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PRE-PACKAGED FOOD LABELLING AND USE AMONG HOUSEHOLDS IN ACCRA

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DEPARTMENT OF POPULATION FAMILY AND REPRODUCTIVE HEALTH

INTEGRI PROCEDAMUS

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DECLARATION

I hereby declare that this thesis 'Pre-packaged food labelling and use among households in Accra' is a product of my original independent research work. Professor Richmond Aryeetey was my lead supervisor and other members of the supervision team were Dr Adom Manu and Professor Amos Laar. I affirm that this is my original work and it has not been submitted for award of any degree or examination. All references used or quoted have been duly acknowledged.

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DEDICATION

I dedicate this work to the glory of our Father Lord Jesus Christ for his unfailing love and grace.

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The inspiration, the progress and the completion of this PhD journey were borne out of the contributions of many that I am forever grateful for.

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ABSTRACT

The rate of diet-related non-communicable diseases (NCDs) is increasing rapidly in Africa. Consumption of pre-packaged foods which are nutrient-poor and calorie-rich is one of the main drivers of NCDs. Food labels can guide consumers to make healthy food choices. In Ghana, there is paucity of evidence on the type of nutrition and health-related label information that consumers are exposed to, and whether consumers use such information in their purchase decisions. Therefore, this study assessed label characteristics of pre-packaged foods, and determined the drivers of label use among consumers in urban Accra.

This study employed a quantitative cross-sectional multi-method design. A survey of food labels was conducted in community-based retail shops. Information on labels of pre-packaged foods were obtained by taking pictures and analysing the contents based on the International Network for Food and Obesity/Non-Communicable Diseases Research, Monitoring and Action Support's (INFORMAS) taxonomy. Besides, respondents (510) were selected using a multi-stage sampling technique. Participants were interviewed, using a structured pre-tested questionnaire. Questions assessed consumers' pre-packaged food use behaviour, their perceptions of health-related label information, understanding of food labels and socio-demographic covariates.

Three hundred and fifty-one (N=351) pre-packaged foods were sampled. Out of 343 labelled products, 68.8% had nutrition declaration information. Back- of-Pack (BOP) nutrition label formats were dominant (87.3%) compared to the Front-of -Pack (FOP) format. Guideline Daily Amount (GDA) was the commonest FOP identified. Nutrition claims were twice as frequent as health claims. Most products (>84%) with health and nutrition claims complied with FDA and Codex Alimentarius standards. Although the disclosure of nutrition and health-related information was appreciable it did not meet

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the current recommendations set out by Codex and INFORMAS in promoting a healthy environment.

Majority of survey respondents (79.4%) were females and had at least secondary school-level education (65.3%). Most households (77%) purchased pre-packaged foods from traditional markets or corner shops and a few (7%) purchased from supermarkets. Most consumers had a positive perception of food labels, and their purchase behaviour was driven more by taste and price. Although most (62%) respondents reported adequate understanding of labels, objective assessments showed a lower (9%) consumer knowledge and skill in using labels. Only a third of respondents were food label users. Labels were used mainly to ascertain product safety and less likely for nutrition and health reasons. Higher proportions (45%) of non-label users indicated technical nature of label information and limited understanding as reasons for not using labels. In multiple logistic regression modelling, being part of a larger household (AOR: 2.41; 95% CI: 1.16-4.99), having tertiary education (AOR: 6.75; 95% CI: 1.99-22.88), adequate nutrition-related knowledge of labels (AOR: 1.92; 95% CI: 1.15-3.20) and food label understanding (AOR: 2.51; 95% CI: 1.19-5.29) as well as individuals with self-reported understanding of labels (AOR: 10.06; 95% CI: 2.40-42.27) predicted food label use. However, a multiple linear regression analysis the following variables: levels of education, individuals with food allergies, those who had a previous education on the use of labels, those who perceived labels are easy to understand and individuals who self-reported adequate food label understanding showed positive association with the use of health-related label information.

Therefore, these findings suggest that educational interventions and labelling policy reforms are needed to encourage, enable, and improve consumer use of nutrition and health-related information on food labels in Ghana.

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LIST OF ABBREVIATIONS

AMA -	Accra Metropolitan Area
BMI -	Body Mass Index
BOP-	Back- of- Pack
CAC -	Codex Alimentarius Commission
CVD –	Cardio-vascular diseases
DALYs -	Disability-adjusted life years
EA -	Enumeration Areas
FAO -	Food and Agriculture Organization
FDA -	Food and Drugs Authority -
FOP -	Front-of-Pack
GDA -	Guideline daily allowance
GDA -	Guideline Daily Amounts
GDHS -	Ghana Demographic Health Survey
GHS -	Ghana Health Service
GSS -	Ghana Statistical Service
HICs -	High-income countries
HIU -	Health-related Information Use
HNCs –	Health and Nutrition Claims
INFORMAS -	International Network for Food and Obesity/NCDs Research, Monitoring and Action Support
LMICs -	Low-to-middle-income countries
LMICs, -	Low-to-middle income countries
MP -	Minimally Processed foods
MTL -	Multiple Traffic Lights
NCDs -	Non-Communicable Diseases
NFT -	Nutrition Fact Table
NRV -	Nutrient Reference Values
OECD -	Organization for Economic Co-operation and Development
PCI -	Processed culinary ingredients.
PF -	Processed foods
PHC -	Population and Housing Census

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SES -	Socioeconomic status
UPFDs -	Ultra-processed foods and drinks
WCRF -	World Cancer Research Fund
WHO -	World Health Organization
WL -	Warning labels

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CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

Non-Communicable Diseases (NCDs) negatively affect the health, socio-economic well-being, and development of the population (Murray et al., 2020). The prevalence of NCDs is increasing worldwide, especially, in Low- and -Middle-income countries(LMICs) (WHO, 2019). Heart disease, diabetes, cancer, and chronic respiratory disease are the leading cause of premature death and disability in the region (Bigna & Noubiap, 2019). Disability Adjusted Life Years (DALYs) due to NCDs in Africa has risen by 67% from 1990 to 2017 (Gouda et al., 2019).

In Ghana, the Global Burden of Disease Report estimated that 40% of all deaths were linked to NCDs (IHME, 2019). Ischemic heart disease, stroke , diabetes and lower respiratory diseases are the major causes of morbidity and mortality in the Ghanaian population (Adu-Gyamfi et al., 2020). This growing burden of NCDs coupled with high prevalence of infectious diseases is causing huge financial loss and putting undue pressure on the already weak healthcare system (Nyaaba et al., 2020).

NCDs are rooted in a complex web of causes including genetic, physiological, environmental, and behavioural factors (Michele Cecchini et al., 2010; Wright & Aronne, 2012). However, modifiable lifestyle factors such as smoking, harmful use of alcohol, unhealthy diets, and physical inactivity are the main drivers of NCDs (Hazreen et al., 2014). These lifestyles also contribute, significantly, to increasing rates of obesity and high blood pressure, which are major metabolic risk factors for NCDs. Obesity ranks sixth among the world's leading causes of disability-adjusted life years (DALYs) (Ford et al., 2017). The majority of the world's obese people live in developing countries (Ng et al., 2014).

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The obesity epidemic has been linked with changes in diet as a result of increasing income, rapid urbanization, and advancement in technology(Hawkes et al., 2017). These diet-related transitions are characterized by consumption of energy-dense foods such as fast foods, and ultra-processed foods which are high in fat, salt, and sugar (Bielemann et al., 2015; Carlos A Monteiro & Cannon, 2012). Consumption of these foods is motivated by increased availability and access, increased household affordability, convenience and palatability (Hawkes et al., 2017). The changes in eating habits, from traditional diets (typically made of whole foods such as legumes, cereals and whole grains, and low fat, salt and sugar) to diets high in salt, refined sugar, and oils are typical of the Nutrition transition (Hawkes et al., 2017; Popkin et al., 2011).

The World Health Organization (WHO) has proposed population- and individual-level recommendations for reducing the burden of obesity and other diet-related NCDs (WHO, 2013). The recommendations include (i) limiting high energy intake from total fats especially from saturated fat, (ii) eliminating trans-fat, (iii) limiting intake of free sugars and (iv) limiting salt intake from all sources.

A supportive environment that enhances healthy food choices is important for improved nutrition. Consumer awareness and use of labels on pre-packaged foods and beverages constitute a potentially cost-effective means for addressing the rising burden of obesity and diet-related NCDs (Michele Cecchini et al., 2010; Corvalán et al., 2013; Hawkes et al., 2015).

Food labels represent the interface of communication between consumers of pre-packaged foods and manufacturers. Labels give information on food composition, ingredients and their relative amounts, nutrient content, origin of the product, and preservation (Rayner et al., 2013). Therefore, labels can serve as important public

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health tools to help consumers make informed decisions when purchasing or using pre-packaged foods.

On the other hand, food labels have the potential of misinforming and misleading consumers in their food choice, especially information related to health and nutrition claims (Hawkes et al., 2013;Hawkes, 2004). Although food and nutrition claims can provide consumers with information on potential nutrition and health benefits of products, if such benefits have been substantiated, there is debate on how useful they are considering that the primary purpose for their use by manufacturers is for marketing rather than to aid consumers to select healthy foods (Bialkova et al., 2016).

To this end, the Codex Alimentarius Commission has developed standards and guidelines for nutrition labelling on food products (Codex, 2001). Many nations have adapted these guidelines; or aspects of them in labelling regulations, not only to meet food safety requirements, but also as a policy response to promote healthy foods. These guidelines are intended to influence consumer behaviour , promote healthier food choices, and stimulate the production of healthier, nutritious foods by industry (Hawkes, 2004).

In Ghana, food labelling is regulated by the Food and Drugs Authority (FDA), as established by law (Public Health Acts, 2012). The FDA guidelines for labelling of pre-packaged foods states that 'all pre-packaged food products, whether locally-manufactured or imported to be offered as such to consumers, or for catering purposes must be labelled'. This guideline makes pre-packaged food labelling mandatory. However, the Nutrition fact panel (NFP), a component of food labels, is voluntary under Ghanaian law, except when a claim is made. The FDA labelling recommendations are based on and consistent with Codex Alimentarius Commission guidelines.

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While monitoring food label information on pre-packaged food products is a worthy public health goal, the plethora of pre-packaged foods available on the Ghanaian market and the multiplicity of the retail markets make this challenging. In this regard, the International Network for Food and Obesity/Non-Communicable Diseases Research, Monitoring and Action Support (INFORMAS) has developed a stepwise approach in surveying the food retail environment to monitor health-related label information(see figure 1) on pre-packaged foods (Swinburn et al., 2013). The INFORMAS approach harmonizes data collection across different countries to inform strategies for creating a healthy food environment and reduce obesity.

1.2 Statement of the Problem

Consumer knowledge, attitudes, and perceptions of food and nutrition labels have received considerable attention as an important strategy for addressing poor diets and the obesity epidemic worldwide (WHO, 2006). As obesity and diet-related NCD prevalence rise in LMICs, consumer understanding and use of nutrition information on food labels can be useful for public health policy and action (Hawkes et al., 2013). Majority of the research and recommendations in this area originate from developed countries. But in developing countries, limited attention has been given to research to understand consumer behaviour towards food label use in improving diets and preventing obesity (Mandle et al., 2015).

To critically examine consumer's use of food labels and how it translates into healthy dietary choices, examination of both consumer (demand-side) and product-related (supply-side) factors are important (Grunert, Fernández-celemín, et al., 2010; Hieke & Taylor, 2012). It is essential to analyse how nutrition information is communicated on labels of pre-packaged foods (Rayner et al., 2013). However, there is currently no empirical evidence on health-related label characteristics of pre-

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packaged foods, especially, the extent of penetration of food labels carrying nutrition and health claims in Ghana, as well as their utilization (Booth et al., 2021).

Existing studies on consumer food label use in Ghana reports that consumers consult food labels (Ababio et al., 2012; Aryee et al., 2019; Azila-gbettor & Adigbo, 2013; Darkwa, 2014; Osei Mensah et al., 2012). However, not much is known about whether the consumer possesses the knowledge and skills that allow them to make healthy food choices as communicated on food labels. Evidence on consumers' understanding of labels have been mixed (Booth et al., 2021). For instance, Aryee and his colleagues (2019) in their study assessing consumers food label use and understanding in Tamale, indicated that 66.7 % respondents claimed to understand food labels while Darkwa (2014) found only 22 % of consumers in Koforidua had adequate nutrition knowledge. These previous studies are limited since they employed subjective assessments in measuring consumer understanding and use of food labels.

Besides, Ghanaian consumers are known to focus on expiry dates, however, use of health-related information such as nutrient composition of foods, ingredients list, health and nutrition claims are rare (Ababio et al., 2012; Osei Mensah et al., 2012). It is not known why the health-related aspects of food labels are not typically used by Ghanaian consumers.

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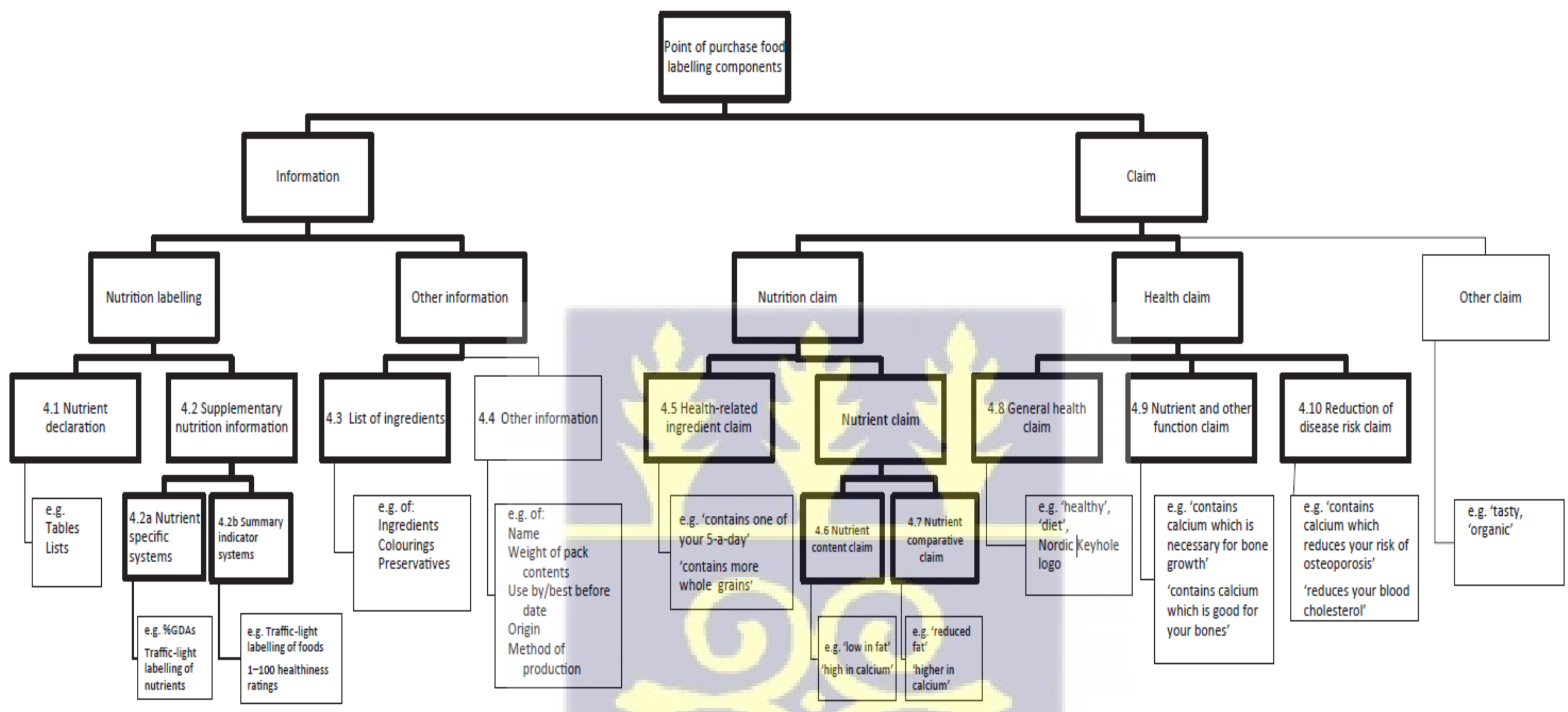

Figure 1: INFORMAS Taxonomy for describing health-related aspect of food labelling

The bolded boxes represent 'health-related food labelling'.

Reference; Rayner, M., Wood, A., Lawrence, M., Mhurchu, C. N., Albert, J., Barquera, S., ... & L'Abbé, M. (2013). Monitoring the health-related labelling of foods and non-alcoholic beverages in retail settings. *obesity reviews*, *14*, 70-81.

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1.3 Justification

In addressing the rising prevalence of NCDs, food labels constitute an important tool to help consumers make healthy food choices (Koen et al., 2016). Thus, this study is intended to fill the evidence gap on consumer understanding and use of nutrition information on food labels in Ghana. It also addresses a critical gap in research about the state of nutrition and health claims on pre-packaged foods in Ghana (Laar et al., 2020).

Food labels constitute an important aspect of the food environment in its ability to aid healthy food choices. Despite its importance, very little is known about the type of nutrition and health-related food label information that consumers are exposed to. This knowledge is not existent in literature on Ghana, and addressing this knowledge gap is important against the backdrop of a rapidly changing food system (Andam et al., 2017; Andam et al., 2015).

This study fills a significant gap in knowledge of Ghanaian consumers' ability to use food labels to select healthy foods. Also, the study is important in extending our knowledge on the predictors of food label use beyond demographic characterizations such as the types of health-related information checked on pre-packaged foods, and to explore Ghanaian consumers' reasons for non-use of food labels or otherwise.

Finally, the evidence generated from this study will form part of the evidence needed to stimulate policies on food system reforms such as re-evaluation on nutrition labelling regulations, decisions on food marketing, healthier food product reformulations and consumer protection actions in Ghana

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1.4 Objectives of Study

1.4.1 General Objective

The main objective is to assess label characteristics of pre-packaged foods and to determine the drivers of label use among consumers in urban Accra.

1.4.2 Specific objectives

I. To describe and classify health-related nutrition information on labelled pre-packaged foods sold in local retail shops in Accra.

II. To examine the level of compliance of health and nutrition claims information on labelled pre-packaged foods to Food and Drug Authority regulations and Codex standards.

III. To determine pre-packaged food use behaviour among urban-dwelling households in Accra.

IV. To characterize consumer perception and understanding of health-related information of labelled pre-packaged foods.

V. To identify factors that are associated with consumer understanding and use of health-related label information on pre-packaged foods.

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CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Food processing and unhealthy diets

Advancements in food processing technology have increased the range of foods available, reduced cooking times, and improved the quality and safety of products. However, these benefits come with a cost on food systems, and may contribute to the increasing burden of chronic disease. A growing body of evidence has linked consumption of processed foods, especially ultra-processed foods (UPFs) with the global burden of non-communicable disease (Baker et al., 2020; Bielemann et al., 2015; Elizabeth et al., 2020; Fiolet et al., 2018).

Although the relationship between food processing and health outcomes is still emerging, Hall and colleagues (2019) have suggested that consumers of ultra-processed foods showed increased total calorie intake and weight gain compared to non-consumers (Hall et al., 2019). In studies assessing dietary quality, a large share of ultra-processed foods, as part of the diet, are indicative of reduced dietary quality since they replace traditional whole and minimally-processed foods of populations (Luiten et al., 2016; Martínez et al., 2017). Industrial processing alters the chemical and structural properties of foods, thereby affecting the body's metabolic response to food. Ultra-processed foods have been shown to elicit higher glycemic response and lower satiety than minimally-processed foods(Fardet, 2016). Further, processed foods containing certain food additives disrupt the normal gut microflora, increase gut permeability and induce autoimmune diseases(Lerner & Matthias, 2015).

Observational studies have shown strong associations between increasing production and consumption of processed foods and increasing rate of obesity and other diet-related NCDs (Bielemann et al., 2015; Canella et al., 2014; da Costa Louzada et

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al., 2015). Also, an ecological assessment by Monteiro et al, (2018) in 19 European countries, showed that the household availability of ultra-processed foods was directly linked to the increasing prevalence of obesity(Monteiro et al., 2018). In prospective cohort studies, intake of ultra-processed foods were associated with the onset of cardiovascular disease linked with trans-fat, obesity, type 2 diabetes, hypertension and some cancers(De Souza et al., 2015; Fiolet et al., 2018; Mendonça et al., 2016, 2017; Rauber et al., 2015).

Moreover, concerns about the health risks associated with consumption of processed foods and NCDs, have led to the development of food classification systems to differentiate between various categories of processed foods(Moubarac et al., 2014). In the extant literature, seven systems of classifying processed foods are mentioned and notable among them is the Nova food classification system (Sadler et al., 2021). The various criteria used in classifying processed foods include the extent of change of food from its natural state, the type of the change, where and who is making the change, the method whether traditional or modern methods and the reason or value of processing.

The Nova system of food processing classification was developed by a group of researchers from the school of Public Health of the University of São Paulo.(Hall et al., 2019; Monteiro, 2009). Nova is based on the purpose, nature, and extent of processing of food or drink. The nova system classifies foods into four categories; minimally processed foods (MP), processed culinary ingredients (PCI), processed foods (PF) or ultra-processed foods and drinks (UPFDs)(Monteiro et al., 2010). UPFD foods rely on heavy industrial processing/formulations derived from whole foods. Examples include sugar, fatty or salty-rich packaged products, burgers, frozen pizza and pasta dishes, nuggets and sticks, crisps, biscuits, confectionery, cereal bars,

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carbonated and other sugary drinks. They usually contain less fiber or whole foods, high in salt, sugar, or fat.

In recent years, there has been an increasing interest in the Nova system(FAO, 2015;Monteiro, et al., 2018). The Nova system has been widely used in studies assessing food security, diet quality and health outcomes such as obesity and diet-related NCDs (da Costa Louzada et al., 2015; Marrón-Ponce et al., 2019; Martínez Steele et al., 2017). Subsequently, it has influenced dietary guidelines of countries such as Brazil, Ecuador, Peru, Uruguay, Belgium and France(Herforth et al., 2019). The Nova framework has also received recognition from international organizations such as Pan American Health Organization (PAHO) and the FAO.

However, the Nova system has come under serious criticism from the food industry and a section of the academic community(Gibney et al., 2017), challenging the evidence linking UPFDs with high dietary energy intake. Gibney et al, (2017), claim the evidence linking micronutrient malnutrition and UPFD consumption is weak. There is also criticism about the lack of considerations for portion sizes and rate of energy intake in the Nova classification as such not credible to inform the development of dietary guidelines (Gibney, 2019). These assertions had, however, been refuted with rebuttal publication from Monteiro et al, 2018, stating Gibney et al, (2017), refused to critically appraise the extant literature or probably doing the bidding for the Big Foods(Transnational food companies) (Monteiro et al., 2018). At the moment , there is no international agreement on what constitutes the levels of food processing(Sadler et al., 2021).

Despite the growing evidence of the negative link between consumption of processed foods and health, little attention is being paid to food processing in public health, nutrition and epidemiological research especially in LMICs(Monteiro, et al.,

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2018). Most processed foods and drinks offered come pre-packaged. Pre-packaged food products are vectors of these unhealthy diets. Worldwide, 75 % of the world's food purchases are processed pre-packaged foods and non-alcoholic beverages (Moodie et al., 2013;Popkin et al., 2011).

Meanwhile, dietary habits have changed leading to increased consumption of pre-packaged foods(Baker et al., 2020;Popkin et al., 2013). Sales and rate of consumption of processed foods are increasing more rapidly in LMICs than in high-income countries (HICs)(Moodie et al., 2013). It is projected that the sales of ultra-processed foods in East and South Asia will be equal to those of high-income countries by 2035 (Haddad et al., 2016).These patterns are being driven by increasing globalization, technological advancement, industrialization of food systems, infiltration and activities of transnational food companies, and increasing economic growth (Moodie et al., 2013;Popkin, 2015; Stuckler et al., 2012).

In Ghana, the food system is changing rapidly, with a notable shift in dietary behaviour towards increased consumption of processed pre-packaged foods, due to rapid urbanization and economic prosperity (Andam & Silver, 2016). Although the domestic production of processed foods is increasing, imported processed food dominate our market and their retailing is commonplace (Andam et al, 2016). There is also a boom in the supermarket industry associated with higher consumption of processed foods, and adversely, increases in the rates of obesity (Rischke et al, 2015). The supermarkets, public markets, shops and street hawkers offer consumers easy access to these processed foods. In Accra, it is easy for one to have home food shopping even in a car while driving home from work since street hawkers inundate consumers with a variety of packaged processed foods(Ofosu-Boateng, 2020). Consequently, there

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has been an increase in the availability, accessibility and affordability of pre-packaged foods(Dowuona-Hammond, 2018).

2.2 The burden of diet-related NCDs

Globally, the prevalence of obesity and diet-related non-communicable disease (NCDs) continues to increase, especially in low- and -middle-income countries. NCDs account for the premature deaths of 15 million people annually and 85% of these deaths occur in low-and middle-income nations. (WHO, 2019). With already weak health systems in many parts of Africa and a high prevalence of communicable diseases, increasing numbers of patients with NCDs are putting unbearable pressure on health systems(Nyaaba et al., 2020). NCDs increase health expenses, thus worsening the plight of the poor and reducing nations' productivity and economic growth (Bollyky et al., 2017; Chaker et al., 2015).

Although the aetiology of NCDs is complex, four main risk factors of tobacco use, harmful use of alcohol, unhealthy diets and physical inactivity are responsible for the increasing prevalence of these chronic diseases (Michele Cecchini et al., 2015; Knai et al., 2018). However, dietary risk factors contribute more to the global burden of NCDs than tobacco, alcohol and physical inactivity combined (Danaei et al., 2014; Hyseni et al., 2017; Meier et al., 2019). Dietary risk factors(Poor diets) refer to high intake of calorie-dense foods, especially ultra-processed foods containing high amounts of sugar, salt, saturated and trans fat with the lesser intake of healthy foods like whole grains, pulses, nuts, fruit and vegetables (Melaku et al., 2016). Unhealthy diets are associated with increased risk of raised blood pressure, blood sugar, and lipids, as well as obesity in individuals. However, obesity represents a significant risk factor for the development of diabetes, cardiovascular diseases (CVD), osteoarthritis, sleep apnea, cancer, liver and kidney diseases(Pi-Sunyer, 2009). Over-weight and obesity represent

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excess calorie intake over the body's energy requirements. As at 2013, little over two billion people were overweight or obese and 62 % of these individuals live in LMICs (Ng et al., 2014). In 2016, obesity was identified to be the world's sixth-leading cause of disability-adjusted life years (DALYs) and the burden of obesity has been rising in LMICs (Ford et al., 2017). More recently, from 2010 to 2019 high body mass index (BMI) was the leading risk factor of disability-adjusted life years(DALYs)(Murray et al., 2020). One feature of the obesity epidemic is, no country has been successful in reversing the increasing trend once it has begun.

Obesity and diet-related NCDs have become a public health concern in Ghana (de Graft Aikins et al., 2012; Ofori-Asenso et al., 2016). Trend analysis of obesity data of Ghana Demographic Health Survey (GDHS) from 1993 to 2014, shows that the prevalence of obesity has increased from 3.4% to 15.3%(Ghana Statistical Service (GSS), Ghana Health Service (GHS), 2015). It is estimated that 43% of adults in Ghana are either obese or overweight (Ofori-Asenso et al., 2016). Despite the increasing prevalence of obesity and diet-related NCDs, there are no clear-cut comprehensive food policy approaches in Ghana aimed at improving healthy food choice and preventing diet-related NCDs (Allen et al., 2018; Laar et al., 2020; Nyaaba et al., 2020).

2.3 Food Labelling Policies addressing unhealthy diets and the obesity epidemic

Fundamentally, food labelling policies were intended to inform and protect consumers about food products as well as ensure fair marketing. However, it has transitioned into a health policy tool to motivate change in consumer dietary behaviour and stimulate the production of healthy foods (Hawkes et al., 2013). On this basis, labelling that misleads and deceives consumers is frown upon by national legislations, international laws, and even private standards. Food label information should be truthful so that consumers can make informed decisions during purchase. Also,

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businesses are protected from unfair competition by the prohibition of false claims being made on products.

Hawkes and her colleagues (2015), posited that food policies aimed at reducing the obesity epidemic should provide an enabling environment for healthy food choices, overcome barriers of healthy food choices, encourage consumers to select healthy food (empower the consumer) and provide the needed stimulus for the production of healthier foods (Hawkes et al., 2015). Similarly, the NOURISHING framework developed by WCRF (World Cancer Research Fund) identified the food environment, the food system and behavioural change communications as the main domains to comprehensively tackle obesity and diet-related NCDs (Hawkes et al., 2013). Since the causes of obesity are multifaceted preventive approaches must cut across individual, societal, environmental and economic aspects. Equally, a wide range of policies and regulatory interventions have been implemented over the years to prevent unhealthy diets and obesity in many parts of the world. Some notable actions include restrictions on unhealthy food advertisements especially to children, tax increases on sugar-sweetened beverages and mass media education to promote healthy eating and increased physical activity (Allen et al., 2018).

Therefore, food labelling is well-fitted into this policy framework in addressing unhealthy diets and obesity. The provision of easy-to-understand nutrition information on pre-packaged foods would inform and empower consumers' selection of healthy foods and incentivize the food industry to formulate healthier food products (Corvalán et al., 2013). Also, food labelling represents an important avenue for the 'making the healthy choice the easier choice' maxim as emphasized by many consumer watch groups in promoting healthy food choice (Ashe et al., 2011; Castres, 2016).

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Increasingly, food labelling has become one of the important policy areas in tackling unhealthy diets and obesity-associated NCDs in many parts of the world(Hawkes et al., 2013; Kanter et al., 2018; Stefan Storcksdieck genannt Bonsmann & Wills, 2012; Waterlander et al., 2017). Hence, WHO has recommended food labelling as one of its global policy packages to mitigate the rising burdens of diet-related NCDs (WHO, 2006). Likewise, the National Academy of Medicine (NAM) of the United States, the Organization for Economic Co-operation and Development (OECD) and the International Network for Food and Obesity/NCDs Research, Monitoring and Action Support (INFORMAS) have all identified food and nutrition labelling as an important policy area in addressing unhealthy diets and the obesity epidemic (Michele Cecchini et al., 2015; C Hawkes et al., 2013; McGuire, 2012; Swinburn et al., 2013). Furthermore, Bellagio conference (conference on programme me and policy options for preventing obesity in LMICs countries) reiterated the importance of nutrition labelling practices in addressing the obesity epidemic in LMICs (Popkin et al., 2013).

There are, however, dissenting views about how food and nutrition labelling could help change the dietary behaviour of the population. Firstly, the knowledge on how labelling information aids a consumer to choose healthy foods is limited in many observational studies (Cowburn & Stockley, 2005; Drichoutis et al., 2006; Grunert & Wills, 2007). Although eye-tracking technology was employed to bring the needed objective measurement in food labelling research to mimic real-world shopping, it is limited by the use of unrepresentative samples for such study designs (Graham et al., 2012).

Barker et al, (2012), question the importance of labels and argued that simply providing easy-to-understand information can not directly translate into much improvements in diets (Barker et al., 2012). Similarly, review of literature assessing

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effectiveness of various nudges towards healthy eating , label information-cognitive nudge- was found to have the least impact compared with affective and behavioural nudges(Cadario & Chandon, 2019). These studies demonstrated that there is a disconnect between what consumers with nutrition label knowledge do in real shopping experience and what they claim they do.

Mhurchu and Gorton, 2007 in their review of nutrition labelling and claims in New Zealand, contended that the provision of nutrition labels in an easy-to-understand and user-friendly manner provides a supportive environment that empowers people to make healthy food choices (Mhurchu & Gorton, 2007). Magnusson (2010) argues that food labelling is only a part of a whole range of policies needed to make gains in obesity prevention and public health which has a potential to empower the consumer and act as catalyst for production of healthier foods(Magnusson, 2010).Also, in analysing the effect of different types of labels on nutritional quality of supermarket food purchases, Dubois *et al.*(2021) point outs that the marginal effect on nutritional quality must be situated in the right perspective since small changes in the nutritional quality of diets over a long period can have significant health outcomes (Dubois et al., 2021).

Moreover, it is argued that a strong legislative and regulatory environment coupled with nutrition education has the potential of changing the dietary behaviour of populations(Michele Cecchini et al., 2010; Mandle et al., 2017). The provision of easy-to-understand label information coupled with education on nutrition would lead to improvement in individual dietary behaviour. Implementing an effective food labelling policy is in tandem with the axiom "making the healthy choice an easy choice'' for consumers purchasing pre-packaged foods. In this way, food labelling will have a greater impact on addressing unhealthy diets and the growing epidemic of obesity and diet-related NCDs (Volpp & Asch, 2017). Despite these benefits of food labels to the

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individual and public health as a whole, the prevalence of actual use of food labels has been lower than self-reported use especially in LMICs (Cowburn & Stockley, 2005).

2.4 Food and nutrition labelling of Pre-packaged Foods and their Regulation

2.4.1 Food Labelling of pre-packaged foods a standard of Codex

Information on food labels is generally set and standardized by Codex. The Codex Alimentarius Commission (Codex) was established by the Food and Agriculture Organization and the World Health Organization in 1962 with a core mandate for developing food standards. They also provide guidelines for label information and food groups. The aspects include standards on general labelling of pre-packaged foods (Codex Stan-1985), labelling of food additives (Codex Stan 107-1981), labelling of and claims for pre-packaged foods for special dietary uses and foods of medical purposes(Codex Alimentarius Commission, 2001). Also, they provide guidelines on nutrition labelling and claims as well as their uses. Additionally, they provide guidelines on labelling information of production, processing, marketing and religious indications on pre-packaged foods (CAC/GL 23-1997, CAC/GL 24-1997, CAC/GL 32-1999).

Generally, Codex guidelines are fundamentally based on the principle that any information provided on labels should not be false, misleading or deceptive for the consumer. According to Codex, food labelling is 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 to promote its sale or disposal'.(Codex Alimentarius Commission, 2001). Likewise, Codex defines a food label of a pre-packaged food as ' any tag, brand, mark, pictorial or other descriptive matter that is written, printed, stencilled, marked, embossed or impressed on, or attached to, a container of food product'(FAO, 2016). Pre-packaged food and drink are defined as 'any food item for

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presentation to the consumer or caterer made in advance in a container including wrappers such that packaging completely or partially encloses the food item such a way the contents cannot be altered without opening or changing the packaging' (Codex, 2012; FDA, 2013b).

A wide range of pre-packaged foods carries labels from minimally processed to ultra-processed food products. Food labels contain a lot of information but the food identity (name of food product, lot number, address of the manufacturer, country of origin, its net weight), ingredients list, food additives, allergenic ingredient declarations and date markings are minimum information requirements that must be provided on labels. These requirements are mandatory for food labelling in most countries. Information on nutrient composition and provisions of claims are voluntary indications on pre-packaged foods in many countries(FAO, 2016). Nevertheless, nutrition labels, ingredients list and claims are aspects that convey nutrition and health information intended to guide selection of food products. These components of labels are often the subject matter of food label research and government regulations (Miller & Cassady, 2015; Rayner et al., 2013). Food labelling practices are regulated by many nations based on codex standards and guidelines.

2.4.2 Nutrition and Health Information on Pre-packaged Foods

Nutrition labelling is the disclosure of information on food composition, nutrient constituents, and quantities in food products. Therefore, ingredient list, nutrition fact table and supplementary nutrition information (use of health and nutrition claims) constitute nutrition and health information on food labels. Essentially, the provision of these aspects of the label characterizes how consumers are informed about the contents of foods, the benefits and risks associated with nutrients of public health significance. In this way, a consumer is empowered to make an informed food choice.

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Currently, nutrition display formats on pre-packaged foods fall into two general categories: Back- of- Pack (BOP) and Front-of-Pack (FOP). These aspects of nutrition labelling are discussed below.

2.4.2.1 Nutrition Fact Table (Back-of-Pack)

A typical Nutrition Fact Table (NFT) consists of a nutrient list, their relative amounts and other forms of numerical quantifications such as serving size and percent daily values of macronutrients, vitamins and minerals (see figure 2). It is usually displayed at the back of package, and it is often referred to as Back-of-Pack (BOP) or Nutrition Fact Panel (NFP). The NFT is the most commonly used nutrition label format worldwide (Temple et al., 2014) however there are variations in the way information is presented across nations due to different regulatory controls. In the US, the enactment of Nutrition Labelling and Education Act (NLEA), some three decades ago made nutrition labelling mandatory on pre-packaged foods. Currently, codex recommends mandatory nutrition information of proteins, available carbohydrates, saturated fat, total fat, sodium and sugars total calories, serving sizes and nutrients relative percent daily values (Codex, 2012). Percent daily values are based on nutrient reference values (NRV). NRVs are a set of numerical values established for nutrition labelling based on scientific data associated with nutrient requirements or with reducing the risk of diet related-NCDs(Codex, 2012).

Auditing nutrition labelling on pre-packaged foods in countries with high consumer awareness of labels and mandatory nutrition labelling, showed a high rate of nutrition label presence. For example in the US, over 98% of NFT were on pre-packaged foods on the market, averagely 85% of products have NFT in Europe, 88% in China and 96% in Australia(Bonsmann et al., 2010; Huang et al., 2016; Legault et al., 2004; Sussman et al., 2019). However, in the analysis of pre-packaged nutrition

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labelling practices in some LMICs, in Malawi, 40.4% of products sampled had nutrition declaration, 65.9% in Serbia and 70% in Slovenia (Davidović et al., 2015; Kasapila & Shaarani, 2013).

The nutrition fact table is an important information source to help consumers compare the nutrient profiles of different processed foods, ascertain claims and select products to meet their dietary requirements. However, consumer use of this component has several limitations. The issue of low visibility(found at the back of pack), the complexity of information especially quantitative information makes it difficult for consumers to comprehend and some consumers find its details too overwhelming (Campos et al., 2011; Grunert, Fernández-celemín, et al., 2010). Thus, across the world, NFTs have been shown to be inadequate in helping consumers, especially those with low nutrition literacy in selecting healthy foods (Anastasiou et al., 2019; Campos et al., 2011; Cowburn & Stockley, 2005).

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Canada

Nutrition facts/Valeur nutritive
Serving 1¼ cup (30 g) / Portion de 1¼ tasse (30 g)

Amount per serving / Teneur par portion	Cereal / Céréales	With 1/2 Cup 2 % Milk / Avec 1/2 tasse de lait 2 %
Calories / Calories	110	180
	% Daily Value / % valeur quotidienne	
Fat / Lipides 0 g†	0 %	4 %
Saturates / saturés 0 g + Trans / trans 0 g	0 %	8 %
Cholesterol / Cholestérol 0 mg	0 %	3 %
Sodium / Sodium 220 mg	9 %	12 %
Potassium / Potassium 30 mg	1 %	7 %
Carbohydrate / Glucides 26 g	9 %	11 %
Fibre / Fibres 1 g	4 %	4 %
Sugars / Sucres 2 g		
Starch / Amidon 23 g		
Protein / Protéines 2 g		
Vitamin A / Vitamine A	0 %	8 %
Vitamin C / Vitamine C	0 %	0 %
Calcium / Calcium	0 %	15 %
Iron / Fer	30 %	30 %
Vitamin D / Vitamine D	0 %	25 %
Thiamin / Thiamine	45 %	50 %
Riboflavin / Riboflavine	50 %	60 %
Niacin / Niacine	8 %	15 %
Vitamin B_6 / Vitamine B_6	10 %	15 %
Floate / Folate	8 %	10 %
Vitamin B_{12} / Vitamine B_{12}	0 %	25 %
Pantothenate / Pantothénate	6 %	15 %
Phosphorus / Phosphore	2 %	10 %
Magnesium / Magnésium	0 %	8 %
Zinc / Zinc	0 %	6 %

† Amount in cereal / Dans les céréales.

INGREDIENTS: FLAKED MILLED CORN, SUGAR/GLUCOSE-FRUCTOSE, MALT (CORNFLOUR, MALTED BARLEY), SALT, NATURAL COLOUR, VITAMINS (THIAMIN HYDROCHLORIDE, NIACINAMIDE, PYRIDOXINE HYDROCHLORIDE, FOLIC ACID, d-CALCIUM PANTOTHENATE), IRON, BHT ADDED TO PACKAGE MATERIAL TO MAINTAIN PRODUCT FRESHNESS. CONTAINS TRACES OF SOYBEANS.

INGRÉDIENTS : MAÏS MOULU EN FLOCONS, SUCRE/GLUCOSE-FRUCTOSE, MALT (FARINE DE MAÏS, ORGE MALTÉE), SEL, COLORANT NATUREL, VITAMINES (CHLORHYDRATE DE THIAMINE, NIACINAMIDE, CHLORHYDRATE DE PYRIDOXINE, ACIDE FOLIQUE, d-PANTOTHÉNATE DE CALCIUM), FER, POUR CONSERVER LA FRAÎCHEUR DU PRODUIT, DU BHT A ÉTÉ AJOUTÉ AU MATÉRIEL D'EMBALLAGE, CONTIENT DES TRACES DE SOYA.

USA

Nutrition facts

Serving size 1/2 cup dry (40 g)
Servings per container: 13

Amount per serving

Calories 150 Calories from Fat 25

	% Daily value*
Total Fat 3 g	4 %
Saturated Fat 0·5 g	2 %
Trans Fat 0 g	0 %
Cholesterol 0 mg	0 %
Sodium 0 mg	0 %
Total Carbohydrate 27 g	9 %
Dietary Fiber 4 g	15 %
Sugars 1 g	
Protein 5 g	
Vitamin A	0 %
Vitamin C	0 %
Calcium	0 %
Iron	10 %

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

Australia

NUTRITION INFORMATION

Servings per package: 3
Serving size: 150 g

	Quantity per serving	Quantity per 100 g
Energy	608 kJ	405 kJ
Protein	4.2 g	2.8 g
Fat, total	7.4 g	4.9 g
– saturated	4.5 g	3.0 g
Carbohydrate, total	18.6 g	12.4 g
– sugars	18.6 g	12.4 g
Sodium	90 mg	60 mg
Calcium	300 mg (38 %)*	200 mg

* Percentage of recommended dietry intake

Ingredients: Whole milk, concentrated skim milk sugar, strawberries (9 %), gelatine, culture, thickener (1442).

United Kingdom

Nutrition information
Typical values per 100 g

Energy	245 kJ/58 kcal
Protein	4.6g
Carbohydrate	7.2g
of which sugars	6.5g
Fat	1.2g
of which saturates	0.2g
Fibre	0.2g
Sodium	0.1g

Figure 2: Examples of Nutrition label BOP adapted from(Campos et al., 2011)

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2.4.2.2 Ingredient List

The ingredient list component conveys information on constituents used to make food products. For some food packages, it is part of the nutrition fact table. Except for single-ingredient item foods, provision of the ingredient list on pre-packaged foods are mandatory. This aspect of labels helps consumers to assess the nutritional and health value of foods. Consumers can identify processed foods with significant amounts of healthy ingredients. For instance, it can be used to assess the level of synthetic additives (e.g. tartrazine- synthetic colour- is in sweetened beverages) and ingredients that must be avoided or reduced in food products such as saturated fat, added sugar or salt. In a focus group study of label use in South Africa, participants cited allergic reactions to certain food additives drove them to pay attention to ingredient lists on pre-package foods (Kempen et al., 2011).

Regulatory authorities recommend various specifications regarding the content, the style and the formats of how ingredients should be listed. These recommendations are meant to aid consumers in their evaluation of the food items (FAO, 2016). For example, ingredients are listed in descending order of their quantities by weight so smaller ingredients are towards the end of the list. Even though font sizes are specified for easy readability, most studies indicate font sizes are barriers to the use of ingredients (Campos et al., 2011; Mackey & Metz, 2009). Nutrition information provided on labels must be consistent with national dietary guidelines. For example, the 2020-2025 US Dietary Guidelines states that; " increase whole grains in place of refined grains by using the *ingredient list* on packaged foods to select foods that have whole grains listed as the first grain ingredient"(USDA, 2020). Despite most studies include ingredient list as an information source, some studies ignore their usage in assessing consumer nutrition label use (Miller & Cassady, 2015).

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2.4.2.3 Front-of-Pack Labels (FOP)

FOP nutrition declaration system is an effort to enhance the BOP format for easy consumer understanding and use. Here, information is presented on the front of food packages in simple and easy-to-understand formats allowing consumers to make a quick decision about the nutritional content and relative healthiness of food products (see examples in Figure 3). FOP nutrition labelling is also seen as a nudge policy approach in creating a healthy food environment (Scrinis & Parker, 2016). The formats are designed in a way to lead consumers towards healthy foods as much as possible.

There are two main identifiable groups of FOP systems in literature (Dean et al., 2014; Roseman et al., 2018). They include nutrient-specific and summary systems. The nutrient-specific system provides nutritional information of several nutrients as a guide such as Guideline Daily Amounts (GDA) in the USA, the Multiple Traffic Lights (MTL) in the UK (Scrinis & Parker, 2016) and warning labels in Chile. More recently, Mexico has also adopted the FOP warning label system replacing the GDA(White & Barquera, 2020). The summary system tends to display information about the whole nutritional quality of the food product based on a nutrition profiling system, examples include the keyhole symbol in Sweden, the choice logo in the Netherlands, guiding health stars in Australia and 5-colour nutritional labels in France (Julia et al., 2017; Khandpur et al., 2018).

Most of the FOP systems developed originated from food industry associations and non-governmental organizations. However, development of some FOP labelling systems was the collaboration between industry efforts, the research community, consumer groups, governments and non-governmental organizations. Initially, FOPs were implemented voluntarily by food industry associations. However, in quest of promoting healthy diets, governments have led the implementation of FOP systems in

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many countries. For example, in the UK, the Traffic Light Labelling system idea was mooted by the Non-Government Organisations(NGO) Coronary Prevention group and the choice programme was an international industry-led action before governments took over (Dean et al., 2014). For the past decade, the multiple traffic light (MTL), the daily amount (GDA) and choices logo FOPs have dominated the European market space (Pauline et al., 2015). In a study on GDA preference, Grunert et al, (2010) reported that respondents prefer GDA in their assessment of food products' healthiness. In the United States, middle-to high-income consumers reported that multiple traffic light systems were their preferred format in identifying and evaluating nutritional profiles of foods(Gorski Findling et al., 2018). In a more recent study, warning label was widely reported as the best understood and preferred FOPs than other FOPs and NFT(Nieto et al., 2019). However, in systematic review and meta-analysis of randomized studies, MTLs were found to be more effective in helping consumers choose healthier foods than other labelling formats(M. Cecchini & Warin, 2016). More recently, the FOP formats, Multiple traffic lights and warning systems have been shown to lead consumers to healthy products (Emrich et al., 2017; Neal et al., 2017). Up to date, there is no international agreement as to which FOP labelling system is most helpful in guiding consumers to choose healthier foods.

Several studies have reported the potential benefits of FOP labelling systems influencing population diets(M. Cecchini & Warin, 2016; Pettigrew et al., 2017; Rønnow, 2020; Scrinis & Parker, 2016). The evidence of FOP labelling impact is stronger in its influence of the supply side; that manufacturers' reformulation of healthier foods than the demand side-consumer behaviour (Vyth et al., 2010). Thus, there is a gradual global trend towards FOP nutrition labelling with many countries adopting various formats-fig. 3- (Kanter et al., 2018). Currently, there are no clear-cut

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indications and guidelines for national mandatory FOP nutrition labelling (Kanter et al., 2018).

Moreover, the FOP system has been criticized by others as a mere marketing strategy of food industries to increase profits rather than a public health policy tool(Brownell, 2012; Brownell & Koplan, 2011). In other situations, the implementation of the FOP system and its regulations have led to legal tussles between the food industry and governments (Jones et al., 2019). For example, due to the implementation of warning labels in Chile, Pepsico sued the Chilean Treasury for the prohibition of certain features on their food packages as it infringed on its intellectual property rights (Aguayo, 2017). Also, the European Commission initiated infringements proceedings against the UK regarding the 'traffic light' labelling scheme (Salas & Simões, 2014).

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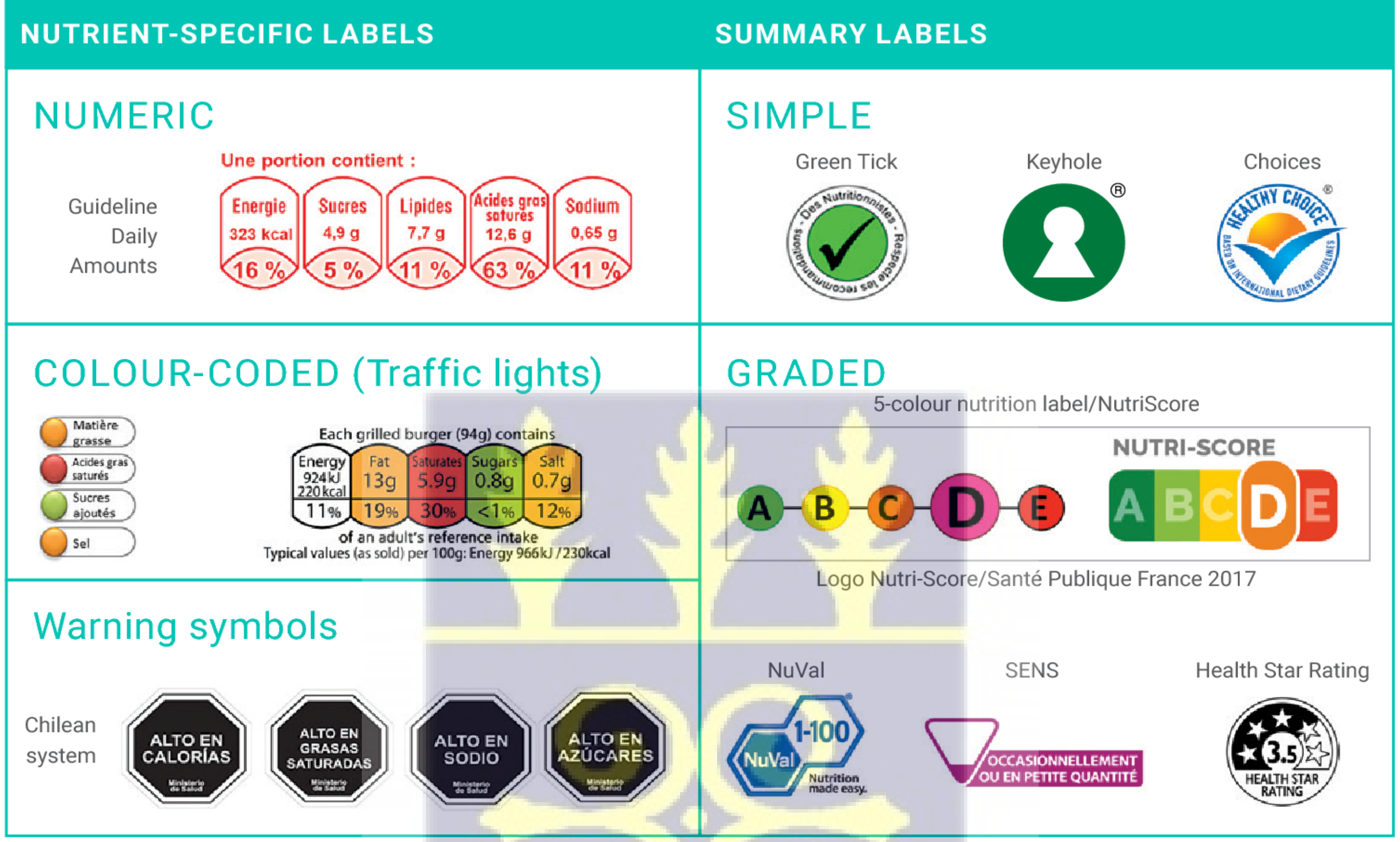

Note: the circled images were used in the comparative study on perception, understanding and use of front-of-pack systems.

Figure 3: Examples of FOP labelling systems adapted from Chantal, J., Hercberg, S., & World Health Organization. (2017).

Development of a new front-of-pack nutrition label in France: the five-colour Nutri-Score. Public Health Panorama, 3(04), 712-725.

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2.4.2.4 Health and Nutrition Claims

Another aspect of nutrition labelling that provides the consumer easy-to-understand information is the use of claims especially claims relating to nutrition and health. Health and nutrition claims are representations either presented in words, numbers or pictures that relate to unique nutrition or health properties of the food product. Their definitions and their classifications vary from one jurisdiction to another. However, Codex guidelines identify '*nutrient content claim*' and '*nutrient comparative claim*' as two groups of nutrition claims. Also, '*nutrient function claim*', '*reduction of disease risk claim*' and '*other functions claims'* are the types of health claims in the standards of the Codex. Codex guidelines recommend that health and nutrition claims should be consistent with national nutrition policy. Besides, claims allowed should be substantiated by sound scientific evidence.

INFORMAS provided elaborate and more definitive definitions of claims in general (see figure 1). Their definitions are based on the different types of claims proposed by Codex (Rayner et al., 2013). Among the sub-categories of health and nutrition claims, nutrient content claims are most common on labelled food products. They are provided on a voluntary basis. They usually relate to calories, protein, carbohydrate, fat, sodium, vitamins and minerals which NRVs values have been established in the standards of codex. Examples of nutrient content claims' phrases include low in, high in, source of, no added, source of and fortified/enriched with.

Although the provisions of claims on package foods were commonplace in wealthy nations, their presence has become a feature of retail markets in developing countries. Arguably, it has become a marketing tool for food manufacturers to boost their sales. Research has shown that health and nutrition claims on packaged foods can influence consumer evaluation of the healthiness of the products and can lead to an

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increase in the sales of products (Anastasiou et al., 2019; A. Kaur et al., 2017). On the other hand, they may lead consumers to overrate the healthiness of products and could lead to overconsumption. The use of claims could also mislead consumers in their food choice by showcasing beneficial aspects of the product while hiding lesser desirable attributes.

In monitoring the US food supply, it was identified that 43.1% of new pre-packaged products introduced on the market had one form of HNCs claims or the other (Martinez, 2013). In assessing the prevalence of HNC in one of the largest grocery supermarkets in the UK, 32% of the pre-packaged food products either had health and nutrition claims (A. Kaur et al., 2016) and an average of 26% was identified from food products across five European countries (Hieke et al., 2016). In a similar study in Mongolia, only 9% of all food product samples had at least a nutrition or health claim (Chimedtseren et al., 2020). In Africa, a study to analyse the presence of claims on pre-packaged foods supply, 14% of HNC was identified on pre-packaged foods produced in Malawi, 20% for South Africa and 36.6% from other southern African countries (Kasapila & Shaarani, 2013).

Inherent in food laws across many nations; food products presented to consumers should not be false, misleading or deceptive. In general, provisions of nutrition and health claims on packaged are meant to be substantiated in the nutrition fact table of label information or are to be part of the approved list from regulatory bodies. Therefore, governments have the responsibility to monitor, regulate and enforce laws to ensure the credibility of claims made on labelled pre-packaged foods.

2.4.3 Voluntary and Mandatory Nutrition Labelling of Pre-packaged foods

Globally, regulatory controls for nutrition labelling for pre-packaged foods had mainly focused on nutrition fact tables and their contents (BOP nutrition labelling). The

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legislative and regulatory controls for nutrition labelling either fall into mandatory or voluntary controls. In the review of Hawkes et al, (2004), countries can be grouped into the following categories of nutrition regulatory policies.

- Mandatory requirements of Nutrition Fact Table/NIP on some or all pre-packaged foods.
- Voluntary requirements of NFT unless a health or nutrition claim is made.
- Voluntary requirement excerpt in the case of food with special dietary uses like baby foods, diabetic foods, fortified enriched foods.
- Voluntary requirements but prescribes standards in case of use.

Essentially, nutrition labelling regulation can be viewed as either mandatory or voluntary requirements, with variations in regulatory provisions for the format and content indications of nutrition labels across different countries. Disclosure of nutrition information on pre-packaged foods is voluntary in most nations. Under the voluntary regulation regime, producers are permitted to present nutrition information in any format acceptable. There are no restrictions to which type of product that should have nutrition information. However, in some jurisdictions, declaring a health or nutrition claim requires the provision of NFT. For example, Botswana, Malawi, Mozambique, Namibia, Tanzania, Zambia, Zimbabwe, Egypt, Kenya and including Ghana subscribe to voluntary nutrition labelling (EUFIC, 2018).

Although voluntary labels allow food producers to be innovative about communicating nutrition information, it does not allow consistency in the marketplace to enable consumers to compare nutrition profiles of different products. Also, under voluntary schemes, producers can hide undesirable attributes of their products. Audit analysis of pre-packaged in countries with voluntary nutrition labelling , showed low standard of labelling practices were observed including; low compliance to labelling

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standards and insufficient nutrition labelling (Chimedtseren et al., 2020; Kasapila & Shaarani, 2013; Wang et al., 2011). In Ghana, presently, it is unclear whether nutrition declarations, as well as provisions of health and nutrition claims on food labels, are monitored and evaluated to understand the kind of nutrition information consumers are exposed to (Laar et al., 2020).

Mandatory labelling policies had been a key regulatory feature of developed countries like the USA, Canada, Australia, Japan, the European Union but in recent times, a lot more LMICs are turning to mandatory nutrition labelling (EUFIC, 2018). For example, Nigeria recently turned to mandatory nutrition labelling for all pre-packaged foods. Mandatory nutrition information disclosure allows for a standard format that enables consumers to easily compare nutrient profiles of food products. Also, under mandatory labelling more food products disclose nutrition information than voluntary labelling. It requires full information disclosure about food products enabling producers to even disclose otherwise undesirable information about their product. This mandatory requirement can stimulate producers to reformulate healthier food products (Hawkes et al., 2015).

With interest in FOP labelling, which is mainly regulated voluntarily, it is possible to identify both voluntary and mandatory information on single packaged food. Regardless of whether a country adopts either voluntary or mandatory nutrition labelling, efforts must be made to continue to align labelling policy towards informing and empowering consumers towards healthy food choice (Jones et al., 2019).

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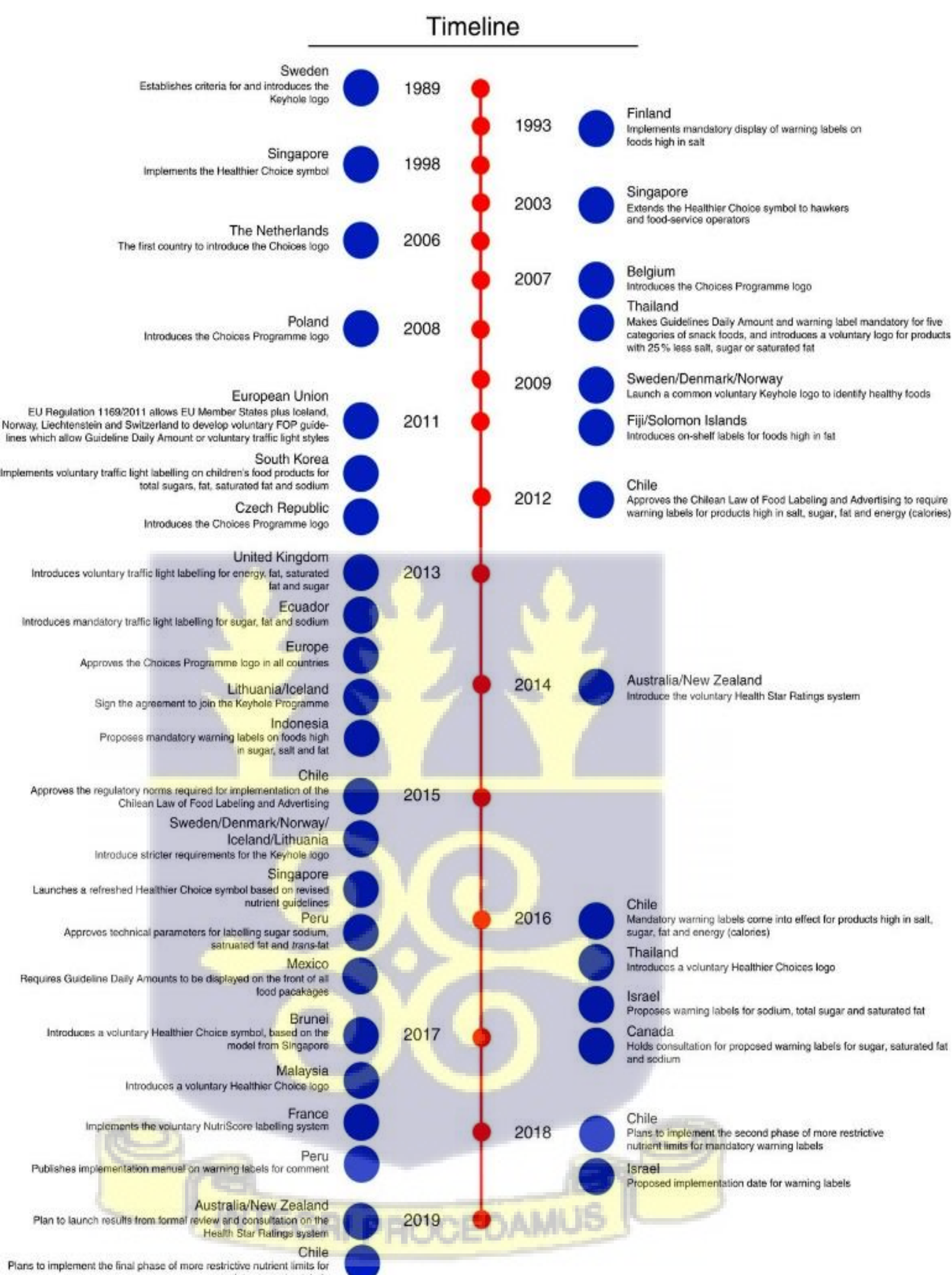

Figure 4: Timeline of countries all over the world adopting FOP labeling system.

Adopted from (Kanter et al., 2018)

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2.5 Consumer food label use

Food label use: a behaviour of how consumers engage with food label information is defined in a variety of ways across studies. Four main concepts were identified in literature.

- Self-reported food label use

-Food label understanding through self-reports or objective test that measures actual understanding

-The tracking of retail data to see how food label use affects purchase

-Longitudinal and modelling approaches in measuring changes in dietary consumption patterns with label use (Campos et al., 2011; Mandle et al., 2015)

However, self-reported food label use studies dominate the literature (Campos et al., 2011). Hence, self-reported studies indication of label use is typically higher above 50% than studies that employed objective assessments of respondents(Campos et al., 2011; Cowburn & Stockley, 2005). Lower rates of understanding of labels are reported among respondents who were assessed objectively (Grunert, Fernández-celemín, et al., 2010).

Besides, operationalizations of the term 'food label use' also is defined differently across studies making comparisons difficult. In most cases, the search for and the reading of nutrition labels within certain time frames are identified as 'label users'. In analysing cross-sectional data on the use of labels, Christoph and colleagues, 2018 identified a 'label user' as respondents who responded ' most of the time' and 'always' to the question 'How often do you use food label: ingredient list, serving size information , nutrition and claims before buying or choosing to eat a food product for the first time?'(Christoph et al., 2018). Other responses are deemed 'non label users.

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In the study of assessing consumer understanding and use , Jacobs et al, employed a food labelling task which is seen to be a more objective assessment among consumers(Jacobs et al., 2011). While such assessments are seen to be more objective than self-reports they are also limited because they do not mimic the real world of shopping and affected recall bias. Therefore, an approach that seems to answer the research question of how nutrition label use can translate in healthy dietary choices is the use of eye-tracking cameras. These precise eye-tracking cameras monitor consumer visual attention and measures how consumers view and evaluate labels during shopping.

Food label use prevalence (in terms of frequency) was found to be 82% in New Zealand (Mhurchu & Gorton, 2007), 52 % in Canada, 47 % in EU (Grunert, Fernández-celemín, et al., 2010) and 75% in the USA (Campos et al., 2011) according to their national representative data. For other non-representative studies, it was 40.5% in Lesotho (Mahgoub et al., 2007), 48 % in South Africa (Bosman et al., 2014), 63.2 % in United Arab Emirates (Basarir & Sherif, 2012) and a study found 80.8 % use prevalence in Nigeria (Oghojafor et al., 2012).

Despite the numerous studies on consumer label use, most studies rely on convenience samples and a section of the population limiting our understanding of the predictors of food label use (Soederberg & Cassady, 2015). The situation is not different from Ghana where five studies on labelling identified, is only one that attempted to use random samples (Darkwa, 2014) and the rest use non-representative samples (Ababio et al., 2012; Aryee et al., 2019; Azila-gbettor & Adigbo, 2013; Osei Mensah et al., 2012) . It is difficult to generalize such results to the larger population. Also, not much of the situation is known about Accra since other studies were done outside Accra (Darkwa, 2014).

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2.6 Reasons for use and non-use of nutrition information on food labels

At the end of the international conference on Nutrition dubbed, Rome Declaration (2014), it was recommended that all countries should endeavour to empower consumers and create healthy food environments. Food labelling as a policy tool has the potential of a wider reach, a good source of health-related information of food products, less restrictive and low cost than strategies of using subsidies and taxes. Therefore, it is important to explore the reasons for non-use and use of nutrition information to inform labelling strategies to create the awareness, ensure effective use and empower the consumer toward healthy food choice.

Historically, investigators had attempted to answer this research question in the US after food labels became widely available (Klopp & MacDonald, 1981). For instance, Klopp and MacDonald, (1981) in exploring reasons for consumer reasons for non-use identified three categories of reasons for low rate of use. The reasons offered were related to three categories of consumer behaviour: shopping practices, the absence of need and perceived inability. The study identified 79% of non-users indicating that they trusted in their ability to choose a healthy food without consulting food labels (absence of need), few others complained of time constraints when shopping and a smaller number explained that nutrition information is confusing (perceived inability). In a more recent study in South Africa , consumers who do not use labels ranked price and taste as more important than nutrition information (Jacobs et al., 2011) however for label users the motivation to use health stem from reasons relating to the product and their health. Besides, most label users said they read food labels to know the level of nutrient content in food and product quality. In a cross-sectional survey of consumers in Madrid Spain, the investigators identified time constraints (38.9%), absence of need

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(27.1%), and reading problems (18.1%) as common reasons given for not using information on food labels (Prieto-Castillo et al., 2015).

In Rothschild's(1999) conceptual framework, observed differences in behaviour of consumers were explained by the levels of motivation, opportunity and ability of individual consumers (Rothschild, 1999). The influences of and the interplay of sociodemographic factors including literacy and numeracy skills, the type of food environment, knowledge of nutrition issues explained whether the consumer has the motivation to search for, read, understand and use label information to guide his or her purchase. The rest of the sections discussed the influences of these factors.

2.7 Consumer perception and understanding of food labels

Food choice can be a complex decision to make. The food choice process model states that an individual decision to select food is based on the negotiations of taste, price, health, convenience and social reasons (Furst et al., 1996). Label information is an important tool to raise awareness of nutrition and health implications linked with pre-packaged food consumption. Some research has revealed that most consumers consider nutrition labels as an important information tool however their understanding is seen to be poor (Campos et al., 2011; Cowburn & Stockley, 2005).

Understanding food labels is key to the effective use of labels (Hieke & Taylor, 2012). According to behavioural models on the consumer decision-making process and attitude formation, perception is a strong precursor to understanding (Grunert & Wills, 2007; Jacobs et al., 2011). Individual perception is either conscious or subconscious with conscious perception exerting a stronger effect on subsequent behaviour. Therefore, how information is perceived determines the kind of meaning attached. The meaning can either be subjective or objective. Subjective understanding is the kind of meaning an individual perceives information is, but objective understanding is the kind

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of meaning an individual perceives about the actual truth. Motivation in, interest, and knowledge of nutrition issues are expected to be stronger determinants of how label information is perceived, understood and use (Campos et al., 2011; Drichoutis et al., 2005). As often pointed out, individual demographics are described as predictors of label use, but in actual terms, they are predictors of motivation, interest and nutritional knowledge (Grunert, Wills, et al., 2010). Therefore, motivation of, interest in, and knowledge of nutrition and health are the immediate predictors of food label use.

Generally, observational studies suggest that the younger population, those with higher education, good literacy and numeracy, with better socioeconomic status and nutrition knowledge were more likely to report positive perception and understanding of nutrition labels (Koen et al., 2016; Mandle et al., 2015). With studies that employed a more objective assessment of understanding requiring respondents to perform a labelling task, the understanding was greater in younger adults, being female, educated, with adequate subjective understanding, high interest and appreciable knowledge in nutrition, positive attitude towards and motivation to use the nutrition labels (Grunert, Wills, et al., 2010; Liu et al., 2015; Mandle et al., 2015).

2.8 Factors associated with Consumer food label use

In the critical review of nutrition labelling, Hieke and Taylor, (2011) opined that to investigate factors associated with consumer food label use, it is important not only to analyse demographic factors but examine label characteristics (the type of information and their manner of presentation) consumers are exposed to. Generally, in the extant literature, studies are either examining consumer characteristics with little or no involvement of the food product information consumers are exposed to or vice versa.

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Research on the examination of label characteristics can be divided into two broad categories; format and wording (Hieke & Taylor, 2012). The focus has largely been on nutrition information and claims. Research has shown that nutrition information of BOP labelling is not easily comprehensible for most consumers, especially those with little or no knowledge of nutrition as compared to FOP labelling(Mandle et al., 2015). Wansink (2003) using FOP and BOP labels demonstrated that short claims of FOP combined with more detailed provision at the back of the package led consumers to a better decision about healthy foods (Wansink, 2003). On the other hand, regarding label wording, most consumers prefer verbal or pictorial (qualitative) information than numeric (quantitative information) (Howlett & Kennedy, 2011).

Regarding factors associated with food label use, the literature has focused on two main aspects; personal and socio-demographic factors (Campos et al., 2011). Personal factors refer to ability (efficacy), motivation and the knowledge levels of individuals to search, read and understand food labels at the point of purchase. According to Barreio-Hurle (2010), nutrition knowledge is the strongest predictor of food label use since consumers with higher knowledge are motivated and are capable of using the information to choose healthy foods (Barreiro-Hurl, Gracia, & de-Magistris, 2010).

Socio-demographic factors such as age, gender, family size, education, income/ occupation, religion and ethnicity/race are shown to be associated with label use (Campos et al., 2011; Hieke & Taylor, 2012; Jamal & Sharifuddin, 2015; Mandle et al., 2015). However, in extant literature education and income levels seem to be stronger predictors of consumer food label use than other socio-demographic factors (Campos et al., 2011; Grunert, Fernández-celemín, et al., 2010).In a recent systematic review,

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Anastasious and colleagues (2019), found that food label use was associated with overall improved diet quality, reduced calorie intake and increased consumption of fruits and vegetables (Anastasiou et al., 2019).

Ethnic and religious differences have been observed to be associated with food label use in terms of the type of information sought. For example, in a study among ethnically diverse shoppers in New Zealand, low-level food label usage was observed among minority ethnic groups (Gorton et al., 2009). Also, some consumers' religious belief informs their dietary choices such vegetarians who watch out for no trace of meat/fish in a product, Muslims watch out for 'halal' symbols on meat products while Judaists watch out for 'kosher' (Jamal & Sharifuddin, 2015; Zepeda et al., 2013).

2.9 Conceptual Framework

The conceptual framework for this study (Figure 5) is an adaptation of Grunert and Wills, (2007) and Jacobs *et al.*, 2011 conceptual models (Grunert & Wills, 2007; Jacobs et al., 2011). The combination of the two frameworks help maps out, identify pathways and explain linkages of consumer understanding and use of food label information. The theoretical framework of Grunert and Wills (2007), posited that the understanding and use of labels are based on consumer choice behaviours and the drivers of choice. Jacob et al, (2011), distinguished these drivers as *external/supply factors* (including product attributes, the food label information, role of food manufacturers and food labelling regulation) and *internal/demand factors* (factors about individual demographics characteristics and their situational factors).

The goal of this study was to assess label characteristics of pre-packaged foods and to determine the drivers of label use among consumers in urban Accra. Grunert and Wills (2007), model provided a pathway to analyse consumer decision making and food

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label understanding and use behaviour while Jacob et al., (2011) framework identify the drivers of label use, as such the current conceptual framework is apt for this study.

In this conceptual framework, the outcome measure is consumer behaviour towards food labels on pre-packaged foods (the middle rectangle in Figure 5). However, consumer behaviour towards food label was operationalised to measure consumer food label use and understanding as the main dependent variables for this study. The internal factors (independent variables) are those that fall within the consumers' power and influence their decisions on label use and understanding. However, external factors influence the type of information provided and communicated on food labels to the consumer (Balasubramanian & Cole, 2002). Both the external and internal factors are important determinants of consumer comprehension and use of labels, and consequently, consumers' ability to make informed pre-packaged food choices.

Consumer decision-making is based on the processes that influence food product selection in the face of multiple options and how label information available on each alternative affects their selection (Figure 5). Therefore, consumers' *motivation* to buy certain food products might be due to the label information they are *exposed* to, and their *perception* of product's information. The probability of *exposure* is increased if consumers *search* for label information to read. However, the exposure would lead to how the information on the product is *perceived*. How the product is *perceived* would inform consumer *appreciation (liking)* and their *understanding* of the label information on the product.

Moreover, for label use to drive better decision-making, understanding the product's label is important. This is particularly relevant, in respect of consumer processing of label information, and subsequently, its effects on decision-making regarding the product (Cowburn & Stockley, 2005). Hence, differences in consumers'

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nutrition knowledge, demographic characteristics and situational factors influence understanding and food label use. Situational factors include time, ability to prioritize, nature of work, health status, and socioeconomic status. However, with appropriate nutrition knowledge, a consumer can be motivated to select healthy food products.

In assessing consumer understanding, it is important to differentiate between subjective and objective understanding (Grunert, Wills, et al., 2010; Jacobs et al., 2011). Subjective understanding refers to the meaning the consumer ascribed to information and their perception of the information. Objective understanding, on the other hand, refers to the intended meaning of the information provided by the manufacturer, and the extent to which the consumer appreciates this intended message.

It is important to note that *liking* a product may not necessarily mean understanding the message on the label. It could also mean that consumers appreciate other characteristics of the product, for example the symbols and colours of the label or packaging. This perception could lead to a positive evaluation of the food product, which will be misleading, if it is not linked to the understanding of nutrition information provided. Petty and Cacioppo, 2012, refer to this type of information evaluation as peripheral information processing(Petty & Cacioppo, 2012).

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Internal Influences
- **Demographic characteristics**

Gender
Age
Household size
Education
Health Status
Nutrition Knowledge

- **Situational Status**

Work Status
Income
Time

Need/Motivation
Search
Exposure
Perception
Liking
Understanding
Food label Use
Informed Food Choice
Consumer Benefits

External Influences

- **Product Attributes**

Price
Taste

- **Food Label Information**

Ingredient List
Nutrition information
Food claims
Expiry/manufacture dates

- **Role of Food Manufacturers**
- **Food-Labelling regulation**

Compliance of nutrition and health claims

Recommendations

Figure 5: An adapted Conceptual Framework of consumer understanding and use of food label

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2.10 Limitation of the Literature Review

Although a critical literature review was undertaken, it is limited in the light of the fact that a more systematic approach of searching, screening, extracting and synthesis of research articles, reports and grey literature was not employed.

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CHAPTER THREE

3.0 METHODOLOGY

3.1 Introduction

This chapter describes the research design, study location, survey procedure, and statistical analyses.

3.2 Philosophical Basis of the Study

Research is about the quest for knowledge. It is designed to answer a question or address a problem. How a research question or problem is understood is often influenced by the researcher's personal view or philosophy as what makes up acceptable knowledge (ontological perspective) and how it is acquired -epistemological perspective- (Creswell, 2009).

Generally, the philosophies of *positivism*, *interpretivism/constructivism* and *pragmatism* are known philosophical underpinnings of most research designs(Saunders & Tosey, 2015). The positivist model posits that the natural world is rule-governed, and it is about cause and effect. Thus, it must be investigated by the methods of natural science- 'the scientific method'-. This paradigm is associated with quantitative research. In contrast, the interpretivism model posits that the social world is explained through how individuals relate and interact. It advances the argument that knowledge should be seen as personal, subjective and unique. Hence, must be investigated through the interaction of the researcher with his/her subjects. Qualitative research is usually associated with this philosophical paradigm.

Unlike the two philosophical paradigms, the pragmatism approach is interested in the relevance of research findings rather than means of enquiry. The approach considers that no single approach can ever give the entire picture but there are multiple realities

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to a research problem. Therefore, a pragmatist researcher is guided by the research question and its given contexts such as purpose of enquiry, available resources including timelines. Mixed method study designs are usually associated with this paradigm and relevant to the goals of new public health research (Kaur, 2016). However, it does not mean that a pragmatist researcher will always employ a mixed method design since the given context of the study determines choice of design (Saunders et al., 2015). As a public health practitioner, interested in how core research evidence will translate into policy and practicable applications, this research was underpinned by the philosophy of pragmatism.

3.2 Research Design

This cross-sectional study employed two methods of data collection: 1) content analyses of labels of pre-packaged foods, and 2) a household consumer survey. This study design was chosen because of the nature of study objectives. Cross-sectional studies have been confirmed to be good at providing a quick insight for descriptive research and in examining associations between outcome and risk factors(Levin, 2006). Therefore, this design was found suitable to address the current research objectives.

Regarding the food label content analysis, the photographic approach of collecting photographs of pre-packaged foods label information in-store was adopted for this study. This approach was adopted because it has been found to be less costly than in-store mystery shopping and online food labelling methods (Kanter et al., 2017; Rayner et al., 2013). The photographic label data obtained from selected community-based retail shops in the study areas were analysed to provide information on label characteristics such as the presence or absence of nutrition and health claims, types of nutrition label formats, and compliance to Food and Drugs Authority and Codex Alimentarius standards (Codex, 2012; FDA, 2013a).The household consumer survey

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gathered data on knowledge, perception, and use of pre-packaged foods use behaviour, as well as the use of health-related food labels.

3.4 Study Location

The study was implemented in the Accra Metropolitan Area (AMA), which is in the Greater Accra region of Ghana. Accra is the capital city of the Region. The population of the AMA is estimated to be over three million people (AMA, 2019; Statistical Service (GSS), 2012).

The AMA is made up of eleven (11) Sub-Metropolitan Areas including Ablekuma North, Ablekuma Central, Ablekuma South, Ashiedu Keteke, Ayawaso Central, Ayawaso East, Ayawaso West, La, Okaikoi North, Okaikoi South, and Osu Klottey (figure 2).Communities within the AMA are classified into four wealth classes based on residential data from 2010 Population and Housing Census -table 1- (GSS, 2014).

Makola, Agbogbloshie, Kantamanto, and Kaneshie Market Complex are large markets in Accra. These markets offer consumers unprocessed agricultural produce – fish, yam, cassava, plantain, fruits, and vegetables, as well as processed and packaged foods. These agricultural products are brought into the city from various farming communities elsewhere in Ghana. Most packaged foods available in the markets are imported from other countries (Andam et al, 2017). The food retail environment in Accra is characterized by open air stalls, street vendors, traditional, non-self-service shops; self-service grocery stores with one register; self-service standalone supermarkets with two or more registers and Self-service supermarkets with two or more registers that are part of a store chain (Andam et al, 2017).

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There are also several large-size shopping malls and western style supermarkets. Notable among these are Melcom supermarket, Shoprite, Game supermarket in Accra Mall, Marina Mall and other supermarkets in A & C Mall, Makola shopping Mall, and Osu Oxford Street which offer consumers different types of food products and services. These supermarkets attract a huge number of shoppers every day (Anning-Dorson et al., 2013).

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Table 1. Classification of Communities in Accra by Socio-economic status (SES).

1st Class Accra	2nd Class Accra		3rd Class Accra	4th Class Accra
Abelemkpe 1	Abelemkpe 2	Nii Boi town	Aborfu	Abossey Okai
Airport residential area	Accra new town	North Kaneshie	Alajo	Asere
Asylum down	Achimota	North Labone	Avenor area	Bukom
Burma Camp	Agbogboshie	Odawna	Bubuashie	Chorkor
Dansoma 1	Akorkorfoto	Odorkor	Chemuna	Ussher town
Dzorwulo	Akweteman	Okaishie	Dansoman Amanhoma	Zongo
East cantonments	Alajo	Old Dansoman	Darkuman	
East Legon	Apenkwa	Osu	Gbegbeyise	
East Ridge	Asylum down 2	Osu-Ako Adjei estates	Korle Gonno	
Independence avenue	Avenor	Sahara	Kotobabi	
Kanda Estate	Chorkor 1	Sakaman	Mamobi	
Kuku Hill	Dansoman 2	Sempe	Mampose	
North Dzorwolu	Darkuman	South Amanhoma	New Fadama	
North Labone	East Legon (Okponglo)	South Kaneshie	New Mamprobi	
Police headquarters Area	Kokomlemle	South Labadi	Nima	
Ridge	Kotobabi	South Odorkor	North Labone	
Ringway Estates	Kwashieman	Tesano	Odorkor	
Roman ridge	Labadi-Aborm	West Okponglo	Osu-Ako-Adjei	
South Shiashie	Latebiokorshie		Osu-Alata/Ashante	
T/Junction	Link road		Shiabu	
Tesano	Mantseman		South shiashie	
Zoti area	Mataheko		Sukura	
	New Abossey Okai			

Source; Ghana Statistical Service, 2010(Statistical Service (GSS), 2012)

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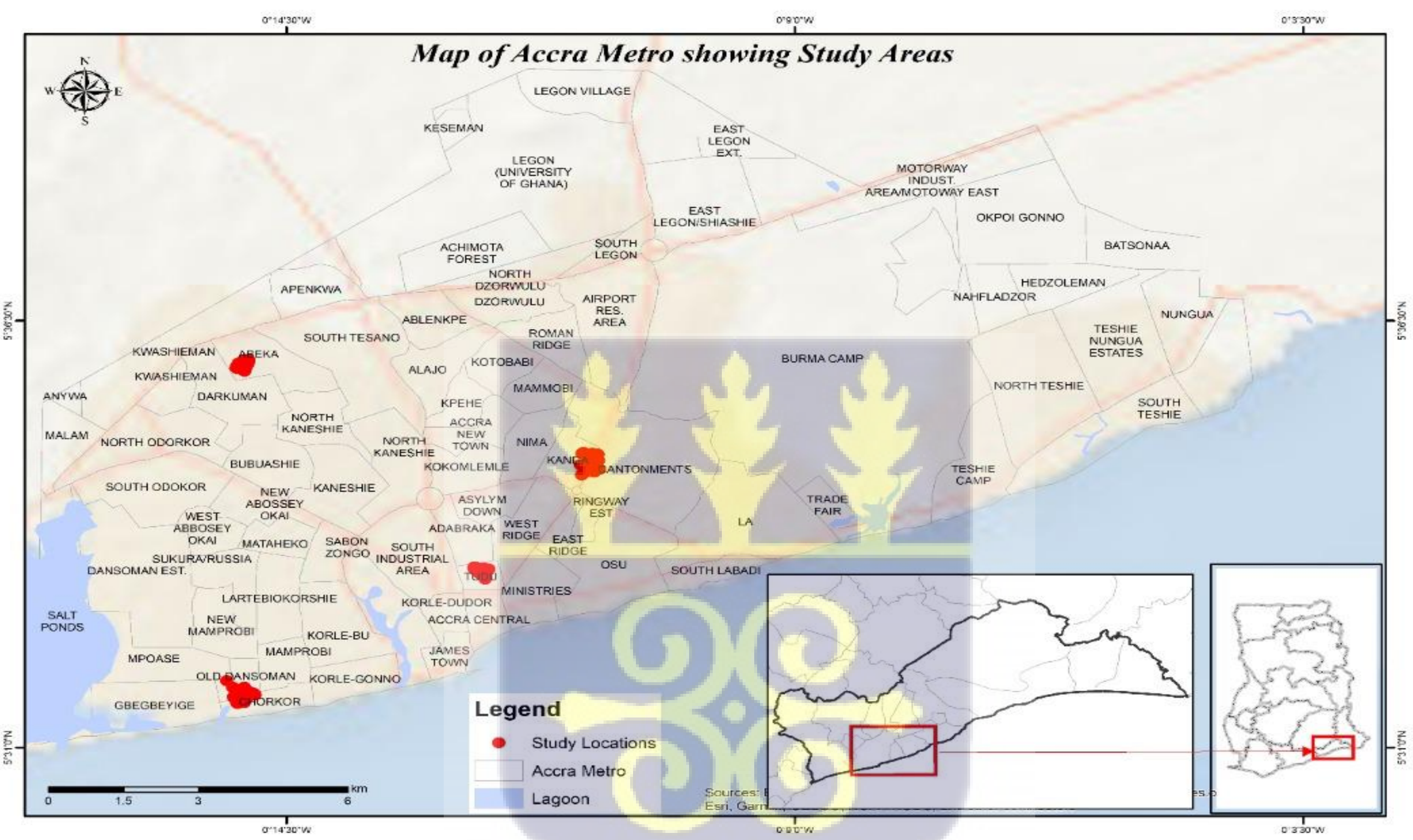

Figure 6: Map of Accra Metropolitan Area (Source; Ghana Statistical Service)

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3.5 Pre-packaged Food label Survey

3.5.1 Sampling Locations

The food label information on the pre-packaged foods was sampled from the community-based retail shops in the selected study communities - East Cantonments, Okaishie, New Fadama and Chorkor.

3.5.2 Sampling of Food Retail Outlets

For this study, local food retail outlets were identified as street vendors, corner and traditional shops operating within kiosks or buildings where pre-packaged foods are sold. In each of the sampled Enumeration Areas (EA) of the sampled communities, food retail outlets (local retail shops) were listed to serve as the sampling frame. The retail outlets were selected by ballot whereby the names or designated names of the retail shops were indicated on a token that was placed in a bowl and mixed up before balloting. However, in some cases, the outlets that did not grant permission for the study were identified for exclusion during a subsequent balloting process. Altogether, four (4) retail shops per community were selected for the pre-packaged food survey.

3.5.3 Sampling size for Food Products

Using the Cochrane formula, a prevalence rate for health and nutrition claims of 20%, obtained from a similar study in Malawi (Kasapila & Shaarani, 2013), and using a confidence interval of 5% gave a sample size of 246 for the pre-packaged foods to be sampled.

3.5.4 Pre-packaged Food Products: Inclusion/Exclusion Criteria

In this study, pre-packaged food was defined based on the FDA's regulation on food label information (FDA/FERD/GL-LAB/2013/02) as well as Codex standards (Codex, 2012; FDA, 2013b). The FDA defines a pre-packaged food as 'any food item

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for presentation to the consumer or caterer made in advance in a container including wrappers such that packaging completely or partially encloses the food item in such a way that the contents cannot be altered without opening or changing the packaging'.

The main categories and sub-categorizations of pre-packaged foods applied in this study were based on those developed by the INFORMAS food classification system (Rayner et al., 2013; Rayner & Vandevijvere, 2017). The categories included Beverages (non-alcoholic), bread and bakery products, breakfast cereal, cereal Products (others), dairy products, sweets, sauces, spreads and oils, meat products, fish products, Fruit and Vegetables (pre-packaged), Snacks, and Powdered foods (Fufu powder, kokonte, banku)-see Appendix A4 for full details-. \

Infant foods, dietary supplements, teas, coffees, and alcoholic beverages with alcohol content of 0.5% or greater, were excluded. This is because standards of these food products are different.

3.5.5 Data Collection procedure

3.5.5.1 Pre-testing of Photographic data collection method

Before data collection, the photographic data collection method was pre-tested. The photographs of some pre-packaged foods labels were obtained from local retail shops. Then, photographic data were uploaded to a laptop and label data was entered into a CSentry (CSPro) application (structured questionnaire) programme med on the Samsung galaxy tabs. CSPro is an electronic data collection software system tool. Electronic data collection is less prone to errors and more effective than paper systems (Matthew, Johns, & Abraham, 2017). These were done to ascertain the validity and reliability of the process.

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3.5.5.2 Photographic Data Collection

Data collection was conducted in the first week of March 2020. In each of the selected retail shops, permission was obtained from the shop owners to photograph pre-packaged food products in the various categorizations. However, some shop owners refused participation, especially in Okaishie and New Fadama. When permission was granted, trained research assistants took photographs of the front, back, and sides of pre-packaged foods to capture the label information.

Data collection was carried out by two groups of research assistants. Each group was assigned to sample from different sections of the shops. Products were sampled from one local shop per EA. To avoid unintentional repetition of sampled products, only products that were not found in the previous shops were sampled. This approach of data collection for analysing labels is consistent with previous studies (Huang et al., 2016; Kanter et al., 2017; Rayner et al., 2013). Research assistants were provided with power banks to ensure adequate battery life of tablets during the entire data collection. Data was backed up daily after each day of data collection.

3.5.6 Data Entry, Processing and Management

The pictures of the products were organized into a photo database with the product's unique code. The code specified product identification, food category and product's location. The photograph database was managed daily by deleting entries of the same products, unclear photos, and incompletely captured photos of pre-packaged food labels. Blurred and incomplete photos of products were re-photographed. The photo data was uploaded to a laptop to view the details of photos. Then, details of labelling information were entered onto the CSentry.

A data entry guidance document was provided to help research assistants enter data entry more accurately. The same data was entered twice by different research

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assistants to ensure the efficiency of the data entry. The guidance document was an adaptation of INFORMAS food labelling protocol (Rayner & Vandevijvere, 2017). A comprehensive coding book (appendix A5) based on the food categories and sub-categorizations was included in the data entry guidance document designed (Kanter et al, 2017). Data was then exported into a Stata data file for cleaning and analyses. To secure the data collected, a backup data file was stored in a password-secured cloud account.

3.5.7 Label Characteristics (Variables) Measured

The following main label characteristics (components of food labelling) of pre-packaged food were measured.

1. The presence or absence of food label, defined as: -any tag, mark, brand, pictorial or other descriptive matter, written, printed, marked, stencilled, embossed or impressed on, or attached to, a container of food.
2. Basic Food Labelling Components information: The presence or absence of product name, brand name, the language of label information, name and address of manufacturing company, country of origin/production, permitted food additives, storage/ preparation instructions, date markings including manufacturing and expiry dates, standard logos, batch markings and ingredient list.
3. The legibility of labels was measured subjectively to indicate whether the text on the label was legible or not to the naked eyes.
4. The presence of a nutrition declaration on pre-packaged food was defined as information on the nutrient's composition and energy value of the food.
5. The position of the declared nutrition information: either as back-of-pack (BOP) or front-of-pack (FOP).

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a. FOP refers to easy-to-understand nutrition information placed on the front of the package for quick viewing while BOP nutrition label format refers to nutrition information usually in tabular form placed at other sides of the pack, apart from the front view.

b. BOP format refers to labels on which the nutrition declaration is presented as a table or panel usually at any other place on the package, apart from the front view.

6. The content of nutrition information (BOP), referred to as the "Big 4", the "Big 8", the ''Big 4" plus extra information but less than "Big 8", and the "Big 8" plus extra information.

a. The "Big 4" refers to the amount of three macronutrients (protein, carbohydrate and fat) and the total caloric energy value of the food.

b. The "Big 8" refers to the "Big 4" information plus the levels of saturated fat, fibre, sodium, and sugar in the food product

c. The "Big 4 plus extra information" refers to the "Big 4" and other nutrients but less than the "Big 8".

d. The "Big 8 plus extra information" refers to '" Big 8" and levels of other nutrients in food. (Bonsmann et al., 2010)

7. The type of presentation of FOP includes Guideline daily allowance (GDA), Multiple traffic light (MTL), 5-colour nutrient scale, health logo, and warning labels.

a. GDA is a type of FOP where levels of nutrients are expressed in percentages of their recommended daily requirements.

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b. MTL is a type of FOP presentation where traffic light colours - red, yellow/orange and green - are used to interpret nutrients' levels especially for fat, salt and sugars in foods.

c. A five-colour nutrient scale is a type of FOP presentation that grades the quality of food using colour coded letters.

d. Health logo is also a type of FOP system where there is a quality endorsement of the product with a symbolic tag on the label based on a certain quality benchmark such as nutrient profiling scheme.

e. Warning labels (WL) are FOP systems where symbols are used to denote high levels of nutrients such as sugar, salt and fat contained in the food.

8. The presence of claims and types of claims measured.

   a. Nutrition claims; nutrient content claims, nutrient comparative claim and Health-related ingredient claim

   b. Health claims; general health claim, nutrient and other function claim and reduction of disease risk claim

   c. Other claims; environment-related claims and other health-related claims.

9. Format of claims refers to whether the claim was verbal, numerical, symbolic, or mixed.

The descriptions and the definitions of food label components including health and nutrition claims for this study were based on the definition proposed by the INFORMAS and Codex Alimentarius Commission guidelines (Rayner et al., 2013) (see Appendix A6 for details).

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3.5.8 Quantitative Content Analysis

The analyses of label characteristics were executed using Stata version 16.1. statistical software and Microsoft excel. A unique brand of the pre-packaged food was used as the unit of analysis. The results of analyses were presented as frequencies in tables and charts.

Univariate analyses were conducted to report frequencies of the different label characteristics. For analysis, some of the food categories such as powdered foods and cereal products were condensed, and ten food categories were reported. At bivariate levels, chi-square test was used as test statistics in comparing nutrition label characteristics across different food categories.

In addition, the compliance of nutrition and health claim to current regulatory standards were assessed by examining whether or not label information captured followed specifications of the Food and Drugs Authority (FDA) as well as Codex standards on labelling pre-packaged foods (Codex, 2012; FDA, 2013a). These were assessed against a checklist based on requirements of FDA and Codex. [See Appendix A2,3]. According to the FDA, when either a nutrition or health claim is made on a product, it must be substantiated by declaring a complete nutrition profile of the food and for health claim a form endorsement provided.

Besides, an index of compliance to basic food labelling standards was computed. A product that followed all the requirements of all the labelling standards (10-items) was deemed compliant to mandatory food label requirement and any product short of at least one these or otherwise was considered non-compliant.

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3.6 Consumer Household Survey

3.6.1 Study Population, Sample size calculation and Sampling Procedure

The survey population included household members in the AMA consisting of adults of eighteen years and above who usually purchase food for the family.

3.6.1.1 Sample size Calculation

The sample size was obtained using the formula: $$n = \left(\frac{z^2 \times (p)(q)}{d^2} \right) \times f$$

(Snedecor, George & Cochrane, 1989).

Where n is the Sample size to be determined, z is the z-score (reliability coefficient) of 1.96 at 95% confidence level, d is the margin of error of 5% (0.05), and q is $1-p$, and f is the design effect assumed to be 1.2. p is prevalence set at 22 %, 33% and 34.7 % since similar previous studies on food label use in Ghana showed prevalence of understanding of nutrition label (22%), health-related label use (34.7%) and claims use (32.2%) (Ababio et al., 2012; Darkwa, 2014; Osei Mensah et al., 2012). However, prevalence at 35 % was used to determine the sample size as this computation produced the highest number of participants to be interviewed. Substituting these figures into the formula above gave:

$$n = \left(\frac{1.96^2 \times (0.35)(1-0.35)}{0.05^2} \right) \times 1.2$$

$$n = \left(\frac{3.8416 \times 0.2275}{0.0025} \right) \times 1.2$$

$$n = \left(\frac{0.873964}{0.0025} \right) \times 1.2$$

$$n = 349.5856 \times 1.2$$

$$n = 419.50276 \approx 420$$

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Accounting for a 15% non-response rate of the estimated sample size of 420, the sample size was upwardly adjusted and rounded to 483 households. Fifteen percent (15%) non-response rate was chosen for this study since previous surveys in Accra have indicated high non-response rates (Addo et al, 2015; Duda et al., 2007; GSS, 2014; Ghana Health Service (GHS), 2015).

$$\left(\frac{15}{100} \times 420\right) = 63$$
$$\therefore n = 63 + 420$$
$$n = 483$$

It must be noted that there was oversampling; five hundred and ten (510) respondents were interviewed to allow for a more representative sample of the population.

3.6.1.2 Sampling Procedure

A multi-stage sampling procedure was employed in this study, similar to the study of (Norman et al., 2013). Accra Metropolitan Area (AMA) was pre-stratified by location into four strata based on the housing types and rent rates of the 2010 Population and Housing Census, i.e., first, second, third, and fourth class neighbourhoods (Ghana Statistical Service (GSS), 2012) -see table 1-. The strength of this sampling design is that households were sampled across the socio-economic strata (from wealthier to poorer neighbourhoods) in Accra.

Firstly, the communities in Accra stratified into the four socio-economic strata, one community was randomly selected (through cluster sampling 1) in each stratum. Therefore, East Cantonments, Okaishie, New Fadama, and Chorkor were the communities selected for the study (see table 1).

At the second stage, for each selected community, two Enumeration Areas (clusters) were selected randomly from a complete list of EAs for each of the four

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communities (cluster sampling 2). The list of EAs were obtained from Ghana Statistical Service (GSS). Enumeration Areas (EAs) are subdivisions of a community estimated as the area that one enumerator would be able to canvas and collect data from.

Thereafter, a complete listing of households was done for the selected EAs in each of the four communities to serve as the sampling frame. For this study, a household was defined as a person or group of persons that lives together and share the same food as a unit. The listing involved mapping out and identifying the households in the EAs within the study locations (Tomlinson et al., 2009). The listing was done by assigning a unique number written on the houses and showing the direction of how the households are connected. In the household listing, popular landmarks like churches, shops, taxi stations, or popular spots were identified, then the first household was numbered and then direction to the next house was also marked. This was done till all the houses in the EA were identified and mapped.

For each community's EAs, sample size allocated proportional to size was computed in relation to the overall study sample size. Then, the list of households to be interviewed were selected by systematic sampling. This process involved selecting random the first household by random selection, and thereafter every n^{th}(interval) household in the household sampling frame data using 'rand and mod' function respectively in excel.

Prior to the listing, community leaders, including assembly men were contacted, and the project aims were explained to them. During the listing exercise, enumerators also took the opportunity to inform households about the survey. In a selected household, the person who usually purchased food for the household and meets the inclusion criteria was enlisted to participate in the survey. However, in cases where

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more than one eligible respondent lives in a household, a simple random sampling method, by balloting was employed to choose a respondent. Also, for any selected household which does not have an eligible or consenting respondent, the next selected household on the list was visited.

3.6.2 Inclusion/ Exclusion criteria

Persons 18 years and above, able to read and speak English (since labels are written in English), not visually impaired to read labels, resident in Accra at least two years and a member of the selected household who usually buys food and beverages for the family qualifies to be included in this survey.

However, individuals who met the inclusion criteria, but height and weight measurements could not be obtained as result of physical deformity or ailment were excluded.

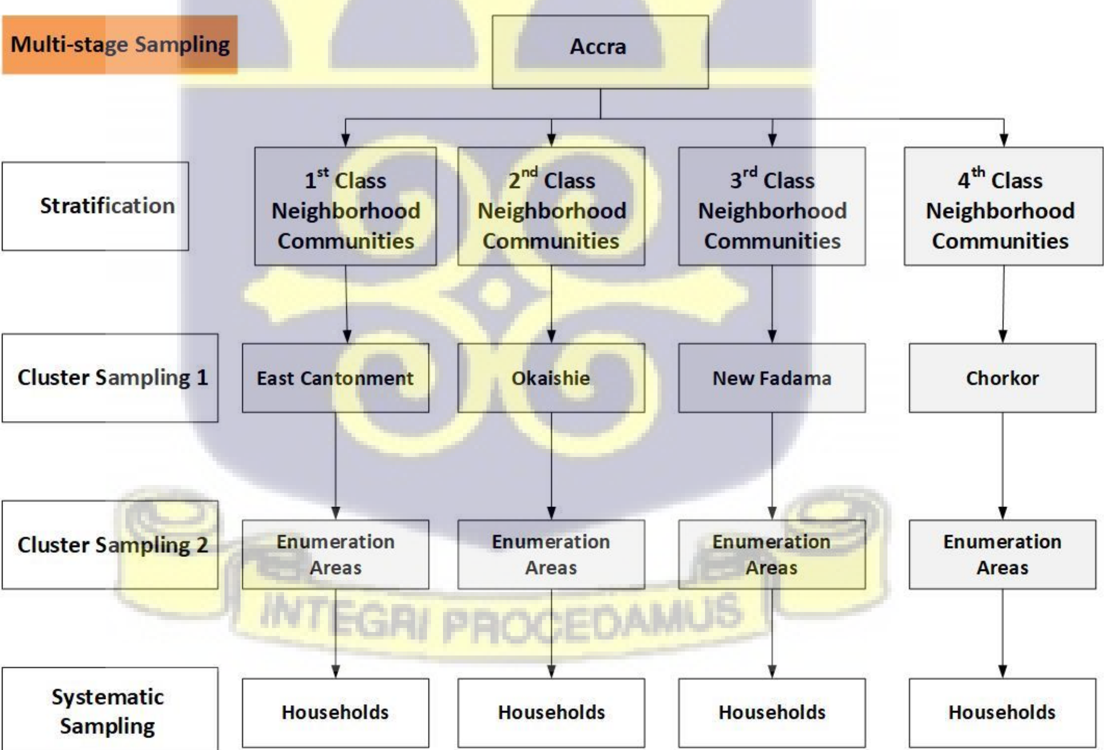

Figure 7: Schematic Diagram of Sampling Design

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3.6.3 Data Collection for Consumer Household Survey

The household data was collected by face-to-face interviews using structured questionnaires -CSentry (CSPro) application- programme med on Samsung Tab 8. The data collection started in October and ended in December 2019. Data collection was carried out by four research assistants who were trained and supervised by the researcher. For the purposes of safety, accountability, and accuracy, two research assistants worked together per EA. However, the interview was done by a research assistant.

Prior to data collection, eligible respondents were contacted for their consent. Some of the households declined participation; households that were not ready to honour the interview at the time of visit were rescheduled.

The aim of the research, issues of their right to withdraw from the study at any point, anonymity in relation to the study and confidentiality of data collected were explained to eligible respondents at the start of the respective interviews. Then consent was obtained by the respondent appending his/her signature. The interviews were in English since food labels are in English language and an inclusion criterion.

Data collected included socio-demographic information, pre-packaged food purchase and use behaviours, their knowledge on nutrition and their perception on food label use. Also, understanding of food labels were assessed by asking respondents to perform a food labelling task after dummy labels (labels representing real food products) were presented to them. This was intended as an objective assessment of respondents' understanding of food labels in the context of real-life situations. Assessment of the frequency of purchase and consumption of pre-packaged foods, a

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food frequency questionnaire (FFQ) based on commonly consumed pre-packaged foods and drinks was used.

Besides, respondents' weight and height measurements were obtained to compute their Body Mass Index. Respondent's height was measured with a standard portable stadiometer to nearest 0.1 cm and weight was measured with a standard digital floor weighing scales with a precision of 0.05kg. These measurements were taken twice to ensure precision and their mean values computed for analysis. Data collection per respondent varied between forty-five minutes and an hour.

3.6.3.1 Data Collection Instruments

The data collection instruments for this study were adapted from existing instruments used in food labelling studies and food consumption surveys (Aryeetey et al., 2016; Christoph et al., 2018; Klopp & MacDonald, 1981; Mackison et al., 2010; Marietta et al., 1999; Obayashi et al., 2003; Vijaykumar et al., 2013). The questions and statements were modified to ensure validity and reliability for the Ghanaian consumer, after pilot testing.

The questionnaire for this study was organised into different sections. Section A consisted of questions on sociodemographic and background characteristics of respondents. This included sociodemographic characteristics such as sex, age, marital status, ethnicity, household size, the number of children per household; other information gathered were diet status, non-communicable disease status and food allergy status. Section B collected data on pre-packaged food purchase and use behaviour of consumers. The questions used to describe pre-packaged food behaviour included the usual places of purchase and important reasons for purchasing pre-package food.

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Section C comprised food label use questions and reasons for use or non-use. Section D consisted of questions relating to nutrition knowledge and food label understanding as well as questions on perception. Dummy labels (author's construct) were used to assess respondents' understanding of food labels. Dummy food labels were developed for corn flakes, two for different evaporated milks, a fruit juice and instant noodle (see appendix AII) . The final section E comprised a pre-packaged food frequency questionnaire. This was used to assess the consumption and purchased levels of pre-packaged foods. It consisted of over eighty-one pre-packaged food products, grouped into sixteen food groups.

3.6.4 Survey Variables and measures

Independent Variables

Place of purchasing household pre-packaged foods.

This variable measured respondent's usual place of buying pre-packaged food products such as corner shops, supermarkets and traditional markets.

Pre-packaged food dietary pattern

Pre-packaged food dietary patterns were measured in terms of the frequency of purchase and consumption. For frequency of purchase, respondents were asked to indicate how often they buy a list of pre-packaged foods over the last month with responses; '*daily*, *weekly*, *fortnightly*, *monthly* and *none*'. Respondents were asked to indicate the frequency of consumption of the same list of pre-packaged foods over the last month; '1-time daily, more than once a day, 1-3 times a week, 4-6 times a week and never '.

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Reasons taken into consideration when purchasing pre-packaged foods

Respondents selected reasons for purchasing pre-packaged foods; 'taste', 'price', 'convenience', 'brand/familiarity', nutrition information, health information and others (specify) that best describes their shopping behaviour. Afterwards, they were asked to rank three topmost considerations when purchasing pre-packaged foods.

Perception of health-related information on labelled pre-packaged foods

This construct was operationalized to measure how a consumer perceived health-related information (health and nutrition claims, the nutrient facts table and ingredient list) on pre-packaged foods. Also, consumer perception about the usefulness, accuracy, and truthfulness of health-related information were measured.

Nutrition-related knowledge of food labels(self-report)

This measured the level of consumer's knowledge of nutrition and health in relation to food labels by asking respondents to rate their own knowledge on a 4-point scale; very well, intermediate, poor or not sure. 'Very well' and 'intermediate' responses were coded as adequate nutrition knowledge. Whereas, 'poor' and 'not sure' were coded with inadequate nutrition knowledge.

Understanding of food label(self-report)

This measured the level of consumer's own understanding and use of food labels by asking respondents to rate their own understanding on a 3-point scale; very well, intermediate or poor. 'Very well' and 'intermediate' responses were coded as adequate understanding of food label. Whereas, 'poor' and 'not sure' were coded as inadequate understanding of food labels.

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Prior nutrition education

This construct measured whether a consumer who had nutrition education focused on food label use and the sources of such knowledge. A list of sources; formal education, media, internet, health professionals were presented to the respondents. An option to specify other sources of knowledge was also provided.

Reasons for non- use of food labels

Reasons for use of food labels was assessed by presenting three categories of reasons for non-use of label information to respondents to select which one best applies to them.

A. shopping practices i.e., time constraints during shopping of foods

B. Absence of need i.e., can select nutritious foods without the use of labels

C. Perceived inability i.e., Information provided on labels is too technical to comprehend (Bazhan et al., 2015; Klopp & MacDonald, 1981) (see appendix for the listed reasons). However, options were provided to consumers who had other reasons for non-use.

Reasons for Food label Use

Reasons for use of food labels was assessed by presenting some reasons of label use to respondents to pick which one best applied to them (see appendix questionnaire).

Basic Socio-demographic variables

These includes respondents' sex, age, marital status, religion, ethnic group, employment status, socioeconomic status (SES), household composition and the number of household members. Socioeconomic status of respondents were determined by wealth index questions as used in Ghana Demographic and Health Survey (Ghana Statistical Service (GSS), Ghana Health Service (GHS), 2015).

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Other Socio-demographic variables

Self-reports of respondents' food allergy status, dieting status, family history of NCDs and NCDs health status were assessed. Nutritional status was determined with weight and height measurements of respondents to be able to compute their Body Mass Index (BMI).

Dependent variables

Food Label use Food label use was operationalised to determine consumer reading, interpretation and evaluation of food label information. Food label use was measured by asking consumers how frequently they use food labels in their purchase or consumption decisions of pre-packaged foods over the past three months. This was measured by a 4-point Likert scale; yes, always, yes, sometimes, yes, rarely and never. For analysis, label use was dichotomized by categorizing yes always, yes sometimes as label user and yes rarely, never responses as non-label user as described by Christoph et al, 2018 (Christoph et al., 2018).

Health-related information use index (HIU-index)

Health-related information use index was measured with four aspects of food label related to obesity and diet-related NCD as described by Stran and Knol, 2013 (Stran & Knol, 2013). It includes a nutrition fact panel, ingredient list, serving size and health and nutrition claims. These four items were measured on a 5- point Likert scale (never- always). The Likert scale was converted into an index with 4 as lowest level and 20 as highest given that Likert scale is coded as never-1, rarely-2, occassionally-3, often-4 and always -5.

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Food label understanding (objective understanding of labels)

Food label understanding measure determined the level of respondents' food label comprehension and use. This was measured by presenting five (5) different dummy labels to participants and were asked to perform food labelling tasks. The labelling task involved the ability of the participants to understand and use nutritional table including serving size, ingredients list and claims to compare the nutritional information of two similar products. In total, there were ten (10) questions with three (3) on the nutritional table, three (3) on ingredient list and four (4) on claims. This variable was found to be highly reliable (10 items: $\alpha = .95$). The responses to these were marked and scored. A score of 1 was awarded for a correct response and 0 was awarded for incorrect response or 'I don't know response'. Based on Bloom's criteria, a total score of six (6) and above represented a respondent with adequate understanding of labels and score below 6 represented inadequate understanding of food labels.

Nutrition-related knowledge of food labels (Objective nutrition knowledge)

Nutrition-related knowledge of food labels measured respondents' level of nutrition and health to help an individual to use food labels. A total of 28-items questionnaire(adapted from Bukenya et al,2017) was used to assess respondents' knowledge; 16-items were on level of sugar, salt and fat contents in foods, 3 items were on expert recommendations and 9 items were diet-disease relationships(Bukenya et al., 2017). The objective nutrition knowledge composite variable was found to be reliable (28 items: $\alpha = .85$). The responses were coded as right or wrong. A total score was indexed to 100%. Based on Bloom's criteria, a total score of 60% and above was deemed to be adequate objective nutrition knowledge and below 60% inadequate nutrition knowledge.

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Table 2: Summary of variables and their form of utilization in the survey's data analysis

Variable	Measurement	Form of utilization in analysis
Dependent variables		
Food label use	Ordinal (1-4)	Binary; Label user and non-label user
Health-related information use index (HIU)- Only laber users	Metric	Metric 4(lowest) – 20(highest)
Understanding of food label use(objective)	Metric (scores)	Binary; adequate OUF and inadequate OUF
Nutrition-related knowledge of food labels(objective)	Metric	Binary; adequate ONK and inadequate ONK
Independent variables		
Sociodemographic (Age, sex, education, marital status, ethnicity, religion)	Categorical	Categories
House composition	categorical	Categorical
Wealth status	Composite	Ordinal (1-5)
Body Mass index	Composite	Categorical
NCD health status	Categorical	Categorical
Food allergy status	Categorical	Categorical
Perceptions on health-related food label information	Categorical	Categorical
Nutrition knowledge (subjective/self-report)	ordinal	Binary; adequate or inadequate
Food label understanding (subjective/ self-report)	ordinal	Binary: adequate or inadequate

3.6.5 Data Analysis for Consumer Survey

Prior to data analysis, the data were cleaned to ensure data quality. At the univariate stage of analysis, all categorical and ordinal variables were reported as frequencies and percentages in tables and charts. For continuous variables, mean and standard deviations were reported; median values were reported for skewed dataset. For composite variables such as objective nutrition knowledge and objective food label understanding, Cronbach's alpha was estimated to test construct reliability. A

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Cronbach's alpha level 0.70 was deemed acceptable for internal consistency (Nunnally, 1978).

Body Mass Index (BMI) was calculated by dividing weight in kilograms by the square of height in meters. The BMI values were then classified using the following cut-off points <18.5= Underweight, 18.5-24.9= Normal, 25-29.9= Overweight, ≥30 Obese). Wealth index was estimated using factor analysis. Factor analysis was used to predict assets owned by respondents. In STATA, the "xtile" command was used to generate quintiles from the asset values obtained from the factor analysis. These five quintiles were then classified as 1st quintile (Lowest), 2nd quintile (Second), 3rd quintile (Middle), 4th quintile (Fourth) and 5th quintile (Highest). Wealth index was then measured using these categorizations.

Principal Component Analysis (PCA) was used to identify the pre-packaged foods purchased, and consumption patterns. The Kaiser's rule was used to retain components. Components which best describes the buying and consumption of pre-packaged foods of respondents were selected using a scree plot and the interpretability of their factor loadings. Factor loadings less than ±0.3 were considered weak association between the components, and thus were omitted. Those larger than ±0.3 were considered to have strong association and were retained. The suitability of the data for either a factor or component analyses was assessed prior to performing the principal component analysis. This was done using the Kaiser-Meyer-Olkin (KMO) measure of sampling accuracy which gave overall KMO values of 0.8752 for buying and 0.8280 for consumption of pre-packaged foods. Identified components were labelled to describe buying and consumption patterns. For bivariate analysis, depending on the nature of dependent variable a linear regression or logistic regression was used to examine the relationship between independent variables and dependent variables.

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Intra-class Correlation Coefficient (ICC) and the Median odd Ratio (MOR) were performed to ascertain whether the clustering attribute of the data was significant or not. Since the data had a cluster-level effect violating the independent assumptions of a standard logistic model, hierarchical logistic regression analysis was employed.

Bivariate analyses were conducted for the three dependent variables: food label use (label user & non-label use), objective understanding of foods labels (adequate or inadequate understanding) and objective nutrition knowledge (adequate or inadequate objective nutrition knowledge) and the independent variables to determine the strength of associations. Independent variables found significant (p-value of <0.05) were included into the multilevel logistic regression analyses. Issues relating to multicollinearity were addressed using the Variance of Inflation Factor (VIF) command in STATA. To test for goodness of fit model, the likelihood ratio test was used to examine the likelihood of data under the full model as against the likelihood of the data under a model with reduced number of independent variables. A p-value for the overall model obtained was less than 0.05. Thus, it was concluded the model was good. These were repeated for two other dependent variables. Strengths of association between independent and dependent variables were determined using crude odds ratio and adjusted odds ratios reported at 95% confidence interval with p-value less than 0.05.

For the fourth dependent variable, a multiple linear regression was used to determine the predictors of health-related information use (HIU) index. Independent variables with p-values less than 0.05 were considered predictors of HIU index. All analyses were executed using STATA MP.16.0.

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3.7 Quality Control/Assurance

3.7.1 Training of data collectors

Three days of in-depth training workshop was organized for recruited field research assistants. The training entailed the following.

i. Introduction of the study; background and objectives.
ii. Training on food and nutrition labels reading and use.
iii. Training on using food frequency questionnaire to assess food consumption.
iv. Community and household entry procedures.
v. Issues on Ethics and informed consent.
vi. Interview skills.
vii. Review of questionnaires and training on electronic data collection and management.
viii. Role plays and practical demonstrations of data collection.

This study recruited four (4) research assistants for the two waves of data collection: consumer survey and product sampling survey. A minimum qualification of Higher National Diploma was the requirement for the recruitment of research assistants.

3.7.2 Ethical Considerations for the Study

This survey research strictly adhered to ethical guidelines regarding the use of human participants. The ethical clearance was obtained from the Institutional Review Board (IRB) of Noguchi Memorial Institute for Medicinal Research (NMIMR) before the starting of data collection period (Ref. No: IRB/081/18-19).

Respondents were fully informed about the study objectives, the benefits and risks associated with this study, maintenance of their privacy and anonymity in relation to this study and their right to withdraw at any point. Before a respondent was interviewed, he/she signed a consent form. Also, respondents were assured of the confidentiality of the data to be collected and the contacts of the researcher was provided for any additional information about the study where necessary.

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CHAPTER FOUR

RESULTS

4.0 Introduction

This chapter presents the results of the content analysis of label information on pre-packaged food and drink products and consumers' pre-packaged food use behaviour, their perception, knowledge and understanding of food labelling.

4.1 Content Analysis of Food Labels

4.1.1 Overview of Pre-packaged Food Products sampled

A total of 351 unique pre-packaged food types were sampled across ten food groups, as shown in figure 8. About a quarter of the sampled products were beverages (26.5%) and less than a fifth were bakery products, including bread (17.9%). Fruits- and vegetable-based products, and confectionaries constituted the least proportion of sampled categories.

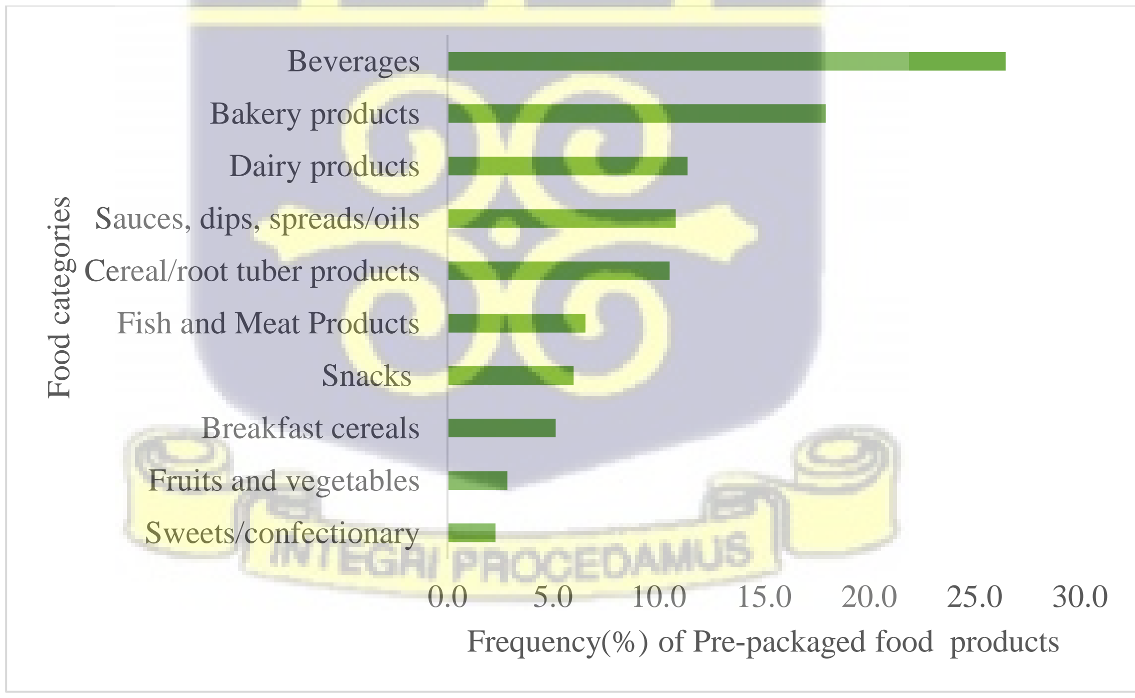

Figure 8: Proportion of Pre-packaged Food Products categories sampled from neighbourhood shops in Accra.

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4.1.2 Nutrition and Health-related Label Information on Pre-packaged Foods

Health-related label information on pre-packaged foods is shown in Table 3. Out of the 351 products sampled, only 2.3% did not have any form of label. Majority of products (92%) had ingredient information, 68.8% had nutrition declarations, 17.8% had nutrition claims and 6.7 had health claims. BOP labelling was dominant (87.3%) among all products with nutrition declaration.

Table 3. Health-related and Nutrition label information on sampled Pre-packaged Foods obtained from neighborhood shops in Accra.

Health-related Label Characteristics	Total [N]	frequency[f]	%
Food products with label	351	343	97.7
List of Ingredients	343		
Food products without List of ingredients		21	6.2
Food products with List of ingredients		315	91.8
Single Ingredient Foods products		7	2.0
Nutrition label declarations	343		
Products without nutrition declarations		107	31.2
Products with nutrition declarations		236	68.8
Type of nutrition declaration	236		
BOP*		204	82.3
FOP#		32	12.7
Types of claims on labels	343		
Nutrition claims[a]		61	17.8
Health claims[b]		23	6.7
Other claims[c]		119	34.7
No claims		140	40.8

*__Back-of-Pack__; #**Front-of-Pack; Nutrition claims**[a]: "Any representation which states, suggests or implies that a food has particular nutritional properties including but not limited to the energy value and to the content of protein, fat and carbohydrates, as well as the content of vitamins and minerals". **Health claims**[b] are "any representation that states, suggests, or implies that a relationship exists between a food or a constituent of that food and health". **Other claims**[c] refers to other claims not related to nutrients or diseases but could be health-related e.g gluten free, environment-related e.g organic or food description e.g tasty.

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4.1.3 Nutrition label information

BOP and FOP labellings were classified and described. BOP nutrition labelling profile of the food products are depicted in figure 9. Labels displaying "*greater than Big 4 but less than Big 8"* BOP nutrition information were dominant across most of the food product categories, except for confectionaries. Apart from "*greater than Big 4 but less than Big 8", "Big 4" labels* were displayed more frequently on bakery products; "*greater than Big 8"* labels were displayed more frequently on dairy categories. Among the confectioneries, *"Big 8"* was the most dominant category. However, at an α-level of 0.05, a chi-square test showed that there were no statistically significant differences (0.06) among the various food categories nutrition labels.

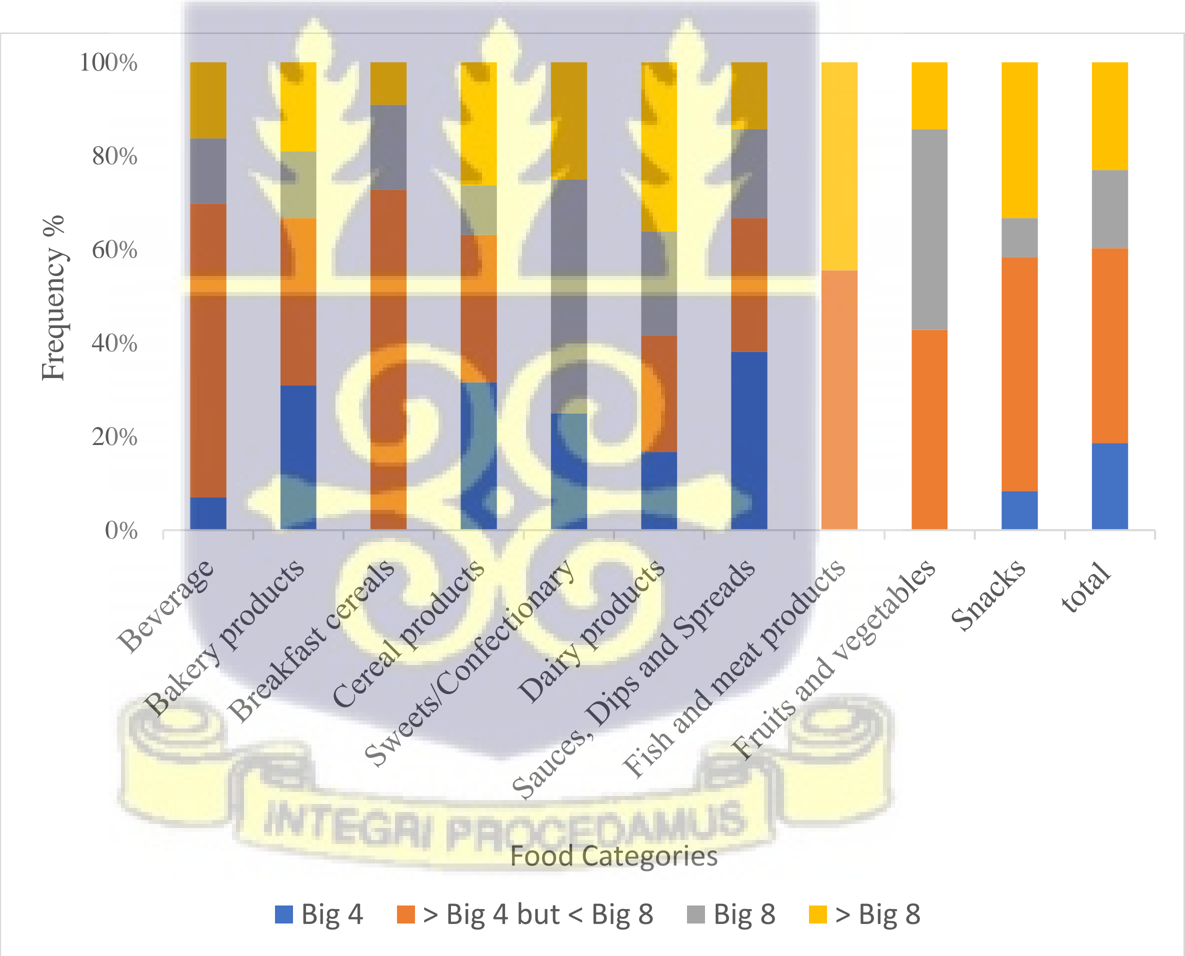

Figure 9: Back of Pack (BOP) Nutrition labels across various pre-packaged food categories: *"Big 4" =energy value, carbohydrates, fat, protein; "Big 8" = "Big 4" plus sugar, saturated fat, sodium and fibre*

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Four FOP labelling schemes were identified including Multiple Traffic Light (MTL), Guidelines Daily Allowance (GDA), 5-Colour Nutrient Scale (5-CNS) and summary table/logo (Figure 10). Majority of the FOPs (68.7%) identified were guidelines daily allowance (GDA). The only 5-CNS labels identified, originated from Ghana. The four FOP types observed originated from Ghana. However, products observed with the GDA labelling schemes had their country of origin from Ghana, other African countries, and the USA.

Four types of FOPs were identified in the beverage and dairy food product categories. However, GDAs were only observed among cereal/root-tuber-based products, sauces/spreads/oils, vegetable/fruit-based products and snacks. The 5CNs were observed only among beverage and dairy products.

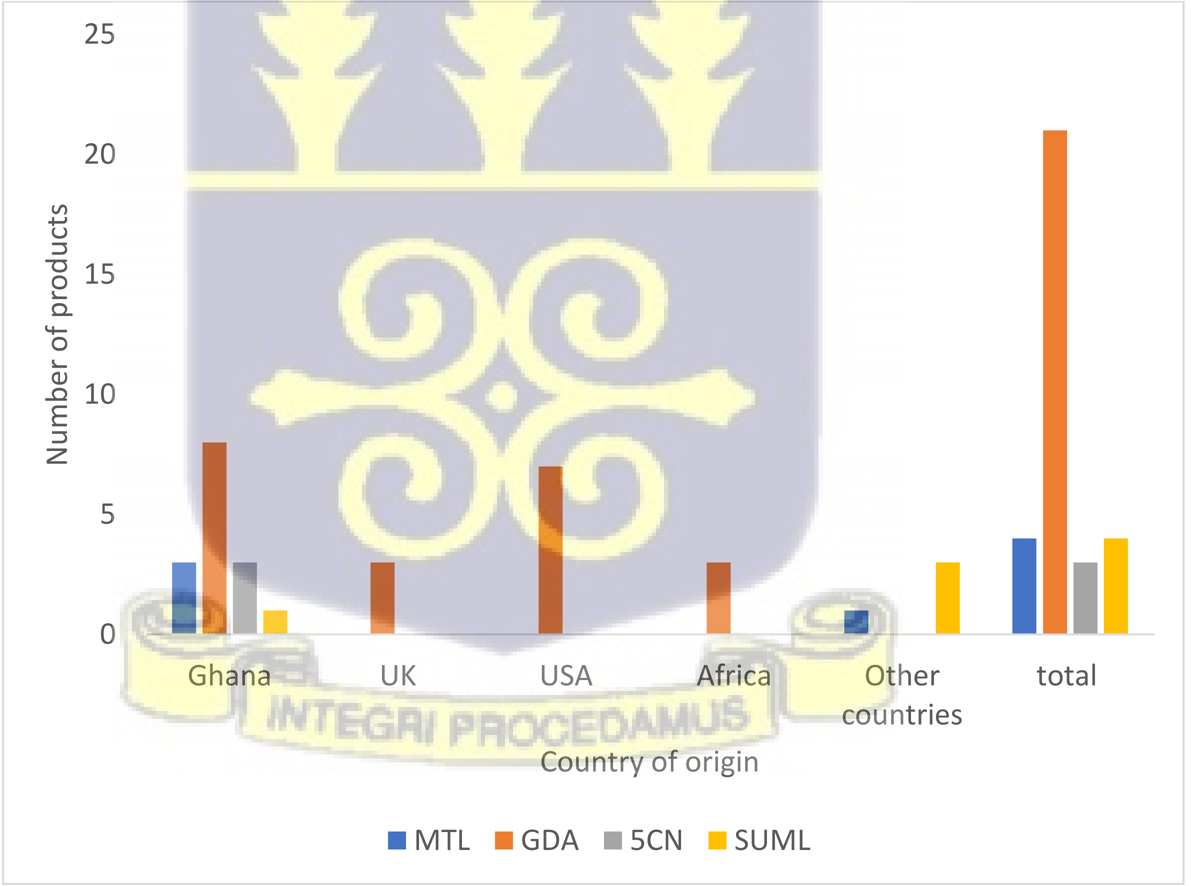

Figure 10: Types of FOPS schemes and their country of origin

MTL: Multiple Traffic Light, GDA- Guideline Daily Allowance, 5CN- Color Nutrient Scale, SUML- Summary Logo.

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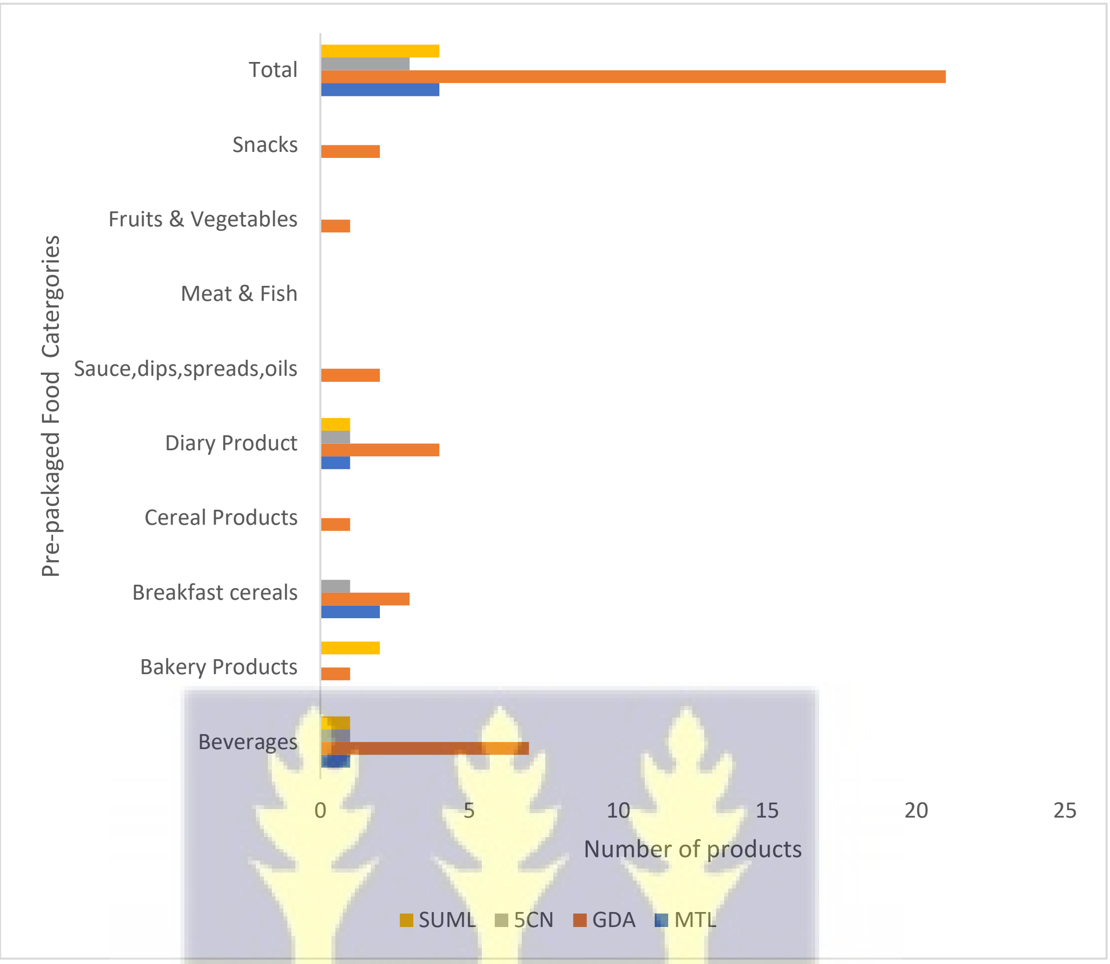

Figure 11: Types of FOPs on various pre-packaged food categories

4.1.4 Food label claims across various pre-packaged foods

Except for the reduction of disease risk claims, all other types of health/nutrition claims were found on product labels (Table 4). Nutrient content claims were observed across all types of pre-packaged foods examined (see figure 4). Bakery products carried a larger proportion (53.3%) of Health-related ingredient claims. At least four types of claims were observed across beverages, bakery products, breakfast cereals, cereals, dairy products and sauces, dips and spreads. Fruit and vegetable-related products had few claims only relating to nutrient content claims.

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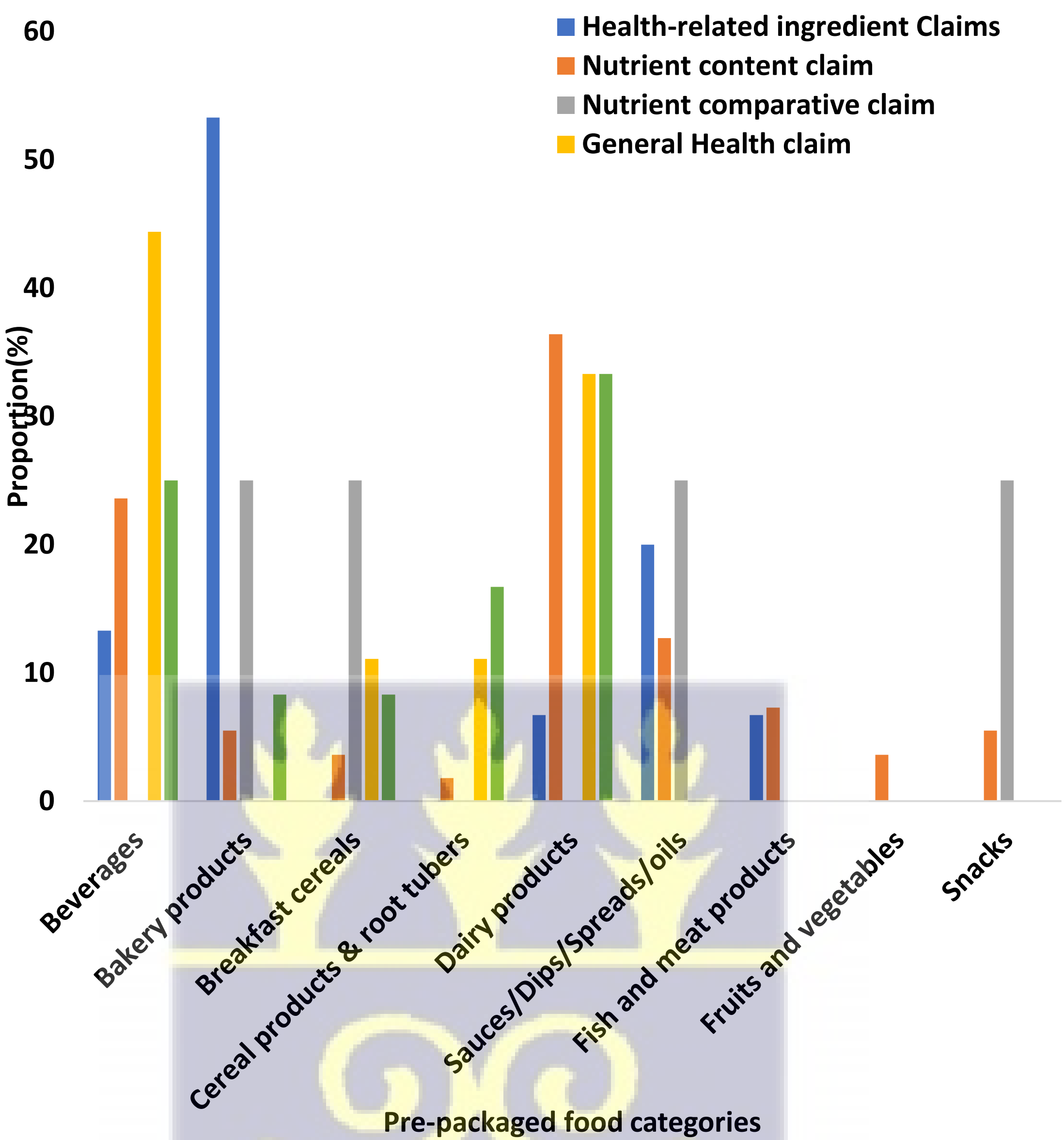

Figure 12: Distribution of different types of Health-related claims on various categories of pre-packaged foods according to INFORMAS taxonomy

4.1.5 Health and nutrition claims

Table 4 shows the types of health and nutrition claims identified (examples shown), and how frequently each type of claim was encountered in the analysis as well as their forms of presentation. *Nutrient content claim* (50.0%) was the most frequently identified nutrition claim. *Nutrient comparative claims* (6.0%), and *nutrient and other function claims* (8.3%) were less frequently found.

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Claims were classified as those with text, numeric or symbolical/pictorial formats and mixed formats (combination of text, symbol, or numeric). Most of the claims' presentations on labels were textual; symbolic format claims were the least frequently identified.

Table 4: Types of Health and Nutrition Claims and format of presentation on Labels

Types of Health and Nutrition claims	An illustrative example of the claims	Claims format			Total	
		Text	Symbol	Mixed		
a. Nutrition Claims						%
Health-related ingredient claim	100% cocoa	11	0	3	14	16.7
Nutrient content claim	Low cholesterol	29	4	9	42	50.0
Nutrient comparative claim	Higher in Fibre	5	0	0	5	6.0
b. Health claims						
General Health claim	Super healthy	14	0	2	16	19.0
Nutrient and other function claim	Calcium for stronger bone	6	0	1	7	8.3
Total		65	4	15	84	

4.1.6 Compliance of food labels to labelling standards.

Compliance with FDA and CODEX Alimentarius guidelines was high as shown in Table 5. Almost all product labels (99.1%) were written in the English language, 96% had expiry date markings, 80% had legible characters for the expiry dates and products requiring ingredient lists 93.7% complied. There was high compliance to nutrition and health claims requirements for pre-packaged foods (Table 5). Out of sixty-eight products evaluated for compliance of labelling nutrition claims, 88.2% were compliant. Also, 84.2% of products evaluated for health claims were compliant with labelling standards.

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Overall, the majority (69.1%) of the pre-packaged food products were deemed to be compliant (See figure 13). Compliance across the various food categories showed that fruits and vegetable-based pre-packaged foods were the highest compliant (90.0%) and beverages were the least compliant (61.0%).

Table 5: Compliance of food labels to Basic Labelling Requirements by the Food and Drugs Authority, Ghana (N=343)

Compliance indicators		
a. Basic food label requirements	**Compliance rate**	
	frequency	**(%)**
Identity of product (name)	343	100
Name and address of company	331	96.5
Country of origin	335	97.7
Food label language (English)	340	99.1
Net contents/drained weight	328	95.6
Net content legibility	342	99.7
Date markings including expiry	329	95.9
Legibility of expiry date	277	80.9
Reading Legibility of label	307	89.5
List of ingredients [a]	315	93.7
b. Health and Nutrition Claims		
Nutrition claims made and nutrition information provided [b]	60	88.2
Health claims made and substantiation given in terms of nutrient value or endorsement [c]	19	88.4

List of ingredients (including food additives and allergens) [a] n=336
Nutrition claims [b] n= 68
Health claims [c] n= 23

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Figure 13: Compliance with FDA Labelling Guidelines (index) for various categories of pre-packaged foods.

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4.2 Consumer Survey

This section presents findings on consumers' perceptions, knowledge and behaviour related to pre-packaged foods and food labels.

4.2.1 Household and Socio-demographic characteristics of respondents.

Table 6 shows the sociodemographic characteristics of the consumers interviewed in this study. Five hundred and ten (510) respondents were interviewed. About one-third (34.1%) of them were aged 20-29 years and only a few (3.7%) were aged 60 years or older. Majority of the respondents (79.4%) were females. More than half of the respondents (65.3%) had at least senior secondary level of education. Almost half were employed in the private sector (44.1%). A little more than half (52.7%) of respondents were married, and majority were Christians (82.2%). A large proportion of respondents did not report involvement in a diet plan (92.9%); 42.5% had normal (between 18.5 and 24.9 kg/m^2) body mass index, and 26.7% were obese (>30 kg/m^2). Only a few respondents (9.0%) reported being diagnosed with non-communicable disease and having an allergy to at least one type of food (4.3%).

Less than half (40.2%) indicated a household size between 3 and 4 people. About 22% of households included were ranked among the lowest wealth index; 16.1% belonged to the highest wealth index.

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Table 6: Household and Socio-demographic characteristics of survey respondents (N=510)

Characteristic	Frequency	Percentage
Individual level socio-demographics		
Age (years)		
< 20	34	6.7
20-29	174	34.1
30-39	146	28.6
40-49	94	18.4
50-59	43	8.4
60+	19	3.7
Sex		
Male	105	20.6
Female	405	79.4
Education		
Primary	74	14.5
Junior High School	103	20.2
Senior High School	170	33.3
Tertiary Institution	163	32.0
Occupation		
Unemployed	162	31.8
Public sector worker	117	22.9
Private/self-employed worker	225	44.1
Retired	6	1.2
Marital status		
Married	269	52.7
Single	213	41.8
Others (Widowed/Separated/Divorced)	28	5.5
Religious affiliation		
Christianity	419	82.2
Islam	91	17.8
Currently following a Diet Plan		
No	474	92.9
Yes	36	7.1
Body Mass Index*		
Underweight	4	0.8
Normal	217	42.5
Overweight	153	30.0
Obese	136	26.7
Reported Non-Communicable Disease status		
Yes	49	9.0
No	464	91.1
Reported Food Allergy status		
Yes	22	4.3
No	488	95.7
Household level demographics		
Number of people in household		
1-2	113	22.2
3-4	205	40.2
5+	192	37.6
Wealth Index**		
Poorest	114	22.3
Poor	110	21.6
Medium	82	16.1
Wealthy	122	23.9
Wealthiest	82	16.1

Body Mass Index* based World Health Organization cut-off points

Wealth index** refers to the composite variables based on household characteristics and assets ownership to represent socioeconomic level.

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4.2.2 Usual places for purchasing pre-packaged foods.

Respondents indicated that they usually purchase pre-packaged foods either at corner shops (39.8%), in traditional markets (36.7%), or supermarkets (7.4%) (Figure 14).

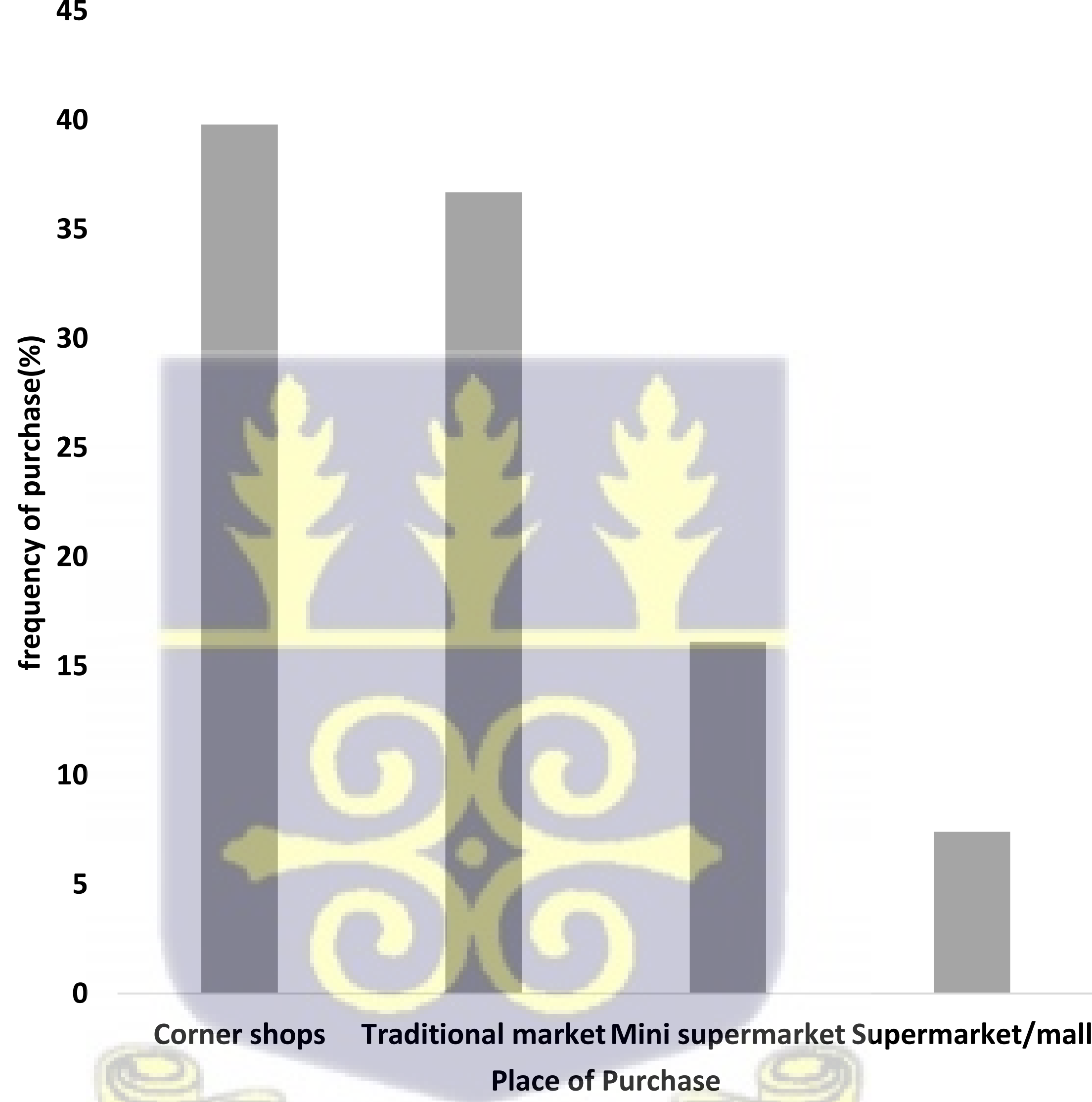

Figure 14: Usual places of purchase of pre-packaged foods

4.2.3 Consumers' considerations while purchasing pre-packaged foods.

Overall, consumers indicated taste (29.6%), price (24.8%), health information (17.3%) and nutrition information (6.8%) as main considerations while purchasing pre-packaged foods as shown in Figure 15.

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However, when consumers were asked to rank their considerations for purchasing pre-packaged foods, a higher percentage of them ranked Health information (42.2%) as the most important reason for purchasing pre-packaged foods, followed by taste (30.2%), and then price (13.9%) as depicted in Figure 16.

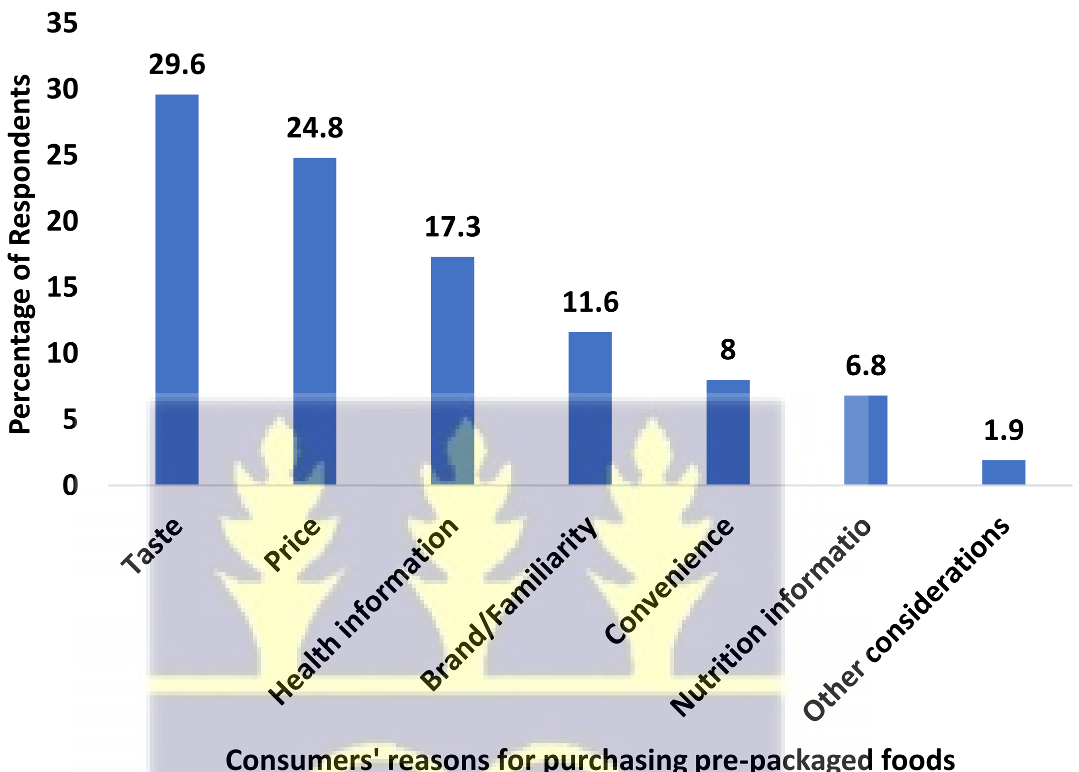

Figure 15: Consumers' considerations while purchasing pre-packaged foods

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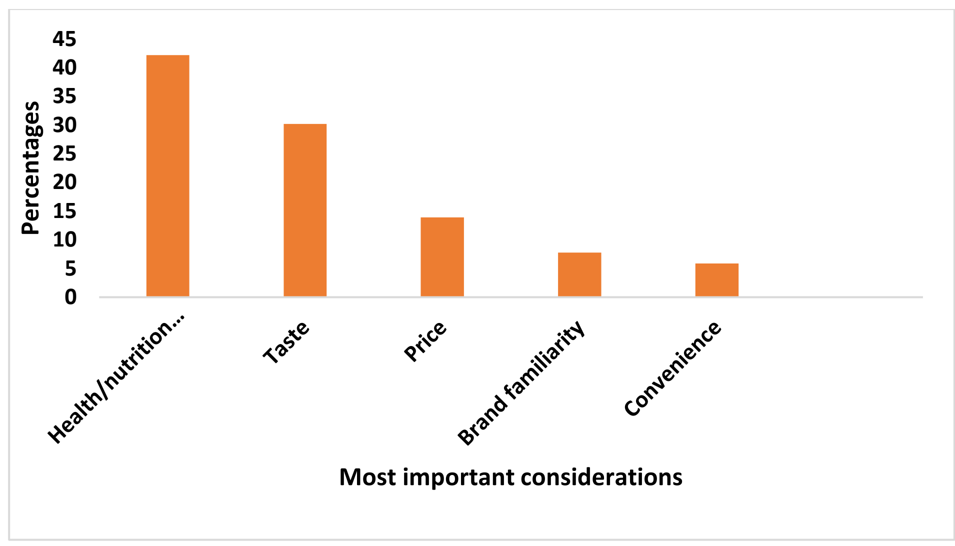

Figure 16: Consumers' rankings of most important reasons for choosing pre-packaged food products.

4.2.4 Household Pre-packaged food dietary patterns.

The household patterns of frequently purchased and consumed pre-packaged food categories are displayed in a scree plot Figure 17. Using Principal Component Analysis (PCA), nine components were generated to reflect the frequently consumed pre-packaged food categories and ten for frequently purchased pre-packaged foods above Eigen value of 1 and shown by percentages of explained variations. Processed proteins (fish and meats), ready-to-eat packed foods, spreads and fruits juice emerged as the top three pre-packaged food product categories frequently purchased by households.

However, for consumption, (processed proteins, spreads), fruits juice, (oils, seasonings and pasta) emerged as the top-three frequently consumed pre-packaged food categories. The full details of the patterns generated with variations in scree plot distances are shown in the supplementary results section (appendix C).

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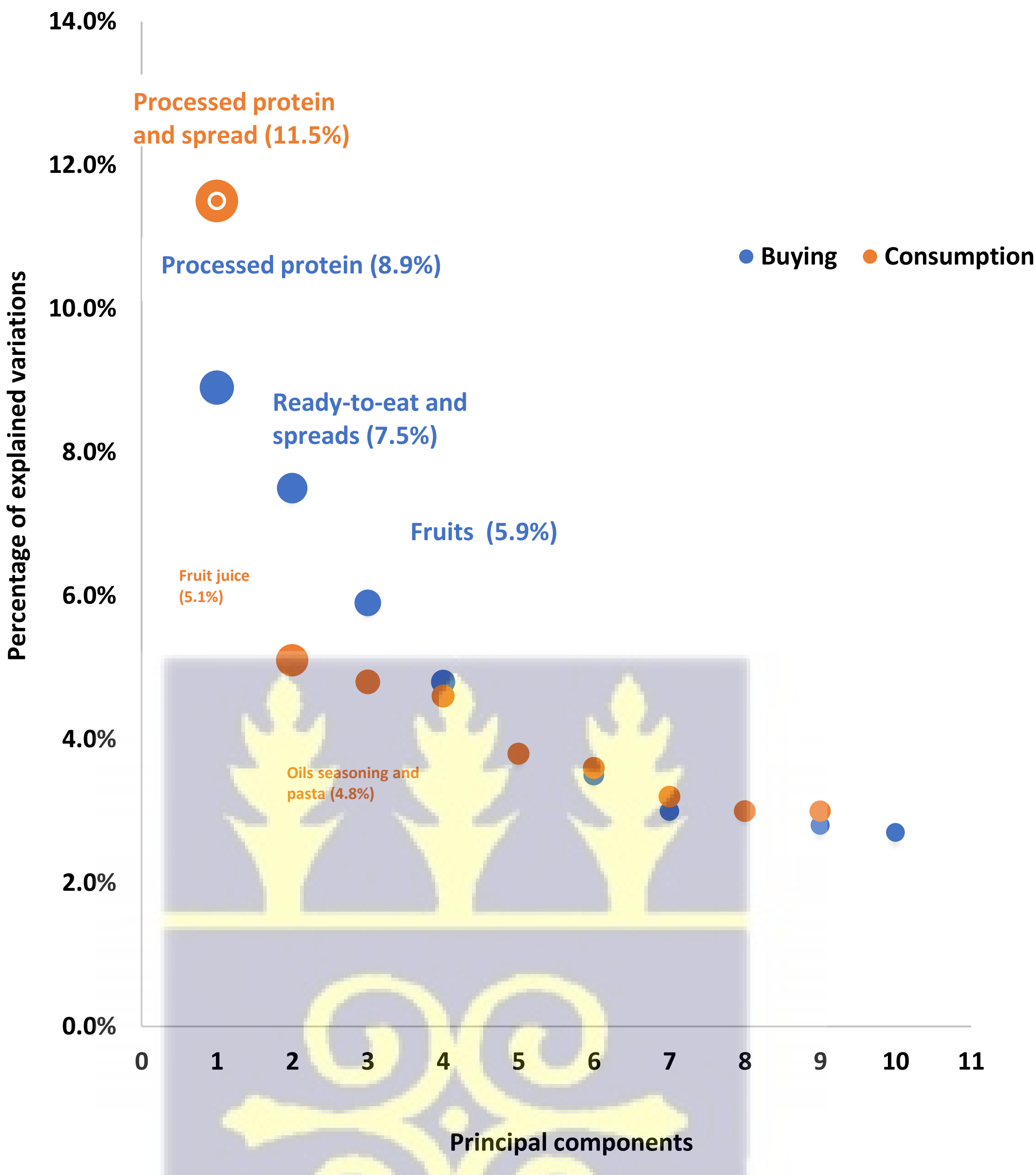

Figure 17: Household Patterns of Frequently Purchased and Consumed Pre-packaged food Categories.

4.2.5 Consumers perceptions towards nutrition and health-related information on pre-packaged foods

Table 7 shows respondents' perceptions toward various aspects of nutrition and health-related label information. Only about 42% of respondents indicated food labels were easy to understand.

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Majority (72.2%) of respondents reported that they believed the nutrition and health-related information on pre-packaged food products were correct (Table 7). Majority (80%) indicated that claims related to sodium or fiber were truthful. Also, about 70% of respondents thought nutrition facts panels on food labels are accurate.

Table 7: Consumers perception towards nutrition and health-related information on pre-packaged foods

Variable	Frequency	Percentage (%)
Ease of understanding information on pre-packaged foods		
Easy to understand	215	42.2
Difficult to understand	219	42.9
Do not know	76	14.9
Belief in statements on Food Labels		
a. "Diet low in sodium may reduce the risks of high blood pressure"		
Yes	408	80.0
b. "High fibre diet and low fat that appear on the front page of food packages are truthful"		
Yes	406	79.6
c. "Information of ingredients and nutrient composition values are accurate"		
Yes	368	72.2

4.2.6 Nutrition-related knowledge of food labels

In assessing nutrition-related knowledge of food labels (Figure 18), 72% of respondents reported they had adequate nutrition-related knowledge of food labels (subjective knowledge) but 34.7 % were deemed to have adequate nutrition knowledge.

When respondents were asked about their sources of nutrition knowledge, 42.5 % reported TV/radio/print media as their main source of information, followed by health professionals (30.8%), peers/family (25.9%) and the school (6.5%) was the least frequently reported the source of nutrition information (see appendix C). In rating these sources of nutrition knowledge on a three-point scale (unreliable, reliable, very

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reliable), information from health professionals (56.7%) was found to be the most 'very reliable' source of information and media (12%) was the 'unreliable' source of nutrition knowledge.

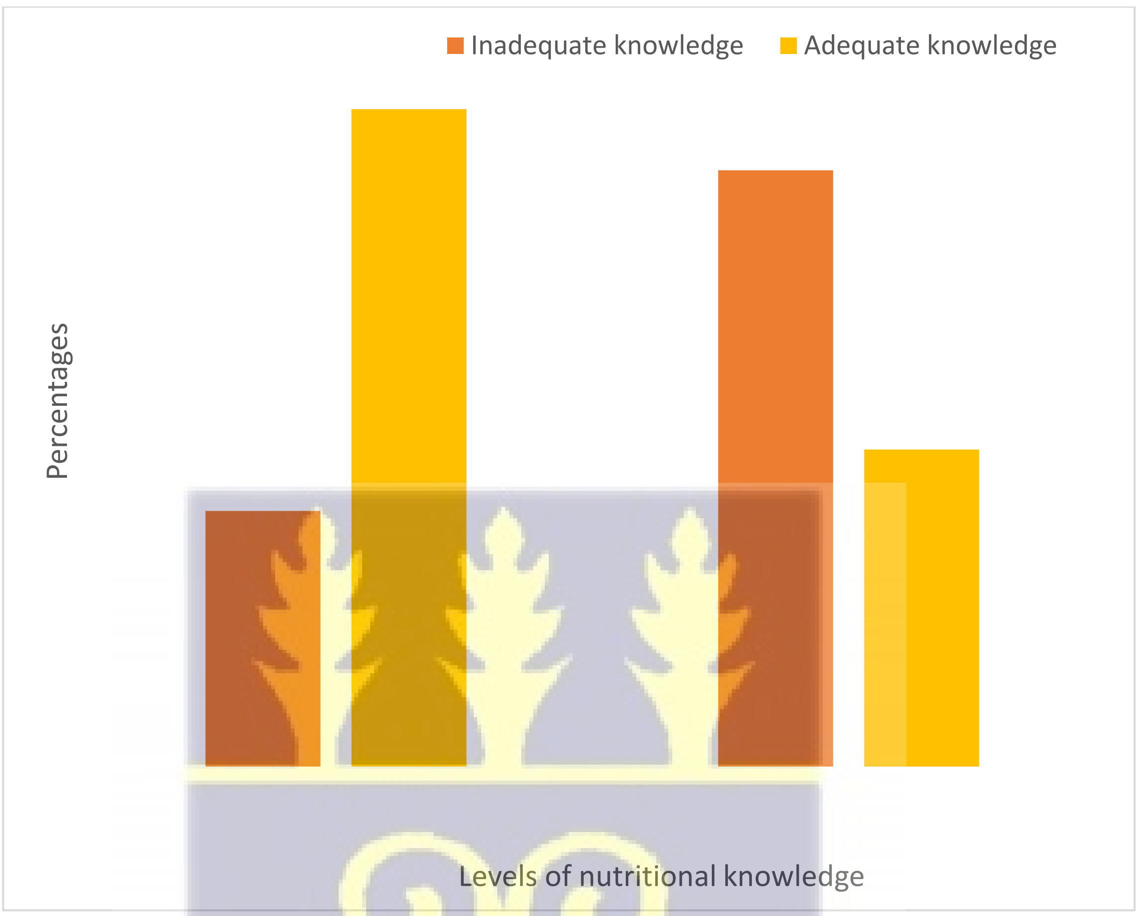

Figure 18: Levels of food label nutritional knowledge of Respondents

4.2.7 Food label understanding of respondents.

Majority (62%) of the respondents reported having an adequate understanding (subjective) of food labels. However, only 9.4% demonstrated adequate understanding (objective) of food labels (Figure 19).

For interpretation of labels, knowledge regarding the use of nutrition facts table was difficult for most respondents and claims usage was the least difficult as depicted in table 8. Only a few respondents could select healthy products (9.8%), evaluate the fat content of products (8.6%) and interpret ingredient list sections of food products

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(6.7%). However, most respondents were able to recognize health and nutrition claims (87.5%), ingredient list (68.5%) and artificial food additives (58.4%) components of labels.

When respondents were asked whether they had received any form of education on the use of food labels, majority (82.8%) had not (see Table 10). Of the respondents who had a form of education on the use of food labels, a greater proportion of them cited the internet (33.6%) as their source of education and the school was the least cited source of education of food labels (12.1 %)-see Appendix C-.

Figure 19: Levels of understanding of food label among respondents

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Table 8: Respondents' levels of understanding of health-related food label information (n=510)

Aspects of Label	Food label domains evaluated	The correct interpretation of label information	
		Frequency	percentage
Nutrition table			
	Serving size	106	20.8
	Fat content	44	8.6
	Salt content	120	23.5
Health and nutrition claim			
	Health and nutrition claims	446	87.5
	Comparison of fat contents of two products	55	10.8
	Selection of 'less fatty' food product	50	9.8
Ingredient question			
	Identification of ingredient list section	334	65.5
	Identification of artificial food additives	298	58.4
	Interpretation of ingredient list	34	6.7
	Level of added sugar	274	53.7

4.2.8 Factors associated with respondents' nutrition-related knowledge of food labels.

At the bivariate level of analysis, higher education, employment in the government sector, wealth index, other ethnic groups (apart from Ga, Akan and Ewe), Islamic faith, household of five or more, on a diet plan, previous education on the use of food labels, adequate knowledge of label understanding and positive perceptions about labels were associated with adequate nutrition-related knowledge of food labels (see Appendix C).

However, multivariable multilevel logistic regression results showed that females were more likely to have adequate nutrition-related knowledge of food labels

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compared to males (AOR: 2.27; 95% CI: 1.25-4.09), respondents with higher educational attainment were more likely to have adequate nutritional knowledge; JHS education (AOR: 4.96; 95% CI: 1.58-15.50), SHS education (AOR: 11.09; 95% CI: 3.52-35.01) and tertiary education (AOR: 17.7; 95% CI: 5.02-62.63) were more likely to have adequate knowledge compared to those with primary education, respondents living in a household of five and more members were also more likely to have adequate knowledge compared to those with fewer household members (AOR: 2.05; 95% CI: 1.03-4.06) and individuals with wealthy index category were also more likely to have adequate nutrition knowledge (AOR: 4.37; 95% CI: 1.91-9.96). The model also predicted that respondents who had adequate understanding of food labels were more likely to have adequate nutrition knowledge than their counterparts (AOR: 4.7; 95% CI: 1.94-9.42)- Table 9.

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Table 9: Factors associated with respondents' nutrition-related knowledge of food labels.

	Nutrition Knowledge				
Covariates	**Inadequate knowledge n (%) [n=333]**	**Adequate knowledge n (%) [n=177]**	**Total n (%) [n=510]**	**COR (95% CI)**	**AOR (95% CI)**
Sex					
Male	77(23.1)	28(15.8)	105(20.6)	Ref	Ref
Female	256(76.9)	149(84.2)	405(79.4)	1.60(0.99-2.58)	2.42 (1.31-4.47) **
Education					
Primary	69(20.7)	5(2.8)	74(14.5)	Ref	Ref
JHS	74(22.2)	29(16.4)	103(20.2)	5.40(1.98-14.76) ***	3.96 (1.22-12.82) *
SHS	103(30.9)	67(16.4)	170(33.3)	8.98(3.44-23.41) ***	9.48 (2.86-31.37) ***
Tertiary	87(26.1)	76(42.9)	163(32.0)	12.06(4.62-31.44) ***	11.13 (2.90-42.74) ***
Number of people in house					
1-2	83(24.9)	30(17.0)	113(22.2)	Ref	Ref
3-4	137(41.1)	68(38.4)	205(40.2)	1.37(0.83-2.28)	1.28(0.68-2.43)
5+	113(33.9)	79(44.6)	192(37.6)	1.93(1.16-3.21) *	2.05(1.03-4.06) *
Wealth index					
Poorest	94(28.2)	20(11.3)	114(22.3)	Ref	Ref
Poor	89(26.7)	21(11.9)	110(21.6)	1.11(0.56-2.18)	1.03(0.47-2.24)
Medium	56(16.8)	26(14.7)	82(16.1)	2.18(1.11-4.26) *	1.59(0.72-3.52)
Wealthy	42(12.6)	80(45.2)	122(23.9)	8.95(4.86-16.48) ***	4.37 (1.91-9.96) ***
Wealthiest	52(15.6)	30(16.9)	82(16.1)	2.71(1.40-5.24) **	1.47(0.58-3.71)
Understanding of food labels					
Inadequate understanding	319(95.8)	143(80.8)	462(90.6)	Ref	Ref
Adequate understanding	14(4.2)	34(19.2)	48(9.4)	5.42(2.82-10.41) ***	4.27 (1.94-9.42) ***

Location was used as the group variable for the multilevel logistic regression model

*p<0.05; **p<0.01 ; ***p<0.001, Reference variable(ref)

See Appendix C for complete table

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4.2.9 Factors associated with food label understanding of respondents

For bivariate analysis, factors such as education, adequate nutrition-related knowledge of food labels, work status, wealth and body mass index were associated with adequate understanding of food labels of respondents (See appendix Table C4).

But following a multivariable multilevel logistic regression, only two factors were found to be significantly associated with adequate understanding of food labels. Individuals who have previous education on the use of labels were more likely to understand food labels compared to those who did not (AOR: 2.59; 95% CI: 1.19-5.67). Besides, respondents with adequate nutrition-related knowledge of labels were more likely to have adequate understanding of food labels than their counterparts (AOR: 4.42; 95% CI: 2.01-9.75).

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Table 10: Factors associated with respondents' understanding of food labels

Covariates	Inadequate n (%) [n=462]	Adequate n (%) [n=48)	Total n (%) [n=510]	COR (95% CI)	AOR (95% CI)
	Understanding of food labels				
Education on the use of labels					
No	390(84.4)	32(66.7)	422(82.8)	Ref	Ref
Yes	72(15.6)	16(33.3)	88(17.2)	2.71(1.41-5.19) **	2.59 (1.19-5.67) **
Nutrition-related knowledge on food labels					
Inadequate	319(69.1)	14(29.2)	333(65.3)	Ref	Ref
Adequate	143(30.9)	34(70.8)	177(34.7)	5.42(2.82-10.41) ***	4.42 (2.01-9.75) ***
Body Mass Index (BMI)					
Normal	202(39.6)	19(33.3)	221(43.3)	Ref	Ref
Overweight	134(29.0)	19(39.6)	153(30.0)	0.17 (0.88-3.59)	0.18 (0.01-2.50)
Obese	125(27.1)	11(22.9)	136(26.7)	0.08 (0.01-1.15)	0.07 (0.01-1.15)

Location was used as the group variable for the multilevel logistic regression model

*p<0.05; **p<0.01 ; ***p<0.001, Reference variable(ref)

See Appendix C for complete table

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4.2.10.0 Food label usage of respondents

Approximately, one-third (31.8%) of the respondents were regarded as food label users when purchasing or consuming pre-packaged foods over a three-month period (Figure 20).

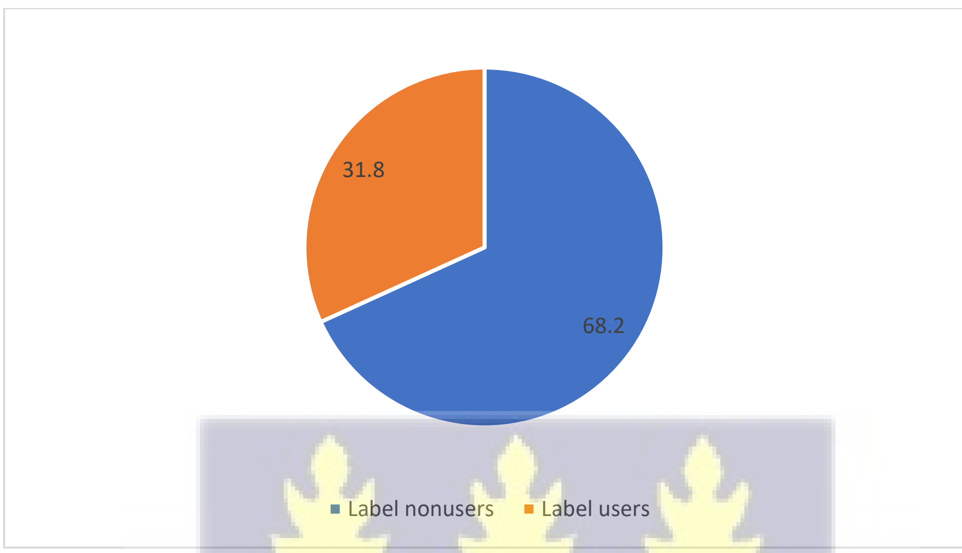

Figure 20: Food label usage

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4.2.10.1 Frequency of checking of food label components

The frequency of checking the various food label components among label users based on a 3-point Likert scale is shown in Figure 21. In general, most food label components are occasionally checked. However, shelf-life was the most regularly checked component (76%) and allergen component was the least or never checked component (34%).

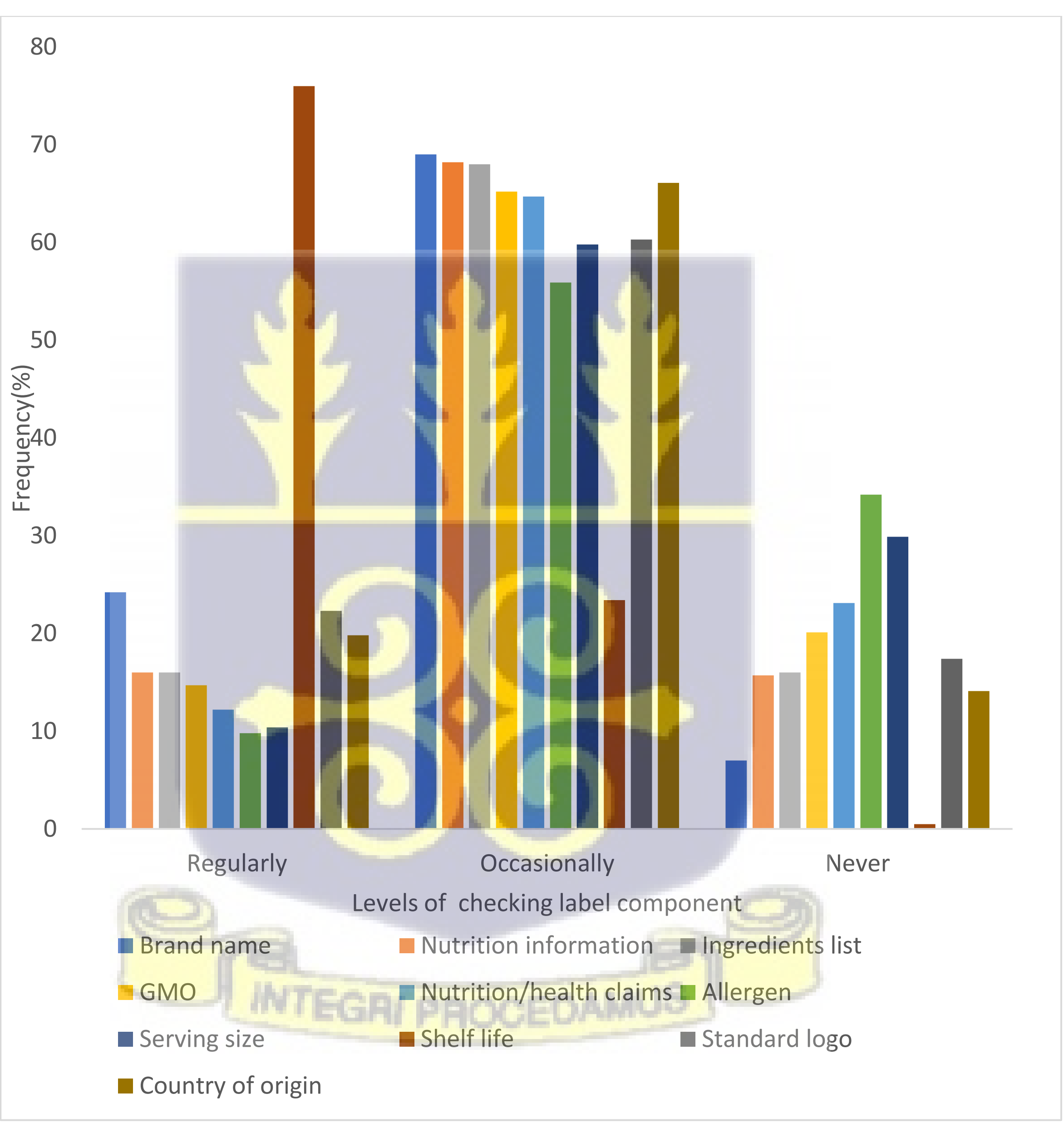

Figure 21: Frequency of checking food label components

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4.2.10.2 Reasons for use and non-use of food labels

Among those who reported using food labels within the last one month, almost half (44.8%) used food labels to ensure the products were genuine; about 40% used food labels to ensure product safety and 10% used labels when purchasing food for the first time (Figure 22).

Table 11 shows the reasons reported for not using food labels. About 45% thought they were unable to use the label, 36.4% were related to shopping behaviour and 18.9% did not see any need to use labels.

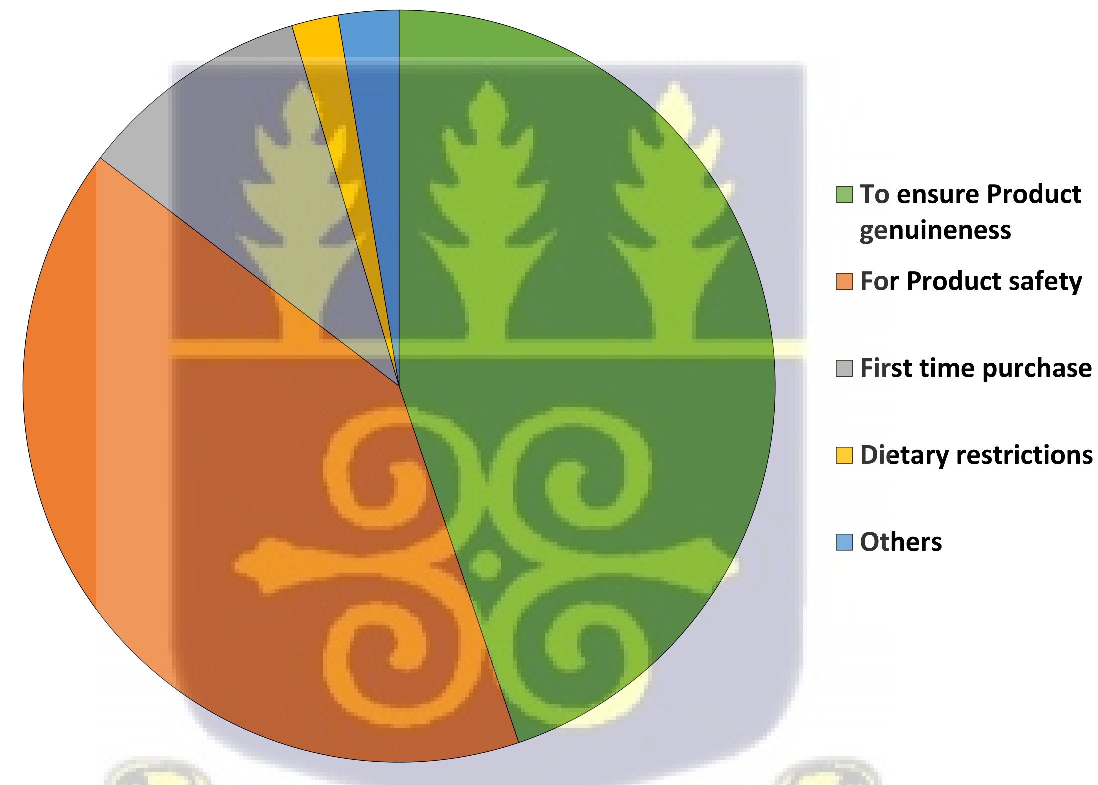

Figure 22: Reasons for reading food labels.

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Table 11: Consumers' reasons for non-use of pre-packaged food labels (N=348)

Reasons for nonuse	Percentage (%)
1. Absence of Need	
I trust my ability to select foods without label	18.9
2. Shopping Practices	
I don't have time to read food labels	30.0
The price is important for me	1.6
Loyalty to favorite brand	3.2
I don't take notice of labels	1.6
Total	***36.4***
3. Perceived inability	
Limited understanding of food labels	16.8
Information is too technical to comprehend	26.8
Small print of label on pre-packaged foods	1.1
Total	***44.7***

4.2.11 Factors associated with food label use

Multivariable multilevel logistic regression was used to determine factors associated with food label use among respondents. Factors were determined using adjusted odds ratios and their respective confidence intervals as displayed in table 14. In the adjusted model, respondents with tertiary education were more likely to use food labels as compared to their counterparts who had primary education (AOR: 6.72; 95% CI: 1.97-22.95). Respondents who had five or more individuals in their households were 2 times more likely to use food labels compared to those with 1 to 2 people in the household (AOR: 2.41; 95% CI: 1.15-4.99). Individuals with adequate nutrition-related knowledge of labels were almost two times more likely to use food labels compared to those who do not (AOR: 1.93; 95% CI: 1.14-3.27).

Furthermore, respondents with an adequate understanding of food labels were almost three times more likely to use food labels compared to those with inadequate understanding (AOR: 2.54; 95% CI: 1.17-5.51). Those who self-report to have a higher understanding of food labels were also more likely to use food labels compared to those who indicated they were not sure of understanding (AOR: 10.06; 95% CI: 2.40-42.27).

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Table 12: Factors associated with food label use

Characteristics	Food label use NonUsers n (%) [n=348]	Label Users n (%) [n=162)	Total n (%) [n=510]	COR (95% CI)	AOR (95% CI)
Education					
Primary	68(19.5)	6(3.7)	74(14.5)	Ref	Ref
JHS	82(23.6)	21(13.0)	103(20.2)	2.90(1.11-7.60) *	1.96 (0.63-6.08)
SHS	119(34.2)	51(31.5)	170(33.3)	4.86(1.98-11.91) **	2.89 (0.95-8.78)
Tertiary	79(22.7)	84(51.8)	163(32.0)	12.05(4.95-19.33) ***	6.72 (1.97-22.95) **
Number of people in a house					
1-2	85(24.4)	28(17.3)	113(22.2)	Ref	Ref
3-4	140(40.2)	65(40.1)	205(40.2)	1.41(0.84-2.37)	1.52 (0.78-2.98)
5+	123(35.3)	(69(42.6)	192(37.6)	1.70(1.01-2.86) *	2.40 (1.15-5.00) *
Residential status of household					
Own	26(7.5)	22(13.6)	48(9.4)	Ref	Ref
Rented	119(34.2)	54(33.3)	173(33.9)	0.54(0.28-1.03)	1.14(0.45-2.89)
Workplace residence	99(28.4)	57(35.2)	156(30.6)	0.68(0.35-1.31)	0.37(0.13-1.04)
Family house	99(28.4)	24(14.8)	123(24.1)	0.29(0.14-0.59) **	0.83(0.29-2.35)
Others	5(1.4)	5(3.1)	10(2.0)	1.18(0.30-4.62)	1.11(0.21-6.53)
Wealth index					
Lowest	95(27.3)	19(11.7)	114(22.3)	Ref	Ref
Second	87(25.0)	23(14.2)	110(21.6)	1.32(0.67-2.59)	1.01(0.46-2.25)
Middle	53(15.2)	29(17.9)	82(16.1)	2.75(1.40-5.43) **	1.34(0.58-3.08)
Fourth	61(17.5)	61(37.6)	122(23.9)	5.00(2.72-9.17) ***	2.14(0.92-4.97)
Highest	52(14.9)	30(18.5)	82(16.1)	2.89(1.48-5.62) **	0.85(0.30-2.42)
Nutrition knowledge					
Inadequate	259(74.4)	74(45.7)	333(65.3)	Ref	Ref
Adequate	89(25.6)	88(54.3)	177(34.7)	3.46(2.34-5.12) ***	1.93 (1.14 -3.27) *

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Table 12 Continued

Characteristics	Food label use NonUsers n (%) [n=348]	Label Users n (%) [n=162)	Total n (%) [n=510]	COR (95% CI)	AOR (95% CI)
Understanding of food labels					
Inadequate	328(94.3)	134(82.7)	462(90.6)	Ref	Ref
Adequate	20(5.7)	28(17.3)	48(9.4)	3.43(1.86-6.29) ***	2.54 (1.17-5.51) *
Understanding of food labels (self-report)					
Not sure	52(14.9)	4(2.5)	56(11.0)	Ref	Ref
Poor	119(34.2)	19(11.7)	138(27.1)	2.07(0.67-6.40)	2.60(0.71-9.30)
Intermediate	150(43.1)	105(64.8)	255(50.0)	9.10(3.19-25.93) ***	6.33(1.90-20.14) **
Very well	27(7.8)	34(21.0)	61(12.0)	16.37(5.2-50.96) ***	10.02(2.37-42.27) **

Location was used as the group variable for the multilevel logistic regression model.

*p<0.05; **p<0.01 ; ***p<0.001

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4.2.12 Predictors of health-related information use (HIU) among food label users

Table 13 shows predictors of health-related information use (HIU) using multiple linear regression analysis. HIU index of food label users represented the level of usage of health-related information of labelled pre-packaged foods. The analysis showed that levels of education, individuals with food allergies, those who had a previous education on the use of labels, those who perceive labels are easy to understand and respondents who indicated 'intermediate' and 'very well' level of understanding of labels were significant predictors of HIU.

Thus, respondents with higher education showed a significant increase in the HIU index by 0.51 units (β=0.51, 95% CI 0.03-2.43) as compared to those who do not. Individuals with food allergies were significantly associated with an increase in use index by 1.23 units (β=1.23, 95% CI 0.03-2.43) as compared to those without allergies. Individuals who perceived labels were easy to understand were significantly associated with an increase in HIU index by 1.35 units (β=1.35, 95% CI 0.61-2.01). Those who had a previous education on the use of labels had significantly increased health-related information use index by 0.80 units compared to their counterparts who indicated otherwise (β=0.80, 95% CI 0.038-1.55). Respondents who evaluated their understanding of food labels as 'intermediate' and 'very well' significantly increased the use index by 1.35 and units compared respondents who were not sure about understanding food label (β=1.35, 95% CI 0.26-3.90)

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Table 13: Predictors of health-related use (HIU) index[a] among food label users(N=162)

Predictor	Coefficient (β)	Mean (SD)	Standard error	95% CI
Education	0.51 *	-	0.22	0.074 – 0.95
Food allergy status				
No	Ref	9.0(3.09)		
Yes	1.23 *	11.7(4.80)	0.61	0.03-2.43
NCD status				
Absent	Ref	9.2(3.24)		
Present	-0.029	8.9(3.71)	0.61	-1.23 – 1.18
Understanding of information on pre-packaged food				
Difficult to understand	Ref	10.5(3.33)		
Easy to understand	1.35 ***	7.7(2.62)	0.38	0.61 – 2.09
Do not know	0.28	7.7(1.93)	0.51	-0.73 – 1.28
Education on food label use				
No	Ref	8.7(2.96)		
Yes	0.80 *	11.0(3.72)	0.39	0.038 – 1.55
Nutrition-related knowledge of	-0.011	-	0.011	-0.033 – 0.0094
food labels	-0.0059	-	0.014	-0.033 – 0.021
Nutrition knowledge(self-report)				
Not sure	Ref	7.5(2.9)		
Poor	-0.77	6.9(2.39)	0.88	-2.51 – 0.96
Intermediate	-0.044	8.9(2.69)	0.81	-1.64 – 1.55
Very well	1.18	12.1(3.99)	0.96	-0.72 – 3.08
Understanding of food labels(self-report)				
Not sure	Ref	6.9(1.89)		
Poor	0.41	7.2(2.59)	0.62	-0.90 – 1.63
Intermediate	1.35 *	9.2(2.82)	0.56	0.26 – 2.44
Very well	2.41 **	12.2(3.63)	0.75	0.93 – 3.90

[a]HIU index was formed using the frequency of ingredient lists, health or nutrition claims, serving size and nutrition facts table use aspects of food labels. The frequency was measured on 5-point Likert scale from never (1 point) to always (5 points). Therefore, the sum of responses ranges from 4 to 20. Median (25th-75th percentiles): 9 (7-11)

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CHAPTER FIVE

5.0 DISCUSSION

5.1 Introduction

This chapter discusses the study's findings. The first part discusses the disclosure of health-related label information on pre-packaged foods and the extent of compliance with regulatory standards. The second part discusses consumers' pre-packaged food use behaviour, their perceptions on various aspects of food labels, nutrition knowledge and understanding of food labels concerning food label use. Also, factors associated with consumers' nutrition knowledge, understanding of food labels and use are discussed.

5.2 The disclosure of nutrition and health-related Information on pre-packaged food products

Nutrition and health-related information are important label descriptions to guide healthy food choices. Provision of such information is an important step in achieving the public health goal of improved diets. The first objective of this study was to describe nutrition and health-related information on pre-packaged foods sold in local food retail outlets in Accra.

Generally, studies investigating the extent of health-related information disclosure on pre-packaged foods vary across countries (Rayner et al., 2013). Besides, results are difficult to compare due to differences in methodological approach, terminologies used, time frames of data collection and different food categories used. In this study, a standardized methodological approach (Rayner & Vandevijvere, 2017) developed by INFORMAS was used.

The results of this study show that beverages, bakery, and dairy products were the three leading categories of pre-packaged foods found in these local retail shops in Accra

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(figure 8). This suggests that the consumption of these food product categories is high and so, a higher supply in these shops to keep abreast with the demand. In a study investigating the food environment in the cities of Accra and Ho, the sale, advertisement and the consumption of these three categories were found to be high (Green et al., 2020; Holdsworth et al., 2020).

In recent investigations regarding health-related information on pre-packaged foods, the focus had been mainly Front-of-Packs (FOP) and health/nutrition claims (A. Kaur et al., 2017). However, ingredient list is an important source of information to aid consumers to evaluate nutrient profiles of food products. For example, the 2020 US Dietary Guidelines advise consumers to increase whole grains foods consumption in place of refined ones by using ingredient list on labels to select foods having whole grains listed first (USDA, 2020). Also, the framers of the NOVA classification system recommend that consumers can use the 'ingredient list' section of labels to identify levels of processing of pre-packaged foods. Cosmetic additives such as flavors and colorings make them tastier and more attractive are typical ingredients found in ultra-processed foods(Monteiro et al., 2018). High prevalence of ingredient list (92%) on pre-packaged foods sampled was probably due to the fact it is a mandatory requirement for general food labelling, except single-ingredient products.

Notwithstanding the mandatory food label requirement for pre-packaged foods in Ghana (FDA, 2013b), 2.3 % of the pre-packaged foods did not have labels. The unlabelled products included local snacks, cereals and bakery foods which are unlicensed with FDA and are regarded as foods produced by petty food traders. Non-compliance with mandatory food labelling requirements and weak enforcements tends to be common observations in countries with voluntary nutrition labelling (Kasapila & Shaarani, 2013; Lv et al., 2011).

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The current study suggests disclosure of health-related information on pre-packaged foods was appreciable against the backdrop that nutrition labelling policy in Ghana is voluntary. The extent of nutrition information declarations was 68.8 % however BOP nutrition labels constituted 87.3% against 12.3 % for FOP. While there is generally dearth of research papers in this area particularly in Africa (Turner et al., 2020), this finding is consistent with a study in Malawi, a country with a similar nutrition labelling policy, nutrition information declaration was 68.6 % (Kasapila & Shaarani, 2013). However, higher rates were reported in developed countries. For instance, at a time nutrition labelling policy was voluntary in the European Union, 85% was reported for pre-packaged across five food categories from 28 countries(S Storcksdieck genannt Bonsmann et al., 2010). In the USA, 98% of pre-packaged foods audited have BOP labels(Legault et al., 2004) and 43 % of new food products on the market had health or nutrition claims(Martinez, 2013).

Regarding the details of BOP nutrients declaration, the presentations of nutrient information were inconsistent across the food product categories and brands. The study found that '*greater than Big 4 but less than Big 8'* descriptions of the BOP nutrition were more across most of the food product categories than greater than Big 8. In a related study examining nutrition labelling on pre-packaged foods in Serbia, different forms BOPs nutrition labelling was reported(Davidović et al., 2015). Presently, codex recommends mandatory nutrition information for eight nutrients: energy, proteins, available carbohydrates, saturated fat, total fat, trans-fat, sodium and sugars (Codex, 2012). Likewise, this recommendation is in line with the proposed benchmark of INFORMAS(Rayner et al., 2013). An implication of this is the possibility of consumers having limited nutrition information to make healthy food choice decisions. Besides, these inconsistent declarations of nutrients list make it difficult for consumers to compare the

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same products across different brands. These observations are features of countries operating under voluntary nutrition labelling policies (EUFIC, 2018).

Under voluntary labelling policies, food manufacturers are permitted to present nutrition information in a way that suits them. In this situation, manufacturers are unlikely to report unfavourable attributes of their products. This is different for manufacturers operating in countries with mandatory nutrition labelling policy. For instance, in the USA, mandatory labelling requirements stimulated the reduction in levels of trans fats through reformulation by the food industry (Unnevehr & Jagmanaite, 2008). Therefore, it is important Ghana takes steps in adopting a mandatory nutrition labelling policy as recommended by Codex in promoting a healthy food environment. The priority nutrients recommended include protein, total carbohydrate (excluding fibre), total sugars, total fat, saturated fat, trans fat and salt (sodium). Most of these nutrients are recognized to be more pertinent to obesity and NCDs prevention than others. Thus , these nutrients are recommended to be subject of food label monitoring(Rayner et al., 2013).

Front-of-Pack (FOP) nutrition labelling offers additional easy-to-understand nutrition information than the BOP and leads to a healthier food choice(Rønnow, 2020). Although the prevalence of FOP was low, different types of FOP schemes were identified in this study, and most were locally applied (see figure 10). A possible explanation for this observation is that Ghanaian food industries export to countries where FOP labelling schemes have been implemented. They would normally adhere to these specifications. Another plausible reason is the infiltration of transnational food companies producing food products for the local market and export (Andam et al, 2017). The study identified GDA as the most prominent form of FOPs. These findings are consistent with other studies examining the extent of penetration of FOP labels(Bonsmann et al., 2010; Davidović et al., 2015; Julia et al., 2015; Bonsmann & Wills, 2012). The GDA an initiative of the food

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industry provides nutrient values for energy, key nutrients and their percentage daily values to stated Nutrient Reference Values (NRV) (Bonsmann & Wills, 2012). However, it has been criticized by public health experts that apart from its focus on limited nutrients it also requires a consumer with enough understanding and time in making a healthy choice(Scrinis & Parker, 2016). Also, the information could mislead consumers since the selection of nutrients and serving sizes are done by the food industry themselves. At the moment, no single FOP format has emerged as the best in guiding consumers to choose healthier foods(Pauline et al., 2015). And at the same time, research has shown the provision of inconsistent label formats and multiple systems may lead to consumer confusion regarding the selection of healthy foods(Hieke & Taylor, 2012).

As of the end of 2019, close to 32 countries including South Africa have endorsed FOP labelling with most countries implementing one form of FOP or the other in the effort to tackle obesity and diet-related NCDs(Jones et al., 2019). Without the implementation of a standardized interpretative FOP and its regulation, the influx of all manner of FOPs can be seen only to increase profits margins of food companies rather than achieving a public health goal (Brownell, 2012; Kanter et al., 2018). Therefore, adopting a standardized FOP and its regulation in Ghana must be prioritized to help consumer selection of healthy foods and incentivize the production of healthy foods. Using the Healthy Food-Environment Policy Index(Food-EPI) in assessing healthy food environment policy in Ghana, Laar and his colleagues (2020) identified FOP and mandatory nutrition labelling as policy gaps in addressing diet-related NCDs (Laar et al., 2020).

Meanwhile, the rate of implementation of healthy food environment policies including FOP policy actions in Africa have been slow and scanty(Booth et al., 2021). The diversity in the sociopolitical economies in the region coupled with power dynamics

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especially from transnational food companies could be blamed for this (Laar, 2021; Moodie et al., 2013). Regulatory and trade issues across borders are also posing problems for its implementation of FOP labelling(Jones et al., 2019). There is a critical need to constantly provide evidence to support and advocate for healthy food environment policies such as FOP labelling in tackling the increasing prevalence of obesity and NCDs.

This study also assessed the prevalence of nutrition and health claim on pre-packaged foods. Twice as many foods carried nutrition claims (18%) compared to health claims (7%). Much of the nutrition claims related to "nutrient content claims" and much more of "nutrient function and other claims: for health claims (see table 2). Besides much of these claims were presented verbally (78%) and 16% was reported for mixed of symbols and words. These results may be explained by the fact that most nutrition marketing strategies are presented in catchy phrases on food labels to influence consumer food purchase and increase sales. Food label at point of sale is an advertising tool and claims are known to influence product sale(Castro et al., 2018).

In the study of Kasapila and Shaarani (2013), the prevalence for nutrition claims on pre-packaged foods in Malawi was 14.8%, 20% for South Africa and 36.6% for other Southern African countries (Kasapila & Shaarani, 2013)as compared to 18% reported in this study. Outside Africa, in a related studies of five European countries in 2015, an average of 21% of products carried nutrition claim (Hieke et al., 2016), 29% reported for a study undertaken in the UK in 2011(A. Kaur et al., 2016) and 37% in Slovenia in 2015 (Pravst & Kušar, 2015). In a similar study in Canada (Schermel et al., 2013) and the USA (Colby et al., 2010), 46% and 49% of the presence of nutrition claims were reported respectively.

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Likewise, in this present study, the prevalence of health claim was 7% as compared to 6% in the Malawian study (Kasapila & Shaarani, 2013), 11% to reported in the European study (Hieke et al., 2016), 15% in the study in UK(A. Kaur et al., 2016) and 13% in the Slovenia study (Pravst & Kušar, 2015). These observations suggest that there is an increasing influx of this type of information on labelled pre-packaged foods on the Ghanaian market. It also suggests that food producers are aware of public interest in healthy eating hence the provisions are intended not only to boost sales but meet consumer demands. Presently, it is not clear how the extent of these provisions of health/nutrition claims information affects Ghanaian consumers' purchase of pre-packaged foods.

5.3 Compliance of Food labels and Nutrition/Health claims to FDA and Codex Requirements

Fundamentally, the general principle that underlines labelling of pre-packaged foods is that labelling should not be presented or describe in a manner that is false, deceptive or misleading. Therefore, provisions of label information are based on standards provided by national regulators consistent with international standards. Ghana's food labelling standards are based on Codex Alimentarius standards. According to this standard, the labelling of pre-packaged foods must meet these minimum labelling requirements; identity of the product (name, brand, lot/batch number), address of the manufacturer, the country of origin, ingredient list including food additives, net/drain weight and date markings including production and expiry dates. This study examined the compliance of food labels to these minimum food labelling requirements. The data showed high compliance (90% and above) for the different food label components however legibility of expiry date and general label information was slightly lower (between 80 % and 90%).

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The findings of high compliance to labelling requirement are consistent with an earlier study (Steele-Dadzie et al., 2015) assessing labelled pre-packaged foods to labelling standards in Ghana. This finding was unexpected since low compliance to food laws seems to be a feature of developing countries including Ghana (Ababio et al., 2016; Dowuona-Hammond, 2018). Meanwhile, very high compliance is observed with regulatory regimes with mandatory nutrition labelling (Hawkes, 2004). For instance, a survey of pre-packaged foods in the US found that 98% of the products complied with labelling standards (Legault et al., 2004).

These high compliance of pre-packaged food products to labelling requirements are indicative of the presence and functional regulatory system where pre-packaged foods sold on the market are duly licensed, registered and monitored. Several reasons may account for this observation. A possible explanation for this might be due to certain structural and administrative reforms at FDA, Ghana such as the creation of Food Market Surveillance Department (FMS) and Food Industrial Support Services Department (FISS)(FDA, 2020). These units are involved in offering food labelling services to food industries and ensuring food labelling standards are met by undertaking frequent market surveillance of pre-packaged foods. In their recent annual report, 2019 noted that due to increase market surveillance operations, about hundred and twenty-five thousand (125,000) non-compliant products were found in trade (FDA, 2020).

Health and nutrition claims components of food labels offer consumers a quick and easy way to evaluate products quality but they can become a means of exploiting consumers by food producers or marketers to boost product sale(Lwin et al., 2015). This has drawn a level of scepticism about the authenticity and credibility of these claims for most consumers (A. Kaur et al., 2017). Under the current voluntary nutrition labelling

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policy of Ghana, for claims to be made on pre-packaged foods they must be substantiated by providing a nutrition fact table specifying the nutrient value (FDA, 2013b).

The results of this study showed that compliance for health and nutrition was appreciably high. The data showed that more than 80% of products reporting nutrition and health claims had corresponding nutrition fact tables and their nutrient values. However, the compliance of nutrition claims was higher than an earlier study in Malawi where the overall nutrition and health claim compliance was 32.9% (Kasapila & Shaarani, 2013). Also, in related study examining the credibility of health and nutrition claims in Mongolia - a LMIC- only about 30% of products complied (Chimedtseren et al., 2020). This difference might be due to higher imports of pre-packaged foods on our shelves than more local production that pertains in Malawi and Mongolia. Since imported foods must meet trade and export regulations, adherence to specifications is usually high.

Regarding these studies in developed countries, higher compliance rates were reported. For instance, a recent study assessing health and nutrition claim of breakfast cereals in supermarkets in Australia, found 91.6% compliance to their national labelling standards (Sussman et al., 2019). In another study monitoring of supply in Austria, 95% of claims were consistent with their food standards and guidelines (Sobierajski et al., 2006). In many developed countries, the use of health and nutrition claims is well regulated. For example , food producers are only allowed to use authorized health claims in the European Union register(EC, 2012). In Australia and New Zealand, a nutrient profile model called Nutrient Profiling Scoring Criterion (NPSC) was developed as a minimum nutritional criterion for food products should meet before producers can make nutrition or health claims (FSANZ, 2017). A similar criterion is used in Canada and the US where set thresholds are made for sodium, saturated fat and cholesterol (Labonte et al., 2015).

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Nutrient profiling is the scientific procedure of classifying food products based on their nutrient composition to prevent diseases and promote health (WHO, 2011).

Furthermore, nutrient declarations including claims on pre-packaged foods are verified for accuracy. This is done by comparing declared values on the pack to laboratory-tested values or values in the Food composition database (Kok & Radzi, 2017). It is expected that nutrient content will not deviate substantially from the laboratory-tested values but within tolerable limits. These are done to ensure consumers are not misled by manufacturers making health/nutrition claims on their products. It is unclear whether the Ghanaian regulatory and standard activities cover such areas, and the extent legislation is enforced.

Besides, the presentation of nutrition and health-related information on pre-packaged foods must be consistent with national dietary recommendations and policies (Codex, 2012). This means that only nutrition and health related information that is in line with national nutrition policy should be permitted. Now, it apparent that there are no records of whether the labelling policy of Ghana was develop based on nutritional needs of the population. It is important that provisions on food labels be consistent with nutrition policy to achieve improved diets and prevent diets related NCDs.

Although the photographic approaches adopted in this study, is less costly than mystery shopping or in-store data collection methods, it has certain limitations (Kanter et al., 2017). Some product packages are difficult to photograph resulting in poor images of information. Product packages that are difficult to photograph include packaged foods with small prints, shiny(metallic) or transparent and contrasting backgrounds, large size packages, cylindrical packages as well as packages with stickers. Using product photos, legibility as compliance indicator was subjectively evaluated in this study. This is a limitation in checking compliance of pre-packaged foods to labelling standards.

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5.4 Pre-packaged food use behaviour among households in Accra

The third objective of this study relates to consumer pre-packaged food use behaviour. The data suggested that households in Accra do purchase and consumed a wide variety of pre-packaged foods. Traditional markets and corner shops were reported to be the usual sources of these foods while very few purchased food products at the supermarkets.

Although these findings corroborate previous studies that most Ghanaian purchase their groceries and other foods from traditional markets and corner shops (Aryeetey et al., 2016; Field et al., 2010; Meng et al., 2014) it is contrary to expectation against the backdrop of increasing infiltration of supermarkets in the Ghanaian food retail space (Kwau Andam & Tschirley David, Asante Seth, Al-Hassan Ramatu, 2017). This trend of consumer purchase behaviour is similar to a related study in urban Zambia that showed most consumers obtain their food from both traditional markets and supermarkets simultaneously (Khonje & Qaim, 2019). An earlier study indicated that preference for traditional markets was informed by consumer perceptions that these markets offer access to a wide variety of foods with lower prices (Aryeetey et al., 2016). As pointed by Hawkes (2008), in LMICs supermarkets tend to be expensive upon market entry but become price attractive with time. A feature observed for countries that have experienced the supermarket boom.

Research has suggested that increasing supermarket growth leads to more consumption of unhealthy diets including ultra-processed foods and rising obesity (Hawkes, 2008; Rischke et al., 2015). While supermarkets tend to offer convenience for consumers to compare attributes of different products through labelling reading, most traditional markets are chaotic and congested which would not permit effective food label use. These present results are significant and policies focusing on only supermarkets to

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turn the tide of obesity could be misleading since traditional markets remain the usual place of purchasing pre-packaged foods among urban populace.

Several factors influence consumer choice of food products to buy or consume. This choice decision can be complex. According to Tanis Furst et al., (1996), the conceptual model of the food choice process, selection decisions are trade-offs among factors such as taste, price, convenience, health and nutrition concerns as well as the importance of social tiers. In this study, respondents reported they were influenced predominantly by taste, price, health and associated nutritional information when purchasing pre-packaged foods. Respondents ranked health information, taste and price as the top three reasons. In a related study, the researchers reported that the price of food is a main consideration of consumers in Ghana who usually have large family sizes (Hayford et al., 2015; Meng et al., 2014). These results are consistent with data obtained in a study exploring South African consumers' reasons for not reading labels, majority indicate that taste (75%) and price (73.5%) were more important to them than nutrition information provision (Jacobs et al., 2011). In another related study in urban India, exploring reasons consumers consider while buying pre-packaged foods, taste ranked first, followed by convenience and ease of use informed purchase decisions (Vemula et al., 2014). A similar study among shoppers indicated taste, what my family wants, health and nutrition, as well as price, determined their choice(Grunert, Fernández-celemín, et al., 2010). These results suggest that in the choice of pre-packaged foods, though nutrition and health information are important for consumers they do not rank first. Thus, the issue of cost should be a concern for policymakers since research suggests that healthy foods are costly especially for low-income households (Hawkes et al., 2015).

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5.5 Consumer perceptions, nutrition knowledge and food label understanding among consumers in Accra

The data showed that most consumers were motivated and had a positive perception about health-related information on labels. Most consumers (80%) believe the information on nutrient composition and ingredients on labels are accurate. Also, most of them believe that information on health and nutrition claims is truthful. However, their perception of the ease of understanding the information on labels was split, while some believe it was easy to understand others considered it difficult. These findings of high awareness and perception about food labels are consistent with the results obtained from previous studies on food labelling in other parts of Ghana (Ababio et al., 2012; Affram & Darkwa, 2015; Aryee et al., 2019; Azila-gbettor & Adigbo, 2013; Osei Mensah et al., 2012).

Although respondents had a positive perception towards food labels, majority of them hardly or do not use labels. A possible explanation for such observation is that consumers could have a positive perception towards labels but does not imply they found the need to use them. The use of food labels differs depending on consumers' familiarity with pre-packaged food and the need to consult labels is usually greatest for unfamiliar foods (Besler et al., 2012; Cowburn & Stockley, 2005; Grunert, Fernández-celemín, et al., 2010). Besides, this phenomenon explains the role of motivation in cognitive development and comprehension. Motivation is important to learning but it does not guarantee comprehension it only draws individual attention to knowledge (Miller et al., 2010).

According to consumer behaviour al theory expunged by Grunert and Wills (2007), the likelihood for a consumer to effectively use nutrition labels depends on how the consumer perceives and understands the information on the label (Grunert & Wills, 2007). Several factors do influence consumers' decision-making process however prior

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knowledge and understanding of nutrition and health-related issues have been shown to support the effective use of food labels (Grunert, Fernández-celemín, et al., 2010; Miller & Cassady, 2015). More importantly, understanding or knowledge can be distinguished as subjective or objective. Subjective understanding relates to consumer perceived understanding, but objective understanding relates to the actual understanding intended. Miller and Cassady,2015, in their review of effects of nutrition knowledge on nutrition label use, showed if consumer subjective understanding predicted effective label use it is usually at par with objective understanding based on prior nutrition knowledge.

Consistent with literature, this research found a higher degree of subjective(perceived) understanding and a low degree of objective understanding of food label use among participants (Campos et al., 2011; Cowburn & Stockley, 2005; Hieke & Taylor, 2012; Mandle et al., 2015). Similarly, a higher degree of subjective nutrition knowledge and low objective nutrition knowledge were found in this study. Regarding the objective assessment of food label use understanding, participants found questions relating health and nutrition claim easier but found quantitative nutrition information questions difficult to understand. These findings are consistent with a similar study among shoppers in Koforidua, it was reported that only 22% of the respondents could correctly explain "26% RDA(Recommended dietary allowance) Vitamin A per serving" information on a label (Darkwa, 2014). In a recent study among university students in Ghana, the authors reported that although the students attached importance to food labels majority of them had a limited understanding of food label information (Madilo et al., 2020). These observations extend beyond Ghana. In a related study among Singaporean shoppers, researchers found that most shoppers consult food labels but had limited understanding of the information especially quantitative nutrition information (Vijaykumar et al., 2013). Also, in a study assessing food label use and understanding among adult consumers, it was

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found that consumers who claim to use food labels when put to food labelling task showed little or no understanding of food label information(Jacobs et al., 2011).

5.5 Food label use behaviour, reasons for using and not using food labels

Little of over one-third of respondents reported reading food labels sometimes and always, before the purchase of pre-packaged foods. Most respondents reported product genuineness and safety as predominant reasons for reading food labels among others. Thus, the study data showed shelf-life/expiry date was the most regularly checked food label component.

Regarding self-reported food label use, previous cross-sectional studies in Ghana seem to report higher rates of label use than this present study. In a study of Aryee et al, (2019), in Tamale, 51.9% of respondents reported frequent use of food label, 82% in a similar study in Ho and 80% was reported for a study in Kumasi (Affram & Darkwa, 2015; Osei Mensah et al., 2012). This discrepancy can be attributed to convenience samples employed in these studies. For example, the study by Aryee et al, (2019), food label use was measured at point sale and convenience sampling was employed to recruit participants. These measures point to selection bias leading to over-reporting and limit the external validity of the findings (Miller & Cassady, 2015). However, it was noted that studies employing probabilistic sampling approach tend to report lower food label use than studies employing convenient sampling to recruit participants for the study (Campos et al., 2011; Cowburn & Stockley, 2005; Mandle et al., 2015).

In the systematic and meta-analyses of some food labelling use studies, authors pointed out the weaknesses in the use of non-random samples and self-administered questionnaires as such tend to report higher prevalence rates of food label use and understanding (Anastasiou et al., 2019; Campos et al., 2011; Cowburn & Stockley, 2005;

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Hieke & Taylor, 2012; Miller & Cassady, 2015). They alluded that use of subjective and self-reported measures in these studies led to over-reporting due to the tendency of social desirability by respondents (Grunert, Fernández-celemín, et al., 2010; Miller & Cassady, 2015; Podsakoff et al., 2003). These observations were confirmed in studies using objective measures and probability sampling methods, they tend to report a lower level of use and understanding of food labels (Campos et al., 2011; Cowburn & Stockley, 2005). Meanwhile, the use of convenience samples is justified by the issue of point-of-purchase surveys. Preference for such measures is explained by the fact that consumers' insights and experiences about labelling are best captured during shopping(Vijaykumar et al., 2013).

The measure of food label use varies across studies and between countries making comparisons difficult (Mandle et al., 2015). Most studies examining food labelling also use the term nutrition label. This term refers to label components such as nutrition fact tables including serving size, ingredient list, health, and nutrition claims. According to a systematic review of nutrition labelling studies, Campos et al,2011 found that higher rates of label use and knowledge levels are reported for developed countries than developing countries. For instance, a study by Grunert and Wills (2010), indicated that 52% of consumers reported using nutrition labels always and occasionally in the UK, 50% in Sweden, 63% in France and 65% in Ireland.

About food label components usually checked by consumers, the results of this study are in line with previous studies on food labelling in Ghana. For instance, the study in Tamale(Aryee et al., 2019), and others in major towns in Ghana (Ababio et al., 2012; Azila-gbettor & Adigbo, 2013; Darkwa, 2014; Madilo et al., 2020; Osei Mensah et al., 2012), consumers ranked expiry date as the aspect of labels to be frequently checked by consumers when purchasing pre-packaged foods. This consumer behaviour reported in

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this study is consistent with previous studies in South Africa and India, where most consumers reported expiry dates as the most frequently checked food label component(Jacobs et al., 2011; Vemula et al., 2014). Since food safety issues are major public health concerns in the developing countries including Ghana (Ortega & Tschirley, 2017) product safety and genuineness of pre-packaged foods are of much a concern for consumers.

In exploring reasons why majority of the respondents do not use food labels, reasons sufficed included perceived inability, shopping practices and absence of need. A larger proportion of non-users based their lack of use on reasons related to perceived inability which includes, limited understanding of food labels and small prints. Others due to reasons related to their shopping behaviour and absence of need (see Table 8). This phenomenon was confirmed when most of them performed poorly when put to food labelling task (see table 11). However, these findings corroborate those reported for earlier studies assessing consumer reasons for non-use (Cowburn & Stockley, 2005; Hieke & Taylor, 2012; Klopp & MacDonald, 1981). This situation suggests that most consumers in Accra are susceptible to being misinformed on nutrition issues or might misuse food label information. This assertion is confirmed by the fact that a greater proportion of the respondents indicated mass media (radio/TV/internet) as their main sources of nutrition knowledge. It is known that media reportage on nutrition-related issues can further add to consumer confusion regarding the subject (Green, 2015; Spiteri Cornish & Moraes, 2015). This is observed in many contradictory and ever-changing information that keeps emerging all the time. Besides, currently, there are no official national food-based dietary guidelines or nutrient recommendations to assist Ghanaian consumers in selecting healthy foods.

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The combination of these findings provides some support for the theory of Capability, Opportunity and Motivation(COM-B) system to effect behaviour change among consumers (Michie et al., 2011; Nabec, 2017). This model advances the concept that in improving health-related behaviour s such as label reading, there need to motivate consumers, improve the capability of consumers and provide contextual opportunities for the consumer to read labels.

5.6 Factors associated with consumer understanding and use of health-related label information on pre-packaged foods.

Regarding nutrition-related knowledge of food labels, little over one-third of participants were deemed to have adequate nutrition-related knowledge of food label. In multivariate analysis of data showed being female, having tertiary education, bigger household size, being wealthy and prior knowledge on food label use were found to be significantly associated with nutrition-related knowledge of labels. This study disproportionately leaned towards female respondents since most of them tend to do household food shopping. This is no surprise since women are considered gatekeepers for food and nutrition choices at home. Females tend to be more health-conscious, wary of their body shape and interested in healthy eating than men, hence their ability to gain more nutrition knowledge. These assertions have been confirmed in previous studies (Grunert et al., 2012; Miller et al., 2010; Stran & Knol, 2013).

Higher education tends to lead to better socioeconomic status and improved health. These two socio-demographic variables (education and income) are known predictors of well-being including nutrition knowledge (Donkin et al., 2018). Having higher education affords individual access and the opportunity to learn more about nutrition and health issues. Thus, people of higher education might pay more attention to, and understand label information on food products (Grunert et al., 2012).

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Living situation and household composition can have different effects on nutrition knowledge levels of individuals (Christoph et al., 2018). In this study, the relationship between household size and nutrition knowledge could be explained that, bigger household size might require meeting different dietary and nutrition goals especially for children and older adults, nutrition knowledge becomes handy in managing household these goals. This could lead to more efforts in acquiring nutrition-related knowledge. This could explain why an individual in a larger household might have a higher nutritional knowledge.

Previous studies have suggested that lifestyle factors such as having a chronic disease, desire to lose/gain weight and being health conscious were significantly associated with nutrition knowledge (Hieke & Taylor, 2012; Mandle et al., 2015). This result may be explained by the fact that people with these sicknesses become conscious of their health, learn more about nutrition and health-related issues to maintain good health.

The multivariable multilevel logistic regression analysis showed food label understanding was significantly influenced by higher nutrition-related knowledge of labels (objective), consumers who indicated they had education on the use of labels and under-weight individuals. Thus, this finding supports evidence from previous studies examining the relationship between nutrition knowledge and food label use and understanding (Cowburn & Stockley, 2005; Drichoutis et al., 2005; Krešić & Mrduljaš, 2016; Miller & Cassady, 2015). This finding reiterates the fact that providing nutrition education and promoting health would increase food label use. This is corroborated by several interventional studies that have shown that implementing education strategy on nutrition and food labelling increases food label use and improves diets (Anastasiou et al., 2019; da Costa Souza et al., 2016; Kollannoor-Samuel et al., 2016; Medeiros et al., 2019; Moore et al., 2018).

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Food label use is affected by several demographic and personal factors. Previous studies have demonstrated that urban location, household size, social grade/income levels, marital status, gender, age and ethnicity are determinants of consumer label use (Anastasiou et al., 2019; Campos et al., 2011; Hieke & Taylor, 2012; Mandle et al., 2015). Personal factors such as time constraints when shopping, being health-conscious and having NCDs have also been reported to affect label use (Anastasiou et al., 2019; Christoph et al., 2018). However, in a systematic review of nutrition label studies across 15 European countries, Grunert and Wills contended that in examining the determinants of label use, consumer demographic factors should be seen as correlates of actual determinants such as interest in and knowledge about nutrition, health status and price consciousness (Grunert & Wills, 2007).

This study results confirmed that individuals with adequate nutrition-related knowledge of food labels were more likely to use food labels compared to those with inadequate nutrition knowledge (Christoph et al., 2018; Liu et al., 2015). Besides, individuals with adequate food label understanding were more likely to use labels than those who do not. Other behavioural determinants such as BMI and NCD status were not significant in this study. This might be explained by the fact that such consumers lack the understanding of the implications of increasing BMI and NCDs risks connections to their diet.

Also, two demographic factors education and household size showed a positive influence on food label use. In related studies in Kumasi and Koforidua, the study suggested that consumers with tertiary education were most likely to use food labels (Ababio et al., 2012; Darkwa, 2014). This result is also consistent with other labelling studies in Mauritius, Nigeria, South Africa, and India. Consumers with bigger family sizes are usually with children who do have bigger shopping and are more likely to use labels.

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Therefore, a bigger household size tends to predict food label usage (Christoph et al., 2018). Although, being female predicted having adequate nutrition-related knowledge of food labels but did not predict food label use in this study. A plausible explanation for such an observation is nutrition knowledge might not necessarily translate into label use since familiarity with certain products might not warrant label reading.

Food label components such as serving size, nutrition table, ingredient list, health and claims are more pertinent to health (Rayner et al., 2013). In this study, the health-related information use (HIU) index was used to estimate the use of health-related information on labelled pre-packaged foods among label users. The multivariate linear regression showed that having higher education, a respondent having a food allergy, prior education on the use of labels and individuals who perceived food labels were easier to understand, and those who perceive themselves as having adequate knowledge had a positive effect on HIU index. These correlates of HIU collaborate earlier findings of higher education, prior health literacy and motivation increases the likelihood of individuals using nutrition label (Bosman et al., 2014; Christoph et al., 2018; Koen et al., 2016). Allergic reactions can have devastating effects such as rashes, severe itching, running nose, shock, or even death. Therefore, individuals with knowledge about their allergies are keen to examine ingredient lists to ensure they don't consume foods containing substances to which they are allergic (Vierk et al., 2007).

5.7 Strengths and contributions to knowledge

This present study has been one of the first attempts in Ghana to thoroughly examine both the supply and demand side of food label information. A content analysis of nutrition and health-related label information on pre-packaged foods was done to understand the food labelling information space in Accra, Ghana. Evidence was provided on the extent and penetration of nutrition and health related claims about pre-packaged food products

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in our markets. Also, the study assessed 'how well' these label information especially health and nutrition claims presented complied with FDA and Codex Standards. These findings have contributed to our understanding of the food environment in Ghana.

Moreover, previous studies assessing consumer understanding and use of labels (demand side of label information) especially in Ghana relied on subjective assessments(Booth et al., 2021; Mandle et al., 2015). Food label use was measured mostly by 'how often' it is used with little or no emphasis on 'how well' the information was understood. However, in this present study, a more objective assessment was employed to assess consumer understanding and use of labels. Respondents were asked to performed labelling tasks. This shed a new light in our understanding of consumer nutrition knowledge and understanding of health-related information on labelled pre-packaged foods. The evidence from this study suggested that consumers in Accra lack the knowledge and skill to use health-related aspects of labels.

Prior studies on consumer food labelling especially in Ghana relied on non-probability sampling approaches in recruiting respondents which has a limitation of low external validity and generalizability of results. This current study employed a multi-stage random sampling approach - stratified random and cluster sampling which enabled the inclusion of respondents from varying socioeconomic households to examine whether there are differences in the understanding and use of label information. Thus, the findings of this study, has a much stronger external validity.

5.8 Limitations of the study

Notwithstanding the numerous strengths of this study, here are some limitations discussed. Firstly, the scope of work on pre-packaged food products survey was small since only neighbourhood shops, not supermarkets were sampled due to limited resources.

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In this case, the potential of missing other product varieties on the market is high. Therefore, one must be cautious in generalizing the findings of this study.

Due to the cross-sectional nature of this study, seasonal variations in food availability were not accounted for during the pre-packaged food products survey. Therefore, products that are linked or influenced by seasonal variations were likely missed, limiting our knowledge on the extent of health-related label information on pre-packaged foods. Also, as with cross-sectional study design, the study was unable to establish a clear causal relationship between variables.

The consumer survey relied on some self-reported and subjective measures to ascertain respondents' behaviour s. The reliability of these findings might be affected by the social desirability and recall bias of respondents. This may result in over/under-reporting and deviation from the actual behaviour s of respondents.

Lastly, consumer food label use studies are limited to only a section of the population the 'literates' and this study was no exception. Thus, the views and behaviour of a significant portion of the population who purchase and consume pre-packaged foods were missed.

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CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1 Conclusions

As obesity and diet related NCDs continue to increase, food labels represent an important source of information to help consumers make healthy food choices. Adequate food label use and how it translates into healthy food choice are influenced by the kind of health-related label information provided and consumers' ability to read, interpret, and understand the information. Therefore, this study set out to describe food label characteristics of pre-packaged foods and determine drivers of food label use among households in Accra.

The study found most of the pre-packaged food products sold in local retail shops in Accra carried nutrition information. The nutrition information was more of nutrition fact tables (BOP) than that of interpretative nutrition labels (FOP). Also, most labelled pre-packaged food products had mandatory ingredient list components. Various types of interpretative nutrition labels (FOP) were identified but Guideline Daily Allowance (GDA) was the most common format.

In addition, the study found that nutrition claims were twice as much as health claims on pre-packaged foods. Most of the claims were written and the others were a combination of words, numbers, and pictures/symbols. Most of label information presentations including health and nutrition claims complied with FDA and Codex standards.

Analysis of consumer survey data suggests that households purchase a variety of pre-packaged foods and mostly done by women. Also, the study indicated that nutrition and health information on pre-packaged foods were important for consumers however their purchases were driven more by taste and price. While consumers had a positive perception of food labels, they lack the knowledge and the skill to use them. Also, most

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participants' performance on nutrition-related knowledge of food labels was inadequate. An implication of this is the possibility that most consumers in Accra are susceptible to being misinformed on nutrition issues or might misuse food label information.

Only a third of respondents were deemed to be food label users. Among the reasons for not using labels, more of it is related to a perceived inability to use food labels. Other reasons include limited understanding of labels, technical information, inability to read small prints of label information, time constraints and a few did not find the need for food labels when shopping. Conversely, the study identified that food label users do consult labels mainly to ascertain product safety and less for nutrition and health reasons.

Furthermore, the study found that being part of a larger household, having a tertiary education, adequate nutrition-related knowledge of food labels and understanding of food label predicted consumer label use. Among food label users, individuals having higher education, with food allergies, who perceive labels are easy to understand, who obtained education on the use of labels and individuals who self-report having adequate food label understanding predicted health-related use of food label information.

Taken together, the study has shown consumers in Accra do purchase a wide variety of pre-packaged foods, have positive perceptions about food labels but they show limited understanding and use of nutrition and health-related aspects of food labels. Besides, analysis of food labels on pre-packaged found in local retail shops indicates the dominance of not-easy-to-understand BOP nutrition label formats over that of FOP, inconsistent BOP presentations and other food claims. The extent of nutrition and health-related information disclosure in this do not meet current provisions of Codex and INFORMAS in promoting a healthy food environment.

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6.2 Recommendations

Based on the findings of this study, the following recommendations are made.

Recommendation for Policy

- Generally, the nutrition and health-related information disclosure rate on pre-packaged foods found in this study did not meet the current position of Codex and the benchmarks set out by INFORMAS in promoting healthy food environment. Therefore, the adoption of mandatory nutrition and FOP labelling policy in Ghana must be a key policy priority as means of addressing the problems of obesity and increasing prevalence of NCDs.
- There is a need for the government through the Ministry of Health with other stakeholders including the academia, research institutions, consumer groups and the food industry to lead and develop national Food Composition Database, Food-Based Dietary and Nutrient Guidelines. These will aid consumer selection of healthy foods. This is equally important for manufacturers in developing new products and guiding their provision of label information consistent with national dietary guidelines.
- With the low level of understanding of food labels recorded in this study, it is recommended that the use of food labels and their corresponding nutrition knowledge should find a significant space in our educational curriculum. Besides, adoption of FOPs such as Multiple Traffic Light (MTL), healthy logos/indications and Warning Labels (WL) which are easy to comprehend and use even by consumers with low literacy or numeracy skills.

Recommendations for Public Health Practice

- As part of health promotion activities of Ghana health service, education on nutrition and the use of food labels are strongly recommended.

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- There should be concerted efforts from registered dieticians and nutritionists to encourage food label use and support consumers in correctly understanding this information.

Recommendations for Future research

- Further research is needed to measure the prevalence of different types of health-related information present on pre-packaged foods and non-alcoholic beverages in stores with a larger share of products. Also, a study is needed to evaluate whether there are differences in the nutrient profiles between pre-packaged food products that carry health or nutrition claims compared to those products that do not carry such claims.
- The presence of FOP labelling- a more interpretative nutrition labelling- on our markets calls for further interventional studies to identify schemes that will encourage label use and be user-friendly for the Ghanaian consumer.
- A natural progression of this work is to conduct qualitative studies in probing consumers' thoughts and observations to gain insights about consumers' decision-making and choice behaviour in purchasing pre-packaged foods.
- Experimental studies are needed to elucidate the causal links among nutrition knowledge, food label use and dietary intake of consumers. This will help public health authorities to design tailored-made interventions to encourage and promote the use of food labels.

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REFERENCES

Ababio, P. F., Adi, D. D., & Amoah, M. (2012). Evaluating the awareness and importance of food labelling information among consumers in the Kumasi metropolis of Ghana. *Food Control*, *26*(2), 571–574. https://doi.org/10.1016/j.foodcont.2012.02.015

Ababio, P. F., Taylor, K. D. A., Daramola, B. A., & Swainson, M. (2016). Food law compliance in developed and developing countries: Comparing school kitchens in Lincolnshire–UK and Ashanti Region of Ghana. *Food Control*, *68*, 167–173.

Addo, P. N. O., Nyarko, K. M., Sackey, S. O., Akweongo, P., & Sarfo, B. (2015). Prevalence of obesity and overweight and associated factors among financial institution workers in Accra Metropolis, Ghana: a cross sectional study. *BMC Research Notes*, *8*(1), 599. https://doi.org/10.1186/s13104-015-1590-1

Adu-Gyamfi, S., Tomdi, L., & Amakye-Boateng, K. (2020). DISCOURSE ON NON-COMMUNICABLE DISEASES INTERVENTIONS IN GHANA (1990-2018). *Journal of Basic and Applied Research International*, *26*(2).

Affram, P. C., & Darkwa, S. (2015). Consumersknowledge, understanding and use of food label information, and how it affects purchasing decision in ho, Ghana. *Asian Journal of Empirical Research*, *5*(3), 24–39.

Aguayo, E. (2017). Martínez. *Pepsico Subsidiary Sues Treasury for Food Labeling Law Marca Sur*, *14*.

Allen, L. N., Pullar, J., Wickramasinghe, K. K., Williams, J., Roberts, N., Mikkelsen, B., Varghese, C., & Townsend, N. (2018). Evaluation of research on interventions aligned to WHO 'Best Buys' for NCDs in low-income and lower-middle-income countries: a systematic review from 1990 to 2015. *BMJ Global Health*, *3*(1).

AMA. (2019). *The Assembly*. https://ama.gov.gh/theassembly.php

Anastasiou, K., Miller, M., & Dickinson, K. (2019). The relationship between food label use and dietary intake in adults: A systematic review. *Appetite*, *138*, 280–291.

Andam, Kwau, & Tschirley David, Asante Seth, Al-Hassan M Ramatu, D. X. (2017). Observing Ghana's food system transformation through an assessment of processed food retail in four major cities. *Presented at CSAE Conference 2017: Economic Development in Africa . St Catherine's College, Oxford March 19-21 2017.*, 1–6. https://editorialexpress.com/cgi-bin/conference/download.cgi?db_name=CSAE2017&paper_id=888

Andam, Kwaw, Al-Hassan, R. M., Asante, S. B., & Diao, X. (2015). *Is Ghana making progress in agro-processing?: Evidence from an inventory of processed food products in retail shops in Accra* (Vol. 41). Intl Food Policy Res Inst.

Andam, Kwaw, & Silver, J. (2016). *Food processing in Ghana: Trends, constraints, and opportunities*. International Food Policy Research Institute (IFPRI).

Anning-Dorson, T., Kastner, A., & Mahmoud, M. (2013). Investigation into mall visitation motivation and demographic idiosyncrasies in Ghana. *Management*

University of Ghana http://ugspace.ug.edu.gh

Science Letters, *3*(2), 367–384.

Aryee, P. A., Helegbe, G. K., Agordoh, P. D., Mohammed, A. J., Muntala, J., Koblaji, F. A., & Kumoji, H. N. (2019). Exploring consumer knowledge, understanding and use of food and nutrition label information in the tamale metropolis of Ghana. *African Journal of Food, Agriculture, Nutrition and Development*, *19*(2), 14415–14431.

Aryeetey, R., Oltmans, S., & Owusu, F. (2016). Food retail assessment and family food purchase behavior in Ashongman Estates, Ghana. *African Journal of Food, Agriculture, Nutrition and Development*, *16*(4), 11386–11403.

Ashe, M., Graff, S., & Spector, C. (2011). Changing places: policies to make a healthy choice the easy choice. *Public Health*, *125*(12), 889–895.

Azila-gbettor, E. M., & Adigbo, E. D. (2013). *EXPLORING CONSUMER KNOWLEDGE AND USAGE OF LABEL INFORMATION IN HO MUNICIPALITY OF GHANA*. *9*(28), 297–311.

Baker, P., Machado, P., Santos, T., Sievert, K., Backholer, K., Hadjikakou, M., Russell, C., Huse, O., Bell, C., & Scrinis, G. (2020). Ultra-processed foods and the nutrition transition: Global, regional and national trends, food systems transformations and political economy drivers. *Obesity Reviews*.

Balasubramanian, S. K., & Cole, C. (2002). Consumers' search and use of nutrition information: The challenge and promise of the nutrition labeling and education act. *Journal of Marketing*, *66*(3), 112–127.

Barker, M., Lawrence, W., Robinson, S., & Baird, J. (2012). Food labelling and dietary behaviour: bridging the gap. *Public Health Nutrition*, *15*(5), 758–759.

Barreiro-Hurl??, J., Gracia, A., & de-Magistris, T. (2010). Does nutrition information on food products lead to healthier food choices? *Food Policy*, *35*(3), 221–229. https://doi.org/10.1016/j.foodpol.2009.12.006

Basarir, A., & Sherif, S. (2012). Consumers awareness of food labeling: a case study of United Arab Emirates. *African Journal of Agricultural Research*, *7*(28), 4021–4028.

Bazhan, M., Mirghotbi, M., & Amiri, Z. (2015). Food labels: An analysis of the consumers' reasons for non-use. *Archives of Advanced in Bioscience*, *6*(1).

Besler, H. T., Buyuktuncer, Z., & Uyar, M. F. (2012). Consumer understanding and use of food and nutrition labeling in Turkey. *Journal of Nutrition Education and Behavior*, *44*(6), 584–591.

Bialkova, S., Sasse, L., & Fenko, A. (2016). The role of nutrition labels and advertising claims in altering consumers' evaluation and choice. *Appetite*. https://doi.org/10.1016/j.appet.2015.08.030

Bielemann, R. M., Minten, G. C., Horta, B. L., & Gigante, D. P. (2015). *Consumption of ultra-processed foods and their impact on the diet of young adults Consumo de alimentos ultraprocessados e impacto na dieta de adultos jovens*. https://doi.org/10.1590/S0034-8910.2015049005572

Bigna, J. J., & Noubiap, J. J. (2019). The rising burden of non-communicable diseases in

University of Ghana http://ugspace.ug.edu.gh

sub-Saharan Africa. *The Lancet Global Health*, *7*(10), e1295–e1296. https://doi.org/10.1016/S2214-109X(19)30370-5

Bollyky, T. J., Templin, T., Cohen, M., & Dieleman, J. L. (2017). Lower-income countries that face the most rapid shift in noncommunicable disease burden are also the least prepared. *Health Affairs*, *36*(11), 1866–1875.

Bonsmann, S. S., Celemín, L. F., Larrañaga, A., Egger, S., Wills, J. M., Hodgkins, C., & Raats, M. M. (2010). Penetration of nutrition information on food labels across the EU-27 plus Turkey. *European Journal of Clinical Nutrition*, *64*(12), 1379–1385.

Booth, A., Barnes, A., Laar, A., Akparibo, R., Graham, F., Bash, K., Asiki, G., & Holdsworth, M. (2021). Policy action within urban African food systems to promote healthy food consumption: a realist synthesis in Ghana and Kenya. *International Journal of Health Policy and Management*.

Bosman, M. J. C., Van der Merwe, D., Ellis, S. M., Jerling, J. C., & Badham, J. (2014). South African adult metropolitan consumers' opinions and use of health information on food labels. *British Food Journal*, *116*(1), 30–43.

Brownell, K. D. (2012). Thinking forward: the quicksand of appeasing the food industry. *PLoS Med*, *9*(7), e1001254.

Brownell, K. D., & Koplan, J. P. (2011). Front-of-package nutrition labeling—an abuse of trust by the food industry? *New England Journal of Medicine*, *364*(25), 2373–2375.

Bukenya, R., Ahmed, A., Andrade, J. M., Grigsby-Toussaint, D. S., Muyonga, J., & Andrade, J. E. (2017). Validity and Reliability of General Nutrition Knowledge Questionnaire for Adults in Uganda. *Nutrients*, *9*(2). https://doi.org/10.3390/nu9020172

Cadario, R., & Chandon, P. (2019). Effectiveness or consumer acceptance? Tradeoffs in selecting healthy eating nudges. *Food Policy*, *85*, 1–6.

Campos, S., Doxey, J., & Hammond, D. (2011). Nutrition labels on pre-packaged foods: A systematic review. *Public Health Nutrition*, *14*(8), 1496–1506. https://doi.org/10.1017/S1368980010003290

Canella, D. S., Levy, R. B., Martins, A. P. B., Claro, R. M., Moubarac, J.-C., Baraldi, L. G., Cannon, G., & Monteiro, C. A. (2014). Ultra-processed food products and obesity in Brazilian households (2008–2009). *PloS One*, *9*(3), e92752.

Castres, P. (2016). *Make the healthy choice the easy choice The case for a multifaceted approach BEUC work on nutrition. April*.

Castro, I. A., Majmundar, A., Williams, C. B., & Baquero, B. (2018). Customer Purchase Intentions and Choice in Food Retail Environments: A Scoping Review. *International Journal of Environmental Research and Public Health*, *15*(11), 2493.

Cecchini, M., & Warin, L. (2016). Impact of food labelling systems on food choices and eating behaviours: A systematic review and meta-analysis of randomized studies. *Obesity Reviews*, *17*(3). https://doi.org/10.1111/obr.12364

Cecchini, Michele, Lauer, J. A., & Sassi, F. (2015). The OECD/WHO Chronic Disease Prevention (CDP) Model: A Tool to Identify Effective and Efficient Strategies to

University of Ghana http://ugspace.ug.edu.gh

Prevent NCDs. *Applying Modeling to Improve Health and Economic Policy Decisions in the Americas*, 7.

Cecchini, Michele, Sassi, F., Lauer, J. A., Lee, Y. Y., Guajardo-Barron, V., & Chisholm, D. (2010). Tackling of unhealthy diets, physical inactivity, and obesity: Health effects and cost-effectiveness. *The Lancet*, *376*(9754), 1775–1784. https://doi.org/10.1016/S0140-6736(10)61514-0

Chaker, L., Falla, A., van der Lee, S. J., Muka, T., Imo, D., Jaspers, L., Colpani, V., Mendis, S., Chowdhury, R., & Bramer, W. M. (2015). The global impact of non-communicable diseases on macro-economic productivity: a systematic review. *European Journal of Epidemiology*, *30*(5), 357–395.

Chimedtseren, N., Kelly, B., McMahon, A.-T., & Yeatman, H. (2020). Prevalence and Credibility of Nutrition and Health Claims: Policy Implications from a Case Study of Mongolian Food Labels. *International Journal of Environmental Research and Public Health*, *17*(20), 7456.

Christoph, M. J., Larson, N., Laska, M. N., & Neumark-Sztainer, D. (2018). Nutrition Facts Panels: Who Uses Them, What Do They Use, and How Does Use Relate to Dietary Intake? *Journal of the Academy of Nutrition and Dietetics*. https://doi.org/10.1016/j.jand.2017.10.014

Codex Alimentarius Commission. (2001). Codex Alimentarius Commission Standards. In *Codex Stan 12-1981*.

Codex, C. A. (2012). GUIDELINES FOR USE OF NUTRITION AND HEALTH CLAIMS. *CAC/GL 2 FAO/WHO*, 1–5.

Colby, S. E., Johnson, L., Scheett, A., & Hoverson, B. (2010). Nutrition marketing on food labels. *Journal of Nutrition Education and Behavior*, *42*(2), 92–98.

Corvalán, C., Reyes, M., Garmendia, M. L., & Uauy, R. (2013). Structural responses to the obesity and non-communicable diseases epidemic: The Chilean Law of Food Labeling and Advertising. *Obesity Reviews*, *14*(S2), 79–87. https://doi.org/10.1111/obr.12099

Cowburn, G., & Stockley, L. (2005). Consumer understanding and use of nutrition labelling: a systematic review. *Public Health Nutr*, *8*. https://doi.org/10.1079/PHN2005666

Creswell, J. W. (2009). Mapping the field of mixed methods research. In *Journal of mixed methods research* (Vol. 3, Issue 2, pp. 95–108). SAGE publications Sage CA: Los Angeles, CA.

da Costa Louzada, M. L., Baraldi, L. G., Steele, E. M., Martins, A. P. B., Canella, D. S., Moubarac, J.-C., Levy, R. B., Cannon, G., Afshin, A., & Imamura, F. (2015). Consumption of ultra-processed foods and obesity in Brazilian adolescents and adults. *Preventive Medicine*, *81*, 9–15.

da Costa Souza, S. M. F., Lima, K. C., & Alves, M. do S. C. F. (2016). Promoting public health through nutrition labeling-a study in Brazil. *Archives of Public Health*, *74*(1), 48.

Danaei, G., Lu, Y., Singh, G., Stevens, G., Cowan, M., Farzadfar, F., Lin, J., Finucane, M., Rao, M., & Khang, Y. (2014). Cardiovascular disease, chronic kidney disease,

University of Ghana http://ugspace.ug.edu.gh

and diabetes mortality burden of cardiometabolic risk factors from 1980 to 2010: a comparative risk assessment. *The Lancet*, *2*(2), 634–647.

Darkwa, S. (2014). *Knowledge of nutrition facts on food labels and their impact on food choices on consumers in Koforidua , Ghana : a case study*. *27*(1), 13–18.

Davidović, D. B., Tomić, D. V, Paunović, K. Ž., Vasiljević, N. D., & Jorga, J. B. (2015). Nutrition labelling of pre-packaged foods in Belgrade, Serbia: current situation. *Public Health Nutrition*, *18*(11), 1969–1978.

de Graft Aikins, A., Addo, J., Ofei, F., Bosu, W. K., & Agyemang, C. (2012). Ghana's burden of chronic non-communicable diseases: future directions in research, practice and policy. *Ghana Medical Journal*, *46*(2), 1–3.

De Souza, R. J., Mente, A., Maroleanu, A., Cozma, A. I., Ha, V., Kishibe, T., Uleryk, E., Budylowski, P., Schünemann, H., & Beyene, J. (2015). Intake of saturated and trans unsaturated fatty acids and risk of all cause mortality, cardiovascular disease, and type 2 diabetes: systematic review and meta-analysis of observational studies. *Bmj*, *351*, h3978.

Dean, M., Spence, M., Hodgkins, C., & Raats, M. M. (2014). Front-of-pack (FOP) labelling of foods and beverages. In *Advances in Food and Beverage Labelling: Information and Regulations*. https://doi.org/10.1533/9781782420934.2.113

Donkin, A., Goldblatt, P., Allen, J., Nathanson, V., & Marmot, M. (2018). Global action on the social determinants of health. *BMJ Global Health*, *3*(Suppl 1), e000603.

Dowuona-Hammond, C. (2018). Consumer Law and Policy in Ghana. *Journal of Consumer Policy*, *41*(4), 333–354. https://doi.org/10.1007/s10603-018-9379-y

Drichoutis, A. C., Lazaridis, P., & Nayga Jr, R. M. (2006). Consumers' use of nutritional labels: a review of research studies and issues. *Academy of Marketing Science Review*, *2006*, 1.

Drichoutis, A. C., Lazaridis, P., & Nayga, R. M. (2005). Nutrition knowledge and consumer use of nutritional food labels. *European Review of Agricultural Economics*, *32*(1), 93–118. https://doi.org/10.1093/erae/jbi003

Dubois, P., Albuquerque, P., Allais, O., Bonnet, C., Bertail, P., Combris, P., Lahlou, S., Rigal, N., Ruffieux, B., & Chandon, P. (2021). Effects of front-of-pack labels on the nutritional quality of supermarket food purchases: evidence from a large-scale randomized controlled trial. *Journal of the Academy of Marketing Science*, *49*(1), 119–138.

Duda, R. B., Darko, R., Seffah, J., Adanu, R. M. K., Anarfi, J. K., & Hill, A. G. (2007). Prevalence of Obesity in Women of Accra , Ghana. *African Journal of Health Sciences*, *14*(3), 154–159. https://doi.org/10.4314/ajhs.v14i3.30855

EC. (2012). *Commission Regulation (EU) No 432/2012 Establishing a List of Permitted Health Claims Made on Foods, Other than Those Referring to the Reduction of Disease Risk and to Children's Development and Health.*

Elizabeth, L., Machado, P., Zinöcker, M., Baker, P., & Lawrence, M. (2020). Ultra-Processed Foods and Health Outcomes: A Narrative Review. *Nutrients*, *12*(7). https://doi.org/10.3390/nu12071955

University of Ghana http://ugspace.ug.edu.gh

Emrich, T. E., Qi, Y., Lou, W. Y., & L'Abbe, M. R. (2017). Traffic-light labels could reduce population intakes of calories, total fat, saturated fat, and sodium. *PLoS ONE*. https://doi.org/10.1371/journal.pone.0171188

EUFIC. (2018). Global Update on Nutrition Labelling:The 2018 Edition. In *Brussels EUFIC* (Issue June).

FAO. (2015). *Guidelines on the collection of information on food processing through food consumption surveys*. FAO Rome.

FAO. (2016). *HandBook On Food Labelling To Protect Consumers*. http://www.fao.org/3/a-i6575e.pdf

Fardet, A. (2016). Minimally processed foods are more satiating and less hyperglycemic than ultra-processed foods: a preliminary study with 98 ready-to-eat foods. *Food & Function*, *7*(5), 2338–2346.

FDA. (2013a). *Food and Drugs Authority Guidelines for the Labeling of Prepackaged Foods*. *February*.

FDA. (2013b). *General Labelling Requirements Food and Drugs Authority Ghana*.

FDA. (2020). *2019 ANNUAL REPORT*. https://www.fdaghana.gov.gh/img/annualrep/2019 Annual Report.pdf

Field, S., Masakure, O., & Henson, S. (2010). Rethinking localization—a low-income country perspective: the case of Asian vegetables in Ghana. *Cambridge Journal of Regions, Economy and Society*, *3*(2), 261–277.

Fiolet, T., Srour, B., Sellem, L., Kesse-Guyot, E., Allès, B., Méjean, C., Deschasaux, M., Fassier, P., Latino-Martel, P., & Beslay, M. (2018). Consumption of ultra-processed foods and cancer risk: results from NutriNet-Santé prospective cohort. *Bmj*, *360*, k322.

Ford, N. D., Patel, S. A., & Narayan, K. M. V. (2017). Obesity in Low- and Middle-Income Countries: Burden, Drivers, and Emerging Challenges. *Annual Review of Public Health*, *38*(1), annurev-publhealth-031816-044604. https://doi.org/10.1146/annurev-publhealth-031816-044604

FSANZ. (2017). *Australia New Zealand food standards code; Nutrition, Health and related claims*. Food Standards Australia New Zealand.

Furst, T., Connors, M., Bisogni, C. A., Sobal, J., & Falk, L. W. (1996). Food choice: a conceptual model of the process. *Appetite*, *26*(3), 247–266.

Ghana Statistical Service (GSS), Ghana Health Service (GHS), and I. I. (2015). *Ghana Demographic and Health Survey 2014*.

Gibney, M. J. (2019). Ultra-processed foods: definitions and policy issues. *Current Developments in Nutrition*, *3*(2), nzy077.

Gibney, M. J., Forde, C. G., Mullally, D., & Gibney, E. R. (2017). Ultra-processed foods in human health: a critical appraisal. *The American Journal of Clinical Nutrition*, *106*(3), 717–724.

Gorski Findling, M. T., Werth, P. M., Musicus, A. A., Bragg, M. A., Graham, D. J., Elbel, B., & Roberto, C. A. (2018). Comparing five front-of-pack nutrition labels'

University of Ghana http://ugspace.ug.edu.gh

influence on consumers' perceptions and purchase intentions. *Preventive Medicine*. https://doi.org/10.1016/j.ypmed.2017.10.022

Gorton, D., Mhurchu, C. N., Chen, M., & Dixon, R. (2009). Nutrition labels: a survey of use, understanding and preferences among ethnically diverse shoppers in New Zealand. *Public Health Nutrition*, *12*(9), 1359–1365.

Gouda, H. N., Charlson, F., Sorsdahl, K., Ahmadzada, S., Ferrari, A. J., Erskine, H., Leung, J., Santamauro, D., Lund, C., & Aminde, L. N. (2019). Burden of non-communicable diseases in sub-Saharan Africa, 1990–2017: results from the Global Burden of Disease Study 2017. *The Lancet Global Health*, *7*(10), e1375–e1387.

Graham, D. J., Orquin, J. L., & Visschers, V. H. M. (2012). Eye tracking and nutrition label use: A review of the literature and recommendations for label enhancement. *Food Policy*, *37*(4), 378–382.

Green, H. (2015). *Should foods or nutrients be the focus of guidelines to promote healthful eating?* Wiley Online Library.

Green, M. A., Pradeilles, R., Laar, A., Osei-Kwasi, H., Bricas, N., Coleman, N., Klomegah, S., Wanjohi, M. N., Tandoh, A., Akparibo, R., Aryeetey, R. N. O., Griffiths, P., Kimani-Murage, E. W., Mensah, K., Muthuri, S., Zotor, F., & Holdsworth, M. (2020). Investigating foods and beverages sold and advertised in deprived urban neighbourhoods in Ghana and Kenya: a cross-sectional study. *BMJ Open*, *10*(6), e035680. https://doi.org/10.1136/bmjopen-2019-035680

Grunert, K. G., Fernández-celemín, L., & Wills, J. M. (2010). *Use and understanding of nutrition information on food labels in six European countries*. 261–277. https://doi.org/10.1007/s10389-009-0307-0

Grunert, K. G., Wills, J., Celemín, L. F., Lähteenmäki, L., Scholderer, J., & genannt Bonsmann, S. S. (2012). Socio-demographic and attitudinal determinants of nutrition knowledge of food shoppers in six European countries. *Food Quality and Preference*, *26*(2), 166–177.

Grunert, K. G., & Wills, J. M. (2007). *A review of European research on consumer response to nutrition information on food labels*. 385–399. https://doi.org/10.1007/s10389-007-0101-9

Grunert, K. G., Wills, J. M., & Fernández-Celemín, L. (2010). Nutrition knowledge, and use and understanding of nutrition information on food labels among consumers in the UK. *Appetite*, *55*(2), 177–189. https://doi.org/10.1016/j.appet.2010.05.045

GSS. (2014). *2010 population and housing census report*. Ghana Statistical Service.

Haddad, L., Hawkes, C., Waage, J., Webb, P., Godfray, C., & Toulmin, C. (2016). *Food systems and diets: Facing the challenges of the 21st century*.

Hall, K. D., Ayuketah, A., Brychta, R., Cai, H., Cassimatis, T., Chen, K. Y., Chung, S. T., Costa, E., Courville, A., & Darcey, V. (2019). Ultra-processed diets cause excess calorie intake and weight gain: an inpatient randomized controlled trial of ad libitum food intake. *Cell Metabolism*, *30*(1), 67–77.

Hawkes, C, Jewell, J., & Allen, K. (2013). A food policy package for healthy diets and the prevention of obesity and diet-related non-communicable diseases: the NOURISHING framework. *Obesity Reviews*, *14*, 159–168.

University of Ghana http://ugspace.ug.edu.gh

https://doi.org/10.1111/obr.12098

Hawkes, Corinna. (2004). *Nutrition labels and health claims : the global regulatory environment*.

Hawkes, Corinna. (2008). Dietary implications of supermarket development: a global perspective. *Development Policy Review*, *26*(6), 657–692.

Hawkes, Corinna, Smith, T. G., Jewell, J., Wardle, J., Hammond, R. A., Friel, S., Thow, A. M., & Kain, J. (2015). Smart food policies for obesity prevention. *The Lancet*, *385*(9985), 2410–2421. https://doi.org/10.1016/S0140-6736(14)61745-1

Hawkes, Corrina. (2004). *Nutrition labels and health claims: the global regulatory environment*. 1–88.

Hawkes, Corrina, Harris, J., & Gillespie, S. (2017). *Urbanization and the nutrition transition*. International Food Policy Research Institute (IFPRI).

Hayford, F., Steiner-Asiedu, M., & Sakyi-Dawson, E. (2015). Food Choice Behaviour among Ghanaians: Implications for Health Promotion. *World Journal of Nutrition and Health*, *3*(1), 22–28. https://doi.org/10.12691/jnh-3-1-4

Hazreen, M. A., Su, T. T., Jalaludin, M. Y., Dahlui, M., Chinna, K., Ismail, M., Murray, L., Cantwell, M., Sadat, N. Al, & Group, M. S. (2014). An exploratory study on risk factors for chronic non-communicable diseases among adolescents in Malaysia: overview of the Malaysian Health and Adolescents Longitudinal Research Team study (The MyHeART study). *BMC Public Health*, *14*(Suppl 3), S6–S6. https://doi.org/10.1186/1471-2458-14-S3-S6

Herforth, A., Arimond, M., Álvarez-Sánchez, C., Coates, J., Christianson, K., & Muehlhoff, E. (2019). A global review of food-based dietary guidelines. *Advances in Nutrition*, *10*(4), 590–605.

Hieke, S., Kuljanic, N., Pravst, I., Miklavec, K., Kaur, A., Brown, K. A., Egan, B. M., Pfeifer, K., Gracia, A., & Rayner, M. (2016). Prevalence of nutrition and health-related claims on pre-packaged foods: A five-country study in Europe. *Nutrients*, *8*(3), 137.

Hieke, S., & Taylor, C. R. (2012). A critical review of the literature on nutritional labeling. *Journal of Consumer Affairs*, *46*(1), 120–156.

Holdsworth, M., Pradeilles, R., Tandoh, A., Green, M., Wanjohi, M., Zotor, F., Asiki, G., Klomegah, S., Abdul-Haq, Z., Osei-Kwasi, H., Akparibo, R., Bricas, N., Auma, C., Griffiths, P., & Laar, A. (2020). Unhealthy eating practices of city-dwelling Africans in deprived neighbourhoods: Evidence for policy action from Ghana and Kenya. *Global Food Security*, *26*, 100452. https://doi.org/https://doi.org/10.1016/j.gfs.2020.100452

Howlett, S., & Kennedy, O. B. (2011). The UK food industry's views on front of pack nutrition labelling: a quantitative study. *Proceedings of the Nutrition Society*. https://doi.org/10.1017/S0029665111002084

Huang, L., Neal, B., Dunford, E., Ma, G., Wu, J. H. Y., Crino, M., & Trevena, H. (2016). Completeness of nutrient declarations and the average nutritional composition of pre-packaged foods in Beijing, China. *Preventive Medicine Reports*, *4*, 397–403.

University of Ghana http://ugspace.ug.edu.gh

Hyseni, L., Atkinson, M., Bromley, H., Orton, L., Lloyd-Williams, F., McGill, R., & Capewell, S. (2017). The effects of policy actions to improve population dietary patterns and prevent diet-related non-communicable diseases: scoping review. *European Journal of Clinical Nutrition*, *71*(6), 694.

IHME. (2019). *Institute of Health Metrics and Evaluation. Global Burden of Disease Study 2019*. IHME.

Jacobs, S. A., de Beer, H., & Larney, M. (2011). Adult consumers' understanding and use of information on food labels: a study among consumers living in the Potchefstroom and Klerksdorp regions, South Africa. *Public Health Nutrition*, *14*(3), 510–522.

Jamal, A., & Sharifuddin, J. (2015). Perceived value and perceived usefulness of halal labeling: The role of religion and culture. *Journal of Business Research*, *68*(5), 933–941.

Jones, A., Neal, B., Reeve, B., Mhurchu, C. N., & Thow, A. M. (2019). Front-of-pack nutrition labelling to promote healthier diets: current practice and opportunities to strengthen regulation worldwide. *BMJ Global Health*, *4*(6).

Julia, C., Ducrot, P., Péneau, S., Deschamps, V., Méjean, C., Fézeu, L., Touvier, M., Hercberg, S., & Kesse-Guyot, E. (2015). Discriminating nutritional quality of foods using the 5-Color nutrition label in the French food market: Consistency with nutritional recommendations. *Nutrition Journal*. https://doi.org/10.1186/s12937-015-0090-4

Julia, C., Péneau, S., Buscail, C., Gonzalez, R., Touvier, M., Hercberg, S., & Kesse-Guyot, E. (2017). Perception of different formats of front-of-pack nutrition labels according to sociodemographic, lifestyle and dietary factors in a French population: Cross-sectional study among the NutriNet-Santé cohort participants. *BMJ Open*, *7*(6). https://doi.org/10.1136/bmjopen-2017-016108

Kanter, R., Reyes, M., & Corvalán, C. (2017). Photographic methods for measuring packaged food and beverage products in supermarkets. *Current Developments in Nutrition*, *1*(10), e001016.

Kanter, R., Vanderlee, L., & Vandevijvere, S. (2018). Front-of-package nutrition labelling policy: global progress and future directions. *Public Health Nutrition*, *21*(8), 1399–1408.

Kasapila, W., & Shaarani, S. (2013). A survey of nutrition labelling on packaged foodstuffs sold in Malawi : Manufacturer practices and legislative issues. *Food Control*, *30*(2), 433–438. https://doi.org/10.1016/j.foodcont.2012.08.006

Kaur, A., Scarborough, P., Matthews, A., Payne, S., Mizdrak, A., & Rayner, M. (2016). How many foods in the UK carry health and nutrition claims, and are they healthier than those that do not? *Public Health Nutrition*, *19*(6), 988–997.

Kaur, A., Scarborough, P., & Rayner, M. (2017). A systematic review, and meta-analyses, of the impact of health-related claims on dietary choices. *International Journal of Behavioral Nutrition and Physical Activity*, *14*(1), 93.

Kaur, M. (2016). Application of Mixed Method Approach in Public Health Research. *Indian Journal of Community Medicine : Official Publication of Indian Association*

University of Ghana http://ugspace.ug.edu.gh

of Preventive & Social Medicine, *41*(2), 93–97. https://doi.org/10.4103/0970-0218.173495

Kempen, E., Bosman, M., Bouwer, C., Klein, R., & van der Merwe, D. (2011). An exploration of the influence of food labels on South African consumers' purchasing behaviour. *International Journal of Consumer Studies*, *35*(1), 69–78.

Khandpur, N., Swinburn, B., & Monteiro, C. A. (2018). Nutrient-Based Warning Labels May Help in the Pursuit of Healthy Diets. *Obesity*, *26*(11), 1670–1671.

Khonje, M. G., & Qaim, M. (2019). Modernization of African Food Retailing and (Un)healthy Food Consumption. In *Sustainability* (Vol. 11, Issue 16). https://doi.org/10.3390/su11164306

Klopp, P., & MacDonald, M. (1981). Nutrition labels: an exploratory study of consumer reasons for nonuse. *Journal of Consumer Affairs*, *15*(2), 301–316.

Knai, C., Petticrew, M., Mays, N., Capewell, S., Cassidy, R., Cummins, S., Eastmure, E., Fafard, P., Hawkins, B., & JENSEN, J. D. (2018). Systems Thinking as a Framework for Analyzing Commercial Determinants of Health. *The Milbank Quarterly*, *96*(3), 472–498.

Koen, N., Blaauw, R., & Wentzel-Viljoen, E. (2016). *Food and nutrition labelling : the past , present and the way forward*. *29*(1), 13–22.

Kok, S. C., & Radzi, C. W. J. M. (2017). Accuracy of nutrition labels of pre-packaged foods in Malaysia. *British Food Journal*.

Kollannoor-Samuel, G., Shebl, F. M., Segura-Pérez, S., Chhabra, J., Vega-López, S., & Pérez-Escamilla, R. (2016). Effects of food label use on diet quality and glycemic control among Latinos with type 2 diabetes in a community health worker–supported intervention. *American Journal of Public Health*, *106*(6), 1059–1066.

Krešić, G., & Mrduljaš, N. (2016). The relationship between knowledge and the use of nutrition information on food package. *Acta Alimentaria*, *45*(1), 36–44.

Laar, A. (2021). The role of food environment policies in making unhealthy foods unattractive and healthy foods available in Africa. *EClinicalMedicine*, *36*.

Laar, A., Barnes, A., Aryeetey, R., Tandoh, A., Bash, K., Mensah, K., Zotor, F., Vandevijvere, S., & Holdsworth, M. (2020). Implementation of healthy food environment policies to prevent nutrition-related non-communicable diseases in Ghana: National experts' assessment of government action. *Food Policy*, 101907.

Labonte, M.-E., Poon, T., Gladanac, B., Ahmed, M., Franco Arellano, B., Rayner, M., & L'Abbe, M. L. (2015). Systematic review of nutrient profile models developed for nutrition-related policies and regulations aimed at noncommunicable disease prevention. *PROSPERO# CRD42015024750 [Internet][Cited 2017 Sep 18]. Available from: Https://Www. Crd. York. Ac. Uk/Prospero/Display_record. Asp*.

Legault, L., Brandt, M. B., McCabe, N., Adler, C., Brown, A.-M., & Brecher, S. (2004). 2000–2001 food label and package survey: an update on prevalence of nutrition labeling and claims on processed, packaged foods. *Journal of the American Dietetic Association*, *104*(6), 952–958.

Lerner, A., & Matthias, T. (2015). Changes in intestinal tight junction permeability

University of Ghana http://ugspace.ug.edu.gh

associated with industrial food additives explain the rising incidence of autoimmune disease. *Autoimmunity Reviews*, *14*(6), 479–489.

Levin, K. A. (2006). Study design III: Cross-sectional studies. *Evidence-Based Dentistry*, *7*(1), 24–25.

Liu, R., Hoefkens, C., & Verbeke, W. (2015). Chinese consumers ' understanding and use of a food nutrition label and their determinants. *Food Quality and Preference*, *41*, 103–111. https://doi.org/10.1016/j.foodqual.2014.11.007

Luiten, C. M., Steenhuis, I. H. M., Eyles, H., Mhurchu, C. N., & Waterlander, W. E. (2016). Ultra-processed foods have the worst nutrient profile, yet they are the most available packaged products in a sample of New Zealand supermarkets. *Public Health Nutrition*, *19*(3), 530–538.

Lv, J., Chen, Y., Wang, S., Liu, Q., Ren, Y., Karrar, S., & Li, L. (2011). A survey of nutrition labels and fats, sugars, and sodium ingredients in commercial packaged foods in Hangzhou, China. *Public Health Reports*, *126*(1), 116.

Lwin, M. O., Vijaykumar, S., & Chao, J. (2015). "Natural" and "Fresh": An Analysis of Food Label Claims in Internationally Packaged Foods in Singapore. *Journal of Food Products Marketing*, *21*(6), 588–607.

Mackey, M. A., & Metz, M. (2009). Ease of reading of mandatory information on Canadian food product labels. *International Journal of Consumer Studies*, *33*(4), 369–381.

Mackison, D., Wrieden, W. L., & Anderson, A. S. (2010). *Validity and reliability testing of a short questionnaire developed to assess consumers ' use , understanding and perception of food labels*. 210–217. https://doi.org/10.1038/ejcn.2009.126

Madilo, F. K., Owusu-Kwarteng, J., Kunadu, A. P.-H., & Tano-Debrah, K. (2020). Self-reported use and understanding of food label information among tertiary education students in Ghana. *Food Control*, *108*, 106841.

Magnusson, R. S. (2010). Obesity prevention and personal responsibility: the case of front-of-pack food labelling in Australia. *BMC Public Health*, *10*(1), 1–12.

Mahgoub, S. E., Lesoli, P. P., & Gobotswang, K. (2007). Awareness and use of nutrition information on food packages among consumers in Maseru (Lesotho). *African Journal of Food, Agriculture, Nutrition and Development*, *7*(6).

Mandle, J., Tugendhaft, A., Michalow, J., & Hofman, K. (2015). Nutrition labelling: a review of research on consumer and industry response in the global South. *Global Health Action*, *8*(1), 25912.

Mandle, J., Tugendhaft, A., Michalow, J., Hofman, K., Mandle, J., Tugendhaft, A., Michalow, J., & Hofman, K. (2017). *Nutrition labelling: a review of research on consumer and industry response in the global South*. *9716*(June). https://doi.org/10.3402/gha.v8.25912

Marietta, A. B., Welshimer, K. J., & Anderson, S. L. (1999). Knowledge, attitudes, and behaviors of college students regarding the 1990 Nutrition Labeling Education Act food labels. *Journal of the American Dietetic Association*, *99*(4), 445–449.

Marrón-Ponce, J. A., Flores, M., Cediel, G., Monteiro, C. A., & Batis, C. (2019).

University of Ghana http://ugspace.ug.edu.gh

Associations between Consumption of Ultra-Processed Foods and Intake of Nutrients Related to Chronic Non-Communicable Diseases in Mexico. *Journal of the Academy of Nutrition and Dietetics*, *119*(11), 1852–1865. https://doi.org/10.1016/j.jand.2019.04.020

Martinez, S. W. (2013). Introduction of new food products with voluntary health-and Nutrition-Related Claims, 1989-2010. *USDA-ERS Economic Information Bulletin*, *108*.

Martínez Steele, E., Popkin, B. M., Swinburn, B., & Monteiro, C. A. (2017). The share of ultra-processed foods and the overall nutritional quality of diets in the US: Evidence from a nationally representative cross-sectional study. *Population Health Metrics*, *15*(1), 1–11. https://doi.org/10.1186/s12963-017-0119-3

McGuire, S. (2012). Institute of Medicine. 2012. Front-of-Package Nutrition Rating Systems and Symbols: Promoting Healthier Choices. Washington, DC: The National Academies Press. *Advances in Nutrition*, *3*(3), 332–333.

Medeiros, M., Ramalho, R., Pereira, P., & Machado, V. (2019). Educational-based intervention on food labeling: results of the Project "Eat slowly and well and move yourself 2017." *Annals of Medicine*, *51*(sup1), 170.

Meier, T., Gräfe, K., Senn, F., Sur, P., Stangl, G. I., Dawczynski, C., März, W., Kleber, M. E., & Lorkowski, S. (2019). Cardiovascular mortality attributable to dietary risk factors in 51 countries in the WHO European Region from 1990 to 2016: a systematic analysis of the Global Burden of Disease Study. *European Journal of Epidemiology*, *34*(1), 37–55. https://doi.org/10.1007/s10654-018-0473-x

Melaku, Y. A., Temesgen, A. M., Deribew, A., Tessema, G. A., Deribe, K., Sahle, B. W., Abera, S. F., Bekele, T., Lemma, F., & Amare, A. T. (2016). The impact of dietary risk factors on the burden of non-communicable diseases in Ethiopia: findings from the Global Burden of Disease study 2013. *International Journal of Behavioral Nutrition and Physical Activity*, *13*(1), 122.

Mendonça, R. de D., Lopes, A. C. S., Pimenta, A. M., Gea, A., Martinez-Gonzalez, M. A., & Bes-Rastrollo, M. (2017). Ultra-processed food consumption and the incidence of hypertension in a Mediterranean cohort: the Seguimiento Universidad de Navarra Project. *American Journal of Hypertension*, *30*(4), 358–366.

Mendonça, R. de D., Pimenta, A. M., Gea, A., de la Fuente-Arrillaga, C., Martinez-Gonzalez, M. A., Lopes, A. C. S., & Bes-Rastrollo, M. (2016). Ultraprocessed food consumption and risk of overweight and obesity: the University of Navarra Follow-Up (SUN) cohort study. *The American Journal of Clinical Nutrition*, *104*(5), 1433–1440.

Meng, T., Florkowski, W. J., Sarpong, D. B., Chinnan, M. S., & Resurreccion, A. V. A. (2014). Consumer's food shopping choice in Ghana: supermarket or traditional outlets? *International Food and Agribusiness Management Review*, *17*(1030-2016–82985), 107–130.

Mhurchu, C. N., & Gorton, D. (2007). Nutrition labels and claims in New Zealand and Australia: a review of use and understanding. *Australian and New Zealand Journal of Public Health*, *31*(2), 105–112.

Michie, S., Van Stralen, M. M., & West, R. (2011). The behaviour change wheel: a new

University of Ghana http://ugspace.ug.edu.gh

method for characterising and designing behaviour change interventions. *Implementation Science*, *6*(1), 1–12.

Miller, L. M. S., & Cassady, D. L. (2015). The effects of nutrition knowledge on food label use. A review of the literature. *Appetite*, *92*, 207–216.

Miller, L. M. S., Gibson, T. N., & Applegate, E. A. (2010). Predictors of nutrition information comprehension in adulthood. *Patient Education and Counseling*, *80*(1), 107–112.

Monteiro, Carlos A. (2009). Nutrition and health. The issue is not food, nor nutrients, so much as processing. *Public Health Nutrition*, *12*(5), 729–731.

Monteiro, Carlos A, & Cannon, G. (2012). The impact of transnational "big food" companies on the South: a view from Brazil. *PLoS Medicine*, *9*(7), e1001252.

Monteiro, Carlos Augusto, Cannon, G., Moubarac, J.-C., Levy, R. B., Louzada, M. L. C., & Jaime, P. C. (2018). The UN Decade of Nutrition, the NOVA food classification and the trouble with ultra-processing. *Public Health Nutrition*, *21*(1), 5–17.

Monteiro, Carlos Augusto, Levy, R. B., Claro, R. M., Castro, I. R. R. de, & Cannon, G. (2010). A new classification of foods based on the extent and purpose of their processing. *Cadernos de Saúde Pública*, *26*(11), 2039–2049. https://doi.org/10.1590/S0102-311X2010001100005

Monteiro, Carlos Augusto, Moubarac, J.-C., Levy, R. B., Canella, D. S., da Costa Louzada, M. L., & Cannon, G. (2018). Household availability of ultra-processed foods and obesity in nineteen European countries. *Public Health Nutrition*, *21*(1), 18–26.

Monteiro, Carlos Augustof, Cannon, G., Moubarac, J.-C., Levy, R. B., Louzada, M. L. C., & Jaime, P. C. (2018). Ultra-processing. An odd 'appraisal.' *Public Health Nutrition*, *21*(3), 497–501.

Moodie, R., Stuckler, D., Monteiro, C., Sheron, N., Neal, B., Thamarangsi, T., Lincoln, P., Casswell, S., & Group, L. N. C. D. A. (2013). Profits and pandemics: prevention of harmful effects of tobacco, alcohol, and ultra-processed food and drink industries. *The Lancet*, *381*(9867), 670–679.

Moore, S. G., Donnelly, J. K., Jones, S., & Cade, J. E. (2018). Effect of Educational Interventions on Understanding and Use of Nutrition Labels: A Systematic Review. *Nutrients*, *10*(10), 1432. https://doi.org/10.3390/nu10101432

Moubarac, J.-C., Parra, D. C., Cannon, G., & Monteiro, C. A. (2014). Food classification systems based on food processing: significance and implications for policies and actions: a systematic literature review and assessment. *Current Obesity Reports*, *3*(2), 256–272.

Murray, C. J. L., Aravkin, A. Y., Zheng, P., Abbafati, C., Abbas, K. M., Abbasi-Kangevari, M., Abd-Allah, F., Abdelalim, A., Abdollahi, M., & Abdollahpour, I. (2020). Global burden of 87 risk factors in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019. *The Lancet*, *396*(10258), 1223–1249.

Nabec, L. (2017). Improving dietary behaviour with nutrition labelling: Towards a

University of Ghana http://ugspace.ug.edu.gh

research agenda that serves consumer well-being. *Recherche et Applications En Marketing (English Edition)*, *32*(2), 71–97.

Neal, B., Crino, M., Dunford, E., Gao, A., Greenland, R., Li, N., Ngai, J., Mhurchu, C. N., Pettigrew, S., Sacks, G., Webster, J., & Wu, J. H. Y. (2017). Effects of different types of front-of-pack labelling information on the healthiness of food purchases—a randomised controlled trial. *Nutrients*. https://doi.org/10.3390/nu9121284

Ng, M., Fleming, T., Robinson, M., Thomson, B., Graetz, N., Margono, C., Mullany, E. C., Biryukov, S., Abbafati, C., Abera, S. F., Abraham, J. P., Abu-Rmeileh, N. M. E., Achoki, T., AlBuhairan, F. S., Alemu, Z. A., Alfonso, R., Ali, M. K., Ali, R., Guzman, N. A., … Gakidou, E. (2014). Global, regional, and national prevalence of overweight and obesity in children and adults during 1980-2013: a systematic analysis for the Global Burden of Disease Study 2013. *Lancet (London, England)*, *384*(9945), 766–781. https://doi.org/10.1016/S0140-6736(14)60460-8

Nieto, C., Jáuregui, A., Contreras-Manzano, A., Arillo-Santillan, E., Barquera, S., White, C. M., Hammond, D., & Thrasher, J. F. (2019). Understanding and use of food labeling systems among Whites and Latinos in the United States and among Mexicans: Results from the International Food Policy Study, 2017. *International Journal of Behavioral Nutrition and Physical Activity*, *16*(1), 87.

Norman, I. D., Aikins, M., & Binka, F. N. (2013). Faith-Based Organizations: Sexual Harassment and Health in Accra-Tema Metropolis. *Sexuality and Culture*, *17*(1), 100–112. https://doi.org/10.1007/s12119-012-9141-6

Nunnally, J. C. (1978). *Psychometric Theory: 2d Ed*. McGraw-Hill.

Nyaaba, G. N., Stronks, K., Masana, L., Larrea-Killinger, C., & Agyemang, C. (2020). Implementing a national non-communicable disease policy in sub-Saharan Africa: experiences of key stakeholders in Ghana. *Health Policy Open*, *1*, 100009.

Obayashi, S., Bianchi, L. J., & Song, W. O. (2003). Reliability and validity of nutrition knowledge, social-psychological factors, and food label use scales from the 1995 Diet and Health Knowledge Survey. *Journal of Nutrition Education and Behavior*, *35*(2), 83–92.

Ofori-Asenso, R., Agyeman, A. A., Laar, A., & Boateng, D. (2016). Overweight and obesity epidemic in Ghana—a systematic review and meta-analysis. *BMC Public Health*, *16*. https://doi.org/10.1186/s12889-016-3901-4

Ofosu-Boateng, I. (2020). Influence of consumer sales promotion on consumers' purchasing behaviour of the retailing of consumer goods in Tema, Ghana. *Journal of Marketing Management*, *8*(1), 24–36.

Oghojafor, B. E., Ladipo, P. K., & Nwagwu, K. O. (2012). *An empirical determination of consumers' reaction to nutritional labeling of prepackaged food products in Lagos, Nigeria.*

Ortega, D. L., & Tschirley, D. L. (2017). Demand for food safety in emerging and developing countries: a research agenda for Asia and Sub-Saharan Africa. *Journal of Agribusiness in Developing and Emerging Economies*.

Osei Mensah, J., Lawer, D. R., & Aidoo, R. (2012). Consumers' use and understanding of food label information and effect on their purchasing decision in Ghana: a case

University of Ghana http://ugspace.ug.edu.gh

study of Kumasi Metropolis. *Asian Journal of Agriculture and Rural Development*, *2*(3), 351–365.

Pauline, D., Caroline, M., Chantal, J., Emmanuelle, K. G., Mathilde, T., Léopold, F., Serge, H., & Sandrine, P. (2015). Effectiveness of front-of-pack nutrition labels in french adults: Results from the nutrinet-santé cohort study. *PLoS ONE*, *10*(10). https://doi.org/10.1371/journal.pone.0140898

Pettigrew, S., Talati, Z., Miller, C., Dixon, H., Kelly, B., & Ball, K. (2017). The types and aspects of front-of-pack food labelling schemes preferred by adults and children. *Appetite*, *109*. https://doi.org/10.1016/j.appet.2016.11.034

Petty, R. E., & Cacioppo, J. T. (2012). *Communication and persuasion: Central and peripheral routes to attitude change*. Springer Science & Business Media.

Pi-Sunyer, X. (2009). The medical risks of obesity. *Postgraduate Medicine*, *121*(6), 21–33. https://doi.org/10.3810/pgm.2009.11.2074

Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: a critical review of the literature and recommended remedies. *Journal of Applied Psychology*, *88*(5), 879.

Popkin, B. M. (2015). Nutrition transition and the global diabetes epidemic. *Current Diabetes Reports*, *15*(9), 64.

Popkin, B. M., Adair, L. S., & Ng, S. W. (2011). *Global nutrition transition and the pandemic of obesity in developing countries*. *70*(1), 3–21. https://doi.org/10.1111/j.1753-4887.2011.00456.x

Popkin, B., Monteiro, C., & Swinburn, B. (2013). Overview: B ellagio C onference on P rogram and P olicy O ptions for P reventing O besity in the L ow-and M iddle-I ncome C ountries. *Obesity Reviews*, *14*, 1–8.

Pravst, I., & Kušar, A. (2015). Consumers' exposure to nutrition and health claims on pre-packed foods: Use of sales weighting for assessing the food supply in Slovenia. *Nutrients*, *7*(11), 9353–9368.

Prieto-Castillo, L., Royo-Bordonada, M. A., & Moya-Geromini, A. (2015). Information search behaviour, understanding and use of nutrition labeling by residents of Madrid, Spain. *Public Health*, *129*(3), 226–236.

Public Health Acts, Pub. L. No. 148.7 (2012). http://extwprlegs1.fao.org/docs/pdf/gha136559.pdf

Rauber, F., Campagnolo, P. D. B., Hoffman, D. J., & Vitolo, M. R. (2015). Consumption of ultra-processed food products and its effects on children's lipid profiles: a longitudinal study. *Nutrition, Metabolism and Cardiovascular Diseases*, *25*(1), 116–122.

Rayner, M., & Vandevijvere, S. (2017). Informas Protocol: Food Labelling Module. *J. Contrib*.

Rayner, M., Wood, A., Lawrence, M., Mhurchu, C. N., Albert, J., Barquera, S., Friel, S., Hawkes, C., Kelly, B., Kumanyika, S., L'Abbé, M., Lee, A., Lobstein, T., Ma, J., Macmullan, J., Mohan, S., Monteiro, C., Neal, B., Sacks, G., … Walker, C. (2013). Monitoring the health-related labelling of foods and non-alcoholic beverages in

University of Ghana http://ugspace.ug.edu.gh

retail settings. *Obesity Reviews*, *14*(S1), 70–81. https://doi.org/10.1111/obr.12077

Rischke, R., Kimenju, S. C., Klasen, S., & Qaim, M. (2015). Supermarkets and food consumption patterns: The case of small towns in Kenya. *Food Policy*, *52*, 9–21.

Rønnow, H. N. (2020). The Effect of Front-of-Pack Nutritional Labels and Back-of-Pack Tables on Dietary Quality. *Nutrients*, *12*(6), 1704.

Roseman, M. G., Joung, H. W., & Littlejohn, E. I. (2018). Attitude and Behavior Factors Associated with Front-of-Package Label Use with Label Users Making Accurate Product Nutrition Assessments. *Journal of the Academy of Nutrition and Dietetics*. https://doi.org/10.1016/j.jand.2017.09.006

Rothschild, M. L. (1999). Carrots, sticks, and promises: A conceptual framework for the management of public health and social issue behaviors. *Journal of Marketing*, *63*(4), 24–37.

Sadler, C. R., Grassby, T., Hart, K., Raats, M., Sokolović, M., & Timotijevic, L. (2021). Processed food classification: Conceptualisation and challenges. *Trends in Food Science & Technology*, *112*, 149–162. https://doi.org/https://doi.org/10.1016/j.tifs.2021.02.059

Salas, B., & Simões, B. G. (2014). The European Commission Initiates Infringement Proceedings against the UK over its ‘Traffic Light’ Nutrition Labelling Scheme. *European Journal of Risk Regulation*, *5*(4), 531–534. https://doi.org/DOI: 10.1017/S1867299X00004116

Saunders, M. N. K., Lewis, P., Thornhill, A., & Bristow, A. (2015). *Understanding research philosophy and approaches to theory development*.

Saunders, M. N. K., & Tosey, P. (2015). *Handbook of research methods on human resource development*. Edward Elgar Publishing.

Schermel, A., Emrich, T. E., Arcand, J., Wong, C. L., & L’abbé, M. R. (2013). Nutrition marketing on processed food packages in Canada: 2010 Food Label Information Program. *Applied Physiology, Nutrition, and Metabolism*, *38*(6), 666–672.

Scrinis, G., & Parker, C. (2016). Front-of-Pack Food Labeling and the Politics of Nutritional Nudges. *Law and Policy*. https://doi.org/10.1111/lapo.12058

Sobierajski, M., Spratt, B., Williams, P., Houston, A., Roesler, A., Ridges, L., Rafferty, J., & Yeatman, H. R. (2006). Nutrition function, health and related claims on packaged Australian food products-prevalence and compliance with regulations. *Asia Pacific Journal of Clinical Nutrition*, *15*(1), 10.

Soederberg, L. M., & Cassady, D. L. (2015). The effects of nutrition knowledge on food label use . A review of the literature ☆. *Appetite*, *92*, 207–216. https://doi.org/10.1016/j.appet.2015.05.029

Spiteri Cornish, L., & Moraes, C. (2015). The impact of consumer confusion on nutrition literacy and subsequent dietary behavior. *Psychology & Marketing*, *32*(5), 558–574.

Statistical Service (GSS). (2012). *Ghana Population and Housing Census Report 2010*.

Steele-Dadzie, R., Dzivenu, P., & As Boateng, L. (2015). An assessment of food labels of some selected pre-packaged food products on the Ghanaian market. *International*

University of Ghana http://ugspace.ug.edu.gh

Journal of Current Research, *7*(8).

Storcksdieck genannt Bonsmann, S, Celemín, L. F., Larrañaga, A., Egger, S., Wills, J. M., Hodgkins, C., & Raats, M. M. (2010). Penetration of nutrition information on food labels across the EU-27 plus Turkey. *European Journal of Clinical Nutrition*, *64*(12), 1379–1385. https://doi.org/10.1038/ejcn.2010.179

Storcksdieck genannt Bonsmann, Stefan, & Wills, J. M. (2012). Nutrition labeling to prevent obesity: reviewing the evidence from Europe. *Current Obesity Reports*, 1–7.

Stran, K. A., & Knol, L. L. (2013). Determinants of food label use differ by sex. *Journal of the Academy of Nutrition and Dietetics*, *113*(5), 673–679.

Stuckler, D., McKee, M., Ebrahim, S., & Basu, S. (2012). Manufacturing epidemics: the role of global producers in increased consumption of unhealthy commodities including processed foods, alcohol, and tobacco. *PLoS Med*, *9*(6), e1001235.

Sussman, R. L., McMahon, A. T., & Neale, E. P. (2019). An audit of the nutrition and health claims on breakfast cereals in supermarkets in the Illawarra region of Australia. *Nutrients*, *11*(7), 1604.

Swinburn, B., Vandevijvere, S., Kraak, V., Sacks, G., Snowdon, W., Hawkes, C., Barquera, S., Friel, S., Kelly, B., & Kumanyika, S. (2013). Monitoring and benchmarking government policies and actions to improve the healthiness of food environments: a proposed G overnment H ealthy F ood E nvironment P olicy I ndex. *Obesity Reviews*, *14*, 24–37.

Temple, N. J., Ph, D., Fraser, J., & Ph, D. (2014). Food labels : A critical assessment. *Nutrition*, *30*(3), 257–260. https://doi.org/10.1016/j.nut.2013.06.012

Tomlinson, M., Solomon, W., Singh, Y., Doherty, T., Chopra, M., Ijumba, P., Tsai, A. C., & Jackson, D. (2009). The use of mobile phones as a data collection tool: a report from a household survey in South Africa. *BMC Medical Informatics and Decision Making*, *9*(1), 1–8.

Turner, C., Kalamatianou, S., Drewnowski, A., Kulkarni, B., Kinra, S., & Kadiyala, S. (2020). Food Environment Research in Low- and Middle-Income Countries: A Systematic Scoping Review. *Advances in Nutrition*, *11*(2), 387–397. https://doi.org/10.1093/advances/nmz031

Unnevehr, L. J., & Jagmanaite, E. (2008). Getting rid of trans fats in the US diet: Policies, incentives and progress. *Food Policy*, *33*(6), 497–503. https://doi.org/https://doi.org/10.1016/j.foodpol.2008.05.006

USDA. (2020). *Dietary Guidelines for Americans, 2020-2025* (9th ed.). Available at DietaryGuidelines.gov.

Vemula, S. R., Gavaravarapu, S. M., Mendu, V. V. R., Mathur, P., & Avula, L. (2014). Use of food label information by urban consumers in India–a study among supermarket shoppers. *Public Health Nutrition*, *17*(9), 2104–2114.

Vierk, K. A., Koehler, K. M., Fein, S. B., & Street, D. A. (2007). Prevalence of self-reported food allergy in American adults and use of food labels. *Journal of Allergy and Clinical Immunology*, *119*(6), 1504–1510.

University of Ghana http://ugspace.ug.edu.gh

Vijaykumar, S., Lwin, M. O., Chao, J., & Au, C. (2013). Determinants of food label use among supermarket shoppers: A singaporean perspective. *Journal of Nutrition Education and Behavior*, *45*(3), 204–212. https://doi.org/10.1016/j.jneb.2012.09.001

Volpp, K. G., & Asch, D. A. (2017). Make the healthy choice the easy choice: using behavioral economics to advance a culture of health. *QJM: An International Journal of Medicine*, *110*(5), 271–275.

Vyth, E. L., Steenhuis, I. H. M., Roodenburg, A. J. C., Brug, J., & Seidell, J. C. (2010). Front-of-pack nutrition label stimulates healthier product development: a quantitative analysis. *International Journal of Behavioral Nutrition and Physical Activity*, *7*(1), 1–7.

Wang, S., Chen, Y., Liu, M., Hong, Z., Sun, D., Du, Y., Su, M., Yu, C., Liu, Q., & Ren, Y. (2011). The changes of nutrition labeling of packaged food in Hangzhou in China during 2008~ 2010. *PloS One*, *6*(12), e28443.

Wansink, B. (2003). How do front and back package labels influence beliefs about health claims? *Journal of Consumer Affairs*, *37*(2), 305–316.

Waterlander, W. E., Ni, C., Eyles, H., Vandevijvere, S., Cleghorn, C., Scarborough, P., Swinburn, B., & Seidell, J. (2017). *Food Futures : Developing effective food systems interventions to improve public health nutrition*. 1–8. https://doi.org/10.1016/j.agsy.2017.01.006

White, M., & Barquera, S. (2020). Mexico Adopts Food Warning Labels, Why Now? *Health Systems & Reform*, *6*(1), e1752063.

WHO. (2006). *Global strategy on diet, physical activity and health: a framework to monitor and evaluate implementation*.

WHO. (2011). *Nutrient profiling: Report of a WHO*.

WHO. (2019). *Noncommunicable diseases Fact sheet , Word Health Organisation*. https://www.who.int/features/factfiles/noncommunicable_diseases/facts/en/

World Health Organization. (2013). GLOBAL ACTION PLAN FOR THE PREVENTION AND CONTROL OF NONCOMMUNICABLE DISEASES iii WHO LIBRARY CATALOGUING-IN-PUBLICATION DATA. *WHO Press*, 55. www.who.int/about/licensing/copyright_form/en/index.html

Wright, S. M., & Aronne, L. J. (2012). Causes of obesity. *Abdominal Radiology*, *37*(5), 730–732.

Zepeda, L., Sirieix, L., Pizarro, A., Corderre, F., & Rodier, F. (2013). A conceptual framework for analyzing consumers' food label preferences: An exploratory study of sustainability labels in F rance, Q uebec, S pain and the US. *International Journal of Consumer Studies*, *37*(6), 605–616.

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APPENDICES

Appendix A: Data Collection Instruments

1. Structured Questionnaire to collect label Information for Quantitative Content Analysis

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DEPARTMENT OF POPULATION, FAMILY & REPRODUCTIVE HEALTH.

Pre-packaged Food Labelling and Use Among Households in Accra.

Area code_______
Date___________
Household ID_____ **Data Entry ID ______**

Label Attributes	Codes
Area	001.East cantonments 002.Okaishie 003.New Fadama 004. Chorkor
Date of photographing	
Name of food	……………………………………………….
Brand name	…………………………………………………..
Food group Code 1	……………………………………………………..
Food group Code 2	
Food group Code 3	
Pack size	1-Large [ ] 2 Medium [ ] 3 Small [ ] 4 Sachet [ ] 5 Small cubes [ ]
Food label	0 Absent [ ] 1 Present [ ]
Food label language	1 English [ ] 2 English and other languages [ ] 3 Other languages [ ]___________________
Country of origin stated	0 Absent [ ] 1 Present [ ]
Country of origin	1 Ghana [ ] 2 UK [ ] 3 USA [ ] 4 China [ ] 5 Other African countries [ ] 6 Other countries [ ]_______________________
Name and address of company	0 Absent [ ] 1 Present [ ]
Lot/Batch number	0 Absent [ ] 1 Present [ ]
Net contents / drained weight	0 Not declared [ ] 1 Declared [ ]

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If net contents / drained weight are declared, what is their legibility	0 Not legible [ ] 1 Legible [ ]
Expiry date	0 Absent [ ] 1 Present [ ]
If expiry date is available, what is its legibility	0 Not legible [ ] 1 Legible [ ]
Reading legibility of label	1 Large font size [ ] 2 Small font size [ ] 3 Not visible for reading [ ]
Storage/cooking instructions	0 Absent [ ] 1 Present [ ] 2 Not applicable [ ]
List of ingredients	0 Absent [ ] 1 Present [ ] 2 Not applicable [ ]
Declarations of ingredients known to cause adverse effects eg hypersensitivity	0 Not declared [ ] 1 Declared [ ]
Additives in ingredients	0 Absent [ ] 1 Present [ ]
Permitted additives, eg emulsifiers and stabilizers	0 Absent [ ] 1 Present [ ]
Permitted nutrient fortificants, egg vit C	0 Absent [ ] 1 Present [ ]
General purpose food additives, egg….	0 Absent [ ] 1 Present [ ]
Permitted flavoring and artificial coloring ..e.g. ….	0 Absent [ ] 1 Present [ ]
Other additives, e.g.…..	0 Absent [ ] 1 Present [ ]
Food label format	1 BOP [ ] 2 FOP [ ]
If BOP format is stated, how was it presented?	1 Tabular [ ] 2 Linear [ ]
If FOP format is stated (Nutrition information), how was it presented?	1 Multiple traffic light [ ] 2 Guidelines daily allowance [ ] 3 5-colour nutrient label [ ] 4 Summary table label (logo, choice programme , obaasima etc.) [ ] 5 warning labels [ ]
Claims	0 Absent [ ] 1 Present [ ]
If claims are present, type of claims?	1. Health related ingredient claim 2. Nutrient content claims [ ] 3. Nutrient comparative claim [ ] 4. General Health claims [ ] 5. Nutrient and other function claims [ ] 6. Reduction of disease risk claim 7. Other claim specify __________ 8. None
Format of Claim	1. Numerical 2. Verbal 3. Symbolic
Wording of Claim	See tables for codes _ _ _ _ _ _ _ _ _ _
Place of claim	1. Front of Pack 2. Elsewhere on the package

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Promotion	Type of promotional character: 1. Cartoon/Company owned character 2. Licensed character 3. Amateur sportsperson 4. Celebrity 5. Movie tie-in 6. Famous sportsperson/team 7. Non-sports/historical events/festivals 8. 'For kids' 9. Awards 10. Sport events 0. None

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2. Compliance Checklist for Mandatory Labeling Requirements for Prepackaged Foods by Food and Drugs Authority Ghana.

Compliance Indicators Description	**Codes**
1. Is the name of product (brand or generic) clearly stated on the label?	1=Yes 2= No
2. Does the label provide the net weight/net volume/drained weight of the food product?	1=Yes 2= No
3. **Provision of list of ingredients** (specific **names of ingredients** and/or **E-numbers**? (Not required for solid sugar and other prepackaged foods that can be considered as ingredient)	1= Yes 2= No 3= Not applicable (NA)
4. Date of manufacture clearly provided on the label?	1=Yes 2= No
5. Expiry date, Best Date or Use by Date **(Not required for solid sugar)** provided on the label**?**	1=Yes 2= No
6. Batch or lot number or scanned code provided on the label?	1=Yes 2=No
7. Does the country of origin clearly stated on the label	1=Yes 2=No
8. Name and complete address of the manufacturer/agent provided?	1= Yes 2= No
9. Direction for use provided on the label.	1= Yes 2=No 3= NA
10. Instructions for storage/handling on the label	1= Yes 2=No 3= NA
11. Labeling is Legible with indelible ink. When the font size is below '12' word format size.	1=Yes 2= No
12. Labeling is in English	1=Yes 2= No
13. If Nutrition declarations and claims are made on the label a documentary evidence(Nutrition table and ingredient must show the relative quantity in the product)	1= Yes 2= No 3= NA
14. Any information or pictorial device written, printed, or graphic matter displayed that is in direct conflict of compliance indicators (1-13) or is false, deceptive or misleading in any form or way.	If Yes = 1 Reason stated. No =2

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3. Compliance Checklist for Labeling Nutrition and Claims according to Codex Guidelines

Compliance Indicators Description	Codes
1. Nutrition claims made but nutrition information not provided	1=Yes 2= No
2. Nutrition claims made but no nutrient values given in the Nutrition facts table (Nutrition Information Panel)	1=Yes 2= No
3. Use of health claims that are not allowed	1= Yes 2= No IF Yes specify_______
4. Use of figures other than the Nutrient Reference Values (NRVs)	1=Yes 2= No

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4. Table Details of Pre-packaged Food Categories used in data collection according a Standardized Method (Kanter et al., 2017)

Food categories and subcategories						
Food GP 1 No.	Food group name	1st Subcategory number	1st subcategory name	2nd Subcategory name/Description	2nd Subcategory Number	Numerical code
1.	Beverage	01	Fruit & Vegetable Juices	Juice concentrates	1	010101
				Fresh juices (normal, diet & light)	2	010102
				Canned juices	3	010103
				100% fruit juice	4	010104
		02	Juice drinks	Concentrated Juice drinks	1	010201
				Juiced drinks (normal, diet or light)	2	010202
		03	Flavored beverages-	Powdered juice drinks	1	010301
				Liquid juice drinks	2	010302
				Liquid tea	3	010303
				others	4	010304
		04	Fizzy drinks	With sugar	1	010401
				Without sugar	2	010402
		05	Energy drinks	With sugar	1	010501
				Without sugar	2	010502
		06	Powdered flavored drinks	With sugar	1	010601
				Without sugar	2	010602
		07	Flavored waters	With sugar	1	010701
				Without sugar	2	010702
		08	Sorbets	Popsicles	1	010801
				Cartons	2	010802
		09	Cocoa drinks	With sugar	1	010901
				Without sugar	2	010901
		10	Other Beverages	Ghanaian local drinks	1	011001
2	Bread & Bakery products	01	Bread (packaged only)	White bread (sugar)	1	020101
				White bread(tea bread) without sugar	2	020102
				White bread (butter)	3	020103

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Food categories and subcategories						
Food GP 1 No.	Food group name	1st Subcategory number	1st subcategory name	2nd Subcategory name/Description	2nd Subcategory Number	Numerical code
				Brown bread (whole meal)	4	020104
				White Bread with grains	5	020105
				Other breads	6	020105
		02	Cookies/ Crackers	Cookies (with sugar)	1	020201
				Cookies with filling	2	020202
				Salty crackers	3	020203
				Whole grain crackers	4	020204
				Single large packaged cookies	5	020205
				Soda crackers	6	020206
		03	Cakes, muffin and pastries	Biscuits	1	020301
				Cakes	2	020302
				Filled Wafers	3	020303
				Wafers without filling	4	020304
				Muffins	5	020305
				Ghanaian pastries- meat pie	6	02030
		04	Breads/baked products	Others	1	020401
3	Breakfast cereals	01	Breakfast cereals			030101
				Corn flakes	1	
				Oatmeal	2	030101
				Puffed cereals	3	030103
				Muesli	4	030104
				Granola	5	030105
		02	Granola			
				Granola bar with fruit	1	030201
				Granola bar with chocolate	2	030202
		03	Other breakfast cereals	Others	1	030301
04	Cereal products	01	Noodles	Noodles	1	040101
		02	Pasta	Pasta	1	040201
		03	Maize	Maize	1	040301
		04	Semolina	Semolina	1	040301
		05	Banku/koko/tom brown	Banku/koko/tom brown	1	04053
05	Sweets/Confectionary	01	Chocolates & caramels	Hard caramels	1	050101

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Food categories and subcategories						
Food GP 1 No.	Food group name	1st Subcategory number	1st subcategory name	2nd Subcategory name/Description	2nd Subcategory Number	Numerical code
				Soft toffees	2	050102
				Chocolates	3	050103
				Bonbons	4	050104
				Chewy candies	5	050105
				Hard lollipops	6	050106
				Nuts covered in chocolate	7	050107
		02	Gelatin based candies/Jellies	Gummy candies	1	050201
				Marshmallow candies	2	050202
		03	Chewing gum	Gum	1	050301
				Gum with filling	2	050302
				Hard candies filled with gum	3	050303
		04	Ghanaian candies	Others	1	050401
06	Dairy Products	01	Milk	Evaporated Milk	1	060101
				Condensed milk	2	060102
				Powdered whole milk	3	060103
				Powdered skimmed milk	4	060104
				Flavoured milk liquid	5	060105
				Flavoured powdered milks	6	060106
				Liquid milks –whole, skimmed	7	060107
		02	Desserts	Rice pudding	1	060201
				Caramelized milk	2	060202
				Custard	3	060203
		03	Ice creams	Milk-based ice creams	1	060301
				Ice cream bars	2	060302
				Frozen yogurt	3	060303
		04	Yoghurts drinks	Plain	1	060401
				Flavored	2	060502
		05	Creams	Whipped creams	1	060501

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Food categories and subcategories						
Food GP 1 No.	Food group name	1st Subcategory number	1st subcategory name	2nd Subcategory name/Description	2nd Subcategory Number	Numerical code
				Pasty creams	2	060502
				Other creams	3	060503
		06	Cheeses	Normal fresh cheeses	1	060601
				Light fresh cheeses	2	060602
				Semi-hard cheeses	3	060603
				Cream cheeses and spreads	4	060604
				Shredded cheeses	5	060605
				Soft ("buttery") cheeses	6	060606
		07	Dairy drinks-others	Ghanaian dairy drinks	1	060701
07	Sauces, dips & Spreads/Oils	01	Sauces	Tomato sauces	1	070101
				Mayonnaise	2	070102
				Ketch-up	3	070103
		02	Spreads	Cocoa/chocolate spreads	1	070201
				Butter	2	070202
				Margarine	3	070203
				Honey	4	070204
				Palm syrup	5	070205
				Peanut butter	6	070206
		03	Edible oils	Vegetable oils	1	070301
				Palm oil	2	070302
				Coconut oil	3	070303
				Canola oil	4	070304
				Others	5	070305
08	Meat Products	01	Processed meats-canned	Beef	1	080101
				Chicken	2	080102
				Pork	3	080103
				hamburger	4	080104
				Sausage/hot dogs	5	080105
		02	Frozen meat	chicken	1	080201
				Beef	2	080202

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Food categories and subcategories						
Food GP 1 No.	Food group name	1st Subcategory number	1st subcategory name	2nd Subcategory name/Description	2nd Subcategory Number	Numerical code
				Sausage/ hot dog	3	080203
09	Fish and Fish products	01	Processed fish-canned	Sardines in oil	1	090101
				Sardine in brine	2	090102
				Tuna flakes in oil	3	090103
				Tuna flakes with spices in oil	4	090104
				Tuna flakes in brine	5	090105
				Others	6	090106
10.	Fruits & Vegetables	01	Vegetables	Canned tomato products	1	100101
				Canned beans & peas	2	100102
				Baked beans in tomato sauce	3	100103
				Canned sweet corn	4	100104
				All other canned vegetables	5	100105
				Pickled vegetables & olives	6	100106
				Frozen unprocessed vegetables	7	100107
		02	Fruits	Dried fruits including coconut	1	100201
				Fruit based bars	2	100202
				Fruits products canned in juice/syrup	3	100203
				Fruit gels, fruits in jelly & fruit puree	4	100204
		03	Jams and Spreads	Jams, marmalades and other preserves	1	100301
11	Snacks					
		01		Potatoe chips	1	110101
		02		Potato shoestrings	1	110201
		03		Plantation chips	1	110301
		04		Corn /Tortilla chips	1	110401
		05		Sweet or salty puffed snacks	1	110501
		06		Nuts	1	110601
		07		Baked corn snacks	1	110701
		08		Snack foods-others	1	110801
12	Powdered food products	01	Powdered food	fufu	1	120101
				Konkonte	2	120102

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Food categories and subcategories						
Food GP 1 No.	Food group name	1st Subcategory number	1st subcategory name	2nd Subcategory name/Description	2nd Subcategory Number	Numerical code
				Koose powders	3	120103
				Other powdered foods	4	120104
13.	Unable to be categorized	01				

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5. Interpretation Guide and Definitions for Coding Instrument for Content analysis of Food Label Information

Definitions According to International Network for Food and Obesity/NCDs Research, Monitoring and Action Support (INFORMAS) - (Rayner et al., 2013)

Food labelling – "any written, printed or graphic matter 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".

List of ingredients – "All ingredients [in a food] shall be listed in descending order of ingoing weight (m m−1) at the time of the manufacture of the food".

Nutrition labelling – "a description intended to inform the consumer of nutritional properties of a food".

Nutrient declaration – "nutrition labelling which is 'a standardized statement or listing of the nutrient content of a food".

Supplementary nutrition information/Front-of Pack – "nutrition labeling 'intended to increase the consumer's understanding of the nutritional value of their food and to assist in interpreting the nutrient declaration".

Nutrition claim – "any representation which states, suggests or implies that a food has particular nutritional properties including but not limited to the energy value and to the content of protein, fat and carbohydrates, as well as the content of vitamins and minerals".

***Health-related ingredient claim* – "**any representation which states, suggests or implies that a food has particular nutritional properties not related to its energy value or to the content of protein, fat and carbohydrates, vitamins and minerals but related to the content of an ingredient".

Nutrient Claims

Nutrient content claim – "a nutrition claim that describes the level of a nutrient contained in a food or its energy value".

Nutrient comparative claim – "a nutrition claim that compares the nutrient levels and/or energy value of two or more foods".

Health claim – "any representation that states, suggests, or implies that a relationship exists between a food or a constituent of that food and health".

General health claim – "a health claim concerning the general beneficial effects of the consumption of foods or their constituents on health".

Nutrient and other function claim – "a health claim that describes the physiological role of the nutrient in growth, development and functions of the body".

Other function claims- are "claims concerning specific beneficial effects of the consumption of foods or their constituents, in the context of the total diet on normal

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functions or biological activities of the body. Such claims relate to a positive contribution to health or to the improvement of a function or to modifying or preserving health."

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6. Questionnaire-Consumer Survey

SCHOOL OF PUBLIC HEALTH, UNIVERSITY OF GHANA

DEPARTMENT OF POPULATION, FAMILY & REPRODUCTIVE HEALTH

Pre-packaged Food Labelling and Use Among Households in Accra

Area code_______
Date___________

Household Number_____

Section A. Socio-demographic and Background Information	Code
1. _How many people live in this household?	HSNU [ ]
2. How many people do you buy food for?	BUNU [ ]
3. Sex of Respondent 1= Male 2= Female	SEXRES [ ]
4. Age of Respondent _______	AGRES [ ]
5. Marital status 1= Married 2= Single 3= Widowed 4= Separated/ Divorced 5 = other	MARST [ ]
6. How many children are in your family (< 18yrs)? ____	HHCHD [ ]
7. Highest level of completed education of respondent 1= No formal education =2 Primary education 3= Junior high education 4 =Senior high education 5= Tertiary education	EDULE [ ]
8. Which ethnic group do you belong to? 1= Akan 2= Ga 3= Ewe 4= other specify ___________________	ETHGP [ ]
9. What is your religious affiliation? 1= Christian 2= Islam 3=Traditional 4= Other __________________	RELAF [ ]
10. What is your primary occupation? 1= Professional 2= Clerical 3= Services 4= Skill manual 5= Unskilled manual 6= Agriculture – self-employed 7= Agriculture –employee 8= Domestic/Housekeeping 4=Other specify _______________	OCPN [ ]

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11. Residential Status of household 1=own 2=rented 3= workplace residence 4= family house 5= others_________________________	RESTAS [ ]
12. Do your family own any of the following? Passenger vehicle 1=Yes 2= No Work vehicle (e.g., truck, tanker, etc.) 1=Yes 2= No Refrigerator/Deep freezer 1=Yes 2=No Gas/electric cooker 1=Yes 2=No Television set 1=Yes 2=No Video deck/VCD/DVD player 1=Yes 2=No Satellite dish/ DSTV/ Multi TV 1= Yes 2=No Air conditioner 1=Yes 2=No Mobile phone/tablet 1=Yes 2=No Computer (desktop/laptop) 1=Yes 2=No	VEH [ ] FRID [ ] COKR [ ] TELEV [ ] VIDEC [ ] DSTV [ ] AIRCON [ ] MOBFON [ ] COMPUT [ ]
13. Are you or any member of your family following a specific diet? 1= Yes 2= No	DIET [ ]
14. Are you or any member of your family allergic to any food? 1= Yes 2= No If No move to yes 16	ALLG [ ]
15. Which type(s) of food are you allergic to? 1.Fish 2.wheat 3. milk 4. Soy 5.peanuts 6.tree nuts 7.Egg 8.Crustacean shellfish	ALLG2 [ ]
16. Please confirm whether you have the following existing health condition (s)? *(choose as many that apply)* 1= High blood pressure (hypertension) 2= Diabetes 3= High cholesterol 4= Stroke 5= cancer 6= Kidney disease 7= Other	NCDSI [ ]
17. Please confirm whether any house member has the following existing health condition(s)? (choose as many that apply) 1= High blood pressure (hypertension) 2= Diabetes 3= High cholesterol 4= Stroke 5= cancer 6= Kidney disease 7= Other	NCDSII [ ]

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B. Pre-packaged Food Use Behaviour *Pre-packaged food in this study are defined as a food or drink item packaged or made up in advance in a container, ready for use or purchase by the consumer either directly eating or using for cooking purposes'* *Thinking about last one month and your experience in purchasing or using prepackaged foods.*	
18. What was/were the most important consideration(s) when buying or using pre-packaged foods? 1= Taste 2= Price 3= brand loyalty/familiarity 4=convenience 5= nutrition information 6= health information 7= others(specify)	CONPFS [ ]
19. From question 15, please rank your three (3) most important considerations that guided your purchase of pre-packaged foods. (*Indicate by numbering from 1- 3 in order where 1 is the least important to 3 the most important*.	
Taste	TAS _____
Price	PCE _____
Brand/familiarity	BRD _____
Convenience	CONV ____
Nutrition information	NTRIF _____
Health Information	HTHIF _____
Others	
20. Where do you usually buy majority of your household pre-packaged foods? 1=hawkers 2 =corner shops 3=mini-supermarket 4=traditional market 5= supermarket (mall)	HHPFS [ ]
Food Label Use *For the next set of questions, think about last three months and your experience in purchasing or using pre-packaged foods.*	
21. How often do you use (reading, interpretation and evaluation of information) food labels? 1= Yes, always 2. Yes, sometimes, 3. yes, rarely, 4= Never A response of *yes, rarely* and *Never* go to question Q23	FODL [ ]
22. What was your reason for reading/using food labels? 1= due to purchasing the product for the first time 2= to ensure genuineness of the product 3= because of dietary restrictions 4= concerned about safety of product 5= others specify_______ *select all applicable options*	REAFP [ ]
23. Please select the reason(s) that best explain why you did not use food label information. 1=I trust my ability to select good foods without using label information.	REANU [ ]

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2=I don't have time to read the nutrition food label information when purchasing food. 3= I am loyal to my favorite brands and choose irrespective of the nutrition information. 4=The price of the food is more important. 5=I don't see the label information on most of the pre-packaged foods that I buy. 6=I do not understand am limited to how to use nutrition food labels so I don't even bother to read them. 7=The information on most labels are too technical to comprehend and use. 8=The print size on writing on the food nutrition label is too small to read. *include all applicable responses*	

Please indicate how often you used the following aspects of food labels when purchasing or using pre-packaged foods.						
	Always=5	Often=4	Occasion ally=3	Rarely= 2	Never=1	NUTRL
Brand name						[ ]
Nutrition Information						[ ]
List of ingredients						[ ]
Whether ingredient are from Genetically Modified Organisms/foods						[ ]
Nutrition information						[ ]
Nutrition/ Health claims						[ ]
Allergen						[ ]
Serving size						[ ]
Shelf life						[ ]
Standard Logo						[ ]
Country of origin						[ ]

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c. Knowledge of Nutrition and Health-related label Information

In this section, your knowledge of nutrition, food nutrition label and perceptions will be evaluated. This is not an exam; it is a survey to determine levels of knowledge to inform public health. Your answers are important to aid healthy food choice advice for adults.

24. Knowledge on foods and nutrients — KNOW1

a. Do you think the under-listed foods are high or low in added sugar? Mark the spaces provided

	High	Low	Not sure	
Bananas				
kenkey				
Fruit juice				
Soda/minerals				

b. Do you think the listed foods are high or low in salt?

	High	Low	Not sure	
Sausages				
Smoked fish				
Beef				
Koobi				
Instant noodles				
Groundnut paste				
Condiments				
spices				

c. Do you think the under listed foods are high or low in fibre/roughage?

	High	Low	Not sure	
Hausa porridge				
Bananas				
Beef				
green leafy vegetables				
Fish				
Yam				
Cowpea				

d. Brown sugar is a healthy alternative to white sugar. [ ]
1= Agree 2=Disagree 3= Not sure

e. If you want to cut down on fat, which dairy product would be best? Choose one [ ]
1= Full cream milk
2= semi-skimmed milk
3= do not take any dairy product
4= Not sure

f. A glass of unsweetened fruit juice is a good alternative to the whole fruit. (tick one) [ ]
1=Agree 2=Disagree 3=Not sure

g. Are you aware of any health problems or diseases that are related to a low intake of fruit and vegetables? [ ]
1=Yes 2= No 3= Not sure

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If yes, what diseases or health problems do you think are related to a low intake of fruit and Vegetables? (*Name at least one*)	
h. Are you aware of any health problems or diseases that are related to a low intake of fibre or roughage? 1= Yes 2= No 3= Not sure If yes, what diseases or health problems do you think are related to fiber or roughage? (*Name at least one*)	[ ]
i. Are you aware of any major health problems or diseases that are related to how much sugar people eat? 1= Yes 2= No 3= Not sure If yes, what diseases or health problems do you think are related to eating sugary foods like sweets? (*Name at least one*)	[ ]
j. Are you aware of any health problems or diseases that are related to how much salt or sodium people eat? 1= Yes 2= No 3= Not sure If yes, what diseases or health problems do you think are related to salt? (*Name at least one*)	[ ]
k. Are you aware of any health problems or diseases that are related to the amount of fat people eat? 1= Yes 2= No 3= Not sure If yes, what diseases or health problems do you think are related to fat? (*Name at least one*)	[ ]
25. How will you best evaluate your nutrition knowledge? 1=very well 2= intermediate 3= poor	[ ]
26. How will you best evaluate your understanding of labels? 1=very well 2= intermediate 3= poor	[ ]
27. Where do you usually get information about nutrition? (tick that apply) Source 1= Yes 2= No Schools Peers/friends Health personnel Parents/Guardian Radio/TV/ magazines/books Internet Other (specify)_________	 [ ] [ ] [ ] [ ] [ ] [ ]
28. From the choices you have selected above, how would you rate them as sources of information? (circle one choice) 1= Very unreliable; 2= Unreliable; 3= Reliable; 4= Very reliable Schools Peers/friends Health personnel Parents/Guardian Radio/TV/ magazines/books	[ ]

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Internet Other (specify)________	
29. Knowledge of Nutrition Labels(Food labeling Task) *This is not an exam but to determine your knowledge on the use of health-related information on prepackaged foods.* *Please carefully consider the pictures various prepackaged food labels. These labels have information that you are likely to find on a food label.*	FLKN2
Consider the box of cornflakes (Product 1). a. How much kilocalories is in one serving (30 g)? Consider this tin of evaporated milk (Product 2, Product 3). b. How much saturated fat is in a serving of Product 2? c. What are the health or nutrition-related message(s) on these products? d. You desire to cut down on your fat intake. Between Product 2 and 3, which of the products will meet your dietary goals. e. Explain your choice in question (d) above. Consider this packet of instant noodles (Product 4) f. What is the percentage daily amount of salt needed that this product offers? g. Does this product contain vegetable oil? 1=Yes 2=No h. Does this product contain artificial food additive? 1=Yes 2=No Consider a container of red grape juice (Product 5) i. What is the major component of this product? j. Does this product contain sugar? 1= Yes 2= No	____________ ____________ ____________ ____________ ____________ ____________ ____________ ____________ ____________ ____________
Perceptions on Nutrition and health information on prepackaged foods 27. Do you think nutrition and health information on prepackaged foods are 1= easy to understand 2= difficult to understand 3= don't know	PERC1 [ ]
28. Do you believe statements on the food label like a. diet low in sodium may reduce the risks of high blood pressure a disease associated with many factors are truthful. *1= Yes* *2= No*	[ ] [ ]

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b. Nutrition information such as high fibre diet and low fat that appear on the front page of food packages are truthful. *1= Yes 2= No* c. Information of ingredients and nutrient composition values at the back of food packages are accurate. *1= Yes 2= No*	[ ]
29. Have you ever received any information about how to use food label information? 1= Yes 2= No b. Have you ever read any material on the use of food label information? 1= Yes 2= No	[ ] [ ]
30. Please indicate the source(s) of your knowledge of food labels <u>Sources</u> 1= Yes 2= No Schools Peers/friends Health personnel Parents/Guardian Radio/TV/ magazines/books Internet Other (specify)________	KNL3 [ ] [ ] [ ] [ ] [ ] [ ] [ ]
31. Weight measurement …………………………….. Height measurement……………………………..	[ ] [ ]

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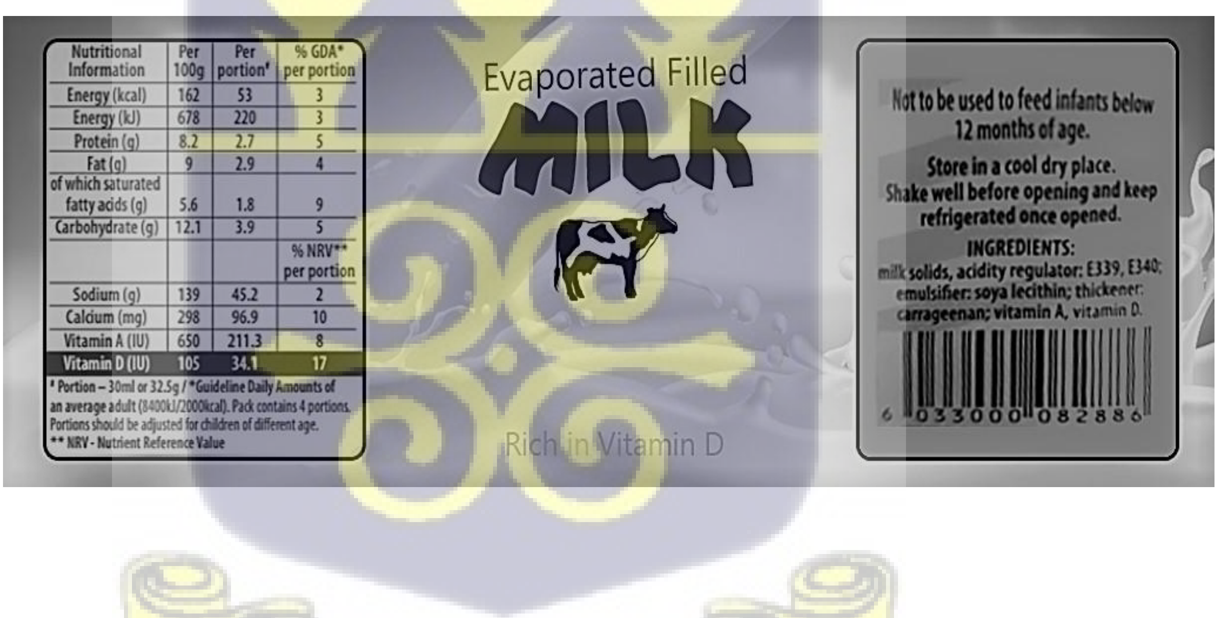
(II). Dummy Labels for Consumer Food Labelling Task

Product 1

Product 2



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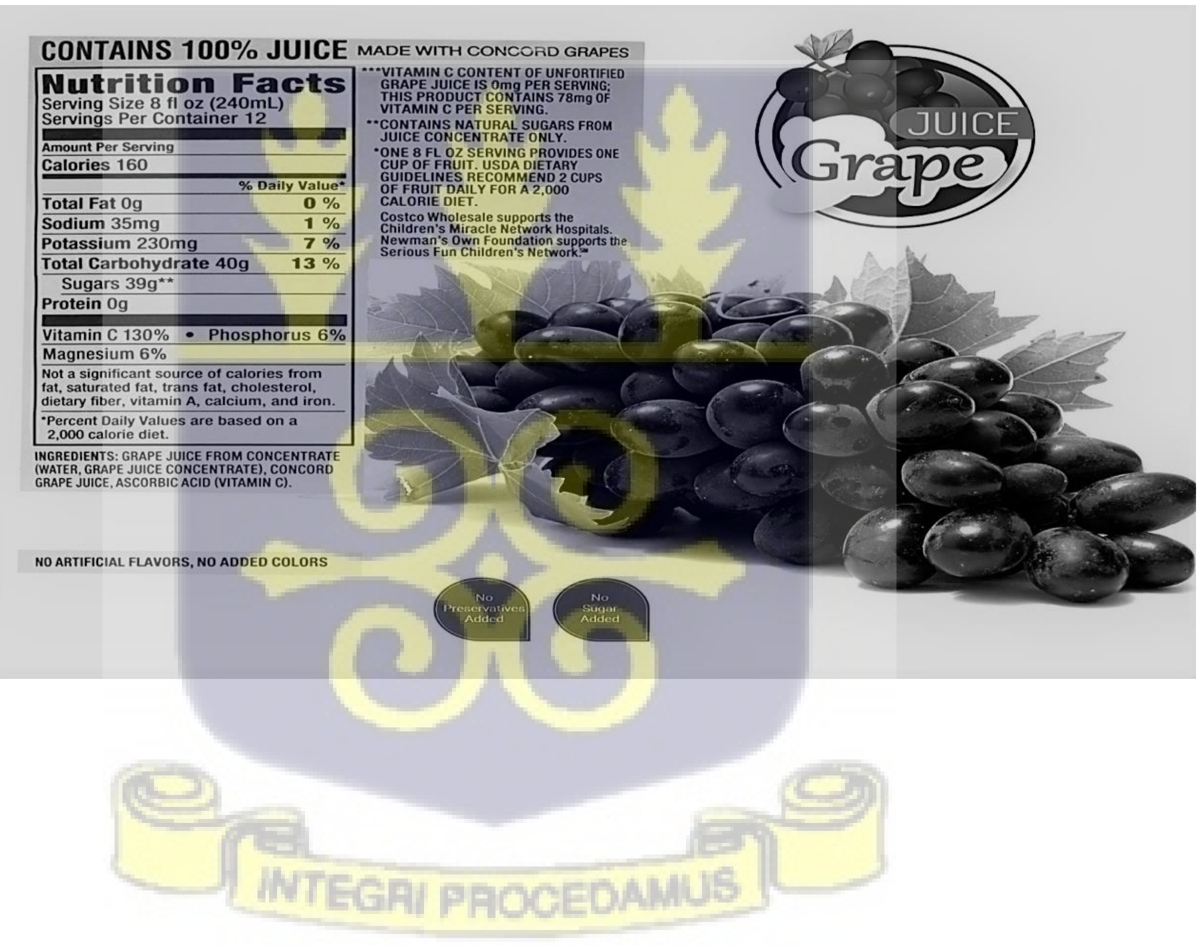
Product 3

Product 4



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Product 5

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III. Pre-packaged Food frequency questionnaire

Thinking about your household food purchase and intake over the last one month, please tell me about which pre-packaged foods you have purchased or consumed in the last one month for the household and how frequently.

'Pre-packaged food in this study are defined as a food or drink item packaged or made up in advance in a container including wrappings, ready for use or purchase by the consumer either ready to eat or use for cooking purposes'

How often, in the past month, did you eat/drink the following?	never	**Less than**	**1-3 times**	**4-6 times**	**1 time per**	**>1 times**	**How often, in last month did you buy the following?**					
							N o	**N o**	**m o**	**F o**	**W e**	**D**
1. **Sweetened drinks , fruit juices and energy drinks**												
Sweetened drinks(Tampico, kalyppo, refresh, fruity)												
Fruit juices (Ceres, pure heaven),												
Natural juice (blueskies)												
Malted drinks(Guiness, Vitamalt, Amstel, Beta Malt, Chocomalt, etc)												
Minerals(Fanta, Coke, Sprite, Lemon tonic, etc)												
Energy and sports drinks(rush, storm, blue jeans)												
Local/traditional drinks(Asana, sobolo, lamugin												
2.Cocoa, milk and dairy products												
Milk (evaporated, powdered-fresh, cowbell flavored drinks)												
Milk and milk-based drinks (countre milk, milko,												
Cocoa drink bases(ovatine, cowbell flavored chocolate drinks)												

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milk substitutes: including fresh, flavoured and dried milk, soy, rice and oat milk												
yoghurt: plain and flavoured yoghurt and other dairy snacks												
Ice creams: including sorbets and frozen yoghurt												
Chocolates/toffees/jellies/lollipops												
3.Breads, Biscuits and Pastries												
Bread(sugar, tea, butter, bran bread)												
Biscuits/cookies/crackers												
Cakes, sponges and muffins												
Other pastries(pie, bans, baked chips)												
Pizza												
Others												
4.Pasta, spaghetti and macaroni												
Pasta (Indomie)												
spaghetti , macaroni												
5.Breakfast cereals and porridge(canned , in plastic/paper container)												
Corn flakes and other cereals												
Oats												
Puddings- rice, custard etc												
Porridge(hausa koko, maize etc)												
Others												
6.Sugars and sweeteners												
White sugar												
Brown sugar												
Sweeteners												
7. **Spreads & Toppings**												
Margarine												
Butter												
Jam. Marmalade												
Honey												
Groundnut paste												

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Chocolate spread												
Salad cream/mayonnaise												
Cheese spread												
Others,												
8.Sauces, soups and condiments												
Shittor												
Pepper mix												
Vegetable soups												
Tomatoes ketch-up												
Mustard												
9.Seasonings, herbs and spices												
10.Fats and Oils												
Palm oil												
Coconut oil												
Vegetable oil												
Others												
11. Proteins (Processed)												
seafood products: canned salmon, tuna, sardines and oysters												
processed meats: beef												
Canned bacon												
Sausage (frozen)												
Sausage (canned)												
Canned ham and other processed meats												
Canned meat												
Corned beef												
Processed ; Burgers steaks, pork												
Eggs												
Fish Dried Smoked, fried, Canned (Belma,)												
Baked beans – canned												

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12. Snacks												
Fried plantain/kelewale/yam/**others**												
Groundnut roasted, fried												
Potatoes, potato chips,												
Plantains unripe, ripe												
Other nuts												
13. Flours												
Gari												
instant fufu												
Koko (Hausa)												
Banku, instant banku												
Maize, maize meal,												
14.Vegetables; Canned/wrapped												
Green leafy vegetables (Cabbage, lettuce, alefu, kontomire, ayoyo, etc) Cucumber Okro Garden eggs Carrot Green beans Peppers Bell pepper												
15. **Fruits(canned or wrapped)**												
Orange Pawpaw Apple Mango Banana Grapes Avocado Pear Pineapple												

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16.	**Ready to Eat Pre-packaged foods**												
Instant noodles													
Pasta													
Fried rice/jollof/ waakye													
Kenkey and fish													
Banku/fufu/Tuo zaafi with soup													
Fried yams/potatoes and chicken													
Others													

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Appendix B: Consent Form and Ethical Approval Letter

SCHOOL OF PUBLIC HEALTH, UNIVERSITY OF GHANA

DEPARTMENT OF POPULATION, FAMILY & REPRODUCTIVE HEALTH

CONSENT FORM

Title: Pre-packaged food labelling and use among households in Accra

Principal Investigator: Geoffrey Adebayo Asalu

Address: Department of Population, Family and Reproductive Health, School of Public Health. University of Ghana P. O. Box LG 13. Legon, Accra. Phone number: 0289109022

Email: pfrh@ug.edu.gh

General Information about Research

Chronic diseases such diabetes, hypertension, cardiovascular disease and cancer are among the world's leading causes of death. Pre-packaged foods tend to contain high levels of fat, sugar and salt which are risk factors for these diseases. Pre-packaged food in this study is defined as a food or drink item packaged or made up in advance in a container, ready for use or purchase by the consumer either ready to eat or use for cooking purposes'. Therefore, it is recommended that individuals should reduce consumption of sugar, salt, and fat intake. Food labels provide information on the level of these nutrients in pre-packaged foods and helps consumer make informed decision about their purchase. Also, food labels give information on potential allergens and nutrition and health related message for example 'contains gluten', 'low fat', 'able to reduce your cholesterol level' etc.

Therefore, our research is interested in describing the health-related information present on labels of prepackaged foods and to assess what extent consumers use these health-related information on labels. This research will assess the perception and knowledge of consumers on nutrition and the use of nutrition information on labels. To qualify for this study, participants should be 18 years of age and above, able to read and speak English, resident in Accra at least two years and who usually buys food and beverages for the family. It is expected that the interview will last for an hour.

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Possible Risks and Discomforts

There are no foreseeable risks and discomforts participating in this research. However, participants might be inconvenienced as result of time, questions on your food purchase pattern and taking of pictures of pre-packaged foods.

Possible Benefits

There is no direct benefit for participating in this study. However, through the interview participant may acquire knowledge on the use of food labels to inform their purchase of pre-packaged foods and the findings of this study will help in formulating policies to address food and nutrition label use in Ghana.

Compensation

There are no payments or compensation whatsoever connected with this study however, weight and height measurements of participants will be used to compute their body mass index (BMI) which will be explained to them.

Confidentiality

All information collected from this survey will be kept in strict confidence and be used for research purposes only. In addition, the data collected will be kept private and confidential. All information will be kept securely with the Principal Investigator under lock and key. Research participants will not be identified by name in anyway such as during data entry or publication purposes. However, study investigators will have access to your information, and it may be requested by Institutional Review Board of the University of Ghana.

Voluntary Participation and Right to Leave the Research

Participation in this survey is **completely voluntary**. You have the right to withdraw from participation in this research at any time without any consequences.

Contacts for Additional Information

For further concerns and questions, it can be addressed to Mr Geoffrey Asalu on mobile phone number **0263540520**.

Your rights as a Participant

This research has been reviewed and approved by the Institutional Review Board of Noguchi Memorial Institute for Medical Research (NMIMR-IRB). If you have any questions about your rights as a research participant you can contact the IRB Office between the hours of 8am-5pm through the landline 0302916438 or email addresses: nirb@noguchi.ug.edu.gh

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VOLUNTEER AGREEMENT

The above document describing the benefits, risks and procedures for the research title ***'Pre-packaged food labelling and use among households in Accra'*** has been read and explained to me. I have been given an opportunity to have any questions about the research answered to my satisfaction.
I agree to participate as a volunteer.

________________________ ____

Date Name and signature or mark of volunteer

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.

________________________ ____

Date Name and signature of witness

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.

________________________ ____

Date Name Signature of Person Who Obtained Consent

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(II). **Ethical Clearance Letter**

NOGUCHI MEMORIAL INSTITUTE FOR MEDICAL RESEARCH
Established 1979 A Constituent of the College of Health Sciences
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P. O. Box LG 581
Legon, Accra
Ghana

My Reference: DF 22

January 18, 2021
PhD Cand. Geoffrey Adebayo Asalu
University of Ghana, Population Family and Reproductive Health
P. O. Box LG 13
Legon
Accra

RE: Our Study # 081/18-19 **At:** NOGUCHI MEMORIAL INSTITUTE FOR MEDICAL RESEARCH-IRB

Dear Geoffrey Adebayo Asalu:

Meeting Date: 5/6/2020 **At:** NOGUCHI MEMORIAL INSTITUTE FOR MEDICAL RESEARCH-IRB
Protocol Title:

Pre-packaged Food labelling and use among households in Accra

This is to advise you that the above referenced Study has been presented to the Institutional Review Board, and the following action taken subject to the conditions and explanation provided below.

Internal #: 2649
Expiration Date:
On Agenda For: Expedited
Reason 1: Procedure **Reason 2:** Amendment
Description: The PI is requesting the following changes:
1. To increase the sample size form 403 to 483 participants.
2. To sample pre-packaged foods from shops instead of households.
IRB ACTION: Approved
Condition 1: Amendment
Action Explanation: The amendments to the protocol was approved.

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Appendix C: Supplementary Results for Chapter Four

Table C1: Demographic characteristics of respondents (N=510)

Characteristic	**Frequency**	**Percentage**
Mean age (SD)	34.4(11.6)	
Area		
East cantonment	99	19.4
Okaishie	121	23.7
New Fadama	130	25.5
Chorkor	160	31.4
Age (years)		
< 20	34	6.7
20-29	174	34.1
30-39	146	28.6
40-49	94	18.4
50-59	43	8.4
60+	19	3.7
Sex		
Male	105	20.6
Female	405	79.4
Education		
Primary	74	14.5
JHS	103	20.2
SHS	170	33.3
Tertiary	163	32.0
Occupation		
Unemployed	162	31.8
Public sector worker	117	22.9
Private sector worker	225	44.1
Retired	6	1.2
Marital status		
Married	269	52.7
Single	213	41.8
Others (Widowed/Separated/Divorced)	28	5.5
Ethnicity		
Akan	164	32.2
Ga	141	27.6
Ewe	88	17.3
Others	117	22.9
Religious affiliation		
Christianity	419	82.2
Islam	91	17.8
Number of people in a household		
1-2	113	22.2
3-4	205	40.2
5+	192	37.6
Residential status of household		
Own	48	9.4

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Characteristic	Frequency	Percentage
Rented	173	33.9
Workplace residence	156	30.6
Family house	123	24.1
Others	10	2.0
Wealth index		
Lowest	114	22.3
Second	110	21.6
Middle	82	16.1
Fourth	122	23.9
Highest	82	16.1
Being on specific diet		
No	474	92.9
Yes	36	7.1
Body Mass Index		
Underweight	4	0.8
Normal	217	42.5
Overweight	153	30.0
Obese	136	26.7
Reported NCD status		
No	464	91.0
Yes	49	9.0
Food Allergy status		
No	488	95.7
Yes	22	4.3

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Table C2a: Patten of purchase of pre-packaged foods by respondents

Food item	Pattern 1	Pattern 2	Pattern 3	Pattern 4	Pattern 5	Pattern 6	Pattern 7	Pattern 8	Pattern 9	Pattern 10
% variance	8.9%	7.5%	5.9%	4.8%	3.8%	3.5%	3.0%	3.0%	2.8%	2.7%
	Processed protein	Ready to eat and spreads	Fruits	Sauces	Sweetened drinks and beverages	Breakfast cereals	Seasonings	Oils, drinks, breakfast	Vegetables and spreads	Pasta
Canned bacon	0.3345									
Oats						0.3905				
Vegetable oil								0.3087		
Cucumber									0.3069	
Pawpaw			0.3459							
Shittor		0.3626								
Cocoa drinks								0.3890		
Pepper mix				0.4301						
Jam									0.3657	
Canned ham	0.3261									
Maggie cube							0.4341			
Pudding								0.4788		
Sweetened drinks					0.3092					
Spaghetti										0.3457
Orange			0.3107							
Instant banku		0.3218								
Fruit juice					0.3317					
Banana			0.3414							
Bread								0.3226		
Minerals					0.3286					
Curry powder							0.4605			
Kenkey		0.3035								
Milk based drinks					0.3097					
Salad cream									0.4561	
Canned meat	0.3053									

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Table C2b: Pattern of Intake of pre-packaged food among respondents

Food item	Pattern 1	Pattern 2	Pattern 3	Pattern 4	Pattern 5	Pattern 6	Pattern 7	Pattern 8	Pattern 9
% variance	**11.5%**	**5.1%**	**4.8%**	**4.6%**	**3.8%**	**3.6%**	**3.2%**	**3.0%**	**3.0%**
	Processed protein	**Fruits**	**Oils, seasoning and pasta**	**Drinks and dairy**	**Breakfast and dairy**	**Processed protein and spreads**	**Spreads and toppings**	**Breakfast, drinks and pastries**	**Processed protein, vegetables**
Canned bacon	0.4436								
Baked beans						0.4279			
Vegetable oil			0.3685						
Natural drinks								0.4103	
Mango		0.317							
Yoghurt				0.3286					
Burger									0.5452
Pasta			0.3211						
Jam							0.4367		
Canned ham	0.3225								
Maggie cube			0.3934						
Pudding					0.3982				
Cucumber									0.3043
Cake								0.3236	
Green beans									0.4750
Pear		0.3757							
Cheese spread							0.4056		
Minerals				0.3150					
Curry powder			0.3986						
Corn flakes								0.3825	
Milk sub drinks					0.3073				
Salad cream						0.4057			
Canned meat	0.3931								

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Table C3: Respondent's nutrition and food label knowledge sources and their level of reliability

Variable	Frequency	Percentage
1. Education on the use of labels(n=510)		
No	422	82.7
Yes	88	17.3
2. Source of knowledge on food labels (n=88)		
School	11	12.1
Health Professionals	27	30.4
Media	21	23.9
Internets	29	33.6
3. Sources of nutrition knowledge		
School	33	6.5
Peers/Family	132	25.9
Health professional	157	30.8
Media (Radio, TV, Magazines, Books)	216	42.4
Internet	167	32.8
Other sources	36	7.1
Rating the different sources of nutrition information		
7. Schools(n=33)		
Unreliable	-	-
Reliable	24	72.7
Very reliable	9	27.3
8. Family/peers (n=132)		
Unreliable	8	6.0
Reliable	91	68.9
Very reliable	33	25.1
9. Health professionals (n=157)		
unreliable	4	2.5
Reliable	64	40.8
Very reliable	89	56.7
10. Media (n=216)		
Unreliable	8	3.8
Reliable	182	82.2
Very reliable	26	12.0
11. Internet sources (n=167)		
Unreliable	5	3.0
Reliable	127	76.0
Very reliable	35	21.0
12. Other sources of information (n=36)		
Unreliable	2	5.6
Reliable	26	72.2
Very reliable	8	22.2

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Table C5: Factors associated with nutrition-related knowledge of food labels

Characteristics	Inadequate knowledge n (%) [n=333]	Adequate knowledge n (%) [n=177)	Total n (%) [n=510]	COR (95% CI)	AOR (95% CI)
Age (years)					
< 20	22(6.6)	12(6.8)	34 (6.7)	Ref	Ref
20-29	107(32.1)	67(37.8)	174 (34.1)	1.15(0.53-2.47)	1.39 (0.48-3.98)
30-39	110(33.0)	36(20.3)	146 (28.6)	0.60(0.27-1.33)	0.81 (0.25-2.62)
40-49	50(15.0)	44(24.9)	94 (18.4)	1.61(0.72-3.63)	1.50 (0.44-5.11)
50-59	31(9.3)	12(6.8)	43 (8.4)	0.71(0.27-1.87)	0.50 (0.12-2.07)
60+	13(3.9)	6(3.4)	19 (3.7)	0.85(0.26-2.80)	2.05 (0.36-11.71)
Sex					
Male	77(23.1)	28(15.8)	105(20.6)	Ref	Ref
Female	256(76.9)	149(84.2)	405(79.4)	1.60(0.99-2.58)	2.42 (1.31-4.47) **
Education					
Primary	69(20.7)	5(2.8)	74(14.5)	Ref	Ref
JHS	74(22.2)	29(16.4)	103(20.2)	5.40(1.98-14.76) ***	3.96 (1.22-12.82) *
SHS	103(30.9)	67(16.4)	170(33.3)	8.98(3.44-23.41) ***	9.48 (2.86-31.37) ***
Tertiary	87(26.1)	76(42.9)	163(32.0)	12.06(4.62-31.44) ***	11.13 (2.90-42.74) ***
Occupation					
Unemployed	111(33.3)	51(28.8)	162(31.8)	Ref	Ref
Public sector worker	66(19.8)	51(28.8)	117(22.9)	1.68(1.03-2.75) *	1.39 (0.59-3.26)
Private sector worker	152(45.7)	73(41.2)	225(44.1)	1.04(0.67-1.61)	2.13 (1.07-4.25) *
Retired	4(1.2)	2(1.1)	6(1.2)	1.09(0.19-6.13)	0.66 (0.07-6.61)
Marital status					
Single	145(43.5)	68(38.4)	213(41.8)	Ref	
Married	170(51.1)	99(55.9)	269(52.7)	1.24(0.85-1.81)	
Others	1895.4)	10(5.7)	28(5.5)	1.18(0.52-2.70)	
Ethnicity					
Akan	94(28.2)	70(39.6)	164(32.2)	Ref	
Ga	94(28.2)	47(26.5)	141(27.6)	0.67(0.42-1.07)	
Ewe	47(14.1)	41(23.2)	88(17.3)	1.17(0.69-1.97)	
Others	98(29.4)	19(10.7)	117(22.9)	0.26(0.14-0.46) ***	
Religious affiliation					
Christianity	254(76.3)	165(93.2)	419(82.2)	Ref	
Islam	79(23.7)	12(6.8)	91(17.8)	0.23(0.12-0.44) ***	
Food Allergy status					
No	319(95.8)	169(95.5)	488(95.7)	Ref	

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Table C5: Factors associated with nutrition-related knowledge of food labels

Characteristics	Inadequate knowledge n (%) [n=333]	Adequate knowledge n (%) [n=177)	Total n (%) [n=510]	COR (95% CI)	AOR (95% CI)
Yes	14(4.2)	8(4.5)	22(4.3)	1.08(0.44-2.62)	
NCD status					
Absent	298(89.5)	166(93.8)	464(91.0)	Ref	
Present	35(10.5)	11(6.2)	46(9.0)	0.56(0.28-1.4)	
Number of people in household					
1-2	83(24.9)	30(17.0)	113(22.2)	Ref	Ref
3-4	137(41.1)	68(38.4)	205(40.2)	1.37(0.83-2.28)	1.45 (0.75-2.79)
5+	113(33.9)	79(44.6)	192(37.6)	1.93(1.16-3.21) *	2.61 (1.27-5.36) **
Number of children aged less 18 years in house					
No child	109(32.7)	58(32.8)	167(32.7)	Ref	
1-2	170(51.1)	88(49.7)	258(50.6)	0.97(0.65-1.46)	
3-4	43(12.9)	28(15.8)	71(13.9)	1.22(0.69-2.17)	
5+	11(3.3)	3(1.7)	14(2.7)	0.51(0.14-1.91)	
Residential status					
Own	19(5.7)	29(16.4)	48(9.4)	Ref	
Rented	124(37.2)	49(27.7)	173(33.9)	0.26(0.13-0.50) ***	
Workplace residence	78(23.4)	78(44.1)	156(30.6)	0.65(0.34-1.26)	
Family house	108(32.4)	15(8.5)	123(24.1)	0.09(0.04-0.20) ***	
Others	4(1.2)	6(8.5)	10(2.0)	0.98(0.24-3.95)	
Wealth Index					
Poorest	94(28.2)	20(11.3)	114(22.3)	Ref	Ref
Poor	89(26.7)	21(11.9)	110(21.6)	1.11(0.56-2.18)	0.83 (0.37-1.87)
Medium	56(16.8)	26(14.7)	82(16.1)	2.18(1.11-4.26) *	1.17 (0.51-2.70)
Wealthy	42(12.6)	80(45.2)	122(23.9)	8.95(4.86-16.48) ***	4.37 (1.91-9.96) ***
Wealthiest	52(15.6)	30(16.9)	82(16.1)	2.71(1.40-5.24) **	1.15 (0.42-3.14)
Dieting					
No	315(94.6)	159(89.8)	474(92.9)	Ref	Ref
Yes	18(5.4)	18(10.2)	36(7.1)	1.98(1.00-3.91) *	1.78 (0.74-4.33)
Body Mass Index					
Underweight	2(0.6)	2(1.1)	4(0.8)	1.71(0.24-12.39)	
Normal	137(41.1)	80(45.2)	217(42.5)	Ref	

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Table C5: Factors associated with nutrition-related knowledge of food labels

Characteristics	Inadequate knowledge n (%) [n=333]	Adequate knowledge n (%) [n=177)	Total n (%) [n=510]	COR (95% CI)	AOR (95% CI)
Overweight	107(32.1)	46(26.0)	153(30.0)	0.74(0.47-1.14)	
Obese	87(26.1)	49(27.7)	136(26.7)	0.96(0.62-1.51)	
Place of purchase of household food					
Mini supermarket	62(18.6)	20(11.3)	82(16.1)	Ref	
Traditional market	118(35.5)	69(39.0)	187(36.7)	1.81(1.01-3.25) *	
Corner shops	123(36.9)	80(45.2)	203(39.8)	2.02(1.13-3.59) *	
Supermarket/mall	30(9.0)	8(4.5)	38(7.4)	0.83(0.33-2.09)	
Understanding of information on pre-packaged food					
Difficult to understand	145(43.5)	74(41.8)	219(42.9)	Ref	
Easy to understand	130(39.0)	85(48.0)	215(42.2)	1.28(0.866-1.89)	
Do not know	58(17.4)	18(10.2)	76(14.9)	0.61(0.33-1.11)	
Believe in health claims on pre-packaged food					
No	74(22.2)	28(15.8)	102(20.0)	Ref	
Yes	259(77.8)	149(84.2)	408(80.0)	1.52(0.94-2.45)	
Believe in nutrition information on pre-packaged food					
No	77(23.1)	27(15.3)	104(20.4)	Ref	
Yes	256(76.9)	150(84.7)	406(79.6)	1.67(1.03-2.71) *	
Believe in nutrient and ingredient information on pre-packaged foods					
No	94(28.2)	48(27.1)	142(27.8)	1.06(0.70-1.59)	Ref
Yes	239(71.8)	129(72.9)	368(72.2)		1.41 (0.72-2.74)

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Table C5: Factors associated with nutrition-related knowledge of food labels

Characteristics	Inadequate knowledge n (%) [n=333]	Adequate knowledge n (%) [n=177)	Total n (%) [n=510]	COR (95% CI)	AOR (95% CI)
Previous education on label use					
No	304(87.4)	118(72.8)	422(82.7)	Ref	Ref
Yes	44(12.6)	44(27.2)	88(17.3)	2.05(1.29-3.27) **	1.76 (0.94-3.32)
Understanding of food labels					
Inadequate understanding	319(95.8)	143(80.8)	462(90.6)	Ref	Ref
Adequate understanding	14(4.2)	34(19.2)	48(9.4)	5.42(2.82-10.41) ***	4.27 (1.94-9.42) ***
nutrition knowledge (self-knowledge)					
Not sure	34)10.2)	4(1.3)	38(7.4)	Ref	Ref
Poor	69(20.7)	36(20.3)	105(20.6)	4.43(1.46-13.48) **	2.87 (0.70-11.78)
Intermediate	189(56.8)	113(63.8)	302(59.2)	5.08(1.76-14.70) **	1.48 (0.37-5.93)
Very well	41(12.3)	24(13.6)	65(12.8)	4.97(1.57-15.75) **	0.75 (0.13-4.16)
Understanding of food labels(Self-knowledge)					
Not sure	42(12.6)	14(7.9)	56(11.0)	Ref	Ref
Poor	104(31.2)	34(19.2)	138(27.1)	0.88(0.48-2.01)	0.49 (0.18-1.37)
Intermediate	152(45.7)	103(58.2)	255(50.0)	2.03(1.06-3.91) *	0.57 (0.22-1.51)
Very well	35(10.5)	26(14.7)	61(12.0)	2.23(1.01-4.91) *	0.62 (0.16-2.34)

Location was used as the group variable for the multilevel logistic regression model

*p<0.05; **p<0.01; ***p<0.001

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Table C6: Factors associated with food label understanding of respondents

Characteristics	Inadequate n (%) [n=462]	Adequate n (%) [n=48]	Total n (%) [n=510]	COR (95% CI)	AOR (95% CI)
Age (years)					
< 20	30(6.5)	4(8.3)	34 (6.7)	Ref	Ref
20-29	155(33.5)	19(39.6)	174 (34.1)	0.92(0.29-2.89)	0.89 (0.22-3.67)
30-39	139(30.1)	7(14.6)	146 (28.6)	0.38(0.10-1.37)	0.36 (0.07-2.04)
40-49	84(18.2)	10(20.8)	94 (18.4)	0.89(0.26-3.06)	0.69 (0.12-3.93)
50-59	38(8.2)	5(10.4)	43 (8.4)	0.99(0.24-4.00)	0.73 (0.11-5.08)
60+	16(3.5)	3(6.3)	19 (3.7)	1.40(0.28-7.07)	0.55 (0.04-6.89
Sex					
Male	92(19.9)	13(27.1)	105(20.6)	Ref	Ref
Female	370(80.1)	35972.9)	405(79.4)	0.67(0.34-1.32)	0.67 (0.29-1.55)
Education					
Primary	72(15.6)	2(4.2)	74(14.5)	Ref	Ref
JHS	96(20.8)	7(14.6)	103(20.2)	2.62(0.53-13.01)	1.11 (0.19-6.46)
SHS	144(31.2)	26(54.2)	170(33.3)	6.50(1.50-28.15) *	3.22 (0.63-6.56)
Tertiary	150(32.5)	13(54.2)	163(32.0)	3.12(0.68-14.19)	1.99 (0.29-13.76)
Occupation					
Unemployed	151(32.7)	11(22.9)	162(31.8)	Ref	Ref
Public sector worker	108(23.4)	9(18.7)	117(22.9)	1.14(0.46-2.85)	1.13 (0.31-4.09)
Private sector worker	199(43.7)	26(54.2)	225(44.1)	1.79(0.86-3.74)	2.39 (0.87-6.56)

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Table C6: Factors associated with food label understanding of respondents

Characteristics	Inadequate n (%) [n=462]	Adequate n (%) [n=48]	Total n (%) [n=510]	COR (95% CI)	AOR (95% CI)
Retired	4(0.9)	2(4.2)	6(1.2)	6.86(1.13-41.70) *	8.99 (0.56-144.37)
Marital status					
Single	197(42.6)	16(33.3)	213(41.8)	Ref	
Married	243(52.6)	26(54.2)	269(52.7)	1.32(0.69-2.52)	
Others	22(4.8)	6(12.5)	28(5.5)	3.36(1.19-9.47)	
Ethnicity					
Akan	147(31.8)	17(35.4)	164(32.2)	Ref	
Ga	127(27.5)	14(29.2)	141(27.6)	0.95(0.45-2.01	
Ewe	81(17.5)	7(14.6)	88(17.3)	0.75(0.30-1.88)	
Others	107(23.2)	10(20.8)	117(22.9)	0.81(0.36-1.83)	
Religious affiliation					
Christianity	378(81.8)	41(85.4)	419(82.2)	Ref	
Islam	84(18.2)	7(14.6)	91(17.8)	0.77(0.33-1.77)	
Food allergy status					
No	441(95.5)	47(97.9)	488(95.7)	Ref	
Yes	21(4.5)	1(2.1)	22(4.3)	0.45(0.06-3.40)	
NCD status					
Absent	422(91.3)	42(87.5)	464(91.0)	Ref	
Present	40(8.7)	6(12.5)	46(9.0)	1.51(0.60-3.76)	

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Table C6: Factors associated with food label understanding of respondents

Characteristics	Inadequate n (%) [n=462]	Adequate n (%) [n=48)	Total n (%) [n=510]	COR (95% CI)	AOR (95% CI)
Number of people in house					
1-2	103(22.3)	10(20.8)	113(22.2)	Ref	
3-4	186(40.3)	19(39.6)	205(40.2)	1.05(0.47-2.35)	
5+	173(37.4)	19(39.6)	192(37.6)	1.13(0.51-2.53)	
Number of children aged less 18 years in house					
No child	154(33.3)	13(27.1)	167(32.7)	Ref	
1-2	232(50.2)	26(54.2)	258(50.6)	1.33(0.66-2.66)	
3-4	64(13.8)	7(14.6)	71(13.9)	1.29(0.49-3.40)	
5+	12(2.6)	2(4.2)	14(2.7)	1.97(0.40-9.78)	
Residential status					
Own	34(7.4)	14(29.2)	48(9.4)	Ref	
Rented	161(34.8)	12(25.0)	173(33.9)	0.18(0.08-0.43) ***	
Workplace residence	141(30.5)	15(31.2)	156(30.6)	0.26(0.11-0.59) ***	
Family house	117(25.3)	6(12.5)	123(24.1)	0.12(0.04-0.35) ***	
Others	9(1.9)	1(2.1)	10(2.0)	0.27(0.03-2.33)	
Wealth index					
Lowest	106(22.9)	8(16.7)	114(22.3)	Ref	Ref

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Table C6: Factors associated with food label understanding of respondents

Characteristics	Inadequate n (%) [n=462]	Adequate n (%) [n=48]	Total n (%) [n=510]	COR (95% CI)	AOR (95% CI)
Second	103(22.3)	7(14.6)	110(21.6)	0.90(0.32-2.57)	1.36 (0.40-4.59)
Middle	75(16.2)	7(14.6)	82(16.1)	1.24(0.43-3.56)	1.18 (0.34-4.14)
Fourth	103(22.3)	19(39.6)	122(23.9)	2.44(1.02-5.83) *	2.55 (0.81-8.02)
Highest	75(16.2)	7(14.6)	82(16.1)	1.24(0.43-3.56)	2.17 (0.54-8.72)
Dieting					
No	432(93.5)	42(87.5)	474(92.9)	Ref	
Yes	30(6.5)	6(12.5)	36(7.1)	2.06(0.81-5.22)	
Body Mass Index					
Underweight	2(0.4)	2(4.2)	4(0.8)	12.56(1.66-95.18) *	0.07(0.01-0.99) *
Normal	201(43.5)	16(33.3)	217(42.5)	Ref	Ref
Overweight	134(29.0)	19(39.6)	153(30.0)	0.17 (0.88-3.59)	0.18 (0.01-2.50)
Obese	125(27.1)	11(22.9)	136(26.7)	0.08 (0.01-1.15)	0.07 (0.01-1.15)
Place of purchase of household food					
Mini supermarket	79(17.1)	3(6.2)	82(16.1)	Ref	
Traditional market	166(35.9)	21(43.8)	187(36.7)	2.93(0.92-9.36)	
Corner shops	179(38.7)	24(50.0)	203(39.8)	3.10(0.98-9.80)	
Supermarket/mall	38(8.2)	0(0.0)	38(7.4)	0.29(0.01-5.85)	

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Table C6: Factors associated with food label understanding of respondents

Characteristics	Inadequate n (%) [n=462]	Adequate n (%) [n=48]	Total n (%) [n=510]	COR (95% CI)	AOR (95% CI)
Understanding of information on pre-packaged food					
Difficult to understand	192(41.6)	27(56.3)	219(42.9)	Ref	
Easy to understand	199(43.1)	16(33.3)	215(42.2)	0.57(0.30-1.09)	
Do not know	71(15.4)	5(10.4)	76(14.9)	0.50(0.18-1.35)	
Believe in health claims on pre-packaged food					
No	97(21.0)	5(10.4)	102(20.0)	Ref	
Yes	365(79.0)	43(89.6)	408(80.0)	2.28(0.88-5.92)	
Believe in nutrition information on pre-packaged food					
No	98(21.2)	6(12.5)	104(20.4)	Ref	
Yes	364(78.8)	42(87.5)	406(79.6)	1.88(0.79-4.56)	
Believe in nutrient and ingredient information on pre-packaged foods					
No	130(28.1)	12(25.0)	142(27.8)	Ref	
Yes	332(71.9)	36(75.0)	368(72.2)	1.17(0.59-2.33)	
Previous education on the use of labels					
No	390(84.4)	32(66.7)	422(82.8)	Ref	Ref

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Table C6: Factors associated with food label understanding of respondents

Characteristics	Inadequate n (%) [n=462]	Adequate n (%) [n=48]	Total n (%) [n=510]	COR (95% CI)	AOR (95% CI)
Yes	72(15.6)	16(33.3)	88(17.2)	2.71(1.41-5.19) **	2.59 (1.19-5.67) **
Nutrition-related knowledge on food labels					
Inadequate	319(69.1)	14(29.2)	333(65.3)	Ref	Ref
Adequate	143(30.9)	34(70.8)	177(34.7)	5.42(2.82-10.41) ***	4.42 (2.01-9.75) ***
nutrition knowledge(self-report)					
Not sure	37(8.0)	1(2.1)	38(7.4)	Ref	
Poor	96(20.8)	9(18.7)	105(20.6)	3.37(0.42-28.34)	
Intermediate	271(58.7)	31(64.6)	302(59.2)	4.23(0.56-31.93)	
Very well	58(12.5)	7(14.6)	65(12.8)	4.46(0.53-37.78)	
Understanding of food labels(self-report)					
Not sure	53(11.5)	3(6.3)	56(11.0)	Ref	
Poor	128(27.7)	10(20.8)	138(27.1)	1.38(0.36-5.21)	
Intermediate	227(49.1)	28(58.3)	255(50.0)	2.18(0.63-7.43)	
Very well	54(11.7)	7(14.6)	61(12.0)	2.29(0.56-9.33)	

Location was used as the group variable for the multilevel logistic regression model
*p<0.05; **p<0.01; ***p<0.001

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Table C7: Factors associated with consumer food label use

Characteristics	Non-Label Users n (%) [n=348]	Label Users n (%) [n=162]	Total n (%) [n=510]	COR (95% CI)	AOR (95% CI)
Age (years)					
< 20	24(6.9)	10(6.2)	34 (6.7)	Ref	Ref
20-29	118(33.9)	56(34.6)	174 (34.1)	1.14(0.51-2.54)	0.87 (0.31-2.48)
30-39	102(29.3)	44(27.2)	146 (28.6)	1.04(0.46-2.34)	1.39 (0.44-4.37)
40-49	59(16.9)	35(21.6)	94 (18.4)	1.42(0.61-3.32)	0.96 (0.29-3.19)
50-59	32(9.2)	11(6.8)	43 (8.4)	0.82(0.30-2.26)	0.95 (0.24-3.79)
60+	13(3.7)	6(3.7)	19 (3.7)	1.11(0.33-3.74)	2.56 (0.43-15.34)
Sex					
Male	66(19.0)	39(24.1)	105(20.6)	Ref	Ref
Female	282(81.0)	123(75.9)	405(79.4)	0.74(0.47-1.16)	0.94 (0.52-1.70)
Education					
Primary	68(19.5)	6(3.7)	74(14.5)	Ref	Ref
JHS	82(23.6)	21(13.0)	103(20.2)	2.90(1.11-7.60) *	1.96 (0.63-6.08)
SHS	119(34.2)	51(31.5)	170(33.3)	4.86(1.98-11.91) **	2.89 (0.95-8.78)
Tertiary	79(22.7)	84(51.8)	163(32.0)	12.05(4.95-19.33) ***	6.72 (1.97-22.95) **
Occupation					
Unemployed	115(33.1)	47(29.0)	162(31.8)	Ref	Ref
Public sector worker	66(19.0)	51(31.5)	117(22.9)	1.89(1.14-3.11) *	1.49 (0.58-3.78)
Private sector worker	164(47.1)	61(37.7)	225(44.1)	0.91(0.58-1.42)	1.30 (0.65-2.58)
Retired	3(0.9)	3(1.8)	6(1.2)	2.25(0.47-12.56)	0.64 (0.07-6.02)
Marital status					
Single	149(42.8)	64(39.5)	213(41.8)	Ref	
Married	180(51.7)	89(54.9)	269(52.7)	1.15(0.78-1.70)	
Others	19(5.5)	9(5.6)	28(5.5)	1.10(0.47-2.57)	
Ethnicity					
Akan	105(30.2)	59(36.4)	164(32.2)	Ref	
Ga	101(29.0)	40(24.7)	141(27.6)	0.70(0.43-1.14)	
Ewe	51(14.7)	37(22.8)	88(17.3)	1.29(0.76-2.19)	
Others	91(26.1)	26(16.1)	117(22.9)	0.50(0.30-0.87) *	
Religious affiliation					
Christianity	276(79.3)	143(88.3)	419(82.2)	Ref	
Islam	72(20.7)	19(11.7)	91(17.8)	0.51(0.29-0.88) *	
Food Allergy status					
No	333(95.7)	155(95.7)	488(95.7)	Ref	
Yes	15(4.3)	7(4.3)	22(4.3)	1.00(0.40-2.51)	
NCD status					
Absent	315(90.5)	149(92.0)	464(91.0)	Ref	
Present	33(9.5)	13(8.0)	46(9.0)	0.83(0.42-1.63)	
Number of people in household					
1-2	85(24.4)	28(17.3)	113(22.2)	Ref	Ref
3-4	140(40.2)	65(40.1)	205(40.2)	1.41(0.84-2.37)	1.52 (0.78-2.98)
5+	123(35.3)	(69(42.6)	192(37.6)	1.70(1.01-2.86) *	2.40 (1.15-5.00) *
Number of children aged less 18 years in house					
No child	114(32.8)	53(32.7)	167(32.7)	Ref	
1-2	179(51.4)	79(48.8)	258(50.6)	0.94(0.62-1.44)	
3-4	45(12.9)	26(16.0)	71(13.9)	1.24(0.69-2.22)	
5+	10(2.9)	4(2.5)	14(2.7)	0.86(0.25-2.87)	
Residential status					
Own	26(7.5)	22(13.6)	48(9.4)	Ref	Ref

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Table C7: Factors associated with consumer food label use

Characteristics	Non-Label Users n (%) [n=348]	Label Users n (%) [n=162]	Total n (%) [n=510]	COR (95% CI)	AOR (95% CI)
Rented	119(34.2)	54(33.3)	173(33.9)	0.54(0.28-1.03)	1.14 (0.45-2.89)
Workplace residence	99(28.4)	57(35.2)	156(30.6)	0.68(0.35-1.31)	0.37 (0.13-1.04)
Family house	99(28.4)	24(14.8)	123(24.1)	0.29(0.14-0.59) **	0.83 (0.29-2.35)
Others	5(1.4)	5(3.1)	10(2.0)	1.18(0.30-4.62)	1.11 (0.19-6.53)
Wealth Index					
Poorest	95(27.3)	19(11.7)	114(22.3)	Ref	Ref
Poor	87(25.0)	23(14.2)	110(21.6)	1.32(0.67-2.59)	1.01 (0.46-2.25)
Medium	53(15.2)	29(17.9)	82(16.1)	2.75(1.40-5.43) **	1.34 (0.58-3.08)
Wealthy	61(17.5)	61(37.6)	122(23.9)	5.00(2.72-9.17) ***	2.14 (0.92-4.97)
Wealthiest	52(14.9)	30(18.5)	82(16.1)	2.89(1.48-5.62) **	0.85 (0.30-2.42)
Dieting status					
No	328(94.2)	146(90.1)	474(92.9)	Ref	
Yes	20(5.8)	16(9.9)	36(7.1)	1.79(0.90-3.57)	
Body Mass Index					
Underweight	3(0.9)	1(0.6)	4(0.8)	0.68(0.07-6.71)	
Normal	146(41.9)	71(43.8)	217(42.5)	Ref	
Overweight	101(29.0)	52(32.1)	153(30.0)	1.06(0.68-1.64)	
Obese	98(28.2)	38(23.5)	136(26.7)	0.80(0.50-1.27)	
Place of purchase of household food					
Traditional market	124(35.6)	63(38.9)	187(36.7)	1.80(0.99-3.31)	
Corner shops	137(39.4)	66(40.7)	203(39.8)	1.71(0.94-3.12)	
Mini supermarket	64(18.4)	18(11.1)	82(16.1)	Ref	
Supermarket/mall	23(6.6)	15(9.3)	38(7.4)	2.31(1.01-5.34) *	
Understanding of information on pre-packaged food					
Difficult to understand	164(47.1)	55(34.0)	219(42.9)	Ref	Ref
Easy to understand	120(34.5)	95(58.6)	215(42.2)	2.36(1.57-3.55) ***	1.18 (0.58-2.40)
Do not know	64(18.4)	12(7.4)	76(14.9)	0.56(0.28-1.11)	0.81 (0.32-2.06)
Believe in health claims on pre-packaged food					
No	73(21.0)	29(17.9)	102(20.0)	Ref	
Yes	275(79.0)	133(82.1)	408(80.0)	1.21(0.76-1.96)	
Believe in nutrition information on pre-packaged food					
No	77(22.1)	27(16.7)	104(20.4)	Ref	
Yes	271(77.9)	135(83.3)	406(79.6)	1.42(0.87-2.31)	
Believe in nutrient and ingredient information on pre-packaged foods					
No	88(25.3)	54(33.3)	142(27.8)	Ref	
Yes	260(74.7)	108(66.7)	368(72.2)	10.68(0.45-1.02)	
Previous education on label use					
No	304(87.4)	118(72.8)	422(82.7)	Ref	
Yes	44(12.6)	44(27.2)	88(17.3)	2.58(1.61-4.12) ***	
Nutrition knowledge					
Inadequate	259(74.4)	74(45.7)	333(65.3)	Ref	Ref
Adequate	89(25.6)	88(54.3)	177(34.7)	3.46(2.34-5.12) ***	1.93 (1.14 -3.27) *
Understanding of food labels					

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Table C7: Factors associated with consumer food label use

Characteristics	Non-Label Users n (%) [n=348]	Label Users n (%) [n=162]	Total n (%) [n=510]	COR (95% CI)	AOR (95% CI)
Inadequate	328(94.3)	134(82.7)	462(90.6)	Ref	Ref
Adequate	20(5.7)	28(17.3)	48(9.4)	3.43(1.86-6.29) ***	2.54 (1.17-5.51) *
Nutrition knowledge (self -report)					
Not sure	37(10.3)	1(0.6)	38(7.4)	Ref	Ref
Poor	86(24.7	19(11.7)	105(20.6)	8.17(1.0563.34) *	3.81 (0.42-35.02)
Intermediate	193(55.5)	109(67.3)	302(59.2)	20.90(2.82-154.42) **	4.11 (0.47-35.77)
Very well	32(9.2)	33(20.4)	65(12.8)	38.16(4.93-294.89) ***	4.60 (0.45-47.00)
Understanding of food labels(self-report)					
Not sure	52(14.9)	4(2.5)	56(11.0)	Ref	Ref
Poor	119(34.2)	19(11.7)	138(27.1)	2.07(0.67-6.40)	2.60 (0.71-9.52)
Intermediate	150(43.1)	105(64.8)	255(50.0)	9.10(3.19-25.93) ***	6.33 (1.90-21.14) **
Very well	27(7.8)	34(21.0)	61(12.0)	16.37(5.25-50.96) ***	10.02 (2.37-42.30) **

Location was used as the group variable for the multilevel logistic regression model

*p<0.05; **p<0.01; ***p<0.001