

An Analysis of Sugar-Sweetened Beverages Elasticity of Demand in Malaysia

(Analisis Keanjalan Permintaan Minuman Bergula di Malaysia)

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ABSTRACT

Sugar-Sweetened Beverage (SSB) tax is one of the measures undertaken by the government to improve the health index of Malaysians. This study intends to examine the SSB demand elasticity of low, medium, and high-income groups. Demand elasticity analysis is a technique for determining the impact of tax implementation on price increases. The study further examines SSB elasticity of demand based on age groups to explain obesity issues among children and diabetes among the elderly. In addition, this study examines the cross-elasticity of demand for SSB to investigate the effect of substitution. The Almost Ideal Demand System (AIDS) estimating model based on microdata from Malaysia Household Expenditure Survey, 2019, was used in this study. Results showed that households significantly reduced the intake of SSB when price increased. Price should accordingly be adopted by policymakers as an essential tool in controlling SSB consumption. However, consumers switch to SSB substitute to avoid the sugar tax. This study demonstrated the impact of SSB price changes on demand and the substitution effect of SSB which may guide pricing policy and the establishment of the SSB tax in Malaysia.

Keywords: Consumer; cross elasticity of demand; price elasticity of demand; sugar sweetened beverages; tax; Almost Ideal Demand System

ABSTRAK

Cukai Minuman Manis Bergula (SSB) merupakan salah satu langkah kerajaan untuk meningkatkan indeks kesihatan rakyat Malaysia. Kajian ini bertujuan mengkaji keanjalan permintaan SSB bagi kumpulan berpendapatan rendah, sederhana dan tinggi kerana beberapa kajian menunjukkan bahawa isi rumah pendapatan rendah mengambil lebih banyak minuman bergula. Kajian itu juga mengkaji keanjalan berdasarkan kumpulan umur untuk menjelaskan isu obesiti dalam kalangan kanak-kanak dan diabetes dalam kalangan warga tua. Di samping itu, kajian ini mengkaji keanjalan silang permintaan untuk menerangkan kesan penggantian. Kajian mengenai keanjalan permintaan terhadap SSB di Malaysia adalah sangat terhad. Analisis keanjalan permintaan ialah teknik untuk menentukan kesan pelaksanaan cukai ke atas kenaikan harga. Kajian ini menggunakan model anggaran "Almost Ideal Demand System" (AIDS) untuk menganalisis mikrodata daripada Tinjauan Perbelanjaan Isi Rumah Malaysia, 2019. Kajian ini mendapati isi rumah mengurangkan pengambilan SSB secara signifikan apabila harga meningkat. Keputusan ini memberi isyarat kepada pembuat dasar untuk menggunakan harga sebagai alat penting untuk mengawal penggunaan SSB. Walau bagaimanapun, pengguna menggantikan SSB dengan minuman yang tidak dikenakan cukai. Penyelidikan ini memberikan gambaran tentang kesan perubahan harga SSB terhadap permintaan dan kesan penggantian SSB. Kajian ini boleh menyumbang kepada dasar penentuan harga dan memberi cadangan kepada pembentukan cukai SSB di Malaysia.

Kata kunci: Cukai; keanjalan silang permintaan; keanjalan harga permintaan; pengguna; minuman bergula; Almost Ideal Demand System

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INTRODUCTION

Diabetes and obesity have become a problem of global public health concerns including Malaysia (Chew et al. 2016). In addition to the issue of various types of care that need to be provided for diabetic patients, the increasing cost of treating diabetic patients is also a concern that has to be borne by the family and the government (Chew et al. 2016; Ibrahim et al. 2010). The problem of obesity and overweight prevalent in the community is symptomatic of an unhealthy lifestyle and should be changed to a healthy one (Verma & Hussain 2017; Hussein et al. 2015). Obesity is one of the causes of diabetes (Felber & Golay 2002; Verma & Hussain 2017). And diabetic patients need treatment such as insulin pumps, intensive insulin regimens, and continuous glucose monitoring systems for managing glycaemic control (Hussein et al. 2015; Mafauzy 2005). The cost of treating diabetes borne by the public healthcare system in 2019 was estimated at RM174 million (Aljunid et al. 2019). According to Ganasegeran et al. (2020), the economic and other costs related to diabetes treatment in Malaysia from 2000 until 2019 is high and are related to factors such as age, type of treatment centre, treatment time and frequency of treatment. The costs incurred are increasing yearly and require effective solutions that need to be addressed (Chew et al. 2016; Mustapha et al. 2017).

Interventions outside the health care system can significantly impact a nation's health, as recognised in WHO's 'health-in-all-policies' framework (Leppo et al. 2013). Government can improve population health by establishing incentives and disincentives to drive change throughout the food system, including consumer purchases (Cecchini et al. 2010). Small changes in diet for many individuals can translate into significant population health gains at relatively low cost (Rani et al. 2011).

Some studies reported that a substitution effect occurs when the consumption of taxed sugary drinks is reduced with increased uptake of untaxed substitutes (Miriam et al. 2019; Juan et al. 2018). In this case, the SSB tax does not effectively reduce sugar consumption due to the nullifying effect of SSB substitution. Since SSBs are among the most high-calorie beverages, switching to other drinks will surely minimise total beverage calories. The tax implications are however ambiguous when switching to non-beverage items is considered since some food items, such as candy or cookies, are higher in calories per dollar than SSBs. As a result, if the SSB tax switches from the consumption of SSBs to these foods, intake of net calories could increase (Le Bodo et al. 2022).

The report issued by PAHO & WHO (2020) suggested that to formulate a more effective SSB tax, the government should consider the indicators, analyse substitution effects and the need to model the demand to simulate tax policy in the future. The study also examined the proposal made by the report to examine the tax indicators and measure the substitution effect due to the increase in SSB price, as a step in improving the implementation of SSB tax in Malaysia.

This research aimed at analysing SSB elasticity of demand in order to estimate the impact of tax on SSB intake. The elasticity of demand was measured by using *Almost Ideal Demand System* (AIDS) model that explained the relationship of price and quantity demand. Since the Malaysian government had implemented tax on SSB, the effectiveness of the policy to curb sugar intake by the populace were elucidated in this study. The findings suggested that SSB demand was responsive to price changes. It was thus concluded that the tax policy to curb SSB intake is one of the effective ways that should be considered. Nevertheless, the magnitude of the impact and implementation process are elements that need to be enhanced and developed to ensure the effectiveness of the tax implementation.

In this study, the analysis was extended to include the impact of increasing SSB price due to consumer demand for other sugary products. There was a concern that if the consumer reduced SSB consumption, they might channel their sugar crave to other sweet drinks (Royo Bordonada et al. 2022). If this eventuated, a comprehensive and flexible tax strategy should be manoeuvred since the aim is to reduce sugar intake. Merely taxing SSB alone is arguable and may not be effective. Some studies (Pell et al. 2021; Stacey et al. 2019; Nakamura et al. 2018) have firmly supported the SSB policy to reduce sugar intake. Through the analysis on SSB demand, the effect of tax on price can be estimated. There is a growing concern that relates high SSB intake with diabetes among the elderly, low income household burdened with healthcare cost and obesity among school children. This study comprehensively analysed SSB elasticity of demand based on the socioeconomic and demographic characteristics. It also estimated the effect of increasing SSB price to its demand based on income group, family with children age 12 years old and less, and age of household heads. It is hoped that the findings may contribute as guide to SSB intake. In addition to accessing the effectiveness of SSB taxation, the study may also monitor specific groups such as low-income, children and elderly which are important segments of the society and need our extra care.

BACKGROUND OF THE STUDY

In July 2019, the Malaysian government taxed SSB to reduce sugar intake. Their consumption is often associated with obesity, overweight and other chronic diseases (Guerrero-López et al. 2017; Jithitkulchai & Andreyeva 2018). In line with the Shared Prosperity Vision Core 2030 which is fiscal strengthening and improving the Malaysian health index, a continuation of the Strategic Plan of the Ministry of Health Malaysia (KKM) 2016-2020, the government has imposed a tax on SSB sugary drinks starting July 2019 as an excise tax at a rate of 40 cents per litres. Calculations were made over the two categories of sugary drinks in the form of ready-to-drink packaging with the sugar content threshold value. The threshold value of taxable beverages is as follows; sugar content for drinking water under tariff code head 22.02

containing added sugar or other sweeteners containing sugar exceeding five grams per 100 millilitres (ml), and fruit and vegetable juices under tariff code head 20.09, which contain sugar exceeding 12 grams per 100ml. A literature review showed that SSB tax rates vary from one country to another. More than 50 countries have imposed tax on SSB including, for example, the United Kingdom, Mexico, and South Africa. Some studies indicated that the SSB tax was a successful tool in reducing the consumption of taxed sugary drinks in the United Kingdom, Mexico, and South Africa (Pell et al. 2021; Stacey et al. 2019; Nakamura et al. 2018).

LITERATURE REVIEW

In taxation, the government can implement several types of taxes on goods and services, such as sales tax, consumption tax, excise tax and value-added tax (Hildreth 2019; Salanie 2011). This section explains the effect of the SSB tax on consumption, the elasticity of demand and cross-elasticity, and the problems that have plagued society due to SSB consumption. The effectiveness of the tax was evaluated based on consumers' responses to price increases (John et al. 2022; Lozano-Rojas & Carlin 2022; Powell & Leider 2020).

We defined SSB as drinks containing sugar added prior to packaging such as soft drinks, sugary drinks, non-alcoholic drinks, soda, sweet drinks, fruit drinks, sports drinks, cold drinks and carbonated drinks. Other beverages like full cream milk, low-fat milk, skim milk, water, tea and coffee were excluded because they may contain some nutritional value, and none contain sugar added before packaging.

"Own-price elasticity" is an index that expresses the responsive need of the quantity demanded to the change in price. It is the ratio of the percentage change in the amount demanded to the percentage change in price. The percentage change should be negative since the demand for certain products typically decreases as prices increase. The demand is 'elastic' if the own-price elasticity is greater than the absolute value of 1. Demand is inelastic if it is less than 1 (Case & Fair 2007; Blundell et al. 1989). A related concept is 'cross-price elasticity', which measures the change in the quantity demanded of one good in response to a change in the price of another good. It can be either positive or negative. Positive cross-price elasticity indicates that an increase in the price of X causes the demand for Y to rise. It also implies that the goods are substitutes. A negative cross-price elasticity demonstrates that an increase in the price of X causes a decrease in the demand for Y, which implies that the goods are complements (Case & Fair 2007; Blundell et al. 1989).

The SSB tax affects the price of sugary drinks and the demand for substitute goods (Royo Bordonada et al. 2022). An increase in the price of a particular good will cause consumers to respond by reducing consumption of that particular good if it is a normal one. A SSB tax effectively reduces the consumption of sugar-based foods and drinks in the United Kingdom, South Africa and North America (Pell et al. 2021; Stacey et al. 2019; Nakamura et al. 2018). SSB taxes have played an essential role in reformulating SSB products in the UK by reducing the amount of sugar in SSB without losing revenue to the industry. This reformulation has reduced 45 million kg of sugar in the soft drink industry yearly (UK Government 2018). In Mexico, the implementation of SSB has reduced sugar purchase by 37% (Pedraza et al. 2019). In South Africa, following the SSB tax, the number of carbonated drinks purchased fell by an average of 29%. The number of sugary drinks purchased fell by 51% (Stacey et al. 2019). The government can reduce the issue of obesity and body weight indirectly through taxing sugary drinks and the effect of increasing prices from the tax (Segovia et al. 2020).

SSB consumption significantly differs across income groups, gender and age (Phulkerd et al. 2020). Low-income households consume more than other income groups (Rehm et al. 2008). Low-income families are also more resistant to consuming SSB, so they are willing to reduce their intake of nutritious foods such as milk to continue the habit of consuming SSB (Segovia et al. 2020). Consumers are also constantly trying to satisfy their addiction to sugary drinks to the extent that they are willing to cross the borders into regions where SSB is taxed to get the cheaper commodity (Powell & Leider 2020). SSB users will not reduce SSB consumption if the price increase can still accommodate income (Phulkerd et al. 2020).

THEORETICAL FRAMEWORK

This study aimed at analysing the elasticity of SSB demand and SSB cross elasticity of demand to determine the effectiveness of the SSB tax implemented by the government. Given the health-threatening effects of over consumption of SSB, this study was motivated to contribute research findings to guide policies related to the pricing of SSB.

Excessive consumption of SSBs will cause problems of obesity and diabetes. To reduce this problem, the government imposed a tax on the commodity which consequently triggered the increase in SSB price. Consumer's response to the price rise can be measured in two ways. First, by measuring own price elasticity, and second, by cross-price elasticity.

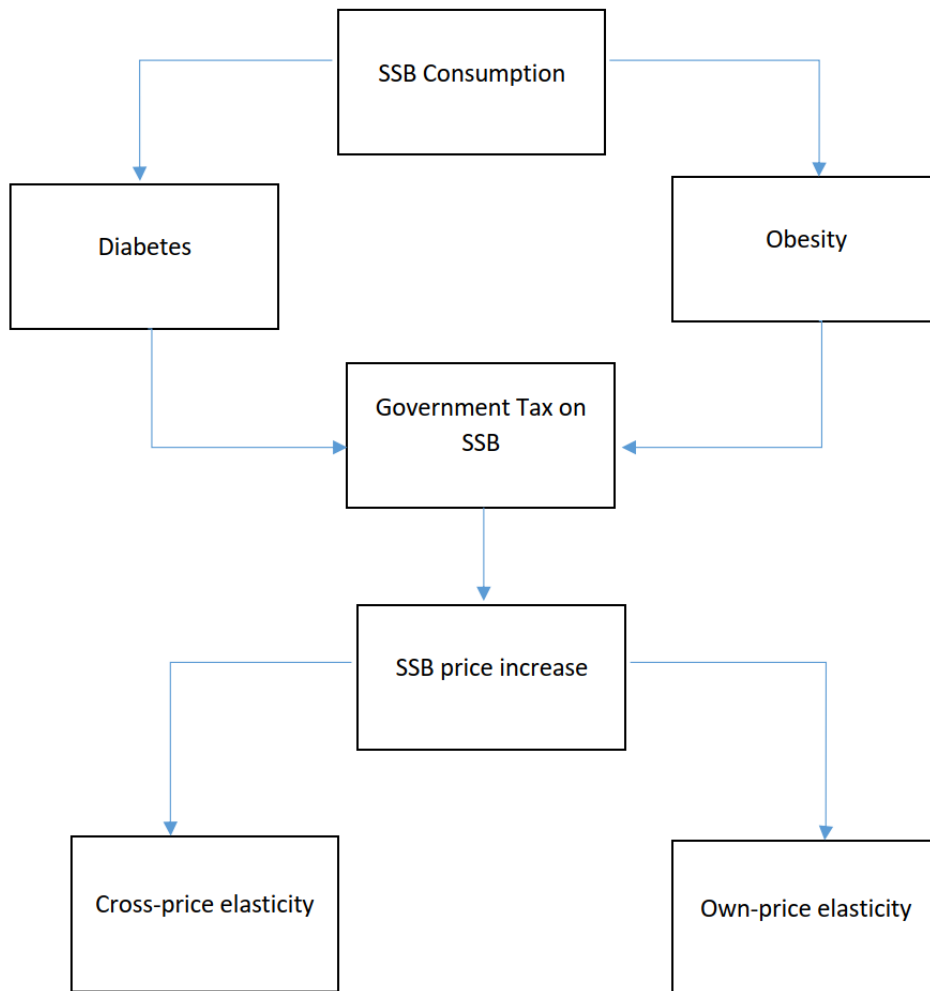


FIGURE 1. Theoretical framework

METHODOLOGY

Demand elasticity analysis on SSB is a technique to determine the impact of price increases on SSB consumption (Guerrero-López et al. 2017; Jithitikulchai & Andreyeva 2018; Segovia et al. 2020). Price elasticity of demand indicates the change in the amount demanded in percentage due to changes in the price of per unit product (Perloff 2009; Pindyck et al. 2018). Through the calculation of the elasticity of demand, changes in quantity demanded due to price changes could be determined. In this study, we measured SSB's price elasticity by calculating the amount of SSB consumption due to the change in price per unit of SSB. In comparison, we estimated the cross-elasticity of demand by the changes in the amount demanded due to changes in the price of other products (Cabrera Escobar et al. 2013). In this study, we referred to Cabrera Escobar et al. (2013) and calculated the cross-elasticity value by measuring the change of SSB and changes in the quantity demanded of other products including sugar, bread and bakery products, biscuits, chocolate, sweets and ice cream, evaporated and condensed milk, fresh and reconstituted milk together with milk powder and other dairy products.

Data on information of price and quantity of SSB for each household was used to calculate the elasticity of demand for SSB. Since the HES 2019 data only provide information on the amount of expenditure and the frequency of purchase for each item in aggregate form, the simplest method for determining the price value was that given by Deaton (1975); i.e., through dividing the value of the amount of expenditure by the frequency of purchase. He also described that the log-log or double logarithmic estimation model provided the most straightforward and concise method for determining the relationship between price and demand. Wolak (2021) and Shah et al. (2020) similarly explained that this method was the simplest, despite the subsequent criticisms that it cannot measure and demonstrate the quality of the product. Many researchers used this method to estimate the regression model's parameters. It corresponds to the definition of elasticity,

which determines the percentage change in quantity demanded due to a unit percentage change in price. According to Wahab et al. (2018), the log-log regression model enables straightforward calculation on the effect of the independent variable on the dependent variable in percentage measurement units.

Deaton (1975) was one of the earliest economists to measure price, expenditure, and income elasticity. He explained that the log-log model or double logarithmic functions constitute the most fundamental and appropriate method for determining income elasticity. This procedure is ideally suited for aggregate data. He further claimed that different data types need different approaches to calculating price elasticity. Using actual price value when analysing time series data is crucial because the intercorrelation between independent variables, income, total expenditure, and price, will render the response between variables undetectable or too small over time.

DATA

The study used the Household Income and Expenditure Survey (HES), a comprehensive survey data, provided by the Department of Statistics Malaysia (DOSM). HES data provided the purchase frequency of each item of goods, allowing the researcher to obtain the total quantity through the count as incorporated in the method of the SPSS software version 27. The HES data were also extensive and stratified, allowing for generalised findings in the Malaysian population. HES data are widely used by government and non-government agencies for policy purposes related to national development (DOSM 2020). The researcher believed that using HES data was the best option to measure SSB elasticity of demand because of its nature that enabled the study results to be generalised for the Malaysian population. The sample size of HES 2019 comprised 16,354 households. According to Ismail et al. (2023), the huge sample size was however stratified and supported the findings in socioeconomics and demographic perspectives of the whole Malaysian population. The HES 2019 data were selected for the study because of their availability. The data allowed for the count process in the SPSS that provided options in deriving the quantity of each product purchased as compared to those in HES 2019 that provided aggregated amount of SSB expenses. The HES 2019 data suitably represented SSB consumption following SSB tax implementation through examining SSB's price elasticity. In this study, we define SSB as a combination of soft drinks, mineral water, fruits and vegetable juices in accordance to the nature of the data presented by DOSM.

MODEL ANALYSIS

The Almost Ideal Demand System (AIDS) model by Deaton and Muellbauer (1980) was adopted in the study. AIDS gave an arbitrary first-order approximation to any demand system. It exactly satisfied the axioms of choice. It aggregated perfectly over consumers without invoking parallel linear Engel curves. It possessed a functional form, which was consistent with household-budget data. Furthermore, it largely avoided the need for non-linear and precise estimates. Further, it can be used to test the restrictions of homogeneity and symmetry through linear constraints on fixed parameters.

The regression model for SSB is as the following model:

$$Q_{SSB_i} = \beta_0 + \beta_1 \log P_{SSB_i} + \sum_{i=1} \beta_2 \log E + \sum_{i=1} \beta_3 D + \varepsilon$$

Variables in the models are as follows:

Q_{SSB_i} is the quantity of SSB consumed by household i .

P is the unit price of SSB for household i .

E is the total expenditure

D represents household i demographics factors: Strata, gender of household leader, age of household leader, number of children below 12 years old, education level, marital status and household size.

ε is the error term.

In this study, the model was constructed using the approach by (Deaton & Muellbauer 1980; Vu 2020; Guerrero-López et al. 2017). We used the same model to calculate cross elasticity. We replaced the left side of the equation with the quantity of sugar, bread and bakery products, biscuits, chocolate, sweets, ice cream, evaporated and condensed milk, fresh and reconstituted milk, milk powder, and other consumer dairy products.

RESULTS AND DISCUSSIONS

A descriptive analysis of total SSB expenditure revealed a difference in the mean value of spending across the categories of selected factors. Table 1 shows the total SSB expenditure based on income groups, household groups with and without 12-year-old children, age of household head, urban and rural households, gender of household head, marital status and household size. The findings revealed that the higher the income level, the higher the amount of SSB expenses. B40 households spent a maximum of RM333 per month, and M40 households spent RM377. The highest SSB spending value

was RM700 per month for high-income households. This finding was inconsistent with the study by Rehm et al. (2008) who showed that low-income families consumed more SSB compared to other income groups.

Households with no children below 12 years old showed that the highest SSB expenditure per month was RM264, while families with 12 years old spent a maximum of RM700 per month. Urban households recorded higher spending than rural households, with a maximum of RM700 per month while rural ones spent RM264 per month. In addition, total SSB expenditure also recorded differences based on the age of household heads. Those in the age group of 45-64 years recorded the highest spending. The high consumption of sugary foods by this age group raised concerns of high risk in health problems. Male household heads also recorded higher spending on SSB compared to female counterparts. Families with married couples showed higher total spending than singles or single parents. From the perspective of household size, SSB expenditure was highest in households with 6-10 members. Families with small household members consumed more SSB than larger ones. The expenditure gap shown between household groups was relatively high. In general, the highest SSB expenditure per household member was by those with single status.

TABLE 1. Sociodemographic descriptive statistic

Variables	Category	N	Mean	Median	Std. Deviation	Minimum	Maximum	Variance
Income group	B40	1569.0	17.4	11.7	20.7	0.4	333.6	428.6
	M40	1394.0	24.7	17.5	27.4	0.9	377.0	752.6
	T20	733.0	34.4	22.8	43.1	1.0	700.0	1854.9
The family have a child aged 12 and below	No kids below 12 years old	1845.0	23.4	15.4	27.2	0.4	264.0	739.4
	Family with 12 years old kids	1853.0	23.7	15.8	31.7	0.9	700.0	1005.1
Strata	Urban	2638.0	25.0	16.8	31.2	0.9	700.0	973.3
	Rural	1060.0	19.9	12.9	24.6	0.4	264.0	603.3
Age of household leader	17 and below	1.0	23.7	23.7	0.0	23.7	23.7	0.0
	18-24	94.0	19.7	11.1	27.1	0.9	209.7	734.0
	25-34	709.0	23.3	16.3	25.7	1.0	226.7	660.9
	35-44	967.0	23.6	15.8	29.4	1.0	377.0	863.1
	45-64	1629.0	24.3	16.0	31.9	0.4	700.0	1018.9
	65	298.0	20.3	13.5	25.4	1.0	247.5	642.4
Gender of household leader	Male	3083.0	23.8	16.0	29.8	0.4	700.0	887.6
	Female	615.0	22.0	13.8	28.2	1.0	282.5	794.5
Marital status of household leader	Single	485.0	23.0	15.2	27.1	1.0	224.0	735.6
	Couples	2904.0	24.1	16.0	30.7	0.4	700.0	941.8
	Widow	205.0	18.7	11.8	21.5	1.0	157.4	460.2
	Divorcee	79.0	20.2	13.0	18.4	2.0	87.6	336.6
	Separated	25.0	19.1	12.0	17.9	1.0	76.9	321.3
Household size	1	188.0	16.5	10.6	20.6	1.0	204.4	424.5
	2-5	659.5	23.1	15.4	26.9	0.8	295.7	723.0
	6-10	166.0	28.6	15.8	47.4	1.2	313.4	3502.7
	11 and above	4.2	25.4	20.6	0.0	11.1	59.2	0.0

The demand for SSB is sensitive to price changes which thus allows the imposition of a tax to reduce consumption. Table 2 shows the price elasticity of SSB and the cross-elasticity of its demand with the need for sugar, bread and bakery products, biscuits, chocolate, sweets, and ice cream, evaporated and condensed milk, fresh and re-mixed milk together with milk powder and other dairy products. The price elasticity value of SSB showed that a 10% increase in its price will decrease demand by 1.73%. This finding was consistent with Pell et al. (2021), Stacey et al. (2019) and Nakamura et al. (2018). These studies indicated that increase in price level due to taxes will effectively reduce SSB demand. Taxes on SSB is therefore an effective way to reduce SSB intake. An increase in price of SSB produced positive impact on other sweet foods and drinks which was consistent with the findings of Royo Bordonada et al. (2022).

TABLE 2. SSB price and cross-price elasticity of demand

Items	Price and cross elasticities
Softdrink	-0.173 (0.000)***
Sugar	-0.005 (0.756)
Bread and bakery products	-0.195 (0.000)***
Biscuits	-0.003 (0.868)
Chocolate, sweets and ice cream	-0.127

	(0.000)***
Jam and honey	0.013 (0.377)
Evaporated and condensed milk	0.003 (0.001)***
Fresh and reconstituted milk	-0.053 (0.01)**
Milk powder and other dairy products	0.019 (0.328)

Note: *** significant at 1%, ** significant at 5% and * significant at 10%

The study also established that consumers tend to seek substitute products as a reaction to the increase in SSB price. This will also reduce SSB consumption with consumers driven to other sweetened food items. The cross-elasticity value significantly showed that evaporated and condensed milk, among others, were the preferred substitutes with the increase in SSB price. Malaysians are very fond of beverages such as tea, milo, coffee and all kinds of drinks that contain condensed milk which combines creamer and sugar that produce a delightful taste. The study showed that a 10% increase in the price of SSB will increase the consumption of evaporated and condensed milk by an average of 0.3% which is consistent with Miriam et al. (2019) and Juan et al. (2018).

The study clearly indicated that consumers seek other sugary products to substitute for SSB. Switching from SSBs to other drinks would almost guarantee a reduction in total calorie consumption since these are among the most energy-dense beverages. Higher net calories could increase if consumers consume less SSB and switch to more sugary non-beverage items. The SSB tax should reduce caloric consumption and hence the body weight of consumers. A healthy diet requires limited caloric, fat, and sodium intake (Ragelienė & Grønhøj 2020). Since SSBs are low in the latter two components, it is possible that the tax could increase their consumption, thus reducing any health gains that may be achieved through reduced caloric intake.

Table 3 shows the value of price elasticity based on income groups, household groups with and without children aged 12 and the age of the household head. The results established that households were sensitive to changes in SSB prices. A 10% increase in prices will decrease demand for B40, M40 and T20 households by 1.67%, 1.70% and 1.90%, respectively. The highest degree of response by T20 households was comparable to those for M40 and B40 households. What is important, however, is that households respond to prices that will justify the imposition of taxes or price-related policies to influence SSB consumption. This study also focused on SSB consumption among families with children aged below 12 years old. Such households were found to be more sensitive to changes in SSB prices than others. The opportunity to control the intake of SSB for families with children was thus expected to reduce the risk of obesity among them. In addition, household heads aged between 25-34 years were most sensitive to price changes. The older the leader, the less elastic his reaction is to price changes. Household heads aged 65 and over were less responsive to prices than younger ones aged 25-64. This finding raised concerns since greater sugar intake among older members increased the risk of diabetes. Assuming that price increase has less impact on demand, it should thus be replaced with other measures such as consumer age as the price factor.

TABLE 3. Price elasticities of demand based on socioeconomic and demographic

Variables		Price elasticity of demand SSB
Income group	B40	-0.167 (0.000)***
	M40	-0.170 (0.000)***
	T20	-0.190 (0.000)***
The family have child aged 12 and below	No child below 12 years old	-0.152 (0.000)***
	Family with 12 years old child	-0.187 (0.000)***
Age of household leader	24 years old and below	0.097 (0.454)
	25-34	-0.221 (0.000)***
	35-44	-1.76 (0.000)***
	45-64	-1.70 (0.000)***
	65 years old and above	-1.53 (0.011)**

Note: *** significant at 1%, ** significant at 5% and * significant at 10%

CONCLUSION

SSB consumption has become a debatable issue in the country due to implication of health threats. Health problems due to overconsumption of SSB have compromised the health of every layer of society, from children to adults. The

Malaysian government has taken the step of imposing a tax on SSB as an initiative to curb its direct consumption and it can also be used as a measure to prevent non-communicable diseases indirectly. To verify that the imposition of taxes is effective in constraining the uptake of SSB, a literature review suggested methods of analysis of demand elasticity and cross-elasticity relevant to the price issue. The purpose of price elasticity analysis is to ensure price effectiveness as a policy tool that efficiently controls the intake of SSB. Cross-elasticity calculations aim to determine goods that are substitutes to sugar intake to avoid taxes imposed on SSB. The study found that households significantly reduced the intake of SSB when the price was increased. The implication is for policymakers to use price as an essential tool to control SSB consumption. The result importantly showed that an increase in the price of SSB was caused by enhanced consumption of sweetened condensed milk as a substitute. This unexpected consequence triggered health concerns since sweetened condensed milk in Malaysia contains high sugar content and is unhealthy due to its lack of nutrition value.

Among the limitations of this study was to assume soft drink data used as an aggregate of mineral water, vegetable juices and fruit juices. Such data should thus be disaggregated as per HES data in other countries, so that the impact of imposing the SSB tax on consumption of soft drinks can be determined at the aggregate level, namely mineral water and nutritious drinks. The data of this study are also relatively inadequate. Analysis related to the effectiveness of taxes on SSB recruitment can also be carried out in more depth by recruiting respondents who suffer from non-communicable diseases such as diabetes and obesity. In addition, for cross elasticity analysis, the replacement of food types can also be further diversified into high-caloric and low-caloric intake foods. The study may potentially contribute to guiding policymakers in controlling the consumption of SSB in terms of SSB price effect and the impact of substitutes such as food or other sweet drinks, due to the imposition of the SSB tax. In addition, the study may also contribute to the extant literature on the sugar tax in this country.

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