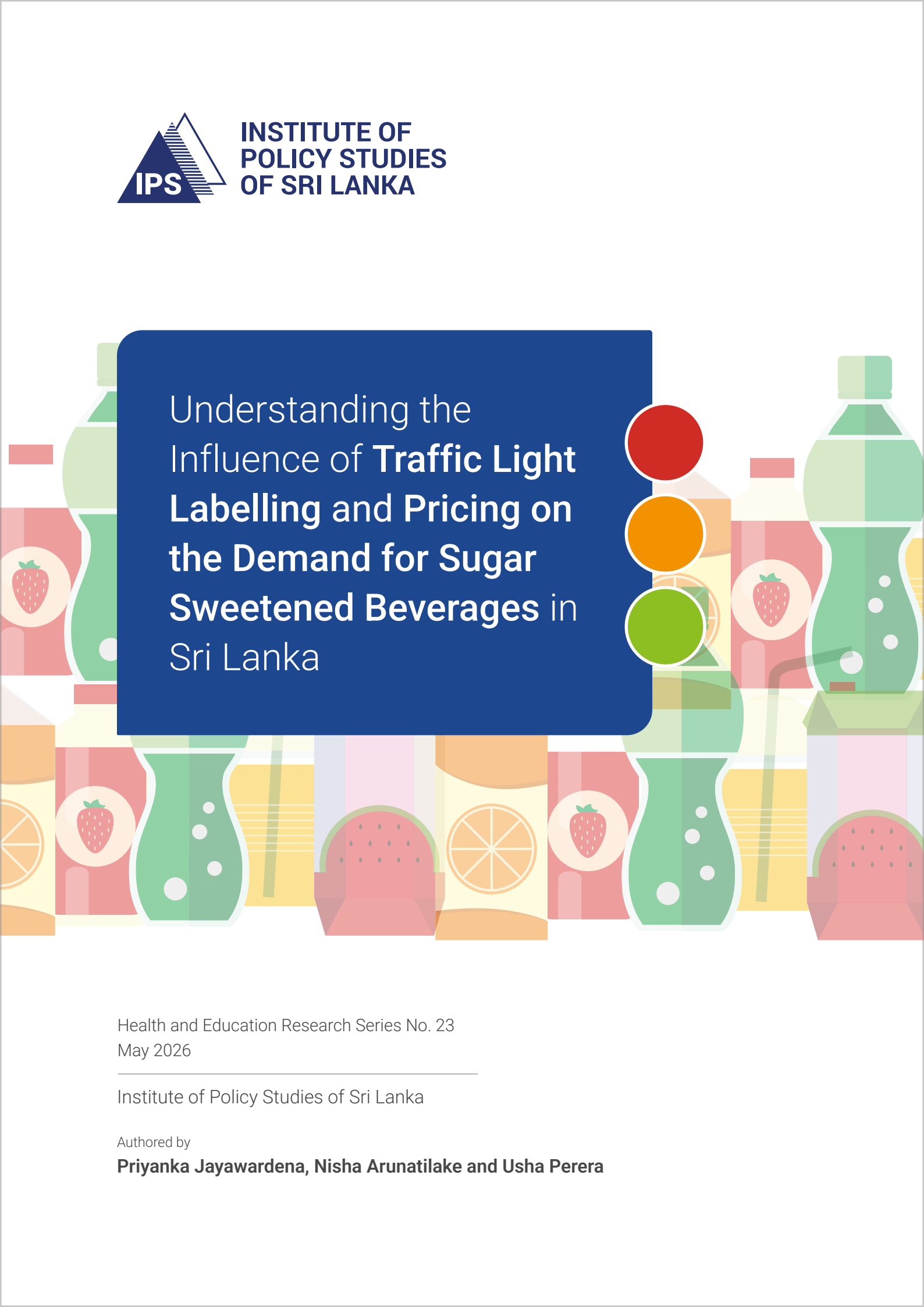




INSTITUTE OF
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Understanding the Influence of **Traffic Light Labelling** and Pricing on the Demand for Sugar Sweetened Beverages in Sri Lanka

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Authored by

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List of Abbreviations

AIC	Akaike's Information Criterion
APO	Asian Productivity Organization
BIC	Bayesian Information Criterion
BOI	Board of Investments
CAPI	Computer-Assisted Personal Interviewing
CCS	Ceylon Cold Stores
CE	Choice Experiment
c/g	cents per gram
CPI	Consumer Price Index
CSDs	Carbonated Soft Drinks
DCE	Discrete Choice Experiment
DCS	Department of Census and Statistics
EASI	Exact Affine Stone Index
FLABEL	Food Labelling to Advance Better Education for Life
FOP	Front-of-Pack
FOPNL	Front-of-Package Nutrition Labelling
GDA	Guideline for Daily Amounts
GST	Goods and Services Tax
HIES	Household Income and Expenditure Survey
LKR	Sri Lankan Rupees
MTLLs	Multiple Traffic Light Labels
MXL	Mixed Logit
NBT	Nation Building Tax
NCDs	Non-Communicable Diseases
Q1, Q2, Q3, and Q4	First, Second, Third, and Fourth Quartiles
SD	Standard Deviation
SSBs	Sugar-Sweetened Beverages
TLL	Traffic Light Label
VAT	Value Added Tax
WHO	World Health Organization

Executive Summary

This study examines the effectiveness of two key policy interventions - traffic light labelling (TLL) and sugar sweetened beverage (SSB) taxation aimed at reducing SSB consumption in Sri Lanka. The study specifically assesses whether these interventions have influenced consumer awareness, purchasing behaviour, and demand for SSBs, and evaluates the extent to which they are achieving their intended public health objectives.

The study reveals that approximately two-thirds of consumers are familiar with the TLL system on SSBs, with awareness varying across socioeconomic and demographic characteristics. Consumer awareness is a prerequisite for the effectiveness of Front-of-Pack Nutrition Labelling (FOPNL). Findings from the consumer survey indicate that approximately 66% of consumers are aware of TLL on SSBs, however, the awareness is unevenly distributed across socioeconomic and demographic groups. Higher awareness is observed among more affluent, educated, female, and non-elderly consumers, while lower awareness persists among socioeconomically disadvantaged groups, highlighting important equity concerns.

The study provides empirical evidence supporting the implementation of TLL as a means to enhance consumers' capacity to make low-sugar SSB choices. To assess the behavioural impact of TLL in the presence of competing product attributes, the study employs a Discrete Choice Experiment (DCE) method. The findings reveal that TLL plays a meaningful role in discouraging the selection of high-sugar SSBs, even when other product features, such as beverage type and price, are considered. The results provide empirical support for the effectiveness of TLL in influencing consumer choices and strengthening consumers' ability to make informed dietary decisions.

In contrast, the influence of the TLL varies significantly across different socioeconomic groups. The study indicates that TLL is less effective among individuals from lower socioeconomic backgrounds. Such consumers are less likely to be exposed to TLL and are less familiar with the regulations governing it. Even when aware, they tend to prioritise other product features over TLL during the purchasing process. Moreover, the study indicates that socioeconomically disadvantaged groups exhibit greater price sensitivity. The lack of availability of healthy SSBs at affordable prices compels these populations to opt for unhealthy alternatives.

The study also provides robust evidence that demand for SSBs in Sri Lanka is price-responsive. Price sensitivity analysis of Carbonated Soft Drinks (CSD), using 2019 Household Income and Expenditure Survey (HIES) data, indicates that a 10% increase in CSD prices is associated with a 15% reduction in quantity demanded. These findings confirm the effectiveness of SSB taxation as a tool in reducing consumption. However, the results point to a notable reduction in consumer price sensitivity over time, evidenced by the drop in the estimated own-price elasticity of soft drink demand from 2.08 in 2016 to 1.53 in 2019. To sustain and strengthen the price impact while reducing affordability over time, it is essential to periodically increase SSB tax rates. In line with international best practice, regular indexation of SSB taxes is required to prevent erosion of their real value, to maintain the intended price signal, and to curb the affordability of SSBs as incomes rise.

Overall, the study provides robust, evidence-based insights into the role of TLL and SSB taxation in shaping consumer behaviour in Sri Lanka. While both interventions align with global best practices and have demonstrated effectiveness, their full potential remains constrained by critical policy gaps-particularly in relation to awareness, equity, coverage, and tax calibration. Addressing these gaps is essential to maximise public health gains, reduce inequalities in dietary risks, and strengthen Sri Lanka's response to diet-related Non-communicable Diseases (NCDs).

1 Introduction

Rising rates of obesity and incidence of Non-communicable Diseases (NCDs) have long been a concern for Sri Lanka's health sector. The country has made significant strides in addressing communicable diseases, and policymakers are now shifting focus to NCDs. According to the World Health Organization (WHO), NCDs account for an estimated 74.8% of all deaths in Sri Lanka (WHO, 2025).

Fiscal policies and regulations on unhealthy food are common policy measures to promote healthy diets. Unhealthy food taxation is one of the population-based strategies proposed by the WHO to reduce the affordability of unhealthy food and reduce the dietary risk factors of NCDs. Other strategies include implementing recommendations on the marketing of foods and non-alcoholic beverages to children; food labelling, specifically the interpretative front-of-pack nutrition labelling (FOPNL) on pre-packaged foods to reduce intake of salt, sugar, and fat; promoting product reformulation; and mass media campaigns to raise awareness and advocate for healthy dietary behaviours (WHO, 2018b).

Globally, an estimated record of 9.8% of new type 2 diabetes cases and 3.1% of new cardiovascular disease cases in 2020 were attributable to SSB consumption.

A large and growing body of scientific evidence indicates that energy-dense, low-nutrient-value foods and beverages are detrimental to health (WHO, 2022). The intake of sugar-sweetened beverages (SSBs)¹ is a risk factor for obesity and diabetes (WHO, 2022). Because they are liquid, SSBs are rapidly consumed and digested, leading to reduced satiety, excess caloric intake, and subsequent weight gain (Pan & Hu, 2011). Globally, an estimated record of 9.8% of new type 2 diabetes cases and 3.1% of new cardiovascular disease cases in 2020 were attributable to SSB consumption (Lara-Castor, O'Hearn, & Cudhea, 2025). In response to this growing public health burden, the WHO recommends fiscal policies, such as excise taxation to reduce SSB consumption.

Furthermore, enhancing consumer awareness of food attributes through nutrition labelling, such as Traffic Light Labels (TLL), is a key strategy endorsed by the WHO to promote healthier eating habits and mitigate the risks of diet-related diseases.

In line with the global recommended practices to reduce SSB consumption, the Sri Lankan Government introduced regulations and taxes for SSB products. For instance, to reduce consumption by improving consumers' knowledge, the TLL system for SSBs was introduced in August 2016. Thereafter, an excise tax was introduced for SSBs in November 2017 to reduce affordability.

¹ The WHO defines SSBs as all types of beverages containing sugars. These include carbonated or non-carbonated soft drinks, fruit/vegetable juice and drinks, liquid and powder concentrates, flavoured water, energy and sports drinks, ready-to-drink tea/coffee, and flavoured milk drinks.

However, despite the presence of many policies, the extent of their reach to consumers and impact remains unclear due to data gaps. Additionally, there may be issues with implementation, enforcement, monitoring, and evaluation.

The current TLL on SSBs, which promotes a healthy food environment, has been in place for 9 years. It is essential to understand the effectiveness of the SSB regulation in influencing consumer behaviour through an improved food environment and increased food-related information in the country. However, despite the growing evidence base, the effectiveness of the TLL on SSBs has not been formally evaluated, therefore consumer awareness of TLL and its impact on consumption behaviour remain unknown. Similarly, the effectiveness of a tax on SSBs will depend on the coverage of the SSB tax policy, effective rates, and other factors- such as the prices of substitute products and household income. Therefore, evaluations of national and context-specific behaviours, consumption patterns, and the impact of the above fiscal policies and regulations are necessary to increase effectiveness and strengthen existing measures.

In this context, one of the main areas of interest in this study is examining the effectiveness of SSB taxes and regulations in reducing SSB consumption in Sri Lanka. This study aims to provide policy recommendations for enhancing the effectiveness of the policies mentioned above, by improving their implementation and coverage.

1.1 The Rationale of the Study

Fiscal measures and regulatory policies are gaining momentum in global public health discourse as effective strategies to address unhealthy dietary habits. However, due to their relatively recent introduction, evidence of their impact, particularly in low- and middle-income countries, remains limited. Most existing research on nutrition labelling originates from high-income countries in Europe, North America, and Oceania. For example, a systematic review by Song (2021) covering 156 studies found that only four were conducted in Asia, highlighting the scarcity of regional evidence. Moreover, recent literature indicates that aside from food taxes, other food-environment-related interventions, including labelling, have shown limited effectiveness in reducing dietary inequalities across consumer groups (Løvhaug et al., 2022). Within this context, our study contributes to closing this evidence gap by evaluating the effectiveness of both SSB taxation and labelling regulations in a developing country context of Sri Lanka.

Sri Lanka was among the first countries in Asia-and the first in South Asia-to implement mandatory nutrition labelling (World Cancer Research Fund International, 2019). Despite this early adoption, only a limited number of studies have

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explored the impact of SSB labelling regulations on consumer purchasing decisions in Sri Lanka, and most have been small-scale and largely descriptive. In contrast, the present study considers a nationally representative sample and employs econometric techniques to assess the effectiveness of TLL on SSB choices. It aims to evaluate these effects, offering evidence-based insights for policymakers to identify implementation gaps and improve the effectiveness of SSB regulations in shaping consumer behaviour through enhanced food environments and information.

Estimating demand elasticities is also essential to predict how SSB consumption may change in response to taxation. To date, Sri Lanka lacks empirical studies estimating the price elasticity of demand for SSBs. As a result, earlier work, including a technical study by the WHO, has relied on assumed elasticity values (WHO, 2018b). Addressing this gap, the current study estimates own-price, cross-price, and income elasticities of demand for SSBs, providing a more reliable foundation for forecasting the impact of SSB taxes. Additionally, the study examines how variations in food prices (for SSBs and potential substitutes) and income levels influence consumption patterns.

1.2 Research Objectives

The primary objective of this study is to provide evidence-based insights into the effectiveness of SSB taxes and TLL in influencing consumers' SSB consumption behaviour.

Accordingly, the study addresses the following specific research questions:

1. Assessment of TLL effectiveness:

- a) What is the impact of TLLs on consumers' choices of SSBs when other product attributes are considered?
- b) How effective are TLLs across different socioeconomic groups?

2. Price sensitivity analysis:

The study examines the price sensitivity of SSBs through own and cross-price elasticity analysis:

- a) How have SSB taxes influenced SSB consumption?
- b) To what extent are the effects of SSB taxes influenced by the prices of substitutes and household income?

3. Policy and implementation review:

The study identifies policy and implementation gaps in the current SSB tax and TLL frameworks and offers recommendations to enhance their design and implementation. The goal is to improve the national food environment and reduce unhealthy food consumption.

2 Literature Review

2.1 Type of SSB Taxes

Global literature shows that countries have adopted a wide range of approaches to taxing SSBs; including excise taxes, import duties, and Value Added Taxes/Goods and Services Tax (VAT/GST), with excise taxes being the most commonly used instrument (World Bank Group, 2020). These taxes fall under the broader category of “sin taxes,” which are designed to address the social costs of consumption that exceed private costs, with the primary objective of influencing consumer behaviour (WHO, 2018b). Excise taxes on SSBs can be structured as specific taxes-based on volume or sugar content-or as ad valorem taxes that are levied as a percentage of product value. Internationally, single-tier volume-based excise taxes have been the most widely adopted, followed by ad valorem taxes, tiered volume-based taxes, and finally sugar-content-based taxes (World Bank Group, 2020).

The literature highlights several advantages of specific excise taxes. Evidence from tobacco taxation suggests that specific taxes, whether based on volume or sugar content, are more effective than ad valorem taxes in reducing consumption (WHO, 2018b). Specific taxes are also easier to administer, less susceptible to industry price manipulation, more visible in shelf prices, and generate more stable revenue over time (World Bank Group, 2020). Single-tier volume-based taxes, in particular, are simple to implement and effective at raising revenue. However, they are not specifically tailored to variations in sugar content across beverages, and provide limited incentives for product reformulation (World Bank Group, 2020).

Specific taxes, whether based on volume or sugar content, are more effective than ad valorem taxes in reducing consumption.

A key limitation of specific taxes identified in the literature is their vulnerability to inflation. Without periodic adjustment, the real value of the tax erodes over time, reducing its effectiveness in discouraging consumption (WHO, 2018b). Consequently, international best practice recommends regularly adjusting SSB tax rates to account for inflation and income growth, to preserve their real deterrent effect (WHO, 2016; World Bank Group, 2020). In contrast, ad valorem taxes automatically adjust with price changes and therefore do not require inflation indexing. However, they may encourage consumers to substitute toward cheaper SSB options, thereby weakening their impact on overall sugar consumption. To address this, some studies suggest combining ad valorem taxes with specific volume- or sugar-based taxes, particularly for higher-priced products such as energy drinks (World Bank Group, 2020).

More recently, the literature has increasingly emphasised the potential advantages of sugar-content-based taxes. These taxes are considered more efficient because they directly target the underlying policy concern, which is excess sugar consumption, while also

providing strong incentives for manufacturers to reformulate products and for consumers to shift toward lower-sugar alternatives (WHO, 2018b; Grummon et al., 2019; World Bank Group, 2020).

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2.2 Different Types of Taxes by Different Countries and Their Effectiveness

A growing number of countries have adopted SSB taxes based explicitly on sugar content, reflecting an effort to better target excess sugar consumption. To date, only a limited number of countries—namely the Cook Islands, France, Mauritius, South Africa, and Sri Lanka—have implemented absolute sugar-content-based taxes. Among these, the Cook Islands, Mauritius, and Sri Lanka apply an absolute sugar-based tax, while South Africa has adopted a threshold-based design (World Bank Group, 2020). In parallel, several jurisdictions have implemented tiered volume-based taxes, that apply higher tax rates to beverages with higher sugar content. By mid-2019, eight jurisdictions had introduced such tiered systems, including Brunei, Estonia, Ireland, Malaysia, Portugal, Thailand, the United Kingdom, and Spain's Catalan region (World Bank Group, 2020).

Existing literature suggests that tiered volume-based taxes can potentially be more effective in encouraging consumer substitution toward lower-sugar beverages and incentivising product reformulation across tiers. However, these taxes do not incentivise reformulation within tiers, highlighting the importance of carefully defined thresholds and robust nutrient profiling in tax design (Grummon et al., 2019). Evidence from countries such as Chile and the United Kingdom indicates that multi-tiered systems can generate substantial short-term reductions in the sales of high-sugar beverages, alongside increases in sales of lower- or zero-sugar alternatives (Caro et al., 2018; Nakamura et al., 2018; Griffith et al., 2019; Public Health England, 2019).

Despite these successes, the implementation of SSB taxes has often faced strong opposition from the beverage industry. In several countries, industry lobbying has delayed, weakened, or even reversed SSB tax policies. While countries such as Portugal and South Africa succeeded in introducing excise taxes despite resistance, others including Denmark, Slovenia, and parts of the United States have repealed, withdrawn, or abandoned SSB taxes altogether (World Bank Group, 2020). These experiences highlight the political and institutional challenges that can influence both the design and durability of SSB tax policies.

Empirical evidence from jurisdictions that have implemented SSB taxes generally demonstrates reductions in the sales and purchases of taxed beverages, although the magnitude of these effects varies considerably across contexts. Reported reductions

range from 4% in Barbados (Alvarado et al., 2019), to 39% in Philadelphia (Roberto et al., 2019), and as high as 58% for energy drinks in Saudi Arabia (Alsukait, 2020). Such variation reflects differences in tax design, baseline consumption patterns, and context-specific socioeconomic factors. Distributional responses also differ: lower-income households have shown greater price responsiveness in settings such as Mexico and Berkeley, whereas higher-income consumers were more responsive to tiered tax structures in Chile (Caro et al., 2018; Colchero, Molina, & Guerrero-López, 2017; Colchero et al., 2017; Falbe et al., 2016; Nakamura et al., 2018). Evidence from Barbados further suggests that ad valorem taxes may be less effective than specific excise taxes, as consumers may switch to cheaper products rather than reducing overall SSB consumption (Alvarado et al., 2019).

The literature also emphasises the role of substitution effects in shaping the overall effectiveness of SSB taxes. Consumers may substitute toward untaxed or lower-taxed products, potentially diluting the intended health impact of the tax. As a result, broad-based taxes that apply across a wide range of unhealthy products may limit substitution opportunities and lead to greater improvements in overall diet quality (World Bank Group, 2020). However, systematic reviews of fiscal interventions highlight a lack of robust empirical evidence on substitution patterns in low- and middle-income countries, raising concerns about the direct transferability of findings from high-income settings (Alagiyawanna et al., 2015).

Despite accumulating international evidence, several gaps remain. First, much of the existing literature focuses on high-income or upper-middle-income countries, with relatively limited evidence from lower-middle-income settings such as Sri Lanka. Second, little is known about how different tax designs interact with consumer substitution behaviour in these contexts. Third, there is a lack of country-specific evidence on the longer-term effectiveness and sustainability of SSB taxes, especially in settings where tax rates are adjusted, reduced, or not indexed to inflation. Addressing these gaps is essential to guide the design of SSB taxes that are both context-sensitive and effective over time.

2.3 Usage of Nutrition Labels for Controlling Unhealthy Diets

With the rising prevalence of diet-related diseases such as obesity, overweight, coronary heart disease, diabetes, and high blood pressure, many researchers have identified that consumers are influenced to pay more attention to nutrient labelling. In addition, when consumer purchasing decisions are influenced, there will also be an impact on the reduction of diet-related diseases (Majid et al., 2015).

Labelling food products is crucial for providing clear, accessible information at the point of sale. Approximately 82% of consumers make their purchasing decisions in-store (Newman, Howlett, & Burton, 2016). Thus, marketers have greater influence over changing consumption behaviour through the use of nutrition labels (Newman, Howlett, & Burton, 2016). Hence, labelling could be used to attract attention and influence perceptions at the point of sale.

Nutritional labels aim to inform consumers about available choices and influence consumption patterns as well as the production of healthy food (Azman & Sahak, 2014). It will assist consumers to make informed decisions or judgments on the overall value of a product (Asian Productivity Organization – APO, 2022; Azman & Sahak, 2014).

Consumers' ability to choose their diets will partly depend on the quantity and quality of information provided by nutrition panels (Azman & Sahak, 2014). The labels help consumers track their intake of sodium, fat, sugar, fibre, carbohydrates, and protein. Moreover, nutrient labelling may promote the intake of a balanced diet, thus helping maintain a healthy body weight, as the labels help make the right food choices. Nutritional labelling as the is of special concern among female consumers, as reading the nutrient label is crucial, especially when attention to body image influences purchasing decisions (Majid et al., 2015).

Additionally, manufacturers would focus more on nutrition labelling if it would increase their revenue and ultimately their profits. It could be beneficial for certain products that have the potential to influence purchasing at the point of sale or increase sales by providing correct information. Manufacturers can also expect to see changes in consumer purchasing patterns driven by labels and adjust their production accordingly. If manufacturers focus more on nutrient labelling, it would ultimately lead to better food choices for consumers, thereby benefiting the entire population (Majid et al., 2015).

Front-of-Pack Nutrition Labelling

Front-of-Pack Nutritional Labels (FOPNLs) have been implemented in over 40 countries world-wide. The two main goals of the FOPNLs are to provide consumers with additional information to help them make healthier food choices and to encourage the food industry to reformulate products toward healthier options, specifically by reducing the amounts of salt, sugar, and fats in foods. Depending on the type of information provided, FOPNL schemes can be classified as “nutrient-specific” or “summary indicators” (EFSA, 2022).

Nutrient-specific schemes simply indicate specific nutrients the food contains. For example, numerical or colour-coded labels can indicate the content of nutrients (e.g., salt, fat, sugars) in the food. Likewise, “summary indicators” provide consumers with an overall appreciation of the food's healthfulness. For example, summary indicators demonstrate that foods with positive endorsement logos (key hole symbol, Healthy Choice, heart/health logos) are healthier within their respective food groups. Similarly, the Nutri-Score, which grades foods with a colour and letter indicating their healthiness, provides a scale of healthiness. More details of the different formats of the FOPNLs are given in Annex A.

2.4 Effectiveness of Using Labels to Control Unhealthy Diets

A substantial body of literature has examined the effectiveness of FOPNL systems in influencing consumer food choices. Overall, the evidence suggests that exposure to FOPNL increases the likelihood of avoiding less healthy products and choosing healthier alternatives (Balcombe, Fraser, & Di Falco, 2010; Defago et al., 2019; Castronuovo et al., 2022). Studies also show that the presence of nutrition labels positively affects healthy food purchases compared to products without any labelling (Department of Health & Social Care, Food Standards Agency, Llywodraeth Cymru Welsh Government, & Food Standards Scotland, 2020). Simplified nutrition information, in particular, has been found to support healthier decision-making, and Multiple Traffic Light Labels (MTLLs) appear to be more effective among individuals with average or above-average dietary habits (Defago et al., 2019). However, consumer responses to FOPNL are heterogeneous and shaped by socioeconomic characteristics, attitudes, and prior dietary behaviours (Balcombe, Fraser, & Di Falco, 2010; Teran et al., 2019). This suggests that changes in dietary patterns may require additional strategies to ensure that label information is sufficiently salient at the point of purchase, particularly relative to branding (Teran et al., 2019).

Simultaneously, evidence from the Food Labelling to Advance Better Education for Life (FLABEL) initiative highlights important limitations in the real-world application of FOPNL systems. While consumers are generally able to understand nutrition labels and rank products by healthfulness, limited attention and motivation often constrain effective use of this information in actual purchase settings (European Commission, 2013). Consumers typically spend only a very short time-around 25 to 100 milliseconds-looking at nutrition labels, which may be insufficient to fully process the information provided. Moreover, the effectiveness of labels appears to depend on consumers having an explicit health goal at the time of purchase (European Commission, 2013). Sonnenberg et al. (2013) found that awareness of TLL alone is not sufficient; noticing and engaging with the label at the point of purchase is critical for influencing purchasing behaviour.

The literature also presents mixed evidence regarding label complexity. While FLABEL findings indicate that some consumers prefer more detailed labels, particularly when they are familiar with the format, other studies argue that simplified labels are more effective in guiding healthier choices (Defago et al., 2019). This divergence may partly reflect contextual differences, as much of the FLABEL evidence is drawn from developed-country settings, whereas studies supporting simplified labels often emerge from developing or middle-income countries.

Evidence from South Asia further underscores both the potential and the limitations of FOPNL systems. Studies from the region suggest that warning labels, TLL, MTLLs, and Nutri-Score can improve consumers' understanding of nutritional quality (Mandal et al., 2020; Shrestha, 2022; Singh, 2022). However, the extent to which these labels translate into sustained changes in purchasing behaviour remains unclear. The findings consistently highlight the importance of complementary measures such as public awareness campaigns and nutrition education, to enhance the effectiveness of FOPNL systems in South Asian contexts.

Despite the growing international and regional evidence base, several gaps remain. First, there is limited empirical evidence from low- and middle-income countries on how FOPNL systems operate in a developing country context, where FOPNL coverage, market and population characteristics play critical roles. Second, there is a void in the literature on how customers make beverage choices when presented with several product characteristics, including price on SSBs. In reality, buyers consider other aspects of the product (price, beverage type, etc.) apart from these labels when making purchasing decisions. Finally, there is a lack of context-specific evidence assessing how consumer heterogeneity-particularly socioeconomic status- moderates the effectiveness of FOPNL systems. Resolving these limitations are essential in designing FOPNL policies that are both context-appropriate and effective in influencing consumer behaviour.

2.5 Nutrition Labelling: Implementation Issues

Industry influence and capacity barriers for implementation

It was observed that the food industry often opposes policies and even lobbies politicians to block them. For example, certain actors in the European Food Industry have opposed the introduction of the TLL system to pre-packaged food items, especially in the United Kingdom (Morestin et al., 2011).

Financial considerations have also been identified as a significant concern for the food industry in implementing nutrition labels. Many reports have emphasised the need for a prolonged transition period to ensure a smooth implementation process and manage costs effectively. Longer implementation times will allow businesses to limit losses associated with their current labelling and even implement the new labelling alongside other necessary changes. According to a study conducted in Ireland with food manufacturers, the cost of additional nutrient analysis and label redesign was the main reason manufacturers cited for not implementing FOPNL. Food and beverage manufacturers who use nutrition labelling have often taken the opportunity to implement it when launching a new product or making changes to packaging or brand design, in order to reduce costs.

The costs of implementing nutrition labelling were reported to be higher for small businesses, as they have limited capacity in nutrition analysis, label design, and label production (WHO, 2021). Furthermore, it was identified that the implementation of nutrition labelling was hindered by a lack of technical expertise and limited time to calculate FOPNL information, particularly for smaller businesses. There is also concern about producing incorrect information and being penalised (WHO, 2021).

Nutrition Labelling: Format Issues

One of the main challenges identified in presenting nutritional information was the limited space available on pre-packaged food items. This issue has been particularly observed in Canada, with the added challenge of presenting labels in bilingual formats (Morestin et al., 2011).

Furthermore, studies have identified issues with nutrition label formats when communicating health messages to consumers. The monochromatic GDA system is identified as not providing interpretative information. It simply provides a miniature version of the nutritional information in a numeric format, displayed in a panel on the front of the packaging. Furthermore, GDA systems do not address the well-established disparities associated with understanding numeric nutrient information, including nutrient and health literacy, numeracy, and socioeconomic status (Pan American Health Organization, 2020). On the other hand, a colour-coded GDA system requires greater knowledge and training for consumers. A product could be simultaneously red and green, which would distort the intended purpose and result in 'paralysis by analysis' (Pan American Health Organization, 2020).

Furthermore, one of the main weaknesses identified in the endorsement and summary score system is that consumers are not allowed to identify excessive amounts of specific critical nutrients. Thus, they do not fit the intended purpose. Nutritional warning signs directly provide the information to accurately, quickly, and easily identify the products that contain excessive amounts of certain critical nutrients. Thus, cater to the intended purpose of informing consumers properly (Pan American Health Organization, 2020).

3 Background

NCDs represent the most significant health burden in Sri Lanka. Approximately, 74.8% of all deaths in the country are attributed to NCDs, with diabetes ranking as the third leading cause among them, resulting in 49.8 deaths per 100,000 population (WHO, 2025). In

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2023, there were 310.1 hospital admissions per 100,000 people due to diabetes (Ministry of Health, 2024). Since 2007, the prevalence of NCDs has been on the rise, with diabetes showing the highest rate of increase at 43.4% (Ruwanpathirana et al., 2019).

Excessive sugar consumption is a major contributor to several diet-related NCDs, including type 2 diabetes, dental caries, and weight gain, which in turn lead to- obesity, cardiovascular disease, cancer, and stroke (WHO, 2022). With the rising incidence of obesity and diet-related NCDs, reducing daily sugar intake has become a public health priority. Health professionals especially emphasise the

importance of cultivating sugar-free habits, particularly among young people. To address dietary risk factors for NCDs, the WHO has proposed a range of recommendations to influence consumer choices regarding unhealthy foods and beverages. Among these, the taxation of SSBs is globally recognised as a highly effective policy measure.

Research supports taxing SSBs over other sugary products due to their strong link with NCDs, high sugar content, and minimal nutritional benefits (WHO, 2022). Beyond improving health outcomes, SSB taxes also generate public revenue, making them a practical and cost-effective tool for reducing NCD rates. Other key WHO recommendations include promoting healthier food options, reformulating existing products, and adhering to proper food labelling standards that indicate levels of sugar, salt, and fats (WHO, 2018a).

Reflecting global best practices, the Sri Lankan government has prioritised such interventions. To curb SSB consumption and its contribution to NCD risk, Sri Lanka introduced both taxation and labelling regulations. In 2016, the government enacted the 'Food Colour Coding Regulations' for SSBs, requiring manufacturers to visually indicate sugar levels using the TLL system. This system assigns red, amber, or green labels based on the product's sugar content. The regulation applies to carbonated drinks, fruit nectars, fruit juices, and ready-to-serve beverages, excluding milk-based products. This initiative aims to raise consumer awareness and promote healthier choices by making the sugar content more transparent and easier to understand. Thereafter, an excise tax on SSBs was introduced in November 2017 to reduce their affordability and discourage excessive sugar consumption. Additionally, the 2018 budget projected that the SSB Tax in Sri Lanka would generate Sri Lankan Rupees (LKR) 5 billion to the state coffers (Ministry of Finance - The Treasury of Sri Lanka, 2017).

3.1 SSB Tax Policy and Legislative Framework

In Sri Lanka, the SSB excise tax is imposed as a specific tax, where the tax is applied to a specific volume of SSB or based on the sugar content of the SSB (volume content of the SSB–tax per litre; tax rate per gram of sugar). Therefore, the effects of the SSB tax on consumption depend on several factors, including the tax type, tax rate, and applicability, as discussed in Section 2.1.

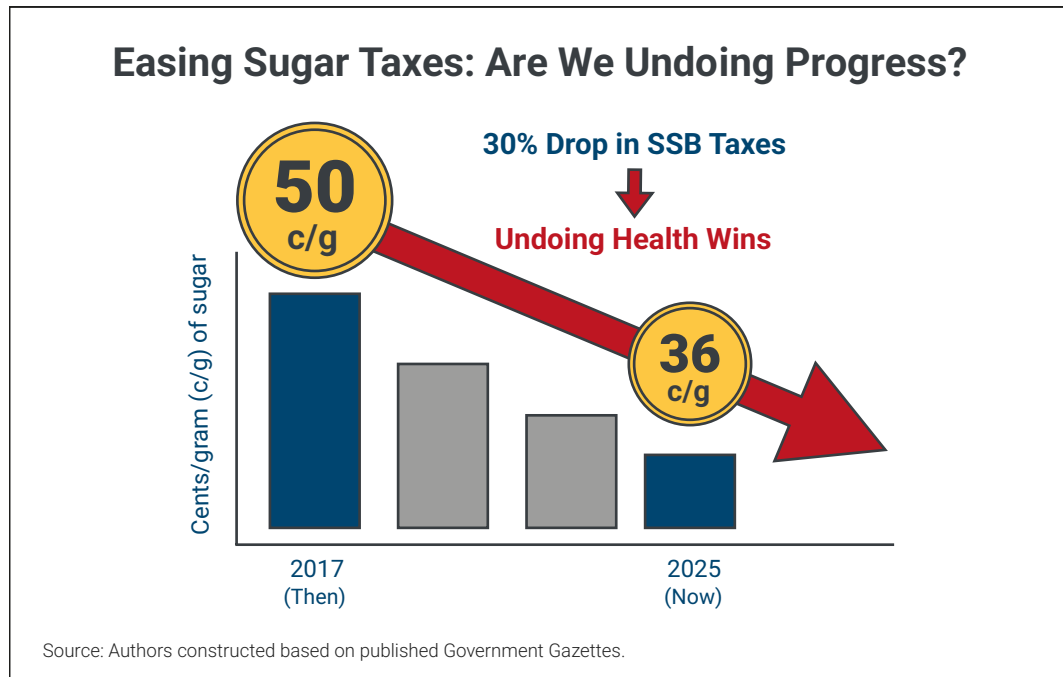
The initial tax targeted the carbonated soft drinks (CSDs) segment, with a tax rate of 50 cents per gram of sugar or LKR 12 per litre of the drink, whichever is higher. Subsequently, in a special gazette notification issued in July 2018, the government extended the excise duty imposed on sweetened beverages based on fruit or vegetable juice at the rate of LKR 12 for one litre of drinks or 50 cents per gram of sugar contained in the product (excluding 6g per 100 millilitres), whichever is higher.

Currently, the SSB excise tax applies to the following four categories, which are classified under the “Beverages, Spirits and Vinegar” tariff codes.

- Waters, including mineral waters and aerated waters, containing added sugar or other sweetening matter or flavoured.
- Beverages put up for retail sale as “Energy Drinks”.
- Beverages based on fruit or vegetable juice, the sugar content of which is more than 6g/100ml.
- Beverages based on cereal, grain, or tree nuts, the sugar content of which is more than 6g/100ml.

3.2 SSB Tax Policy Gaps

As of 2025, the excise tax rate for SSBs is LKR 15 per litre or 36 cents per gram of sugar. The SSB tax rate is very low in the current high inflation environment, which has a minimal impact on SSB prices in real terms and thus not discouraging SSB consumption. Although the tax rate should be adjusted for inflation, the excise duty rate has been changed ad hoc over time. For instance, the SSB tax was initially introduced at 50 cents per gram (c/g) of sugar in 2017. However, eight years later, the current rate has dropped to 36 c/g-falling below the original rate at the time of implementation. Please refer to Table 1 for more details on the SSB tax changes from 2017 to 2025.



On the other hand, the SSB excise tax does not apply to milk-based beverages, tea in beverage form, pure fruit and vegetable juice or concentrates, irrespective of whether sugars are added, which are also excluded from the excise tax. Excluding these SSBs from the excise tax is a key challenge of the current SSB tax policy. For example, sweetened milk beverages high in sugar are widely consumed and heavily promoted for children in Sri Lanka.

In this context, it is argued that the tax's objective is not achieved, as consumers can easily substitute for cheaper SSBs, since most of these SSBs are not subject to the tax. For the same reason, the tax's neutrality principle is ignored when applied to carbonated and certain other drinks. In contrast, it is not levied on milk-based and certain other SSBs (Warusavitarana, 2019). Moreover, according to the WHO, SSBs include all beverages containing sugars, including carbonated or non-carbonated soft drinks, fruit/vegetable juice and drinks, liquid and powder concentrates, flavoured water, energy and sports drinks, ready-to-drink tea/coffee, and flavoured milk drinks (WHO, 2017).

Table 1: SSB Tax Revisions

Effective date	Waters, including mineral waters and aerated waters, containing added sugar or other sweetening matter or flavoured	Beverages put up for retail sales as “Energy Drinks”	Beverages based on fruit or vegetable juices	Other-Sugar contents of which is more than 6g per 100ml
10/11/2017	Rs. 12 per litre or 50 c/g of sugar			
25/07/2018	Rs. 12 per litre or 50 c/g of sugar		Rs. 12 per litre or 50 c/g of sugar (excluding 6 g per 100ml)	
04/12/2018	Rs. 12 per litre or 30 c/g of sugar (excluding 6 g per 100ml)		Rs. 12 per litre or 30 c/g of sugar (excluding 9 g per 100ml)	
06/03/2019	Rs. 12 per litre or 40c/g of sugar (excluding 4 g per 100ml)		Rs. 12 per litre or 40 c/g of sugar (excluding 8 g per 100ml)	
01/01/2023	Rs. 12 per litre or 30 c/g of sugar (excluding 6 g per 100ml)		30 c/g of sugar (excluding 8 g per 100ml)	
01/01/2024	Rs. 14 per litre or 34 c/g of sugar (excluding 6 g per 100ml)		34 c/g of sugar (excluding 8 g per 100ml)	
11/01/2025	Rs. 15 per litre or 36 c/g of sugar (excluding 6 g per 100ml)		36 c/g of sugar (excluding 8 g per 100ml)	

Source: Authors constructed based on published Government Gazettes.

3.3 Implications of the SSB Tax in Sri Lanka

The imposition of the tax on SSBs sparked considerable debate. It was both lauded as an admirable step in tackling NCDs while also provoking strong opposition from the soft drink industry (Warusavitarana, 2019). Following the implementation of the SSB tax, the demand for SSBs dropped. For instance, the SSB tax imposition led to a 30%-50% increase in SSB prices, which in turn discouraged consumer purchases (Senaratne & Mendis, 2018).

The original SSB tax targeted the CSDs segment, which is dominated by local player Ceylon Cold Stores (CCS), also known as Elephant House, as well as two multinational giants- Coca-Cola and Pepsi (Chandrasena, 2018). In 2018, the finance ministry extended the excise duty imposed on SSBs to fruit juice, fruit drinks and Nectar. The sugar tax sparked a huge debate among industrialists, as they were heavily affected by the decline in their earnings, sales, and profits. For instance, John Keells Holdings PLC, which dominates the market share in CSDs, experienced a 37% decline in sales volume due to the sugar tax. Furthermore, the volume of production in the beverage sector has declined by 16%, while soft drink prices have risen by an average of 33% (Sirimanna, 2018).

Furthermore, it is apparent that following the imposition of the sugar tax, the popularity of sugar-free variants increased, driven by a more health-conscious market. As a result, sugar-free variants entered the local beverage market in 2018, which mitigated the decline in volumes to some extent (Chandrasena, 2018). Coca-Cola and Pepsi introduced sugar-free variants globally, which they heavily promoted after the SSB tax was introduced. Elephant House followed suit, introducing its sugar-free variant in the first half of 2018 (Chandrasena, 2018). However, beverage sales of Elephant House, Coca-Cola Lanka (Pvt) Ltd., and Varun Beverages Lanka (Pvt) Ltd. were impacted by the sugar tax, as retail prices increased by 40% (Chandrasena, 2018). Hence, the industry's opposition to the sugar tax is evident.

3.4 Industry Reaction to SSB Tax

In Sri Lanka, industry lobbying and domestic politics have also played significant roles in altering the SSB taxes in an ad hoc manner.

As evident globally, industry opposition could be examined in several ways, in terms of constituency building and lobbying, legal action (or threat of), negative public information campaigns, aggressive marketing and pricing strategies, and donations to community groups, local institutions, and policymakers (Du et al., 2018).

In Sri Lanka, industry lobbying and domestic politics have also played significant roles in altering the SSB taxes in an ad hoc manner (World Bank Group, 2020). This accounts for a 28% reduction in taxes from the beginning to date (from 50 cents to 36 cents), illustrating the ad hoc nature of the tax change. Hence, industry opposition has effectively

weakened the existing taxes in Sri Lanka. On the other hand, certain companies are implementing rigorous advertising and marketing strategies to offset potential losses from decreased demand driven by higher prices on taxed products.

One of the major arguments raised by the industrialists was that consumers would be deprived of more organic and natural fruit juice and beverages due to the consequent price increase. Several leading companies manufacture fruit juice, encouraging a large number of fruit cultivators and local fruit cultivation. Industrialists argue that the tax would discourage cultivation as demand would deteriorate throughout the production process (Sirimanna, 2018).

Another argument presented was that the local farmers would be adversely affected. The above companies purchase over 12 million kilograms of fruit annually from local fruit farmers, accounting for about 80% of total production. Additionally, more than 90 family-based small and medium-scale fruit drink producers earn a living from this business. Furthermore, local manufacturers pay more than Rs. 1.3 billion in annual taxes to the government coffers. In addition, they pay VAT, Nation Building Tax (NBT), and income tax upon the excise tax levied. However, there are Board of Investments (BOI) approved fruit juice companies that enjoy tax-free benefits for importing fruits and selling any excess production locally at low prices. Hence, the industrialists emphasised that foreign companies could build a monopoly, which would adversely affect local producers. On the other hand, local companies will lose opportunities to export and to earn foreign exchange due to higher production costs (Sirimanna, 2018). Furthermore, it was noted that the special fruit out-growers project (passionfruit, pineapple, and aloe vera) is also adversely affected as demand for sugary beverages has dropped significantly due to price increases (Sirimanna, 2018).

3.5 SSB Regulation in Sri Lanka

In August 2016, the Sri Lankan Government enacted the Food (Colour Coding for Sugar levels) Regulations for SSBs. The regulation mandates sweetened beverage producers to label the sugar content of their products using a single symbol version of the TLL system (see Table 2). This TLL applies to four types of SSBs: carbonated beverages, fruit nectar, fruit juices, and ready-to-serve beverages other than milk-based products. According to the regulations, the container or package containing such food must have a label adhering to the following specifications.

Table 2 : Sugar Content for the Colour Coding

Sugar Content (per 100 ml of drink)	Relative Sugar Level	Colour Code
More than 11g	High Sugar	Red
2g to 11g	Medium Sugar	Amber
Less than 2g	Low Sugar	Green

Source: Government gazette No. 1965/18, May 03, 2016.

As discussed in Section 3.2, according to the WHO definition, sweetened milk beverages are classified as SSBs. Exclusion of sweetened milk beverages created a clear coverage gap in Sri Lanka's SSB regulations. The revised Food Regulations (Colour Coding for Sugar Levels – Liquid), which came into operation on January 1, 2024, address this gap by expanding the regulatory scope to include sweetened milk-based products.

3.6 Implications of SSB Regulations in Sri Lanka

At the regional workshop on nutrition labelling to promote healthy diets, the implementation of TLL for beverages in Sri Lanka has been identified as a positive step taken. The colour-coding system led to a near-immediate reduction in beverage sugar levels, and carbonated beverage sales dropped by 15% (WHO- Regional Office for South-East Asia, 2018). The addition of non-sugar sweeteners to beverages was a consequence of the colour coding. The industry's resistance and technical resistance to thresholds, as well as the lack of industry commitment to reduce sugar in significant amounts, led to marginal reductions to stay within the lower colour code, which were recognised as challenges (WHO- Regional Office for South-East Asia, 2018).

Hettiarachchi (2018) demonstrates that Sri Lanka has robust regulations on labelling, however, there are areas of controversy and ambiguity that necessitate further clarification and review. The study was conducted by developing a checklist based on the Codex standards and Sri Lankan regulations. This was done by using broad areas of definitions of terms, general characteristics of the label, and other related factors. The regulated logo for sugar level, a numerical description of sugar content, a description of relative sugar level, and a colour code for sugar level in fruit-based drinks were identified as strengths in Sri Lankan labelling, as various experts and organisations have approved the traffic light system.

4 Data and Methodology

4.1 Sources of Data

4.1.1 Household Income and Expenditure Survey

The Household Income and Expenditure Survey (HIES) contain information on quantities and expenditures of food and non-food items used to define poverty lines, as well as reports socioeconomic and demographic information of the households. Furthermore, the HIES data provides information on the different types of non-alcoholic beverages consumed by households, the quantities consumed, and the expenditure on these beverages.

Given the period when the SSB tax was implemented (November 2017), the HIES-2016 data is used as the baseline and the HIES-2019 data as the post-data, following the SSB tax implementation. The total sample sizes of HIES 2016 and 2019 are 21,756 and 19,911 households, respectively. First, we use the HIES 2016 data to estimate SSB consumption before implementing the SSB tax. To evaluate the consumption effect of tax increases, we use the HIES 2019 data. However, the surveys are cross-sectional, therefore the study does not capture changes in purchases of the same individual or household over time.

4.1.2 Consumer Survey

The consumer survey involved in-person market exit interviews from February to March 2022. The survey was conducted with a sample of approximately 2,500 consumers across 14 districts, targeting supermarkets and Sathosa outlets spanning all 9 provinces, ensuring representation from both urban and rural areas. Details of the sampling procedure are given in Annex B.

The survey collects information from consumers regarding their choices of SSBs. The survey was conducted through a computer-assisted Personal Interviewing (CAPI) system. A graphic designer was employed to create images of beverages to resemble the considered attribute levels of beverage products in the marketplace. In addition to the choice questions, the survey collected information on respondents' demographic characteristics and their attitudes and behaviours toward SSB choices. The questions focused on attitudes toward the SSBs and knowledge of TLL.

The sample consisted of 2,500 consumers, of whom 59% were male. The largest age group was 40–59 years, accounting for 36% of respondents, followed by 30–39 years, which accounted for 31%. In terms of education, 33% had completed their A-Levels, while 28% held a diploma or university degree. The majority of respondents (68%) were employed, whereas 17% were engaged in household duties, 9% were students, 4% were unemployed, and 2.5% were retired or too elderly to work. Regarding household income, 42% reported earning between LKR 50,000 and 100,000 per month, 30% between LKR 25,000 and 50,000, and 23% exceeding LKR 100,000.

4.2 Methodology

4.2.1 SSB Elasticity Analysis

To address the significant presence of zero expenditures for SSBs in the HIES, the study employs the Exact Affine Stone Index (EASI) censored demand system for elasticity analysis. Accordingly, the Sri Lanka SSB elasticity analysis methodology was developed based on the censored EASI model introduced by Zhen et al. (2014). The EASI incomplete demand system to account for censoring is as follows:

$$w_{hi} = \sum_{j=1}^J a_{ij} \ln p_{hj} + \sum_{r=1}^L b_{ir} y_h^r + \sum_{k=1}^K g_{ik} z_{hk} + u_{hi} \quad h=1,..H; i=1,...,J-1$$

Where W_{hi} is the latent budget share of category i for household h ; p_{hj} is the price index of category i ; H is the number of households; J is the number of goods; the J^{th} good is the composite numéraire good; y_h is household income; L is the highest order of polynomial in y_h ; K is the number of exogenous demand shifters; z_{hk} is the k^{th} demand shifter; a_{ij} , b_{ir} , and g_{ik} are parameters; and u_{hi} is the residual.

Fisher's ideal price index

Fisher's ideal price indices for the six beverage categories were calculated based on the category-level prices and quantities.

Following Zhen et al. (2014), the Fisher ideal price index for the beverage category ($j=1,..., J-1$) was calculated using.

$$p_{hj} = \sqrt{\frac{\sum p_{kh} q_{ko}}{\sum p_{ko} q_{ko}} \frac{\sum p_{kh} q_{kh}}{\sum p_{ko} q_{kh}}}$$

Where p_{kh} and q_{kh} are the price and purchase quantity of beverage k (of category i) for household h in the period, respectively, and p_{ko} and q_{ko} are the base price and base quantity of beverage k at their national means. If the demand for category j by household h is censored, then we substitute $\sum p_{kh} / \sum p_{ko}$ for $\sum p_{kh} q_{kh} / \sum p_{ko} q_{kh}$

EASI Methodology Application

In Sri Lanka, pre-packaged non-alcoholic beverages primarily consist of carbonated drinks, juice and nectars, flavoured milk and other dairy drinks, energy drinks and bottled water. Furthermore, other informal beverages include tea and coffee in beverage form, natural fruit and herbal drinks, and drink packets.

Given the availability of data in the HIES, this analysis included SSB tax-applicable beverages (soft drinks and fruit drinks), while available non-taxable beverages included milk packets, bottled water, milk tea, plain tea, and drink packets.

Table 3: Construction of Variables

Variables	Description
Beverage expenditures	Quantity (bottles/packs)
	Expenditure per quantity (LKR)
Household wealth quintiles	Constructed based on the total household food and non-food expenditure
Demographic variables	Number of members, kids, school-aged children, HH expenditure, head's and spouse's education, head's employment, working mother

The following data preparation was done for the EASI model application:

- Household expenditure surveys may include zero expenditure for certain food groups for several reasons, such as unavailability, lack of preference, unaffordability, or infrequent purchases. When expenditure for the beverage category was reported as zero (for a non-purchasing household), the household's quantity of that beverage item was set to zero. This is done because, as Deaton (1997) suggests, it is useful to include all households in the tax and price reform analysis, whether they purchase or not.
- The estimated beverage prices replaced the beverage price for those zero-beverage quantities. These prices were estimated based on observed household beverage prices, whereas the regression model includes district, month, and demographic variables. The regressions were separately estimated for each beverage category. Then, for each beverage category, predicted prices were used to replace the prices for households reporting zero beverage quantity.
- Then we constructed the Fisher ideal price index for each beverage category. National average prices were considered as the base prices.
- Following Zhen et al. (2014), a composite numéraire good was added, which included all other food items purchased by the household to account for the incomplete demand system.
- We used the Consumer Price Index (CPI) as the numéraire for goods and adjusted for regional variation using spatial price indices developed by the Department of Census and Statistics (DCS).

4.2.2 Discrete Choice Experiment (DCE) Method

The literature has recognised that exploring and understanding the main elements of consumers' decision-making processes is vital to improving food policies (Reisch, Eberle, & Lorek, 2013; Van Loo, Caputo, & Lusk, 2020). The DCE method was used to assess consumers' responses to TLL when making SSB choices. The reason we employ a DCE method is that it permits an examination of multiple factors influencing decision-making, and all choices involve trade-offs across multiple factors, which cannot be easily understood or quantified using other methods. Attribute-based DCEs allow the exploration of consumer preferences across options as attribute levels vary. It is well established in the food choice literature that food choice has emerged as an important field of application in the research domain of DCEs (Lizin et al., 2022). Further, the DCE method provides the advantage of simulating a real-world situation. The sections that follow discuss the adopted methodology and application of the DCE method in this study, which assesses the effectiveness of the TLL system in Sri Lanka.

Econometric Analysis

We employed Bayesian methods to estimate the mixed logit (MXL) model, which has been widely used in statistical decision theory (Lancsar, Fiebig, & Hole, 2017).

DCEs are based on random utility theory, which assumes that an individual maximises utility when choosing between J alternatives. Let x_{njt} denote a $k \times 1$ vector of attributes from the CE presented to the n^{th} consumer ($n = 1, \dots, N$) in the j^{th} choice option ($j = 1, \dots, J$) of the t^{th} choice set ($t = 1, \dots, T$). Then U_{njt} be the utility of n^{th} individual attains from $x_{nj,t}$.

It is assumed that the utility can be partitioned into a systematic component or representative utility, V_{njt} , and a random component, ε_{njt} , such that:

$$U_{njt} = V_{njt} + \varepsilon_{njt}$$

The systematic component, V_{njt} , is a function of the attributes of alternative j , while ε_{njt} represents characteristics and attributes unknown to the researcher, measurement error and/or heterogeneity of tastes in the sample.

Accordingly, a preference space model was considered where the following utility model gives the utility individual n derives from choosing alternative j of SSBs:

$$U_{nj} = \alpha P_j + \beta_1 X_{nj}^{Red} + \beta_2 X_{nj}^{Yelw} + \beta_3 X_{nj}^{Grn} + \beta_4 X_{nj}^{fnctr} + \beta_5 X_{nj}^{fjuce} + \beta_6 X_{nj}^{milk} + \varepsilon_{nj}$$

where P_j is price, X_j dummy-coded variables representing TLL code and beverage category, whereas 'no TLL' and carbonated beverage are the reference levels, respectively. The parameters α , $\beta_1 - \beta_6$ have units of utility.

The DCE was analysed with MXL model using STATA. The TLL code and beverage type attributes were modelled as random parameters and were assumed to be normally distributed, with the exception of 'price'. Halton draws with 1,000 replications were used for the estimations.

Application of the DCE Method

The present research assesses whether TLL are effective when making SSB choice. Taking into consideration the SSB regulations and SSB product characteristics, three attributes-beverage categories, TLL, and price were considered for the DCE model. In this way, we investigate the impact of TLL on consumers' SSB choices. Further, according to the existed SSB regulation in 2022,² milk-based products were excluded from the TLL. Thus, to investigate the impact of TLL exclusion on milk-based product consumption, we incorporated these products into the same DCE model application. Accordingly, the TLL code for milk-based is considered a no-label category. All attributes and their respective levels are presented in Table 4.

Table 4: The DCE Design: SSB Attributes and Levels

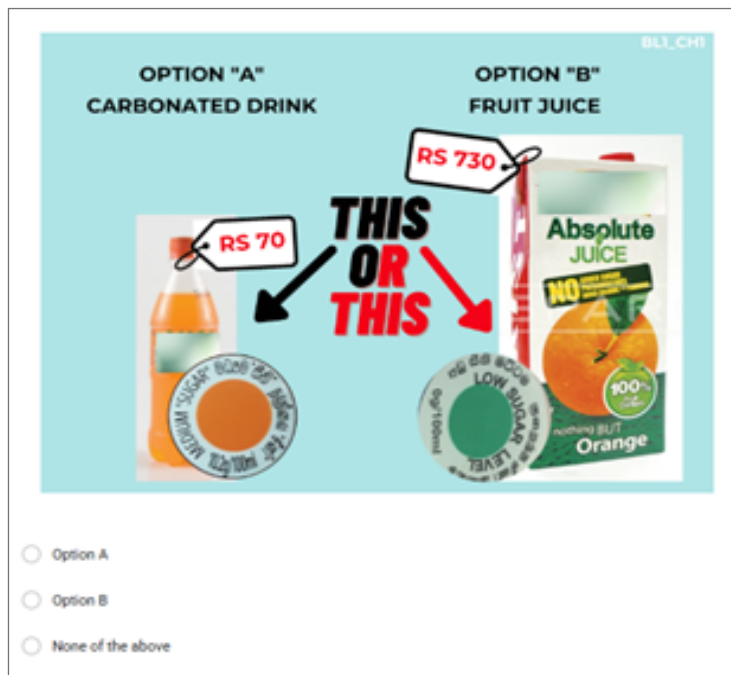
Attributes	Levels
Beverage category	• Carbonated beverages
	• Fruit nectar
	• Fruit juices
	• Milk-based products
TLL code	Red, Amber, Green, no label
Price	Price levels (LKR)
	• Carbonated-small bottle (70, 100), big bottle (150, 220)
	• Fruit nectar-small bottle (60, 70), big bottle (150, 270)
	• Fruit juices-small pack (90, 220), big pack (450, 730)
	• Milk-based-small pack (50, 65, 70), big pack (290)

² Sweetened milk has covered in the revised Food (Colour Coding for sugar levels - liquid) Regulation (No. 2319/42) with effective from January 1, 2024.

In the choice experiments (CE), respondents must choose between two different SSBs and a "NONE" option. Both SSB products were characterised by three attributes- beverage category, TLL, and price, each with four levels. Accordingly, the full factorial design included 64 (4 x 4 x 4) SSB choices. As seen in the sample choice set (Figure 1), we produced choice sets with two options. Implementing a complete factorial design with 64 SSB options would be problematic due to the 2,016 (i.e., ${}^{64}C_2$) potential pairs. Consequently, we employed a fractional factorial experimental design, which utilises a subset of all feasible experimental combinations.

STATA was used to create a fractional factorial design for the DCE. The design resulted in 50 distinct choice sets that were divided into 5 blocks of 10 choice sets. Respondents were randomly assigned one of the 5 blocks. Accordingly, a structured questionnaire captured the respondent's SSB choices for the 10 paired comparisons. This produced 25,370 choice panels; of those, Option A was selected in 10,839, Option B in 9,073, and the 'None' option in 5,458. Since each panel includes all three alternatives, the total number of observations is 76,110.

Figure 1: Example of a Choice Set



4.3 Limitations

The study has some limitations in terms of the SSB price sensitivity analysis, as secondary survey data (HIES) was used. Since the HIES data does not include detailed beverage categories, we cannot separate expenditures on diet soft drinks from those of non-diet soft drinks. As such, we cannot examine the demand differences between tax-applicable and non-tax-applicable soft drinks separately. Furthermore, in our estimations, measurement error could arise because prices were derived from information on the beverage quantities and expenditures reported by households. The HIES was conducted at the household level; thus, we did not have accurate information on individuals' actual consumption patterns.

To assess the effectiveness of TLL, we employed the DCE methodology. The DCE method has the distinct advantage of replicating real-world decision-making scenarios. In this analysis, we considered a hypothetical no-TLL category to assess the impact of the TLL system on SSBs already regulated and thus not easily accessed through an observational survey. To minimise bias from the artificial environment, the experiment was designed to keep respondents unaware of the hypotheses, thereby promoting natural interactions with the stimuli. Accordingly, any prior explanation or description of the TLL was withheld in the survey. This approach was intended to minimise introduction bias and better reflect on how consumers engage with TLLs in real-world settings, thereby enhancing the external validity of the hypothetical choice tasks. However, the hypothetical approach may differ somewhat from actual purchase behaviour. Although respondents were not explicitly guided to choose the healthiest product, they may have perceived that the TLL information was the primary focus among the given SSB choices. This focus could have led to overestimating the impact of TLL information on SSB selection. Future research using real purchase scenarios would be valuable for validating these findings.

Another limitation is the assumption that consumers who are aware of the TLL are also able to correctly understand and interpret it. In addition, the estimated TLL effects within these sub-samples may capture not only the influence of the TLL itself but also unobserved factors such as health preferences and health literacy. As a result, the estimated effects may overstate the true impact of TLL information for the average consumer.

5 Results

5.1 Household Level SSB Consumption

On average, a household with SSB expenditure spends approximately LKR 1,000 per month on prepared non-alcoholic beverages, accounting for 1.5% of the total expenditure (Refer Table 5). More than half of the non-alcoholic beverage spending was spent on tea. For instance, the average monthly expenditure on tea was approximately LKR 650 in 2019,

**Approximately
75% of the
consumed
sweetened
beverages are not
covered under
the SSB policy
framework.**

which is considerably higher than on other SSBs. Furthermore, the share of spending on tea has increased considerably, while the share of spending on soft drinks and fruit drinks has decreased substantially in 2019 compared to 2016. The reduction in consumption of soft drinks and fruit drinks could be attributed to the price increase of these beverages following the introduction of the SSB tax in 2017.

However, SSB tax and TLL coverage are very limited, whereas approximately 75% of the consumed sweetened beverages are not covered under the SSB policy framework. As discussed in Section 3.2, there are some exemptions from the excise tax on SSBs: tea and milk-based beverages are excluded from the excise tax. As such, the effect of a tax on consumption and health can be offset if consumers substitute SSBs with other affordable, untaxed SSBs. Similarly, Sri Lanka's SSB regulations, primarily focus on formal packaged and bottled sweetened beverages, leaving a significant coverage gap.

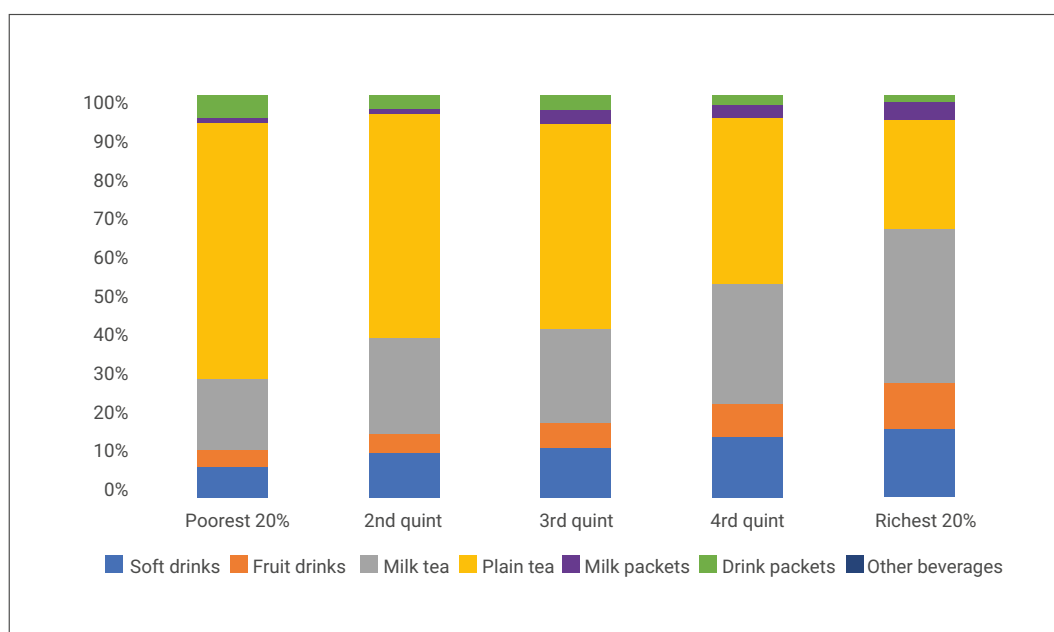
The limited coverage of the SSB tax and regulations disproportionately impacts economically disadvantaged groups, who consume more informal sweetened beverages. Among the bottom 40% of households, 85% of sweetened beverage consumption comes from informal sources, such as plain tea, milk tea, and drink packets, which are not subject to the SSB tax or regulations (Figure 2).

Table 5: Average Monthly Expenses and Budget Shares for Households with Non-alcoholic Beverage Expenditure

Expenditure Item	2016		2019	
	LKR	% of TE	LKR	% of TE
Total expenditure (TE)	66,262		78,133	
Food and beverages	23,266		26,733	
Non-alcoholic beverages	971	1.47	1,089	1.39
Soft drinks	154	0.23	135	0.17
Fruit drinks	104	0.16	81	0.10
Milk tea	209	0.32	293	0.37
Plain tea	242	0.36	363	0.46
Milk packets	40	0.06	30	0.04
Drink packets	28	0.04	21	0.03
Gruel	63	0.09	46	0.06
Bottled water	41	0.06	31	0.04
Other	91	0.14	89	0.11

Source: Authors' calculations based on HIES 2016 and HIES 2019 microdata.

Figure 2: Non-Alcoholic Beverage Consumption Patterns Across Population Groups, 2019



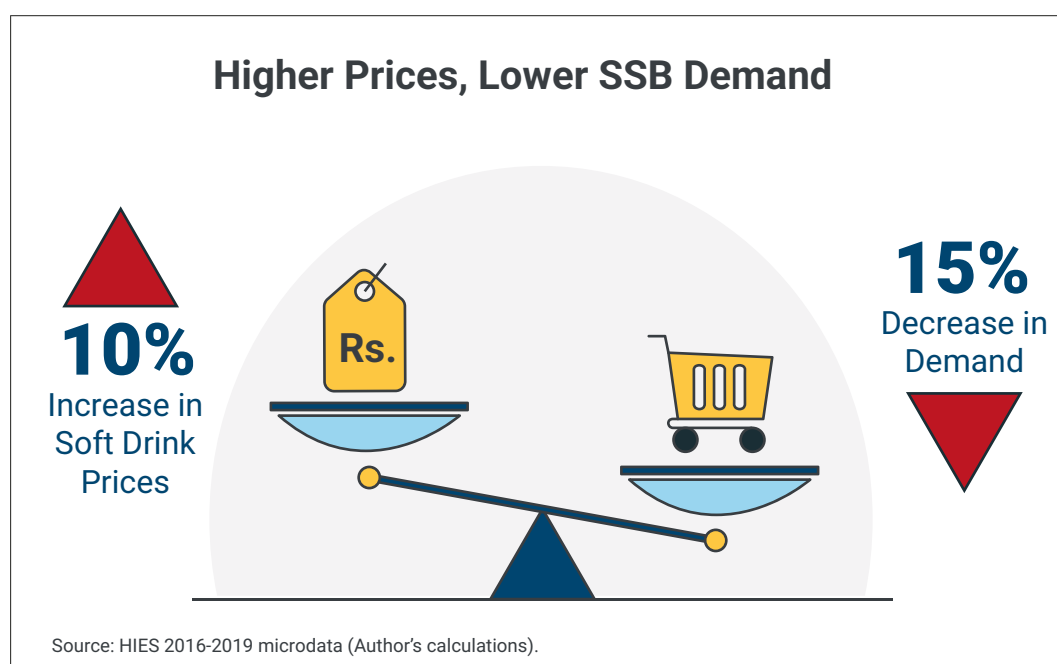
Source: Authors' calculations based on HIES 2019 microdata.

5.2 Economic Analysis of SSB Demand

Understanding both own- and cross-price elasticities of SSBs offers important insights into the factors shaping demand, and provides useful guidance for policymakers. These measures reflect consumers' sensitivity to changes in SSB prices. A negative price elasticity indicates that demand declines as prices rise and increases when prices fall, highlighting consumer responsiveness to price changes. This relationship between price and purchasing behaviour emphasises the potential impact of pricing policies on SSB consumption. Such insights are especially relevant for designing effective fiscal strategies to reduce high-sugar beverage intake. This section presents the estimated price elasticities for SSB products in the Sri Lankan context.

5.2.1 The Impact of SSB Prices on Consumption

As expected, own-price elasticities are negative and strong (absolute value of price elasticity > 1), indicating that all beverages are considerably price-sensitive (Table 6). In other words, the percentage decrease in quantity exceeds the percentage increase in price. Furthermore, milk packets, milk tea, and drink packets are highly price-sensitive. Similarly, 2019 elasticity estimates indicate that if the prices of soft drinks increase by 10%, the quantity demanded of those beverages will decrease by 15%.



Moreover, analysis of the two cross-sectional HIES data sets, from 2016 and 2019, reveal that price elasticities have changed over time. The estimated own-price elasticity of demand for soft drinks declined from 2.08 in 2016 to 1.53 in 2019, indicating a reduction in consumer price sensitivity over time. One possible explanation is that the tax-induced price increases were relatively modest, and soft drinks may have become more affordable over the period, thereby dampening consumers' responsiveness to price changes. The primary objective of the SSB tax is to reduce affordability through price increases and, in turn, discourage consumption. However, the observed decline in elasticity suggests that the demand-reducing effect of price increases has weakened over time. As discussed earlier, while international best practice recommends adjusting tax rates to account for inflation, SSB tax rates in Sri Lanka were reduced in subsequent years, potentially further eroding the tax's real value and effectiveness. For instance, the tax was initially set at 50 cents per gram of sugar in 2017 and reduced to 40 cents in 2019. Additionally, the own-price elasticity estimates for milk tea have become more elastic in 2019 than in 2016, while the price elasticities of drink packets, plain tea, and bottled water have decreased during the same period.

The estimated own-price elasticity of demand for soft drinks declined from 2.08 in 2016 to 1.53 in 2019, indicating a reduction in consumer price sensitivity over time.

Table 6: Own Price Elasticity Estimates of SSBs

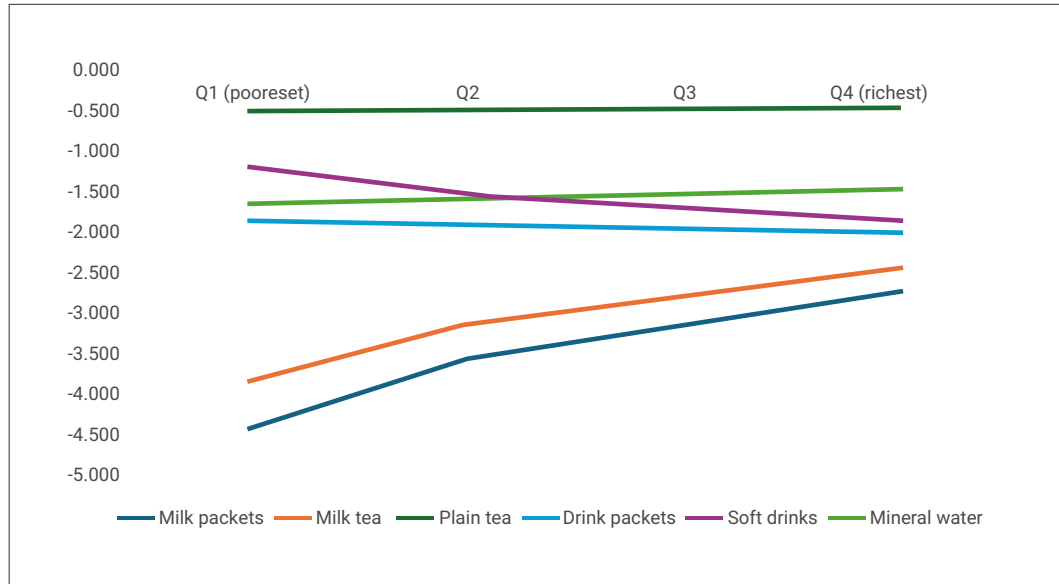
	2016	2019
Milk packets	-3.894	-3.442
Milk tea	-2.045	-3.035
Plain tea	-1.927	-0.459
Drink packets	-3.082	-1.914
Soft drinks	-2.079	-1.534
Bottled water	-2.170	-1.511

Source: Authors' calculations based on HIES 2016 and 2019 microdata.

Figure 3 presents the estimated own-price elasticity of beverages across income quartiles. The data indicate that lower-income groups are highly price-sensitive to milk tea and milk packets. In contrast, plain tea is relatively inelastic, meaning its demand remains stable despite price changes, regardless of income level. Plain tea is a widely consumed beverage in Sri Lanka, enjoyed in all settings and at all times. Notably, among households in the poorest quintile, plain tea accounts for over 50% of non-alcoholic beverage consumption (Figure 2). The elasticity values for plain tea exhibit minimal variation across quartiles, ranging from -0.448 in Q1 (poorest) to -0.441 in Q4 (richest).

On the other hand, the price elasticities for soft drinks and drink packets across income quartiles do not exhibit a clear pattern of responsiveness, unlike those for other beverages. For instance, the own-price elasticity for these beverages among low-income households does not differ significantly from that of their mid- to high-income counterparts. Soft drinks, for example, exhibit a price sensitivity range of -1.15 in Q1 (poorest) to -1.80 in Q4 (richest), indicating that richer groups have slightly higher price sensitivity to this item than poorer groups. This could be because these beverage consumption patterns differ across income groups. For example, soft drink consumption is considerably higher among high-income households.

Figure 3: Own Price Elasticities by Economic Groups, 2019



Source: Authors' calculations based on HIES 2019 microdata.

5.2.2 Substitution Effect and Income Effect of SSBs

Cross-price elasticities measure the percentage change in demand for a product when the price of an alternative product increase by 1%. For instance, as shown on the off diagonals of Table 7, a change in the price of the beverage product in the column induces an increase (substitute)/decrease (complement) in demand for the beverage products in the rows. Moreover, positive cross-price elasticities suggest that the products are substitutes, while negative cross-price elasticities suggest that the products are complements.

Given the applicability of the SSB tax, the cross-price elasticities of soft drinks were examined. Results suggest that milk packets and plain tea are substitutes for soft drinks (the cross-price elasticity is positive), while some considered beverages are complements of soft drinks (the cross-price elasticity is negative). For instance, a price increase in soft drinks is associated with greater consumption of milk packets and plain tea. However, a price increase for soft drinks reduces milk tea consumption, with an indirect effect that is less clear. Furthermore, it is worth noting that bottled water is a substitute for milk packets, milk tea and plain tea.

Table 7: Own and Cross Price Elasticity Estimates of SSBs, 2019

	Milk packets	Milk tea	Plain tea	Drink packets	Soft drinks	Bottled water
Milk packets	-3.442	0.122	-0.395	0.220	1.233	0.055
Milk tea	0.339	-3.035	-0.393	0.302	-0.309	0.239
Plain tea	-0.772	-0.307	-0.459	-0.279	0.579	0.194
Drink packets	0.146	0.070	-0.094	-1.914	-0.206	-0.060
Soft drinks	1.581	-0.136	0.393	-0.443	-1.534	0.001
Bottled water	0.112	0.190	0.198	-0.200	-0.004	-1.511

Source: Authors' calculations based on HIES 2019 microdata.

Notes: Shaded and unshaded areas depict own and cross-price elasticities, respectively.

5.3 Assessing the Effectiveness of the TLL on SSBs

5.3.1 Consumer Awareness of TLL

Consumer survey reveals that two-thirds of participants were aware of the TLL system on SSBs, while awareness differs by demographic and socioeconomic characteristics.

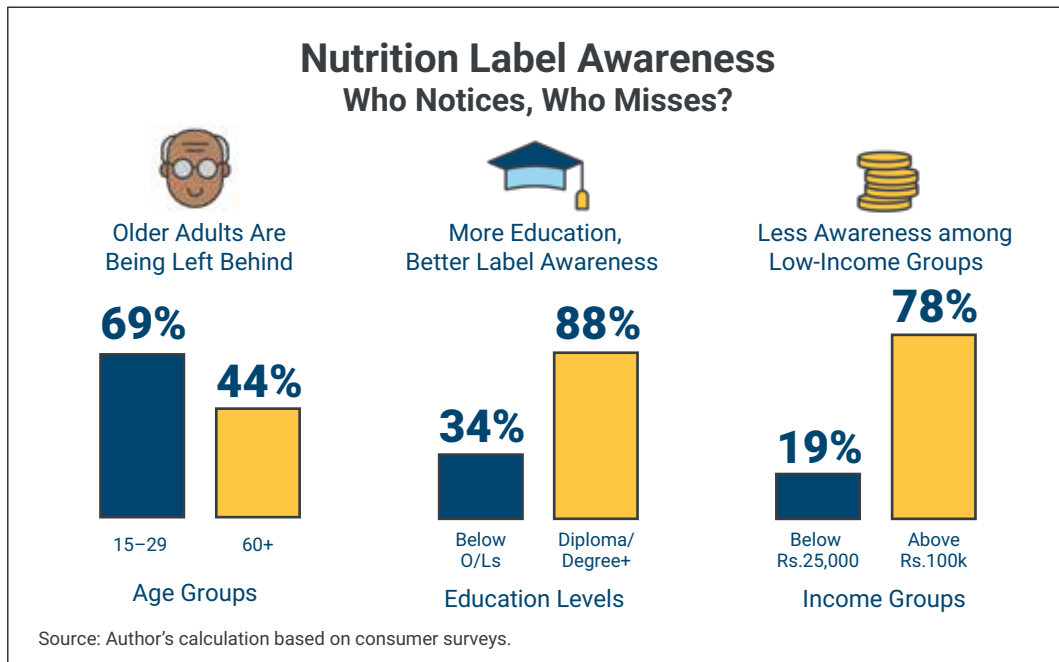
The consumer survey reveals that two-thirds of participants were aware of the TLL system on SSBs, while awareness differs by demographic and socioeconomic characteristics. For example, TLL awareness among females was higher than among males (Table 8). Similarly, across age groups, younger and middle-aged people were considerably more aware of TLL, while knowledge among older people was reported to be substantially lower. This is mainly due to limited exposure to TLL, which was introduced six years ago. Older individuals may have had fewer opportunities to encounter or engage with this information, while younger people are more likely to be aware of it through peers or by receiving information from their children. Furthermore, a clear association exists between TLL knowledge and socioeconomic status. For instance, there is a clear positive relationship between the level of education and the consumers' knowledge.

Further, the awareness of better-off groups is higher. These indicate that exposure to information influences knowledge of TLL. Accordingly, those with limited exposure to information are at a higher risk of vulnerability in accessing unhealthy food items due to a lack of awareness.

Table 8 : Survey Descriptive Statistics

	Sample Distribution	Awareness of TLL in Each Subgroup
Gender		
Female	41%	69%
Male	59%	65%
Age group		
15-29	23%	69%
30-39	31%	74%
40-59	36%	65%
60 above	10%	44%
Education		
Below O/Ls	16.4%	34%
Passed O/Ls	22.2%	55%
Passed A/Ls	33.3%	72%
Diploma/degree & above	28.1%	88%
Income group		
Below 25,000	5.3%	19%
25,000 - 50,000	29.8%	56%
50,001 - 100,000	42.1%	74%
Above 100,000	22.8%	78%
Main activity		
Employed	67.9%	69%
Unemployed	3.9%	63%
Student	9.0%	72%
Household activities	16.7%	61%
Unable to work	2.4%	29%

Source: Authors' calculations based on consumer survey.



While awareness of the TLL system plays a crucial role in shaping purchasing decisions, it is not sufficient on its own to ensure that consumers consistently choose healthier food options. As highlighted in the literature review, DCEs are widely used in food research to capture the trade-offs consumers make when selecting alternatives. In line with this, DCEs were employed to address the research questions and provide empirical insights into how TLL influences consumer choice behaviour. The following sections present the findings from the CEs that examine the effect of TLL on SSB choices.

5.3.2 Effect of TLL on Consumers' SSB Choices

In preference space models, the estimated coefficients represent marginal changes in utility. As the TLL and beverage type attributes were modelled as normally distributed across the population, each attribute is characterised by two parameters: the mean and the standard deviation (SD). For example, the mean and SD of the TLL-Red attribute indicate

that, relative to the "no TLL" baseline, the marginal utility of "TLL-Red" follows a normal distribution $\beta_1 \sim N(\mu = -0.682, \sigma = 1.121)$.

A significant relationship between the TLL system and consumer preferences for low-sugar SSB options.

The marginal utility estimates from the preference space model demonstrate a significant relationship between the TLL system and consumer preferences for low-sugar SSB options (Table 9). The mean coefficients of the TLL attributes suggest that consumers are more likely to choose beverages with a TLL-Green and tend to avoid those with a TLL-Red. Specifically, compared to the "no TLL" category, TLL-Green has a positive coefficient (0.826), indicating a higher likelihood of purchase, while TLL-Red

has a negative coefficient (-0.682), reflecting reduced purchase intent. Moreover, the decline in utility from TLL- Green to TLL-Amber suggests that respondents comprehended the intended meaning of the TLL scale.

The analysis further shows that beverage type plays a key role in shaping consumer preferences. Notably, the high positive coefficients for sweetened milk-based beverages indicate a strong preference for these products, making them more likely to be selected compared to other SSBs. However, as previously noted, existed SSB regulations prior to 2024 did not cover sweetened milk-based drinks.³ On average, Nectar is preferred over carbonated beverages, while juice is not. Significant heterogeneity in preferences across beverage types is also observed, as indicated by the large standard deviations.

The interaction effects between TLL and beverage category are particularly evident for Nectar. Here, TLL-Green is strongly associated with increased product appeal (Figure 4). As expected, TLL-Red generally reduces utility, consistent with its function as a warning label. However, for Nectar, TLL-Red surprisingly increases utility by 0.529 ($p < 0.001$), which is counterintuitive given that it typically signals high sugar content (Table 9). This unexpected result may suggest that consumers perceive Nectar as a natural and affordable product, which could override the negative message implied by the TLL-Red label. In contrast, the impact of TLLs on Juice choices is weaker, except for TLL-Green, which shows a positive and statistically significant effect.

Furthermore, SSB choices are significantly influenced by price. The negative coefficient for price indicates that higher prices reduce the likelihood of purchase, consistent with standard economic theory. Among beverage types, Milk and Nectar are more price-sensitive, whereas juice is the least price-sensitive.

³ Sweetened milk has covered in the revised Food (Colour Coding for sugar levels - liquid) Regulation (No. 2319/42) with effective from January 1, 2024

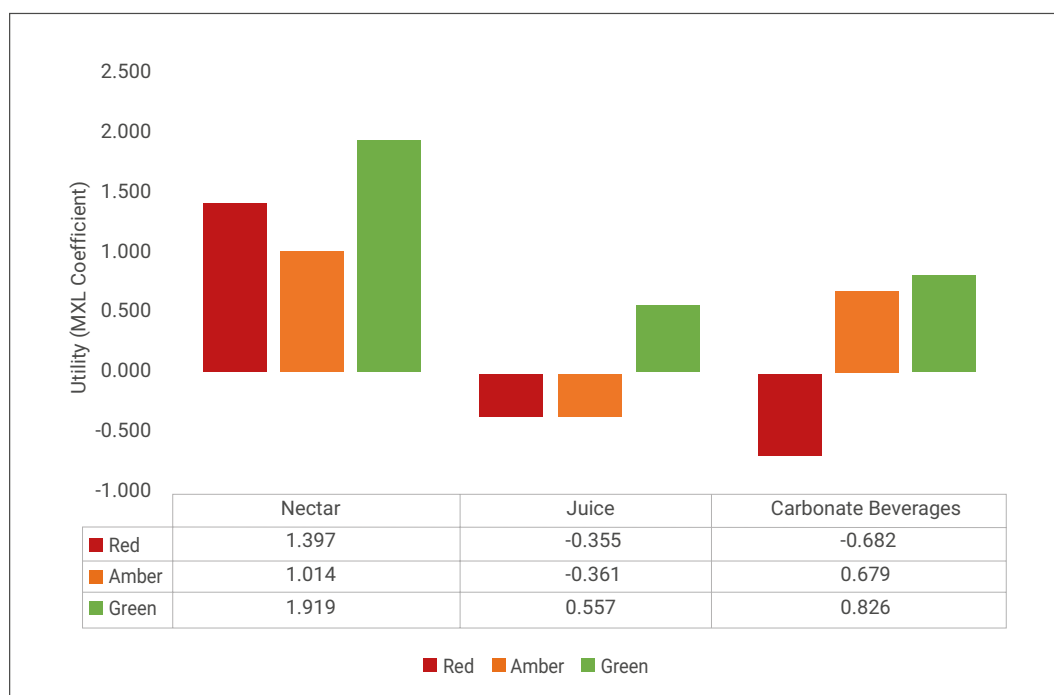
Table 9: Estimates for Consumers' Marginal Utilities in the Preference Space Model

	Mean	SD	P>z
Beverage type (base -- Carbonated beverage)			
Nectar	0.868	2.019	***
Juice	-0.244	4.081	
Milk	1.594	3.957	***
None	-1.124	3.538	***
TLL (base -- no TLL code)			
Red	-0.682	1.121	***
Amber	0.679	-0.053	***
Green	0.826	1.728	***
TLL effect on beverage			
Nectar x Red	0.529	0.180	***
Nectar x Amber	0.146	-0.587	
Nectar x Green	1.051	-0.122	***
Juice x Red	-0.112	0.735	
Juice x Amber	-0.118	0.680	
Juice x Green	0.801	-0.071	***
Price effect on beverage			
Price x Nectar	-0.004		***
Price x Juice	-0.002		***
Price x Milk	-0.004		***
Total observations	76,110		
AIC	38,278		
BIC	38,546		
Log-likelihood at convergence	(19,110)		

Significance level *p < 0.05; **p < 0.01; ***p < 0.001.

Source: Authors' calculations based on consumer survey.

Figure 4: Influence of TLL by Beverage Type



Source: Authors' calculations based on consumer survey.

5.3.3 Effect of TLL Across Socioeconomic Groups

An examination was conducted on how consumers' socioeconomic levels influence their responses to TLL codes in beverage choices. To capture this interaction, terms were introduced between income groups (low and middle) and TLL colour codes, as well as between price and income groups, to assess variation in label effectiveness across socioeconomic strata. As highlighted in the descriptive survey analysis (Table 8), awareness of the TLL system is associated with socioeconomic status. To address disparities in TLL awareness, the preference space model was applied only to consumers who reported familiarity with TLL codes, thereby controlling for the influence of TLL knowledge gaps on SSB choice behaviour.

The results show that even among TLL-aware consumers, the influence of TLL on SSB choices is strongly shaped by socioeconomic status (Figure 5). The TLL interaction coefficients by income groups reveal notable differences in the influence of TLL on SSB choices across income groups (Table 10). For example, low-income consumers respond positively to TLL-Green, but to a lesser extent than the mid- or high-income groups. Similarly, the deterrent effect of TLL-Red labels is less pronounced in this group. In contrast, TLL-Green and TLL-Red have significantly stronger effects among higher-income consumers (see Figure 5), providing clear evidence that the utility derived from TLLs varies by socioeconomic background. This heterogeneity may also reflect differences in the influence of other product attributes, such as price and beverage type, across income groups.

Figure 5: Consumers with TLL Knowledge: Relative Preference for TLL Codes on SSBs by Income Group



Note: For this analysis, two lower-income groups were merged to achieve reasonable sample sizes.

Source: Authors' calculations based on consumer survey.

Moreover, price has a significant negative effect on SSB choices, indicating that higher prices reduce the likelihood of purchase (Table 10). The income interaction model shows that low-income consumers are more price-sensitive (coefficient: -0.003) than middle- and high-income consumers (both -0.001). This suggests that the lack of affordable, healthy SSB options may hinder healthier choices among economically disadvantaged consumers. Supporting this, the consumer survey revealed that 93% of respondents identified cost as a key factor influencing their selection of SSBs.

Table 10: Consumers with TLL Knowledge: Estimates for Consumers' Marginal Utilities in the Preference Space Model Across Socioeconomic Groups

	Mean	SD	P>z
Beverage type (base -- Carbonated beverage)			
Nectar	0.850	2.219	***
Juice	0.606	3.993	***
Milk	1.615	3.969	***
None	-0.705	3.418	***
TLL (base -- no TLL code)			
Red	-1.112	1.439	***
Amber	0.949	0.433	***
Green	2.554	1.889	***
TLL effect by Income group			
Low income x Red	0.791	0.000	***
Low income x Amber	-0.277	-0.362	*
Low income x Green	-1.493	-0.244	***
Mid income x Red	0.366	-0.714	**
Mid income x Amber	0.255	0.415	*
Mid income x Green	-0.062	-0.904	
Price effect by Income group			
Price x Low income	-0.003		***
Price x Mid income	-0.001		***
Price x High income	-0.001		**
Total observations	50,610		
AIC	25,180		
BIC	25,436		
Log-likelihood at convergence	-12,561		

Note: For this analysis, two lower-income groups were merged to achieve reasonable sample sizes.

Significance level *p < 0.05; **p < 0.01; ***p < 0.001

Source: Authors' calculations based on consumer survey

6 Conclusion and Policy Recommendations

Unhealthy dietary patterns have emerged as a major contributor to the global surge in NCDs. Promoting healthier dietary habits, particularly through policies that enhance consumer awareness and provide accessible nutritional information, is essential to mitigate the growing burden of diet-related NCDs. This study offers evidence-based insights into the influence of SSB taxation and TLL on consumer behaviour in Sri Lanka. It reveals that, while these interventions align with the best global practices for reducing SSB consumption, their effectiveness is undermined by critical policy gaps.

Notably, Sri Lanka's current SSB tax and regulatory framework excludes approximately 75% of sugary beverages, primarily informal beverages such as tea, sold outside the formal market. The limited scope of the SSB tax and related regulations disproportionately affects economically disadvantaged populations, as they tend to consume more informal sweetened beverages that fall outside the scope of the SSB control policy framework. On the other hand, sweetened milk-based beverages remain outside the scope of SSB taxation and were only recently brought under the TLL regulations. Findings from the preference model indicate that milk-based beverages are the most preferred formal SSB options among consumers. In this context, the recent regulatory change introducing TLL for sweetened milk-based products represents an important step toward addressing existing policy gaps. Nevertheless, expanding fiscal policies and regulatory measures to cover all categories of sugary beverages is essential to ensure comprehensive consumer protection.

Effectiveness of SSB Taxes

This study provides supportive evidence of the effectiveness of the SSB tax in Sri Lanka. For example, the own-price elasticity estimates for soft drinks show a strong negative response to price increases. The estimated elasticities for 2019 show the potential effects of tax-induced price changes—a 10% price increase is predicted to result in a 15% reduction in quantity demanded.

Furthermore, the results indicate that consumer behaviour has responded to the tax, whereas the descriptive analysis shows that the share of household spending on soft

This study provides empirical evidence that demand for SSBs is price-responsive, indicating that higher prices can effectively reduce consumption.

drinks and fruit drinks declined from 2016 (before the tax) to 2019 (after the tax). While this pattern does not provide causal evidence, it is consistent with the expectation that the introduction of the SSB tax may have reduced consumption of sugary beverages.

This study provides empirical evidence that demand for SSBs is price-responsive, indicating that higher prices can effectively reduce consumption. To sustainably reduce the affordability of SSBs, it is necessary to increase SSB tax rates over time. As discussed in Section 2.1, without

periodic adjustment, the real value of the tax erodes due to inflation and income growth, weakening its effectiveness in discouraging consumption. Consistent with international best practice, SSB tax rates should be regularly adjusted to preserve their real deterrent effect. Such indexation would help maintain the intended price signal, curb affordability, and ensure that the tax continues to influence consumer behaviour and deliver public health benefits over time.

Effectiveness of the TLL System

This study reveals that the TLL system can be an effective tool in guiding consumers toward healthier SSB choices. The DCE results indicate that, overall, consumers show a clear preference for low-sugar SSBs, and their demand for high-sugar SSBs declines when TLL codes are present. These findings suggest that TLL is a valuable policy measure in promoting healthier consumption patterns and reducing sugar intake.

However, the effectiveness of the TLL system is not uniform across the population. The study highlights substantial disparities in TLL impact across consumer awareness and socioeconomic backgrounds. Only around 66% of surveyed consumers reported awareness of TLLs on SSB products. Moreover, awareness levels tend to be higher among more affluent, educated, female, and younger individuals. Conversely, low-income, less educated, and older populations are less likely to recognise TLL information in their decision-making.

**Purchasing
behaviour among
lower-income
groups appears
less sensitive to
TLL codes.**

Even among those aware of the TLL system, the degree to which TLL influences consumers' SSB choices varies. High-income consumers are more responsive to TLL cues, demonstrating stronger preferences for TLL-Green (low-sugar) products and a stronger avoidance of TLL-Red (high-sugar) products. In contrast, purchasing behaviour among lower-income groups appears less sensitive to TLL codes. This limited responsiveness may stem from affordability constraints.

The study further finds, through the preference-space DCE model, that price is a critical factor shaping consumer choices, particularly among low-income groups, for whom price sensitivity is notably high. These findings underline the importance of addressing both informational and economic barriers to healthy eating. While TLL is a step in the right direction, its success relies on a supportive environment where nutritional information is not only visible but also accessible and actionable for all.

Beyond direct behavioural impacts, the TLL system may also generate favourable indirect effects. Labelling can act as a catalyst for industry reformulation, encouraging manufacturers to reduce sugar content or introduce healthier product variants to avoid being labelled as such. This aligns with prior research indicating that labelling schemes can shift public perceptions, build awareness, and ultimately reshape industry practices

in response to consumer demand. If consistently implemented and expanded, the TLL system has the potential not only to guide individual choices but also to influence supply-side changes that benefit the wider population.

To enhance the reach and equity of the TLL system, complementary strategies are needed. These may include targeted public awareness campaigns, particularly in underserved communities, as well as measures to enhance the affordability of low-sugar options. Tailoring interventions to the diverse needs and capacities of different consumer groups is essential to maximise the public health benefits of TLL labelling.

The SSB tax has the potential to reduce SSB consumption in Sri Lanka, sustaining and amplifying its impact will require careful policy calibration, including regular tax adjustments and effective implementation.

In summary, while both the SSB tax and regulatory measures, such as the TLL system, have proven effective in influencing consumer behaviour and reducing sugary beverage consumption, existing policy gaps limit their full potential. To enhance the reach and impact of these interventions, it is essential to expand the scope of the SSB taxation to include all types of sugary beverages, including milk-based products. While the SSB tax has the potential to reduce SSB consumption in Sri Lanka, sustaining and amplifying its impact will require careful policy calibration, including regular tax adjustments and effective implementation, to ensure long-term health and fiscal objectives are met.

Furthermore, improving the affordability of low-sugar beverage options and tailoring interventions to the varied needs and capacities of different consumer groups are critical to maximising the public health impact of the TLL system. Such an inclusive approach would offer stronger consumer protection, particularly for low-income groups who are currently underserved by existing policies. In addition, improving enforcement mechanisms and investing in public awareness campaigns-especially through clear, FOPNL-can further support healthier consumer choices. Closing these policy gaps is critical for advancing a more equitable and effective public health strategy that addresses diet-related NCDs and promotes overall population health.

Improving the affordability of low-sugar beverage options and tailoring interventions to the varied needs and capacities of different consumer groups are critical to maximising the public health impact of the TLL system.

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Annex A

The FOPNL formats are designed to provide clear, at-a-glance nutrition information to help consumers make healthier food and beverage choices. Different FOPNL formats vary in how information is presented, ranging from numeric and interpretive labels to warning symbols and colour-coded systems, and in the level of guidance they offer to consumers. These formats are shaped by policy objectives, consumer literacy, and country context, and they differ in their effectiveness in improving understanding, influencing purchasing decisions, and encouraging product reformulation. The main characteristics of the different FOPNL designs are outlined below.

The TLL System

The Traffic light symbols, represented on the front-of-package (FOP) in a single column of three colours, are one of the simplest methods for facilitating information to consumers to reduce their intake of sugar, salt, and fat. This system enables consumers to quickly determine whether pre-packaged food items contain low, medium, or high quantities of fat, saturated fat, sugar, and salt, based on the daily intake of an adult.

In 2013, the UK Government and Developed Administrations issues guidance to step by step develop a TLL. This label should be inclusive of energy value in kilojoules (kJ) or kilocalories (kcal) per 100g/ml and in a specified portion of the product, the quantity of nutrients in grams of fat, saturated fat, (total) sugars and salt in grams in a specified portion of the product, portion size information expressed easily and recognisably for consumers, percentage reference intake for adults based on the amount of each nutrient and energy value in a portion of the food or drink, and colour coding of the nutrient content of the food or drink (Department of Health & Social Care, Food Standards Agency, Llywodraeth Cymru Welsh Government, & Food Standards Scotland, 2020).

Nutritional Warning Signs

Nutritional warning signs are FOP text-based seals that inform consumers when a product contains excessive amounts of critical nutrients (Pan American Health Organisation, 2020). The Chilean government implemented a mandatory regulation to display FOP 'Warning Labels', presented as stop signs, on all packaged food high in calories (energy), sugars, saturated fats, and sodium. This was to inform consumers that the product exceeded the recommended nutrient threshold. Food items that include these nutrients in high levels in their natural form, such as nuts, avocados, and bananas, are excluded. If a particular product exceeds recommended nutrient thresholds in more than one area, multiple warning labels must be stated with respect to the respective nutrient. Accordingly, some food items may require up to four stop signs (Department of Health & Social Care, Food Standards Agency, Llywodraeth Cymru Welsh Government, & Food Standards Scotland, 2020).

Guideline for Daily Amounts (GDA) Systems

The GDA system represent the amount of nutrients in a panel as a FOPNL that a healthy adult should consume daily based on a 2000 kcal diet. Colour-coded GDA is a further step in the GDA process, utilising a combination of colours as illustrated in the TLL system, with miniature GDA cells filled with colour codes of red, amber, and green, depending on the level of nutrient content. Red represents a high level, amber represents a medium level, and green represents a low level of nutrient content. According to a UK market study, there is a high awareness of both GDA and TLL systems. In terms of understanding, GDA has been better, as the exaggeration of the meaning of colours characterised the TLL. (Borgmeier & Westenhoefer, 2009; Pan American Health Organization, 2020)

Nutri Score

The Nutri Score label was given official recognition in France in 2017. It is implemented as an EU regulation in Belgium, Spain, and the Netherlands. This colour-coded label is intended for use on processed food items and non-alcoholic beverages. Colours range from dark green to dark orange. Letters are also generated from A to E, where A represents the healthiest food items and E represents the unhealthiest food items. Product's ratings will be based on nutrients per 100g (Department of Health & Social Care, Food Standards Agency, Llywodraeth Cymru Welsh Government, & Food Standards Scotland, 2020).

Simple Healthier Choice Tick

The tick symbol is widely used in many countries, with few differences. In Australia and New Zealand, the "pick the tick" symbol is used to indicate approved foods that are low in saturated fat, total fat, added sugar, and sodium. "Smart spot" labelling is used in the USA for similar products. In the Netherlands, the "healthy choice" logo is represented by a single tick, based on standards derived from the WHO regarding trans fat, saturated fat, sugar, and sodium. The tick label simply illustrates a combined evaluation of the food's nutrient content (Borgmeier & Westenhoefer, 2009). This is primarily developed by companies producing ultra-processed products (Pan American Health Organisation, 2020).

Annex B

Sampling Procedure: Consumer Survey

A cross-sectional market exit survey was conducted among consumers in selected districts across Sri Lanka. The total sample size comprised **2,500 consumers**, drawn from **14 districts** representing all provinces. The sample was allocated **proportionately to district population size**.

One to two districts were selected from each province to ensure geographic coverage and provincial representation. Within each selected district, **50% of Divisional Secretariat (DS) divisions** were selected to ensure adequate representation of urban and rural areas.

From each selected DS division, two **supermarkets/outlets** were purposively selected to capture variation in retail formats:

- **One private supermarket** (e.g., Keells, Cargills, Arpico, or Laughs), and
- **One public or cooperative outlet** (e.g., Sathosa or Cooperative shops).

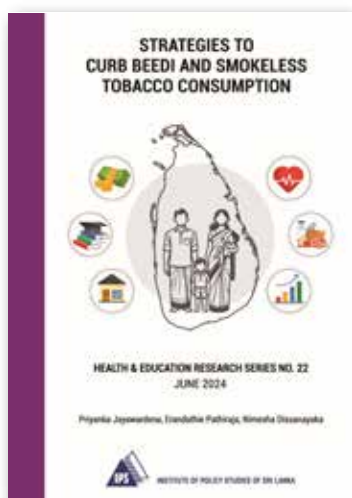
At each selected outlet, up to **20 consumers** exiting the store after completing a purchase were recruited using **systematic sampling**. To capture variation in purchasing patterns, data collection was conducted across **three time slots**: 9:00–12:00, 12:00–16:00, and 16:00–21:00, in different supermarkets.

Data collection at each outlet continued until the allocated quota for that outlet and district was achieved.

Table B1 : Consumer Survey District Level Sample

District	Sample
Colombo	365
Gampaha	362
Kalutara	191
Kandy	216
Nuwara Eliya	111
Galle	167
Matara	128
Batticaloa	81
Ampara	102
Kurunegala	253
Anuradhapura	134
Badulla	128
Rathnapura	170
Jaffna	92
Total	2500

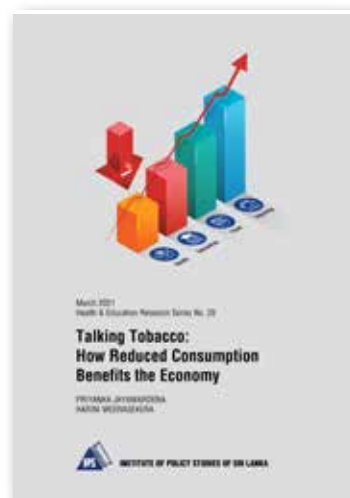
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