

**UNIVERSITY OF GHANA**  
**COLLEGE OF BASIC AND APPLIED SCIENCES**  
**DEPARTMENT OF NUTRITION AND FOOD SCIENCES**



**THE READINESS OF SUGAR-SWEETENED BEVERAGE INDUSTRY IN GHANA  
FOR MANDATORY NUTRITION LABELLING; CONSUMER UNDERSTANDING  
AND PERCEPTION OF NUTRITION LABELLING**

**By**

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### DECLARATION

I, Bernadette Brobbey Ahiable do hereby declare that this thesis, with the exclusion of identified citations and duly acknowledged references are the results of my research under the supervision of Prof Matilda Steiner-Asiedu, Prof Firibu Kwesi Saalia and Dr Agartha Ohemeng.



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## ABSTRACT

**Background:** Increased consumption of sugar-sweetened beverages (SSB) among all age groups is a global public health concern due to its association with non-communicable diseases (NCDs). In response to this concern, some countries are employing multifaceted policy interventions that includes mandatory nutrition labelling of pre-packaged foods to control the rise in diet-related NCDs rates. Policy makers require current information on the readiness of the food and beverage industry, and consumers to effectively implement mandatory nutrition labelling.

**Objectives:** The study sought to determine whether SSB manufacturers are ready for future mandatory nutrition labelling, as well as consumers' use and understanding of nutrition label information, and their perception about mandatory nutrition labelling. The study further sought to determine the caloric load of SSBs commonly consumed by study respondents.

**Methods:** An in-depth interview with representatives from SSB manufacturing companies were conducted to assess the industry's readiness for mandatory nutrition labelling. SSB consumers were also interviewed by using a semi-structured questionnaire at supermarkets located within some shopping malls/centres in the Greater-Accra Region. Based on a consumer survey, five commonly consumed SSBs were selected and analyzed for their caloric content. Interviews with SSB companies were transcribed and summarised under five readiness constructs themes (change commitment, change valence, task knowledge, resource availability and change efficacy. Logistic regression analysis was used to determine the association between various factors and consumers' use and understanding of nutrition information.

**Results:** Twelve (12) SSB manufacturing companies were recruited for the study and 11 were large scale manufacturers. From the key informant interviews, respondents exhibited high change valence, task knowledge and resource availability. Stakeholder engagement was found to

be a potential driver whilst financial resource and lack of expertise may serve as barriers of the policy. Based on the consumer survey, a majority (73%) of the study respondents were users of nutrition information on food labels, 66% were found to have high knowledge in nutrition and 59% of the respondents had a high understanding of nutrition labels. Respondents' use of nutrition labels was dependent on high nutrition knowledge (AOR, 0.58; 95% CI, 0.37-0.92;  $p=0.020$ ). Having a high educational level (AOR, 0.21; 95% CI, 0.06-0.70;  $p=0.011$ ), being unmarried (AOR, 0.51; 95% CI 0.29- 0.88;  $p = 0.016$ ) and having a high nutrition knowledge (AOR, 0.39; 95% CI, 0.26-0.61,  $p<0.001$ ) were found to be associated with respondents' understanding of nutrition label information. About 83% exhibited positive perception about mandatory nutrition labelling. Mean caloric load of SSB usually consumed by the study respondents was  $36.58 \pm 22.142$  kcal (range  $0.820 \pm 0.006$  to  $55.100 \pm 0.590$  kcal).

**Conclusion:** Large scale SSB manufacturers are ready to implement mandatory nutrition labelling whereas the only medium scale manufacturer was not ready. SSB industry's involvement at the planning stage of the policy would be a major driver for the policy. However, financial implications may serve as a barrier to policy implementation. Consumers had positive perceptions about mandatory nutrition labelling and would use nutrition information as a guide for healthier food selection. Educational programmes on nutrition label use must consider specific limitations of consumers with low nutrition knowledge, and educational levels. SSB should be consumed in moderation.

## **DEDICATION**

This thesis is dedicated to God Almighty whose grace and mercies has always been sufficient for me. To my parents, Mr. and Mrs. Adu-Brobey, my husband Eric Senam Ahiable and my children Edinam-Kekeli, Selikem and Aseye Ahiable for their immense love and support.

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## LIST OF ABBREVIATIONS

BMI	Body Mass Index
CVDs	Cardiovascular Diseases
FLABEL	Food Labelling to Advance Better Education for Life project
GHS	Ghana Health Service
GSS	Ghana Statistical Service
iLiNS	International Lipid-based Nutrient Supplement
LMICs	Low- and Middle-Income Countries
NCDs	Non-Communicable Diseases
NCD-RisC	Non-Communicable Disease Risk Factor Collaboration
NLEA	Nutrition Labelling and Education Act
NNS	Non-Nutritive Sweeteners
NRVs	Nutrient Reference Values
SDG	Sustainable Development Goals
SSB	Sugar-sweetened Beverages
UNICEF	United Nations International Children’s Emergency Fund
UK	United Kingdom
USA	United States of America
USFDA	United States Food and Drug Administration
WHO	World Health Organisation

## CHAPTER ONE

### 1.0 INTRODUCTION

#### 1.1 Background

An important focus of public health is to achieve a population which observes a healthy lifestyle and is conscious of good nutrition. Good nutrition includes increasing the consumption of fruits and vegetables in addition to physical activity whilst reducing the intake of trans fats, salt and added-sugars (Kushi *et al.*, 2012). Consumption of added-sugar has received renewed attention in the past years because of its associated risk of adverse health outcomes such as dental caries, diabetes, obesity, and other related non-communicable diseases (NCDs). To address this issue, the WHO published a guideline in 2015 to update the recommendations for sugars. The guideline strongly recommended a reduction in added-sugar intake to less than 10% and a further reduction to 5% (conditional recommendation) of total energy intake. These recommendations were based on studies on weight gain and dental caries (Hardy *et al.*, 2018; WHO, 2015). Despite these recommendations, the global consumption of sugar-sweetened beverage (SSB) is reported to be above optimal intake (Afshin *et al.*, 2019). Thailand, Chile, Brazil and China were reported to be leading in the sale and consumption of SSB whilst the United States of America (USA), Mexico and United Kingdom (UK) were experiencing some declines. However, in low-and middle-income countries (LMICs) the sale of SSB is increasing (Popkin & Hawkes, 2016). This trend may be influenced by globalisation and nutrition transition. It is worth noting that, International Diabetes Federation estimated that diabetic patients in Africa would increase by 98.1% between 2010 and 2030 (Audain *et al.*, 2019).

SSB is a source of added-sugar in a diet and contributes to total energy intake and low diet quality among consumers (Torre *et al.*, 2016, Leung *et al.*, 2018). Few studies have been conducted on SSB consumption in Ghana. One of such was conducted among kindergartners in the Accra Metropolis of the Greater Accra Region. It was discovered that 43.1% kindergartners consumed high amounts of SSB which were home-provided (Lopes *et al.*, 2018). Similarly, in an iLiNS DYAD-Ghana trial follow-up study in the Eastern Region, 22.2% of infants as young as nine months and 54.2% of 18 months were found to be exposed to sugary beverages (Okronipa *et al.*, 2019). These findings reflect a WHO summary report by Lobstein, (2014) which indicated that surveys on SSB consumption patterns of children and adolescents in Ghana had identified intakes of a portion or more soft drink per day. Frequent intake of SSB increases the risk of tooth decay and cavities, and NCDs such as cardiovascular diseases, kidney disease, gout and non-alcoholic liver disease among all age groups (Malik *et al.*, 2010; Bernabé *et al.*, 2014; Bonsu 2014; Singh *et al.*, 2015; Steyn & Mchiza, 2014). The WHO (2018) country profile on NCDs, indicated that, NCDs are the leading causes of death globally accounting for 78% deaths, in LMICs and 43% of the overall deaths in Ghana for the year 2016.

Due to the adverse effects of increased SSB intake, some food and beverage manufacturers substitute added-sugar (sucrose) with non-nutritive/non-caloric sweeteners (NNS) to formulate their products to decrease the caloric content and maintain the sweet taste of the products (Daher *et al.*, 2019). However, findings from studies on adverse effects of NNS consumption are not consistent; while some have associated consumption of NNS products to increased risk of certain cancers and other health outcomes (Mahfouz *et al.*, 2014; Schernhammer *et al.*, 2012), another did not find any association (Toews *et al.*, 2019).

Consequently, countries are employing multifaceted policy interventions (Lachat *et al.*, 2013) such as nutrition labelling of pre-packaged foods and beverages and taxation of SSB to control the consumption of these products with the ultimate goal of controlling the increasing obesity and NCD rates (Hyseni *et al.*, 2017; Mandel *et al.*, 2015).

## **1.2 Rationale**

Sugar-sweetened beverage (SSB) consumption has been implicated in the onset of obesity and related non-communicable diseases in both children and adults which has a burden on households and government (WHO, 2014a). Policymakers are therefore prompted to consider revising nutrition regulations, such as making nutrition labelling mandatory (Liu *et al.*, 2015; Mandel *et al.*, 2015). This step may motivate manufacturers to reformulate less healthy products into healthier ones (Ares *et al.*, 2018; Hawkes *et al.*, 2015). Furthermore, this policy may also contribute to the Ministry of Health's commitment to reach Sustainable Development Goal (SDG) 3 target of reducing NCD related mortality by 30% by 2030 (GHS, 2017).

Studies on nutrition labelling in Ghana have indicated high consumer awareness but inconclusive on understanding and use of nutrition label information (Aryee, 2013; Abanga, 2014; Aryee *et al.*, 2019). Additionally, there is a dearth of studies on the local food and beverage industry's readiness for mandatory nutrition labelling of pre-packaged sugar-sweetened beverage given the Codex recommendation on mandatory nutrition labelling of pre-packaged foods. Sugar-sweetened beverages (SSBs) contain high caloric load (Chepulis *et al.*, 2017 and Miller *et al.*, 2019). It is therefore of interest and great importance to determine the caloric load in commonly consumed locally manufactured SSBs to validate and document how much they contain to

inform policy directions regarding the mandatory labelling such that consumers can make informed decisions. It is against this background that the current research sought to determine the readiness of the SSB industry in Ghana for mandatory nutrition labelling, consumer understanding and perception.

### **1.3 Research questions**

The focus of the study was to find answers to the following questions:

- i. Is the local sugar-sweetened beverage manufacturer ready for policy implementation, should there be mandatory nutrition labelling policy in the future?
- ii. Do sugar-sweetened beverage consumers read the nutrition information on the product labels before purchase and, or before consumption?
- iii. Do consumers understand what they read?
- iv. What factors influence consumer's use and understanding of nutrition labelling information and
- v. What are consumer's perceptions about mandatory nutrition labelling?
- vi. What is the caloric load of SSBs commonly consumed by consumers (study respondents)?

### **1.4 Aims and objectives**

#### **1.4.1 Aims**

1. The main aim of the study was to assess the readiness of the local sugar-sweetened beverage industry for mandatory nutrition labelling, consumer understanding of nutrition label information and perceptions about mandatory nutrition labelling in the Greater Accra region.

2. The study also sought to estimate the caloric load of commonly consumed local sugar-sweetened beverage.

#### **1.4.2 Objectives**

1. To assess the readiness of selected local sugar-sweetened beverage industry for mandatory nutrition labelling.
2. To assess consumers' use and understanding of nutrition information on sugar-sweetened beverages.
3. To determine factors associated with consumers understanding and use of nutrition label information.
4. To assess consumers' perception of mandatory nutrition labelling of sugar-sweetened beverage.
5. To estimate the caloric load of selected commonly consumed local sugar-sweetened beverage.

#### **1.4.3 Significance of the study**

The findings of the study would add to current research on nutrition labelling use and understanding among consumers. It would also pave the way for further studies on the readiness of local SSB manufacturing companies for future policies in food labelling. Furthermore, the study would serve as baseline information for policymakers to identify the core areas to target for future policy implementation to achieve effective regulation.

## **CHAPTER TWO**

### **2.0 LITERATURE REVIEW**

#### **2.1 Introduction**

This section provides in-depth information on the studies conducted in the research area. Beginning with the definition of Food label, food labelling as well as nutrition labelling laws and regulations are discussed. The nutrition labelling issues in some countries are discussed under the heading, “trends in mandatory nutrition labelling”. Nutrition label types or formats are explained, and pictorial examples are also provided for illustration. Additionally, this section briefly describes the food industry and nutrition labelling, revealing how the industry has responded to nutrition labelling in some geographical locations. Industry’s readiness for policy change is explained citing examples from other studies. The importance of nutrition labelling in nutrition and health is explained under sub-headings; “nutrition labelling and dietary intake”, and “nutrition labelling and nutritional management of disease”. Furthermore, consumer awareness of nutrition labels and barriers to nutrition label use among consumers are explained under the heading “consumer knowledge and use of nutrition labelling”. Factors which affect consumer use and understanding of nutrition labels investigated by other studies are reviewed. Sugar-sweetened beverage and nutrition is reviewed delving into the caloric load of SSBs, consumption patterns of SSB and health implications.

#### **2.2 Food labelling**

##### **2.2.1 Food labelling laws and regulations**

The Codex General Standard for Labelling of Pre-packaged Foods (Codex Stan 1-1985) defines a food label as “any tag, brand, mark, pictorial or other descriptive matter, written, printed,

stencilled, marked, embossed or impressed on, or attached to, a container of food”. It is the information placed on a food product, which is visible to everyone. Food labels provide both safety and quality information about the product including safe preparation, cooking, and storage (Albert *et al.*, 2016). It serves as the primary medium through which information is exchanged between the manufacturer and the consumer. Therefore, it corrects the information asymmetry that exists between food manufacturers and consumers. Food labelling is also defined as “any written, printed or graphic matter that is present on the label, accompanies the food, or is displayed near the food, including that for the purpose of promoting its sale or disposal” (FAO, 2013). It may be used as a policy tool to motivate modifications in food production practices and behaviour change among consumers. A consumer’s confidence in a product starts from the information on the product label.

Labelling of pre-packaged foods is mandatory worldwide (FAO & WHO, 2007). Therefore by observing the label of a product, the consumer can identify the type of product being offered, its composition, quality, use, as well as the risks and benefits associated with it (FAO, 2015). The Codex Alimentarius General Standard for Labelling of Pre-packaged Foods provides a list of information which should be mandatory on a food label. These include the name of the food, list of ingredients, name and address of the manufacturer, packer, distributor, importer, exporter or vendor, country of origin, lot identification, date marking and storage instructions, instructions for use, quantitative labelling of ingredients and irradiated foods (FAO & WHO, 2007). Though implementation of the Codex Alimentarius requirements is voluntary, the World Trade Organisation (WTO) identifies it as a reference for international trade and disputes in trade (Thow *et al.*, 2018).

### **2.2.2 Nutrition labelling regulations**

Nutrition labelling is a listing of the nutritional content of a food product on its label and is supplemented by some form of quantification (Hawkes & WHO, 2004). Nutrition labels may be located on the food product itself, menu or shelf of supermarket related to the food. This information tells consumers about the nutritional characteristics of a food product to serve as a guide in the selection of nutritious food products. It draws the consumer's attention to the possible benefits and risks of a specific food product. This can only be effective when nutrition labelling information is correct, trustworthy, and complete (Albert, 2014).

Nutrition labelling has two components; nutrient declaration and supplementary nutrition information. Codex Alimentarius (CAC/GL 2-1985) defines nutrient declaration as a standardised statement or listing of the nutrient content of a food. A nutrient declaration provides consumers with an appropriate profile of the nutrients present in the food. The nutrient should be considered nutritionally significant. Any other nutrition information provided is regarded as a piece of supplementary nutrition information. The nutrient declaration may be stated as a percentage of nutrient reference values (NRVs) where regulatory bodies have established such values (Albert *et al.*, 2016). A typical nutrition label contains information on serving size, calories and nutrients with corresponding per cent daily values (Miller & Cassady 2015).

The Codex Alimentarius General Standards for the Labelling of Pre-packaged Foods had previously recommended nutrition labelling to be voluntary unless a nutrient claim was made (Alimentarius, 1999). These guidelines have since been revised. The revised Codex Alimentarius General Standards for the Labelling of Pre-packaged Foods, CAC/GL 2-1985, section 3,

subsection 3.1.2 recommends mandatory nutrient declaration for all pre-packaged foods (with or without nutrition claims) except in countries where national circumstances cannot support the declarations. Nevertheless, there are exemptions for certain foods, based on their dietary or nutritional insignificance or foods with small packaging (Alimentarius, 2012).

Nutrition labelling regulations vary between countries and between different target groups depending on the needs of the target group and the country's public health needs. Some countries have nutrition regulations which reflect the Codex voluntary nutrient declaration whilst others have developed alternative requirements to suit their population needs. These include; guidelines on formats which nutrients should be listed for voluntarily applied nutrition labels, voluntary nutrition labelling except for foods with special dietary uses or mandatory for all packaged products. Other countries have no regulations at all yet food products on their markets are not without nutrition labelling information (Hawkes, 2010).

### **2.2.3 Trends in mandatory nutrition labelling and benefits**

The Nutrition Facts Panel was mandated in the United States by the Nutrition Labelling and Education Act (NLEA) of 1990. It provided standardised nutrition information on a panel indicating amounts of macro and selected micronutrients in a food product in percentage recommended values (Graham *et al.*, 2012; Grunert *et al.*, 2012). In May 2016, the United States Food and Drug Administration (USFDA) updated the content and format of nutrition facts panel to include more information such as the amount of added sugars (in grams) in a serving and the per cent daily value (%DV) of added sugars. The serving sizes of nutrients were to be updated to correctly reflect the quantity of drink and food that people consume. The document was revised

to enhance consumer understanding (Food & Drug Administration, 2016). Canada first introduced nutrition labelling on pre-packaged food products in 2003 (Franco-Arellano *et al.*, 2017) and became mandatory in 2007 (Campos *et al.*, 2011) which required manufacturers to provide nutrition information on their products.

The Council Directive of 24 September 1990 (90/496/EEC) was the regulatory framework used to regulate nutrition labelling among the European Union (EU) member states. By this regulation, nutrition labelling was only mandatory when a nutrient claim was made on a product. Manufacturers were required to use one of the two formats; the “Big 4” or “the Big 8”. The “Big 4” format required protein, fat, carbohydrate and energy contents to be declared whilst the “Big 8” required four other nutrients (sugar, saturated fat, fibre and sodium) in addition to the nutrients in the “Big 4” to be declared (Cowburn & Stockley, 2005; Byrd-Bredbenner *et al.*, 2000). However, in 2011 the European Union enforced mandatory nutrition labelling among its member states. This required manufacturers to declare energy value, proteins, salt, saturated fats, fats, carbohydrates and sugars of their food products (Viola *et al.*, 2016). Fibre, vitamins and minerals could be added as supplementary labels. Front-of-package label, known in other jurisdiction as principal display panel has also been initiated by the food industry and some governments. The aim was to provide simplified information to enable consumers to make healthier food selections and also to motivate the reformulation of healthy products (Popkin *et al.*, 2012). Detailed nutrition labelling is mandatory in countries such as United States, Canada, United Kingdom, Australia, New Zealand, Malaysia, Israel, Mexico, Brazil, Malaysia, South Korea, and Argentina (Koen *et al.*, 2016).

The food and beverage industry may develop voluntary nutrition labelling on their own to contribute to the promotion of healthful food, as an introduction of a new tool for marketing their product or as a new way of gaining competitive advantage. They may also do so to divert the evolution of the government's mandatory standards. Policymakers on the other hand recognise that nutrition labelling promotes healthy eating while maintaining the freedom to choose foods (Albert, 2014; Hawkes & WHO, 2004). Reliable nutrition labelling prevents information asymmetry thereby ensuring transparency in the food environment. It enables consumers to exercise their right to know (van Trijp, 2009). Governments, therefore, develop standards and regulations on nutrition labelling of food products to improve on the quality of information by standardising formats for labelling nutrients (Grace, 2016). This helps to reduce or avoid confusion among consumers, particularly in situations where food and beverage manufacturers use a variety of formats. Policymakers may also use nutrition labelling to ensure that food manufacturers label both "positive" nutrients (vitamins) and "less desirable" nutrients (e.g. added sugar), to proof that nutrient claims are truthful and also to ensure labelling does not deceive or mislead consumers. Nutrition labelling may also facilitate the export of locally produced food products as manufacturers meet the requirements of the importing countries (Albert, 2014; Hawkes, 2010).

The rise in the prevalence of diet-related non-communicable diseases has been one of the primary drivers of nutrition labelling globally. Mandatory nutrition labelling requires that all products implicated in the regulation must bear nutrition information unless such products have been exempted (Alimentarius, 2012). It may create opportunities for the food and beverage

industry to formulate their products into healthier options. In this way, all consumers benefit including those who cannot read (Moeser *et al.*, 2009).

Nutrition labelling is currently voluntary in Ghana. The labelling regulations enforced is the Ghana Standards Board (Food Drugs and Other Goods) General Labelling Rules, 1992, L.I.1541 and the Codex Alimentarius General Standard for Labelling of Pre-packaged Foods (CODEX STAN 1-1985) which does not require nutrition labelling unless a manufacturer makes a claim. In such an instance, the manufacturer must declare the content of protein, fat, carbohydrate, and energy on the product label. Food manufacturers may therefore decide to display information which is of interest to them in different designs, formats and reference settings which may create confusion for consumers (Mojduszka & Caswell, 2000; Hawkes, 2004).

#### **2.2.4 Types of nutrition labels**

Nutrition labels can be grouped into two types: nutrition facts panel (NFP) and the graphical formats (Hawkes, 2010). The NFP is presented in a boxed table format where nutrients and their corresponding amounts found in a product are listed. It is usually found at the back or side of a packaged food. The more up-to-date type is the graphical nutrition label in which nutrition information is displayed in an explanatory graphical format. Modified forms of these labels have been adapted for use by different countries. The European Food Labelling to Advance Better Education for Life project (FLABEL) proposed three categories of nutrition labelling in Europe based on the amount of nutrition information placed on the label and the extent to which it directs the consumer to make a decision. These are: the non-directive (figure 1 and figure 2), semi directive (figure 3) and directive (figure 4) (Bialkova *et al.*, 2014; Hodgkins *et al.*, 2012). Numerical information on fat, energy, saturated fat, sugar and salt per serving is usually found on

the non-directive and semi-directive formats. For the non-directive format, there is no reference standard on the label for the consumer to make a decision. This means the consumer will have to process the information to make a decision. The semi-directive label format provides detailed numeric information to be processed by the consumer. A reference standard, either in a text form or colour code is also put over the nutrients to indicate their level of healthiness or otherwise in the product. The directive label format provides an overall decision or gives cues to consumers to make a decision that the product is healthy compared to similar products in its group/category. This format does not provide detailed nutrition information that would require the consumer to make a decision. Rather, a logo is used to indicate that the product has been assessed to be healthy. Therefore, the healthy choice option is made for the consumer (Hodgkins *et al.*, 2009).

The format of the nutrition label determines the effectiveness of its use by consumers (Hawkes, 2004). Directive and semi-directive formats, which includes “traffic light”(TL) and logos, based on recommended daily values with colour codes are the most popular and understood formats (UNICEF, 2016; Hawley *et al.*, 2012; Borgmeier & Westenhoefer, 2009). For the TL label, symbols are displayed in red, green and amber to indicate whether a food product contains high, low or medium amounts of nutrients such as added sugar, fat or salt (Campos *et al.*, 2011). Single logos have also enhanced better understanding among consumers (UNICEF, 2016). However, the problem with the single label is that it may lead consumers to make hasty favourable judgements about certain foods which may be labelled “healthy” and underestimate its sodium or caloric content or even serving size.

The figures below illustrate the categories of nutrition label formats proposed by the FLABEL project

Nutrition Facts	
Serving Size 1 cup (228g)	
Servings Per Container 2	
Amount Per Serving	
<b>Calories</b> 260	Calories from Fat 120
% Daily Value*	
<b>Total Fat</b> 13g	<b>20%</b>
Saturated Fat 5g	<b>25%</b>
Trans Fat 2g	
<b>Cholesterol</b> 30mg	<b>10%</b>
<b>Sodium</b> 660mg	<b>28%</b>
<b>Total Carbohydrate</b> 31g	<b>10%</b>
Dietary Fiber 0g	<b>0%</b>
Sugars 5g	
<b>Protein</b> 5g	
Vitamin A 4%	Vitamin C 2%
Calcium 15%	Iron 4%

\* Percent Daily Values are based on a 2,000 calorie diet. Your Daily Values may be higher or lower depending on your calorie needs:

	Calories: 2,000	2,500
Total Fat	Less than 65g	80g
Sat Fat	Less than 20g	25g
Cholesterol	Less than 300mg	300mg
Sodium	Less than 2,400mg	2,400mg
Total Carbohydrate	300g	375g
Dietary Fiber	25g	30g

Calories per gram:  
Fat 9      Carbohydrate 4      Protein 4

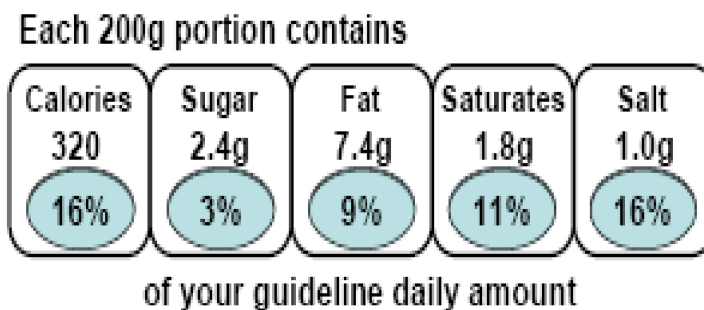


Fig.2 Percentage (%) guideline daily amount nutrition label

Fig.1 US back of pack nutrition facts label

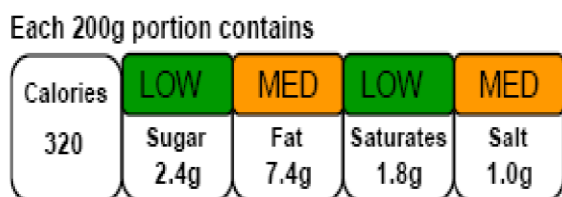


Fig.3 Traffic light (TL) logo



Fig.4 Health logo label

Labels were adopted from Hodgkins *et al.*, 2009 (Typology of nutrition labelling).

## **2.3 The food industry and nutrition labelling**

### **2.3.1 Response of the food and beverage industry to nutrition labelling issues**

The activities of the food and beverage industry are paramount in the quest to prevent obesity and its associated NCDs. Though this industry plays an important role in food laws and regulation, there is limited research on its response to labelling issues. The industry has supported mandatory nutrition labelling in some countries whilst they have opposed the decision in other countries (Mandel *et al.*, 2015; Corvalán *et al.*, 2013; Möser *et al.*, 2009). Some countries have had governments agencies and industry join forces to promote the health of its citizens by revising food labels to include more information such as nutrition information. For example, in Mexico, an agreement between the Ministry of Health, Education Ministry together with the food industry resulted in the elimination of food products with saturated fats and high sugar content from schools. The government of Mexico developed a Ministry of Health-approved label which promotes low sugar, sodium and saturated fat with the inclusion of healthful constituents was also instituted (Popkin *et al.*, 2012). The food industry in Europe also came up with simplified nutrition labelling to inform consumers to make a better choice. In effect, it also informed consumers that such products were quality (Möser *et al.*, 2009). However, in Chile, the food and beverage industry lobbied to prevent any sort of regulation (Corvalán *et al.*, 2013).

The food and beverage industry is hesitant to see nutrition labelling being controlled by public institutions (Albert, 2014). There is a belief that some industry players use nutrition labelling as a way of marketing their products (J. van buul & Brouns, 2015) rather than providing factual information to assist a consumer to make an informed decision. Nutrition labelling and claims

may be used on products whose total nutritional composition may not be beneficial to consumers (Colby *et al.*, 2010; Franco-Arellano *et al.*, 2019). For example, in a study in North Dakota USA, Colby *et al.*, (2010) reported that 23% of all packaged products from a grocery store chain and two regional grocery chains had nutrition marketing with high levels of sodium, saturated fat and/or added sugar. Thus manufacturers may highlight the benefit of a desirable nutrient whilst there could be high levels of less desired nutrients.

When mandatory labelling regulations are enforced, the food and beverage industry may perceive it as a form of harmonisation of existing labels (Morestin *et al.*, 2011) and this may aid in the implementation process and also provide a level playing field for all competitors. Nutrition labelling may involve using more sophisticated machines, employing persons with the required knowledge, providing space for laboratory or outsourcing commercial laboratories to conduct analysis, provision of new information on labels and new packaging material (Möser *et al.*, 2009). All these come with an added cost to industry operations. Though the costs of conducting laboratory analysis on food products, planning and printing labels which has nutrition information may be expensive, these cannot be compared with the human and monetary costs that are associated with managing diet-related diseases (Hawkes, 2004; Byrd-Bredbenner *et al.*, 2000). Once the inclusion of nutrition information to labels generates revenue for the food industry, they may be motivated to provide it on their product labels (Drichoutis *et al.*, 2006).

### **2.3.2 Assessing industry's readiness for policy implementation**

Major changes may occur in an organisation's activities due to factors such as: change in political power, changes in regulations, innovations in technology, financial crises, leadership

and increases in the dynamics of the economic environment (Riddell & Røisland, 2017). Riddell & Røisland (2017) expounded that such occurrences interfere with the usual patterns of organisations and calls those affected to accept new patterns. Changes are implemented through decisions, planned ideas, procedures or programs. Implementation is described as the courses of action taken to put a decision, idea, program or procedure into use (Weiner *et al.*, 2009).

Holt *et al.* (2007) outlined three stages as a driving force for successful change implementation. These include readiness to change, adoption and institutionalisation. Organisational readiness for change is important to ascertain whether a change initiative will fail or succeed. Readiness is shaped by a set of beliefs which provides the basis for adoptive or hostile behaviours to the change. It is important to assess the food and beverage industry's readiness for change to help regulators to know whether the implementation of a possible change will be successful or not. Regulators may be able to detect and appreciate the forces which may oppose the implementation process to develop strategies to achieve optimum results (Lercel, 2019). Hence, strategies will then be developed for optimum implementation processes and resources would also be properly allocated for the particular change (Shea *et al.*, 2014). Organisational readiness has been evaluated in different settings including schools (Arthur *et al.*, 2020), aviation industry (Lercel, 2019), nursing home (Nilsen *et al.*, 2018) and the food sector (Wesana *et al.*, 2018; Mah *et al.*, 2013).

Readiness for change is defined as an individual or organisation's intent, beliefs or attitude as regards to what extent changes are needed and their opinion on their capacity to make those changes successful (Backer, 1995). Weiner's (2009) theory on organisational readiness for

change also defines readiness as “the state of being psychologically and behaviorally prepared to take action”. He pointed out that, organisational readiness is “organisational members change commitment and change efficacy to implement organisational change”. Change commitment refers to the organisational member’s joint decision to follow the path of actions needed to implement a change. Each department or work unit involved in the change will need to contribute their quota towards the change. Change may be stressful and unsuccessful if some departments or work units fail to make the required contribution. It is noteworthy that, stakeholder’s commitment to change is driven by their motives behind the change. That is, do stakeholders think the imminent change is beneficial, needed, or important? The value stakeholders place on the change is described as the change valence. Change commitment is dependent on stakeholder’s change valence and this positively affects change implementation (Weiner, 2009). Stakeholders will have to agree that the change is appropriate and exhibit a high level of commitment and efficacy.

Change efficacy is the complete judgement of perceived abilities to perform a task based on demands of tasks involved, availability of resources and situational factors such as political environment and time (Shea *et al.*, 2014; Weiner, 2009). When organisational members mutually share a positive opinion of the demands of tasks involved in the change, availability of resources and situational factors, they share a common assurance that they can jointly implement the change. This confidence in each other lead to an increase in change efficacy. Shea *et al.* (2014) also indicated that change efficacy is high when members are familiar with the change and perceive that the resources and support needed will be provided by the organisation.

There is a lack of research on industry readiness for a policy in the food sector. However, a study in Uganda to assess stakeholder readiness to adopt measures to reduce food and nutrient losses along the value chain in the dairy industry reported that stakeholders were optimistic about adopting a change in their activities to reduce wastes and nutrient losses. The stakeholders had a high level of awareness of available resources and knowledge of tasks involved in implementing the change (Wesana *et al.*, 2018). A South African study also assessed the educator's perception of organisational readiness for health intervention in a school among school Management from five primary schools in Gauteng province (Arthur *et al.*, 2020). The study used Organisational Readiness for Implementing Change (ORIC) questionnaire to evaluate the participant's readiness for change. Stakeholder consultation, stakeholder communication and educational support for the intervention are among the factors identified to drive the implementation of the intervention. The study also observed that the educators valued the change and would be committed to implementing it. Change efficacy was also found to be high through barriers of non-commitment to implementation was perceived. Some stakeholders may be optimistic about a proposed change; however, they would want to commit to the change only when it is supported by law. For example, a Canadian study to determine stakeholder's attitude toward the restaurant menu labelling policy revealed that almost half of the participants acknowledged menu labelling may be good for business (Mah *et al.*, 2013).. Yet, most of the participants would provide menu labelling only when it is required by legislation

## **2.4 Importance of nutrition labelling in nutrition and health**

### **2.4.1 Nutrition labelling and dietary intake**

Nutrition labelling may serve as an important means of facilitating food choice and promoting the consumption of healthy foods. Studies have shown that use of nutrition label information contributes to decrease in the consumption of less healthy diets and increases consumption of healthier options (Persoskie *et al.*, 2017; Kim *et al.*, 2014). However, consumers' belief and opinions on the association between food and health may guide their dietary behaviour (Bosman *et al.*, 2014).

Several studies have explored the use of nutrition labelling and its impact on healthful diet and concluded that those who use nutrition information frequently follow healthier food selection and consumption habit (Navarrete-Muñoz *et al.*, 2018; Ni Mhurchu *et al.*, 2018; de-Magistris *et al.*, 2010). Other consumers may also be interested in health and so exhibit healthy food selection and consumption habit (Grunert *et al.*, 2010). A study was conducted by Ni Mhurchu *et al.* (2018) where the Food Standard Australia New Zealand Nutrient Profiling Scoring Calculator (NPSC) was used to score the healthiness of products purchased. It was observed that labels of products which participants viewed and purchased during the shopping episode were healthier than products whose labels were viewed and were not purchased. A significant positive relationship was observed between food label use and healthier food purchases.

Individuals who use nutrition information on food labels in food selection tend to consume less fat, reduced total energy intake from saturated and total fat, less sodium and also consumed more fibre than those who do not use nutrition label information (Post *et al.*, 2010). Nutrition label

users also consumed more fruits, vegetables, whole grains, reduced daily servings of sugar-sweetened beverages, a lower amount of added sugars and fewer servings of fried foods and snacks in-between meals (Christoph *et al.*, 2018; Su *et al.*, 2015; de-Magistris *et al.*, 2010). Users of nutrition label information are associated with less intake of unhealthy foods and snacks whilst increasing intake of healthier options (Anastasiou *et al.*, 2019; Buyuktuncer *et al.*, 2018; Kim *et al.*, 2016; Miller *et al.*, 2015). Nonetheless, nutrition label use may not always have a positive effect on the nutritional intake in older folks (Kim *et al.*, 2016). A study conducted among university students in the UK reported that nutrition label use had no effect on dietary quality and so suggested that nutrition label use may mediate nutrition knowledge and diet quality (Cooke & Papadaki, 2014). Hence nutrition label use may not be beneficial to everyone; it may not work for consumers with no knowledge in nutrition. Consumers with no intention of altering their consumption pattern as well as those who may not understand the information put on labels and those who cannot afford to purchase healthier food options may not benefit from nutrition labels (Morestin *et al.*, 2011).

#### **2.4.2 Nutrition labelling and nutritional management of disease**

One of the public health strategies to lower the risk of nutrition-related NCDs is the promotion of healthy food choices. Nutrition information on food product labels is one of the policy interventions which has been adopted by some governments as a public health strategy to manage NCDs (Rideout *et al.*, 2015; Hawkes *et al.*, 2013). It has been suggested to be an effective tool to support informed and healthful food choices among individuals (Franco-Arellano *et al.*, 2017; Hobin *et al.*, 2017). Depending on the health conditions, diet and eating strategy, consumers may look out for nutrient content of specific food products during shopping.

Studies have reported that respondents who have been diagnosed of diet-related illnesses use nutrition information in managing their health ( Aryee, 2013; Campos *et al.*, 2011; Post *et al.*, 2010; Su *et al.*, 2015). Others may use nutrition label information such as ingredient list and health claims to manage diet-related NCDs (Kim *et al.*, 2014; Miller *et al.*, 2015). A study on nutrition label use among adults aged 20years and above in the US found that respondents who were diagnosed with diabetes, reported use of nutrition facts label when purchasing food (An, 2016). Consumers who do not suffer any health condition and so perceive to have good health status may probably not pay attention to nutrition label information (Hayford 2011). Such individuals may be at risk of possible diet-related health outcomes since they rarely check nutrition label information to confirm the nutritional content of what they consume. Nonetheless, in a study to examine the association between nutrition label use and chronic diseases among adults aged 20 to 70 years in Mexico, the researchers found that, participants who had chronic disease had lower odds of using nutrition label information compared with those who had no chronic disease (Nieto *et al.*, 2019). Rimpeekool *et al.* (2017) also reported among Thai adult cohort that, respondents with poor health outcomes indicated less use of nutrition label information. These may suggest a lack of knowledge on food labelling use among the participants.

## **2.5 Consumer knowledge and use of nutrition labelling**

### **2.5.1 Consumer awareness of nutrition labelling information on food labels**

Generally, researchers have reported between 80% to 98% of awareness of nutrition information among consumers (Afram & Darkwa 2015; Aryee, 2013; Aryee *et al.*, 2019; Oghojafor *et al.*, 2012) and this may be due to an increase in consumer's interests about health (Majid *et al.*,

2015). Consumer's awareness or knowledge of nutrition labels may be influenced by the level of literacy. Individuals with high formal educational level have been reported to have a high awareness of label information whereas respondents with low educational level with its related low literacy may have low awareness of nutrition labels (Aryee, 2013; Orozco *et al.*, 2016). In addition to educational level, Aryee (2013), found that individuals with high income were also more aware of nutrition label information. The researcher argued that individuals with high educational levels were more exposed to nutrition and health-related issues because they read academic prints and scientific articles and that wealthy individuals also exhibited more responsibility for their health. However, older and unemployed respondents in a Korean study had higher awareness of nutrition label than younger and employed respondents (Kim *et al.*, 2016). Perhaps these older and unemployed respondents had special interests which could include health. They may also have more time on hand to read materials which may be of less interest to them. The health status of individuals is suggested to influence their awareness of nutrition labels information (Rimpeekool *et al.*, 2016). Individuals who perceive themselves to be in good health may use nutrition label information during shopping to stay healthy and so have a high awareness of nutrition information. A study conducted among rural and urban dwellers in Ecuador found that respondents who perceived themselves to be poor to average health status lacked awareness of nutrition labels (Orozco *et al.*, 2016).

### **2.5.2 Barriers to nutrition label use among consumers**

Consumers' views or opinions about food labels influence their use of food label information (Van der Merwe *et al.*, 2014). Individuals, therefore, have various reasons for not using nutrition information on food labels. Among some of the reasons given by study participants for not

reading nutrition label information include; familiarity of brand or product and lack of time (Danilola *et al.*, 2019), difficulty in using the information on labels due to confusing information and lack of interest (Kim *et al.*, 2016), the characters used on labels being too small (Bazhan *et al.*, 2015) or not legible (Annunziata & Vecchio, 2012). Danilola *et al.* (2019) reported in their study among adult shoppers in Nigeria that, respondents who were familiar with particular brands or products rarely considered reading nutrition information during shopping. The study clarified that the belief that consumers have used the same information in the past and so do not expect any major change in the content of the product may discourage them from reading nutrition information at subsequent shopping.

Consumers who do not understand the technical nutritional terms used on labels perceive that the information is difficult and confusing (Besler *et al.*, 2012; Olatona *et al.*, 2019). In such an instance, consumers struggle to read to make meaning out of them. Nutrition information terms such as serving size, daily value and per cent daily value may be difficult for consumers to interpret, particularly relating to real nutritional values (Campos *et al.*, 2011). Consumers who see technical terms used on labels as difficult to read and understand (Annunziata & Vecchio, 2012) may not want to even look at the nutrition information on labels during shopping. Likewise, consumers who lack concern about nutrition labelling (Bosman *et al.*, 2014) may not understand nutrition label information (Orozco *et al.*, 2016) and so will avoid its use.

Providing too much information on nutrition labels could also deter consumers from using them particularly for those who have less time to shop (Hassan & Dimassi, 2017; Petes-Teixeira & Badrie, 2005; Rimpeekool *et al.*, 2016). Information load on nutrition labels could create confusion in the minds of consumers who lack an understanding of nutritional terms.

Contrastingly, Madilo *et al.* (2020) study among tertiary students in Ghana reported that participants want to see better or more nutrition information on a food label. Similarly, in other studies among adult shoppers in Accra Metropolis of Ghana and Lagos, Nigeria, respondents reported that information provided on labels were not enough (Abagna, 2014; Olatona *et al.*, 2019). This may be due to the nutrition label regulations in Ghana where manufacturers declare nutrition information only when a claim is made on a product.

Other consumers lack trust (Bazhan *et al.*, 2015) or doubt the truthfulness of nutrition information on food labels and may perceive that the information provided is just used for publicity or advertisement (Madilo *et al.*, 2020; Annunziata & Vecchio, 2012). Madilo *et al.* (2020) in their study reported that, about 63.2% of respondents mistrusted nutrition label information. When consumers lack trust in information provided, their interest in the label may also be reduced. Nonetheless, some consumers have trust in nutrition information and think that such information is backed by scientific research (Bosman *et al.*, 2014). Such consumers have a higher tendency to use nutrition information to guide them in purchasing food products. They have positive opinions about food label information and do not believe that labels are used as advertising tools. It is worth noting that some manufacturers may only be using nutrition information to showcase positive nutritional attributes of their product (Grunert *et al.*, 2012). Poor location of labels, format and colour of texts used on labels may also discourage consumers from using nutrition labels especially when these create confusion for them (Besler *et al.*, 2012).

Though most consumers may not understand information on food labels, they do appreciate if such information is made available to consumers (Abagna 2014; Aryee *et al.*, 2019; Bosman *et*

*al.*, 2014; Peters-Teixeira & Badrie, 2005). This may probably be due to an increase in consumer awareness in diet and health relationships (Bosman *et al.*, 2014; Grunert *et al.*, 2012; Majid *et al.*, 2015).

### **2.5.3 Socio-demographic and other factors affecting nutrition label use among consumers**

Sociodemographic factors such as age, gender, income, education, and ethnicity have been identified to be associated with nutrition label use ( Campos *et al.*, 2011; Christoph *et al.*, 2016; Grunert *et al.*, 2010). Several studies have reported different relationships between nutrition label use and age. While some studies found associations between usage of nutrition label information among different age groups (Cannoosamy *et al.*, 2014; Christoph *et al.*, 2018; Norazlanshah *et al.*, 2013), others concluded of no association (Aryee, 2013; Sharif *et al.*, 2014; Van der Merwe *et al.*, 2014). A study among adult shoppers in Lebanon reported more usage of nutrition label among younger respondents between the age of 18-35 years than older respondents (Hassan & Dimassi, 2017). Similarly, in a study among Malaysian adults, Cheah *et al.*, (2015) found that older respondents of 31years and above had lower odds of reading nutrition information compared to respondents between 18 and 30years. Another study conducted among consumers in Ghana reported better label reading among respondents who were 30years and below (Azila-Gbettor *et al.*, 2013). Younger consumers may be curious about getting to know the components of food products and older individuals may find it challenging to read the texts on labels which may be in smaller fonts. Older folks may also find it difficult to understand nutritional terms and numeric values used on the labels or may not pay attention to label information (Cowburn & Stockley 2005; Miller *et al.*, 2017). Nonetheless, other studies reported that nutrition label use is higher in older age group compared to younger age group

(Hayford 2011; Kollannoor-Samuel *et al.*, 2016; Navarrete-Muñoz *et al.*, 2018; Rimpeekool *et al.*, 2017). A study conducted among US adults who had undiagnosed prediabetes and participated in NHANES between 2005 and 2010 reported that older respondents were users of NFP (Kollannoor-Samuel *et al.*, 2016). Older consumers may use nutrition labels to meet their dietary and health needs due to illnesses such as diabetes and hypertension in old age (Affram & Darkwa, 2015; Navarrete-Muñoz *et al.*, 2018). Interestingly, other studies did not find any association between age and nutrition label use (Rose *et al.* 2018; Sharif *et al.*, 2014; Aryee, 2013).

Gender has also been suggested to be related to the use of nutrition label information with females being reported to use nutrition label information compared to males (Besler *et al.*, 2012; Grunert *et al.*, 2010; Liu *et al.*, 2015; Navarrete-Muñoz *et al.*, 2018). Women are usually in charge of household shopping and so have greater exposure to nutrition labels compared to men (Van der Merwe *et al.*, 2014). Females are also generally conscious of their body image and health of family members hence may use nutrition label information during shopping (Kim *et al.*, 2016). Similarly, Liu *et al.*, (2015) indicated in their study among Chinese consumers that, females frequently used nutrition label information than men. Males have been described to have lower odds of reading nutrition information such as fat (OR: 0.71, 95 per cent CI: 0.65-0.77) and sugar (0.84, 0.76-0.92) content on labels compared to women (Cheah *et al.*, 2015). Maybe, men do not consider nutrition label as a tool useful enough to make healthy food choice. However, the male respondents in a study reported higher usage of nutrition label information compared to females (Aryee *et al.*, 2019). Other studies found no association between nutrition label use and gender (Aryee, 2013; Norazlanshah *et al.*, 2013; Olatona *et al.*, 2019; Rose *et al.*, 2018; ). These

studies had a higher percentage of their population being educated and this may have influenced variations in findings.

An individual's employment status and income may also impact his or her frequency of use of nutrition label information. A study reported that, respondents who were gainfully employed and had high household income used nutrition label information frequently than those who were unemployed and had lower income (Cannoosamy *et al.*, 2014). Similarly, Korean study which investigated diet habits among adults reported high nutrition label use among respondents with high income (Kim *et al.*, 2014). However, a study conducted among adults aged between 20 and 78 years in the US to determine associations between nutrition label use and diet quality reported no association between income and label use (Miller *et al.*, 2015). Findings of Cheah *et al.* (2015) among adult urban and rural Malaysians indicated that employed individuals had higher odds of nutrition label usage compared with unemployed individuals. Employed individuals may be exposed to health promotion programmes compared to unemployed individuals. In contrast, a study among literate consumers in the Tamale metropolis of Ghana in which more than half of study population were students, no association was found between nutrition label usage and occupation or income of study participants (Aryee *et al.*, 2019). The difference in the studies could be due to the large student population who were also not employed.

Nutrition label use has been reported to be positively associated with increasing educational level (Aryee, 2013; Christoph *et al.*, 2018; Hayford, 2011; Kim *et al.*, 2014; Nieto *et al.*, 2019; ). Christoph *et al.*, (2018) assessed understanding of nutrition facts panel (NFP) among US adults and reported that, respondents who had a bachelor's degree use NFP more than those with low

education. Similarly, studies by Cannoosamy *et al.* (2014) in Mauritania and Cheah *et al.* (2015) in Malaysia have also reported that respondents with tertiary education levels frequently used nutrition label information than those with lower levels of education. Educated individuals may have more knowledge on food labels which includes nutrition information and may probably pay attention to it during shopping (Aryee *et al.*, 2019) and also have a high interest in health (Kim *et al.*, 2014). However, Olatona *et al.* (2019) study among adult shoppers in Nigeria did not find any association between nutrition label use and education. Similarly, a study which investigated nutrition facts label utilisation Latinos in the US did not find an association between educational level and usage of nutrition label information (Sharif *et al.*, 2014). The finding may be as a result of the low educational levels of the study population.

Few researchers have also indicated that ethnicity had an association with nutrition label use. Cheah *et al.*, (2015) recognised from their study in Malaysia that, Malays who are that majority ethnic group had higher odds of using nutrition information than the other minority groups. Probably the texts on labels are in a language which minority group may not be able to read. However, a study in New Zealand reported that two minority groups, Maori and Pacific groups slightly more often viewed nutrition information on food labels which they purchased than the other shoppers (Ni Mhurchu *et al.*, 2018). The difference could probably be due to the culture and beliefs of the ethnic groups.

Health behaviour and nutrition knowledge may also influence the use of nutrition label information among consumers. With the increasing knowledge of diet and health relationship, use of nutrition information on food labels has increased over the years (Bazhan *et al.*, 2015;

Bosman *et al.*, 2014). Consumers may therefore want to check the labels to ascertain which nutrients are present at what levels in products of interest (Aryee 2013). Knowledge in nutrition has been suggested to be associated with label use. Studies have reported significant associations between nutrition knowledge and use of nutrition label information (Cannoosamy *et al.*, 2014; Hayford 2011; Grunert *et al.*, 2010). Possibly, nutrition knowledge raises a consumer's supposed to benefit and level of the effectiveness of label use. However, not all individuals who are nutritionally knowledgeable may use nutrition information on labels. An individual's knowledge in nutrition may not necessarily translate into his/her behaviour or use of nutrition labels (Drichoutis *et al.*, 2008; Nayga Jr, 2000; Norazlanshah *et al.*, 2013).

Consumers who are overweight or obese and have the desire to lose weight are motivated to do so by using nutrition label information (Christoph *et al.*, 2018; Olatona *et al.*, 2019). Such consumers may check for nutrition label information such as serving size to enable them to determine the amount of nutrient and calories obtained from consuming certain quantities of a food product (Christoph *et al.*, 2018; Persoskie *et al.*, 2017) since this is vital for their weight management goal. Contrary to the finding by Grunert *et al.* (2010), nutrition label use was low in respondents with a high body mass index (BMI). Individual differences and perception about fatness and body image may play a role in such instances as those who do not perceive themselves to be overweight may not consciously consider healthy eating.

#### **2.5.4 Consumer understanding of nutrition label information and related factors**

An individual's understanding of nutrition label information may depend on his or her familiarity with nutrition label information (Liu *et al.*, 2015). Nevertheless, some consumers who have high

awareness or use nutrition labelling information may have low levels of actual understanding of information on nutrition labelling (Mandel *et al.*, 2015; Sharif *et al.*, 2014). Studies have found that factors such as age, gender, education level, income, nutrition knowledge and ethnicity/race do play role in the understanding of nutrition label information (Egnell *et al.* , 2018; Rimpeekol *et al.*, 2017; Sinclair *et al.* , 2013).

Some of the studies have found age to be inversely associated with nutrition label understanding. Older respondents tend to have a lower understanding of nutrition label information compared to younger respondents (Grunert *et al.*, 2010; Liu *et al.*, 2015; Persoskie *et al.*, 2017). Old age may come with difficulty in numeracy skills and lesser attention to nutrition label information (Miller *et al.*, 2017). However, a study among literates aged 15 to 60 years in the Tamale metropolis of Ghana reported a high understanding of nutrition label information among older respondents. (Aryee *et al.*,2019). Similarly, a study among adult Thai cohorts indicated that increasing age was related to good nutrition label understanding. The researchers indicated that individuals desire to know more about healthy diet as they age due to chronic diseases which usually comes with old age (Rimpeekol *et al.*, 2017).

Several studies have found differences between gender and understanding of nutrition label information. Some of the studies have suggested that females have a better understanding of nutrition labelling information than men ( Besler *et al.*, 2012; Christoph *et al.*, 2016; Grunert *et al.*, 2010). Females are usually responsible for shopping for the family and so are familiar with nutrition labels. The familiarity of nutrition labels among women due to frequent usage may have influenced their understanding of nutrition label information. Individuals who are familiar

with nutrition labels tend to have a better understanding of nutrition label information (Grunert *et al.*, 2010; Liu *et al.*, 2015). Females are also known to have a higher interest in nutrition compared to men (Grunert *et al.*, 2012). However, Aryee *et al.*, (2019) reported higher understanding of nutrition label information among men than women in their study. The researchers attributed their findings to the peculiar situation of their study location where socio-cultural practices allowed men to be the key decision-makers of households and so have the privilege of assessing supermarkets. Products in supermarkets are mostly labelled compared to the few labelled products on the traditional Ghanaian markets which may not be patronized by most women in the study location. An online study conducted among adult shoppers in the US found no association between gender and nutrition label comprehension (Rose *et al.*, 2018).

Other studies have investigated the association between educational level and comprehension of nutrition label information and found contrasting results. Some studies have suggested that individuals with high educational levels had a higher understanding of nutrition label information than those with a lower level of education. For example, a study was conducted among adults in the USA to assess the respondent's nutrition label understanding by using the Nutrition Facts Panel label on an ice cream container. The study observed that respondents with higher educational levels performed better than respondents with lower education levels (Persoskie *et al.*, 2017). Educated persons may be informed about nutrition and may also be more prepared to interpret nutrition and health information (Majid *et al.*, 2015; Sharif *et al.*, 2014). Nonetheless, researchers in China found that education was negatively related to the understanding of nutrition label information (Liu *et al.*, 2015). The researchers explained that educated individuals were less likely to believe in the contribution of labels to choosing healthy foods.

Studies have reported an association between level of income and nutrition label understanding. High-income earners have been suggested to have a better understanding of nutrition label information compared to lower-income earners (Hassan & Dimassi, 2017; Sinclair *et al.*, 2013). Similarly, Persoskie *et al.* (2017), found in their study that, respondents in the lower-income bracket exhibited poorer ability to interpret nutrition label information compared to respondents with higher income. However, a French web-based cohort study which assessed objective understanding of different label formats among adult consumers found no association between household income and ability to rank products according to healthiness (Egnell *et al.*, 2018). This may be due to the high percentage of high-income earners in the latter study population.

Though understanding is vital in processing nutrition information, it requires consumer's reference base from his or her former knowledge in nutrition and this might be lacking among some consumers (van Trijp 2009). An individual's previous knowledge in nutrition may be key in interpreting nutrition information and improve understanding of nutrition labels (Hassan & Dimassi, 2017). Nutrition knowledge refers to ideas and practices related to health and nutrition comprising information on diet and health, diet and disease, foods which represent major sources of nutrients and dietary recommendations and guidelines (Miller & Cassady, 2015). Some studies have found that individuals with higher nutrition knowledge have a better understanding of nutrition label information compared with those of lower knowledge (Liu *et al.*, 2015; Grunert *et al.*, 2010). Respondents with higher nutrition knowledge performed better in tasks used to assess nutrition label understanding. It is not surprising that nutrition knowledge predicts dietary

quality. Nutrition knowledge is reported to be low among individuals with lower educational attainment and older individuals (Gibbs *et al.*, 2018).

Studies which have assessed the association between nutrition label understanding and ethnicity have concluded that individuals in the minority group exhibited lower comprehension of nutrition label information compared to those of majority group (Persoskie *et al.*, 2017; Sinclair *et al.*, 2013). Caucasians have a higher nutrition label understanding compared to Hispanics and Blacks. The minority population may find it challenging to read and comprehend texts in a foreign language.

## **2.6 Sugar-sweetened beverages (SSBS) and nutrition**

Sugars are the building units of carbohydrates which play a role in providing energy in the form of glucose for the body. Sugars consist of monosaccharide, disaccharide and polyols. Sucrose (table sugar) is a disaccharide made of glucose and fructose and is usually obtained from sugar beets, sugar cane, honey and corn syrup (Johnson *et al.*, 2009). Monosaccharides and disaccharides are conventionally described as sugars and purified sucrose is also referred to as refined sugar or sugar (Amarra *et al.*, 2016). “Free sugar” is a term used by the WHO to represent all mono and disaccharides including sugars naturally found in fruit juice, fruit juice concentrate, honey and syrup which are added to foods by consumers, cooks or manufacturers. The types of sugars used in food processing include; edible syrups, honey, cane and beet sugar or sucrose, nonfructose-rich corn syrup and fructose (WHO,2015).

Sugar-sweetened beverages (SSBs) are beverages which contain added sugar. These include; soda, fruit drinks (e.g. sweetened bottled water, flavoured drinks, nectars and fruit juices with added sugar), sports drinks, energy drinks, sweetened coffees and teas (Hu & Malik, 2010; Leary & Nowak 2019). Generally, SSBs contain water, flavouring agent and sweetener (Serrano Iglesias et al., 2016). A beverage which is 100% fruit juice and not blended with any sweetener is not sugar-sweetened (Malik et al., 2010).

### **2.6.1 Caloric load of sugar-sweetened beverages (SSBs)**

High concentrations of sweeteners such as high-fructose corn syrup and sucrose may be used to formulate SSBs. For example, a 330ml of SSB (carbonated soft drink) would normally contain sugar of about 35g, i.e. approximately 9 teaspoons, providing the energy of about 140 calories (WHO, 2014b), which is approximately 11g/100ml. The WHO recommends a reduction in free sugar intake to less than 10% total energy intake (WHO, 2015) which converts into 50g/d (12.5 teaspoons) of sugar-based on a 2000kcal diet (Amarra *et al.*, 2016; Min *et al.*, 2017). American Heart Association (AHA) recommends 100kcal/d and 150kcal for women and men respectively (Aune, 2012; Johnson *et al.*, 2009). However, the Dietary and Physical Activity Guidelines of Ghana recommends that about 50% of total energy intake should be sourced from a variety of carbohydrates and not explicit on free sugar intake (ALWG, 2009).

Sugar-sweetened beverages such as fruit juices and carbonated drinks derive total calories from the added-sugar content (Chepulis *et al.*, 2017). A Saudi Arabian study analysed for the sugar content of sugar-sweetened beverages obtained from local supermarkets. The study observed disparities in the amount of sugar in different bottles of the same brand and also between levels

indicated on labels and what was estimated from laboratory analysis (Idris *et al.*, 2016). A similar study in the US was conducted where the sugar content of popular SSBs was analysed to examine the validity of fructose to glucose ratio of SSBs. The study discovered variations in the type and amount of sugar listed on the labels and what was estimated from the laboratory analysis. Whilst a product like Mexican Coca-Cola indicated sugar on its label, the laboratory analysis detected that there was no sucrose in the product. Variations in sugar content indicated on label ranged between 85% to 128% of what was indicated on the label. Bottled Coca-Cola, Sprite and Pepsi, however, recorded 100% of what was on the label (Ventura *et al.*, 2011). As ultra-processed foods, SSBs form a major source of added sugars in the diet, contributing to the dietary energy intake of SSB consumers (Drewnowski & Rehm, 2014; Steele *et al.*, 2016). Increased consumption may be detrimental to health due to its association with poor diet quality and NCD risk.

### **2.6.2 Consumption patterns of sugar-sweetened beverage and possible health implications**

The added sugar, in SSB, provides the characteristic sweet taste which is detected via sweet taste receptors found in the periphery and several brain substrates. The receptors and brain substrates mediate the complex processes to enable individuals to experience sweet taste emotions and sensation of sweetness which begins in the mouth. Infants who are usually fed sweetened water during few months of life have been reported to prefer sweetened water at 2 years (Beauchamp & Moran, 1984) and 6 to 10 years (Pepino & Mennella, 2005) compared with infants who had little or no exposure to sweetened water during early life. Nevertheless, a review on exposure to sweet taste, later acceptance and preference concluded that relating early exposure of sweet taste to sweet taste preference later in life was misleading (Appleton *et al.*, 2018). The review of

similar literature argued that, studies conducted in this area were not huge enough and that, the randomized trials conducted did not have sufficient power and duration to reveal typical behaviour. Another review also indicated two factors, 1) evolutionarily driven taste preference which are inborn and 2) lack of exposure to diversity of healthy foods in early childhood, influence humans to diets which are high in sugar (Mennella *et al.*, 2016).

There have been theories to suggest a possible relationship between intake of SSB, obesity and related NCDs. Some studies argue that, when liquid carbohydrates such as that found in SSB are consumed, it does not provide the kind of fullness that is provided by solid foods, therefore, individuals do not decrease food intake to compensate for the added calories from SSB. The excess calories provided by SSB may contribute to overweight and obesity (Hu & Malik, 2010; Pan & Hu, 2011). It is also anticipated that the calories consumed from SSB avoid the body's homeostatic regulatory systems which control hunger and satiety thereby lowering satiety levels and consequently increase hunger and overconsumption of energy (Hafekost *et al.*, 2011). This may suggest that calories from SSB may just be an "add on" to what is obtained from other foods (Bray, 2013).

A study conducted among adolescents aged 12 to 18 years in the USA to estimate the contribution of SSB to caloric intake and the difference in diets of SSB consumers and non-consumers found that, increased SSB consumption was associated with an increase in food consumption (Mathias *et al.*, 2013). Another study conducted among adolescents in Minnesota, USA examined the extent to which alterations in SSB intake was related to changes in BMI reported that an increase in daily intake of SSB was related to 0.3 increase in BMI (Laska *et al.*,

2012). A South African study among poor resources communities to determine the relationship between SSB consumption and change in body weight also found an increase in weight among participants with high mean SSB consumption (Okop *et al.*, 2019). These studies suggest that increased SSB consumption may contribute to gain in weight attributed to the caloric load of the SSBs. Interestingly, a study conducted in male rats and humans (male) to determine the effect of carbon dioxide in carbonated drinks concluded that carbon dioxide, a key ingredient in carbonated SSBs contributes to increased food consumption when either regular carbonated or diet carbonated SSB was consumed (Eweis *et al.*, 2017). The study found that blood ghrelin (hunger hormone) concentration increased in rats who consumed carbonated beverages an hour after meals compared to individuals who consumed non-carbonated drinks. The rats also gained weight after the study period. However, a study conducted in the UK among British children did not observe any relationship between consumption of SSB and body fat mass (Johnson *et al.*, 2007). A study among Australian adolescents to examine the association between SSB consumption and prevalence of oral health impact (OHI) and obesity did not find any association between SSB consumption and weight gain but found association between daily SSB intake and OHI (Hardy *et al.*, 2018).

Daily intake of SSB is related to dental caries (Leary & Nowak, 2019). Bernabe' *et al.* (2014) conducted a study among Finnish adults to explore the relationship between SSB consumption and increment of dental caries over four years. The study concluded that a dose-response relationship existed between the frequency of SSB intake and increment in dental caries among study respondents. Another study conducted among adult Koreans to evaluate the effect of dietary sugars on disease incidence and death in Korea also found that overconsumption of

dietary sugars ( $\geq 20$ g sugar) from beverages could lead to dental caries, stroke and obesity (Shim *et al.*, 2019). Furthermore, a review to understand the association between sugars, dental caries and fluoride use concluded that caries progressed even when fluoride water and toothpaste were used due to intake of sugars (Sheiham & James, 2014). The researchers recommended sugar intake of between 2-3% of energy intake was optimum for dental health.

Increased SSB consumption is implicated in poor diet quality. A study among rural and urban adults in Texas found an association between high SSB consumption and less healthy eating habits among rural adults (Sharkey *et al.*, 2011). Respondents who consumed high SSB consumed fewer fruits and vegetables, not consistent in consuming breakfast but frequently consumed fast foods. An Australian study among children also found that SSB consumption was associated with a low intake of fruits and calcium (Hafekost *et al.*, 2011). Furthermore, Voster *et al.* (2014) observed in their study among adult urban and rural South Africans that, dietary fibre consumption was higher in respondents who consumed less sugar than those who consumed high amounts of sugar.

It is worth noting that, though a consumer's lifestyle choices and personal failings may contribute to the diagnosis of diet-related NCDs, the market, demographic and political environment should also be considered (Magnusson, 2019). These environments have to a large extent created the increasing rates of physiological and behavioural risk factors to these undesired conditions (NCDs). Providing nutrition label information on SSBs may assist consumers to make healthy dietary choices.

## **CHAPTER THREE**

### **3.0 METHODOLOGY**

#### **3.1 Study design**

This was a mixed-methods study employing both qualitative and quantitative designs. It comprised of in-depth key informant interviews, survey, and laboratory analysis.

#### **3.2 Study settings**

The study was conducted in the Greater Accra Region (GAR) of Ghana. The region is in the south-central part of Ghana and shares borders with three Regions (Central, Volta and Eastern) and the Gulf of Guinea to the west, east, north and south respectively. It is the smallest region occupying about 1.4% of Ghana's total land area and has a total population of about 4,010,054 people located in 10 districts(GSS, 2012). The national capital is found here and so has a lot of amenities and social infrastructure. It is the business hub of the nation with most of the nation's leading food manufacturing facilities and major shopping malls.

SSB manufacturing companies located within GAR were aimed for the industry part of the study. Supermarkets located within the major shopping malls or shopping centres in the Region were the specific study sites for the consumer survey. An online search for a list of major shopping malls and shopping centres in Greater Accra yielded nine malls/shopping centres. This included Accra Mall, Palace Mall, China Mall (Spintex and Ashaiman branches), Junction Mall, A&C Shopping Center, Achimota Mall, Melcom Plus, Marina Mall and West Hills Mall. A list of supermarkets located within the shopping malls was obtained from the Food and Drugs Authority. The supermarkets included Shoprite, Game Discount store, China Mall, Palace Mall,

Melcom Plus, Marina Mall and Max Mart. The Management of Maxmart (A& C shopping centre), Melcom Plus, Game Discount Stores (Accra, Achimota and West Hills malls) and Palace Mall granted the request for the study to be conducted at their facilities.

### **3.3 Study population**

The study population for SSB manufacturing companies comprised company representatives from each participating company. Company representatives acted as key informants i.e. individuals with relevant knowledge about the issues being explored (Marshall, 1996).

Adults 18 years and above who utilised the supermarkets at the study sites were the study population for SSB consumer survey.

#### **3.3.1. Inclusion and exclusion criteria**

##### *3.3.1.1 SSB manufacturers*

Food manufacturing companies who produced SSB, had been in active production in the recent five (5) years, had valid facility license and food product registration number and were willing to participate.

##### *3.3.1.2 SSB consumers*

Anybody 18 and above who self-reported as an SSB consumer or who purchased SSB for the household from any of the supermarkets/shopping malls and were willing to participate, were included in the study. Foreigners and individuals who could not read were excluded from the study.

### **3.3.2 Sample size determination**

#### *3.3.2.1 Sugar-sweetened beverage (SSB) manufacturers*

A list of active SSB manufacturing companies was obtained from the Food and Drugs Authority (FDA). A total of sixteen (16) companies qualified to be included in the study based on the inclusion criteria.

#### *3.3.2.2 Sugar-sweetened beverage (SSB) consumers*

The formula  $N = (z/m)^2 * p*(1-p)$ , where N is the desired sample size, the standard score for the confidence level is z (z=1.96), m is the margin of error 5% at 95% confidence interval (McCabe & Moore, 1993) was used to determine the sampling size of consumers for the study. The proportion of SSB consumers (p) was unknown and so was assumed to be 50%. The sample size was then calculated to be 384. To compensate for data with missing information, 10% of the sample size was added. The final sample size was therefore 422.

### **3.4 Sampling**

The estimated total population (GSS, 2012) of each study district (in which a major mall/shopping centre was located) was used to determine the number of respondents to be recruited from each supermarket by employing proportionate sampling technique. Each district's population size was divided by the total population size of the GAR and multiplied by the total size of the study sample. In all, 78 respondents were recruited from Ga South Municipal, 295 respondents from Accra Metropolis, 13 respondents from Adenta Municipal and 36 respondents from Ledzokuku/Krowor Municipal district. Where more than one supermarket was located in a district, the estimated sample size for the district was divided by the number of supermarkets.

At each recruitment site, research assistants stood close to the aisle where sugar-sweetened beverages (SSB) were stocked. Every other person entering this section at any of the facilities was approached. The researcher briefly explained the study to them, and those who were willing to partake in the study were selected until the required sample size was obtained.

Based on responses from the survey, five most consumed SSB were selected and purchased from the supermarket. Laboratory analysis was then conducted to determine their caloric load.

### **3.5 Ethical consideration**

Ethical approval for the study was obtained from the Ethics Review Committee of the College of Basic and Applied Sciences, University of Ghana (ECBAS protocol number- 017/19-20). Permission was sought from the Management of the SSB manufacturing companies and the selected supermarkets and shopping centres.

Signed consent was taken from representatives of SSB companies after study objectives had been explained to them. Likewise, for consumer survey, a signed consent form was obtained from each participant after study procedures had been explained and all questions by the participant answered. To maintain confidentiality and anonymity, each respondent was given a unique identification code.

### **3.6 Data collection**

#### **3.6.1 Interview guide and instruments**

To assess the readiness of SSB companies for mandatory nutrition labelling, an interview guide based on Shea et al. (2014) constructs for assessing organisational readiness for change was designed. This was used in an in-depth interview with the SSB manufacturing companies by the researcher.

A questionnaire which comprised mostly closed-ended questions with multiple-choice responses and few open-ended questions was used to interview consumers. A total of four trained interviewers who were university graduates assisted in interviewing the respondents.

#### **3.6.2 Assessing sugar-sweetened beverage (SSB) manufacturing company's readiness for mandatory nutrition labelling**

The interview guide was used to obtain data from the participants from SSB manufacturing companies via interviews which lasted approximately 10-15 minutes with the company representatives at the premises of the company or on the telephone. The first part of the guide obtained information on the characteristics of the company. For this part, respondents were asked to indicate the scale/size of their company, based on the number of employees, where small scale means, the company have staff strength of between five to 19 employees, medium scale 20 to 99 employees and large scale, 100 or more employees (Dalitso & Peter, 2000). Company representatives were also to indicate the type of SSB product (s) manufactured by the respective companies and the ownership of the company (whether the company was a global, Ghanaian-foreign partnership or fully Ghanaian owned).

The constructs are, change valence, task knowledge, resource availability, change commitment and change efficacy. Change valence explored the value companies give to the intended change. Some of the questions asked included; ‘Does your company have a nutrition policy (which includes nutrition labelling)? Are you currently labelling any of your products? Is it a good idea to implement mandatory nutrition labelling policy on sugar-sweetened beverages (SSB)? Change commitment was used to ascertain the individual work unit or department’s commitment to the change. Questions under the “change commitment” construct were phrased to solicit information on management position since Management/leadership commitment is vital for organisational readiness (Holt et al 2007). Some of the questions asked included: Can management be committed to implementing nutrition labelling policy? Can management be motivated to implementing nutrition labelling policy? Change efficacy was used to determine the complete judgement of the company’s perceived abilities to perform the task. Interviewees were asked questions such as; Can you keep the momentum going in implementing mandatory nutrition labelling policy? Can you handle the challenges of implementing mandatory nutrition labelling policy? Participants’ knowledge of tasks involved and availability of resources to implement the change were also explored under Task knowledge and Resource availability, respectively. Task knowledge explored interviewee’s awareness of how much effort may be needed to implement the policy and what each work unit or department must do to implement the policy. Resource availability construct also ascertained the company’s awareness of the resources needed for future change. The participants answered questions such as do you have the resources, expertise, skills, equipment, and time needed to implement this policy? What resources are needed to implement this policy? Do you think you will need time to implement this policy? Some few questions were also asked to explore situational factors which may impact the implementation

process. These questions included, what impact will mandatory nutrition labelling have on your company's activities? Do you perceive any opportunities in implementing the policy? How will mandatory nutrition label impact your consumers or customers? Finally, participants were asked whether they would be ready to implement mandatory nutrition labelling in five years.

### **3.6.3 Consumer understanding and use of nutrition label information, and perception about mandatory nutrition labelling**

The pre-tested questionnaire was used for data collection from January to February 2020 at the study sites through face-to-face interviews with respondents who agreed to partake in the study. Interviews were conducted between 10:30 am and 4:00 pm on data collection days. Approximately, 10 to 15 minutes was spent on each respondent. The interview was conducted by using the questionnaire uploaded on android tablets using the ODK software. The questionnaire had five sections comprising; 1) sociodemographic characteristics and health status 2) nutrition label information use, 3) nutrition label information understanding, 4) assessment of nutrition knowledge, 5) perception about mandatory nutrition labelling (see appendix).

#### **3.6.3.1 Socio-demographic data and health status**

Information on socio-demographic characteristics entailed the respondent's characteristics. These included gender, age, marital status, having children under 18, ethnicity, level of education, occupation, and income. Respondents were made to answer questions about their current health status as well as a family history of diet-related health conditions.

### **3.6.3.2 Nutrition label information use and understanding**

Five questions were asked to ascertain the use of nutrition label information by respondents. These questions queried why respondents purchased SSB, whether they read the nutrition information on such products before purchase, how often they considered nutrition information before purchasing or before consumption of SSB and which nutrition information they most likely looked for on SSB nutrition labels.

A set of five closed-ended questions were used to assess respondents understanding of some terminologies used on nutrition labels. They were made to select the possible meanings of terminologies like daily value (DV), per cent daily value (%DV), guideline daily amount (GDA) and serving size. Three different label formats (Nutrition Facts Label, GDA label and traffic light label) were designed to determine whether respondents could differentiate between which product had the highest caloric load (sugar content) compared to the other and also judge the healthier product option using the same set of labels. Using the three different label formats with the same information, the study also ascertained which label format was easier for respondents to understand. Questions were also asked to assess respondents' level of understanding of two (2) nutrition label claims based on Byrd-Bredbenner's (2000) measure.

### **3.6.3.3 Assessment of nutrition knowledge**

Questions were asked to determine respondents' knowledge of basic nutrition. Three (3) key constructs of Parmenter and Wardle (1999) validated scale of nutrition knowledge was adapted and used. These included questions to assess consumer's awareness of expert's advice on diet,

the consumer's knowledge on sources of nutrients (e.g. calories) and their awareness of major health problems related to added sugar.

#### **3.6.3.4 Perception of mandatory nutrition labelling**

In assessing respondents' views on mandatory nutrition labelling, Möser et al., (2010) measure was adapted and used. Five (5) statements were made where respondents were asked to indicate whether they agreed or disagreed to those statements.

#### **3.6.4 Proximate analysis (Caloric load of selected SSB)**

##### **3.6.4.1 Moisture content determination**

ISO 712:2009 procedure was used to determine the moisture content. The test sample was well blended. The moisture dishes and lids were conditioned in a hot air oven at 130°C for 30 minutes, cooled in a desiccator for 30 minutes and then weighed. About 5g of the blended test sample was then weighed into the moisture dish. It was then placed in the oven for 2 hours at 130°C. It was quickly cooled in a desiccator for about 30 minutes and then weighed to the nearest 0.01g. The oven was kept closed and no moist sample was put in the oven during this period.

Calculation:  $\frac{\text{weight of dish + sample (wet)} - \text{weight of dish + sample (dry)}}{\text{Weight of the sample taken}} \times 100$

Weight of the sample taken

##### **3.6.4.2 Crude protein determination**

The Kjeldahl procedure described by AOAC 984:13 was used to determine the protein content of the drinks. This method included three main steps namely, digestion, distillation and titration.

### *Digestion*

About 0.25g of the test sample was weighed into a digestion flask after which 5.0g of a catalyst (CuSO<sub>4</sub>) was weighed and added to the sample. About 10ml of concentrated H<sub>2</sub>SO<sub>4</sub> and the resulting mixture was digested for about 12 hours. The digested sample was then washed with about 50ml distilled water into a distillation tube.

### *Distillation*

About 50 ml of 2% boric acid was measured into a 500ml Erlenmeyer flask and three drops of methylene red indicator were added. Enough NaOH was slowly added down the side of the flask to make the mixture strongly alkaline. The flask was immediately connected to the distillation apparatus and distilled until more than 150 ml distillate was collected into the titration beaker.

### *Titration*

Each distillate was titrated with 0.1N H<sub>2</sub>SO<sub>4</sub> till a faint orange endpoint was observed. The formula used to calculate the % protein is illustrated below:

$$\% \text{Nitrogen} = \frac{\text{titre value} \times 0.0014 \times 100}{\text{Weight of sample}}$$

Weight of sample

$$\% \text{Protein} = \% \text{Nitrogen} \times \text{Conversion Factor (6.25)}$$

### **3.6.4.3 Crude fat determination**

AOAC 2003:06 method was used to determine the fat content. The sample was solidified by mixing it with anhydrous sodium sulphate (Na<sub>2</sub>SO<sub>4</sub>). About 5g of the sample was weighed onto a filter paper which was folded and inserted into an extraction thimble. The thimble was covered with fat-free cotton wool and inserted into the Soxhlet apparatus. Petroleum ether was poured

into the Soxhlet flask until it was half-full. The set up was then arranged after which the heater and tap were turned on. The fat was extracted for six hours. After the extraction, the set up was disabled and the petroleum ether was made to evaporate at 40°C -60°C on a water bath. The flask containing the fat was put into an oven and heated for about 30 minutes. It was then cooled in a desiccator and weighed.

Calculation:

$$\% \text{Fat} = \frac{(\text{weight of flask + fat extract}) - (\text{weight of empty flask})}{\text{Weight of the sample taken}} \times 100$$

Weight of the sample taken

#### **3.6.4.4 Ash determination**

The ash content of the sample was determined by employing the ISO 17025:2005 method. A crucible was conditioned in a furnace at 550°C for one hour. The crucible was then cooled in a desiccator for 30 minutes and then quickly weighed to the nearest 0.1mg. About 3g of the sample (well mixed), was weighed into the crucible to the nearest 0.1mg. The weighed sample was then evaporated on a hot plate at 100°C until it was dry. The evaporated sample was then heated in a furnace at 550°C for one hour. It was removed and cooled in a desiccator for about 30 minutes. The crucible with the ash was re-weighed.

#### **3.6.4.5 Carbohydrate and caloric load content determination**

The carbohydrate content was determined by subtracting the sum of protein, ash, fat and moisture content from 100 in a method described as the differential method.

By using the Atwater factor for each energy-yielding nutrient, the total caloric/energy content of each sample was determined. Fat, carbohydrate and protein yield 9kcal/g, 4kcal/g and 4kcal/g respectively.

### **3.7 Quality control**

To improve content and reliability, the interview guide for SSB manufacturers was pre-tested on representatives from three companies with similar characteristics but not included in the study. Similarly, the questionnaire for SSB consumers was also pre-tested on 10 consumers at a location different from the study location. Pre-test samples were not included in the analysis. Research assistants were part of the pre-test and review of the questionnaire which was used in the data collection. Questionnaires were given unique identification numbers to improve traceability. At the close of daily data collection session, each consumer response was thoroughly cross-checked by an independent person for errors.

Measuring equipment used for laboratory analysis was calibrated before the commencement of each procedure. Validated procedures by AOAC and ISO were used for the analysis which was performed in duplicate.

### **3.8 Data analyses**

The in-depth interviews were audio-recorded and transcribed verbatim into word and then verified with the audio recording. The transcripts were imported into NVivo11, a qualitative analysis software. The five constructs: change valence, change commitment, change efficacy,

resource availability and task knowledge, were used as *a priori* themes to guide in coding the transcripts and summarised according to the themes.

Data from consumer survey was captured on ODK software and exported into Statistical Package for Social Sciences (SPSS), version 20.0 for analysis. The age of respondents was grouped was based on UN categorisation into young adulthood, middle adulthood, older adulthood and retirement (WHO, 1982). The older and retirement group were merged due to the small sample size. For nutrition label utilisation, after each of the five individual questions used to ascertain nutrition label use had been analysed, response options for three of the five questions were dichotomised into “users” of nutrition label information and “non-users” of nutrition label information. Specifically, response to the question of whether consumers read nutrition label information before the purchase was dichotomised as yes and no/not sure. Whilst responses to the questions on how often consumers consider nutrition label information before purchase and before drinking were dichotomised as often/usually/sometimes and rarely/never. A scoring system of one (1) was applied to “yes” and “often/usually/sometimes” and zero (0) to “no” or “rarely/never” with a composite score which ranged from 0 to 3. Respondents who scored 0 on all three questions were classified as “non-users” of nutrition labelling information whilst those who scored 1 on at least one of the use questions were classified as “users” nutrition labelling information.

In analyzing the respondent’s understanding of nutrition label information, for each correct answer, respondents were awarded one (1) and zero (0) for an incorrect answer. Total scores for each respondent was determined by adding each score to rate their level of understanding. The

minimum and maximum scores were 1 and 13, respectively. With a mean score of 7.44, respondents with scores below the mean were considered to have “low” nutrition label understanding and those who scored 7.44 and above were considered to have “high” nutrition label understanding.

Nutrition knowledge was scored as follows; a correct answer was awarded one (1) and zero (0) for an incorrect answer. The scores were added to determine the total level of nutrition knowledge of the respondent. The minimum and maximum scores were 1 and 19, respectively. With a mean score of 12.17, respondents who had scores below the mean were considered to have “low” nutrition knowledge and those with scores of 12.17 and above were considered to have “high” nutrition knowledge.

A two-point scale (1= agree or 2= disagree) was used to rate the respondent’s level of agreement to the perception statements. Affirmative responses were scored 1 otherwise, 0. With a composite score of 5 and a mean 3, respondents who scored  $\leq 2$  were classified to have negative perception whilst respondents who scored  $\geq 3$  were classified to have a positive perception.

Descriptive statistics were used to summarize the background characteristics of respondents in SSB consumer survey. Continuous variables were described as means and standard deviations whereas categorical variables were summarised into percentages and frequencies. Bivariate regression analysis was run to determine factors associated with consumer use and understanding of nutrition label information. Subsequently, a multivariate regression analysis was run after to determine factors that are related to consumer use or understanding of nutrition information.

Based on literature, factors such as gender, age, educational level, employment status, marital status, history of diet-related health conditions and nutrition knowledge were considered. A p-value of  $< 0.05$  was considered statistically significant. Data are described in tables, charts, and graphs.

## **CHAPTER FOUR**

### **4.0 RESULTS**

The study assessed the readiness of selected sugar-sweetened beverage (SSB) manufacturers for mandatory nutrition labelling, consumer understanding of nutrition labelling information and their perceptions about mandatory nutrition labelling in the Greater Accra region. Based on results from a consumer survey, the caloric load of commonly consumed beverages from the survey was also estimated. Below are the findings of the study.

#### **4.1 Readiness of selected local sugar-sweetened beverage industry for mandatory nutrition labelling**

This section presents results of in-depth interviews (IDI) carried out among 12 local sugar-sweetened beverage (SSB) companies in the Greater Accra Region to assess their readiness for mandatory nutrition labelling. The results are presented as narratives with quotes or responses to support the findings from the various respondents. This is made up of seven (7) subsections including company characteristics and the five (5) readiness constructs (Change valence, Task knowledge, Resource availability, Change commitment and Change efficacy).

##### **4.1.1 Company characteristics**

Out of 16 companies invited to participate in the study, 12 companies agreed to participate. All the respondents were individuals in a Management position at the respective companies. Six (6) of them were Quality Assurance Managers and the other six (6) were either General Manager, Sales and Marketing Manager, Production Manager or Packaging Manager. Eight (8) companies were multinational owned and four (4) were Ghanaian owned. Of the twelve (12) companies

interviewed, eleven (11) were large scale manufacturing company and one (1) medium scale manufacturing. Seven (7) companies produced only soft drinks (carbonated and non-carbonated) and five (5) produced both soft and energy drinks. Slightly more than half (7) of the companies were already providing nutrition information on at least one of their product labels.

#### **4.1.2 Readiness constructs (themes)**

##### **4.1.2.1 Change valence**

Change valence theme comprised of responses on the value the companies give to nutrition labelling information. From the interviews, some of the respondents when asked if their company had a nutrition policy which included nutrition labelling, indicated that, even though the regulations in Ghana did not require it (nutrition labelling) of them, it was their company's policy to include the nutritional labelling on their products. These practices, according to some of them, are governed by the policies of their mother companies. Other participants also said they did not have nutritional labelling policy because it was not a regulatory requirement. The responses below reveal these findings:

*“We have the policy to declare all the nutritional content on the product. Those products are guided by requirements and we prioritise them according to countries, and their regulatory requirements precede our policy so where the regulatory requirement does not make it mandatory, we will still go by our internal policy” (Respondent #2)*

*“The policy we have is to comply with all legal requirements so that if nutritional labelling is not required, we will have the leeway to decide whether we should do it or not” (Respondent #7 at an IDI)*

When asked whether it was a good idea to implement mandatory nutrition labelling policy on SSB, the respondents were of the view that it was a way of giving the consumer the information needed to make a choice. They stated that the consumer would get to know what they are consuming hence they can make an informed decision. Consumers will also be able to compare products to make a decision. The responses below give the reasons to support the above findings.

*“I think consumers who are more concerned about nutrition and their health will like to know what they should take. So at least when you have them on your label, they can at least differentiate and know what they will select...” (Respondent #8)*

*“I agree because I think that err, I think consumers need to know. For me, from my point of view, it makes a lot more sense if the consumer knows whether the beverage, what they are getting from the product that he/she is taking. On that basis, I think it’s fair for the consumer to know, so he can make an informed decision on what he is taking.” (Respondent #7)*

However, there was a respondent who thought that mandatory nutritional labelling was not a good idea and that it was going to be time-consuming and expensive This assertion is supported with the quotation beneath:

*“No it is not a good idea. It will add extra cost; it takes time. Because of the cost. You know for business the cost is everything.” (Respondent #12)*

#### **4.1.2.3 Task knowledge**

For task knowledge, interviewees were expected to demonstrate their awareness of the task demands in coming up with nutrition information on their products. The interviews discovered that some of the interviewees were aware of the effort, time and resources that will be needed to implement the mandatory nutrition labelling. They also knew what each work unit or department

was required to do if the policy was to be implemented. Some of the companies who were already implementing such policy stated that they knew what they had to do. They indicated that management had to make funds available for logistics, they had to analyse the products to know the amounts of nutrients present, design new labels and get them approved. These are supported by the ensuing responses:

*“We know what each of us will have to do to implement the policy, we know that Management must make funds available and then the quality department should have the standard and then know the sort of test that they are going to conduct and the sort of outcomes that they want to have.” (Respondent #10)*

*“We need to analyse over some time to make sure that we know the average nutrients of our products so that we can put the right information on the labels for the consumer. We also know that we need to...I mean to get money, approval for the new labels, we need to print and that is already an ongoing cost because we are already printing so we will probably just need time to use the labels that we have already printed but it’s an ongoing cost. (Respondent #6)*

Nonetheless, one respondent was of the view that they did not know what to do and did not know the effort needed to implement the policy since they had no experience. This assertion is backed by the following response:

*“No I do not know. We have no experience.” (Respondent #12)*

#### **4.1.2.4 Resource availability**

Resource availability theme contains responses to interviewees’ awareness of the resources available to the companies to declare nutrition information on their products. Findings of the interviews revealed that more than half of the respondents will require financial resources to

purchase new equipment and design new labels to implement a mandatory nutritional labelling policy. The rest of the respondents also said they already had the skill and expertise and already implemented the policy. This was expressed in the quotes below:

*“So in implementing mandatory nutritional labelling policy, you know you would require certain resources. And these resources are, financial resources, you might need certain basic equipment for you to be able to meet that particular policy because you will need to communicate certain information. You need some test equipment to do that; you might need to get other equipment, manufacturing, processes; in terms of applying the label that is communicating that information” (Respondent #9 at an IDI)*

*“Yes...with the resources, as I said, if this thing is implemented, we will need money to do a whole lot of let’s say product formulations err...labeling if it comes to the package, you have to be changing your labels.” (Respondent #2)*

*“We have the resources to implement this policy, yes. We also have the skills and expertise to implement this policy.” (Respondent #10)*

However, there was a respondent who believed they did not have the experience and the resources at all to implement the mandatory nutritional labelling policy. This is what was said to support the above findings.

*“We do not have the experience and resources at all.” (Respondent #12)*

Respondents were asked if they would need time to implement mandatory nutrition labelling policy. Findings of the interview indicated that several respondents would need time to implement such a policy. Some of the reasons given were that they may have old labels which they would have to exhaust and would also need approvals for logistics to produce new ones.

The above findings are supported by the responses below:

*“Well we, it is a new thing that, if it is made mandatory, we will definitely, it is not something that we can start today as soon as the legislation is passed. We will have a stock of old labels, we will need certain approvals, the approvals do not come immediately, it has to go through processes. We have to create new labels; we may have to make changes to processes and systems in place so it will require some amount of time. I cannot determine how much time it will take but it is not something that can be done overnight.” (Respondent #6)*

*“We will need time to implement policy, from understanding what the requirements are and putting in place the needed you to know, erm, facility, equipment and any other thing to be able to comply. It will take time, it will take a lot of effort, it is going to take a lot of money and you need time to be able to be compliant. It is a good thing but it will take time implementing it if you think about finishing up this current packaging material.” (Respondent #9)*

Nonetheless, other respondents stated that they did not need time to implement mandatory nutrition labelling policy. Some of the responses are indicated in the ensuing quotes:

*“No, we do not need time because we are already in it.” (Respondent #10)*

*“We do not need a lot of time.” (Respondent #8)*

#### **4.1.2.5 Change commitment**

This theme contains respondents’ views on Management’s joint decision to follow the causes of action needed to implement the change. Results from the interview indicated definite responses to the fact that Management was already committed since it was company policy. Others also stated that, Management would be committed once it was a company policy or once it was enforced in the country. These are some of the responses given by interviewees:

*“Yes, we do not have an option because it is part of our company’s policies.” (Respondent #10)*

*“Yes. Because management is committed to our Quality Management System so anything that comes from a quality perspective or regulatory perspective that is not negotiable Management will support it.” (Respondent #7)*

*“Well, Management is committed to whatever is mandatory. If it is mandatory, we cannot sell our products without doing it, we want to make money so we will be committed to it. There is no question about that and I do not think it is something that management will resist, given the option Management will not resist it, it is not going to make much difference with what we already do.” (Respondent #6)*

On the contrary, one respondent did not think that Management would be committed to implementing mandatory nutrition labelling.

The respondents were also asked if Management would be motivated to implement mandatory nutrition labelling. Some respondents believed that Management would feel motivated if they get some form of subsidy from the government or some form of support in addition to making them aware of the benefits associated with the policy. Other respondents also stated that declaring nutritional information on labels may be an add-on to their consumer education and marketing promotions. This, according to them would serve as motivation for Management since they would be able to sell more. The finding above is supported by the following quotes:

*“That one will come from the regulatory bodies and the government at least subsidising some things. When the government comes in, the agents come in to support the industry to put things in place it helps Management not to feel left alone to do everything. They have the support and will be glad to do further”. (Respondent #8)*

*“It is the law and we can also if the information is good if the nutritional information is good, it is a selling point. It is a selling point for the company; we can add it to our consumer education, our promotions and make it a good selling point.” (Respondent #6)*

However, for respondent #12, Management will not be motivated to implement the mandatory nutritional labelling due to lack of human resource and capital.

*“We do not have enough human resource and capital.” (Respondent #12)*

#### **4.1.2.6 Change efficacy**

Change efficacy theme covered responses on an organisation’s common beliefs in their members’ joint competences to organise and execute the actions entailed in the change implementation. When respondents were asked if their companies could maintain drive in implementing mandatory nutritional labelling policy, participants responded positively. They pointed out that they could maintain the drive once there was stakeholder engagement. When policymakers make Management understand the benefit of implementing the policy, they would provide the needed support. Interviewees stated that there will be determined when the majority are in support of the policy.

*“It is something that we do; we are committed to obeying the law. We are committed to making sure that we keep the charge of all mandatory requirements and implement them to the fullest. So we will get the drive, it would not be a problem at all, it is something that we already do.” (Respondent #6)*

*“If management is made to understand the benefits of some of these things it also gives them to zeal to go further and implement the policy and make others learn or follow up as well.” (Respondent #8)*

*“...if the majority are in support then you know that the drive is there.” (Respondent #2)*

Respondents were asked whether they perceived any challenges or had encountered any challenges in generating nutrition label information. Some did not foresee any challenges and others had resolved those challenges because they were already implementing nutrition labelling policy. Some of these views are reflected in the responses below:

*“We will be committed to making sure that it works so we will handle whatever challenges that come up but I don’t foresee any challenges.” (Respondent #1)*

*“Policy already implemented and most of these problems have been resolved.” (Respondent #11)*

*“Well, definitely there will be challenges, but I cannot say that it will be impossible just that it will take more time and money than we think” (Respondent #12)*

#### **4.1.2.7 Impact and opportunities**

Interviewees were asked a few questions on situational factors that may influence the change. Largely, there was a consensus among respondents that the impact of mandatory nutrition labelling on consumers will be positive especially companies who are already implementing it.

*“Well, so far we have not had any negative impact, so we are keeping it, so it is positive.” (Respondent #4)*

*“Now the consumers are informed consumers and most of them pick products, they want to check what they are about to take because of issues of allergies and the rest. The labelling helps them to make informed choices. For nutrition, somebody for instance who is on diet will be*

*watching out for the energy level in your products so it becomes useful to them.” (Respondent #1)*

However, respondent #12 was of the view that though the consumers may be happy to have the nutritional labelling, they may not be able to understand the information.

*“Of course there will be an impact; they will be happy to know. But the point is that basically, I think our consumer is the mass, basically the poor people. I don’t think they will understand. The majority will not understand.” (Respondent #12)*

Respondents were asked whether they perceived any opportunities in declaring nutrition label information on their products. To this, some stated that it would be an opportunity to make consumers aware of quantities of nutrients in the product though some health-conscious consumers may stop consuming the product. In that case, the industry may lose some revenue. However, there would be an opportunity to produce healthier options. Others were also of the view that it would allow them to make their consumers aware that their product is a healthier option. These findings are supported by the responses below:

*“So there is an opportunity and then there is a risk. The risk is that here, at the moment what you know is there is sugar but you do not know the content of sugar in it right? So somebody conscious about sugar, once you put in they will say ah this the amount of sugar that I am taking, I will not take it again. You might lose...or will come back for me to reduce it. Plus, if I have to reduce it, and I can reduce it and still keep it will even save me the cost, after all, I just have to reduce and not change the price. So, there is opportunity and risk but for me, the opportunities outweigh the risk.” (Respondent #7)*

*“Not much, maybe it will help us to sell more, make more money. But then the activities, I do not think much will change, we will just be adding a few things or adding a few lines to what we are already doing in terms of regulation.” (Respondent #6)*

*“Consumers will know our business gives them the healthier option” (Respondent #11)*

However, respondent #12 perceived difficulties in implementing the policy though they knew it is good.

*“I know it may be something good but overall I just think it may be difficult for us to implement”*

*“Mainly is the cost. The cost will be higher” (Respondent #12)*

When respondents were also asked whether they would be ready for mandatory nutrition labelling in five years, some respondents revealed that five years was rather too long for the implementation of mandatory nutrition labelling policy. Other respondents also indicated that they were ready and were waiting for policymakers. The following responses support the findings:

*“We are ready. We are just waiting for them to say, yeah all that we need is, if you are saying next year, I also put in the budget for next year and then next year, that is all.” (Respondent #3)*

*“Five years is a very long time; we can be ready in less than a year.” (Respondent #6)*

Contrary to this finding, a respondent indicated that they would not be ready in five years if there should be a policy on mandatory nutrition labelling.

*“No, we will not be ready in five years.” (Respondent #12)*

## 4.2 Consumers' use and understanding of nutrition information on SSB

### 4.2.1 Background characteristics of SSB consumers

Table 4.2 shows the background characteristics of the consumers interviewed. A total of 422 respondents were recruited from six supermarkets located within six shopping malls in the Greater Accra Region (GAR) through face to face interviews. Of the total respondents recruited, data from 99% of respondents, was included in the analysis. The respondents comprised slightly more females (51.7%) than males (48.3%) with an average age of  $29.5 \pm 10.1$  years for all respondents (age range 18 -68 years). Respondents were mostly young and middle adults (90%), and 74% did not have any children under 18 years of age. About 73.7% of respondents had received tertiary education and 87.4% were employed. More than half received an average monthly income of GH¢ 500 and above.

**Table 4.2: Background characteristics of study respondents (N=416)**

<b>Characteristic</b>	<b>n (%)</b>
<b>Gender</b>	
Male	201 (48.3)
Female	215 (51.7)
<b>Age Group<sup>1</sup> (yrs) (N=413)</b>	<b>29.5 ± 10.1</b>
≤24	156 (37.8)
25-44	215 (52.1)
≥45	42 (10.2)
<b>Ethnicity (n=414)</b>	
Akan	200 (48.3)
Ewe	84 (20.3)
Ga/Adangbe	81 (19.6)
Others <sup>2</sup>	49 (11.8)
<b>Marital Status(N=415)</b>	
Married	127 (30.6)
Unmarried <sup>3</sup>	288 (69.4)

Age group<sup>1</sup> was based on UN categorisation into young adulthood, middle adulthood, older adulthood and retirement. Older adulthood and retirement were merged due to the few numbers of respondents in the retirement group; Others<sup>2</sup> represents Northern, Guan and Mixed (half Ghanaian).

**Table 4.2 cont'd: Background characteristics of study respondents (N=416)**

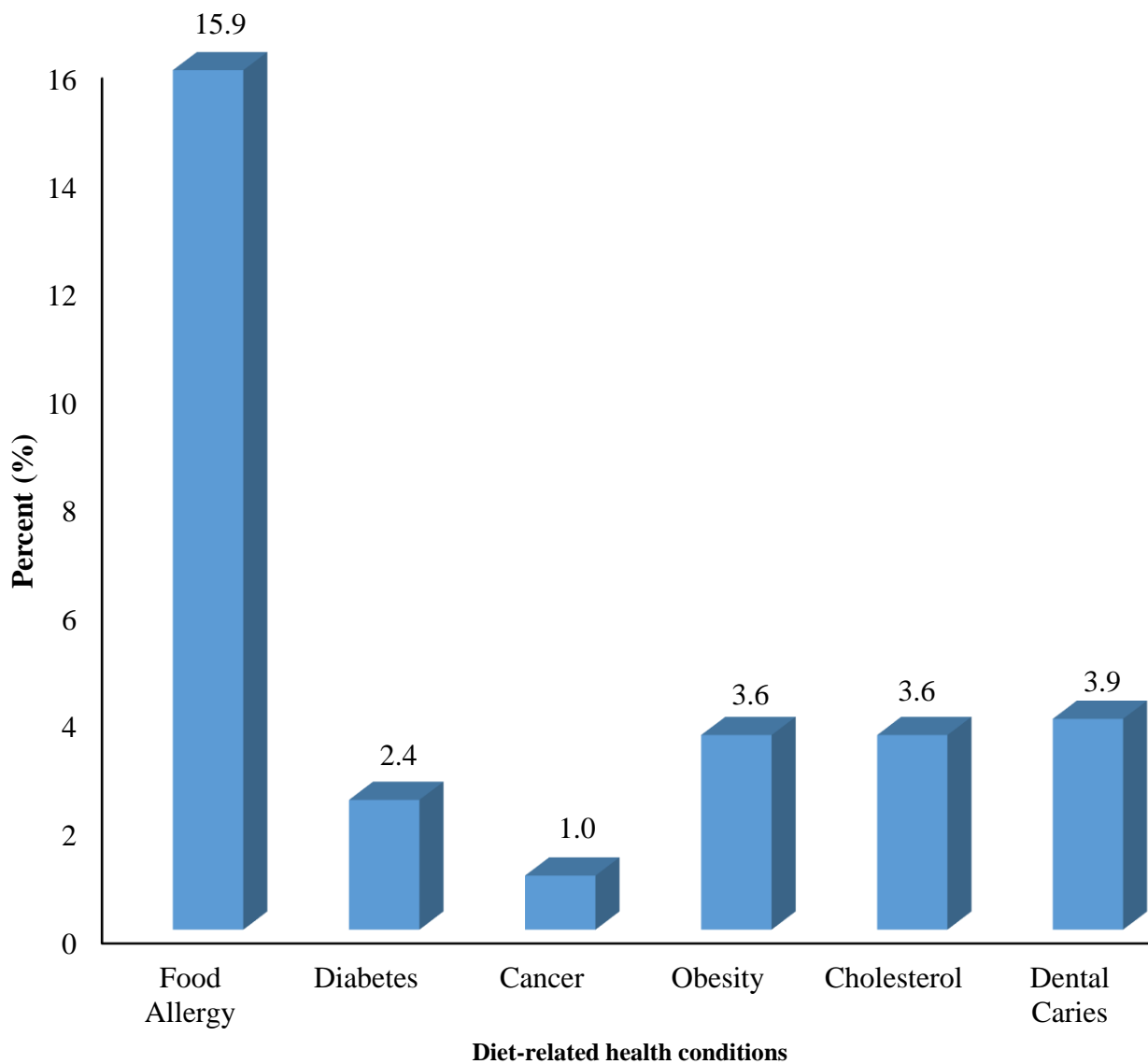
<b>Characteristic</b>	<b>n (%)</b>
<b>Have children under 18yrs</b>	
Yes	108 (26)
No	308 (74)
<b>Educational level(N=415)</b>	
≤ JHS**	16 (3.9)
SHS*/Vocational/Technical	93 (22.4)
Tertiary <sup>4</sup>	306 (73.7)
<b>Employment Status (N=412)</b>	
Employed <sup>5</sup>	362 (87.4)
Unemployed <sup>6</sup>	52 (12.6)
<b>Income Group (GH¢) (N=319)</b>	
≤500	103 (32.3)
501 to1500	117 (36.7)
≥1501	99 (31.0)
<b>Special Diet</b>	
Yes	34 (8.2)
No/Not Sure	382 (91.8)
<b>Family Health History</b>	
Yes	48 (11.6)
No/Not Sure	367 (88.4)

Unmarried<sup>3</sup> represents separated, divorced, single and widowed; Tertiary<sup>4</sup> represents diploma, certificate, professional, degree and postgraduate; Employed<sup>5</sup> represents banking and finance, education, health, manufacturing, trading, farming and artisan; Unemployed<sup>6</sup> represents largely students, job seekers, housewife and retired. JHS\*\*means Junior High School, SHS\*means Senior High School.

#### **4.2.2 Diet-related health condition among respondents**

Some of the diet-related health conditions reported by respondents are presented in figure 4.1.

Food allergy was the common diet-related health condition reported by respondents and cancer was the least condition reported. Other conditions reported were dental caries (3.9%), cholesterol and obesity (3.6%) and diabetes (2.4%).

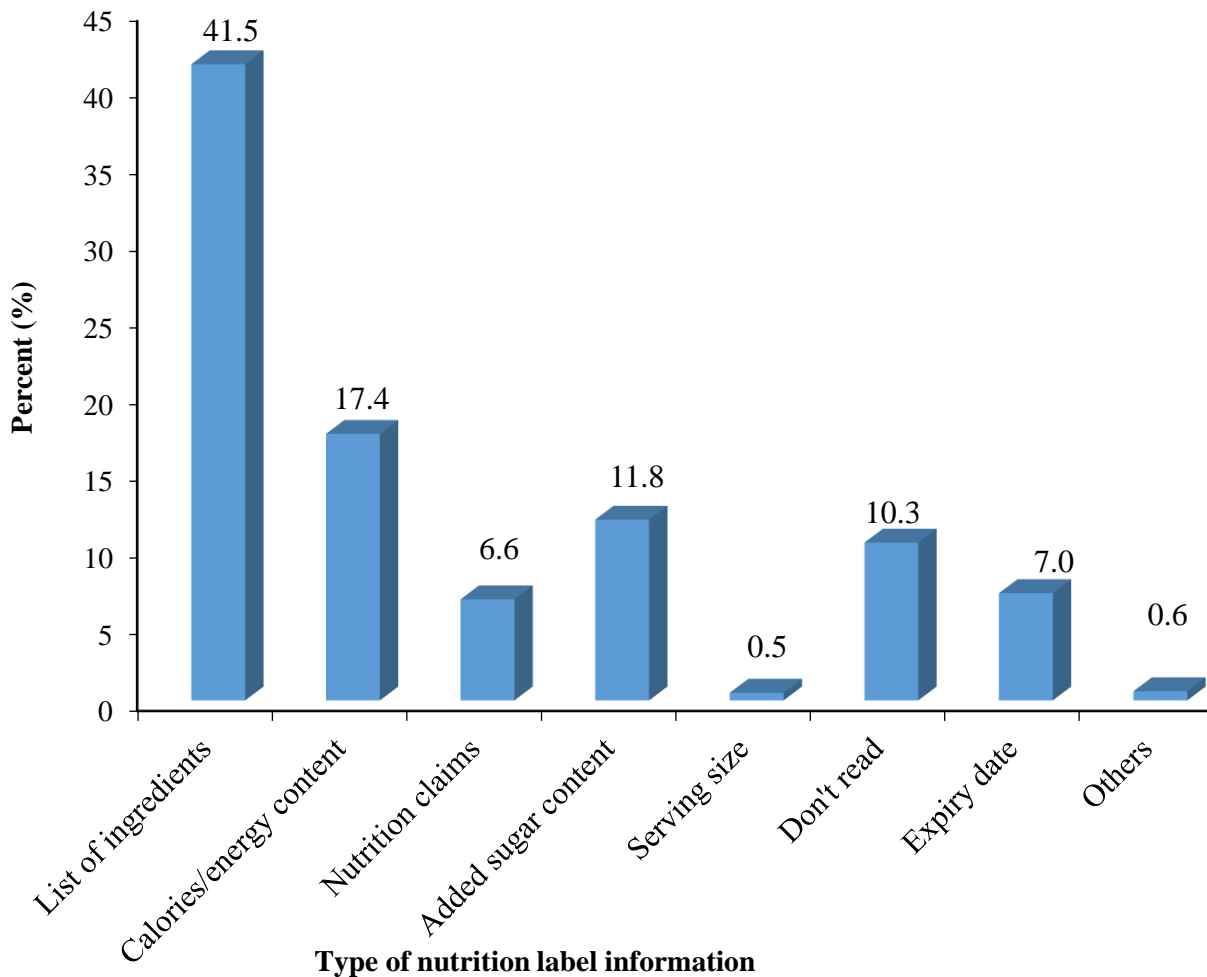


**Figure 4.1: Diet-related health condition reported by respondents**

#### **4.2.3 Consumers' use and understanding of nutrition label information**

Figure 4.2 describes the type of nutrition label information commonly used by the consumers in this study. The most important nutrition label information was the ingredient list (41.5%) and serving size (0.5%) was the least important information for the respondents. Other nutrition information which respondents considered important were caloric/energy content (17.4%),

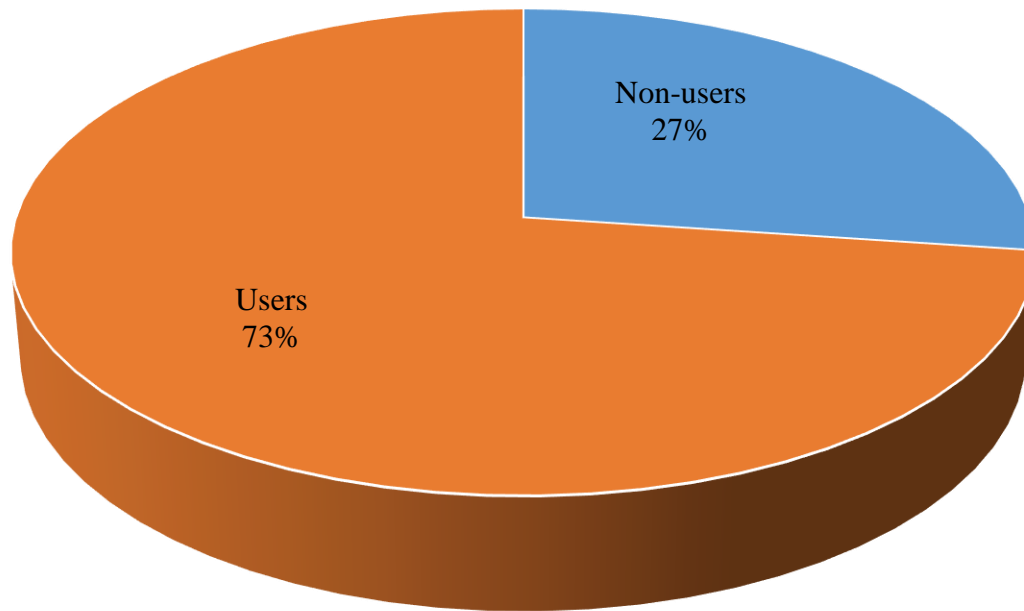
added-sugar content (11.8%) and nutrition claims (6.6%). However, 10.3% indicated they do not read at all while 7.0% checked products for expiry dates.



Others- allergy, freshness and weight of the product.

**Fig. 4.2: Nutrition label information which respondents considered as important**

Approximately 73% of the study population was considered as users of nutrition label information and 27% were non-users of nutrition label information.



**Figure 4.3: Consumers' overall use of nutrition label information**

Generally, respondents' understanding of nutrition labelling terms were low. More than half 55.7% were not sure of the meaning of Daily Value (DV) and 57.2% were not sure of the meaning of % DV. Likewise, 54.9% could not explain Guideline Daily Amount (GDA) and majority 63% (n=262) could not complete the sentence on what GDA specifies. Less than half of the respondents (42.9%) correctly answered the question on the meaning of serving size though 40.5% of respondents were not sure. Respondents correctly answered questions on the meaning

of nutrition label claims “high” (47.2%) and “low” (50%). Table 4.3 shows consumers’ understanding of nutrition label terms.

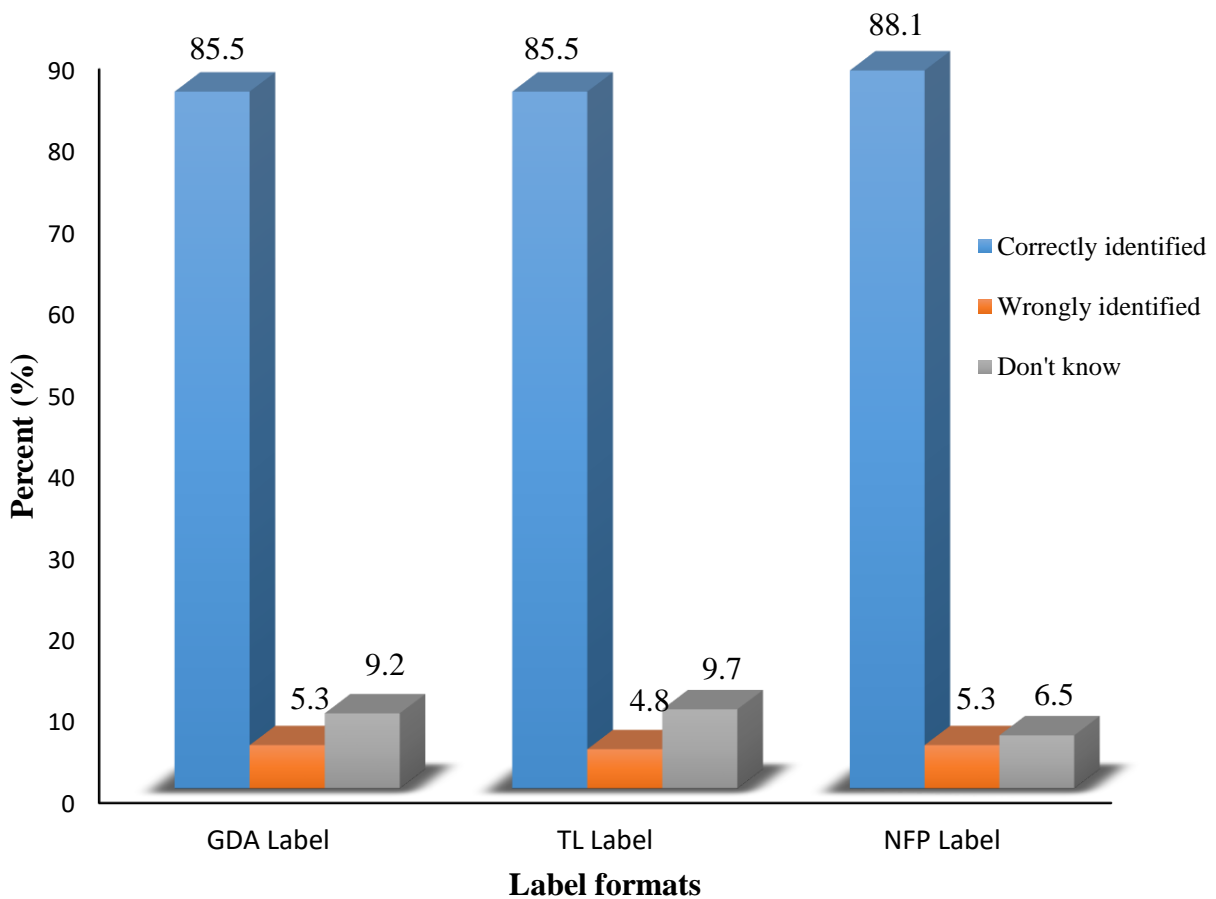
**Table 4.3: Consumers’ understanding of technical terms on nutrition labels.**

<b>Nutrition label term</b>	<b>n (%)</b>
Daily Value (DV)	
Correct	103 (24.8)
Incorrect	81 (19.5)
Not sure	231 (55.7)
% Daily Value	
Correct	156 (37.5%)
Incorrect	22 (5.3)
Not sure	238 (57.2)
Guideline Daily Amount (GDA)	
Correct	94 (22.7)
Incorrect	93 (22.4)
Not sure	228 (54.9)
GDA indication	
Correct	99 (23.8)
Incorrect	55 (13.2)
Not sure	262 (63)
Serving size	
Correct	178 (42.9)
Incorrect	69 (16.6)
Not sure	168 (40.5)
"High" nutrient claim	
Correct	195 (47.2)
Incorrect	18 (4.4)
Not sure	200 (48.4)
"Low" nutrient claim	
Correct	208 (50)
Incorrect	17 (4.1)
Not sure	191 (45.9)

Percentage of respondents who provided the correct response is shown in the boldfaced font

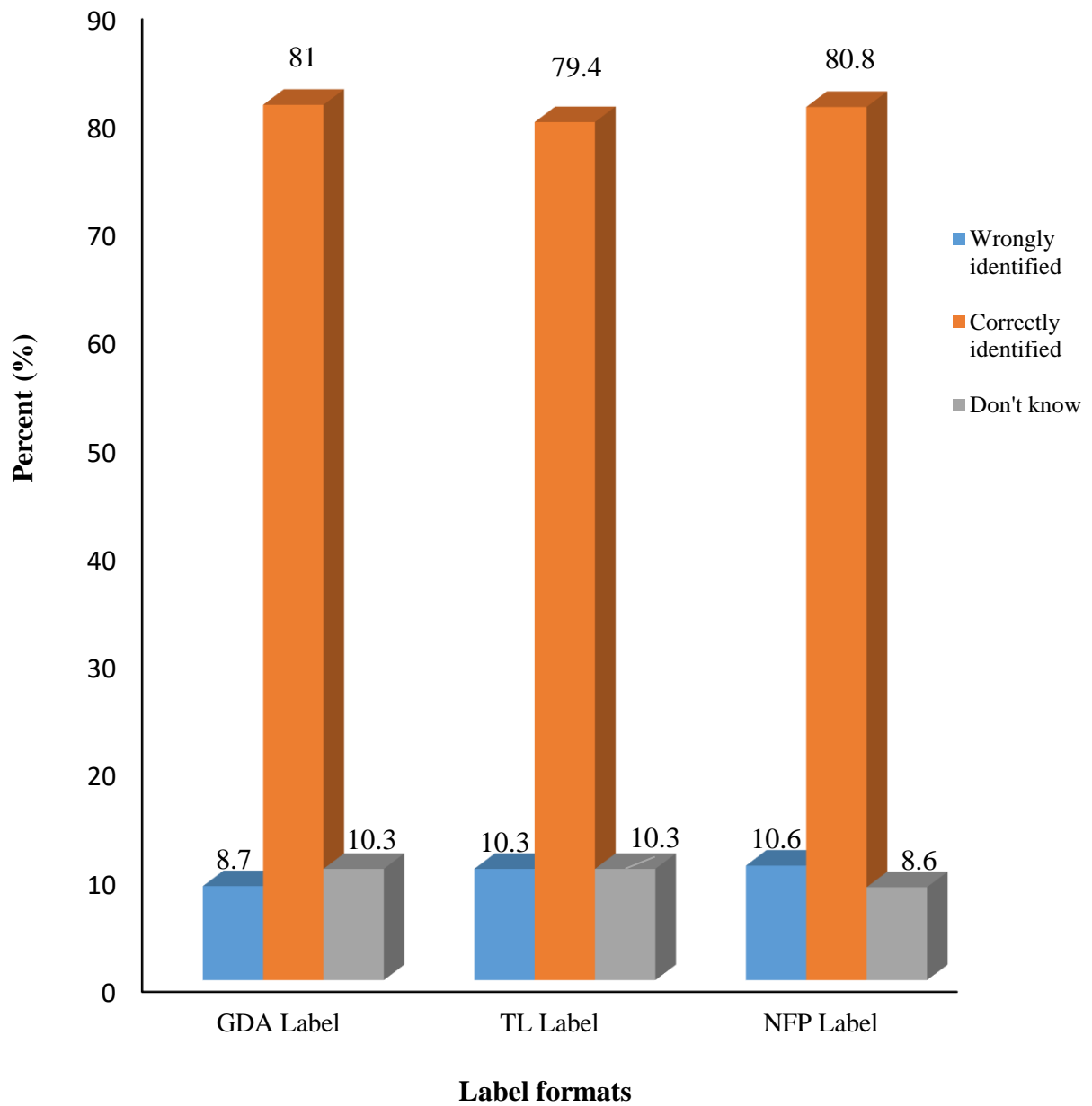
#### 4.2.3.1 Consumer understanding of different formats of nutrition labels

Results for consumer understanding of different label formats are presented in figure 4.4 and figure 4.5. A few (11%) of respondents were unable to select the correct label when two questions were asked to assess their understanding of nutrition labels (based on three label formats). Fig. 4.6: illustrates consumers' overall understanding of nutrition label information. The general understanding of nutrition label information was moderate (32%) to high (27%).



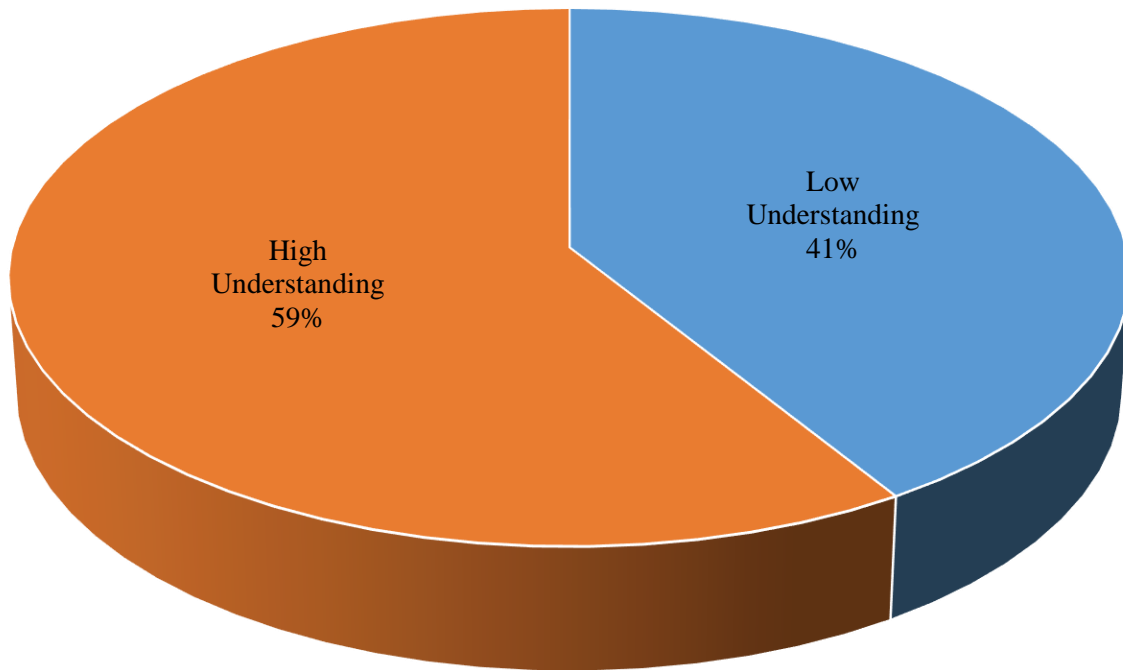
GDA Label- guideline daily amount label TL Label- traffic light label NFP Label-nutrition facts label

**Fig. 4.4: Consumers' response to the product with higher sugar content based on 3 label formats**



GDA Label- guideline daily amount label TL Label- traffic light label NFP Label-nutrition facts label

**Fig. 4.5: Consumers' response to the healthiness of a product based on 3 label formats**

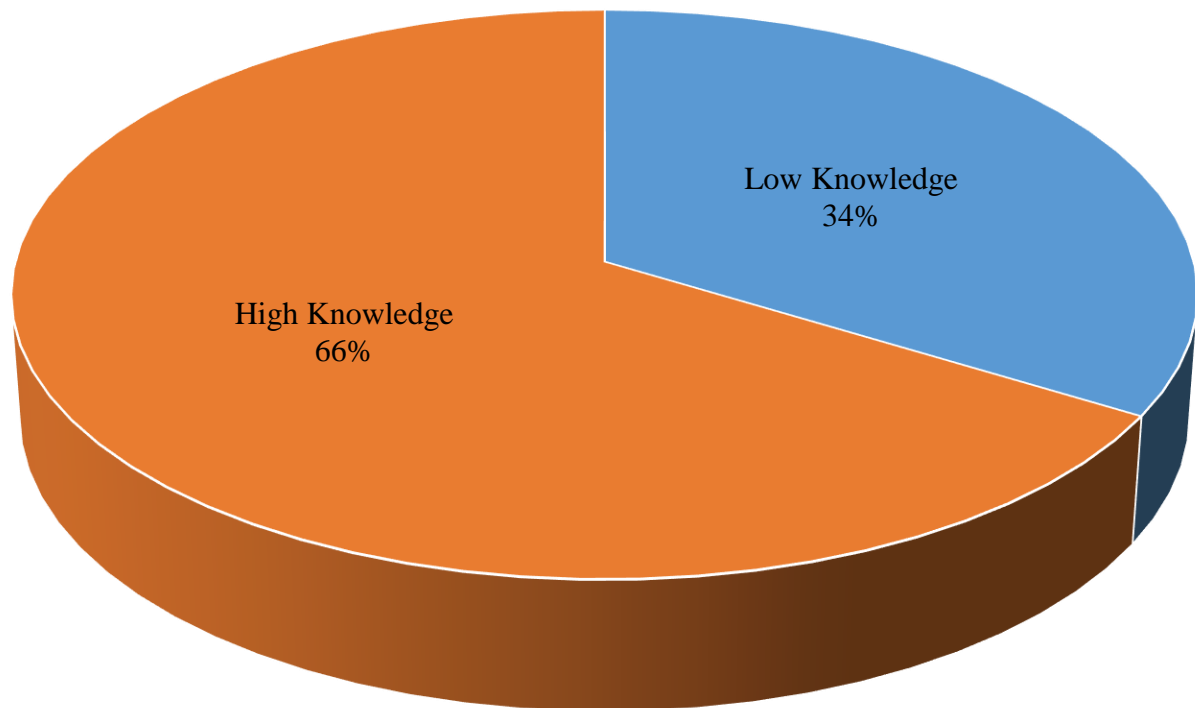


**Fig. 4.6: Consumers' overall understanding of nutrition label information**

### **4.3 Assessment of consumers' nutrition knowledge**

To assess respondents' nutrition knowledge, some questions were asked, including their awareness of health problems associated with the consumption of certain nutrients. The results indicate that majority of respondents (86.8%) were aware that SSB was a contributor of added sugar and was associated with health problems (87%). Almost two-thirds of respondents (65%) were aware of health problems related to calories and a large number of the respondents (78%) were also aware of health experts' recommendation to reduce consumption of sugary drinks. Respondents awareness of health experts' recommendation on which drink to consume more was inquired. Almost all the respondents (97%) were aware of health experts' recommendation to drink more water. However, most respondents (72%) perceived brown sugar to be a healthy alternative to white sugar.

The overall nutrition knowledge of the study respondents is illustrated in figure 4.7. More than half of the respondents (66%) had a high level of nutrition knowledge and 34% had a low level of nutrition knowledge.



**Fig. 4.7: Consumers' overall nutrition knowledge**

#### **4.4 Factors associated with consumers' understanding and use of nutrition label information**

Factors associated with consumers' use and understanding of nutrition label are represented in Tables 4.4 and 4.5, respectively. Table 4.4 describes the factors associated with consumer use of nutrition label in unadjusted and adjusted regression models. Apart from respondents' nutrition

knowledge, (OR, 0.59; 95% CI, 0.67-1.97;  $p=0.021$ ) none of the other factors showed any association with respondents' use of nutrition label information in an unadjusted model. Nutrition knowledge (AOR, 0.58; 95% CI, 0.37-0.92;  $p=0.020$ ) was confirmed to be associated with the use of nutrition information among study respondents in an adjusted regression model which controlled for gender, age, educational level, employment status, and history of diet-related health conditions. Respondents with low nutrition knowledge were 42% less likely to use nutrition label compared to respondents with high nutrition knowledge.

**Table 4.4: Factors associated with consumer use of nutrition labels in unadjusted and adjusted models (n=416)**

Variable	Unadjusted			Adjusted		
	OR	95% CI	<i>p</i> -value	AOR	95% CI	<i>p</i> -value
<b>Gender</b>						
Male	1.08	(0.7, 1.67)	0.724	0.97	(0.62, 1.52)	0.901
Female	1					
<b>Age Group (y)</b>						
≤ 24	0.96	(0.45, 2.03)	0.908	1.05	(0.47, 2.36)	0.896
≥ 25 to 44	1.16	(0.56, 2.43)	0.687	1.12	(0.52, 2.42)	0.780
≥ 45	1					
<b>Educational Level<sup>1</sup></b>						
<SHS/Voc/Tech	0.61	(0.22, 1.72)	0.351	0.62	(0.22, 1.79)	0.382
≥SHS/Voc/Tech	1					
<b>Marital Status</b>						
Married	0.87	(0.55, 1.39)	0.563	-	-	-
Unmarried	1					
<b>Employment Status</b>						
Employed	0.6	(0.33, 1.11)	0.102	0.61	(0.31, 1.19)	0.146
Unemployed	1					
<b>Income Group (GH¢)</b>						
≤ 500	1.15	(0.67, 1.97)	0.623	-	-	-
> 500	1					
<b>Special Diet Status</b>						
Yes	1.23	(0.54, 2.81)	0.62	-	-	-
No/Not Sure	1					
<b>History of Diet- Related health condition</b>						
Yes	0.8	(0.42, 1.54)	0.506	0.65	(0.32, 1.28)	0.208
No/Not Sure	1					
<b>Nutrition Knowledge</b>						
Low Knowledge	0.59	(0.38, 0.92)	0.021*	0.58	(0.37, 0.92)	0.020*
High Knowledge	1					

Reference category 1.0; \*significant at  $p \leq 0.05$ , Educational level<sup>1</sup>- Senior High School/Vocational/Technical; Income group (n=319) OR=unadjusted odds ratio; AOR-adjusted odds ratio

Respondents' educational level (OR, 0.22, 95% CI, 0.07-0.69;  $p=0.009$ ), employment status (OR, 0.55; 95% CI, 0.31-0.98;  $p=0.043$ ) and nutrition knowledge (OR, 0.39; 95% CI, 0.25-0.59;  $p<0.001$ ) were found to be individually associated with their understanding of nutrition label information in an unadjusted regression model. Respondents with educational levels below SHS/Vocational/Technical were 78% less likely to understand nutrition label information compared to respondents whose educational levels were SHS/Vocational/Technical and above. Similarly, unemployed respondents were 45% less likely to understand nutrition labels compared to employed respondents and respondents with low knowledge in nutrition were 61% less likely to understand nutrition label information compared to respondents who had higher nutrition knowledge.

After controlling for age group, gender, special diet status, employment status, educational level (AOR, 0.21; 95% CI, 0.06-0.70;  $p=0.011$ ), marital status (AOR, 0.51; 95% CI 0.29- 0.88;  $p = 0.016$ ) and nutrition knowledge (AOR, 0.39; 95% CI, 0.26-0.61,  $p<0.001$ ) were observed to be associated with respondents' understanding of nutrition label information. Respondents with low education levels were 79% less likely to understand nutrition label information compared to respondents with high educational levels, respondents who were married were 49% less likely to understand nutrition label information compared with respondents who were unmarried and respondents with low nutrition knowledge were 61% less likely to understand nutrition label information compared to respondents with high nutrition knowledge. Table 4.5 describes factors associated with consumer understanding of nutrition label information in unadjusted and adjusted models.

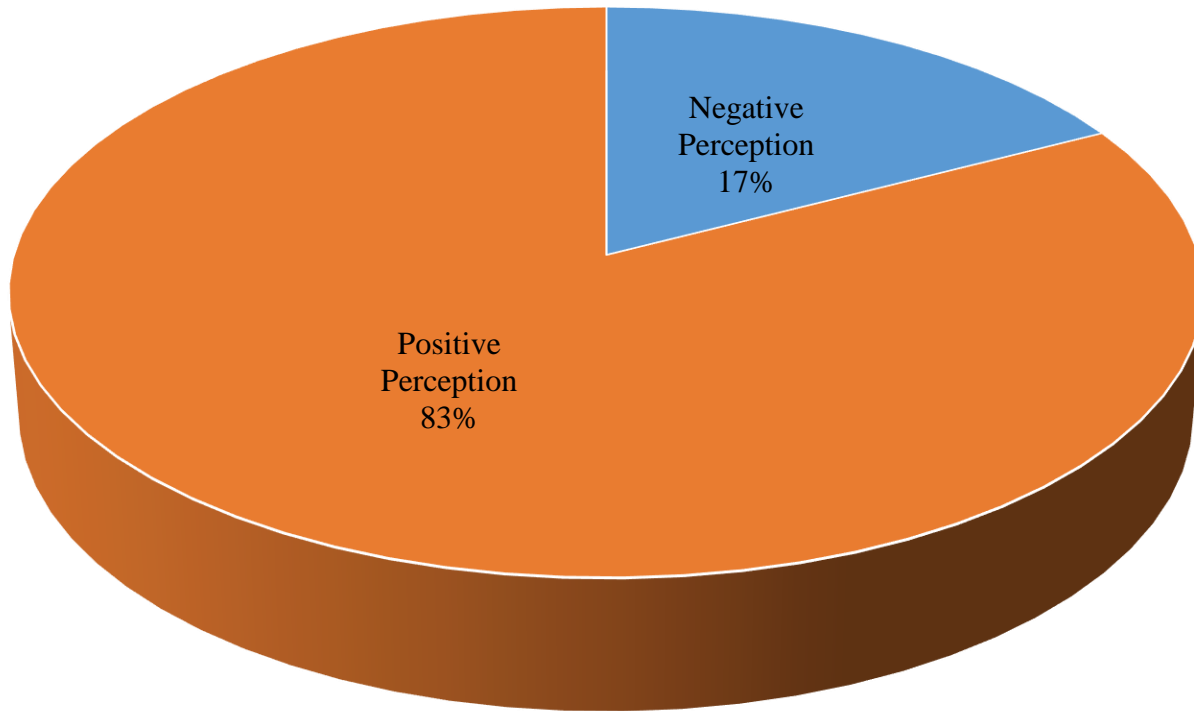
**Table 4.5: Factors associated with consumer understanding of nutrition labels in unadjusted and adjusted models (n=416)**

Variable	Unadjusted			Adjusted		
	OR	95% CI	<i>p</i> -value	AOR	95% CI	<i>p</i> -value
<b>Gender</b>						
Male	0.87	(0.59, 1.29)	0.501	0.76	(0.49, 1.15)	0.193
Female	1					
<b>Age Group (y)</b>						
≤24	0.92	(0.46, 1.83)	0.816	0.59	(0.24, 1.46)	0.256
≥25 to 44	1.24	(0.64, 2.43)	0.528	0.88	(0.41, 1.90)	0.742
≥45	1					
<b>Educational Level</b>						
<SHS/Voc/Tech	0.22	(0.07, 0.69)	0.009*	0.21	(0.06, 0.70)	0.011*
≥SHS/Voc/Tech	1					
<b>Marital Status</b>						
Married	0.76	(0.50, 1.15)	0.196	0.51	(0.29, 0.88)	0.016*
Unmarried	1					
<b>Employment Status</b>						
Employed	0.55	(0.31, 0.98)	0.043*	0.52	(0.27, 1.01)	0.052
Unemployed	1					
<b>Income Group (GH¢)</b>						
≤500	0.84	(0.52, 1.35)	0.467	-	-	-
>500	1					
<b>Special Diet Status</b>						
Yes	2.05	(0.93, 4.50)	0.075	1.80	(0.78, 4.12)	0.167
No/Not Sure	1					
<b>History of Diet- Related health condition</b>						
Yes	1.19	(0.64, 2.22)	0.580	-	-	-
No/Not Sure	1					
<b>Nutrition Knowledge</b>						
Low Knowledge	0.39	(0.25, 0.59)	<0.001*	0.39	(0.26, 0.61)	<0.001*
High Knowledge						

Reference category 1.0; \*significant at  $p \leq 0.05$ , Educational level<sup>1</sup>- Senior High School/Vocational/Technical; Income group (n=319) OR=unadjusted odds ratio; AOR-adjusted odds ratio

#### 4.5 Assessment of consumers' perception of mandatory nutrition labelling of sugar-sweetened beverage

Consumers' perception of mandatory nutrition labelling is described in Table 4.6. Generally, the respondents responded in affirmative to questions to assess consumers' perception of mandatory nutrition labelling.



**Figure 4.8: Consumers' overall perception about mandatory nutrition labelling**

#### **4.6 Caloric load of selected commonly consumed local sugar-sweetened beverage**

Table 4.10 represents results on the caloric load of the five most consumed SSB based on responses from a consumer survey. Since these products are brand names and we want to respect their confidentiality, the products are coded as indicated in the table. All the SSBs sampled and analysed were carbonated soft drinks. The results showed that the caloric load of the samples ranged from  $0.82 \pm 0.006$  kcal/ml in SSB5 to  $55.10 \pm 0.590$  kcal/ml in SSB1.

**Table 4.6: The caloric load of five commonly consumed SSB (based on a consumer survey)**

<b>Sample</b>	<b>Moisture %</b>	<b>Fat (g/ml)</b>	<b>Ash content (%)</b>	<b>Protein (g/ml)</b>	<b>Carbohydrate (g/ml)</b>	<b>Energy (kcal/ml)</b>
<b>Code</b>	<b>Mean±SD</b>	<b>Mean±SD</b>	<b>Mean±SD</b>	<b>Mean±SD</b>	<b>Mean±SD</b>	<b>Mean±SD</b>
SSB1	86.17±0.150	0.15±0.030	0.24±0.030	0.65±0.040	12.80±0.170	55.10±0.590
SSB2	91.23±0.300	Undetected	0.05±0.010	Undetected	8.71±0.300	34.80±1.220
SSB3	86.38±0.080	0.10±0.020	0.22±0.020	0.34±0.060	13.20±0.020	54.90±0.330
SSB4	90.59±0.420	Undetected	0.08±0.010	Undetected	9.33±0.410	37.30±1.640
SSB5	99.79±0.001	Undetected	0.002±0.001	Undetected	0.21±0.001	0.82±0.006

SSB1 and SSB3 were carbonated malted soft drinks; SSB2, SS4 and SSSB5 were flavoured carbonated soft drinks

## **CHAPTER FIVE**

### **5.0 DISCUSSION**

This study explored the readiness of selected SSB manufacturing companies for mandatory nutrition labelling. Consumers use and understanding of nutrition label information, as well as their perception about mandatory nutrition labelling, was also assessed in the study. Additionally, the caloric load of commonly consumed SSBs based on a consumer survey was estimated to determine the added sugar content in them. The findings from the interactions with industry and consumer surveys are discussed in the section below,

#### **5.1 Readiness of selected sugar-sweetened beverage industry for mandatory nutrition labelling**

Sugar-sweetened beverage companies in this study were of the view that mandatory nutrition labelling policy would be beneficial to consumers. This suggests that the industry valued the change. Wesana *et al.* (2018) study made a similar observation in Uganda, when stakeholders' readiness to adopt lean manufacturing to reduce waste and losses in the dairy sector was assessed. The stakeholders perceived benefits from lean manufacturing and were optimistic about adopting it as a means of reducing waste and losses along the value chain.

Additionally, the study found that Management of the industry would be committed to implementing the change, in line with Holt *et al.* (2007), who asserted leadership support influences change. However, SSB companies interviewed who were not providing nutrition information on their products indicated they would be committed to doing so only if it becomes a national policy. Mah *et al.* (2013) also reported similar findings in their study in Canada, where stakeholders in the restaurant industry would declare nutrition information on restaurant menu

only if it was a requirement. This may suggest stakeholders may be fully committed when nutrition labelling is a legislative requirement rather than being a voluntary requirement. Though commitment based on obligation may give some level of commitment, Weiner (2009) argues that commitment is highest when stakeholders have the intent to commit to the change than being obliged to commit to change. Therefore, stakeholder engagement could be a driver of the SSB industry's readiness for the implementation of mandatory nutrition labelling policy. Consultations between policymakers and stakeholders at various levels are essential throughout the development of the policy (Albert *et al.*, 2016) to instill a sense of ownership in stakeholders. Stakeholders may then be fully committed to the change implementation process.

Respondents of this study were optimistic about their ability to maintain the drive and overcome any challenges that may arise in the implementation process. Such observation promotes change efficacy based on the participants' believe in their collective capabilities (Shea *et al.*, 2014). This finding mimic Wesena *et al.* (2018) study which asserted an increase in efficacy due to collaboration along the dairy value chain as stakeholders share responsibility and information. The study indicated that this establishes sustainable commitment to the proposed change.

The study found unavailability of financial resource and lack of expertise as potential barriers to the industry's readiness for mandatory nutrition labelling, especially for the medium scale SSB company. This may be due to the initial cost of policy implementation such as the acquisition of basic equipment, cost of laboratory analyses and staff training. Training support and consultations with all related stakeholders should be encouraged for successful change implementation process (Arthur *et al.*, 2020).

## 5.2 Consumers' use and understanding of nutrition information on SSB

Findings of the study revealed that more than half (73%) of respondents were users of nutrition label information. This may be explained by their educational levels (where more than half had attained SHS/Vocational/Technical education) and age group (about 90% young and middle adults) of the study population. Educated individuals may have a high awareness of nutrition label information (Orozco *et al.*, 2016) and may frequently pay attention to nutrition labels when shopping. Individuals who are educated are interested in health issues (Kim *et al.*, 2014) and so may read nutrition label information. Educated people may also show concern by scrutinising items before purchase; perhaps to ensure they get value for money. Young adults may be concerned about nutrition label information to satisfy their curiosity (Affram & Darkwa, 2015).

These findings are consistent with other studies based on self-reported use of nutrition labels. A study conducted in Lagos Nigeria reported 61.8% of respondents who were mostly young, were highly aware and used nutrition labels during shopping (Danilola *et al.*, 2019). About 53.5% of respondents were either in tertiary institutions or had completed tertiary education. Affram and Darkwa (2015) study in the Volta Region of Ghana which included 89% of respondents with tertiary education also reported that 68% of respondents read food labels while shopping. Aryee *et al.* (2019) study conducted in the Tamale metropolis of Ghana found that 70.8% of the study population used nutrition label information during shopping. About 71.9% of the study population had attained tertiary education and were predominantly young and middle adults. Consumers who use nutrition label information when shopping consume a healthful diet since they follow healthy food selection and consumption patterns (Ni Mhurchu *et al.*, 2018; Kim *et al.*, 2014).

Nutrition information provided on the food label guides consumers to compare similar products to select the healthier option. Among the reasons given by respondents of the current study for reading nutrition label information were; “*for information*” and “*to know the content*” or “*know what I am taking in*”. These findings were aligned with an Italian study which indicated that the motivation driving consumers to use food labels was to obtain information and consider quality features before buying and consuming the product (Annunziata & Vecchio, 2012). Most of the respondents in this study read the information on the ingredient list (41.5%), calories (17.4%) and 11.8% read the information on added-sugar content. This observation reflects Ghana’s current food labelling regulations where the common nutrition information found on food labels is a list of ingredients when a manufacturer does not make a nutritional claim on the product. Similarly, a Nigerian study among adults in Lagos also reported that more than half of the study respondents utilised ingredient list (Olatona *et al.*, 2019). However, Aryee (2013) study among 403 adult shoppers in Accra Ghana found fat (16.4), sugar (16.1) and cholesterol information (13.7) to be the most important nutrition information used by study respondents. The caloric content of food observed as the second most important nutrition information used by the current study respondents could be an indication that respondents looked out for calories to reduce their caloric intake.

Some studies have reported that users of nutrition label information may have underlying health conditions that may require them to use the information (Miller *et al.*, 2015; Su *et al.*, 2015). Consumers who were overweight, on diet and were health-conscious were reported to be motivated to read nutrition label information (Christoph *et al.*, 2018); Grunert *et al.*, 2010). However, a small percentage of the current study respondents reported diet-related health

conditions. This was similar to a study conducted among Thai distance learning adults also reported frequent nutrition label use among respondents without high blood pressure nor high blood lipids (Rimpeekool *et al.*, 2017).

Findings of the study also showed that slightly more than half of the study respondents exhibited high (59%) overall understanding of nutrition labelling information. The high percentage of nutrition label users, the education level attained and the young age of the study population may play a role in the understanding of nutrition label information among study respondents (Campos *et al.*, 2011). Highly educated people benefit from nutrition information on food labels because, they are perceived to more informed and prepared to comprehend nutrition label information (Majid *et al.*, 2015).

Despite the high overall understanding of nutrition information, most of the study respondents lacked understanding of technical terms used on nutrition labels and this observation is quite worrying. Nutrition label terms such as daily value (DV), guideline daily amount (GDA) and % DV could not be explained by most of the respondents. A previous study conducted among predominantly middle adults (34-41years) and educated persons in India reported similar findings. The study found that respondents could not comprehend technical terms such as RDA, used on labels though they reported high use (82%) of label information for the first time (Singla, 2010). In a similar study among Ghanaian tertiary students, respondents indicated food label information was confusing and difficult to understand (Madilo *et al.*, 2020). Due to the labelling regulation currently enforced in Ghana, nutrition information declared by most food manufacturers may be limited to specific products and so respondents may not be familiar with

the technical terms used on nutrition labels. Familiarity improves the understanding of the nutrition information on labels (Liu *et al.*, 2015). There is also the notion that consumers in developing markets have a lesser understanding of nutrition label information (Aryee *et al.*, 2019). This concern may be valid because developed markets are far advanced in nutrition labelling regulations and are now discussing simplified front-of-pack nutrition labels (Egnell *et al.*, 2018). Developing markets on the other hand are just at the initial stages of the conversation (Oghojafor *et al.*, 2012).

Difficulty in understanding nutrition label information has resulted in underutilisation of nutrition labels among certain groups of consumers. Olatona *et al.* (2019) reported in their study conducted among adult shoppers in Lagos Nigeria that, respondents indicated too many technical terms and confusing information were part of the reasons for not using nutrition labels. Orozco *et al.*, (2016) also reported that the main reason why study respondents in the Chimborazo region of Ecuador did not read nutrition labels was lack of understanding. Furthermore, another study conducted among shoppers in Lebanon also revealed that respondents who reported difficulties in comprehending nutrition label information were not reading nutrition label information during shopping (Hassan &Dimassi 2017).

### **5.3 Factors associated with consumer use and understanding of nutrition label information**

The study also investigated consumer socio-demographic and other factors which influenced understanding and use of nutrition label information among the study population. For factors related to consumer use of nutrition labels, previous studies found associations between consumer background characteristics such as age (Christoph *et al.*, 2018; Rose *et al.* 2018;

Norazlanshah *et al.*, 2013), gender (Navarrete-Muñoz *et al.*, 2018; Cheah *et al.*, 2015), education (Nieto *et al.*, 2019; Kim *et al.*, 2014), income (Cannoosamy *et al.*, 2014; Kim *et al.*, 2014), employment status (Chea *et al.*, 2015), nutrition knowledge (Grunert *et al.*, 2010) and use of nutrition label information.

From the present study, logistic regression analyses proved nutrition knowledge (AOR, 0.58; 95% CI, 0.37-0.92;  $p=0.020$ ) as the only factor associated with the use of nutrition labels among study respondents. Respondents with low nutrition knowledge were 42% less likely to use nutrition label compared to respondents with high nutrition knowledge. Previous knowledge in nutrition may have influenced respondents to recall and comprehend nutrition label information (Miller & Cassady, 2015). It may be time for basic nutrition education to form part of formal and informal education to improve the use of nutrition labels among consumers. The finding is similar to that of Cooke & Papadaki (2014) study among UK university students which found nutrition knowledge and attitude to predict students' use of nutrition labels. However, a former study by Norazlanshah *et al.* (2013) among Malaysian university students found no association between nutrition knowledge and use of nutrition label but observed that consumers' attitude was related to using of nutrition labels. The study suggested that respondents might consider other factors more important than nutrition during shopping. Likewise, Liu *et al* (2015) study among adult Chinese shoppers did not find any association between consumers' objective nutrition knowledge and use of nutrition labels suggesting that consumers with more subjective nutrition knowledge may not necessarily use nutrition labels. With the right attitude, nutrition knowledge may motivate individuals to use nutrition information on food labels to make healthy food selection.

The observation that age was not associated with the use of a nutrition label among study respondents has also been reported by several studies (Aryee, 2013; Rose *et al.* 2018; Sharif *et al.*, 2014; Van der Merwe *et al.*, 2014). For instance, Sharif *et al.*'s (2014) study among adults in the USA found that age was not associated with the utilisation of a nutrition facts label. Likewise, Van der Merwe *et al.*, (2014) study among South African adults also found no association between age and label use. The study ascribed the finding to the predominantly younger and educated study population. This reason may also explain the finding of the current study since the majority of the respondents were classified as young and middle adults with education levels of SHS/Vocational/Technical and above. Young people may have a lot of time at hand to read all that intrigues them therefore it may be easier for them to easily grasp the concept on the use of nutrition labels. This population can therefore be targeted for education on the use of nutrition labels. However, a study conducted among young adults in Minnesota, USA found less nutrition label use among individuals aged above 31years (Christoph *et al.*, 2018). Cannoosamy *et al.*'s (2014) study among four hundred adults aged 19 to 50 years in Mauritania to assess consumer knowledge and attitude towards nutrition label use also observed label use to be frequent among younger females.

Gender has also been associated with nutrition label information use. A Spanish study among 1026 university students aged 17 to 35 years by Navarrete-Muñoz *et al.* (2018) to identify determinants of nutrition label use and relationship with adherence to Mediterranean diet observed that women used nutrition label information frequently compared to men. Cheah *et al.* (2015) study among adult Malaysians also reported nutrition label use to be frequent among women possibly, due to their concern and interest in diet, health and body image. In contrast, the

present study found no association between gender and nutrition label use, and this may be due to the increase in consciousness of diet-health issues among both males and females in recent years. Norazlanshah *et al.*, (2013) among Malaysian university students did not find any association between gender and nutrition label use. This observation, according to the study, was because the majority of males (46.5%) and females (61.6%) moderately read nutrition label information and equal percentage were both excellent users. Both females and males need to know the importance of diet-health relationships to enable them to use nutrition labels effectively.

Furthermore, the present study found no statistical association between education and use of nutrition labels among study respondents. This finding is similar to the observations made by Liu *et al.*, (2015), Rose *et al.* (2018) and Sharif *et al.* (2014) studies which found no association between nutrition label use and education. Liu *et al.* (2015) study reported that education did not explain the use of nutrition labels among their study respondents and explained that, highly educated persons were less likely to trust that nutrition labels influence healthier food selection. Nonetheless, Nieto *et al.*, (2019) conducted a study on Mexican adult aged 20 to 70 years to examine the association between nutrition label use and chronic disease and found that nutrition label use was lower among the less educated population. This finding was ascribed to the complex label format and difficulty in understanding nutrition information among the less educated individuals.

The current study observed that respondents' understanding of nutrition label information was influenced by educational level, marital status and nutrition knowledge. Respondents with

education below SHS/Vocational/Technical levels were 79% less likely to understand nutrition labels (AOR, 0.21; 95% CI, 0.06-0.70;  $p=0.011$ ) compared with respondents with SHS/Vocational/Technical education levels and above. A possible explanation of this finding could be that higher educated persons may be more exposed to various information including health issues since they read academic documents and scientific articles (Aryee, 2013). Therefore more educated individuals may possess better knowledge and comprehension of information related to health than those of lower educational levels (Cheah *et al.*, 2015). This finding resonates the findings of an earlier study conducted among US adults which examined respondents' use and understanding of NFP. The study observed that respondents with higher educational level performed better than those with lower educational levels (Persoskie *et al.*, 2017). A web study investigated the objective understanding of front-of-pack (FOP) nutrition label in comparison with other label formats and background characteristics of French respondents. The study found that highly educated respondents showed a better understanding of label information (Egnell *et al.*, 2018). This finding may suggest educational programmes which are directed towards nutrition label use should be designed with persons of lower educational levels in mind to ensure better understanding among the entire populace. However, Liu *et al.* (2015) study in China did not find any relationship between education and understanding of nutrition labels and argued that education negatively encourages consumers to process nutrition information.

Among the study population, married respondents were 49% less likely (AOR, 0.51; 95% CI 0.29- 0.88;  $p = 0.016$ ) to understand nutrition labels compared to unmarried respondents. This may be because married respondents have family and household commitments which may

compete with their time at hand to read and process nutrition label information during shopping. A previous study by Sharif *et al.*, (2014) to determine the use and understanding of NFP among Latinos in Los Angeles also indicated that unmarried participants had a better comprehension of nutrition labels. When married people gain a better understanding of nutrition label, other members of the family may also benefit. Therefore, graphical label formats such as the TL label may be ideal for easy comprehension among individuals who may be challenged by time constraints during shopping.

The significant association observed between nutrition knowledge and nutrition label understanding (AOR, 0.39; 95% CI, 0.26-0.61,  $p < 0.001$ ) suggests that respondents with high nutrition knowledge had a better understanding of nutrition labels compared with respondents low nutrition knowledge. A previous study among consumers in six European countries also reported that consumers with increased knowledge in nutrition performed better in tasks used to assess nutrition label understanding, though performance varied across countries (Grunert *et al.*, 2010). The implication for this finding is that more education should be geared towards bridging the gap in nutrition knowledge among consumers. Simplified basic nutrition education programmes should be consistently provided to the populace through the various media platforms. This may help improve nutrition label understanding and use particularly among less-educated individuals since education influence nutrition knowledge (Hayford 2011).

Policymakers should also consider simplified nutrition labels on food and beverage products in the future. Previous studies have found simplified front-of-pack (FOP) nutrition labels such as the multiple traffic light (MTL) label from UK Food Standard Agency (FSA) and Nutri-Score

label from French FSA as been easily understood by a majority of study respondents including uneducated persons (Egnell *et al.*, 2018).The MTL label provides information on the amount of nutrient (sugar, sodium, total fat and saturated) i.e. low, moderate and high per portion of a product in colours green, orange and red respectively. The Nutri-Score label conversely provides overall nutrient quality of a product based on French FSA nutrient profiling system.

It is worth noting that, the current study did not find any association between age, gender, income, employment status and understanding of nutrition label information though previous studies observed otherwise. Egnell *et al.*, (2018) and Hassan & Dimassi, (2017) found an association between gender and nutrition label understanding. Hassan & Dimassi (2017) study in Lebanon to assess nutrition label use and understanding among 748 supermarket shoppers observed that females had better knowledge of nutrition label information than men and explained that, the role of women in the meal preparation and shopping may influence their knowledge in nutrition labels compared to men. The difference in previous study observations compared to the current study may be explained by the study population and the socio-cultural characteristics of the study location. Whilst women are traditionally more involved in grocery shopping in Lebanon, Accra may be more diverse as both men and women may do grocery for the family.

Varying observations have been made regarding associations between nutrition label understanding and age of respondents. Egnell *et al.*, (2018) and Persoskie *et al.*, (2017) studies found age to be related to comprehension of nutrition labels and reported that younger consumers had a better understanding of nutrition labels than older consumers. Another study to assess

nutrition label understanding and use among 42,750 nationwide Thai adult cohorts also found increasing age was associated with good nutrition label understanding (Rimpeekool *et al.*, 2017). The study stated that the appearance of chronic conditions in the elderly may have increased interest in the use of nutrition labels among this group of consumers. Equally, Hobin *et al.*'s (2017) exit survey on the use of Guiding Stars label in Canada found that respondents aged 45 to 64 showed a higher understanding of nutrition labels than those aged 25 to 44 years. However, in resonance with Rose *et al.*, (2018) study, the current study found no statistical association between age and understanding of nutrition labels. The observation may be due to the large percentage of the young and middle adult group in the current study population who exhibited a high understanding of nutrition labels.

#### **5.4 Consumers' perception of mandatory nutrition labelling of SSB**

The study respondents had positive perceptions of mandatory nutrition labelling. Almost all the respondents perceived that mandatory nutrition labelling would give them confidence in purchasing products and would lead to the declaration of informative and truthful nutrition information on food labels. Likewise, the majority of the respondents did not perceive that mandatory nutrition labelling would confuse using food label information. The predominantly youthful and educated background of study respondents may have accounted for these findings. The observations reflect results of a Nigerian study on nutrition label use and understanding where respondents believed that nutrition labelling information was trustworthy and so consciously searched for nutrition information during shopping (Oghojafor *et al.*, 2012). Equally, a South African study which assessed 1,997 consumers' opinions and use of health information on food labels and found that respondents believed food labels are important

information source and that health information on food labels are based on scientific research. The consumers' therefore believed food label information was trustworthy (Bosman *et al.*, 2014). Similarly, Van der Merwe *et al.* (2014) study among adult South African household shoppers also had positive opinions about nutrition labelling. The study suggested the label reading behaviour of respondents as they constantly search for quality and value for money may have influenced the positive perception observed.

### **5.5 Caloric load of selected commonly consumed sugar-sweetened beverage**

Globally, the implications of increased SSB consumption have led to policies such as mandatory nutrition labelling and sugar taxation (Hawkes, 2010; Mandel *et al.*, 2015). Therefore knowing and understanding the caloric content of commonly consumed SSBs among study respondents is imperative for health promotion especially in the current situation of obesity pandemic and NCDs.

All the five (5) SSB mostly consumed by the study respondents had caloric loads ranging from  $0.82 \pm 0.006$  kcal/ml in SSB5 to  $55.1 \pm 0.59$  kcal/ml in SSB1. However, the American Heart Association recommends a decrease in added sugar consumption to not more than 100kcal per day and 150kcal per day for women and men respectively to achieve and keep a healthy weight (Johnson *et al.*, 2009). A bottle of typical SSB1 is 330ml and this contains about 181.83kcal which exceeds the AHA recommendation.

Several earlier studies have reported associations between increased SSB consumption and weight gain, dental caries, metabolic syndrome, diabetes and CVD (Bernabé *et al.*, 2014; Malik *et al.*, 2010; Shin *et al.*, 2018; Vorster *et al.*, 2014). SSBs contribute to weight gain through the

dense caloric load of such drinks. Shin *et al.*'s (2018) study among Korean adults aged 35 to 65 years observed that increase in SSB consumption among men and women was related to corresponding obesity and metabolic syndrome prevalence.

The estimated caloric load of SSB5 was the lowest ( $0.82\pm 0.006$ ) which may suggest that non-caloric sweetener was used in the product formulation. It is worth mentioning that, increased consumption of non-caloric sweeteners has also been linked to other non-communicable diseases such as cancer (Mahfouz *et al.*, 2014). Such products should be consumed in moderation.

## **5.6 Limitations of study**

The following are some limitations of the study.

- The study being cross-sectional provides evidence for associations but undermines the potential for causality
- The high proportion of large scale manufacturing companies included in the study introduces bias into the findings.
- Company representatives interviewed were mainly from the managerial level of organisational structure. Participants or key informants from different levels of the organisational structure may provide a wider and better assessment of industry readiness.
- The study respondents for the consumer survey were mainly literates and this may affect the interpretation of results

## CHAPTER SIX

### 6.0 CONCLUSIONS AND RECOMMENDATIONS

Extensive research on nutrition label knowledge, use and understanding have been conducted in the developed countries (Koen *et al.*, 2016) whilst few have been conducted in Sub-Saharan African countries such as Ghana. This study assessed the readiness of SSB manufacturing companies for mandatory nutrition labelling, consumer understanding, use of nutrition label information as well as consumer perceptions about mandatory nutrition labelling. Additionally, the caloric load of SSBs mostly consumed by the study respondents was estimated.

#### 6.1 Conclusion

- Large scale SSB manufacturing companies are ready for mandatory nutrition labelling while medium-scale SSB manufacturing companies are not ready due to lack of expertise and financial resources.
- A large proportion of consumers were users of nutrition labels with a high understanding of nutrition label information.
- High nutrition knowledge was found to be associated with consumer use of nutrition labels whilst high educational level, being unmarried and nutrition knowledge was associated with nutrition label understanding.
- Consumers' positive perception of mandatory nutrition labelling policy may infer their desire to use nutrition label information to guide them in making healthy food selection
- The caloric load of SSBs commonly consumed by study respondents ranged from  $0.82 \pm 0.006 \text{kcal/ml}$  in SSB5 to  $55.1 \pm 0.59 \text{kcal/ml}$  in SSB1.

With the springing-up of food and beverage manufacturing companies in Ghana, the findings of the study imply that policymakers should implement mandatory nutrition labelling on SSBs. This

may help curb NCDs as consumers will have information to make informed choices and thus contribute to the Ministry of Health's commitment to reach SDG 3 target of reducing NCD related mortality by 30% by 2030 (GHS, 2017).

## **6.2 Recommendations**

Study findings suggest the following recommendations.

### *Recommendations for further studies*

- Studies should be conducted to assess medium and small scale SSB manufacturers readiness to identify challenges and find solutions to bring them on par with large scale SSB manufacturers if Ghana intends to implement mandatory nutrition labelling policy in future.
- Research into sugar intake among the Ghanaian population is needed to inform policymakers.
- Sugar-sweetened beverage consumption patterns across the age groups of the Ghanaian population should be explored.
- Further studies should be conducted in other demographics such as the rural settings to assess understanding of nutrition label information among consumers to inform and promote nutrition labelling policies.

### *Recommendations for policy*

- Regulatory and Standards agencies should work closely with the food industry in developing a timeline for the implementation of nutrition labelling policies. The government should provide technical and financial assistance to registered food and

beverage industry to overcome any challenge that may arise in the implementation process.

- Nutrition label educational programmes should emphasis on interpretation of nutrition label terminologies to improve nutrition label comprehension among persons across the various educational levels.
- Policy makers should consider mandatory nutrition labelling of pre-packaged SSBs.

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**APPENDICES**

APPENDIX 1- Study Protocol Consent Form-Key informants

UNIVERSITY OF GHANA



Official Use only Protocol number
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COLLEGE OF BASIC AND APPLIED SCIENCES  
**Ethics Committee for Basic and Applied Sciences (ECBAS)**

<b>PROTOCOL CONSENT FORM</b>
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<b>Section A- BACKGROUND INFORMATION</b>
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Title of Study:	The readiness of the local sugar-sweetened beverage industry for mandatory nutrition labelling, consumer understanding and perceptions in the Greater Accra region as well as caloric load of selected beverages
Principal Investigator:	Bernadette Brobbey Ahiable
Certified Protocol Number	ECBAS 017/19-20

<b>Section B- CONSENT TO PARTICIPATE IN RESEARCH</b>
--

**General Information about Research**

We are conducting a study on nutrition labelling of sugar-sweetened beverage in the Greater Accra region and would like to seek your consent to conduct an interview with your company. The purpose of the study is to ascertain what it entails for industry to provide nutrition label information on sugar-sweetened beverage and whether they are prepared to provide nutrition information on the products. Consumers understanding and use of nutrition information will also be sought in this study. And finally, the study will find out consumers’ views on mandatory nutrition labelling of sugar-sweetened beverage.

We invite you to partake in the study. If you agree to partake in this study, your company’s Quality Assurance Manager or representative will be interviewed. Among the questions to be asked will include; current issues concerning nutrition labelling of your sugar-sweetened beverage products, your views on provision of nutrition labelling information on your sugar-sweetened beverages and whether you are prepared for mandatory nutrition labelling of such products. A recorder will be used to record the interview which will be transcribed and deleted accordingly. The interview will take about 10-15minutes of your time.

### **Benefits of the study**

The information you provide will serve as baseline information in addressing nutrition labelling issues, including challenges faced by the industries in Ghana

### **Risk of the study**

There are no risks involved in taking part of this study.

### **Confidentiality**

The information will be kept confidential. Interview guide and forms used for the study will be coded so as not to relate them directly with your company's name. The recorded interview will also be deleted after transcribing. Every information we obtain from you is strictly for research purpose only. Only the researcher and supervisor will have access to this information. You will be asked to sign or thumb print to proof your agreement.

### **Compensation**

In appreciation for your time, you will be given a note pad and a pen.

### **Withdrawal from Study**

Partaking in this study is absolute voluntary. You can decide not to participate or withdraw at any point in time. You will not be adversely affected in any way if you decide not to partake in the study or withdraw from participating.

### **Contact for Additional Information**

Should you have any questions or concerns about this study before or after consent, kindly contact Professor Matilda Steiner-Asiedu. Department of Nutrition and Food Science, University of Ghana, Legon. Telephone: 0541260704 email address: [tillysteiner@gmail.com](mailto:tillysteiner@gmail.com) or Bernadette Brobbey Ahiable Telephone: 0244563287 email address: [bbahiable@st.ug.edu.gh](mailto:bbahiable@st.ug.edu.gh)

- If you have any issues on your rights as a participant you can contact the address below:

**Administrator, Ethics Committee for Basic and Applied Sciences**  
**College of Basic and Applied Sciences**  
**University of Ghana**  
**P. O. Box LG 68**  
**Legon – Accra**  
**IP No.: 3014**  
**Email: [ethicscbas@ug.edu.gh](mailto:ethicscbas@ug.edu.gh)**

### **Section C- VOLUNTEER AGREEMENT**

**"I have read or have had someone read all of the above, asked questions, received answers regarding participation in this study, and I am willing to give consent for me, my child/ward to participate in this study. I have not waived any of my rights by signing this consent form. Upon signing this consent form, I will receive a copy for my personal records."**

---

Name of Volunteer

---

Signature or mark of volunteer \_\_\_\_\_ Date \_\_\_\_\_

**If volunteers cannot read the form themselves, a witness must sign here:**

I was present while the benefits, risks and procedures were read to the volunteer. All questions were answered and the volunteer has agreed to take part in the research.

---

Name of witness

---

Signature of witness \_\_\_\_\_ Date \_\_\_\_\_

I certify that the nature and purpose, the potential benefits, and possible risks associated with participating in this research have been explained to the above individual.

---

Name of Person who obtained Consent

---

Signature of Person who obtained Consent \_\_\_\_\_ Date \_\_\_\_\_

APPENDIX 2- Study Protocol Consent Form -Consumer

UNIVERSITY OF GHANA



Official Use only Protocol number
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COLLEGE OF BASIC AND APPLIED SCIENCES  
**Ethics Committee for Basic and Applied Sciences (ECBAS)**

PROTOCOL CONSENT FORM
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Section A- BACKGROUND INFORMATION
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Title of Study:	The readiness of the local sugar-sweetened beverage industry for mandatory nutrition labelling, consumer understanding and perceptions in the Greater Accra region as well as caloric load of selected beverages
Principal Investigator:	Bernadette Brobbey Ahiable
Certified Protocol Number	ECBAS 017/19-20

Section B- CONSENT TO PARTICIPATE IN RESEARCH
--

**General Information about Research**

Frequent consumption of sugar-sweetened beverage has been associated with obesity among all age groups which may lead to non-communicable diseases such as diabetes type 2 and cardiovascular diseases. These diseases decrease the quality of life of individuals and their (non-communicable diseases) management put burden on households and governments. When producers declare nutrition information on sugar-sweetened beverage, the consumer gets to know the nutrient composition of the product. This will help consumers make informed dietary decisions so as to help curb obesity and its related non-communicable diseases.

The purpose of this study is to ascertain whether sugar-sweetened beverage producers are prepared to provide nutrition information on their products. Consumers understanding and use of nutrition information will also be sought in this study. And finally, the study will find out consumers' views on mandatory nutrition labelling of sugar-sweetened beverage. This will serve as baseline information in addressing nutrition labelling issues in Ghana.

We invite you to participate in this study. If you agree participate, we have designed a simple questionnaire which is divided into 5 sections. Section 1 entails general information about you such as gender, age, educational level and employment; section 2 involves questions to find out whether you use nutrition label information on sugar-sweetened beverage; section 3 has questions on how you understand nutrition label information; section 4 entails questions to assess your knowledge in basic nutrition and section 5 includes questions to find out your views on mandatory nutrition labelling of sugar-sweetened beverage. These questions will take about 10 to 15 minutes of your time.

### **Benefits of the study**

You may not benefit directly from the study. However, the information obtained from you will help in addressing issues concerning consumer understanding of nutrition labelling information and any future policy on nutrition labelling in Ghana.

### **Risk of the study**

There are no risks involved in taking part of this study

### **Confidentiality**

The information you provide will be kept confidential. The forms used for the interview will be coded so as not to relate it directly with your name. Every information we obtain from you is strictly for research purpose only. Only the researcher and supervisor will have access to the information you provide. You will be asked to sign or thumb print to proof your agreement. A copy of this form will be given to you to keep.

### **Compensation**

In appreciation for your time, you will be given a sachet of yoghurt or a bar of chocolate

### **Withdrawal from Study**

Partaking in this study is absolute voluntary. You can decide not to participate or withdraw at any point in time. You will not be adversely affected in any way if you decide not to partake in the study or withdraw from participating.

### **Contact for Additional Information**

Should you have any questions or concerns about this study before or after consent, kindly contact Professor Matilda Steiner-Asiedu. Department of Nutrition and Food Science, University of Ghana, Legon. Telephone: 0541260704 email address: [tillysteiner@gmail.com](mailto:tillysteiner@gmail.com) or Bernadette Brobbey Ahiable Telephone: 0244563287 email address: [bbahiable@st.ug.edu.gh](mailto:bbahiable@st.ug.edu.gh)

If you have any issues on your rights as a participant, you can contact the address below:

**Administrator, Ethics Committee for Basic and Applied Sciences**  
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**IP No.: 3014**  
**Email: [ethicscbas@ug.edu.gh](mailto:ethicscbas@ug.edu.gh)**

### **Section C- VOLUNTEER AGREEMENT**

**"I have read or have had someone read all of the above, asked questions, received answers regarding participation in this study, and I am willing to give consent for me, my child/ward to participate in this study. I have not waived any of my rights by signing this consent form. Upon signing this consent form, I will receive a copy for my personal records."**

---

Name of Volunteer

---

Signature or mark of volunteer \_\_\_\_\_ Date \_\_\_\_\_

**If volunteers cannot read the form themselves, a witness must sign here:**

I was present while the benefits, risks and procedures were read to the volunteer. All questions were answered and the volunteer has agreed to take part in the research.

---

Name of witness

---

Signature of witness \_\_\_\_\_ Date \_\_\_\_\_

I certify that the nature and purpose, the potential benefits, and possible risks associated with participating in this research have been explained to the above individual.

---

Name of Person who obtained Consent

---

Signature of Person who obtained Consent \_\_\_\_\_ Date \_\_\_\_\_

APPENDIX 3- Study interview guide

**DEPARTMENT OF NUTRITION AND FOOD SCIENCE  
UNIVERSITY OF GHANA, LEGON**

Study Title:

**The readiness of the local sugar-sweetened beverage (SSB) industry for mandatory nutrition labelling, consumer understanding and perceptions in the Greater Accra region as well as the caloric load of selected beverages**

Company code: \_\_\_\_\_

**Company characteristics**

Type: Multinational [ ]  
Fully Ghanaian [ ]

SSB products: Flavoured drink [ ]  
Energy drink [ ]

Others [ ]

Soft drink [ ]

Scale: Large [ ] Medium: [ ] Small [ ]

C

**Assessment of readiness for mandatory nutrition labelling policy implementation**

**Change valence**

*These statements rate your views on mandatory nutrition labelling policy*

1. Does your company have a nutrition policy (which includes nutrition labelling)? What is your policy on nutrition labelling? If yes what is the current situation regarding nutrition information on your SSB products. If no why?
  - i. On a scale of 1 to 5 (1-unimportant, 2-slightly important, 3-moderately important, 4-important and 5-very important), is it important to provide nutrition information on SSBs?
  - ii. Is it a good idea to implement mandatory nutrition labelling policy on SSB  
Please explain

**Task knowledge**

*These statements rate your awareness of tasks involved in implementing this policy*

2. how much effort may be needed to implement this policy

Please explain

3. what resources are needed to implement this policy

Please explain

4. what do we have to do to implement this policy

Please explain

### **Resource availability**

*The following statements rate your awareness of the resources you have to implement the policy*

5. Do you have the resources, expertise, skills, equipment and time needed to implement this policy

Please explain

### **Change commitment**

*These statements rate management's commitment to implement the policy*

6. Can management be committed and motivated to implementing nutrition labelling policy or providing nutrition information on your product labels? What will be your level of commitment On a scale of 1 to 5 (1-definitely not committed, 2-probably not committed, 3- possibly committed, 4- probably committed and 5-definitely committed.

Please explain

### **Change efficacy**

*The following statements rate your ability to maintain the policy implementation*

7. Can you keep momentum going in implementing mandatory nutrition labelling policy

Please explain

8. Can you handle the challenges of implementing mandatory nutrition labelling policy

Please explain

### **Situational information**

9. How will nutrition labelling of SSB impact your customers/consumers?

10. What impact will mandatory nutrition labelling have on your company's activities?

11. Do you perceive any opportunities?

12. Will you be ready in 5 years?



1. Banking & Finance [ ] 2. Education [ ] 3. Health [ ] 4. Manufacturing [ ]  
 5. Trading [ ] 6. Farming [ ] 7. Artisan [ ] 8. Others [ ] (Please Specify)

.....

8. What is your average monthly income (GH¢)(from all sources)?

- 1.Less thanGH¢100 [ ] 2. GH¢101- GH¢500 [ ] 3. GH¢501-GH¢1000 [ ]  
 4. GH¢1001-GH¢1500 [ ] 5. GH¢1500 - GH¢2000 [ ] 6. More than GH¢2000 [ ]  
 (Please Specify) .....

9. Are you on a special diet? 1. Yes [ ] 2.No [ ] 3. Not sure

**SECTION 2: Health**

10. Do you have any health or diet related condition(s) (e.g. diabetes, hypertension etc)?

*Please tick all that apply*

	Yes	No		Yes	No
Food Allergy/Intolerance			High cholesterol		
Diabetes			Dental caries		
Cancer			Others (specify)		
Obesity					

11. Do you have a family history of any health/nutrition related condition(s)?

1. Yes [ ] 2. No [ ] 3. Not sure [ ] Please specify if yes:  
 .....

**SECTION 3: Nutrition label information use**

12. Why do you purchase SSB?

- 1. For pleasure [ ]
- 2. For occasion [ ]
- 3. As snack [ ]

13. Do you read nutrition label information before purchasing SSB?

- 1. Yes [ ]
  - 2. No [ ]
  - 3. Not sure [ ]
- Why (reason)? .....

14. How often you consider the nutrition label information when purchasing packaged SSB?

- 1. Often [ ]
- 2. Usually [ ]
- 3. Sometimes [ ]
- 4. Rarely/Never [ ]

15. How often you consider the nutrition label information before drinking SSB?

- 1. Often [ ]
- 2. Usually [ ]
- 3. Sometimes [ ]
- 4. Rarely/Never [ ]

16. What is the most important nutrition information you look out for on the label (Tick one)?

- 1. List of ingredients [ ]
  - 2. Calories/energy content [ ]
  - 3. Nutrition claims [ ]
  - 4. Added sugar content [ ]
  - 5. Serving size [ ]
  - 6. Others [ ] Specify?  
.....,
- why (reasons)? .....

**SECTION 4: Nutrition label information understanding**

*Now I would like to know your general ideas on some nutrition labelling terminologies*

17. What does Daily Value (DV) indicated on nutrition label mean?

- 1. Recommended daily amount for key nutrients [ ]
- 2. Nutritional content of product [ ]
- 3. Not sure [ ]

18. What does % Daily Value (DV) mean?

1. Nutrients in a packaged product [  ]
2. Amount of a particular nutrient in a serving of the food product [  ]
3. Not sure [  ]

19. What does Guideline Daily Amount (GDA) mean?

1. Exact amount of calories/energy and some nutrients e.g. fat, sugars, salt, saturated fat which a person should consume in a day [  ]
2. Guide to the amount of calories/energy and the maximum quantities of some nutrients e.g. fat, sugars, salt which a person should consume in a day [  ]
3. Guide to the amounts of different foods a person should consume in a day [  ]
4. Not sure [  ]

20. GDA indicates the level of nutrients in

1. A serving of the food product [  ]
2. A 100g of the product [  ]
3. Not sure [  ]

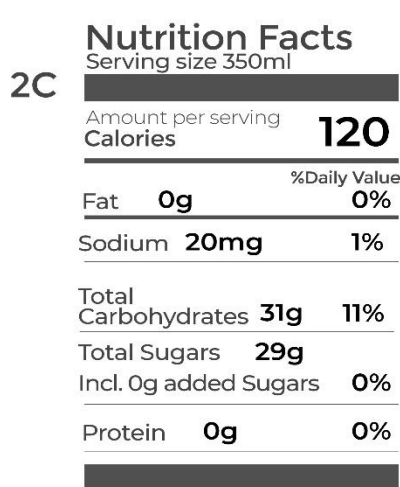
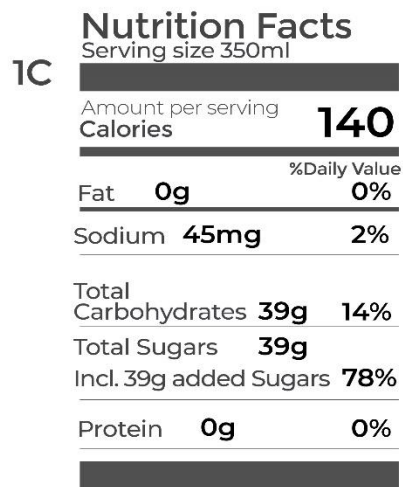
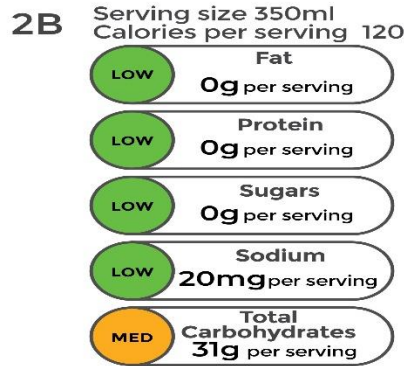
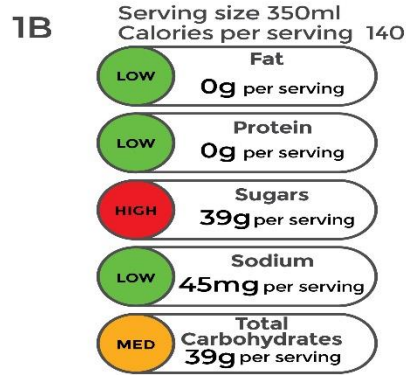
21. What does serving size mean?

1. The amount of food I choose to eat [  ]
2. The standardised amount of food an individual consumes at a time [  ]
3. Not sure [  ]

*Now I would like ask questions to know how you understand nutrient content values on nutrition labels*

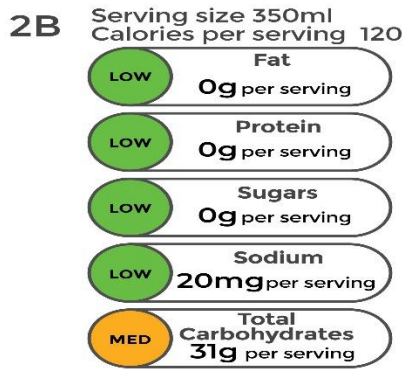
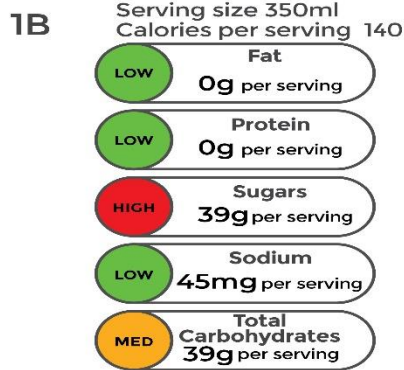
Use the following pictures, to answer questions 22 and 23.

22. For each of the different label format, indicate (tick) the product with the highest added sugar content.



23a. Which of them is healthier?





**1C** **Nutrition Facts**  
Serving size 350ml

Amount per serving		<b>140</b>
Calories		
	%Daily Value	
Fat	0g	0%
Sodium	45mg	2%
Total Carbohydrates	39g	14%
Total Sugars	39g	
Incl. 39g added Sugars		78%
Protein	0g	0%

**2C** **Nutrition Facts**  
Serving size 350ml

Amount per serving		<b>120</b>
Calories		
	%Daily Value	
Fat	0g	0%
Sodium	20mg	1%
Total Carbohydrates	31g	11%
Total Sugars	29g	
Incl. 0g added Sugars		0%
Protein	0g	0%

23b. Why?

*I would like to know your understanding of nutrition label claims*

24. When a product is labelled “high” in a nutrient what does it mean?

1. Contains 20 %DV or more of the nutrient [  ]
2. Contains 5% DV or less of nutrient [  ]
3. Not sure [  ]

25. When a product is labelled “low” source of a nutrient e.g. added sugar, what does it mean?

1. Contains 20 % DV or more of the nutrient [  ]
2. Contains 5% DV or less of the nutrient [  ]
3. Not sure [  ]

### SECTION 5: Assessment of nutrition knowledge

*I would like to know your knowledge on basic nutrition*

26. Which source of energy giving food do experts say people should reduce consumption?

1. Banku [  ]
2. SSB [  ]
3. Not sure [  ]

27. In what quantity do you think health experts recommend people to eat the following sweeteners? (Tick one box per sweetener)

	1. More	2. Same	3. Less	4. Not sure
Brown sugar	[ <input type="checkbox"/> ]	[ <input type="checkbox"/> ]	[ <input type="checkbox"/> ]	[ <input type="checkbox"/> ]
White sugar	[ <input type="checkbox"/> ]	[ <input type="checkbox"/> ]	[ <input type="checkbox"/> ]	[ <input type="checkbox"/> ]
Honey	[ <input type="checkbox"/> ]	[ <input type="checkbox"/> ]	[ <input type="checkbox"/> ]	[ <input type="checkbox"/> ]

28. Which of the following drinks do health experts recommend people to drink more?

1. Water [  ]
2. SSB [  ]
3. Not sure [  ]

29. Brown sugar is a healthy alternative to white sugar.

1. Agree [  ]
2. Disagree [  ]
3. not sure [  ]

30. Do you think these foods are high or low in added sugar? (Please tick one for each)

	1. High	2. Low	3. Not sure
Unflavoured yoghurt	[ <input type="checkbox"/> ]	[ <input type="checkbox"/> ]	[ <input type="checkbox"/> ]

Flavoured fruit drink	[ ]	[ ]	[ ]
Fruit juice (%)	[ ]	[ ]	[ ]
Malt drink	[ ]	[ ]	[ ]

31. Do you think SSB is a high source of added sugar?

1. Yes [ ]                      2. No [ ]                      3. Not sure [ ]

32. Are you aware of health problems or diseases that are related to how much sugar people eat?

1. Yes [ ]                      2. No [ ]                      3. Not sure [ ]

If yes, what disease or health problems do you think are related to sugar?

1. High cholesterol [ ]                      2. Diabetes [ ]                      3. Not sure [ ]

33. Are you aware of any major health problems or diseases that are related to how much energy/calories one consumes?

1. Yes [ ]                      2. No [ ]                      3. Not sure [ ]

If yes, what disease or health problems do you think are related to energy/calorie intake?

1. Obesity [ ]                      2. Gout [ ]                      3. Not sure [ ]

34. Do you think these help reduce the chance of getting diabetes?

	1. Yes	2. No	3. Not sure
Eating more fibre	[ ]	[ ]	[ ]
Eating less sugary drinks	[ ]	[ ]	[ ]
Eating less fruit	[ ]	[ ]	[ ]
Eating more fruits and vegetables	[ ]	[ ]	[ ]

35a. Which SSB type do you usually consume? Please specify

.....

35b. How often do you consume SSB?

1. Once in a week [ ]
2. Two-to-three times in a week [ ]
3. More than 3 times in a week [ ]

**SECTION 6: Perception about mandatory nutrition labelling**

*I would like to know your views on mandatory nutrition labelling*

36. Mandatory nutrition labelling will make nutrition label information on products trustworthy

1. Agree [ ]                      2. Disagree [ ]

5.2 Mandatory nutrition labelling is not necessary

1. Agree [ ]                      2. Disagree [ ]

37. Mandatory nutrition labelling will give me confidence in making healthful decision

1. Agree [ ]                      2. Disagree [ ]

38. Mandatory nutrition labelling will make me well informed

1. Agree [ ]                      2. Disagree [ ]

39. Mandatory nutrition labelling will make me confused

1. Agree [ ]                      2. Disagree [ ]

APPENDIX 4-Ethical Clearance



**UNIVERSITY OF GHANA**  
**ETHICS COMMITTEE FOR BASIC AND APPLIED SCIENCES (ECBAS)**

*P. O. BOX LG 1195, Legon-Accra*

Ref. No: ECBAS 017/19-20

15<sup>th</sup> January, 2020.

Mrs. Bernadette Brobbey Ahiable  
Department of Nutrition  
And Food Science  
University of Ghana  
Legon, Accra

Dear Mrs. Ahiable,

**ECBAS 017/19-20: THE PREPAREDNESS OF THE LOCAL SUGAR-SWEETENED BEVERAGE INDUSTRY FOR MANDATORY NUTRITION LABELLING, CONSUMER UNDERSTANDING AND PERCEPTIONS IN THE GREATER ACCRA REGION AS WELL AS CALORIC LOAD OF SELECTED BEVERAGES**

This is to inform you that the above reference study has been presented to the Ethics Committee for Basic and Applied Sciences for a full board review and the following actions taken subject to the conditions and explanation provided below:

<b>Expiry Date:</b>	17/01/21
<b>On Agenda for:</b>	Initial Submission
<b>Date of Submission:</b>	18/10/2019
<b>ECBAS Action:</b>	Approved
<b>Reporting:</b>	Quarterly

Please accept my congratulations.

Yours sincerely,

Professor Daniel Bruce Sarpong  
ECBAS Chairperson

