Perceived effectiveness of sugar tax on human consumption behaviour in Gauteng

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ABSTRACT

Excessive intake of sugar-sweetened beverages is associated with higher rates of overweight and obesity. Overweight and obesity are correlated with high risk of non-communicable diseases and increased mortality. South Africa is classified as one of the nations where individuals excessively consume sugar-sweetened beverages, leading to a rise in obesity rates and increasing healthcare expenses. South Africa implemented a sugar tax in 2018 to reduce the excessive consumption of sugar-sweetened beverages. The goal was for manufacturers to adjust their products by lowering sugar content, or for consumers to either switch to healthier options or decrease their intake of sugary drinks in response to the higher prices. This study has investigated whether the sugar tax has effectively changed the consumption behaviour of sugar-sweetened beverages among Gauteng residents. It also examines the impact of knowledge about the sugar tax and health awareness campaigns on consumption behaviour. A quantitative cross-sectional descriptive study was conducted by administering a self-assisted online questionnaire to 140 participants in Gauteng who were selected using convenience and snowballing sampling technique. The data collected was examined using Chi-square in the Statistical Package for Social Sciences programme. The study found insignificant association between sugar tax and consumption behaviour. Additionally, knowledge about sugar tax and health awareness programmes were also found to insignificantly impacted consumption behaviour. Only 18% of Gauteng people altered their consumption behaviour due to the sugar tax, as indicated by the results. 42% of participants altered their consuming habits upon being diagnosed with Non-Communicable Diseases (NCDs). The sugar tax was considered ineffectual in altering human consumption behaviour in Gauteng.

KEYWORDS

i. Sugar tax
ii. Sugar sweetened beverages
iii. South Africa
iv. Sin tax

DECLARATION

I, Witness Saurombe, declare that this research report entitled “Perceived effectiveness of sugar tax on human consumption behaviour in Gauteng" is my own unaided work. I have acknowledged, attributed, and referenced all ideas sourced elsewhere. I am hereby submitting it in partial fulfilment of the requirements of the degree of Master of Business Administration at the University of the Witwatersrand, Johannesburg. I have not submitted this report before for any other degree or examination to any other institution.

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Signed at Johannesburg on 28th February 2024

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ACRONYMS

CVD – cardiovascular disease

NCD – non-communicable disease

PHPT – Public Health Product Tax

SA – South African

USA – United States of America

WHO – World Health Organisation

CHAPTER 1: INTRODUCTION

1.1 Introduction

This quantitative study examined the perceived effectiveness of sugar tax on consumption behaviour of sugar sweetened beverages in Gauteng province (South Africa), in order to determine whether there was a change in human consumption behaviour towards sugar sweetened beverages as a result of this tax. The study started by examining the background of where general “sin” taxes came from, why they were introduced, and a brief discussion of why the sugar tax in particular was introduced. This is followed by discussion of the research problem and research question. The objectives of the study are outlined as well as the rationale of why this study was performed. The contributions made by the study are outlined next, followed by delimitations encountered in the study and assumptions used in order to streamline the study. The chapter closes with an outline on how the rest of the study will be presented.

1.2 Background of the study

Governments introduce taxes for various reasons, usually either to raise revenue, discourage consumption, or both. Taxes which discourage consumption are classified as excise taxes as these are levied on the consumption of certain goods and services. These taxes have also been commonly termed “sin taxes” (Munir et al., 2022). The word “sin” is normally found or associated with religious institutions where such items are banned altogether without option for a tax (Munir et al., 2022). Therefore, applying a religious definition to the word ‘sin’ as in ‘sin taxes’ is not appropriate. For the purposes of this dissertation ‘sin tax’ is defined as a form of excise tax which is levied on certain goods and services that are deemed unhealthy (“sinful vices”), addictive, pose negative externalities to the society, or are self-destructive (Munir et al., 2022).

Sin taxes been in existence since the 1500s (Altman, 2009). Pope Leo X started this practice by taxing licensed prostitutes to fund his lavish lifestyle. Two

centuries later, Peter the Great from Russia started taxing men who grew beards (Altman, 2009). In 1791, Alexander Hamilton introduced alcohol tax in United States of America (USA) to curb its consumption and generate revenue to fund the civil war. This also sparked what is now commonly known as “the Whiskey Rebellion” in Pennsylvania (Altman, 2009). Since then, various types of sin taxes have been introduced by various countries with the most common types of such taxes being alcohol tax, sugar sweetened beverages tax, tobacco tax, carbon tax and gambling tax (Miracolo et al., 2021).

Various researchers have linked certain diseases to consumption of certain goods or services. These diseases put pressure on public health budgets as the population become sicker and less productive (Arsenault et al., 2017; U.S. Department of Health and Human Services, 2014; Malik et al., 2013). For example, excessive consumption of tobacco products has been linked to higher chances of developing cancer, non-communicable and chronic illnesses, cardiovascular and respiratory diseases (U.S. Department of Health and Human Services, 2014).

Research work has been conducted in an attempt to measure the effectiveness of using sin taxes to raise revenue and promote healthy living (controlling human behaviour). For example, in the USA, a 159% increase in cigarette tax (tobacco tax) was introduced in April 2009. Some argued that this was a life saving tax as about 900 000 lives were estimated to be saved, almost 2 million children were anticipated to be forced to stop smoking, and 1 million adults smokers were anticipated to quit smoking (Altman, 2009). With regards to sugar tax, Colchero et al. (2017) and Ng et al. (2019) argued that there was an inverse relationship between an increase of sugar tax and the consumption of sugar sweetened beverages in Mexico. In 2021, Miracolo et al. conducted a systematic analysis of sin taxes in Latin America and noted that sin taxes have helped in shaping human consumption behaviour to some extent.

The current study focused on the perceived effectiveness of taxation on sugar sweetened beverages on human behaviour in Gauteng province in South Africa. Sugar sweetened beverages have been associated with weight gain, obesity,

cardiovascular diseases (CVDs), metabolic diseases and increased mortality worldwide (Malik et al., 2006; Malik et al., 2013; Arsenault et al., 2017). About 1.5 billion people were overweight in 2008 and the number was estimated to more than double to 3.3 billion people by 2030. The World Health Organisation (WHO) avers that over 2.8 million deaths per year across the world are caused by obesity related diseases (World Health Organisation [WHO], 2009). South Africa has not been spared from this gloomy picture. The National Health and Nutrition Examination Survey conducted in South Africa in 2012 found that obesity had increased by 1.8% to 10.6% in men and by 11.8% to 39.2% in women (Manyema et al., 2014). By 2016, obesity in adult men had increased to 15.98% (112th rank in the world), 9.82% in male children (101st rank in the world), 40.99% in adult women (23rd rank in the world), and 12.81% in female children (35th rank in the world) (World Obesity, 2023).

The continual growth in the obese population is definitely a matter of concern for the South African government considering the increase in non-communicable diseases (NCDs) and CVDs, with about 7% of all deaths in the country in year 2000 linked to excess body weight (Mayosi et al., 2009). These increases mean that the country has also suffered from ever increasing healthcare related costs. Bertram et al. (2013) noted that in 2013 the country was already paying 11% more towards healthcare costs for moderate obese people and 23% more for serve obese people, and there had been a 326% increase in CVD related healthcare costs from R5 billion in 1991 to R21.3 billion in 2013. Therefore, the government had to act in the best interests of its residents and itself. This gave birth to taxation of sugar sweetened beverages in South Africa in 2018 (Stacey et al., 2019).

1.3 Research problem

The South African government introduced a tax on sugar sweetened beverages which was implemented from 1 April 2018 through what is called a Health Promotion Levy (Stacey et al., 2019). It was following in the footsteps of other countries such as USA, Mexico and Chile which had adopted the same taxation model in trying to address obesity and diseases associated with it (Stacey et al.,

2019). By 2018 many European countries had already introduced sugar tax: Norway in 1981, Finland in 2011, Hungary in 2011 and France in 2012 (National Treasury, 2016). South Africa introduced sugar tax at R0.021 for each additional gram of sugar exceeding 4 grams per 100 ml of sugar sweetened beverages and it was the first on the African continent (Stacey et al., 2019).

Elliot et al., (2022) noted that most of the developing countries borrowed policies from developed countries and implemented them in their economies without assessing whether they would be effective in their respective countries. In addition, Munir et al. (2022) argued that human beings are not always rational, they do not always act in their best interests, and they do not always have time-consistent preferences.

As South Africa was the first country to levy sugar tax on the African continent, this study explored the perceived effectiveness of sugar tax in Gauteng in influencing the intake behaviour of sugar sweetened beverages. Generally, the law of demand states that the higher the price of a product or service, the lower the quantity demanded (Sukartini et al., 2023). In essence, the South African government deployed this theory to justify the implementation of sugar tax (National Treasury, 2016). Therefore, the study explored whether the residents of Gauteng province perceived the existence of sugar tax on sugar sweetened beverages as an influence on their consumption behaviour of sugar sweetened beverages.

1.4 Research questions

The following research questions guided the achievement of the objectives of this study:

i. Do sugar sweetened beverage consumers perceive their consumption behaviour has been influenced by sugar tax?
ii. Does knowledge about sugar tax influences the consumption behaviour of sugar sweetened beverages?
iii. Does sugar sweetened beverages consumers perceive health awareness campaigns influenced their consumption behaviour?

1.5 Research objectives

A sugar tax was introduced in South Africa to curb excessive consumption behaviour of sugar sweetened beverages and was implemented in 2018 (Stacey et al., 2019). This is a fairly new tax and more research needs to be conducted to understand the effectiveness of this tax. Therefore, the objectives of this study were:

i. To determine whether sugar tax has been perceived as effective in affecting the consumption behaviour of sugar sweetened beverages.
ii. To determine whether knowledge on the existence of sugar tax affected the consumption behaviour of sugar sweetened beverages.
iii. To determine whether health awareness campaigns affected the consumption behaviour of sugar sweetened beverages.

1.6 Rationale

Policies are enacted for a specific purpose by governments. The success of such policies can only be measured once they have been implemented. In the case of taxation of sugar sweetened beverages, the South African government hoped to sway away the consumption behaviour of sugar sweetened beverages consumers against sugary drinks. Some researchers have already started measuring its effectiveness (Koen et al., 2022), while others predicted the overall effectiveness before it was implemented (Manyema et al., 2014). Koen et al. (2022) discovered that less than half of the participants in their study knew about the sugar tax and felt that it was insufficient to change their consumption behaviour. The authors also discovered that people who knew about the negative effects of excessive consumption of sugar sweetened beverages were more likely to change their consumption patterns. Manyema et al. (2014) predicted that if sugar tax was going to increase the prices of sugar sweetened beverages by 10%, consumption behaviour was most likely going to be reduced by 13%. However, this was on the assumption that 100% of sugar tax was going to be passed on to consumers.

The South African government adopted this policy after it had studied its effectiveness in other countries like Mexico, France, Brazil and USA (Manyema et al., 2016). However, its implementation in South Africa would not necessarily produce the results achieved in other countries. There are other factors which play a major role in achieving desired results such as availability of affordable substitutes, the ability of producers to absorb additional costs or generally the culture of people (Briggs et al., 2013).

1.7 Research contributions

Despite the work that has already been done by other researchers, this study ought to be done for the following reasons. In Hungary, Gangl (2021) and Kurz and König (2021) discovered that consumption of taxable sugar sweetened beverages declined in the first two years after introduction of sugar tax. However, consumption levels started to rise again after the third year from tax implementation date. Thus, the effectiveness or perceived effectiveness of the sugar tax in Gauteng may not necessarily produce the same results as previous studies, as human behaviour changes over time. Continuous studies of a similar nature are needed to continually assess the perceived effectiveness of the sugar tax and inform the government on the next best course of action to take.

This study will inform policy makers regarding health awareness campaigns and pricing strategies they might need to explore in influencing consumption behaviour of sugar sweetened beverages, since human behaviour is not always consistent and not only driven by changes in prices.

1.8 Delimitations of the study

South Africa has been experiencing increasing obesity levels both in adults and children and sugar sweetened beverages are consumed by people across all age groups (World Obesity, 2023). Therefore, it would be of great value to evaluate the influence of sugar tax on consumption behaviour of sugar sweetened beverages in these two classes of human beings that is, children and adult

groups, but this study excluded children (people under the age of 18 years) as there was a need to get consent from their legal parent(s) or guardian(s).

The perceived effectiveness of this type of tax is best measured by the levels of consumption patterns. Ideally it would include an exact consumption record of sugar sweetened beverages. However, this study did not quantify the increase or decrease in the level of sugar sweetened beverages volume consumed. Briggs et al. (2013) argued that consumption patterns can also be linked to culture. This study did not take cultural differences into cognisance when determining consumption behaviour.

No structural form of selection was used when asking participants to participate in the study. A random selection method was used. Participants were not recorded either through video or audio. No classification was made between participants in urban areas and those in rural areas.

In order to gain more understanding about the perceived effectiveness of this policy, the study classified participants into different income classes according to income per household per month, that is low-income class, middle-income class and higher-income class.

The theory of demand used in the study has assumptions which brought limitations to this study. The theory assumes that human beings are rational and always act in the best interests of themselves. It therefore assumes that human beings act rationally all the time. This is not the case as some consumers develop addictive tendencies from consuming sugar sweetened beverages (Munir et al., 2022). This makes them not act rationally and in the best interests of themselves as they have an urge forcing them to consume sugar sweetened beverages at whatever price is presented in the market.

The theory also assumes that consumers will have full access to complete and correct information about the products they are purchasing (van Rensburg et al., 2021). Previous studies have noted that this is not always the case and have advocated for more awareness campaigns so that consumers are equipped with

information on what they consume (Álvarez-Sánchez et al., 2016). Access to information is not the same for everyone. Therefore, the limitation of information about sugar tax, influenced the consumption decisions made by some sugar sweetened beverages consumers.

Lastly, the theory of demand also works on the assumption that real disposable income of consumers does not change (van Rensburg et al., 2021). This is difficult to control in a real-life environment as consumers change jobs (new employees are joining the market, some are being promoted or retrenched). These are all the factors which are beyond anyone's control and which affected real disposable income of sugar sweetened beverage consumers. Therefore, it was difficult to ensure that disposable income remained constant from when sugar tax came into effect.

1.9 Assumptions

The term "sugar sweetened beverage" is very broad. Therefore, participants might not understand the types of beverages covered in the study, which might lead them to answer the questionnaire incorrectly. This would skew the results of the study. The definition was therefore provided so that participants understood what the study was all about.

The questionnaire used for the purpose of this study was answered online for ease of collation and analysis. However, not every possible participant had a smart phone, computer or tablet. Furthermore, if they had one, not all might have had access to internet to answer the questions. Therefore, this might have limited the range of participants that participated.

The study aimed to understand the perceived effectiveness of sugar tax in Gauteng province. However, it is not possible to interview every resident in the province. Therefore, the results of this study are assumed to represent the participants, and not all consumers in Gauteng. They can, however, be regarded as pointing to trends of consumption patterns in the province.

1.10 Chapter outline

This study is organised into five chapters. Chapter 1 covered the background and introduction of sin tax and sugar tax. It also outlined the problem statement, study objectives and rationale of the study. Chapter 2 covers the literature review on the use of sugar tax and the theoretical frameworks on the effectiveness of using taxation to change human consumption behaviour. Chapter 3 covers the research methodology used for this study. It also describes the research approach and design, data collections methods, population, possible limitations and ethical considerations towards data collection. Chapter 4 critically analyses and interprets the data collected from this study. The study concludes with chapter 5 which provides conclusions and recommendations.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This chapter provides an overview of the peer-reviewed literature on fiscal policy measures (that is imposition of a tax on sugar sweetened beverages) and their influence towards consumption behaviour of consumers, whether knowledge about sugar tax influences consumption behaviour and whether health awareness campaigns have an influence on consumption behaviour of sugar sweetened beverages. The chapter begins by discussing the rationale of taxing sugar sweetened beverages followed by the idea of excise taxation, discussed as an economic theory. The chapter also reviews the empirical evidence from other countries which introduced sugar tax to influence consumption behaviour before South Africa did. The chapter discusses how the theories of demand and knowledge-attitude-behaviour can influence consumption behaviour through sugar tax, knowledge about sugar tax and health awareness campaigns. Finally, the chapter formulates hypotheses from empirical evidence to be tested in the study.

2.2 The rationale for sugar tax

The consensus among some economists has been that when a market failure occurs government can act to either directly or indirectly address the effects of the market failure (Karnani et al., 2016; Wilson & Hogan, 2017). For example, carbon tax was introduced after markets alone could not regulate the time people spent driving carbon producing cars and destroying the environment. Furthermore, motorists were not bearing the full costs of the negative impact they were having on the environment. Therefore, the government tried to regulate and force motorists to contribute to the negative impact they were causing on the environment by introducing a carbon tax (Stern, 2022).

Some researchers have argued that sugar sweetened beverages have caused market failures. One of the market failures identified is a negative externality, that is costs that are imposed on third parties as a result of sugar sweetened beverages consumption (Cawley et al., 2019). It is believed that individual sugar

sweetened beverages consumers do not bear all the costs associated with consuming them. Therefore, it was argued that they have a negative externality to the society (Tiffin et al., 2015).

Cawley et al. (2019) argued that the community does bear the external costs because of NCDs caused by excessive consumption of sugar sweetened beverages which then leads to reallocation of resources from other important programmes like infrastructure development and education to increased government expenditures on the public health care system. Thus, the introduction of sugar tax is aimed at controlling excessive consumption of sugar sweetened beverages to “optimal levels” because consumers will be bearing more of the external costs (Tiffin et al., 2015).

The other type of market failure caused by sugar sweetened beverage excessive consumption is known as internalities, which are future costs that consumers place on themselves as a result of their current behaviour (acting against their own interests) (Allcott & Sunstein, 2015). Munir et al. (2022) refer to internalities as time-inconsistent preferences.

Taljaard and Voster (2018) argued that most consumers make consumption choices based on incomplete knowledge and children in particular are singled out as a strong example of this. Perceived advantages of sugar sweetened beverages consumption through extensive marketing campaigns skews children’s choices by elevating their consumption of sugar sweetened beverages (Battram et al., 2016). Manyema et al. (2016) argued that the consumption of Coca-Cola between 2002 and 2012 surged by 56% because of extensive marketing. They further argued that by 2012, South Africa was ranked as the 10th most Coca-Cola consumer market in the world as each consumer was taking about 285 servings per year.

Briggs (2016) contended that taxing sugar sweetened beverages is an effective way of trying to control market failures brought about by excessive consumption of sugar sweetened beverages. Briggs (2016) is of the view that if the prices of

sugar sweetened beverages are increased through taxation, the quantity demanded and consumed will fall leading to a change in consumption behaviour.

Sugar tax is typically an illustration of a “Pigouvian tax or corrective tax” because its main goal is to correct negative externalities, specifically the rising social costs linked to high consumption of added sugars in the form of sugar sweetened beverages. The expense of increased health care costs is one of the negative externalities connected with sugar sweetened beverages overconsumption. These costs can be transferred from the general public to sugar sweetened beverages consumers through sugar tax. However, some economists make a different argument. Taljaard and Voster (2018) argued that taxation of sugar sweetened beverages alone is not sufficient to address overweight and obesity. They argued that overweight and obesity are caused by many other factors and sugar sweetened beverages consumption is too small to cause concerns.

Álvarez-Sánchez et al. (2016) conducted a study on the effectiveness of sugar tax in Mexico. They found that consumer awareness campaigns about sugar tax had a significant impact on addressing negative internalities caused by high sugar sweetened beverages consumption, especially in the adult population. Therefore, it is worthwhile exploring this in South Africa to assess whether consumer health awareness campaigns about sugar tax have had an influence on sugar sweetened beverages consumption behaviour.

2.3 Excise taxes

Excise taxes are also known as indirect taxes. They are levied directly on a transaction and not to the general public or businesses (van Rensburg et al., 2021). These taxes are narrowly focused on specific selected goods or services (imported or domestically produced) and that is why they are also generally referred to as sin taxes. They can be levied and collected at various intervals in a business cycle, that is at manufacturing, wholesale or retail stage.

It is important to differentiate excise taxes from other general taxes. Other general taxes are normally levied on all good and services. Their main purpose is to raise

revenue for the government (van Rensburg et al., 2021). The main purpose of excise taxes is to influence human behaviour through consumption reduction (van Rensburg et al., 2021). By taxing consumers, the government seeks to internalise the negative externalities imposed by the taxed products or services, thereby forcing consumption of these to socially optimum levels. Munir et al. (2022) termed this type of tax a “sumptuary tax” which they also apply to other products such as tobacco and alcohol. Cnossen (2011) argued that the majority of the products or services that are subject to sumptuary tax are price inelastic. Therefore, the impact of sumptuary taxes on consumption (demand) is likely to be minimal. Another reason for this minimal impact is that suppliers can take advantage of the price inelasticity of their products and shift most of the taxes to consumers through price increases (van Rensburg et al., 2021).

In addition, some researchers have argued that excise taxes are of little use as they are regressive in nature (Falbe, 2020). They argue that most low-income earners are negatively affected by this type of tax as they end up spending a higher proportion of of their income on tax than high income earners. For this reason, Cnossen (2011) advocated for excise taxes to be progressive in nature, that is for high-income earners to bear more tax than low-income earners. This would, however, pose challenges because it would require a very complex system to differentiate between high-income earners and low-income earners (for exemption purposes) when they buy from the same producers, wholesalers and retail stores.

Chaloupka et al. (2019) did not agree with Cnossen’s (2011) argument as they argued that it is mostly the low-income earners who burden the government with healthcare costs because they cannot afford to pay for their own health care costs. Therefore, excise taxes are already progressive in nature as low-income earners will bear most of the burden of tax which will force them to change their consumption behaviour through reduced consumption. This forces them to become healthier people and the government then spends less healthcare costs on them.

2.4 Empirical evidence

Many other countries enacted sugar tax way before South Africa did (National Treasury, 2016), based on the belief that excessive consumption of sugar sweetened beverages was contributing to overweight, obesity and increased NCDs in their population which was also costing their governments through negative externalities. In trying to correct this market failure and internalise the costs of negative externalities, they implemented sugar tax or other type of tax which advocated for reduced consumption of sugar sweetened beverages or other foods deemed unhealthy (National Treasury, 2016).

Subsequent to the implementation of sugar tax, several researchers have conducted studies to assess if the intended consequences of sugar tax have been met, that is reduced sugar sweetened beverages consumption and improved health status of the general population by reducing overweight and obesity. Several conclusions have been reached from these studies. Although most of the studies did note a relationship between decrease in consumption of sugar sweetened beverages and sugar tax, Wilson and Hogan (2017) are of the view that these studies have gaps in them. They argued that most researchers used instruments with methodological inconsistencies and inaccurate measurements (especially studies that failed to take into consideration consumers' substitution of other less expensive calories) – these inconsistencies are why their studies found a plausible relationship of sugar tax and reduced sugar sweetened beverages consumption. Other researchers have argued that reduced sugar sweetened beverages consumption does not guarantee a healthy population (Aguilar et al., 2021). This is because the benefits received from reduced sugar sweetened beverages consumption can be easily outweighed by consumption of other sugary products.

The current study analysed the effectiveness of sugar tax from countries such as Mexico, Hungary, USA, Poland and France in influencing consumption of sugar sweetened beverages and other factors that contributed to reduction of sugar sweetened beverages consumption.

2.4.1 Sugar tax and consumption behaviour

There are various studies by the likes of Augilar et al. (2021), Nava and Dong (2022), Gangal (2021), Kurz and König (2021) and Valizadeh and Ng (2021) which have been undertaken to understand the effectiveness of sugar tax from countries which were pioneers in implementing it. Aguilar et al. (2021) studied the effectiveness of sin taxes on different foods in Mexico, which included sugar tax. Mexico implemented sugar tax at one peso per litre of sugar sweetened beverage produced. They studied the weekly purchases from 8 130 households and noted that the overall calories from taxed sugar sweetened beverages decreased by 2.7% after a 9.7% increase in prices of sugar sweetened beverages driven by sugar tax (Aguilar et al., 2021). Aguilar et al., (2021) concluded that there was a decrease in consumption behaviour of taxed sugar sweetened beverages but consumers substituted these with untaxed beverages.

Nava and Dong (2022) conducted a follow up study from studies by Colchero et al. (2015) and Campos-Vázquez and Medina-Cortina (2019) on the effectiveness of sugar tax in Mexico. From a sample size of over 70 000 households they deduced that the actual sugar tax of one peso per litre of sugar sweetened beverage was equivalent to a 20% price increase in 2014. Their study also established that sugar tax reduced sugar sweetened beverages consumption by between 16.6% and 19.0% (Nava & Dong, 2022). They noted that sugar sweetened beverages' own-price elasticity was quite responsive in Mexico, but the change in quantity demanded was still low compared to the increase in price.

Before the implementation of sugar tax in Mexico, various studies took place which forecasted the likely impact after implementation, which informed policy formation. Colchero et al. (2015) carried out one of the studies and estimated that consumption of sugar sweetened beverages would be reduced by 22.6% if a 20% sugar tax was to be implemented. However, from the studies carried on by Nava and Dong (2022) and Aguilar et al. (2021) it is evident that the actual sugar sweetened beverages consumption decrease was lower than what was forecast by Colchero et al. in 2015.

The government of Hungary introduced the Public Health Product Tax (PHPT) in September 2011 (Gangl, 2021; Kurz & König, 2021; Csákvári et al., 2018). This covered a wide range of products which were deemed unhealthy and non-staple for its population (Gangl, 2021). This tax policy was designed by the Hungarian government to increase prices of unhealthy products and force consumers to shift their purchasing power to healthier products. In addition, the government also wanted to raise revenue to fund its health sector (Bíró, 2015).

Taxation of sugar sweetened beverages and soda drinks was imposed on products with more than 8 grams of sugar per 100 millilitres at 5 Hungarian Forint (equivalent to 1.8 Eurocents at the time) (Csákvári et al., 2018). The Hungarian government increased this tax to 7 Hungarian Forint (equivalent to 2.4 Eurocents at the time) in 2014 which was a 40% increase (Csákvári et al., 2018).

Kurz and König (2021) conducted a study on the impact of sugar taxes on soft drinks sales in France and Hungary using a synthetic control approach and data gathered from Euromonitor International from 2004 to 2018. They discovered that contrary to common beliefs and the expectation of the Hungarian government, consumption of soft drinks in Hungary decreased marginally between 2011 and 2013 and increased from 2014 onwards. This was despite PHPT being increased in 2014. The increase in consumption outweighed the previous decrease so that the net effect was an average of 12% increase in consumption per year since PHPT was introduced.

Kurz and König (2021) observed that sales of sugar sweetened beverages in France decreased marginally following the implementation of sugar tax compared to what was predicted in the pre-tax period. This was concurred with Capacci et al. (2019) who used data from commercial home-scan panel and household purchase data to determine the effectiveness of the sugar tax in France. They observed that the tax rate was low and the 5% increase in sugar sweetened beverages prices caused by sugar tax only resulted in a 3% decrease in sugar sweetened beverages consumption on average. However, they also discovered that the impact was a bit higher for high sugar sweetened beverages consumers. It reduced their consumption levels with about 10% of pre-tax levels.

Gangl (2021) conducted a follow up study focusing on school-aged children in Hungary using a difference-in-difference approach and concurred with the counter-intuitive results of Kurz and König (2021). The authors found that consumption of soda drinks statistically significantly changed with an increase in consumption behaviour among the sample. Gangl (2021) argued that this was most likely caused by lower taxes on soda drinks than other sugar sweetened beverages.

In the USA high sugar consumption from sugar sweetened beverages was regarded as a contributor to obesity (Valizadeh & Ng, 2021). Therefore, sugar tax was introduced to encourage moderate consumption of sugar sweetened beverages. The introduction was selective according to individual city rules, so was not applied countrywide. The city of Berkley in California became the first city to enact sugar tax in March 2015 (Valizadeh & Ng, 2021). The city pegged the tax at one cent per ounce of every sugar sweetened beverage. It was followed by Albany, Oakland, Boulder, San Francisco, Philadelphia and Seattle. Their sugar taxes were pegged between one cent to two cents per ounce of sugar sweetened beverage (Valizadeh & Ng, 2021).

Valizadeh and Ng (2021) conducted a study to determine the effectiveness of sugar tax in changing consumption behaviour in the USA. The researchers noted that most frequent consumers of sugar sweetened beverages were less sensitive to variations in sugar sweetened beverages prices than low consumers. They further noted that the poor consumed sugar sweetened beverages at greater rates and had lower price elasticities due to their stronger sugar sweetened beverages preferences. In addition they argued that because of high consumption of sugar sweetened beverages by the poor, this tax was regressive in nature and the habit formation and addictive nature of sugar sweetened beverages was less likely to be deterred by sugar tax implementation. However, they concluded by arguing that sugar tax does make a difference in reducing consumption quantities despite low elasticity to price changes.

Rojas and Wang (2021) argued that the effectiveness of sugar tax is strongly determined by the tax pass through rate. The tax pass through rate can be defined as the proportion of sugar tax which is passed on by suppliers to their customers through price changes. This was even more important to consider in USA as the tax was not enacted countrywide. Therefore, it was easy for consumers to do their shopping in the next city where there was no sugar tax. This made it difficult for suppliers to pass on sugar tax as consumers could easily access similar products in the closest next city without sugar tax. This was evident in Philadelphia where residents within a 6 miles radius to the border of the next city engaged in cross-border shopping. This had a 24% effect on the average consumption levels on the people who participated in a study conducted by Seiler et al. (2021).

In Berkely, Rojas and Wang (2021) argued that sugar tax pass through rate was 50%. This also affected the price increases in sugar sweetened beverages and regular soda drinks. They discovered that sugar tax resulted in 1% increase in price of all sugar sweetened beverages and 1.5% increase in prices of regular soda drinks and the effect on consumption volumes was negligible (a decrease of 0.13% in all sugar sweetened beverages and 2.015% in regular sodas).

However, Washington city had a better pass-through rate of 110% (Rojas & Wang 2021). Therefore, sugar sweetened beverages prices went up by an average of 6.26% and consumption decreased by 4.6%. Despite these significant different sugar tax pass through rates in Berkely and Washington, it can be noted that the percentage change in prices was more than the percentage changes in quantity demanded. Therefore, the effectiveness of sugar tax was questionable in changing consumption behaviour despite other researchers arguing that it had been effective.

2.4.2 Knowledge about sugar tax and consumption behaviour

A year after introduction of sugar tax in Berkley, about 68% of the population knew about the existence of the tax. However, only a decrease of 0.13% in all sugar sweetened beverages and 2.015% in regular sodas, was achieved during

the same period (Rojas & Wang, 2021). There was no significant association identified between knowledge about sugar tax and its influence over consumption behaviour.

Jasti et al. (2017) conducted a cross-sectional study using regression analysis to examine if there was any association between knowledge about sugar tax and sugar sweetened beverages consumption behaviour among 350 college students in New York. They observed that there was a relationship between knowledge about the sugar tax and consumption behaviour among overweight students, as less knowledge was associated with higher consumption behaviour.

Piekara (2022) conducted a study in Poland to assess whether consumers perspectives and preferences was a result of the sugar tax or other measures in curbing excessive sugar consumption. From the 500 adult consumers sampled, 69,6% of them knew about the imminent sugar tax and 78,9% of them were going to take action to reduce their consumption behaviour. Therefore, she observed a significant association between knowledge about sugar tax and its influence over consumption behaviour.

By 2020, more than half (65,2%) of the Mexicans were aware of the existence of sugar tax (Álvarez-Sánchez et al., 2020). The awareness was mainly driven by activists who were not in favour of the tax. Nevertheless, they assisted in increasing awareness of the tax to the general public. Only a fifth of the entire population thought that sugar tax was an effective way of changing sugar sweetened beverage consumption behaviour. Therefore, Álvarez-Sánchez et al. (2020) argued that sugar tax alone was less likely to achieve its intended goal. They further advocated for an increase in public health awareness campaigns as consumers who were aware of sugar tax were 23% more likely to reduce their consumption levels than those who were not aware. Public health awareness campaigns had also worked well in products with similar taxes such as tobacco in Mexico.

2.4.3 Health awareness campaigns and consumption behaviour

Nava and Dong (2022) noted that education played an important role in reducing sugar sweetened beverages consumption and increased water consumption in Mexico. They noted that most of their participants understood the message which was spread during awareness campaigns and took heed of it. Therefore, their consumption behaviour was also influenced by public awareness campaigns.

The World Health Organisation (2015) carried out an impact assessment a year after PHPT was implemented in Hungary and observed that public health awareness campaigns made some significant contributions towards motivating consumption behavioural changes. 22% to 38% of the people who changed their consumption behaviour after implementation of PHPT attributed this to public health awareness campaigns.

Donnelly et al. (2021) argued another point of view on the effectiveness of sugar tax. They argued that human beings make better decisions if more information is communicated to them. They argued that sugar sweetened beverages purchase patterns do change if sugar tax is reflected on price tags as most human beings are tax averse. During their study in the USA, they observed that sugar sweetened beverages consumption was likely to decrease by a further 5.04% if the amount of sugar tax was clearly labelled on the price tags. Falbe et al. (2016) also argued that, even though the overall impact of sugar tax might be viewed as low in the USA, this would have been lower if pre-tax media campaigns about sugar tax were not implemented.

It can be noted that sugar tax has had varying impacts across the countries analysed above. Even though the effectiveness was not satisfying for most of the countries, it did play a role in changing sugar sweetened beverages consumption behaviour. The next chapter will discuss the analytical and conceptual framework which was used in the study.

2.5 Analytical framework

Chapter 2.5 introduces the theoretical and conceptual underpinnings of this research study, by examining the demand theory, and knowledge-attitude-behaviour model and the tax mechanism used by the South African government to try influence sugar sweetened beverages consumption behaviour.

2.5.1 Theoretical framework

Demand theory

Some academics have argued that overweight and obesity which causes NCDs was being driven by excessive consumption of sugar sweetened beverages (Karnaniet al., 2016; Wilson & Hogan, 2017). Therefore, they argued, if excessive consumption of sugar sweetened beverages can be controlled, overweight and obesity can be controlled leading to reduced NCDs.

The question was how excessive consumption of sugar sweetened beverages could be disincentivised economically. The demand theory came into the picture to try and solve the puzzle as it stems from an argument that there is an inverse relationship between the quantity demanded and the price of that product, that is the higher the price of a product or service, the lower the quantity demanded, and the lower the price of a product or service the higher the quantity demanded (Figure 1) (van Rensburg et al., 2021).

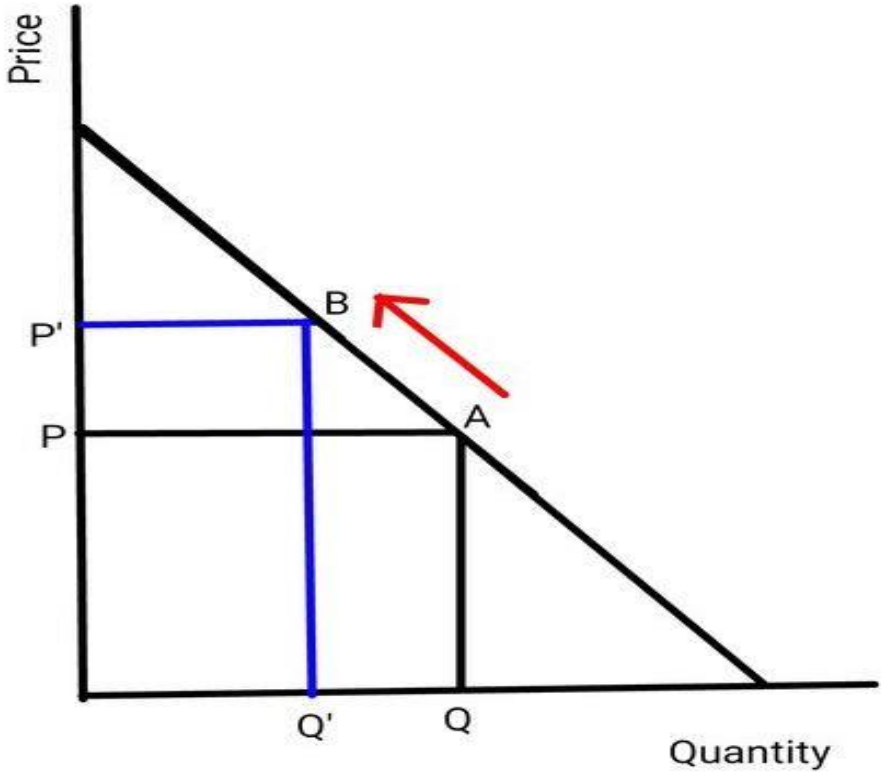

Figure 1. Demand curve

From the demand curve depicted in Figure 1 it is evident that implementation of sugar tax is expected to increase the manufacturing prices of sugar sweetened beverages. The increase in manufacturing costs was expected to be passed on to the final products resulting in selling prices of sugar sweetened beverages increasing from P to P'. All things being equal, the increase in price of sugar sweetened beverages was supposed to be followed by a decrease in quantity demanded from Q to Q', thereby reducing consumption patterns by having a movement along the demand curve from A to B.

Hines (2013) argues that the demand of a product or service will also change as a result of income effect or substitution effect. Regarding the income effect, the demanded of a product or service will change depending on the product being viewed as a normal or inferior product by the customer. Regarding substitution effect, the demand of a product or service will change depending on the availability of substitute products or services.

Van Rensburg et al. (2021) argued that while the quantity demanded of a product has an inverse relationship with the price of substitute products available, the same case is not true regarding changes in disposable income levels. As disposable income levels change, the demanded for the product will change depending on the product being viewed as inferior or as a normal product. For a normal good, if disposable income increases, the demand for the product will increase. Similarly, if disposable income decreases, the demand for the product will decrease. For inferior goods, if disposable income increases, the demand for the product will decrease and if disposable income decreases, the demand for the product will increase.

Therefore, as the prices of sugar sweetened beverages increase as a result of sugar tax, the demanded also changes based on the factors such as the availability of substitute products, whether sugar sweetened beverages are being viewed as inferior or superior products by consumers, and the information possessed by consumers.

In addition, the changes in quantity demanded of sugar sweetened beverages as a result of changes in prices of sugar sweetened beverages will also depend on sugar sweetened beverages' price elasticity of demand. This price elasticity of demand can be either relatively inelastic or relatively elastic. A product can be defined as being price elastic if an increase or decrease in the price of the product will result in a more proportionate decrease or increase in the quantity demanded (Fan & Hyndman, 2011). In the case of sugar sweetened beverages prices and quantity demanded, they will be deemed to be price elastic if the percentage increase in prices results in a more proportionate percentage decrease in quantity of sugar sweetened beverages purchased and consumed.

Similarly, a product can be defined as having price inelasticity if an increase or decrease in the price of the product results in less proportionate decrease or increase in quantity demanded (Fan & Hyndman, 2011). In the case of sugar sweetened beverages, it will be deemed that sugar sweetened beverages have price inelasticity if the percentage increase in price of sugar sweetened beverages results in a less proportionate percentage decrease in the quantity of sugar sweetened beverages demanded (purchased and consumed).

Changes in demand can also be influenced by factors other than the price of the product, such as awareness campaigns. People often make decisions without full information. Awareness campaigns are rolled out to empower people with information so that they can make informed decisions (Briggs et al., 2013). A government can exercise this option to influence the consumption behaviour of sugar sweetened beverages without affecting prices by imposing sugar tax. By empowering people through the provision of information about the negative effects (negative externalities) of excessive consumption of sugar sweetened beverages, the demand curve is expected to shift from D1 to D2, in Figure 2 below, followed by a decrease in demand from Q1 to Q2 without any change in prices of sugar sweetened beverages. The current study investigated whether sugar sweetened beverages consumers consumption behaviour had been influenced by implementing health awareness campaigns.

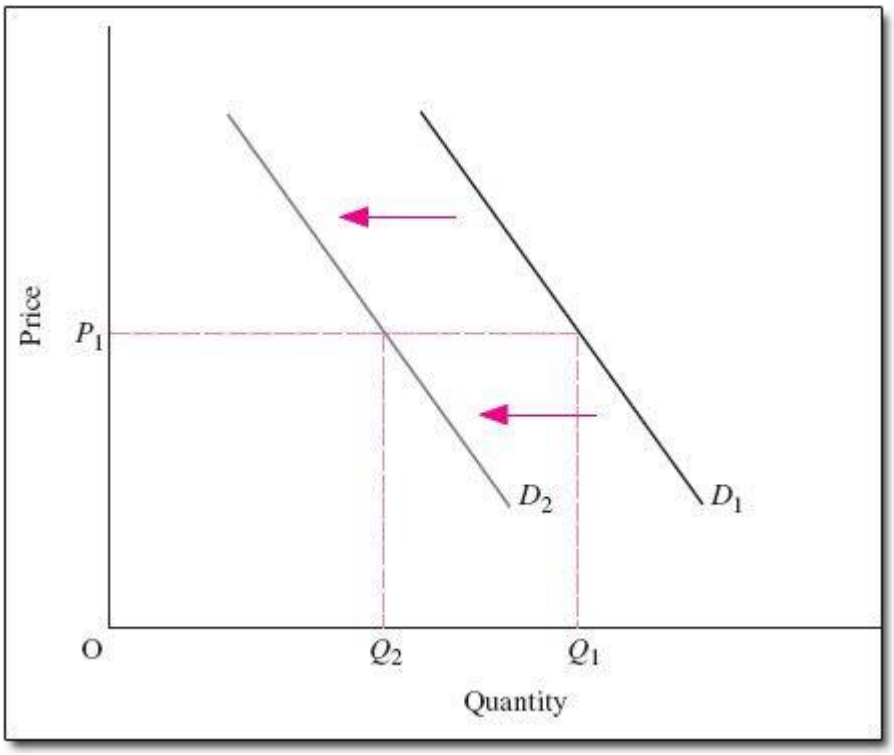

Figure 2. Shift in demand curve

Knowledge-Attitude-Behaviour Theory

The Theory of Knowledge-Attitude-Behaviour (K-A-B) was developed from the same fundamental belief systems of Theory of Planned Behaviour. These four belief systems of the Theory of Planned Behaviour serve as the foundation for the attitudinal component of the Theory of K-A-B. According to the K-A-B paradigm, knowledge influences attitudes, which in turn influence action and behaviour (Baranowski, Cullen, Nicklas, Thompson & Baranowski, 2003). The older Theory of Reasoned Action, which contends that intentions, which are influenced by attitudes and social norms, determine behaviour, provides the foundation for the Theory of Planned Behaviour attitudinal components (Baranowski et al., 2003). For example if people were to form a negative view about excessive consumption of sugar sweetened beverages, this will encourage them to alter their consumption behaviour of sugar sweetened beverages. The Theory of Planned Behaviour also considers how behaviour is influenced by one's perception of control, which means that an individual may have good intentions but little power over the same perception. For example the addictiveness of fizziness and caffeine contained in some sugar sweetened

beverages may override the intentions on wanting to alter sugar sweetened beverages consumption behaviour. This theory is summarised in Figure 3 below.

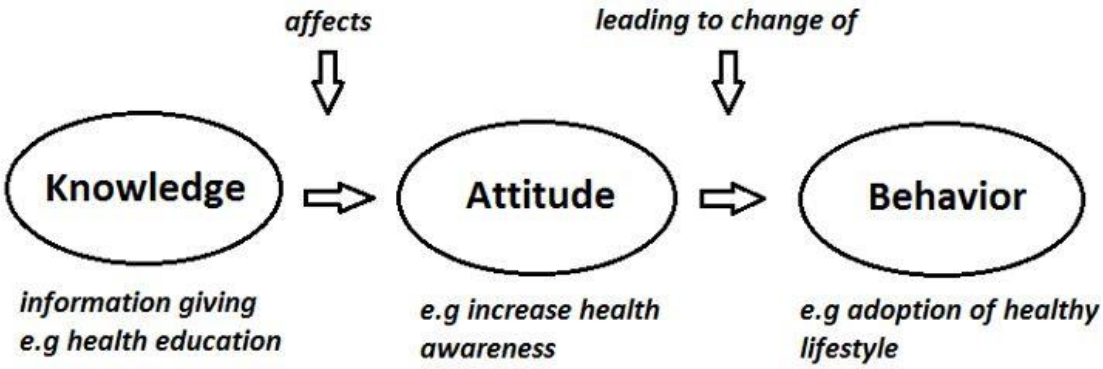

Figure 3. Knowledge-Attitude-Behavioural model

Bettinghaus, (1986) identified two main beliefs from health promotional campaigns carried in the USA. These beliefs are if people are presented with "factual information", they will react in a way that will resonate with the facts presented to them and if people are persuaded to form a positive or negative "attitude" towards something, they will eventually align their behaviour with the attitude they would have formed earlier. These beliefs are in the same align with the same beliefs that have been identified in Theory of K-A-B above. In this study, it will be observed if people who have knowledge about sugar tax have altered or not altered their consumption behaviour of sugar sweetened beverages. Secondly, it will also be observed if knowledge about the negative effects on excessive consumption of sugary drinks is disseminated through health awareness campaigns will have an effect on the consumption behaviour of sugar sweetened beverages.

2.5.2 Conceptual framework

As discussed above in 2.5.1, the key driving factor for considering sugar tax is excessive consumption of sugar sweetened beverages and their contribution to overweight and obese population. The South African government noted that some people are not realising the negative externalities they are bringing to society by being obese through sugar sweetened beverages over consumption

and had to find a way to intervene. This was done through the introduction of sugar tax (National Treasury, 2016).

The structure of the South African sugar tax encourages manufacturers to reformulate their manufacturing processes and include less sugar in their products (National Treasury, 2016). If they do not reformulate their manufacturing processes, they incur sugar tax based on the sugar content in their products. The tax is then either absorbed by the manufacturer and does not affect the ultimate selling price or it will be passed on to the consumer who will have to pay for the taxes imposed on the product. This concept is economically defined as the tax pass on rate (Rojas & Wang, 2021).

If a greater portion of sugar tax is passed on to consumers, the following is expected to happen:

i. Price of sugar sweetened beverages will increase making them more expensive for consumers.
ii. Substitute non-sugar sweetened beverages products will be available for consumers to turn to.
iii. Consumers will feel the impact of sugar sweetened beverages price increase and will reduce sugar sweetened beverages consumption.
iv. Lower sugar sweetened beverages consumption will lower overall energy intake.
v. Lower overall energy intake will make people healthier and reduce overweight and obesity.

The above explanation is summarised in Figure 4.

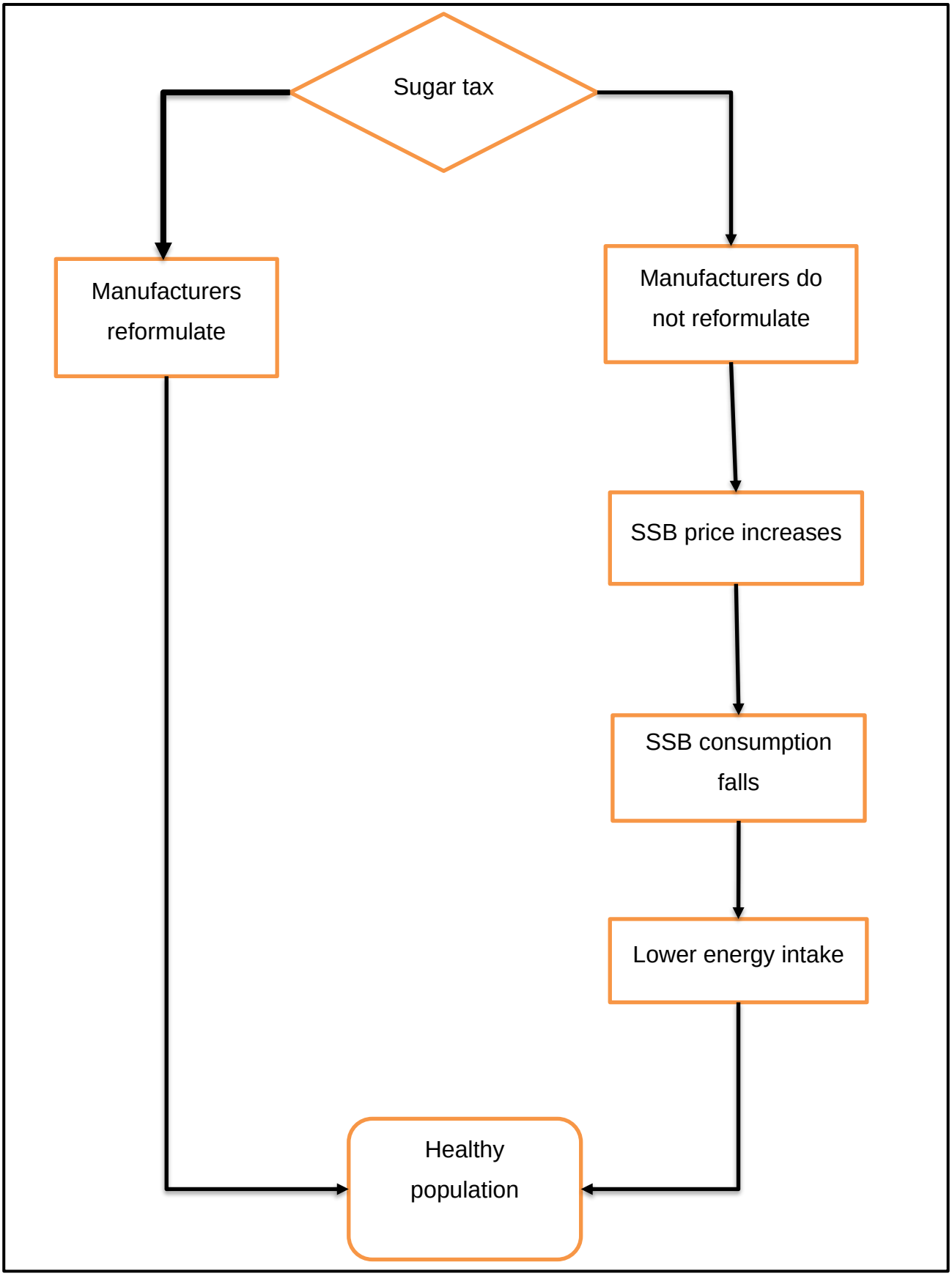

Figure 4. Expected impact of sugar tax

This study examined how sugar sweetened beverages consumers' behaviour has been influenced by sugar tax.

2.6 Hypotheses

The hypotheses tested during this study are presented below.

H_1: Sugar tax influences consumption behaviour of sugar sweetened beverages.

H_2: Knowledge about sugar tax influences consumption behaviour of sugar sweetened beverages.

H_3: Health awareness campaigns influence consumption behaviour of sugar sweetened beverages.

2.7 Conclusion

Excessive consumption of sugar sweetened beverages have led to governments implement sugar tax to try regulate consumption levels and influence consumption patterns. Governments have been trying to shift the costs associated with excessive consumption of sugar sweetened beverages form itself to consumers by implementing sugar tax. This form of tax has worked in other countries like Mexico, USA and France in changing consumption behaviour of sugar sweetened beverages. It has also been observed that knowledge about sugar tax and health awareness programmes do not possess significant association in influencing consumption behaviour of sugar sweetened beverages. The study explained how demand theory was used in justifying implementation of sugar tax to influence consumption behaviour of sugar sweetened beverages. Theory of K-A-B also explained how knowledge about sugar tax and knowledge acquired through health awareness campaigns may affect sugary drinks consumption behaviour. Lastly, three hypotheses were formulated which will tested and analysed in chapter 4. The next chapter will discuss research methodology used.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Research approach

Apuke (2017) defined research as a process of searching for knowledge. The author argued that it is not just a process of collecting or gathering and analysing data but is also a process of gaining a deeper understanding of the information behind the data gathered.

There are three methods of approaching research, namely, quantitative, qualitative and mixed research. This study used a quantitative research approach in searching for new knowledge on whether sugar tax can be perceived as effective in changing consumption behaviour related to sugar sweetened beverages in Gauteng.

Bhandari (2022) defined the quantitative research approach as a process of gathering and interpreting numerical data to identify trends and averages, formulate hypotheses, examine causality, and extrapolate findings to larger populations. The study established how the residents of Gauteng province perceived sugar tax to have effectively changed their consumption behaviour of sugar sweetened beverages.

Koen et al. (2022) also used a quantitative approach in their study of the residents of Cape Town regarding their understanding of, and whether they were aware of, sugar tax on sugar sweetened beverages. Koen et al. (2022) collected data at a specific point in time and not over a period of time. They collected data over a short period of time (three weeks), making it more cost efficient.

In the current study the financial burden was further reduced as data was collected using a self-administered questionnaire. Data was collected over a short period of time (September 2023 to November 2023).

3.2 Research design

Quantitative research can be carried in different forms. These include survey research, correlational research, experimental research, descriptive research and causal-comparative research (Sukamolson, 2007). This study used cross sectional, descriptive research design as it sought to establish the perceived effectiveness of sugar tax on Gauteng residents since it was introduced in 2018.

Cross-sectional research design is used to study a population's interest at a point in time or "single point in time". It gives a snapshot rather than a story of what has happened (Cummings, 2018). The "single point in time" does not necessarily mean the entire study takes place on a specific date; it means observations and collection of data are collected multiple times over a short period of time for the same study.

Cross-sectional research design allows for single variables to be examined and compared across numerous subgroups that are comparable in other aspects (Cummings, 2018). For example, age, race, gender or educational levels can be subgroups to be deduced from a single variable. It is also a cheaper design to administer as variables are observed at a single point in time. There is no long waiting period during data collection which also allows quicker data analysis and reporting of the study (Kesmodel, 2018).

Cross-sectional design does have limitations though, as it cannot explain the chain of events that lead from a cause to an outcome because data is collected at a single moment in time (Cummings, 2018). It works best for identifying trends, correlations, and prevalence rates of a study subject in a population.

Cross-sectional design can be undertaken either for descriptive purposes or analytical purposes (Kesmodel, 2018). The primary goal of descriptive research is to estimate prevalence or features while analytical research seeks to evaluate relationships between several parameters. In this study, cross-sectional research design was chosen because of its ability to analyse data in a descriptive manner.

Cross-sectional, descriptive research design was also used by Koen et al. (2022) to study whether the people of Cape Town understood and were aware of health promotion levy on sugar sweetened beverages. Koen et al. (2022) used the same research design as they were not much focused on the possible relationships which were brought by sugar tax nor did they want to establish the causes between the variables. They wanted to examine the variable of sugar tax over various subgroups of educational levels and income levels.

This was a self-funded study with limited financial resources. Therefore, it was prudent to use a less costly research design to ensure that the study was completed within the available financial means. It made it possible for the study to be completed and not abandoned due to depleted funds.

Lastly, the entire research study needed to be completed by 28 February 2024. This meant there was limited time to gather, analyse data and interpret the analysed results. By choosing cross-sectional descriptive study design, the researcher ensured that data was collected, analysed and reported on in a short period of time allowing the study to be concluded within the stipulated timelines.

3.3 Data collection methods

Data collection is one of the most crucial steps in research as data collected and analysed will inform the researcher whether the hypotheses created will be rejected or not rejected. Data can be collected through self-reports (e.g. interviews, questionnaires, scales), observational methods (e.g. category systems, rating scales) and physiological methods (e.g. self-reports, observation, laboratory tests, electronic tests) (Sadan, 2017). This study used self-reports to collect data.

The study relied on primary data collected solely for the purpose of this study. The data used was collected through a questionnaire. Data was collected for a period of three months (September to November 2023). The questionnaire was distributed via email and WhatsApp platforms with friends, former high school colleagues, former and current university colleagues, former work colleagues and

any other willing participant who could assist in gathering the required data. Participants who received the questionnaire were requested to share it with other people whom they thought would be interested in participating in the study. In addition, data was also gathered from members of the public in places such as outside shopping centres and taxi ranks in Alberton, Boksburg, Germiston, and Johannesburg.

Four data collectors were recruited who assisted in collecting data through self-administered online questionnaires from participants who were approached in public spaces. These data collectors were provided with tablets which were used by participants to answer the interview questionnaire.

At the beginning of the research questionnaire and after the introduction of the research topic and the purpose of the research questionnaire, participants indicated their consent to participate in the study voluntarily by clicking the YES button. Participants who clicked NO, were requested not to proceed with the rest of the interview questionnaire.

All data collected was treated with confidentiality. Data collectors and participants did not have access to any data collected once a questionnaire had been completed. Data was stored at the back end of a Qualtrics system and only the researcher had access to it through logging into the account by providing a valid username and password.

3.4 The research instrument

A research instrument is a device for gathering, measuring, and analysing data in a research study (van Selm et al., 2006). There are two main types of research instruments namely observations and interviews (Saarijärvi & Bratt, 2021). These instruments can also follow a structured, unstructured of semi-structured approach.

This study used a structured questionnaire as its research instrument. It used the Qualtrics systems to create the questionnaire. The questionnaire was

administered online through self-help and/or assisted by data collectors. Self-help was for participants who had access to data and smart devices and who preferred to complete questionnaire at their own time.

Assistance was provided to willing participants who had no access to data or smart devices but wanted to participate in the study or who had access to data and smart devices but preferred to partake in the study by completing the questionnaire on the provided smart tablet. Data collectors provided the tablets for them and guided them in completing the questionnaire where necessary.

This research instrument had numerous advantages as well as some disadvantages. Some of the advantages included the ability of participants to remain anonymous on internet. It also made it easier to reach respondents who were typically hard and difficult to contact and for them to share their experiences and opinions (van Selm et al., 2006).

Online questionnaires are convenient for some respondents (Wright, 2005). Respondents were able to complete the questionnaire at their most convenient time and convenient place. This probably increased the number of people (reach) who participated in the study.

It was also a more efficient way of collecting data. Data was collected and stored in real time (Wright, 2005). Real time storage reduced the chances of data being lost.

It was cost-effective as it rendered recapturing of data at a later stage or writing responses manually irrelevant (van Selm et al., 2006) Once data was captured and stored electronically there was no need to transcribe it. Data was downloaded, cleaned and uploaded into Statistical Package for Social Sciences (SPSS) system for analysis.

However, using online questionnaires also brought some challenges. There was some time devoted to resolve technological issues like finding correct email addresses, validating and replacing incorrect email addresses, and explaining the

form and procedures to respondents who were less technically knowledgeable. These were all time-consuming tasks (van Selm et al., 2006).

Online questionnaires have great potential to reach wider population, which might lead the research instrument finding itself in the hands of people who are not targeted for the purpose of this study (the population) (Wright, 2005). This has the potential of skewing results and leading to incorrect conclusions being made. Participants were requested to indicate if they are residents of Gauteng province by clicking a YES or NO button. They were also requested to confirm if they were 18 years or above by clicking a YES or NO button. All participants who clicked NO were requested not to proceed with the rest of the questionnaire. Those who proceeded nevertheless had their data excluded from data analysis.

Assisted questionnaires are resource draining and/or demanding (Saarijärvi & Bratt, 2021). The researcher had to recruit data collectors to assist in collecting data. These people needed some compensation for the work they did.

In addition, data collectors had to travel to different taxi ranks, shopping centres and shopping malls. They were provided with transport costs and travelling was time consuming.

Lastly, not everyone accepted our invitation to complete the questionnaire (Saarijärvi and Bratt, 2021). Some people were rude towards the data collectors. This demoralised data collectors and affected their interest in continuing with the work initially.

The research questionnaire was adopted from previous studies carried out by Hussain et al. (2023), Koen et al. (2022) and other researchers as the best way to collect information relevant to this study.

3.5 Population and sample

3.5.1 Population

This study focused on the effectiveness of sugar tax in changing human behaviour in Gauteng province, South Africa. Gauteng province had an estimated population of 16.1 million in mid-2022. This represented 26.6% of the national population (Statssa, 2022). The actual adult population (people who are 18 years and older) for the province could not be established. However, of the total provincial population of 16.1 million, 74.6% (12.3 million) of the population were people aged 15 years and older (Statssa, 2022) and this population was deemed as the population size for this study.

3.5.2 Sample and sampling method

When performing a research study, it is always best to collect data from the entire population to get the best and most accurate outcome. However, this might be practically impossible as it requires a lot of resources (financial and non-financial) and it might take longer to finish the study if the population is too big. This is why sampling has been introduced. Acharya et al. (2013) define sample as "a subset of the population, selected so as to be representative of the larger population" (p. 330). Sampling can be done on a probability basis or non-probability basis. The non-probability (convenience and snowballing) basis sampling method is recommended as the population is too big, the methods are cost effective, fast and ease to select the sample and participants will assist in locating other participants.

In determining the sample size, this study borrowed relevant principals from similar studies done from developing countries. Hussain et al. (2023) conducted a study in the United Arab of Emirates where they analysed how excise taxes in the region affected consumption levels, health awareness and brand loyalty. One of the excise taxes they analysed was tax imposed on energy drinks and carbonated drinks. To report on their findings, Hussain et al. (2023) used a sample size of 559 participants. Hussain et al. (2023) used snowball sampling

technique to reach the participants. Participants were asked to reach other participants using their already established connections (snowballing).

Piekara (2022) carried out a study in Poland on how the Polish viewed the potential effectiveness of sugar tax and if they knew anything about it. The study used a sample of 500 adult consumers which was deemed enough to represent the demographics of the Polish. The sample size was determined using a sampling quota.

Koen et al. (2022) assessed how the people of Cape Town thought sugar tax was effective in reducing consumption of sugar sweetened beverages. They based their research conclusion on a sample of 696 people (Koen et al., 2022). The sample size was calculated by approximating a percentage or proportion of the population in order to generate data with a 95% confidence interval and a 4% margin of error; a minimum sample size of 601 customers was required. Participants in the study were selected using field workers own judgement and convenience.

From the studies analysed above, different sampling techniques were used to determine the sample size. The current study used Raosoft online sample calculator (Raosoft, 2023) to calculate the sample size of the study. A 95% confidence level and a 6% margin of error was accepted for the study and a sample size of 264 was recommended for the study.

3.6 Procedure for data collection

Data for this study was collected through an online questionnaire. The questionnaire was compatible with laptops, tablets and smart cell phones to allow as many willing participants as possible to participate in the study.

The online questionnaire link was shared through email addresses and WhatsApp. Participants were also requested to send or share the online survey link via WhatsApp or email with their already established connections. It was also

collected from the general public in places like taxi ranks and outside shopping centres.

Four data collectors were recruited to assist with collecting data from public places. The data collectors were provided with tablets which they used during the course of data collection. Data collectors were stationed in public spaces and not in front of the doors of shops or supermarkets when collecting data.

3.7 Data and information processing

Data processing – this is a process of gathering unprocessed data and turning it into useful and comprehensible information. In order to show the raw data in a comprehensible format, it is first gathered, filtered, sorted, processed, and then examined (Duggal, 2023). Data from the interview questionnaire was captured on a smart device and stored electronically. Data collected was stored and retrieved in Excel format.

Data coding – is a process of transforming collected data from an interview questionnaire into a format where it can be analysed using statistical tools or software. The process entails assigning or allocating numerical or categorical classifications to data objects. The most common types of data coding are nominal, ordinal, dichotomous, numeric, derived variables and truncation (Saldaña, 2021).

Data entry into computer – this is the process whereby data it uploaded into a computer program in a form that is readable by the computer (Duggal, 2023). Data collected for the study was stored in Excel format. The Excel file was uploaded into SPSS so that it could be further cleaned.

Data cleaning – Most of the times data collected will not be in the best format or state to proceed to data analysis. It needs to be tidied up by eliminating blank spaces, redundant records, and typographical errors. This processing is what is termed data cleaning (Kelley, 2023).

3.8 Data storage and protection

The research instrument was created in Qualtrics. An account was created which was protected by a username and password to ensure that data was not accessed by anyone besides the researcher. After data was collected, it was downloaded into a computer which was also username and password protected. Data will be stored for five years before it is destroyed.

3.9 Data analysis strategies and interpretation

Data analysis can be described as a process of cleansing, modifying, and processing raw data in order to obtain useful, pertinent information that enables organisations to make better decisions and lower risks associated with decision making (Kelley, 2023). In a quantitative study, data can be analysed through cluster analysis, cohort analysis, regression analysis, factor analysis, text analysis or descriptive analysis (Calzon, 2023). As the study based its results from a sample of people selected and inferred the results to the entire population of Gauteng province, the study relied on both descriptive and inferential statistics models (Jansen & Warren, 2020; Eteng, 2022).

The study used SPSS software to assist in analysing data as it is more reliable. Descriptive analysis in particular was used as the study aimed to establish the perceived effectiveness of sugar tax in changing human behaviour on sugar sweetened beverages consumption levels (Jansen & Warren, 2020; Eteng, 2022). The study aimed to establish whether consumption behaviour changed as a result of sugar tax, if any knowledge about sugar tax had a bearing on the consumption behaviour of sugar sweetened beverages, and whether sugar sweetened beverage consumers were influenced by health awareness campaigns. The study used the chi-square test to measure the relationships from the variables in the study. Data was collected in a categorical manner as participants were requested to select an appropriate answer from the categories given. The frequency of sugar sweetened beverage consumption levels was assessed for both the pre-sugar tax period and post-sugar tax period. Participants were requested to select an appropriate answer on how often they consumed

sugar sweetened beverages over a week's period for both the pre- and post-sugar tax periods.

3.10 Quality assurance

3.10.1 External validity

Patino and Ferreira (2018) describe external validity as how well a study's findings may be applied to the population that the sample is supposed to represent. This means that the sample which is selected for the study must truly represent the population from which it is selected if the results need to be externally valid and generalised to the entire population.

Studies need to be conducted in an unbiased manner to ensure that data collection in not manipulated. This enables the results from the sample to be generalised to the population. Impartiality starts from sample selection (Calder et al., 1982). The sample selected needs to represent the population from which it is selected. Random sampling makes is easier to generalise the results than controlled sampling (Calder et al., 1982). In this study, a snowball technique was used to ensure the questionnaire was sent to the general public and random people were approached in public places to partake in the study. This enabled the results to be generalised to the entire population.

The other factor which affects external validity is the awareness people have when they realise that they are being tested or if they are under observation (Patino & Ferreira, 2018). Participants tend to answer questions differently if they are not being observed compared to when they are being observed. In addressing this threat to external validity, an online questionnaire was used to ensure that participants were given space to answer questions to the best of their abilities. Secondly, participants were assured that data collected would remain anonymous and would not be shared with other people. Lastly, no personal information was collected which can link data collected to a specific person. This gave participants a platform to be as truthful as they could be in answering the questionnaire.

3.10.2 Internal validity

Patino and Ferreira (2018) describe internal validity as the degree to which the observed results from research accurately reflect and represent the population and that the results are not a product of methodological flaws. If the study results have methodological errors or flaws, they will be of little use as they will have deviated from truth and the conclusions drawn from them will not reflect the effectiveness of whatever is being investigated, in this case, sugar tax and changes in human behaviour.

The study assessed the impact of sugar tax to residents of Gauteng province only. Therefore, any participants who were not residing in Gauteng were excluded from the population and from the sample. This made the study more focused and less prone to errors (Roberts & Priest, 2006). A control question was used in the study to assess if the participant did reside in Gauteng province or not. Responses from non-Gauteng residents were excluded from the data analysed.

In addition, specific events in life change how human beings behave. For example, Covid-19 pandemic may have changed how people eat compared to the past (Hattingh & Ramlakan, 2022). The historic event of Covid-19 encouraged people to be more health conscious as 64% of the people surveyed by Hattingh and Ramlakan (2022) were more willing to eat healthier products or nutritious foods than before. Covid-19 might have also affected how people consume sugar sweetened beverages. For the purposes of this study, the questions were specific to find out if consumption behaviour of sugar sweetened beverages changed because of sugar tax impact or other factors. This enabled the study to take note of the impact on consumption behaviour which might have been caused by other factors.

3.10.3 Reliability

Reliability in research is obtained if a different researcher conducts the same research study in the same way it was done by the previous researcher and gets

the same results (Merriam, 1995). However, this is difficult to achieve if the study involves human behaviour. Human behaviour is constantly changing, therefore achieving the same results as the previous study might be difficult (Sürücü & Maslakçi, 2020). Thus, reliability in a study involving human behaviour gets measured using dependability and consistency of results from the data collected (Merriam, 1995).

In trying to evaluate data consistency, some questions were asked in a reverse mode and analysed to see if the participants' answers were the same. When the answers were the same, data was deemed to be consistent. When the answers were not the same, data was deemed to be inconsistent.

A Cronbach's Alpha coefficient was calculated to determine the reliability of the questionnaire. Four reliability cut-off points have been proposed by Hinton et al. (2014): excellent reliability (0.90 and above), high reliability (0.70-0.90), moderate reliability (0.50-0.70), and low reliability (0.50 and below). Even though there is no agreed set value for reliability, a Cronbach's Alpha of 0.7 or better has been recommended as good (Whitley, 2002; Robinson, 2010).

3.11 Limitations and challenges of the study

Some of the limitations and challenges faced during the course of this study are described below.

i. When using an online questionnaire it is difficult to restrict it to a defined population. The questionnaire was shared with other people who were not residents of Gauteng province. Responses from non-Gauteng residents were deleted during data clean up.
ii. Random and convenience sampling makes it difficult to cover all the demographics of the defined population. Therefore, not all races and age groups were adequately represented as desired. Almost all of the participants were black Africans and not enough participants who were older than 65 years took part in the study.

iii. The study will not be able to determine the extent to which sugar tax has had an impact on changing human behaviour. It will just establish if there was any impact felt by the consumers of sugar sweetened beverages.

3.12 Ethical considerations

Koehler (2003) defined ethics as, “a set of mores, customs, and traditions that may have been derived from social practice or from religious guidance, … and ethics are generally perceived to derive from, and serve as, the application of moral principles" (p. 99). Koelher (2003) further argues that ethics change from time to time as the underlying factors change. It is important to note that any researcher considers the ethics of potential respondents so as not to cause harm (physically or emotionally) and to uphold rights and dignity of them. This section discussed ethical issues which were considered and applied for the study.

Participants from whom data was collected were informed that the process is voluntary and they could only participate if they consent to it (Bhandari, 2022). They were also informed that they could leave or exit the process at any time if they feel like doing so. However, they were encouraged to complete the questionnaire. For participants who were assisted, the statement of voluntary participation was also read to them and marked as such on the questionnaire. For participants who self-completed online questionnaire, statement informing participants of voluntary participation was inserted in the first set of questions which they had to agree to before proceeding to the next section of questions.

Furthermore, anything that could have hurt participants (physically or emotionally) was avoided (Bhandari, 2022). The questionnaire was submitted to University of Witwatersrand post graduate ethics committee to be assessed if they were any questions that could hurt participants and none were noted. Impartiality was also of paramount importance as it gave participants an opportunity to respond to the interview questions by giving their best and honest responses. Data collectors did not react to participants’ answers nor infer their personal beliefs or biases. They only assisted them when needed and they were instructed not to be partial.

No money was paid to participants for partaking in the study and providing the requested data. Participants were informed of this arrangement so as not to create expectations and avoid misunderstanding (Newman et al., 2021). The questionnaire explicitly explained or stated that the study was for the purposes of completing a master's in business administration (MBA) degree and no financial benefit was to be sought from the information that was being gathered.

Participants were informed that data collected would remain anonymous and if they were feeling that the question(s) being asked were too personal for them, they could leave them unanswered (Newman et al., 2021). The study avoided collection of data that can easily be associated with a person such as name and surname, identity number, cell phone number or address of participants.

No participants under the age of 18 years and those declared mentally incapacitated were allowed to participate in the study as this will have needed third party consent.

CHAPTER 4: PRESENTATION OF RESULTS AND DISCUSSION

4.1 Introduction

This chapter reports on the data collected and analysed which was gathered from various points across Gauteng province. The questionnaire was distributed to over 300 potential respondents across the province and a total of 165 respondents returned completed and partially completed questionnaire. This translated to a response rate of 62.5% from the recommended sample size of 264.

During data cleaning, it was also discovered that some non-Gauteng residents and those who are less than 18 of age years completed the questionnaire. These participants were not part of the study scope and had to be excluded. In addition, some respondents did not complete the questionnaire fully that their responses could also not be used for data analysis. This brought down the number of respondents who completed useful data to 140. Some respondents did not complete the entire questionnaire. They left some questions unanswered. These cases were purely arbitrary and it was not an error from the questionnaire. These cases were not deleted as they had some useful data which was used in analysing the information.

The internal consistency of the research instrument was tested for reliability using the Cronbach's alpha test. The research instrument achieved a Cronbach's alpha of 0.718 meaning that the research instrument was reliable as per recommendation from Whitley (2002) and Robinson (2010).

The questionnaire was also tested for validity using the Pearson 2 tailed correlation. All the constructs had a 2 tailed significance level of less than 0.05 indicating that the questionnaire was valid.

4.2 Socio-demographic analysis

Table 1 shows the socio-demographic analysis. The study's participants were predominantly males who constituted 59,3% of the participants, with females constituting the balance of 40,7%. The younger generation (18 years to 35 years) was the dominant age group. This age group contributed 58,6% of the participants who took part in the study. The number of responses from the older generation of 66 years and over was very low (0,7%). The response rate was too low to generalise the results over this age group. Therefore, this age group was excluded from the observations made.

Most of the participants were educated with 84,3% having at least a tertiary qualification and only 2,1% not having any academic qualification. High levels of education translated into most of the participants being employed, with 90% of participants working (14,3% full time employees and 75,7% part time employees) and 60,4% of them being in the middle-income level category (R4 501 to R69 999,99). The study did not generate enough responses from all the ethnicities desired. Most of the responses were from black Africans which constituted 95,7% of the participants. Therefore, the results were not generalised to other ethnicities other than black Africans.

		Count	%
Gender	Male	83	59,3%
	Female	57	40,7%
Age group (years)	18 – 35	82	58,6%
	36 – 49	46	32,9%
	50 – 65	11	7,9%
	66 and over	1	0,7%
Educational level	Not educated	3	2,1%
	Matric	19	13,6%
	Diploma	24	17,1%
	Degree	31	22,1%

	Postgraduate Degree	63	45,0%
Monthly household income	0 – R4 500	19	13,7%
	R4 501 – R69 999.99	84	60,4%
	R70 000.00 and above	36	25,9%
Employment status	Not working	13	9,3%
	Working full time	20	14,3%
	Working part time	106	75,7%
	Retired	1	0,7%
Ethnicity	Asian/Indian	1	0,7%
	Black African	134	95,7%
	White	1	0,7%
	Mixed race	2	1,4%
	Other	2	1,4%

Table 1: Socio-demographic outlay

4.3 Data analysis and interpretation

Participants had to choose one answer which resonated with them most. The questions were mutually exclusive so there was independence of observations between the variables which were tested and only variables with at least five responses were used to make observations using the chi-square test. In cases where an analysis had to be made with less than five variables, a Fisher's exact test was used. Observations were made against each hypothesis (stated in section 2.6) to test which hypothesis would be rejected or fail to be rejected. The observations are discussed in detail below;

4.3.1 Sugar tax and consumption behaviour

Sugar tax was imposed to change consumption behaviour of sugar sweetened beverages despite consumers being aware of it or not (National Treasury, 2016). This study observed how sugar sweetened beverages consumption behaviour was affected by sugar tax.

The study used chi-square to analyse the association between sugar tax and its impact on consumption behaviour of sugar sweetened beverages. It was observed that generally there was no statistically significant association at 5% significant level between sugar tax and sugar sweetened beverages consumption behaviour. A p value of 0.103, (x^2 =6,182, df = 3, p= 0.103) was observed. Therefore, hypothesis (H_1) which states that sugar tax influences consumption behaviour of sugar sweetened beverages is rejected (Table 2).

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	6,182[a]	3	,103
Likelihood Ratio	6,096	3	,107
Linear-by-Linear Association	,331	1	,565
N of Valid Cases	129		

Table 2: Hypothesis 1 chi-square results

Even though hypothesis (H_1) was rejected, there was a general change in consumption behaviour from consumers of sugar sweetened beverages after sugar tax was implemented (Table: 4). Some consumers stopped consuming sugar sweetened beverages completely. Others reduced their weekly consumption levels. Most notably, there was a significant increase (110%) in those who started to consume less frequently (less than once a week) (Table 3). However, all the changes were not solely driven by sugar tax. Most of the changes in consumption were driven by being diagnosed with NCDs (42%).

Sugar tax only had an 18% influence (Figure 5) in changing consumption behaviour of sugar sweetened beverages. Manyema et al. (2014) predicted that consumption behaviour of sugar sweetened beverages was going to be reduced by 13% after the implementation of sugar tax in South Africa. In a similar study

conducted by Koen et al. (2022) in Cape Town, the authors observed that even though about 55% of the residents did notice the price increase of sugar sweetened beverages, only 43% of this population reduced their consumption behaviour as a result of sugar tax. Therefore, the effective change of consumption behaviour was 24% in Cape Town.

Consumption frequency	Before sugar tax		After sugar tax		Change	
At least once a day	26	19%	20	14%	-6	-23%
4 – 6 times a week	50	36%	52	37%	2	4%
1 – 3 times a week	37	26%	14	10%	-23	-62%
Less than once a week	21	15%	44	31%	23	110%
Never consumed	6	4%	10	7%	-4	-67%

Table 3: Sugar sweetened beverages consumption frequency

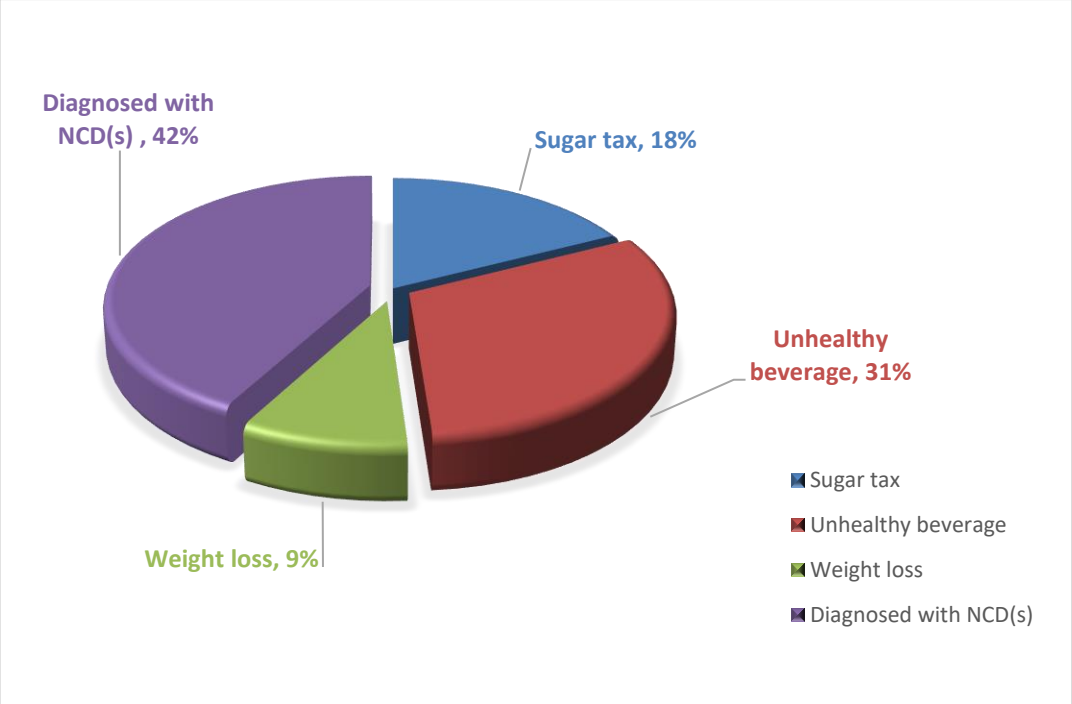

Figure 5: Sugar sweetened beverages consumption behaviour change drivers

Other analyses were made to determine what influenced consumption behaviour of sugar sweetened beverages more (Figure 5). The main two drivers that caused a change in consumption behaviour were consumers who regarded sugar sweetened beverages as unhealthy beverages (31%) and those who had been diagnosed with NCDs (42%), with the latter being the biggest driver.

In general there was no statistically significant association between sugar tax and consumption behaviour, but this was not the case for both males and females. The study observed that there was a statistically significant association in females with a p value of 0,025 and a statistically insignificant association in males with a p value of 0,538.

A further analysis was conducted by considering the association between sugar tax and consumption behaviour using different age ranges. The leading cause for changes in consumption behaviour was being diagnosed with NCD in the young generation (18 – 35 years old) (43,4%) and late middle-aged generation (50 -65 years old) (60%). The middle-aged population (36 – 49 years) identified sugar sweetened beverages as being unhealthy beverages (40,5%), this being what mainly drove their change in consumption behaviour. Imposition of sugar tax was ranked third as a force of driving changes in consumption behaviour across all age groups contributing 17% for both young generation and middle-aged generation and 20% for the late middle-aged generation.

Therefore, there was no statistically significant association between sugar tax and consumption behaviour across all age groups. The young generation had a p value of 0,125, 0,281 for middle-aged generation and 1 for late middle-aged generation.

An additional analysis was done by considering the association between sugar tax and consumption behaviour using different educational levels. The leading cause for changes in consumption behaviour was trying to lose weight for the uneducated group (66,7%), identifying it as unhealthy beverage by people who have matric (36,8%) and diploma (40,9%). People who have degrees and post graduate degrees mostly changed their consumption behaviour because they were diagnosed with NCDs contributing 48,4% and 48,1% to each group respectively. Imposition of sugar tax did not drive any change in consumption behaviour for the uneducated people. It was ranked second among people with matric (26,3%) and degree (19,4%) and third among people with diploma (13,6%) and post graduate degree (14,8%).

There was no statistically significant association between sugar tax and consumption behaviour across all educational levels. Participants with matric had a p value of 0,995, 0,516 for people with diploma, 0,093 for people with degree and 0,256 for people with postgraduate degree.

More analysis was done by considering the association between sugar tax and consumption behaviour using different income earning levels. The leading drivers for changes in consumption behaviour were those considering them as unhealthy beverages and being diagnosed with NCDs in low-income earning group which contributed 27,8% each for both variables. Being diagnosed with an NCD was the leading cause in change of consumption behaviour for middle-income earning group, contributing 48,7%. Higher income earners changed consumption behaviour mainly because of identifying sugar sweetened beverages as unhealthy drinks which contributed 40,6% of the group.

Sugar tax was ranked as the third factor among all the income earning levels in determining changes in consumption behaviour. Only 22,2% of low-income earners, 15,4% of middle-income earners and 18,8% of high-income earners considered sugar tax to be a deterrent to their consumption behaviour.

Therefore, there was no statistically significant association between sugar tax and consumption behaviour across all income earning levels. The low-income earning level had a p value of 0,271, 0,578 for middle-income earning group and 0,455 for high-income earning group.

Lastly, analysis was also done by considering the association between sugar tax and consumption behaviour using different employment statuses. The leading driver for changes in consumption behaviour was being diagnosed with NCDs for those working part-time and full-time each contributing 42,1% and 43,8% to these groups respectively. 38,5% of the unemployed identified sugar sweetened beverages as unhealthy beverages and as the leading driver of change to their consumption behaviour.

Imposition of sugar tax was ranked the least influential factor among the unemployed and those working part-time with 15,5% and 15,8% of groups constituting this segment. 17,7% of those working fulltime pointed out sugar tax as a third factor in deterring them to change their consumption behaviour.

Therefore, there was no statistically significant association between sugar tax and consumption behaviour across all employment statuses. The unemployed had a p value of 0,455, 0,172 for those working part-time and 0,531 for those employed full-time.

The results observed in the current study are similar to the ones observed by Koen et al. (2022) in Cape Town and what was predicted by Manyema et al. (2014) in South Africa. They are also similar to what was observed by Aguilar et al. (2021) and Nava and Dong (2022) in Mexico, Kurz and König (2021) in France, Valizadeh and Ng (2021) and Rojas and Wang (2021) in the USA. These studies observed that although sugar tax had an influence on consumption behaviour of sugar sweetened beverages, the influence was insignificant. Similarly to the current study, sugar tax had an influence on the consumption behaviour of sugar sweetened beverages in Gauteng. However, the influence was insignificant as only 18% of Gauteng residents changed their consumption behaviour as a result of sugar tax.

4.3.2 Knowledge about sugar tax and consumption behaviour

The majority (60%) of Gauteng residents had knowledge about sugar tax in South Africa. Whether this had an association with their sugar sweetened beverages consumption behaviour is analysed below.

The study used chi-square to analyse the association between knowledge about sugar tax and its impact on consumption behaviour of sugar sweetened beverages. It was observed that statistically there is a general insignificant association at 5% significant level between knowledge about sugar tax and sugar sweetened beverages consumption behaviour with a p value of 0,254 (x^2 =2,738; df = 2; p= 0,254) (Table 4). Therefore, hypothesis (H_2) which states that

knowledge about sugar tax influences consumption behaviour of sugar sweetened beverages is rejected.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	2,738[a]	2	,254
Likelihood Ratio	2,721	2	,257
Linear-by-Linear Association	1,016	1	,313
N of Valid Cases	138		

Table 4: Hypothesis 2 Chi-square results

Of the 60,47% Gauteng residents who had knowledge about sugar tax, only 14,1% of them changed their consumption behaviour as a result of sugar tax. Out of 39,5% of Gauteng residents who did not know anything about the sugar tax, 21,6% of them also changed their consumption behaviour as a result of sugar tax. Therefore, there was a bigger change in consumption behaviour from those who had no knowledge about sugar tax than those who had.

This study further performed other robust analyses to find out if there was any association with gender, different age groups, educational levels, income levels, and employment statuses. The first observations were made when gender of the participants was taken into consideration. 68,7% of the male participants knew about the existence of sugar tax and had a p value result of 0,734, while less than half (47,3%) of the female participants knew about the existence of sugar tax and had a p value of 0,448. It was observed that despite more males having more knowledge of the existence of sugar tax than females, they had statistically more insignificant association than females.

Another observation was made using different age groups. The late middle-aged generation (50 – 65 years) had more knowledge on the existence of sugar tax

than other age groups, with 72,7% of them knowing about the existence of sugar tax, followed by middled aged generation (36 – 49 years) with 64,4% and lastly the younger generation (18 – 35 years) with 55,6%. However, even though the younger generation had the least population with knowledge on the existence of sugar tax, there was a statistically significant association between their knowledge of the existence of sugar tax and their consumption behaviour. A p value of 0,047 was observed for this age group. There was no statistically significant association in the late middle-aged and middle-aged population who had a p value of 0,528 and 0,148 respectively despite them having more knowledge on the existence of sugar tax.

On average, above half of people with at least a diploma, degree and/or post graduate degree did have knowledge on the existence of a sugar tax. The leading group was from participants with post-graduate degrees (73,8%). The group of participants with the least knowledge were uneducated people with 0%, followed by people who had matric with an average knowledge of 42,1%. However, there was statistically no significant association between knowledge of existence sugar tax, consumption behaviour and level of education. Participants with a diploma had the most insignificant association with a p value of 1,00 and participants with a post graduate degree had the least insignificant association with a p value of 0,121.

83,3% of higher income earners in Gauteng had knowledge of the existence of sugar tax, followed by middle income earners with 55,4% and lower income earners with the least knowledge at 38,9%. However, even though 83,3% of high-income earners in Gauteng had knowledge on existence of sugar tax, there was no statistically significant association between their knowledge and their consumption behaviour of sugar sweetened beverages. They had a p value of 0,433 followed by middle income earners who had a p value of 0,114 and low-income earners who had a p value of 0,463. The study observed that there was no statistically significant association between knowledge of sugar tax, consumption behaviour across all income earning levels.

It was also observed that people who were employed had more knowledge on sugar tax than those who were unemployed, with 57,9% of full-time employed people having knowledge on sugar tax, followed by part-time employed people who had an average knowledge base of 63,8%. 69,2%% of unemployed people did not know about the existence of sugar tax. However, even though the part-time employees were the most knowledgeable about the existence of sugar tax, they still had no statistically significant association between their knowledge and consumption behaviour. They had a p value of 0,528, followed by unemployed people who had a p value of 0,580, while full time employees had a p value of 0,151.

The results observed were similar to those observed by Álvarez-Sánchez et al. (2020) in Mexico and Rojas and Wang (2021) in USA. These researchers observed that there was no significant association between knowledge about sugar tax and consumption behaviour. However, they are contrary to what was also observed by Jasti et al. (2017) in USA and Piekara (2022) in Poland.

4.3.3 Health awareness campaigns and consumption behaviour

The study lastly used chi-square to observe if health awareness campaigns influence sugar sweetened beverages consumption behaviour. Health awareness campaigns observed included showing sugar tax amount being paid by consumer per beverage on the price stickers, limiting sugar sweetened beverages advertisements during traditional busy hours, showing the amount of sugar contained in each sugar sweetened beverage package, using graphical images to show sugar content, and showing health effects on excessive consumption of sugar sweetened beverages on packages and advertisements.

The study observed that there is no statistically significant association between health awareness campaigns and consumption behaviour of sugar sweetened beverages. An analysis was made using chi-square and the observed p value was 0,234 (x^2 =4,272; df = 3; p= 0,234) (Table 5). Therefore, hypothesis (H_3) which states that health awareness campaigns influences consumption behaviour of sugar sweetened beverages is rejected.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	4,272[a]	3	,234	,233	
Likelihood Ratio	4,239	3	,237	,245	
Fisher-Freeman-Halton Exact Test	4,121			,248	
Linear-by-Linear Association	3,566[b]	1	,059	,063	,036
N of Valid Cases	135				

Table 5: Hypothesis 3 chi-square results

These results are similar to those found by Álvarez-Sánchez et al. (2020) and Nava and Dong (2022) in Mexico and World Health Organisation (2015) in Hungary. These researchers observed that health awareness campaigns contributed between 22% to 38% in influencing consumption behaviour of consumers. Figure 6 shows that 28% of Gauteng residents stated that their consumption behaviour was more likely influenced by health awareness campaigns. However, it is important to note that even though health awareness campaigns did have some influence towards consumption behaviour, the influence was insignificant as 43% of the population were undecided and another 29% of the population indicated that health awareness campaigns did not influence their consumption behaviour.

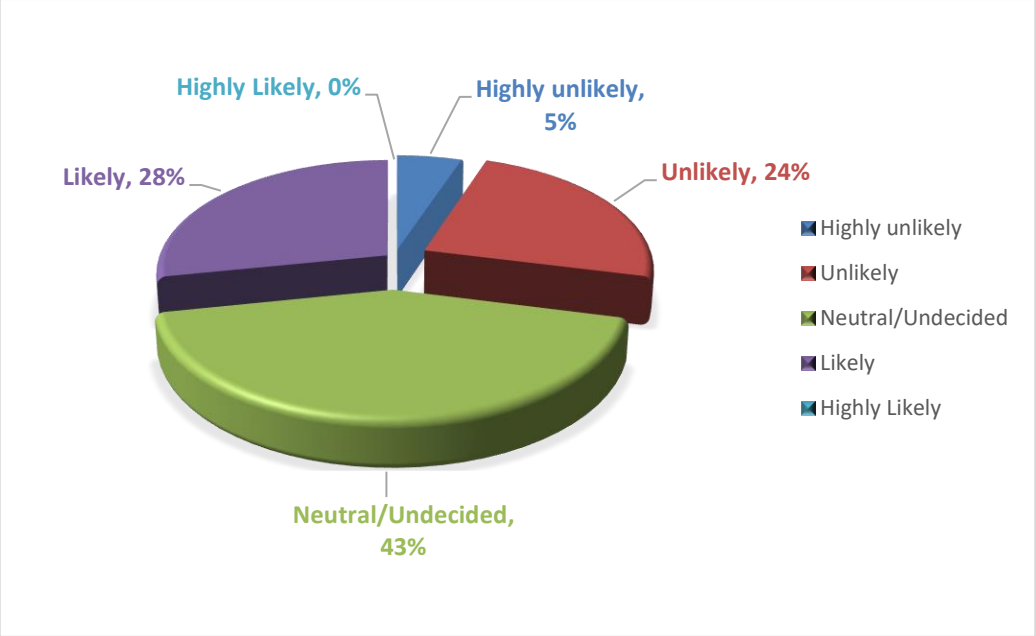

Figure 6: Impact of health awareness programmes on consumption behaviour

The second biggest driver for influencing human consumption behaviour was people who identified sugar sweetened beverages as unhealthy beverages (31%) (Figure 5). This result might have been driven by health awareness campaigns conducted before the sugar tax was implemented.

Sugar sweetened beverages have been associated with being addictive nature (Falbe et al., 2019). Therefore, in order to convince consumers to change their consumption behaviour, more work needs to be done than just having consultative processes and implementing the policy. In South Africa various forms of media campaigns (radio, television, social media, print, online and billboards) in different languages (English, isiZulu and isiXhosa) were rolled out to inform consumers about sugar tax on sugar sweetened beverages before it was implemented, but the same effort has not been exerted since implementation (Department of Health, 2018). This might also explain why most consumers know about sugar tax but not many of them have changed their consumption behaviour. In addition, the study observed that none of the uneducated people from Gauteng knew anything about sugar tax. This calls for a revision in the forms of campaigns used to reach consumers as certain groups of consumers were totally missed.

Most of Gauteng consumers were undecided or neutral (43%) on whether health awareness campaigns affected their consumption behaviour (Figure 6). They were on the border line and some studies have observed that consumers are more likely to respond positively to advocacy about sugar tax if they are presented by evidence-based information (Elliot et al., 2022). Therefore, presenting factual information during health awareness campaigns might motivate Gauteng residents to change their consumption behaviour.

It was observed that 45,1% males and 39,6% females were undecided on whether health awareness campaigns influenced their sugar sweetened beverages consumption behaviour. However, there was a marginal difference in females (1,9%) between those who were undecided and those who thought their consumption behaviour was likely impacted by health awareness programmes (Figure 7).

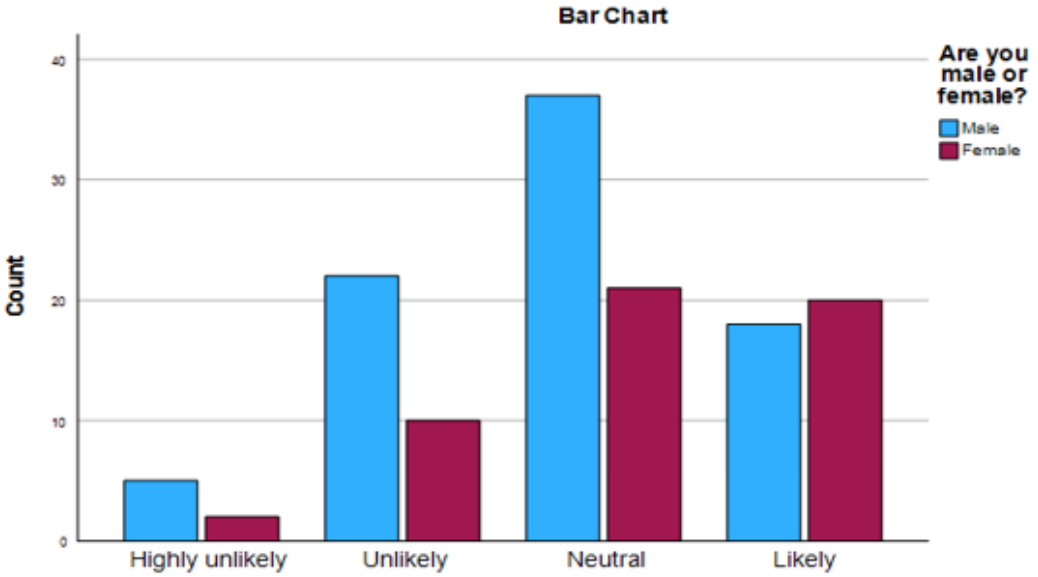

Figure 7: Impact of health awareness programmes on consumption behaviour by gender

Across all the age groups the majority of participants were undecided if their consumption behaviour was influenced by health awareness campaigns. Therefore, there was no statistically significant association between health awareness campaigns and consumption behaviour in all different age groups with a p value of 0,346. However, it is important to note that there was marginal

difference (1,3%) in the young age group between those which were undecided and those who were likely impacted by health awareness campaigns (Figure 8).

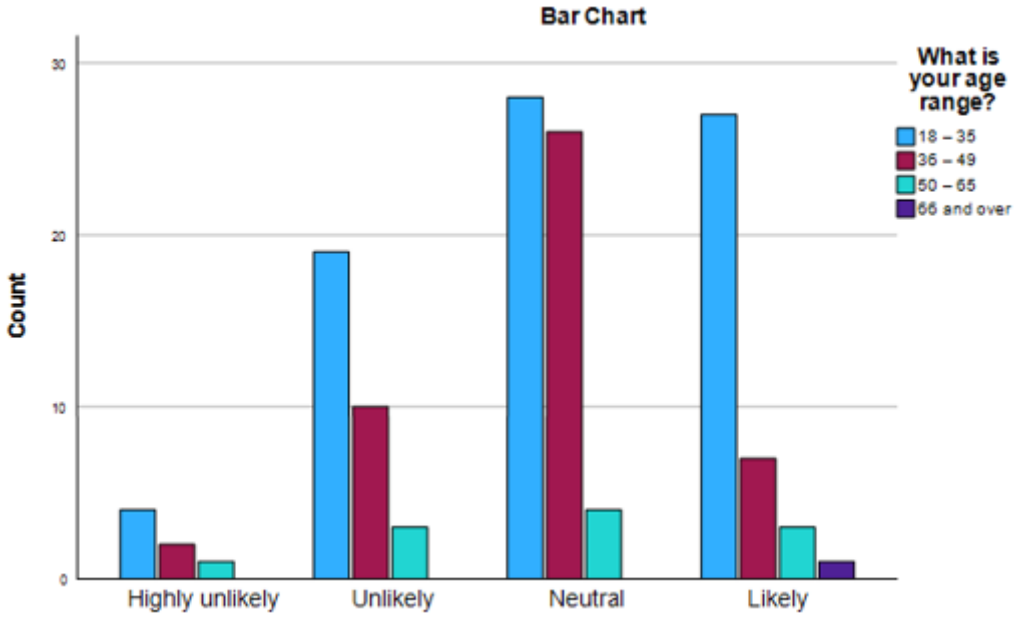

Figure 8: Impact of health awareness programmes on consumption behaviour by age group

The study also observed that across all educational levels, the majority of participants were undecided on whether their consumption behaviour was likely influenced by health awareness campaigns. There was no statistically significant association between health awareness campaigns and consumption behaviour across all educational levels with a p value of 0,7.

Further observations were made between different income earning levels and their association of health awareness campaigns and consumption behaviour. The study observed that there is a statistically significant association between health awareness campaigns and consumption behaviour across different income earning levels. A p value of 0,002 was observed using chi-square test of association.

Even though some participants across different income levels indicated that they were undecided (43,3%) on whether health awareness programmes impacted their consumption behaviour, a combination of those who indicated that they were unlikely (23,9%) and likely (27,6%) impacted by health awareness programmes outnumbered the undecided group forming a statistically significant association.

Lastly, there is no statistically significant association between consumption behaviour and health awareness campaigns across different working statuses. A p value of 0,749 was observed; the majority of the participants (43%) were undecided on whether health awareness campaigns impacted their consumption behaviour.

4.4 Conclusion

The study observed that Gauteng sugar sweetened beverages consumers did not perceive sugar tax as effective in changing their consumption behaviour as was not statistically significant association between sugar tax and sugar sweetened beverages consumption patterns. In addition, knowledge about sugar tax did not significantly affect the consumption behaviour of sugar sweetened beverages nor did health awareness campaigns significantly affect consumption behaviour of sugar sweetened beverages. Therefore, all the hypotheses were rejected.

CHAPTER 5: RECOMMENDATIONS AND CONCLUSION

5.1 Recommendations

Sugar tax in South Africa led to an average increase of 11% on the price of sugar sweetened beverages. This was lower than the minimum of 20% recommended by World Health Organisation for it to be an effective measure. If the South African government really wants to curb sugar consumption behaviour from sugar sweetened beverages it has to consider a multi-faceted approach. Just focusing on sugar tax alone might have dire consequences for the economy in general as there might be more industry job losses in a country already experiencing high unemployment. The government needs to explore empowering the population with factual information about the negative effects of excessive consumption of sugar sweetened beverages. This can be done by heightening public health awareness campaigns and finding the means to spread the message to the less educated groups as they seem to have been left out by the previous campaigns. This is even more important considering that this study has found that 42% of the participants changed their consumption behaviour after being diagnosed with NCDs. The government will need to strengthen its preventative measures rather than rely on corrective measures. The government should also lobby sugar sweetened beverage manufacturers to reformulate their products so that they produce healthier products. Lastly, some researchers have pointed out that it is not only sugar sweetened beverages have been driving obesity and development of NCDs. They have pointed out that there are other foods that the government should consider taxing and/or educating the population about because they also have negative effects if they are excessively consumed.

5.2 Conclusion

Despite sugar tax being perceived as ineffective in significantly changing human consumption behaviour from sugar sweetened beverages, it did make an 18% impact in changing consumer behaviour among the participants in this study. Its impact should not be ignored and totally discarded as a failed project. An

important finding is that a further 42% of the participants indicated that they changed their consumption behaviour even though it was after being diagnosed with NCDs.

The study found that there was statistically insignificant association between knowledge about sugar tax and health awareness campaigns against sugar sweetened beverages consumption behaviour. Only 14% of the participants who had knowledge about sugar tax changed their consumption behaviour compared to 21% of participants that changed despite having no knowledge of the sugar tax. 43% of the participants were neutral/undecided on whether health awareness campaigns affected their consumption behaviour and only 28% indicated that they were likely influenced by health awareness campaigns.

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