attributed to the successful government-led programme ‘Less salt, more life’, introduced in 2011 (Germain, 2017), which encouraged voluntary buy-in from the food industry to lower the Na content of processed foods. However, a lesson from Argentina is that Na discussions often take place between the government and the bigger food companies, and an ongoing challenge is to determine compliance with Na targets in small-sized and medium-sized food producers (Allemandi et al., 2015). Indeed, in the South African context, foods sold by informal street food vendors, and commonly consumed takeaway foods are important targets for future Na reduction efforts, especially for younger South Africans who are estimated to consume, on average, eight servings of fast foods per week (Feeley et al., 2009). Other target groups are children and adolescents in low-income settings who typically consume a range of unhealthy snacks that are high in Na, particularly at school (Steyn et al., 2015). A quantitative study that assessed the nutrition knowledge, attitudes and practices of learners from three primary schools in a South African township found that the most liked and frequently consumed food group was “drinks and snacks” which are foods that remain high in Na, despite being compliant with the permitted Na targets (Mamba et al., 2019).

Sodium reduction is considered a best-buy strategy by WHO because it contributes greatly to preventing cardiovascular diseases and will accelerate a country’s progress to achieving other global NCD targets (World Health Organization, 2013). The World Health Organization has recently published global benchmarks for Na levels in different food categories (World Health Organization, 2021). Interestingly, these tend to be considerably lower than those set by South Africa, which suggests that South Africa may need to revise its current targets across many categories to be in line with best practice recommendations. For example, in the case of bread, the South African target is 380 mg Na/100 g while the WHO global target is lower at 330 mg/100 g. In the present study, 33% of sampled breads exceeded the South African target which is concerning since bread is a relatively cheap staple food consumed by most of the population (Labadarios et al., 2005).

The responsibility of food monitoring has shifted to include the Department of Food Control, the Nutrition Directorate and the Department of Environmental Health. The capacity of these agencies to handle complex and integrated legislative issues in the wake of the COVID-19 pandemic is limited. As reported by other authors (Kaldor et al., 2019), enforcement of Na regulations in South Africa is generally conducted by environmental health officers who are already tasked with enforcement of a large range of regulations and laws, and are under-resourced. The jurisdiction of these officers operates at a local and district level while the majority of food producers operate on a national level. This creates administrative burdens for contraventions of the regulations to be individually prosecuted. Despite financial penalties for failure to comply with the Na regulations, these fines are small, relative to turnover of large companies. A qualitative study of key role players’ perceptions of the current salt legislation in South Africa identified that the strategy was not being reinforced and that its initial momentum had been lost. Concerns were raised regarding the absence of consumer-awareness campaigns, the population’s lack of knowledge regarding salt intake and its relation to health, and the challenges around the monitoring of salt/Na in processed foods (Van Loggerenberg et al., 2023). In the absence of a national effective food monitoring and surveillance system, one method may be a collaboration with TGI to enable the ongoing use of the TGI Data Collector app to collect nutrition information panel data at routine intervals. This method has been used in South Africa immediately prior to the implementation of legislation (Peters et al., 2017), in Kenya to describe the Na content of the food supply (Ndanuko, Maganja, et al., 2021), as well as in the current analysis.

5. Conclusion

Compliance with mandated Na targets in processed foods in South Africa is generally good, except for some breads, processed meat (sausages) and processed meat (uncured). Should these categories persist in displaying non-compliance with the regulation, it would be necessary to engage in consultations with industry partners to tackle any underlying issues they might encounter within these specific categories. The mandatory nature of the regulations has the advantage that all actors within the industry have to comply. Effective and ongoing monitoring mechanisms are required to ensure ongoing compliance and reformulation of certain foods.

The launch of the National Strategic Plan for Non-Communicable Disease (NCD) Prevention and Management (2022–2027) in July 2022 (South African National Department of Health, 2022) may provide impetus for greater attention to monitoring the Na content of processed foods. Given the enormity of the problem and the high burden of NCDs in the country, hypertension and diabetes were selected as the medical conditions targeted for the reduction of the burden of disease. In laying out the prevention and control strategies for NCDs, salt legislation is not directly referred to in the strategy document. However, given the fact that excessive salt consumption is a key driver of hypertension, the strategy indirectly addresses this by also focussing on health policy for food control and unhealthy diets. Moreover, the NCD Strategy emphasizes a need for rigorous research and a monitoring system as key tools for the reduction of the burden of NCDs. A need to target the changing food environment to provide healthier options is highlighted in the Strategy, however, detail on how this is to be achieved and monitored is lacking.

Ethical Standards Disclosure

This research involved data collection of foods from supermarket stores and did not require ethics approval.

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CRediT authorship contribution statement

Webster Jacqui: Conceptualization, Funding acquisition, Methodology, Writing – review & editing. **Cimring Hayley:** Methodology, Writing – review & editing. **Naidoo Pamela:** Conceptualization, Investigation, Methodology, Writing – review & editing. **Nojilana Beatrice:** Methodology, Writing – review & editing. **Hussain Kinza:** Methodology, Writing – review & editing. **Charlton Karen Elizabeth:** Conceptualization, Data curation, Formal analysis, Funding acquisition, Project administration, Writing – original draft. **Shakhane Rhoda:** Formal analysis, Writing – review & editing. **Pretorius Beulah:** Conceptualization, Formal analysis, Methodology, Writing – original draft, Writing – review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data Availability

Data will be made available on request.

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