FORTIFICATION OF FOOD PRODUCTS: A CONSUMER PERSPECTIVE

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DECLARATION

This is to certify that the work in my dissertation is holistically my own apart from the explicitly acknowledged references to textbooks, journals, and newspapers citations. The dissertation has not been previously submitted to any institution including the Durban University of Technology for any purpose whatsoever.

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ABSTRACT

The prevalence of malnutrition and hidden hunger in developed but largely in developing countries, has led to the introduction of mandatory food fortification for the purpose of overcoming micro-nutrients malnutrition. Consumers have inadequate knowledge and are not aware of the relevance of food fortification. It is important for consumers to be conversant with fortified food products in order to make healthy food choices in a bid to overcome the phenomenon of micro-nutrient deficiency. The purpose of the study was to assess consumers' level of awareness of food fortification in South Africa.

A sample of *n*=400 consumers in the Durban central region was selected to participate in the survey. Non-probability convenience sampling was applied to nominate the participants in the study. The positivist cross-sectional study was undertaken using a quantitative paradigm to assess the various factors responsible for consumers' inadequate knowledge of fortification. The measuring instrument was a five-point Likert scale questionnaire that constituted twenty-five questions and one open ended question. The results were captured on excel spreadsheet and analysed using SPSS version 25.0 software package. Descriptive and inferential statistical methods were utilised to summarise and analyse the results respectively.

The study established that most of the consumers are not familiar with food fortification and its importance. The findings indicate further that there is a positive relationship $p < 0.05$ between knowledge of the benefits of fortified products and motivation to buy fortified food products. On the other hand, it was also found that, there is a significant relationship between the shortcomings of food fortification and barriers for fortified food purchase intention. Therefore, there is a need to develop intervention strategies that can create awareness of food fortification basing on the findings of the study.

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CHAPTER 1. INTRODUCTION

1:1 BACKGROUND

Malnutrition is a global issue with an estimated 32% if the world population facing its consequences of low productivity and a decline in economic growth (Motadi, Mbhatsani and Shilote, 2016:1). Experts estimate that nearly two billion people-mostly from developing countries-suffer from malnutrition and hidden hunger (Verma 2015:381). Turk, Spohrer, Manus, Van, Nga, Nyuyen, Poonawala and Garett (2016:1) report that 60% of deaths worldwide are because of nutrition-related diseases. A lot must be done in a bid to eradicate malnutrition. The world is facing poor dietary quality of recent than before which has resulted into the worst consequences of malnutrition (Alkerwi 2014:613). The work of Steyn, Jaffer, Nel, Levitt, Steyn, Lombard and Peer (2016:1) articulate that malnutrition has a big role in the spread of non-communicable diseases (NCDs) such as diabetes and cancer. Eradicating vitamin deficiencies is very important for global health (Tanumihardjo 2015:397). The first Millennium Development Goal (MDG) is to eradicate hunger and malnutrition by 2025 (Motadi *et al.* 2016:1).

According to the South African National Health and Nutrition Examination Survey (SANHANES), South African is among the top 36 countries with malnutrition causing stunting to 20% of children, 30% of the population being overweight and 40% living with obesity (du Plessis, Herselman, Mchachlan and Nel 2016:37). South Africa is faced with chronic malnutrition that include under-nutrition and over-nutrition which has exacerbated the incidence of lifestyle diseases (Wirth 2014:3). Steyn *et al*. (2016:2) argue that, unhealthy behaviour in South Africa contributes to the prevalence of (NCDs) and therefore there is a need to make micro-nutrients cheaper and accessible.

In 2003 South Africa introduced mandatory food fortification (forcefully adding nutrients and minerals to popular food products) to supplement the steady decline in consumer dietary quality (Van Jaarsveld, Faber and Stuijveberg 2015:315). Nkala (2018:24) also adds that, with compulsory food fortification, there is a reduction in micro-nutrient deficiencies. Food fortification increases micro-nutrient intake if the fortified product is regularly consumed by a large segment, however those with

adequate nutrient intake in the same segment suffer toxicity due to excess consumption (Friesen, Aaron, Myatt and Neufeld 2017:98). Since micro-nutrients (vitamins and minerals) are needed in small amounts, it's very difficult to realise the impact and therefore Abeshu and Geleta (2016:1) call it, "hidden hunger". The Argus (2017:19) reported on 03 December 2017 that, South Africa produces enough food with nutritional content and caloric adequacy, but the problem of micro-nutrient deficiency still looms large. South Africa still has diseases caused by under-nutrition despite of the modest investment in food fortification (Koen, Blaauw and Wentzel-Viljoen 2016:15). Consumers are not familiar with and have little knowledge about food fortification which makes them less likely to make healthier choices (Bekoglu, Ergen and Inci 2016:80). The next section explains the problem statement based on the background of the study.

1:2 PROBLEM STATEMENT

According to Abeshu and Geleta (2016:3), food fortification is a health intervention where nutrients are added to food products with insufficient quantities of vitamins and minerals. It can also be done by restoring nutrients after loss during processing. Albeit mandatory fortification programme was introduced to South Africa in 2003, there is still a burden of diseases and economic consequences as a result of malnutrition (Ndlovu 2017:50). Many South African consumers have no knowledge of the significance of food fortification (Nemeth 2016:795). Consumers are not familiar with food fortification which makes the programme less successful (Motadi, Mbhatsani and Shilote 2016:3). The Argus (2017:19) reported that South Africa is not struggling to fill up supermarket shelves with food products of nutritional content, but the low level of awareness of fortified food products has been a major cause of poor dietary choices (Magalis, Giovanni and Silliman 2016:500). Although knowledge of fortified food products may not necessarily translate into purchase, awareness can contribute towards consumer purchase decision.

South Africans have a habit of eating low dietary food with excessive reliance on energy dense nutrients deficient sugar and obesogenic food (Argus 2017:19). That is why even after the fortification programme, there is still zinc, iodine, iron and vitamin A deficiencies (Motadi, Mbhatsani and Shilote 2016:2). About 11% of the South African consumers purchase street food due to urbanization, industrialization,

convenience and lack of proper housing with cooking facilities (Hills, Mchiza, Fourie, Puoane and Steyn 2016:26). Food safety is at risk as industrialization and economic development with urbanization is forcing optimal health eating compromised due to high demand of limited food supply (Alkerwi 2014:614). The rationale of the study is described in the next section.

1:3 RATIONALE FOR THE STUDY

Food has been taken within the boundaries of health and life science, but with the medicalization of food advertising, food manufacturers are now engaging in marketing disease preventing food products (Van Buul and Brouns 2015:1558). Consumer preferences integrated with multiple perspectives of food fortification can to some degree lead to product success (Bimbo, Bonanno, Nocella, Viscecchia, Nardone, de Devitiis and Carlucci 2017:142).

Consumers' low level of awareness and knowledge of fortification calls for understanding the reasons why and providing strategies aimed at creating awareness (Food Advisory Consumer Services [FACS] 2017:2). The works of Schnettler, Supulveda, Bravo, Grunert and Hueche (2018:425) confirm that, consumers are not familiar with fortified food products and are not convinced with the function of fortified food. Consumers' willingness and acceptance of fortified food products depends largely on attitude towards novel health modifications and the information available to support their consumption (Lu 2015:1873). In other instances, consumers may be aware of the health benefits but may not afford dietary practices due to accessibility and affordability coupled by poverty (White, Addison, Campbell, Henderson, McGill, Payton and Anton-la Vigne 2017:2).

Most of the research about food fortification relate to a top-bottom approach of implementing large scale enrichment of common food products to meet a wider segment (Verma 2015:382). There is a need to focus on bottom-up perspective that rejects the thinking that experts know better than consumers (Lee and Kotler 2011:18). The user-centric context conflicts with the old models where professionals are in control while consumers are controlled (Van Buul and Brouns 2015:1558). Therefore, attention should be redirected to the consumers (user centric context) for the success of the fortification programme. A few food fortifications studies that focus on the consumer have been conducted largely outside of South Africa. The researcher

intends to illuminate the consumer perspective towards fortification by assessing knowledge awareness and acceptability. Consumers are not familiar and have little knowledge about food fortification which hinders the purchase (Bekoglu, Ergen and Inci 2016:80). The researcher argues that understanding the consumers' level of awareness provides a platform for intervention strategies to create awareness.

Although vitamin A deficiency has declined due to food fortification, the study of Steinhauser and Hamm (2018:304) emphasise that the bottom-up strategy of understanding consumer characteristics is vital for the success of fortification. Consumer characteristics include; perception, motivation and socio-demographic variables that should not be undermined. Fewer studies have considered the role of a consumer in the structures of fortified food value chain as consumers vary over socio-economic clusters (Bekele, Beuving and Ruben 2017:668).

The significance of good health coupled with the increase in the level of awareness and consumption fortified food products is paramount for a productive society (Wirth 2014:5). Consumer behaviour towards the acceptance of fortified food products and recognition of the significance of preventing chronic and lifestyle health related diseases requires dedicated consumer applied research (Shamal and Mohan 2017:229). The theoretical framework of the study is discussed in the subsequent section.

1:4 THEORETICAL FRAMEWORK

Understanding how consumers acquire knowledge, beliefs and how they approve their belief is very important in consumer studies (Hastings and Domegan 2014:65). Consumer acceptance of change depends largely on the perceived benefits of what is offered to them (Lee and Kotler 2011:332). Learning the consumer along with their societal norms and aspirations is important for the success of the fortification programme. Consumers are rational and change behaviours before a threat (Schneider 2017:210). The perceived severity of the threat, along with perceived effectiveness of the solution, forces action (Lee and Kotler 2011:332).

Consumers demand health enhancing foods to boost their life expectancy and to cut social costs (Bimbo *et al.* 2017:142). Of recent, the social and economic costs of diet related illness like diabetes, cancer and cardiovascular diseases has prompted

consumers to make dietary changes thus the development of fortified food products (Van Buul and Brouns 2015:1552). Steinhauser and Hamm (2018:303) assert that nutrition health risk claims positively influence consumer behavior and purchase intention to improve health lifestyle.

Consumer behavior is to some extent based on; what others do to be accepted in the community, family, ethnicity and the social environment (Shamal and Mohan 2017:23). The role of the consumer characteristics like; age, gender, and cognitive variables determine consumer acceptance and awareness of fortified food products (Bimbo *et al*. 2017:142). Nutrition claims provide information for the consumer to evaluate and make a purchase decision.

Product attributes and trusted popular brands provide greater influence on consumer acceptance and awareness of fortified products like fibre in functional yogurt (Van Buul and Brouns 2015:1556). Nutrition knowledge guides the consumer to make healthier choices with motivation due to perceived healthiness and experience from family or friends suffering from health-related diseases (Steinhauser and Hamm 2018:307). Adequate marketing is important especially strategies to the nutritionally vulnerable consumers who may not access information about fortified food products (Abeshu and Geleta 2016:4).

Masson *et al*. (2016:619) contend that attitude associated with functional food products differs among various cultures and demographic variables. Females perceive health diets more positively than males. High level of education and old age prompts consumers to accept disease preventive foods and seek knowledge as affirmed by the theory of planned behaviour where attitude and norms are pivotal to perceived behavioural control (Shamal and Mohan 2017:232).

Consumers develop their evaluations with attributes like quality and safety in consideration of intrinsic attributes like taste, ordour as well as texture and extrinsic attributes like package, product information and price (Bekele, Beuving and Ruben 2017:667). Perception is also related to naturalness attributed to fortified food products because additives and technology tend to erode naturalness in the consumer's mind (Siegrist and Sutterlin 2017:321). Perceived naturalness is attributed to quality and there is a strong correlation between naturalness and acceptance which influence awareness (Siegrist, Hartmann and Sutterlin 2016:510).

Consumers are influenced by the carrier of nutrients and familiarity to nutritional terms like antioxidants (Bimbo *et al*. 2017:145). Consumers seek information, evaluate it, make a purchase decision, and undergo post purchase evaluation incorporating their experience with the novel fortified food products (Van Buul and Brouns 2015:1555). Communication plays a big role in consumer knowledge and influence attitude coupled with the purchase decision which is supported by health claims (Vicentini, Liberatore and Mastrocola 2016:339). In the next section, the aims and objectives of the study are explained.

1:5 AIM AND OBJECTIVES OF THE STUDY

From the problem statement (as noted in sub-section 1:2 in this chapter), many South Africans have limited information about food fortification (Nemeth 2016:795). The researcher intends to investigate on consumers' perspective towards fortified food products. The aim of the study is to assess the consumer level of knowledge and awareness of food fortification in line with benefits, exposure, disclosure, motivators and barriers against consumer awareness in consideration of the following objective:

- To determine consumer knowledge of the pros and cons of food fortification,
- To assess the motivators of consumer fortified food purchase intention, and
- To identify the barriers for consumer choice of fortified food purchase intention.

Understanding the consumers' level of awareness provides the platform for the intervention strategies to inform consumers of the importance of the fortification programme. The consumer perspective towards fortification should be considered seriously because the programme is targeting consumers for their health wellbeing.

1:6 RESEARCH HYPOTHESES

The research hypotheses are based on the aim and objectives of the study discussed in section 1:5. the study investigates consumers' level of awareness and establish the reasons for the low level of awareness. Wiid and Diggines (2015:57) define a hypothesis as an unproven opinion that assumes that there is a relationship between variables. A null hypothesis denoted by H_0, is the starting point of formulating the research hypothesis which suggests that there is no association between two or more variables (Schumacker 2017:6). However, the alternative hypothesis suggests that

there is a relationship between two or more variables (Wiid and Diggines 2015:264). Therefore, the probability that acknowledges an association is a p-value less than 0.05 by which a null hypothesis is rejected after statistical tests of the empirical data (Schumacker 2017:7). The null hypotheses for the study are as follows:

$H_0$1: Knowledge of the benefits of food fortification does not motivate consumers to purchase fortified food products.

$H_0$2: Awareness of the shortcomings of food fortification is not a barrier to fortified food purchase.

$H_0$3: Socio-demographic variables do not influence consumer purchase of fortified food products.

$H_0$4: Marketing activities do not influence consumer knowledge of the pros and cons of food fortification.

The alternative hypotheses include:

H_1: Knowledge of the pros of food fortification motivate consumer purchase of fortified food products.

H_2: Awareness of the cons of food fortification is a barrier to consumer fortified food purchase.

H_3: Consumers are influenced by socio-demographic factors to purchase fortified food products.

H_4: Marketing activities influence consumer awareness of the pros and cons of food fortification.

The research hypotheses are tested in chapter four of this study. In the next section the scope of the study is explained.

1:7 SCOPE OF THE STUDY

The researcher focuses on consumers around the Durban central region. Fortification involves various stake holders from scientists, politicians, producers, to consumers. The study is restricted to consumer behaviour towards the purchase of fortified food products and barriers for consumer awareness.

Furthermore, the researcher recommends the best intervention strategies to create awareness. The area of study includes Durban city centre, Overport, Berea, Essenwood, South beach, North beach, Greyville, Windermere, Morningside, Musgrave, Glenwood, Mayville, Sydenham, Springfield, Redhill, Clairwood, Bluff, and Mobeni. Due to limited resources, the survey is limited to the listed areas of Durban central region that are selected randomly. Figure 1:1 shows the region to be covered for the study.

Figure 1:1 eThekwini municipality (central region)

Source: eThekwini public map viewer 2018:1.

1:8 STRUCTURE OF THE STUDY

Chapter 1: INTRODUCTION

Chapter one involves the chapter introduction, the background, problem statement, rationale of the study, the theoretical framework related to the study, the aims and objectives of the study, the research questions, structure of the report

Chapter 2: LITERATURE REVIEW

This chapter provides in detail the general consumer awareness of the benefits of food fortification, knowledge of fortified products, awareness of essential vitamins, vital beneficiaries of fortified food products and awareness of the shortcoming of fortified food products, motivators, barriers and intervention strategies to create awareness.

Chapter 3: RESEARCH METHODOLOGY

In chapter three, the quantitative research design is discussed pertaining to its viability regarding the study. The concept operationalization, cross-sectional study, target population of the study, non-probability sampling, and convenience sampling issues are also noted in this chapter. The five-point Likert scale questionnaire designing based on consumer awareness of food fortification is addressed in this chapter. The importance of descriptive statistics followed by inferential statistics is also tackled in chapter three. Finally pretesting, delimitation, validity, reliability, and research ethics are considered in this chapter.

Chapter 4: FINDINGS, ANALYSIS, AND INTERPRETATION

This chapter involves the findings of the study and the statistical analysis relating to the empirical data. A summary of the results is presented in tabular and graphical format which include; reliability test, demographic distribution, sectional analysis relating to merits, demerits, motivators, and barriers. Cross-tabulation and correlation analysis is also included in this chapter to test the research hypotheses.

Chapter 5: RECOMMENDATION AND CONCLUSION

This chapter presents the conclusion and discussion of what should be done to create awareness. A summary of the theoretical and empirical study is also included. Before the conclusion of the entire study in this chapter, the limitations and scope of future studies relating to the marketing intervention strategies to create awareness of food fortification are discussed.

1:9 CONCLUSION

The South African government introduced food fortification as an intervention strategy to overcome the phenomenon of malnutrition. However, the consumers to whom the programme is beneficial are not aware or have limited information about the significance of the programme. This programme requires understanding the consumer, factors that influence knowledge, and the limitations to the purchase intention of fortified food products. The researcher's aim and objectives are to assess consumer knowledge and awareness of the importance and shortcomings of food fortification, motivators as well as the barriers for consumer purchase of fortified food.

There is low level of awareness and familiarity to fortified food products which calls for various intervention strategies to provide information to a consumer and encourage health eating habits. The study covers a sample of consumers from the central of eThekwini municipality. In the subsequent chapter, the study focuses on the previous studies relating to food fortification which will enable further research on the consumer perspective towards fortified food products.

CHAPTER 2. LITERATURE REVIEW

2:1 INTRODUCTION

Following the background in chapter one relating to malnutrition phenomena and measures to overcome it through food fortification, chapter two addresses an in-depth theoretical review of the level of knowledge and awareness of food fortification. This chapter covers consumer knowledge of the general benefits of food fortification, consumer awareness of the fortified products, essential nutrients, knowledge of the shortcomings of food fortification, motivators, barriers and intervention strategies to create awareness and acceptance of fortified products. Most of the countries in the Southern Africa have a similarity in socio-economic characteristics that influence fortified food consumption.

2:2 FOOD FORTIFICATION

Food fortification is the enrichment of food with dietary ingredients (minerals and vitamins) in order to overcome nutrition deficiencies (Hadebych, Van Kogelenberg, Sagalowicz, Michel and Galaffu: 2016:122). Similarly, Tsikritzi, Wang, Collins, Allen, Mavrommatis, Moynihan, Gosney, Kennedy and Methven (2015:1) contend that food fortification refers to the addition of nutrients and minerals in food to improve the health of consumers. Ndlovu (2017:50) defines food fortification as a deliberate intervention to uplift the nutrition status of consumers with the addition of micro-nutrients in food products.

Gavaza (2017:1) reported on news24 that Zimbabwe introduced the food fortification programme on 1st July 2017 under the umbrella of National food fortification strategy (NFFS). Maize, Sugar, Wheat and cooking oil are the main products fortified. In Zimbabwe 19% of children between 6-59 months lack vitamin A and 72% are faced with iron deficiency which has led to anaemia. According to Gharibzahedi and Jafari 2017:119, micro-nutrients are either vitamins or minerals and they are very tiny compounds that include calcium, iron, iodine, zinc among others. When the vitamins and minerals are not consumed adequately, consumers begin to face the phenomena of micro-nutrient malnutrition which is explained in the next sub-section.

2:2:1 Micro-nutrient malnutrition

Motadi, Mbhatsani and Shilote (2016:1) caution that, malnutrition is a great global problem retarding productivity and economic development. Micro-nutrient malnutrition has been labeled “hidden hunger” affecting one third of consumers globally (Hadebych, *et al.* 2016:1). Consumers may have a lot of unhealthy food but with a hidden hunger of essential micro-nutrients necessary for growth. Gebretsadikan, Bultosa, Forsido and Astatkie (2015:846) assert that, micro-nutrient malnutrition causes irreversible consequences that include a high mortality of children and vulnerable adults. Micro-nutrients are not beneficial for energy but are essential for the growth and maintenance of our bodies. They are referred to as micro-nutrients because our bodies need them in small portions (Sabliov, Chen and Yada 2015:13).

The 2016 global nutrition report states that, the world has a lot to do in order to eradicate malnutrition which has caused diet related diseases (Matadi, Mbhatsani and Shilote 2016:1). Experts estimate that nearly two billion people mostly from developing countries suffer from malnutrition and hidden hunger (Verma 2015:381). South Africa is among the countries suffering from micro-nutrient malnutrition. The next sub-section explains food fortification in South Africa.

2:2:2 Food Fortification in South Africa

Moving to South Africa, mandatory food fortification was introduced on 7th October 2003 for the purpose of overcoming nutritional deficiency (Van Jaarsveld, Faber and Stuijveberg 2015:315). According to Ndlovu (2017:50), in 2003 South Africa introduced a legislation to encourage food companies and processors to forcefully fortify common food products such as wheat flour and maize meal in a bid to reduce micro-nutrient deficiencies. However, despite of the existence of the fortification programme since 2003, Motadi, Mbhatsani and Shilote (2016:3) contend that, South Africans have little or no knowledge of food fortification.

Van Jaarsveld, Faber and Stuijveberg (2015:315) affirm that, the purpose of introducing mandatory food fortification in 2003 was to overcome the alarming consequences of malnutrition. However, consumers are not familiar with and have little knowledge about food fortification (Bekoglu, Ergen and Inci 2016:80). Motadi, Mbhatsani and Shilote (2016:3) also emphasize that, most South Africans are not

aware of food fortification. For the success of the fortification programme, consumers who are targeted by the government must be well acquainted with the benefits and shortcomings of food fortification in order to make health dietary choices. The next section covers the benefits of food fortification.

2:3 BENEFITS OF FOOD FORTIFICATION

There is a need to understand how consumers acquire knowledge, beliefs and how they approve their beliefs (Hasting and Domegan 2014:65). Understanding the consumers can offer better strategies geared towards creating food fortification awareness using the marketing tools. In the last decade consumers especially in the U.S.A. believed that health food products contribute to the wellbeing of the society. However, the study in Uruguay proved that knowledge of fortified food (functional food) or enriched food ingredients is still lacking (Bazhan, Keshavarz-Mohammadi, Hosseini, and Kalantari 2017:254).

Exposure and awareness of nutritional knowledge contributes to consumer demand for fortified products (Ndlovu 2017:41). Magalis, Giovanni and Silliman (2016:489) argue that, albeit knowledge is very important in making good health decisions, it is not a guarantee for consumers to change their behaviour to consume healthy food products particularly those who are not health conscious. However, if consumers are aware of the benefits of fortified food products, there is a greater likelihood that they will make healthier food choices. Fortified food products have several benefits to the consumer which are described in 2:3:1, 2:3:2, and 2:3:3 sub-sections.

2:3:1 Cognitive capacity and mental performance

Inadequate dietary intake can suppress mental performance especially among the children (Sandmann, Brown, Mau, Saur, Amling and Barvencik 2015:53). Detzel and Wieser (2015:37) confirm that physiological and cognitive capacity in young children is induced by fortified foods. Bloem and de Pee (2017:80) add that nutrition is very important during the first 100 days of life as a prerequisite for future cognitive capacity which helps the young generation to perform better at school and become useful to the society.Mental retardation, depression, suicidal thoughts, anxiety, bulling due to obesity, inferiority complex are all due to poor dietary intake (Skolnik 2016:211). In a study conducted by Kaur and Singh (2017:167), it was found that, food is not only for

satisfication but the nutrients in food products improve physical and mental abilities of consumers. To consumers it can be hard to believe that nutrients assist the brain to think rationally and have a good sense of judgement and reasoning but if nutrition scientists confirm this argument, consumers can make health food choices in to improve their mental performance.

2:3:2 Economic benefits

According to Sandmann *et al.* (2015:43), Germany suffered a burden of health care totaling to €9 billion and it is expected to increase to over €11 billion in 2025 due to micro-nutrient deficiency like vitamin D. A large sum of money is spent on poor health related diseases. By fortifying food products, there would be a decrease in consumers requiring medical attention thus saving on the costs of health. Many consumers are however not familiar with fortified products, consumers who are health minded and with adequate knowledge of the economic benefits have boosted the market of fortified food products by approximately $168 billion worldwide (Bazhan, Kalantari, Keshavarz-Mohammadi, Hosseini, Eini-Zinab and Alavi-Majd 2018:46).

Enriched food product sales are swelling in U.S.A, Europe and other countries like China, Brazil, Mexico, Russia, India and South Korea (Sabliov, Chen and Yada 2015:331). On the other hand, Detzel and Wieser (2015:37) added that, with a health society, production is improved as more skills are acquired due to better physiological performance. Furthermore, Skolnik (2016:210) states that, labour productivity is influenced by intellectual potential in that, by consuming fortified products, improved production can be realized by preventing anaemia with iron fortification. Many consumers are not aware of the economic benefits of food fortification and those who are aware focus on health benefits but not the resultant economic benefits.

2:3:3 Mortality and morbidity

Consumers are becoming aware of what goes to their bodies by looking at the additional health benefits (Kimberly 2016:58). Some consumers are avoiding certain foods and are seeking for products with added benefits like fibre and omega-3 to optimize health and wellbeing (Jacobsen 2014:42). In a study conducted by Magalis, Giovanni and Silliman (2016:493), it was observed that, most consumers were aware that whole grain diet reduces the risk of contracting heart disease, obesity and type-2

diabetes. However, a considerable number of respondents were not aware that whole grain reduces the risk of contracting cancer. There is also support for the fact that mortality and morbidity due to chronic diseases like cardiovascular complications, diabetes and other lifestyle diseases are a result of unhealthy diets (Montet and Ray 2016:304).

According to White, Addison, Campbell, Henderson, McGill, Payton and Antoine-La Vigne 2017:2), child obesity, morbidity and mortality among African Americans is rising owing to the finding that, these low-income earners are not practicing health food consumption. Families lacking knowledge of health diet have been subjected to fatal illnesses like; measles, pneumonia, diarrhea, night blindness, anaemia and over the next two decades; cardiovascular, chronic respiratory cancer, diabetes, mental health will account $47 trillion in losses (Skolnik 2016:212). Consumers' knowledge of the benefits of eating fortified food can reduce the death rate due to chronic diseases caused by lack of essential nutrients. This can lead to an increase in the population, eventually raising demand and economic growth for functional food.

2:4 CONSUMER KNOWLEDGE OF FORTIFIED PRODUCTS

Meghwal and Goyal (2017:282) suggest that, for the success of fortification, the product that carries nutrients (vehicle) should meet the following criteria; it should be inexpensive, commonly consumed, accessible and economical to produce. Consumers have less knowledge about the products that carry essential nutrients hence end up making unhealthy food choices. Consumers may make fortified food purchase once they know the products that are fortified with the vitamins and minerals for their health benefits. In most of the supermarkets, there is no indication that the food products displayed are fortified except for bread and maize meal which bear a fortification logo. Consumers are tasked with identifying the fortified products which have no label of fortification. The benefits of some of the fortified products are untangled in the subsequent sub-sections. Figure 2:1 reflects some of the popular products that are fortified.

Figure 2:1 Examples of popular fortified food products

Source: Fortified food marketing (Pty) Ltd. (2016:1). https://fortifiedfoods.co.za

2:4:1 Benefits of fortified bread

The study conducted by Guine, Matos, Henriques and Correia (2016:307) describe bread as the main source of energy with vital nutrients and a worldwide staple food of which its origin dates as far back as 4000BC in Egypt for its carbohydrates, proteins, dietary fibres, vitamin B complex and some minerals. De and Garrigues (2015:570) assert that, bread is an ideal vehicle for iodine and zinc which help in growth development especially for children.

According to Magalis, Giovanni and Silliman (2016:489), fortified bread is essential for improving digestive health, protect consumers from cardiovascular diseases and prevents type-2 diabetes. However, 93% of Americans do not meet the whole wheat requirement thus ending up eating the refined grain bread due to lack of knowledge of the health benefits of whole wheat bread. Globally, 2 billion consumers have anaemia, and lack iodine and 254 million pre-school children are vitamin A deficient (De and Garrigues 2015:560). With the awareness that whole wheat bread has compounds that reduce the risk of chronic diseases, more consumers are increasingly demanding whole wheat bread compared to refined bread.

2:4:2 The functional advantages of cereals to a consumer

Due to the presence of vitamins and amino acid in the bran, probiotic oats decrease abdominal bloating and bowel diseases (Montet and Ray 2016:222). Cereals are consumed worldwide and carry important vitamins like riboflavin, niacin, thiamin, folate and minerals such as iron and calcium (Meghwal and Goyal 2017:284). The consumption of breakfast cereal is on the rise with the preference of corn, rye, and wheat among others (Guine, *et al.* 2016:307). Knowledge of the health properties acts as an incentive for consumers especially women and children to consume cereals.

In a study carried out on Filipino children, it was concluded that cereal based products reduce the risk of anaemia among children (Detzel and Wieser 2015:34). Cereals contain vitamin A and zinc which enhances cognitive ability, boost growth and reduce the chances of getting anaemia (Meghwal and Goyal 2017:282). Consumers are aware of the benefits of cereals due to massive advertisement of breakfast cereals worldwide. Companies like Kellogg are so innovative that they develop different flavours and package that attract children (Kotler and Kotler 2013:76).

2:4:3 The benefits of fortified milk and milk products

Meghwal and Goyal (2017:287) contend that, the ideal fortification vehicle for iron is milk as its difficult to add vitamin C to milk since it changes colour. Yogurt is the main carrier of probiotics and fibre as well as folic acids which reduces the risk of contracting lifestyle diseases and chronic diseases such as; diabetes, cancer and obesity (Montet and Ray 2016:221). Since milk is normally taken with cereals, consumers obtain optimal benefits of iron and fibre and they are increasingly getting aware of the benefit of fortified milk. Margarine or butter is fortified with vitamin A and D and packed in opaque containers to avoid loss of vitamins which are beneficial for growth (Skolnik 2016:288). Consumers should be informed and advised to consider dairy products on their daily menu.

2:4:4 Rice fortification and its benefits to the consumer

Rice is the most eaten staple by almost half of the world population (Meghwal and Goyal 2017:294). It is fortified with vitamin B and iron and since its water insoluble, minerals and vitamins are added by coating, although it is washed off by the consumer

during cooking. Kam, Murray, Arcot and Ward (2012:354) emphasize that, worldwide approximately 3 billion people consumer rice fortified with folic acids. Rice is fortified with fibre, vitamin B, minerals that contain antioxidants that reduce; cell damage the prevalence of anaemia and anti-inflammatory effect (Pandey, Asha and Jayadep 2016:1014). The Food Advisory Consumer Service (FACS) (2017:14) confirms that, rice and other cereals fortified with folic acids and iron, plays a role in fighting illness, brain development, forming blood cells and oxygen transport.

2:4:5 Benefits of other fortified products

Iodine reduces the risk of contracting goiter, helps with intellectual potential and its good for cognitive development (Skolnik 2016:203). The salt and other condiments are fortified with iodine, iron and vitamin A (Jalal, Wuehler, Osendarp and De-Regil 2016:28). Consumers use salt every day, but they may not know the benefits of fortified salt. However, added salt can cause hypertension, stroke, and coronary heart diseases (Skolnik 2016:215). Fortified processed meat includes ham, beef bungers, chicken nuggets, sausage, and bacon which are enriched with omega 3 fatty acids, vitamin E, calcium, selenium, dietary fibre, probiotics, herbs and spices (Shan, Henchion, de Brun, Murrin, Wall and Monahan 2017:185).

In USA meat is fortified with vitamin D, potassium and fibre which are beneficial for body formation and a preventive measure of communicable diseases (Cashman and Hayes 2017:198). Since South Africans consume a lot of meat, awareness of the benefits of fortification can be addressed by fortifying all meat products. However, the World Health Organisation (WHO) classified excess meat as carcinogenic (causing cancer) and a source of other chronic diseases (Shan *et al.* 2017:186). Consumers may question the fortification of already health food but due to high consumption of processed meat, its ideal to fortify meat to cover a wide segment. However, with a major outbreak of listeriosis in South Africa 2016-2017, consumers are skeptical of processed meat (World Health Organisation 2018:7). It is important for consumers to be conversant with the benefits of nutrients so that they can select fortified food products with vital nutrients. The next section unravels the benefits of nutrients found in fortified products.

2:5 CONSUMER KNOWLEDGE OF THE BENEFITS OF ESSENTIAL NUTRIENTS

Nutrients in fortification comprise of vitamins and minerals that are added to enrich food products to overcome micro-nutrient deficiency among children and adults (Kerksick and Fox 2016:99). Micro-nutrients as articulated by (Sabliov, Chen and Yada 2015:13), do not improvise energy to the body but rather provide vitamins and minerals for growth and maintaining the body. When consumers are buying food products, it's important to know which product has what vitamins or minerals and what is the purpose of each vitamin and mineral. Marketers always use labels to inform the customers the ingredients in relation to vitamins and minerals for consumers to make healthier choices, but consumers usually ignore this information. Figure 2:2 shows the labels containing nutrients and minerals that consumers need to know their benefits.

Figure 2:2 Labels indicating vitamins and minerals in fortified products

Source: Pictures taken by the researcher in March 2018.

The benefits of nutrients are listed in the subsequent sub-section. Consumers may not know the fortified products but can start by looking out for essential vitamins and minerals if they are aware of nutrient benefits.

2:5:1 Vitamin A

Kerksick and Fox (2016:101) state that, products labeled vitamins A are essential for growth, night vision, wound healing and immune function. Jacobsen (2014:44) adds that most of the beverages fortified with vitamin A can prevent heart diseases and enhance brain development. Sources of vitamin A include; fortifies milk, and other

dairy products (Kerksick and Fox 2016:101). Consumers are aware of vitamin A but may not know its benefits. Marketers label products containing vitamin A with a visible letter A for informing consumers to make health choices.

2:5:2 Vitamin B benefits

The benefits of vitamin B as asserted by Kerksick and Fox (2016:101) include; metabolism of the central nervous system, creating blood cells and breaking down unwanted fat. Vitamin B can be found in fortified milk products and beef. Sabliov, Chen and Yada (2015:16) state that, vitamin B (thiamin) is also found in fortified cereals, whereas vitamin B_2 (riboflavin) can be traced in fortified bread. The germ and bran in cereals is a major source of thiamin and riboflavin which is good for child growth (Meghwal and Goyal 2017:294). Consumers who are aware of the benefits of vitamin B_1, B_2 may select such products bearing in mind the benefits of these vitamins for health purposes.

2:5:3 Vitamin C ascorbic acid

Sabliov, Chen and Yada (2015:21) contend that, vitamin C is essential for boosting immune function and can be traced in juice, especially orange juice products. Vitamin C is a water-soluble antioxidant (supports oxygen) which helps in metabolism (life support). Vitamin C counters unwanted substances in the body. Consumers' awareness of such benefits is minimal which requires intervention strategies aimed at creating awareness and consumption.

2:5:4 Vitamin D

Vitamin "D" deficiency is a worldwide problem but surprisingly it's the only vitamin from which its benefits can also be obtained from exposure to the sunshine (Sandmann *et al.* 2015:53). Close to three billion people have inadequate intake of vitamin D most of the fortified milk products contain vitamin D to help prevent; cardiovascular diseases, increase bone turnover, and enhancing the immune system (Kerksick and Fox 2016:101).

2:5:5 Benefits of Iron

Iron is a mineral that prevents anaemia, helps to transport oxygen and electrons in the body (De and Garrigues 2015:4). Kujawska, Ewertowska, Ignatowicz, Adamska, Szaefer, Zielinska-Dawidziak, Piasecka-Kwiatkowska and Jodynis-Liebert (2016:13) emphasize that, iron deficiency affects the whole world and has caused consumers to suffer from bowel diseases and anaemia. Consumers are not aware of the benefits of iron although it's labeled on products like soya beans, rice and milk. De and Garrigues (2015:568) state that, wheat flour, maize meal, have been successfully fortified with iron. This means that all the by-products of wheat and maize flour are fortified with iron which helps fight anaemia. Consumers who are aware of the benefits of iron choose iron bearing products, but most consumers have little or no knowledge of iron.

2:5:6 The benefits of iodine

Gharibzahedi and Jafari (2017:199) affirm that, Iodine is vital for growth development, reproduction, muscle function, metabolism, production of blood cells, adjustment of body temperature and speed up body processes. Iodine can be found in fortified salt, bread, milk, yogurt, and cheese. Iodine can prevent goiter complications (thyroid) if it is not ingested in excess (Sabliov, Chen and Yada 2015:28). Consumers may be familiar with iodine but do not know its benefits.

2:5:7 The benefits reaped from zinc

Zinc is a mineral that is useful for skeletal development, immunity, reproduction, human excellent performance and this mineral is found in whole grain, fortified cereals and rice are a very important sources of zinc (Kerksick and Fox 2016:107). Zinc also curbs growth retardation, skin disorder, impaired immune system, cognitive dysfunction and prevents susceptibility to infection (Skolnik 2016:203). Gharibzahedi and Jafari (2017:121) contend that, zinc reduces impotence, supports sperm production, and increases sexual maturation. Additionally, zinc maintains the immune system and reduces the risk of contracting acne or boils (FACS 2017:15).

2:5:8 Omega-3 fatty acids

Marriott, Yu, Majchrzak-Hong, Johnson and Hibbeln (2014:168) content that omega-3 prevents the risk of mental illness and cardiovascular diseases. Jacobsen (2014:44) also embraces the findings that, omega-3 is gaining traction in fortified beverages as consumers are getting aware of the health benefits of omega-3. Kaur and Singh (2017:176) affirm that, omega-3 enhanced canola oil has generalized trust among consumers who are aware of its benefits. Deshpande and Deshpande (2017:219) state that most of the seed-based foods contain omega fats such as sunflower, sesame and other legumes. Most of the products are now labelled “high in omega-3” which has led consumers to question the benefits of omega-3 fatty acids.

2:5:9 The benefits of dietary fibre

Kimberly (2016:60) is of the view that, consumers believe fibre is good for their health especially if it comes from natural sources. Dietary fibre is added in bread and whole wheat products to normalize the digestive system and prevent heart diseases (Magalis, Giovanni and Silliman 2016:489). The high nutritional value of dietary fibre fortified in bread and breakfast cereals can prevent heart disease and stimulate growth (Guine *et al.* 2016:307). Fibre food products like oat bran, wheat bran, rice bran, soy flour has high consumer demand nowadays (Longoria-Garcia, Cruz-Hernandez, Flores-Verastegui, Contreras-Esquivel, Montanez-Saenzi and Belmares-Cerda 2018:835). Marketers are now labelling their products “high in fibre” because consumers are slowly getting aware of the benefits of fibre. However, some producers label their products rich in nutrients without scientific approval which renders consumers to believe in false information.

Marketers have a role to play by informing consumers about all the benefits of the vitamins and minerals which are used as fortification materials intended to improve the health of consumers. However, consumers do not understand the information in the ingredients grid on the packages. A more vigorous promotional campaign is needed to expand consumer knowledge, otherwise the information on labels is purposely for the consumer to read and make an informed healthy food purchase decision. Shimp and Andrews (2014:641) add that packages motivate consumers, inform the consumer of brand features and justify value. Therefore, packages that include “omega-3”, high

in fibre, “with extra vitamins” should be designed in a way that will lure consumers to make better health decisions.

2:6 VITAL BENEFICIARIES OF FORTIFIED FOOD PRODUCTS

Essential micro-nutrient deficiencies are predominant in developing countries where there are limited diets compared to developed countries (Kam *et al*. 2012:354). Mills, Wilcox, Ibrahim and Roberts (2018:1) affirm that, dementia, depression and morbidity is rife among older consumers. Dietary deficiencies affect brain function especially with consumers who experience depression like the military (Marriott *et al.* 2014:168). Women at a reproductive age, children and the elderly are the priority to benefit from fortified food products (Samaniego-Vaesken, Alonso-Aperte and Varela-Moreiras 2016:148). Currently four billion people living in cities and by 2030, 60% of global population will be living in cities (Bloem and de Pee 2017:80). This means that there will be many consumers buying processed food than cultivating it in rural areas. All these categories of consumers require special attention towards benefiting from the fortification programme to avoid nutrition deficiency and its consequences. However, fortification benefits all the consumers, but we will focus on the most vulnerable consumers.

2:6:1 The old age consumer group

Baugreet, Kerry, Allen and Hamill (2017:111) state that, there is a health condition among the elderly exacerbated by loss of muscle strength, reduced appetite, decline in body function due to immobility. There is an increase in life expectancy among the elderly consumers especially in developed countries due to the desire to have a quality life and a fear of health costs among the elderly consumers (Vicentini, Liberatore and Mastrocola 2016:343). Older consumers, as articulated by Biesalski and Tinz (2017:65), always suffer from deficiencies of vitamin D and vitamin B and eventually death. This segment should be viewed as vulnerable and dependent on offspring. The marketing effort to encourage the elderly to consider fortified food should be focused on the offspring supporting the elderly as the elderly may not understand the benefits of fortified food products.

2:6:2 Targeting children for fortified products

Detzel and Wieser (2015:36) emphasize that children are at a big risk of iron deficiency which can hinder their metabolism, growth and body formation. Inadequate folate intake has been remarkably noticed among children which has caused many fatalities resulting in increased child mortality rate. Since children are a group that is forming body structure, they require all the essential nutrients adequately. The promotional message should be geared towards mothers' awareness of the benefits of fortified food products among their children.

2:6:3 Targeting pregnant women for fortified food awareness

Skolnik (2016:204) warns that, pregnant women who miss out on iron, zinc, iodine, folate, calcium, stand a chance of giving birth to babies who are stunt, mentally condemned and with enormous birth defects. Folic acid can prevent the incidence of neural tube defects as stated by Samaniego-Vaesken, ALouso-Aperte and Varela-Moreiras (2016:148). In a study conducted by Detzel and Wieser (2015:36), pregnant women stand a high risk of iron deficiency which can lead to anaemia. Health professionals together with marketers should target this group of customers through clinics and T.V commercials to encourage all women of childbearing age to consume fortified food products for the health of their babies as mothers compete for nutrients with their babies.

2:6:4 Awareness of the benefits of fortified food products among athletes

Jocobsen (2015:38) asserts that, fortified drinks provide hydration as well as nutrients that balance the body, heart, bone strength and immunity to optimize the performance of athletes. Iron is the most significant micro-nutrient for oxygen delivery to all the body tissues which can enhance athletes' performance (Kerksick and Fox 2016:103). Dietary fibre, whole grain products, fortified fruits help athletes to keep a normal body and avoid the consequences of obesity which can affect the athlete's career (Skolnik 2016:204). Athletes miss out meals during intense training, consume inadequate vitamins and lack nutrient timing (Kerksick and Fox 2016:211). Therefore, special marketing effort should be focus to all athletes to sensitize them on nutritional information for their health benefits to achieve their career goals of sports excellence.

Packages containing sports icons and the fitness of athletes' graphic artwork can capture the attention of consumers towards awareness of nutritional benefits.

2:6:5 Fortified products are beneficial to consumers of low immune system

It has been observed that probiotic yoghurt and some fermented fortified dairy products improve the immune system, lowers cholesterol and prevent those with low immune system to contract other diseases like ulcer, diarrhea and colon cancer. However, issues of knowledge, familiarity and attitude influence these vulnerable consumers to choose fortified food products (Bazhan *et al.* 2017:254). The global data survey of 2014 indicates that 60% of consumers use food to improve health. Longoria-Garcia *et al.* (2018:842) affirm that, a combination of probiotics and prebiotics especially in fortified bread can reduce bacteria concentration in blood, increase the CD4 count, improve immune system and a significant delay to initiate antiretroviral therapy against HIV/AIDS. Consumers with a compromised immune system like those with chronic illness and HIV patients can take advantage of the benefits of improving their immune system but many consumers have less knowledge as to whether fortified food can improve their immune system.

2:6:6 Impoverished communities

White *et al.* (2017:2) warn that, poverty-stricken societies have limited access to grocery stores, are not exposed to education and eat energy dense food which puts them to a risk of obesity. Government has a duty to access these vulnerable members of the society in order to avail healthy food with essential nutrients. Although this group of consumers may know the benefits of fortified products, they may not afford to buy those functional products. The poor disadvantaged consumers also miss out on Television and advanced media communication about health benefits as they may not have access to Television (Hasting and Domegan 2014:172). According to Penaloza, Toulouse and Visconti (2012:21), it has been observed that the poor sacrifice necessities to afford luxuries. For example, a poor consumer may sell the cow that brings milk and buys a car. Government has a duty to inform the community about nutrition priority against luxuries.

2:6:7 The benefits of fortified food products to urban consumers

Nutrition intervention has been focused to rural areas but today, four billion people are living in cities worldwide (Bloem and de Pee 2017:80). This massive exodus can be translated in a manner that, consumers are competing for health food in urban areas and have left rural agricultural land virtually unproductive to feel the gap on inadequate food. Therefore, processed fortified food products have been welcome in urban areas far more than rural areas. One can infer that urban dwellers have more knowledge for the benefits of fortifies food products than their counterparts in rural areas who do not consume processed food. Marketers should target urban consumers for the purchased of fortified food products.

2:6:8 Fortified products for military diet

Marriot *et al*. (2014:168) embrace the fact that, brain function, depression, suicide, cardiovascular illness, and mental oppression affect consumers in combat. Yet little may be known about nutrition among America duty personnel. Unsaturated omega-3 fatty acids can reduce the degree of psychiatric distress exacerbated by seeing the wounded and killed (Hibbeln and Gow 2014:117). Little is known about diet and nutrients in the US army because the military is not included in the National Centre of disease control and prevention (Marriott *et al.* 2014:168). The omega-3 and omega-6 fats are essential for the brain and body to improve the American military diet (Hibbeln and Gow 2014:118). Since omega-3 and omega-6 fatty acids are commonly extracted from fish, marketers supplying the army should promote eating products fortified with these compounds and increase awareness through labelling and packaging.

Each of the beneficiaries listed require a unique promotional campaign to raise awareness among the vulnerable consumers. However, fortified food products are essential for other groups of consumers who are not listed but to a greater extend the vulnerable should be priority. The researcher has covered the benefits of fortified food products from different angles to an extent that attention is now directed to the shortcomings of food fortification to a consumer.

2:7 AWARENESS OF THE SHORTCOMINGS OF FORTIFIED FOOD PRODUCTS

Albeit fortified food products increase micro-nutrients intake, they are not substitute to natural quality diet that gives adequate nutrition (Meghwal and Goyal 2017:299). Fortified food products have advantages and disadvantages where the advantages can motivate consumers to purchase these health products and the disadvantage can turn out to be barriers against consumer choice of fortified food. However, one cannot talk about motivation or barrier with little or no knowledge of fortified food products on the side of the consumer. The study illuminates on the motives and barriers in the forthcoming sections but for now let the researcher focus on the disadvantages of fortification towards the consumer.

2:7:1 Awareness of the dangers of exposure to minerals in fortified products

Mineral deficiencies have a negative impact on human health that include; anaemia, rickets, osteoporosis and the effect on the immune system (De and Garrigues 2015:563). Fortified salt with iodine mineral contents if taken excessively can lead to heart disease, stroke and blood pressure (Guine *et al*. 2016:316). Skolnik (2016:215) adds that fortified salt can cause hypertension and coronary heart diseases. On the other hand, iron fortification if taken in excess puts the consumers at a risk of developing cancer and heart attack (De and Garrigues 2015:565). The intake of modest doses of dietary sodium has caused 83 million consumers subject to Disability-Adjusted Life Years (DALYs) and death of over 4 million consumers in 2015 globally (Campbell and Train 2017:1). Consumers' lack information about the dangers of some minerals incorporated into fortified food products.

Excess calcium and vitamin D can increase the risk of bone fracture (Whitining, Kohrt, Warren, Kraenzhin and Bonjour 2016:1103). Jacobsen (2015:41) also adds that, calcium can cause arthritis, kidney stones, heart attack and cardiovascular diseases. The US government has introduced measures to counteract the problem of consumer excess consumption of fortified food using recommended dietary allowance (RDAs) and upper intake level (UL) (De and Garrigues 2015:73). However, Whitining *et al*. (2016:1099) contend that fortification of food products with minerals and vitamins is done at a large scale covering a wide segment, it's very difficult to segregate consumers with inadequate nutrients from those with adequate nutrients. There is a

greater risk of excess consumption to some consumers. Consumers are not aware of the dangers of excess consumption of the essential nutrients which can lead to overweight and obesity.

2:7:2 Consumers knowledge of allergies in fortified food products

Guine *et al*. (2016:309) warn that, gluten (mixed proteins) in wheat and eventually in bread, comprises antibodies which can trigger asthma and dermatitis among sensitive customers. Deshpande and Deshpande (2017:293) state that allergies, hyperactivity, attention disorder is because of additives in fortified products. The additives can cause brain damage, nausea, diarrhea, heart defects, liver and kidney failure. In a study carried out by Shaw (2017:3) at the university of New Hampshire, it was found that, allergies are subjective and severe among children causing itching, eczema, skin reaction, swelling around the mouth, wheezing, dizziness, a decrease in blood pressure, increased heartbeat, and inability to breath. Government should put up food safety measures to force food processors to inform consumers the allergic compounds found in fortified food especially milk and peanut products.

2:7:3 Awareness of the dangers of technology used in food fortification

Nanotechnology is the new technology used in processing different household products including fortified food products to improve the shelf life (Montet and Ray 2016:147). Nanoscale bioactive substances and synthetic materials are nano-encapsulated in fortified products for better dispersion of nutrients, protecting nutrients from degradation and masking bad odour or taste (Sabliov, Chen and Yada 2015:348). Shukla, Haidorai, Hwang, Bajpai, Huh and Han (2017:2) affirm that, nanotechnology preserves the flavour, nutrition content, food functionality, and helps to detect the bacteria in food that can cause disease.

Sabliov, Chen and Yada (2015:349) state that nanoscale are prone to toxic substances and physic-chemical properties that may alter the final product which can cause fate in the body. However, Kotler and Kotler (2013:98) embrace companies that are innovating with the new nanotechnology. Food processors should indicate on the package the products that have been manipulated by nanotechnology but because nanoparticles are invisible to the consumer, they may not influence the consumer in purchase decisions. Consumers question the technology used to process the food

they eat especially if its futuristic. For example, the ultraviolet light exposure of the mushroom which increases vitamin D intake was received with suspicion of product quality (Calvo and Whiting 2013:212). Consumers should be informed of the technology used in food processing as they are the final users of the product. This can improve the level of consumer knowledge of the disadvantages and advantage of using technology in food processing.

It can be observed that the advantages of food fortification outweigh the disadvantages hence proving the programme to be beneficial to the consumers. However, consumers' awareness of the pros and cons of food fortification is still very low, and interventions should be instituted to create awareness for better health decisions. Micro-nutrient malnutrition is still prevalent due to consumer limited knowledge of food fortification. Consumers who have some knowledge of fortified food products are motivated by some factors which the study addresses in the next section.

2:8 MOTIVATORS OF CONSUMER FORTIFIED FOOD PURCHASE

According to Kaur and Singh (2017:167), consumers are increasingly recognizing the role of fortified or functional food products due to impending high health costs and the prevalence of health-related diseases. Consumers would like to improve their physical health, maintain weight, and prevent bad health conditions (Sabliov, Chen and Yada 2015:331). Various factors contribute to consumers' choice of fortified food which include; perception, attitude, sensory properties, promotional activities, social-cultural issues and the vehicle carrying fortification materials.

2:8:1 Perception and attitude towards fortified (enriched) food products

Consumers' perceived benefits, quality, risk of contracting diseases and healthiness act as a motivator to make healthier choices (Kaur and Singh 2017:171). Most consumers have a positive attitude towards whole grain diet because they perceive that, the health properties will reduce the risk of heart disease and diabetes (Magalis, Giovanni and Silliman 2016:488). Consumers are avoiding some ingredients and constantly looking for the products with benefits like omega-3 or rich in fibre to meet their health demands (Jacobsen 2014:42). Although consumers are increasingly getting aware of the health benefits due to fears of health-related consequences, there are pockets of ignorant consumers.

Shan *et al*. (2017:186) define attitude as a cognitive tendency to evaluate a situation or substance with some level of favour or disfavour. A positive attitude is driven by perceived reward, like nutritional benefits of iron, zinc and perceived food safety. However, in a study conducted by Bazhan *et al.* (2017:258), most housewives perceived that, health ingredients are unrealistic and unreliable. Despite of the perceived benefits of whole bread, consumers still prefer white bread made from refined flour due to low level of awareness of the health benefits of whole bread (Guine *et al.* 2016:310). Albeit perception motivates the consumer to buy fortified food, consumers need some knowledge of fortified food products to defend their perceptions and attitudes otherwise, other factors may be responsible for consumer motivation.

2:8:2 The influence of fortified product sensory properties

Knowledge and perception of fortified products may not always translate into purchase of fortified food (Magalis, Giovanni and Sillima 2016:489). Fortified food choices are often influenced by flavour, texture, and appearance as articulated by Chanadang, Chambers and Alavi (2016:1211). In addition, consistency and homogeneity is crucial to facilitate cooking. Guine *et al*. (2016:314) contend that, cereals and whole bread purchase are not for the purpose of health concern but a choice of aroma, colour, taste and texture. Kam *et al*. (2012:361) add that, the colour of fortified rice, texture, hardness, and stickiness greatly influence consumers' choice of fortified rice. Pandey, Asha and Jayadep (2015:1017) state that, fortified rice with iron changes colour from white to a yellowish undesirable colour which put off consumers. Other issues of hardness, cohesiveness, stiffness, chewiness go hand in hand with colour to influence consumers' choice.

Kraus (2015:1630) adds that, of all sensory properties, taste is a key factor for marketing fortified food followed by smell, colour and consistency. Longoria-Garcia *et al*. (2018:842) affirm that, acceptability of fortified bakery products doesn't primary depend on appearance, flavour, texture and aroma, but the diameter, and hardness can also influence consumer desires. Withers, Lewis, Gosney and Methven (2014:1233) subscribe to the view that, fortified beverages have a mouth drying astringency and a bad after taste that hinders enjoyment. However, Sabliov, Chen and Yada (2015:69) affirm that, the droplets of nanoscale particles harmonise stability, rheological properties, colour, and taste making fortified products acceptable.

Marketers encourage consumers to purchase enriched food products basing on the sensory properties which in turn encourage awareness. Consumers may desire the taste, aroma or colour and later realise the health benefits of fortified products.

2:8:3 Consumer choice of fortified products basing on fortification materials

The problem of selecting a suitable vehicle (the carrier of nutrients) that will bear consumer acceptance is still looming large (Meghwal and Goyal 2017:282). In a study managed by Lu (2015:1880) it was found that, consumers accept yogurt fortified by omega-3 than beef or cereals enriched by the fatty acids of omega-3. Schnettler, Sepulveda, Bravo, Grunert and Hueche (2018:425) contend that, using meat as a fortification vehicle can have a negative impact on consumers who are conscious of high cholesterol, cancer, obesity and cardiovascular diseases. In another study, it was observed that over 3 billion people accept rice as their caloric intake globally, which makes rice an acceptable vehicle to carry folic acid (Kam *et al.* 354). However, the nutrients wash off during preparation and cooking of rice by the consumers.

Pandey, Asha and Jayadep (2016:1015) emphasize that, fortification of food with iron produces undesirable effects like change in colour. Therefore, iron fortification may not be desirable in milk but can be accepted in condiments and flour (Detzel and Wieser 2015:37). Jalal *et al*. (2016:34) also added that, fortified salt can easily be accepted in condiments.

Shan *et al*. (2017:017) caution that, adding healthy nutrients to unhealthy food can be received with criticism. However, one wonders why fortify food which is already healthy. Bazhan *et al*. (2018:51) observe that, consumers accept fortified products from credible, famous and popular brands. Brands like Kellogg and Nestle carry greater acceptance than unpopular brands. Food producers should choose the fortification materials that match with the vehicle to influence acceptance.

2:8:4 Motivation by socio-cultural and demographic issues

According to Jacobsen (2014:43), millennials have picked a greater interest in fortified foods and are influencing their peers, family and friends through word of mouth (WOM). Families spread information about the health benefits of fortified products which motivates consumers (Bazhan *et al*. (2016:255). Masterson, Phillips and

Pickton (2017:315) are of the view that (WOM) through viral marketing on tweets, postings and other social media sources, influence the consumer choice greatly. Dietary patterns are greatly influenced by family, ethnicity and friends (Hasting and Domegan 2014:63). Kaur and Singh (2017:169) state that, age, gender and education motivate consumers' choice of fortified products. The consumption of fortified food is higher with old adults and the youth. Taste cultures differ depending on gender and social class where we find consumers who are refined, light, heavy, fatty, coarse, delicate food advocates, depending on gender and social class (Penaloza, Toulouse and Visconti 2012:17).

Guine *et al*. 2016:310 adds that, men consume more wheat fortified bread compared to women. The emotional reaction towards food is largely influenced by cultural groupings. Dodds and Chamberlain (2017:43) go on to comment that food known to be unhealthy is taken differently by North Americas compared to the French. Mississippi communities commonly eat fried chicken, fish, and cornbread hence influencing their fellow members to demand the same (White *et al.* 2017:2)

Neophobia (fear for unusual food) negatively affect the consumer when accepting unfamiliar fortified products (Kaur and Singh 2017:169). Cultural and traditional habits influence the dietary demands. Marketers must engage in massive advertising to change consumer bahaviour socially and redirect the society towards health food consumption and awareness of the benefits.

2:8:5 Motivation of the consumer by promotional activities

The discovery of nutrients vital for human health and the development of lifestyle chronic diseases has ushered in the realization of new markets (Dodds and Chamberlain 2017:43). Nearly 30% of North Americans purchase products that contain improved health components (Sabliov, Chen and Yada 2015:332). Bazhan *et al*. (2017:255) assert that, products with nutrition benefits will not be successful on the market unless consumers are aware of their availability. Nutrition content advertised can encourage the consumption of fortified products as articulated by Lu (2015:1874). Grocery stores especially in urban areas are filled with products labeled "low sodium, reduced fat" and "high in omega-3, and many health promotional appeals (Dodds and Chamberlain 2017:43). These promotions slogans motivate the consumer to buy

health fortified products. The promotional messages inform and persuade consumers to understand the benefits of fortified products as well as triggering a purchase action.

Vicentini, Liberatore and Mastrocola (2016:340) emphasise that, new products bearing pictures as well as instructions related to health fortified food are commanding a widening market share. Graphic designs have been seen to be playing a big role in transforming consumers towards health food choices (Kaur and Singh 2017:174). The additional health information increases consumer confidence.

In a study conducted by Bazhan *et al.* (2018:52), it was found that, most housewives obtain nutrition information on television and information on the product package which influenced their purchase decision of enriched products. When consumers see commercials like; Powerful antioxidant, they end up buying products like margarine (Dodds and Chamberlain 2017:44). Health claims with or without nutrition ingredients motivate the consumer to buy fortified products (Lu 2015:1882). However, consumers are losing trust with nutritional claim as addressed in the next section relating to barriers of consumer choice of fortified food products.

Sabliov, Chen and Yada (2015:332) state that, there is continuous mismatch between the decisions of experts like; nutritionists, technologists, marketers, and consumers' concerns about new fortified products. Product development entails knowledge of the consumers and the products to avoid product failure. Consumers enjoy unhealthy food more than health foods, but fear-based promotions can motivate them to change their unhealthy behavior. Marketers together with the physicians are a good source of trusted information where the involvement of nutritionist and doctors advise has seen an increased demand for enriched dairy products (Bazhan 2018:55).

Health components like "natural products" "whole grain", "fortified products" "enriched products", "enhanced with fibre" and "contains vitamin C, or D" increase the perceived quality of the product (Kaur and Singh 2017:168). Marketers have a big role to inform the consumers about the benefits of fortified food products, in order to created awareness which can stimulate the purchase. Consumers rely on the information on the product in media, and within the society in order to make healthy choices. However, there are some barriers that may hinder consumers from making healthy food choices even if they are well informed of the healthy benefits.

2:9 BARRIERS FOR CONSUMER CHOICE OF FORTIFIED FOOD PRODUCTS

Households in developing countries have limited access to fortified products and many have little willingness to purchase these enriched food products (Jalal *et al*. 2016:28). White *et al*. (2017:2) add that, many consumers especially the poor have limited access to; grocery stores, education, and health promotions. There is a problem of affordability, accessibility and availability of fortified food products. Bloem and de Pee (2016:81) are of the view that, nutrition has always been considered as a rural problem, but urban areas of low-income earnings suffer the same problem. The barriers for consumer choice of fortified food range from; high prices of fortified food products as opposed to income, lack of trust in label claims, naturalness, to inadequate health related information on the side of the consumer.

2:9:1 The high price of fortified food products

Detzel and Wieser (2015:40) contend that, poor households are more price sensitive thus buy less of fortified products especially when the price of fortified food like milk is high. Fortified foods are innovative products of which the extra cost is added to the final price the consumer must pay hindering consumer choice negatively (Shan *et al*. 2017:186). Whole grains cost up to 33% more than refined cereals making consumers opt for refined products (Magalis, Giovanni and Silliman 2016:490). Giles-Smith (2015:58) confirms that, consumers who are price conscious do not buy enriched food products. Hadebych *et al*. (2016:123) warn that, mineral ingredients used in fortification like iron are costly, hence shooting the selling price up, which discourages consumers from buying fortified products.

In a study covered by Schnettler *et al*. (2017:425), it was found that consumers are willing to buy ham and margarine fortified with omega-3 and vitamin E if the price remained unchanged. Bazhan *et al*. (2018:52) also agree that, consumers buy food products depending on the price irrespective of the health properties such products carry. The high price of fortified products as articulated by Vicentini, Liberatore and Mastrocola (2016:340), is due to the technology cost manufacturers invest in developing fortified products. In a study conducted by White *et al*. (2017:7), participants insisted that the cost of food is high and maintaining a healthy diet must

be compromised nowadays. Consumers cannot afford the price of enriched products and tend to ignore any information related to the functional products.

Low- and middle-income consumers especially those staying in urban areas spend 70% of their income on food. Bloem and de Pee (2016:82) go further to comment that, since urban poor households depend on imported fortified foods, they are subject to global food price hikes making them demand less of enriched food products. The poorest consumer has a high price elasticity in that a small decrease in price will fetch a high demand for functional foods. The higher monetary sacrifice reduces the purchase intention as observed on the consumption of fortified yogurt (Kaur and Singh 2017:172). Consumers who might be aware of fortified food products are turned away by the price of essential food products, but it can be analysed that, the cost to cure diseases can be higher than the price paid for fortified food products to prevent such poor dietary related diseases.

2:9:2 Lack of trust in label claims

Nutritional messages are changeable and very much confusing to the consumers (Dodds and Chamberlain 2017:42). Claims like; “strengthens hair”, “improves memory”, maintains body weight “high in dietary fibre” and omega-3 fatty acids, have lost consumer trust (Kraus 2015:1629). Buono (2017:42) noted that, the abundancy and complexity of health messages discourage consumers from making proper health choices. In Europe, to claim “high in” the micro-nutrient should not be less than 15% of 100gms. Cashman and Hayes (2017:199) add that, only lean pork, not lamb or beef qualify for the claim “low saturated fat”. Consumers are very critical of label claims and have lost trust. With the loss of trust in label claims, consumers tend to ignore even useful health information calling it fake.

Bazhan *et al*. (2017:258) caution that, the information for fortified dairy products are confusing and inconsistent. The message from radio, television and newspaper differs from the uncertain message from shopping centres. Claims like “reduces the risk of contracting diseases” suggest that, the consumption of such food, will prevent the risk to contract certain diseases has faced criticism (Vicentini, Liberatore and Mastrocola 2016:342). Other claims like “organic” “multi-grain” have been misleading to the consumers, hence raising suspicion. Consumers may not differentiate between healthy and unhealthy food products thus ending up making poor choices.

Consumers are more interested in health promoting information rather than disease prevention claims (Kaur and Singh 2017:169). Labels with a “nano” sign develops skeptics among consumers who have the view that nanostructured minerals like titanium and silica doesn’t dissolve easily in the stomach and can cause toxicity (Florentine 2016:46). Kimberly (2016:59) caution that, the new market with a large influx of fortified food products has created mistrust and a high degree of confusion that has resulted in low demand for fortified food products. Although labels inform the consumer of the health benefits, unscrupulous food processors are taking advantage of the new market for functional food by falsely labelling their products as “healthy”, which has caused consumers’ lack of trust in the health claims.

2:9:3 Naturalness of fortified products

Health oriented consumers are always questioning the naturalness of fortified food products and purity (Shan *et al*. 2017:187). In a study conducted by Megalis, Giovanni and Silliman (2016:494), consumers indicate that refined grains have bleach and chemicals, while others commented that, fortified refined grains are later enriched by nutrients after being deprived of naturalness during food processing. From this consumer perspective, it’s obvious that consumers are least interested in products that are induced with nutrients after being deprived of the natural nutrients originally in the natural products. Consumers favour natural products and are skeptical of processed products making them least interested in buying enriched foods.

Sandmann *et al*. (2015:57) caution that, fortified products contain artificial additives. Consumers believe that preservatives and antioxidants which extend fortified food shelf life, flavour, enhancers, colorants, and sweeteners are artificial (Deshpande and Deshpande 2017:220). Caleja, Barros, Antonio, Oliveira and Ferreira 2017:342) add that anti-microbial, anti-browning and antioxidant agents that preserve delicate fortified products have synthetic molecules that are toxic and carcinogenic (causing cancer). Consumers who are enlightened avoid fortified products claiming that they contain toxic chemicals.

Consumers look out for products that are labeled “natural” provided that the taste and price is not compromised (Scott and Rozin 2017:572). There is a belief among consumers that, functional food products or fortified foods carry some harmful substances as compared to conventional food (Bazhan *et al.* 2017:261). it is evident

from De and Garrigues 2015:560) that, consumers are turning away from fortified products and are seeking for naturally high vitamin and mineral products. Most sausages and ready to eat fortified products like turkey and pork are associated with additives that could be dangerous to human life (Schnettler *et al*. 2017:432). Consumers should be informed that most of the fortification materials are obtained from natural sources to increase consumer interest in fortified products.

Nowadays consumers are willing to pay a premium if the fortified food product has components of nature and therefore in order not to turn off consumers, fortified food should carry the natural content (Kraus 2015:1623). Consumer acceptance of products like fish oil or tuna salad received positive response compared to products fortified with synthetic additives (Lu 2015:1873). Contrary to naturalness, consumers complain about whole grain as being bitter, dry and coarse with a buttery spongy mouth feel and hence prefer refined bread (Magalis, Giovanni and Silliman 2016:490). Additives can modify these properties, but these additives contain chemicals that can cause asthma, vomiting, worsening eczema, tight chest, rashes, bay fever and headaches which bar consumers from consuming fortified products. Caleja *et al*. (2017:345) contend that the additives, however, tend to influence the colour of the final product like fortified biscuit with artificial additives tend to turn yellow and change in lightness which turn away consumers.

Scott and Rozin (2017:572) are of the view that, fortified milk products with the natural fat removed through manipulation and later vitamin D is added, alters the nutrition richness of the milk which impacts consumer acceptance of fortified low-fat milk. Consumers have a negative attitude towards processed fortified food products in that, acceptance of fortified cereal-based products with artificial minerals can be very difficult for consumers who are skeptical of minerals like potassium put in oats, rye and wheat (De and Garrigues 2015:560). However, albeit there are consumer skeptics about artificial additives, fortified products must have additives that preserve, protect, and retain the nutritional content of the food product overtime. Food processors engaging in fortification of food products should as much as possible use natural fortification materials than artificial ones to increase the acceptance of fortified food products.

2:9:4 Convenience due to consumer busy lifestyle

Giles-Smith (2015:57), contends that, consumers with active busy lifestyle do not have time for preparing a healthy fortified meal. The development of technology, urbanization, and increase in female working population has shifted the consumers from the consumption of fortified staples to ready to eat unhealthy food products (Behmadi *et al*. 2015:752). With limited time, convenience food products are increasingly influencing consumers' purchase decision. According to Bloem and de Pee (2017:82) consumers are opting for cheaper convenient unhealthy food from vendors which needs little time to prepare as compared to fortified products. The extra time needed to prepare whole grain as articulated by (Magalis, Giovanni and Silliman 2016:490) and the complexity of preparing whole grain deter consumers from buying fortified food products. Ndlovu (2017:9) also affirms that, consumers deviate away from fortified food products for convenience hence resorting to fast foods with sensory appeal and satisfaction but unhealthy.

Gharibzahedi and Jafari (2017:121) define bioavailability as the fraction of nutrients that are absorbed in our bodies for physiological use to maintain body function. From this definition, one can understand that the quantity of food that we eat doesn't matter more than the quality of micro-nutrients ingested. Consumers demand tasty energy dense food products with less or no bioavailability due to limited time for them to prepare a healthy fortified meal. Bloem and de Pee (2017:82) state that take-aways sell high fat and high sugar drinks to consumers rushing to work in urban cities which has caused a 32% urban population being obese. Often, the busy consumer lifestyle comes with uncontrolled stress at work and home as (Ndlovu 2017:7) stipulates that, people consume meat, fats, sugar and starch during stressful moments. The South African National Health and Nutrition Examination Survey (SANHANES) reported the most shocking news that, 36.3% of ladies between 25-34 are obese and 19% of men in the same group are obese.

The convenience and availability of unhealthy ready to eat products has shifted consumers from demanding healthy fortified products to easily accessible streetwise meals (Kraus 2015:1623). During busy time, consumers are not interested in the health benefits of food products but pay more attention on satiety. The busy lifestyle

unhealthy diets have contributed to lifestyle chronic diseases, disorders, obesity, diabetes and cancer according to WHO (Montet and Ray 2016:304).

However, innovative marketers have come up with the immune ready-to-drink shelf-stable side beverages like cold-pressed juice so that everybody can grab something and go (Buono 2017:44). Whereas other companies like Kellogg, Campbell have developed quick acceptable fortified asparagus soup (Kottler and Kottler 2013:76). Food processors should develop new segments and innovate ready to grab fortified products for consumer living a busy lifestyle especially in the urban areas.

2:9:5 Inadequate nutrition related information

Despite of the health benefits of fortified products, Bazhan *et al.* (2017:254) noted that, consumers have low knowledge of functional ingredients like fibre and antioxidants which leads to low demands. In the study managed by Magalis, Giovanni and Silliman (2016:494), consumers were asked whether whole grain reduces the risk of cancer, a majority of the participants answered incorrectly. One can infer that consumers are not aware or have little essential health information about nutrition which hinder them from buying fortified products. According to Sandmann *et al*. (2015:54), consumer-led opportunities depend on consumer knowledge, therefore market penetration of fortified products depends on consumer awareness. Consumers' knowledge of fortified products, however, is minimal and exacerbated by limited communication. In a study by Ndlovu (2017:41), it is revealed that exposure to health-related nutrition triggers fortified food purchase. There is a positive relationship between nutrition knowledge and health dietary intake.

Research done by Magalis, Giovanni and Silliman (2016:494) concluded that, many consumers are unaware of the logo that represents whole grain and think that refined grains are modified genetically as compared to whole wheat grain. All these findings reveal that consumers are ignorant and need proper communication channels to get information related to nutritional health. Several studies including that of Sandmann *et al*. (2015:57) found that, consumers lack nutritional information. These studies highlight that consumers do not know the source of vitamin D. Albeit 40% correctly answered; sun, milk products, and fish, incorrect answers included water and cereals.

The poor knowledge of nutrition related information is a great deterrent for consumers to purchase fortified products. It suffices to note that even Lu (2015:1879) subscribes to the finding that, nutrition knowledge has a connotation connected to consumer purchase intention of fortified food products. However, nutritional knowledge goes hand in hand with nutritional carrier and taste which may hinder consumers from purchasing functional products.

There is a divide between experts who have better nutrition knowledge and non-experts (consumers) who are the end users of such information. Dodds and Chamberlain (2017:47) go on to comment that, the consumers are forced to rely on experts' recommendations rather than tastes and preferences which disconnect consumers from listening to experts' nutrition information. One can conclude that experts should research consumer preferences first then relate nutrition benefits along consumer aspirations. Lu (2015:1882) concluded that, nutrition information elevates the consumer to make fortified food purchase intention but to a little extent to consumers who have already experienced the benefits of fortified food products.

Efforts should be geared to consumer experience rather than primarily confusing consumers with unclear nutrition information. Sandmann *et al*. (2015:57) caution that, knowledge is sometime severe if consumers get to know that a product is fortified. Some consumers focus on the negative side of food fortification and therefore, the knowledge that the product is fortified may hinder consumers from buying fortified products.

Magalis, Giovanni and Silliman (2016:489) are of the view that, awareness of not only the whole grain but the properties that promote health can influence or bar consumers from choosing refined wheat over whole wheat. Consumers have limited knowledge on the health effect (Bazhan *et al*. 2017:261). For example, Sandmann *et al*. (2015:59) contend that, acceptance of vitamin D-fortified products is related to knowledge of ingredients. Consumers' increased knowledge of risks associated with the deficiency of Vitamin-D triggers consumer purchase intention. Consumers with some knowledge of the benefits food fortification may be willing to purchase fortified food products.

2:9:6 Level of education

White *et al*. (2017:7) agree with the findings of Sandmann *et al*. (2015:54) that consumers have the desire for good tasting unhealthy food products due to limited education. Nutritional information is always complicated and confusing that it requires some form of education therefore consumers end up making ignorant decisions due to limited education (Dodds and Chamberlain 2017:47). With a low level of literacy, consumers are virtually unable to read and interpret nutritional value which limits their health food choices. It was noticed in the study of Guine *et al*. (2016:311) that consumers with a high level of education favour fortified bread compared to refined bread which is as a result of better knowledge of nutritional benefits.

Magalis, Giovanni and Silliman (2016:489) argue that, consumers' knowledge will not always increase the demand for fortified products as other factors like sensory properties may hinder consumers to purchase fortified products. Similar studies in Houston University Texas unveiled significant relationships between nutritional knowledge and healthy dietary intake (Ndlovu 2017:41). From these studies, it can be worth noting that consumers with nutrition information will have a positive response towards fortified products.

2:9:7 Hidden hunger

Micro-nutrient malnutrition unlike macro-nutrient malnutrition, doesn't arise an internal stimulus of hunger because small quantities of micro-nutrients are needed which result in consumers to develop a silent epidemic of hidden hunger (Meghwal and Goyal 2017:204). Consumers may not notice micro-nutrient deficiency immediately rendering them less concerned because the effect is only realised overtime. As a result, consumers are not bothered to seek for health information as they realise no nutritional deficiency effect.

Schnettler *et al*. (2017:430) affirm that, consumers know nothing or very little about the nutritional benefits of fortified products. Therefore, it is very hard for consumers to notice the problem of micro-nutrient malnutrition which renders the purchase of fortified food products useless to consumers. Consumers have little knowledge of the value of nutrients embedded in functional food products.

2:9:8 Family matters

Consumers are information seeking especially those with larger families and children under the age of 12 years (Schnettler *et al*. 2017:436). The interpretation is that small families with no children are not information seeking as regards to nutrition benefits which bar them from choosing fortified products. In a study conducted by Bazhan *et al.* (2017:257), it was found that few housewives could answer correctly that fortified dairy products are more functional than conventional ones. However, in the same study it was realised that half of the housewives who participated in study had in fact consumed skimmed milk probiotic diary fortified with nutrients and omega-3 after defining functional foods. Consumers, therefore, purchase fortified food products without realizing the health benefits they carry.

There is a problem of unhealthy family habits being transferred to family members by encouraging others to take double portions of good tasting, unhealthy food which limits the spread of nutrition information (White *et al*. 2017:7). This can be termed as peer group miss-information of nutrition health which can render consumers to make poor dietary choices. Consumers can influence each other to access unhelpful information regarding nutrition health hence making unhealthy nutrition decisions against the consideration of fortified products. White *et al*. (2017:7) affirm that families with a history of cardiovascular diseases, even with limited education, acquire health related information from their fellow members.

Campbell and Train (2017:7) on the other hand add that adults and some children always challenge each other on the danger of too much fortified salt with iodine. Consumers acquire information from different sources to shape their dietary patterns, but a lack of information has seen consumers making poor nutrition diets.

2:9:9 Insufficient product disclosure

In another instance consumers do not have the dangerous health information that they deserve to know concerning fortification using nanoscale particles that contain titanium and silica which doesn't dissolve in the stomach creating toxins (Florentine 2016:46). Sabliov, Chen and Yada (2015:334) warn that, food processing companies conceal the use of nano-particulars to avoid negative response and the food and drug association (FDA) of USA does not enforce labeling products with "Nano" signs.

Ultimately, consumers are left in shadow with no information regarding food safety. Consumer awareness of the presence of nano-particulars in fortified food products will in future have a negative effect on the purchase of fortified food products.

Action should be taken to eliminate the barriers against consumer choice of fortified food products. For a healthy society, it requires different stake holders to come up with strategies that can create awareness and change consumer unhealthy habits. Different role players in creating awareness are discussed in the next section.

2:10 MARKETING INTERVENTION STRATEGIES

Due to a high level of consumer ignorance about nutrition and fortification, government, insurance companies, food industry, retailers, nutritional scientists, physicians, consumers' protection act, research institution, and marketing experts should intervene to create awareness (Sandmann *et al.* 2015:55). Basing on the benefits, barriers and motivators, strategies can be developed to overcome consumer low level of knowledge of food fortification. The study is to a large extent inclined to the marketing strategies among other strategies, to overcome consumer's low level of awareness of food fortification.

The chartered institute of marketing CIM defines marketing as the managerial function of identifying, anticipating customer needs or wants, and satisfying them efficiently at a benefit (Masterson, Phillips and Pickton 2017:4). Shimp and Andrews (2014:7) define marketing as human endevour geared towards satisfying consumer needs and wants by means of exchange processes using products, price, promotion and place (distribution) aimed at a target. But precisely, marketing is a set of activities of institution and processes that create, communicate, deliver, and exchange valuable offers for consumers, clients and society (Masterson, Phillips and Pickton 2017:4).

Products bearing functional elements are getting more successful in the foods and beverages global market (Bazhan *et al.* 2016:255). The novelty of these products requires advertising and social marketing strategies that will embrace consumer acceptability. Vicentini, Liberatore and Mactrocola (2016:344) state that, the global value of fortified products market was US$168 billion in 2010 with US and Canada reaching 25% of total revenue from enriched products. The role of marketers in this fortified food industry is to focus on consumer expectation, product development,

efficient communication, pricing and effective distribution (Kaur and Singh 2017:173). The World Health Organisation (WHO) has stipulated that fortified products should be the products that are consumed regularly, not significantly altered, and priced in accordance to affordability (Hadebych *et al*. 2016:122). Marketing of fortified food relies on legislative and permissive advertising as asserted by Vicentini, Liberatore and Mastrocola (2016:344).

2:10:1 Market segmentation

Developed and developing countries are involved in mass fortification of common food products to reach a wider segment efficiently (Hadebych *et al.* 2016:122). However, consumers do not have the same level of inadequacy of nutrients. Some consumers find themselves over consuming nutrients. Food markets should be segmented according to psychological, demographic, and socio-economic variables. Ageing societies should have their own segment which spends a lot on health care compared to the middle age group (Kanama and Nakazawa 2017:129). Infants window of growth from birth also requires a different segment (Skolnik 2016:204).

Consumers can be identified and categorized according to the food they eat culturally, gender, and different classes need to be targeted separately (Penaloza, Toulouse and Visconti 2012:17). The price discrimination strategy is designed to favour the poor segment in consideration of income levels (Masterson, Phillips and Pickton 2017:400). Hasting and Domegan (2014:95) assert that, segments should be profitable, fulfilling the sense of awareness, continue with usable channels, focusing on women, children, and community disadvantaged groups. Having a large segment which is predominantly impenetrable is counterproductive.

The marketing tactics used to influence the demand for fortified food and educate the consumer requires collaboration with manufacturers, healthy professional and retailers (Kaur and Singh 2017:173). For example, a marketing mix for vacuum-packs processed lamb, pork and turkey fortified with dietary fibre, omega-3 together with antioxidants can be successful with the affluent even if a high price is charged (Schnetter *et al.* 2017:435). On the other hand, fortification of infant foods like formula, cereals and juice requires prices to be kept at an affordable level (Hadebych *et al.* 2016:122). To curb nutrition deficiencies, fortified powdered milk for children must be changed at lower prices for the poorest consumers' affordability (Detzel and Wieser

2015:40). Providing nutrition information on popular television especially by a doctor and a nutritionist can be very effective in building consumer trust (Bazhan *et al.* 2018:52). Although product innovation should appeal to all segments, fortified products are regarded as replacement products that satisfy conventional needs in addition to functional needs (Masterson, Phillips and Pickton 2017:231). These functional products should fit each segment in the marketplace.

2:10:2 Promotional packaging

Nutritional claims printed on the package provide knowledge for consumers to make health choices for products containing nutrients (Samaniego-Vaesken, Alonso-Aperte and Varela-Moreiras 2016:150). Kimberly (2016:59) states that, messages on the package that include the origin and organic for example, snack bars with whole soy or cocoa bean have high approval of consumers.

The package colour also matters like brown means chocolate, light brown creamiest, red orange yellow “Mood”. Shimp and Andrews (2014:641) go further to state that, Kellogg’s uses yellow to associate with food from cereals, cheerios cereals also use yellow packages for the same reasons, whereas the green colour is for beverages and white means purity for Kellogg’s cereals. Since consumers are more attracted to protein food, breakfast fortified cereals should include protein, fibre and flora contents to attract consumers (Kimberly 2016:60).

Trusted packages include quality guarantee, safety, expire date, production date, natural product and environmentally friendly (Kraus 2015:1628). Consumers perceive large packages of cereals as low priced, metallic as strength, plastic as cheapness, satin as feminine and foil as high quality (Shimp and Andrews 2014:643). White packages in Spain are carrying a product of quality and high price. Packages are very important for the consumer to obtain perceived benefit. Marketers are advised to use the following phrases with caution and scientific proof reduces cancer, strengthen immune system, reduces the risk of cardiovascular diseases, maintains cholesterol level, improves memory and reduces the risk of dementia (Kraus 2015:1628). The packages should be visible with bright colours (Shimp and Andrews 2014:644).

Of recent, products with health functionality stand out in the shelves (Kanama and Nakazawa 2017:128). Brightly coloured packages of fortified breakfast cereals stand

out with high visibility in most supermarkets (Shimp and Andrews 2014:644). The healthful information includes, nutritional value, guaranteed quality and desirable taste which can be presented on packages (Kraus 2015:1627). The cereal packages carry testimonies, endorsements, celebrity comments, comedy and fantasy aimed at attracting the attention and awareness of the consumer (Masterson, Phillips and Pickton 2017:315).

2:10:3 Product strategies

When marketers are developing an intervention strategy, they bear in mind that food choices determine the health results of consumers (Dodds and Chamberlain 2017:44). Marketers have a challenge of marketing compounds that are not visible to a consumer (nutrients). Designing food products of a value-added function, requires identifying the ideal strategies for product development and appropriate nutrition health promoting programmes (Kaur and Singh 2017:173). Montet and Ray (2016:305) state that there is an increased interest in nutrition to prevent diseases which has prompted marketers to develop new products and new segments. Social marketing is seen as very crucial in bahaviour change especially with public health to disseminate the relevance of fortified products (Bazhan *et al*. 2017:255).

Orange juice with antioxidants with heart health properties and immune bosting compounds are some of the new products that are hitting the market (Derkyi, Acheampong, Mwin, Calvo, Tetteh and Aidoo 2018:85). Currently the unique selling point of new health products focuses on texture, flavour, taste and nutrition has become less on focus (Kanama and Nakazawa 2017:128). Fruit and vegetable products have vitamin C, B, folic acid and antioxidants that remove harmful elements that can cause cancer (Derkyi *et al*. 2018:86). This is another unique selling point of fortified products.

New products like green tea extracts, cinnamon and ginger are rich in fibre that can prevent blood, sugar and type-2 diabetes, are widely distributed in retail shops (Jacobsen 2015:39). The freshness, packaging technology, sales system, and upgrades in quality enhance loyalty compelled with emotional attachment (Kanama and Nakazawa 2017:129). In some cases, customers buy fortified products unknowingly without looking at the health benefits on the package (Derkyi *et al*. 2018:88).

Product positioning focuses on fortified food products preventive measures, product features and benefits (Masterson, Phillips and Pickton 2017:161). Albeit fortified or functional foods are widely accepted in developed countries like U.S.A, little is known about fortified products in developing countries (Kavoosi-Kalashami, Pourfarzad, Ghaibi, Allahyari, Surujlal and Borsellino 2017:312).

2:10:4 Word of mouth (WOM) by viral marketing

Dodds and chamberlain (2017:48) contend that, magazine articles about nutrition health are a good source of information for the consumers who eventually spread the benefits through word of mouth WOM. According to Shimp and Andrews (2014:614), WOM can be defined as the informal messaging of the consumers about the product. Its estimated that an average consumer in USA is involved in over 120 WOM discussions every week. Word of mouth or viral marketing is more powerful than television advertising because consumers can tweet, blog, and post health related issues on social media (Masterson, Phillips and Pickton 2017:309). Food producers target stylish women focusing on the desirable outcomes of health eating and the spread of word of mouth (Penaloza, Toulouse and Visconti 2012:398). This is certainly resonated by Facebook, Twitter and other social media platforms.

2:10:5 Advertising strategies

Advertising of fortified products creates awareness, triggers trial stimulation, attitude change, recognition, reminder and correction of misconception (Masterson, Phillips and Pickton 2017:313). Fear ads can persuade consumers up to a certain level of tolerance to raise awareness, revaluation of the significance of fortified products (Hasting and Domegan 2014:165). Consumers' desire for admirable bodies shape the content of advertisement of health fortified food products (Penaloza, Toulouse and Visconti 2012:401).

The fear-based ads are easily remembered however, fear messages can lead to over consumption of fortified products which is also dangerous to health due to obesity (Hasting and Domegan 2014:167). When marketers are advertising fortified food products, they bear in mind that societal marketing is concerned with the long-term wellbeing of consumers and society at large (Masterson, Phillips and Pickton 2017:19). Bazhan *et al*. (2018:47) affirm that, Social Marketing Assessment and

Response Tool (SMART) consists of consumers' analysis, market analysis, channel analysis, planning developing interventions, implementation and evaluation. Manufacturers like Nestle and Kellogg are engaging in nutritional food promotions like BOGOF (buy one get one free) to attract consumers (Masterson, Phillis and Pickton 2017:475).

2:10:6 Fortified food branding

The concern for nutrition brought choice by avoiding lifestyle diseases which has led to the raise of branded functional food (Penaloza, Toulouse and Visconti 2012:21). Branding adds perceived value to the customer (Masterson, Phillips and Pickton 2017:427). Consumers are willing to pay an extra premium on brands with canola oil, apples enriched with antioxidants, diabetes milk, bone health milk, and functional yogurt (Kavoosi-Kalashami *et al.* 2017:312).

Fortified food with popular brands like Nestle guarantee safety, quality and achieve high revenue (Kanama and Nakazawa 2017:127). Brands with a unique name, log and package carry a lot of meaning to the customers' mind to make an image towards awareness (Masterson, Phillips and Pickton 2017:226). Strengthening fortified food brands can be for incremental product innovation (IPI) where gradual changes are made to the products or radical innovation (RI) where a brand contains a completely changed product (Kanama and Nakazawa 2017:127).

Consumers forge brand association basing on the physical and functional properties of fortified product which results into brand authenticity (Masterson, Phillips and Pickton 2017: 431,432). Global food brands have however created issues over obesity as consumers fail to resist the temptation of the fattening foods. Control is not easy for the impulse that drives the consumer to engage in sinful, deviant, excessive eating of fast foods that has led to lawsuits and boycotts against brands like McDonald and other irresistible brands (Penaloza, Toulouse and Visconti 2012:22).

Brands have emotional appeal, encourage consumption using the synergy of the price, product, promotion and place (4Ps) (Hastings and Domegan 2014:171). Masterson, Phillips and Pickton (2017:449) contend that, a brand package is a silent salesman with slogans that aid product recognition. This depends on the distinctiveness of the package for example, fortified milk in bottles, plastics, paper, tin or carton. In the

controversy of the advertisement clutter and with consumers having no access to television, consumers can access brands that stand out with nutrition relevance (Hasting and Domegan 2014:170,171). Lastly, using celebrities on brands add trust and awareness of the product to the consumer (Masterson, Phillis and Pickton 2017:385). Brands are a vital source of information for consumer awareness of fortified food products. The marketing intervention strategies are always supplemented and regulated by the government in creating awareness.

2:11 GOVERNMENT AND COMMUNITY INTERVENTION

The American government is very strict with manufacturers of food products with a functional role in that, the dissemination of messages to the consumers should relate food health to a disease with scientific proof (Vicentini, Liberatore and Mastrocola 2016:342). Nutritional labeling, additives, safety signs and optimal pricing have been regulated by the government (Bazhan *et al*. 2018:50). However, there is inadequate monitoring of the commitment of food producers not to over-fortify or under-fortify due to lack of a property government legislation, policy, and guidelines (Jalal *et al*. 2016:32). Consumers have been protected from overdose of nutrients because the excess nutrients are also dangerous to health.

Government has set up information campaigns, and education programmes especially to women for vitamin D deficiency accompanied by salt iodization programmes (Sandmann *et al*. 2015:60). Updating the data base for food composition, evaluating and monitoring consumer folic acid in-take has been undertaken by the government and sensitizing the population of the benefits of fortified food (Samaniego-Vaesken, Alonso-Aperte and Varela-Moreiras 2016:152).

The government of South Africa has set up a fortification logo to notify consumers of the fortified foods and highly fortified products as indicated in Figure 2:3. However, in a study managed by Magalis, Giovanni and Silliman (2016:494), consumers are unaware of the fortification logo indicating whole grain. The fortification logo helps consumers to identify food products that have been enriched with vital nutrients that are essential for consumers health. The government has a role to sensitize consumers about the importance of fortified food products.

Figure 2:3 Fortified food logos for South Africa

Source: Food advisory consumer service FACS (2017:17). http://foodfacts.org.za/

Most of the South African food products that are fortified carry the fortification logo in colour or black and white. Consumers usually buy the food products without noticing the fortification logo which is meant to create awareness.

Governments establish community-based health care programmes to address the dangers of craving for unhealthy tasty food by creating awareness of the benefits of fortification and addressing the risk of chronic diseases (White *et al*. 2017:11). The European Union (EU) regulations have ordered food processors to disclose products with excessive nutrients like; sugar, fat, salt and a reduction of such excessive nutrients in food products to denote “low fat” for example (Shan *et al*. 2017:192).

The risk reduction claims like “high in fibre” “reducing blood cholesterol” are monitored by council of Europe ensuring scientific proof (Vicentini, Liberatore and Mastrocola 2016:342). The department of agriculture in US, (USDA) recommended that, American consumers should regularly consume whole grain to benefit from the rich fibre (Magalis, Giovanni and Silliman 2016:488). The governments must inform its citizens about the benefits of fortified products in order to have a productive citizenry.

Communities, community leaders, policy makers are assisted by the government to invest in community-based projects and public education regarding dietary practices (White *et al*. 2017:10). In other instances, consumers who are reluctant to buy fortified products because of cooking complexities, receive cooking classes assisted by the community together with the government (Magalis, Glovanni and Silliman 2016:500). As for the high prices of fortified food product, governments have put up mechanisms to lower prices (Detzel and Wieser 2015:40).

In South Africa, Hungary, Denmark, France and Mexico, the governments have introduced taxes on unhealthy foods like sugar tax and have put up efforts to legislate promoting unhealthy food (Skolnik 2016:221). Kotler and Kotler (2013:170) affirm that, the federal drug administration (FDA) of U.S.A has contributed to consumer awareness of the benefits, safety and harmful properties under government regulations. The government is the major strategist to create awareness of fortification for the safety and health of its population to cut national health care costs. However, food processors and supply chain managers also have a role to play in creating awareness.

2:12 FORTIFIED FOOD SUPPLY CHAIN STRATEGIES

Beverage manufacturers have innovated new ways of delivering fortified products to consumer in a convenient format like quick meals rich in fibre and omega-3 (Jacobsen 2014:42). Packaging and processing companies have masked the undesirable odour and taste of fortified food products with sweeteners to attract consumer acceptability (Gebretsadikan *et al*. 2015:854). Greater amount of calcium is added to reduce colour change after fortification (Hadebych *et al*.2016:126).

The liposome fish oil that is used to fortify yogurt has been widely accepted by the consumers. Consumers have been attracted by the colour, taste and odour of fortified food products and are getting more aware of the benefits of fortification. Food supply companies are widening fortified food availability and are allowing consumers to taste the products (Magalis, Giovanni and Silliman 2016:500). Consumers can now get easy access to fortified products.

Food processing companies have introduced appealing additives for fortified food like emulsifiers, stabilizers, thickeners for acceptable uniform texture, taste, and colour to maintain nutrition value (Deshpande and Deshpande 2017:220). Consumers have been cautioned on warning labels to beware of the dangers to fortified salt, allergies as well as added benefits (Campbell and Train 2017:7). Most of the food processors are now fortifying their products with natural ingredients like moringa, soybean and sweet potato which are a good source of minerals and fibre (Gebretsadikan *et al*. 2015:846). To overcome consumer suspicion to the naturalness of fortified food products, supermarkets are now supplying their own products (Masterson, Phillips and Pickton 2017:355).

Gharibzahedi and Jafari (2017:121) define bio-fortification as the enrichment of agricultural crops like rice, maize, wheat legumes, cereals, beans to improve mineral content. When consumers are supplied straight from the farm by supermarkets, reliability and trust is assured (Masterson, Phillips and Pickton 2017:361). The biotechnology to fortify food products naturally makes the fortified product more bio available (Gharibzahedi and Jafari 2017:121). Consumers may have greater trust in bio-fortification than fortifying from processing company using synthetic compounds. Consumers are gaining confidence and trust in fortified food on the basis on naturalness.

The use of *ginseng* in fortification with desirable sensory properties has brought fortified food market success and awareness (Kaur and Singh 2017:175). Lu (2015:1873) contends that, consumers are getting attracted and aware of fortified products that have natural ingredients like fish oil and tuna salad which has reduced suspicion about the synthetic additives associated with fortified food. Processing companies, distributors, and retailers have created consumer awareness in a bid to expand the market of fortified food and at the same time improving the health of consumers.

Among all the intervention strategies, the marketing intervention can provide better strategies that can improve consumer awareness and encouraging consumer purchase of fortified products. Advertisements, packages and labels are efficient tools that are used to inform the consumer of the health benefits and dangers of fortified food products. It's worthy to note that, the synergy among supply chains, government, and marketing tools to create consumer awareness and acceptability of fortified food is paramount.

2:13 CONCLUSION

The literature review references are predominately from developed and a few from developing countries. There is limited information about consumer knowledge and awareness of food fortification in developed and developing countries. Consumers' lack of knowledge of the pros and cons of food fortification has been due to limited information about nutrition value. In the studies covered, some consumers have heard of vitamins and minerals that constitute nutrients. There is a need to set up strategies that can inform the consumer of the benefits and dangers of food fortification. Most of

the governments including South Africa have put up measures geared towards creating awareness. Manufacturers have a duty to indicate health information on fortified food packages for awareness. However, all the efforts to create awareness requires further studies to understand the consumer perspective towards fortified food products. Marketers can intervene with strategies that best suit consumers' attitudes, perceptions and socio-economic situation. For the success of the fortification programme and creating awareness and acceptance of fortified products, marketing strategies aimed at promoting, pricing the product, and distributing the product depends on the characteristics of the consumer. Most of the studies about food fortification were conducted outside Africa, there is a need to understand consumers within South Africa and establish strategies that will create awareness and stimulate consumption of fortified food products. The next chapter provides the researcher the various methods for understanding South African consumers in relation to fortified food products awareness.

CHAPTER 3. RESEARCH METHODOLOGY

3:1 INTRODUCTION

Various theories concerning consumer awareness of food fortification are discussed in the preceding chapter. Chapter three explains in detail the methods and techniques of understanding the consumer level of awareness of food fortification using empirical study. The study intends to understand further the consumer perspective towards fortification focusing on South Africa. Moreover, this research methodology chapter meticulously covers the discourse of a quantitative research design. In this chapter, the ideal ways of gathering information from the consumers and procedures of analyzing data are unraveled. Additionally, principles of descriptive statistics and inferential statistics used in the study, are explained. The target population as well as the sampling methods are addressed in this chapter. Also, in chapter three, the questionnaire designing is covered in relation to validity and reliability assurance. Pretesting, delimitation and ethical issues of research are covered at the end of chapter three. The next section explains the research design used in the study.

3:2 RESEARCH DESIGN

Research is a systematic investigation of empirical data through addressing questions, collecting data, analyzing the findings and making conclusions contributing to a broader base (Trochim, Donnelly and Arora 2016:5). Researchers always ensure that, the manner through which research is carried out from the research question to the findings should be appropriate and pertinent (Mellinger and Hanson 2017:6). If the appropriate methodology is not used, it is meaningless and irrelevant to analyses data even with the best statistical techniques (Picardi and Masick 2014:194).

The research design is tailored with a golden thread to match the context of the research (Trochim, Donnelly and Arora 2016:219). The study is based on a quantitative research design (Mellinger and Hanson 2017:4). o'Leary (2017:132) asserts that, the quantitative paradigm focuses on empiricism and positivism backed by statistical analysis on a large scale. The quantitative research establishes the relationship between variables based on a representative sample using statistical, mathematical, and computer techniques (Wiid and Diggines 2015:64). Gravetter and Forzano (2016:443) are of the view that, quantitative research is descriptive in that

data is organized in numbers, categorized, summarized and simplified in a structured manner. Inferences can be generated there after a descriptive analysis is completed.

Statistics refers to the mathematical ways of analyzing numerical data based on samples (Patten and Newhart 2018:203). The study uses descriptive statistics in the course of summarizing the content of raw data into a meaningful impression which is accomplished by inferential statistics (Mellinger and Hanson 2017:39). Quantitative research begins with identifying the theoretical framework with theories that are testable to help predict the natural world (Eden 2017:2). After the descriptive analysis and drawing conclusion from the summary of description, the study applies inferential statistics to steer generalization of the sample to the population by using statistical significance known as the *p*-value (o'Leary 2017:310).

3:2:1 The rationale for quantitative paradigm

The assumption that there is one single reality validates quantitative methods as an objective research strategy (Eden 2017:2). Quantitative data is more scientific dependable and superior as articulated by (Trochim, Donnelly and Arora 2016:20). The results are reproducible, objective, and generalizable with radomised controlled trials and exclusive statistical inferences (o'Leary 2017:133). In applied research, quantitative methods can provide deductions as to whether a programme is effective and what intervention strategies are needed (Patten and Newhart 2018:29).

Wiid and Diggines (2015:65) contend that, quantitative research focuses on cause effect, and prediction with a larger sample that allows statistical reporting to be generalized. The scientific approach is accurate and enable representation of world affairs due to realism (o'Leary 2017:134). Most consumer researchers consider quantitative methods because consumers have no schedule for extensive interaction with the interviewer due to time (Patten and Newhart 2018:26).

Questions that are quantifiable like; what percentage, to what extent, how many, are usually answered by quantitative research (Goertzen 2017:12). Due to the validity and reliability of quantitative research, the findings are comparable (Powner 2017:14). Quantitative analysis allows data to be released in numerical form concerning intensity, frequency and value (Eden 2017:2). The values obtained are submitted to a statistical analysis for summary and interpretation in a user-friendly manner

(Gravetter and Forzano 2016:26). Quantitative research allows precise measurements with a valid data collection instrument which strengthens the quality of research (Wiid and Diggines 2015:65).

Unlike the objective quantitative studies, qualitative research could not be used because it is subjective in that it allows the acceptance of multiple realities by studies on smaller units (o'Leary 2017:132). The finding from the qualitative studies are therefore subjective. The quantitative approach allows a comparison of empirical data to the existing data to make inferences objectively not subjectively (Mellinger and Hanson 2017:4). The quantitative approach addresses "so what" by contributing to society in setting boundaries for generalization in a clear and precise manner (Patten and Newhart 2018:71). It is understandable that quantitative studies are self-correcting, meaning that the research builds itself by adding statistical findings to the body of knowledge (Eden 2017:5 The disadvantage with quantitative research is that; the sample may not be representative, its limited to researcher's thoughts, inadequate response, no additional questions, honesty of respondents is dubious, and you can't dig for more (o'Leary 2017:141).

3:2:2 Research question and concept operationalization

This study emphasizes that consumers have little knowledge and are not aware of the pros and cons of food fortification and therefore make poor dietary choices (Bekoglu, Ergen and Inci 2016:80). The research is based on whether knowledge of the pros motivate consumers to purchase fortified food products, or whether awareness of the cons is a barrier to consumer choice of fortified products, and whether marketing intervention can improve awareness (Powner 2017:7).

Table 3:1 Concept operationalization strategy

Food fortification Awareness	**Consumer**
Merits	**Motivators:** (Perception, Product attributes)
Demerits	**Barriers:** (Naturalness, Price)
Intervention strategies	**Marketing**

The operationalization strategy is presented in a tabular format as indicated in Table 3:1 basing on the literature review. Operationalization provides a procedure to define variables and attempt to classify related constructs making it a better way to decipher research variables on a scale (Gravetter and Forzano 2016:69). The validity of operationalization depends on whether the constructs capture the information needed (Powner 2017:11). In Table 3:1, the study assumes that the benefits motivate consumers to purchase fortified products depending on perception and product attributes. Awareness of the shortcomings is assumed as a barrier to consumer choice depending on naturalness and price. Awareness can sometimes be based on marketing intervention by creating consumer experience in the product and promotional activities. The next sub-section explains the cross-sectional study.

3:2:3 Cross-Sectional Study

In the study the researcher uses on a cross-sectional approach, where research is done at a single point on time (Trochim, Donnelly and Arora 2016:14). The cross-sectional study allows the researcher to conduct the studies once over the same sample in a single survey (Wiid and Diggines 2015:67). In cross-sectional studies the variables are not manipulate because the same variables are used across multiple groups and numerous characteristics of the population are described once at a time (Cummings 2017:2). But because the cross-sectional studies are carried out at one point, they are a “snapshot” and limit the cause of the sequence of events. Trochim Donnelly and Arora (2016:14) criticize the cross-sectional design as being time bound and ignoring time series.

Cross-sectional research is cheap to conduct, cost effective, and data collection enables swift scientific inquiry without tracking participants over time (Cumming 2017:4). The cross-sectional samples are taken every time the study is conducted however, in longitudinal studies, samples are taken once (Wiid and Diggines 2015:67). Samples may not reflect the entire population interest as cross-sectional studies take the population interest at a single point in time, ignoring volatility of consumers (Cumming 2017:4). Resources are scarce and therefore one cross-sectional research is compatible for academic research.

3:2:4 Selecting the Survey Method

o'Leary (2017:226) asserts that, quantitative data collection from a sample of related characteristics, attributes, and opinion requires a well-designed questionnaire. The survey gathers opinion and perceptions of participants called respondents, whereas the questions are called items (Mellinger and Hanson 2017:30). The data from survey is original, logical, and can be collected quickly in time (Wiid and Diggines 2015:117). The survey processes involve knowing the target for a good sampling approach, clarity of data required, access to participants, and preparing for the unexpected (o'Leary 2017:227). The survey as articulated by Mellinger and Hanson (2017:30), involves collecting respondents' opinion, perceptions using an instrument that is carefully developed and tested whether it's verbal or written, the common instrument is the questionnaire. The target population is identified in the next section.

3:3 TARGET POPULATION

Population is defined as the comprehensive number of people, units, or items that are under the survey umbrella (Wiid and Diggines 2015:188). It is the total group out of which data is collected. Trochim, Donnelly and Arora (2016:81) define population as the group the results and conclusion should be about basing on the sample findings. However, o'Leary (2017:204) adds that, population involves all the elements or the individuals under survey like households, events, or any other unit under study. Generally, population is all the people or objects of common characteristics that the research targets to describe their attitudes and features basing on the results obtained from their sample. Eden (2017:3) also agrees that, population covers all those with similar characteristics of interest to the researcher. The findings of the sample are generalized to the population from which the sample is drawn.

The main purpose of research is to understand the population in the spotlight, but it's not practical to ask everyone in the population (census) (o'Leary 2017:203). The theoretical population involves members who are part of the study but do not participate in the survey and the sample population involves members from whom generalization can be done on the theoretical population (Trochim, Donnelly and Arora 2016:81). Identifying the target population is the core of selecting respondents who

are representative (Eden 2017:3). If the target population is not properly determined, it is very difficult to select a valid sample.

3:3:1 Population groups

The eThekwini Municipality integrated development plan (IDP) (2018:38) reports the Durban municipality population to be 3,767,939 in 2018 with a population of 1,180,000 (34.54%) in the Central, 1,150,000 (33.61) in the North, 758,000 (22.03%) in the South, and 338,000 (9.82%) in the West. The study target population is the Central region. Table 3:2 shows the population distribution of the target which is essential in selecting the sample. The population distribution is pertaining to people residing in Durban Central.

Table 3:2 Population distribution in Central Durban

Age group	Percentage of 1 180 000		Male	Female
18 – 34	33%	330,400	161,896	168,504
35 – 59	28%	389,400	190,806	198,594
60 – over	9%	106,200	52,038	54,162
Total		**823,000**	**404,740**	**421,260**

Source: eThekwini municipality IDP (2018:39).

http://www.durban.gov.za>IDP>documents

Note that the age group of 1-17 years in Table 3:2 has been deliberately eliminated as they are not part of respondents required in our population target group. We only consider urban residents shopping in the central of Durban municipality. Most of the population are female 51% compared to males 49%. The population group of 18-34 has most of the population in our study. Our generalisation of the findings is based on the population distribution as seen in Table 3:2 indicating the target population.

3:3:2 Population clusters

The central of Durban Metropolitan is the target and its further divided in four clusters. Durban central (DC), Durban North (DN), Durban South (DS), and Durban West (DW). When the survey is conducted, the focus is to obtain samples in all corners of Durban central to avoid collecting a biased sample. Within these four regions, the researcher then applies sample selection basing on the population distribution indicated in table 3:2. The aim is to make the sample as representative as possible to the target population enabling the researcher to make valid conclusion. o'Leary (2017:310) insists that, drawing conclusion from the summary of descriptive data is one thing, and making inferences from sample data to the population is another. Whereby, steering generalization of the sample findings should be made by a representative sample to ensure the validity of the conclusion. The conclusion is generally supported by the population under study. In the next section, the sampling process is discussed.

3:4 SAMPLING

Trochim, Donnelly and Arora (2016:80) define sampling as the systematic selection of units like consumer, organisations or any other thing to be measured. A sample is basically a subset of the population in the context of research from whom information is required regarding the population (Wiid and Diggines 2015:183). The researcher develops a sample strategy that is valid when making conclusions from scientific analysis tools (o'Leary 2017:141).

Since the result of research is to make comments about the population basing on the sample, care should be taken to avoid sampling errors (Mellinger and Hanson 2017:9). Wiid and Diggines (2015:119) affirm that, the difference between the population value and sample value is referred to as sample error. The sample should be broad enough to speak on behalf of its population, large enough to permit analysis, and small enough to be manageable (o'Leary 2017:204). The sample selection is done bearing in mind that it is representative of the population with similar characteristics to ensure validity.

3:4:1 Confidence Interval

Picardi and Masick (2014:155) define confidence interval as, the value used to determine the degree of representativeness of the sample to the population which is

normally 0.95 confidence interval. People are widely dispersed, difficult to locate, hard to access, and therefore samples are selected with a certain level of confidence to ensure credibility (o'Leary 2017:204). But the researcher still adheres to o'Leary's comment that, you do not have to taste the entire pot of soup to determine the salt content. The researcher cannot be 100% sure that the sample represents the population unless the researcher surveys the whole population which is unpractical as stated by (Wiid and Diggines 2015:203). There is a tolerable error that researchers accept. Because the findings are from the sample, the researcher cannot generalize that the result are 100% but we use a *p*-value of 0.05 for sampling errors or bias (o'Leary 2017:310). Errors may arise in random sampling, can be systematic or wrong measurements of the sample but most of the sample errors can be minimized by selecting a larger sample (Trochim, Donnelly and Arora 2016:117).

3:4:2 Non-probability sampling method

Mellinger and Hanson (2017:12) caution that, although probability sampling ensures representativeness and generalizability, in some instances a probability sampling can be difficult to apply due to the issues of defining a sample frame or if randomly selected members are unwilling to participate. A sample frame is a list of the details of each member of the population (Wiid and Diggines 2015:188). Since the details of the members of the target population were not available, the researcher decided to use non-probability sampling. The non-probability sampling method can be used if it's impossible to determine the probability that each member of the population has an equal chance to be included (Picardi and Masick 2014:156). Gravetter and Farzano (2016:138) state that, if the population is too large to list in the sample frame, individuals are not known, and the research doesn't use biased methods, then non-probability sampling can apply because probability sampling needs extensive knowledge of the population.

3:4:3 Convenience sampling technique

Although it is not well appreciated by researchers, convenience sampling is the only technique used when the population is too large, difficult to access with limited resources (o'Leary 2017:211). Convenience sampling has been criticized for being prone to biases and lack of representativeness, but it is sometimes the only way to

sample the population (Mellinger and Hanson 2017:12). Schreier (2018:6) argues that, random sampling is not the only way to ensure a representative sample. Where the researchers believe that the variables are stable through the population and generalization is obvious due to similarities and greater resemblances of the population, then convenience sampling cannot be criticized (Mellinger and Hanson 2017:11). In the study, the population of Durban central seem to be having some level of resemblances and therefore the researcher uses convenience sampling. The advantages with convenience sampling are that it is easy, less expensive, time saving, widely used in behavioural science, and easy to get participants (Gravetter and Forzano 2016:147). Depending on the goal of research, convenience sampling can be perfectly suitable (Schreier 2018:8).

3:4:4 Quota Sampling

Quota sampling is a non-random selection procedure of samples from subgroups until each group target is reached (Trochim, Donnelly and Arora 2016:89). Like stratified sampling but in non-probability, quotas can be set for sub-groups depending on the characteristics of the population (Picardi and Masick 2014:156). Sub-groups are fairly represented and once a quota is met, no other member is taken in that sub-group. Wiid and Diggines (2015:193) contend that, population characteristics like age group, gender, and geographical area can provide quotas proportional to the population distribution. Unlike stratified sampling where members are chosen randomly, quotas are not randomly selected and not all the individuals in the group have an equal chance of being selected (Gravetter and Forzano 2016:148). The researcher can also borrow cluster sampling by choosing for example, every fifth person passing the researcher. The aim is to make the sample as representative as possible in a faster and less costly manner.

3:4:5 Sample Size selected

The sample size is the number of members (*n*) selected to form a sample that reflect the population parameter (Wiid and Diggines 2015:200). The bigger the sample, the lesser the sampling errors (Trochim, Donnelly and Arora 2016:103). o'Leary (2017:206) adds that, Intermediate Statistical Analysis (ISA) using a sample size calculator with a population of 1,000,000, requires a sample of *n*=384 participants

given that the confidence interval is p=0.05 below which a sample is not representative. Since the target population is approximately 1,000,000, the researcher selects a sample size of n=400 participants which is very close to n=384 sample size obtained by (ISA). Table 3:3 shows the sample distribution based on the quotas portrayed in the population distribution in Table 3:2 in the previous section, the researcher tries as much as possible to relate the sample to the target population in order to make valid deductions. The sample should have the same characteristics as the population from which the sample is selected. A representative sample enables the researcher to make valid conclusions about the population. The cheapest way of knowing the population is to take a sample and work on it in order to expose that characteristics, attributes, and behaviour of the population.

Table 3:3 Sample distribution basing on sample size and quotas

Age group	Percentage of 400		Male (49%)	Female (51%)
18 – 34	33÷70x100	189	93	96
35 – 59	28÷70x100	160	78	82
60 – over	9÷70x100	51	25	26
Total	**70%**	**400**	**196**	**204**

Since the age group from 1-17 years is not our target group for this study, the researcher must generate a percentage of the target by dividing each percentage in the group by the total percentage of the target groups (70) multiplied by one hundred. Quotas pertaining to gender require the researcher to choose 196 male participants and 204 female counterparts. Quotas developed from age group require us to select 189 participants between the age of 18-34, 160 participants between the age of 35-59, and 51 members who are 60 years and over. In each age group, 49% are male and 51% are female. The researcher now has a representative unbiased sample totaling to 400 participants. In the next section the measuring instrument used in the study is explained.

3:5 MEASURING INSTRUMENT

Mellinger and Hanson (2017:22) assert that, variables must be turned into accurate numbers which is the foundation of the quantitative paradigm. Measuring is a research activity of assigning numbers to people or things to represent quantities by creating a continuum (scale) (Wiid and Diggines 2015:164). Trochim, Donnelly and Arora (2016:115) are of the view that, measurements must be accurate, consistent and measuring what they are supposed to measure. This has led to the introduction of validity and reliability as inaccurate numbers surround the cliché "garbage in garbage out" (GIGO) (Mellinger and Hanson 2017:22). Questionnaire designing is discussed in the sub-section following.

3:5:1 Questionnaire design

A questionnaire is a structured question sheet that is used to generate data from a research project (Wiid and Diggines 2015:164). In applied research, large amounts of data are collected using a questionnaire (Picardi and Masick 2014:137). When designing a questionnaire, the researcher ensures that questions are; easy, consistent, non-threatening, straight forward, non-offensive, unambiguous, and non-cluttered (o'Leary 2017:229).

Trochim, Donnelly and Arora (2016:191) caution that, confusion, misunderstanding, presuming that consumers know the terminologies, stirring respondents, and open-ended questions, should be avoided. Double barreled statements (questions requiring two answers), double negative questions, poor wording, ring-true statements, and hard to disagree statements should be avoided (o'Leary 2017:233). Instead familiar and simple questions without assumption should be used (Wiid and Diggines 2015:173).

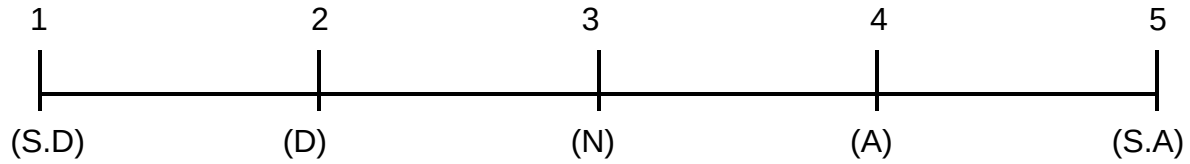
Logical order by starting with instructions, pleasing layout, introductory statement of the aims, assurance and confidentiality matter (o'Leary 2017:228). Trochim, Donnelly and Arora (2016:179) emphasis that, respondents must; be qualified to answer the questions, should know about the issue, and do not require to refer to records or involvement into memorizing answers. Picardi and Masick (2014:161) also add that, questions should not require recall or memorising as word inaccuracy, and vague wording compromise response.

The study utilises a questionnaire that is valid and reliable to ensure credible results. The questionnaire is developed basing on the literature review summary. The study also compares the questionnaire of similar studies drafted by Kam *et al*. (2012:362) in developing the questionnaire. Questions are designed basing on the aims and objectives of the study. A Likert scale is used during questionnaire designing for the study.

3:5:2 Likert scale of measurement

According to Trochim, Donnelly and Arora (2016:153), Rensis Likert devised a simple efficient scaling which requires; defining what to measure, generating items, assigning scale values of which response is in equal intervals. On the Likert scale, multiple items (questions) structured, are inter-dependent but investigate a specific construct with an odd scale on a bipolar scale (Mellinger and Hanson 2017:31). Picardi and Masick (2014:46) warn that, multiple items on the questionnaire should produce similar response measuring the same construct. The degree of attitude ranges from strongly disagree to strongly agree as indicated in Figure 3:1 for the Likert scale. The Likert scale is equidistant in that the distance from one point to another is the same and mutually exclusive.

Figure 3:1 A five-point Likert scale



As reflected in Figure 3:1, score 1 represents strongly disagree (SD), score 2 Disagree (D), score 3 Neutral (N), score 4 Agree (A), and score 5 strongly agree (SA). Gravetter and Forzano (2016:383) point out that, participants tend to avoid extremes and have trouble discriminating among points or avoid the neutral situation. However, this can be avoided by asking simple short questions. Additionally, attempts are in place to avoid negative statements and items are in a reverse coded statement to avoid respondents to only agree or disagree to every statement without a strong opinion (Mellinger and Hanson 2017:32). Researchers disagree with the neutral position

calling it forced response but normally odd numbered scale with neutral in between instead reduces forced choice response (Trochim, Donnelly and Arora 2016:154). Although with the Likert scale the respondents are limited to the set of items in the questionnaire, its time saving.

3:5:3 Physical administering of the questionnaire

Wiid and Diggines (2015:120) caution that, administering a questionnaire face to face requires the interviewer to avoid response error (if respondents don't know the answer), interview error (influencing respondents) and the administrative error (data capturing mistakes). When administering the questionnaire, respondents may want to look good due to social issues by reading what the interviewer wants and avoiding embarrassment for not knowing (Trochim, Donnelly and Arora 2016:180). However, respondents can be motivated by trained interviewers to feel free and develop trust in order to get good response (o'Leary 2017:226). If the respondents do not understand the question the results will be skewed (Mellinger and Hanson 2017:30).

Face-to-face questionnaire administering; attracts a large number, data is obtained in real time, and allows clarification of the statements in the questionnaire, but its time consuming, and adds pressure to answer. Wiid and Diggines (2015:118) go further to comment that, face to face survey is tainted by interviewer-interviewee influence, response time limits, and human communication weaknesses. To proceed to another question, the respondent should know the first question and respond to what we need to know than what is nice to know (Trochim, Donnelly and Arora 2016:184).

However, physically administering the questionnaire can be so lengthy, expensive, limit geographical coverage, do not ensure anonymity/confidentiality fully, and requires intense training (o'Leary 2017:226). The golden rule is to ask for; time, attention, trust for personal information with empathy and giving a word of thanks especially if there are signs of discomfort (Trochim, Donnelly and Arora 2016:193). Respondents are promised a copy of the results. In the next section, descriptive statistical analysis is explained.

3:6 DESCRIPTIVE STATISTICAL ANALYSIS

Gravetter and Forzano (2016:443) state that, describing a set of data by graphs, tables, organizing summaries, and simplification of large data is undertaken by descriptive statistical analysis. Descriptive statistics (o'Leary 2017:311) allows summarizing data whether its univariate, bivariate (two variables) or more than two variables (multivariate) (Patten and Newhart 2018:203). Trochin, Donnelly and Arora (206:14) criticize descriptive statistics as mere public opinion certainly described into percentages. o'Leary (2017:304) adds that, descriptive statistics summarizes the characteristics of sample distribution, percentage relationship, measures of central tendency, measures of dispersion, tables, and graphics presentations. Descriptive statistics is about obtaining a snapshot of the characteristics of the sample, but it's not concerned with the relationship of variables and prediction (Gravetter and Farzano 2016:156). The researcher studies patterns and trends but not causal and no conclusive evidence to determine the course of action (Wiid and Diggines 2015:67).

3:6:1 Frequency distribution

Mellinger and Hanson (2017:40) affirm that, frequency distribution of a sample is a small table of descriptive statistical data that is divided according to variables like; gender, age group, and geographical clusters. The frequency distribution simply gives the scores as per respondents in various categories for further analysis (Patten and Newhart 2018:204). Wiid and Diggines (2015:252) precisely define frequency distribution as the tabular arrangement of data flows from different categories of concern in a research project by showing scores. The frequency distribution is used to determine other descriptive statistics trends. It's the first step to transfer data from questionnaire results from which percentages can be established.

3:6:2 Measures of central tendency

Measures of central tendency demonstrate the most probable and appropriate response (Wiid and Diggines 2015:253). In social and behavioral science, it's believed that, many variables including humans are normally distributed or rather tend to portray similar behavioral patterns in a society (Patten and Newhart 2018:241). There are three commonly used measures of the centre value which include; mean, medium, and mode, where mean ($\bar{x}$) is summing up all the scores divide by the sample size

(Mellinger and Hanson 2017:41). Trochim, Donnelly and Arora (2016:293) calculate the median by arranging all scores in order and selecting the middle score. Whereas, Picardi and Masick (2014:180), define mode as the most common value in the score. The study focuses on mean $(\bar{x})$ however, when skewness is measured, median and mode is required.

3:6:3 Measures of dispersion

Trochim, Donnelly and Arora (2016:294), define dispersion as the spreading away from the centre. In other words, how far are scores away from the mean $(\bar{x})$. Mellinger and Hanson (2017:47) view dispersion as the variability and spread of data around the mean. Variability is the degree at which participants differ from one another (Patten and Newhart 2018:219). There are various measures of dispersion, but the study focuses on range, variance, and standard deviation (Wiid and Diggines 2015:253). Range can be obtained by simply subtracting the lowest score from the highest score and comparing the result with mean (Trochim, Donnelly and Arora (2016:294). If the result is far away from the mean, then the distribution is not normal.

A variance is the spread away from the centre (o'Leary 2017:307). To calculate the variance denoted by (σ^2), we subtract mean $(\bar{x})$, from each score (x), each result is squared, and the total is divided by the sample size minus one (Picardi and Masick 2014:182). High deviations from the mean is worse because there is a wide variation within the data.

Finally, the standard deviation away from the mean, which is the square root of the variance, is also calculated (o'Leary 2017:306). The standard deviation denoted by (SD) can only be zero if the scores are the same and if the answer is big, it means that there is a big divergence from the mean (normality). Mellinger and Hanson (2017:49) define co-variance denoted by (s_{xy}) as comparing two variances say the variance of female participants along that of the male. It can be calculated by multiplying the variance of (x) variable (v_x) by the variance of y variable (v_y) divide by the sample size minus one. The study requires co-variance denoted by (s_{xy}) to compare variations among males against females.

3:6:4 Data distribution

A normal or symmetrical distribution is bell shaped with; mean, median, and mode all touching the highest point of the histogram (o'Leary 2017:307). Wiid and Diggines (2015:254) describe that, there are two main abnormalities in the distribution of data which is skewness and kurtosis. Where skewness greater than zero denote a positive, less than zero a negative, and zero a symmetrical. Patten and Newhart (2018:241) caution that, skewness may be about income where a small number are richer, and a majority are poor making the distribution skewed to the left.

Mellinger and Hanson (2017:51) define kurtosis as the peakedness of the distribution with a bell shape being normal, a high peak meaning positive and a flatter shorter peak being negative. The study considers at the skewness to the left or right of the mean and the peakedness (Kurtosis) in inferential statistics to establish the relationships. Where kurtosis is greater than 3 its sharper than normal and if kurtosis is less than 3 its flatter while kurtosis=3 indicates a normal acceptable data distribution.

3:6:5 Tables, graphs, pie charts, donuts and percentages

Meaningful summaries of the results are presented graphically, using tables, pie charts, donuts, and percentages (Trochim, Donnelly and Arora 2016:280). o'Leary (2017:307) states that, percentages should be used together with ratios to portray realism. Wiid and Diggines (2015:256) add that, putting data into meaningful categories, like histograms, line bars, graphs and bar charts and pie charts allows data comparison to facilitate inferential deductions. Bar charts and histograms are used especially for ordinal data and histogram for the intervals of the Likert scale results (Mellinger and Hanson 2017:52).

3:6:6 Statistical Package for the Social Sciences (SPSS)

After gathering data, it should be captured into an analysis package by MS Excel to allow the SPSS work out the measures of central tendency, variations, generating graphs and charts (Wiid and Diggines 2015:233). Large volumes of data cannot be processed manually. The study uses a computer package that summarizes the data in order to make analysis. The SPSS software is used to generate graphs and charts

to facilitate analyses. In the next sub-section, the importance of cross-tabulation and chi-square when analysing data is discussed.

3:6:7 Cross-tabulation and Chi-square tests

Although in descriptive statistics relationship are not emphasized, crosstabulation ensures whether there is a significant relationship or not between two or more variables. Cross-tabulation is done by deducing frequency distribution, measures of central tendencies measures of dispersion (Wiid and Diggines 2015:260). All the descriptive statistical work is summarized by using cross-tabulation and Chi-square tests are used in analysing the pattern or behaviour of categories in relation to opinions (Shumacker 2017:2). The association between two categorical variables should have a 95% level of confidence or more with a benefit of doubt at a level of 5% probability that there is no relationship (Wiid and Diggines 2015:280). The significant relationship is indicated with a $(p - value)$ where *p* is the probability that there is an association between two or more variables which should be $p < 0.05$ (Shumacker 2017:3) Inferential statistics discussed in the next chapter is used to analyse data in this study.

3:7 INFERENTIAL STATISTICS

While descriptive statistics explains data as it is naturally, inferential statistics allows us to jump onto conclusion by relating the sample results to the population (Trochim, Donnelly and Arora 2016:306). o'Leary (2017:310) asserts that, drawing conclusion from descriptions of data requires population data and sample data to make valid generalisations. In this study, mathematical assumptions are utilised to determine the representativeness of the sample (Mellinger and Hanson 2017:23).

While descriptive statistics shows the patterns, inferential statistics relate the sample results to the population through deductions (Patten and Newhart 2018:204). Accuracy of the sample replicate population behavior and there should be no discrepancy between the statistics and the parameters (Gravetter and Forzano 2016:443). Since the findings are from the sample not the population parameter, the researcher cannot generalize that the sample results match 100%, but the study uses the *p*-value=0.05 which confirms that the probability that the researcher got the findings by chance is 5% with 95% confidence level (o'Leary 2017:310).

3:7:1 Pearson's (*r)* correlation coefficient

Pearson correlation (*r)* is a linear relationship among two continuous variables both at interval or ratio level (Mellinger and Hanson 2017:180). Where the increase or decrease in one continuous variable lead to an increase or decrease in another, there is a positive or negative correlation ranging from -1 to +1 with zero showing no correlation (Patten and Newhart 2018:231). Care is taken to avoid Alpha (type I error) stating that, something is caused by another when it's not ($p \neq 0.05$) or Beta (type II error) where conclusions are made that there is no relationship while there is (beta) $\beta \neq 0.08$ (Picardi and Masick 2014:178). The study compares whether knowledge of benefits motivate consumers or whether awareness of shortcoming is a barrier to consumer choice of fortified products.

3:7:2 *t*-Tests

The *t*-tests assess the difference between two means but on the same construct (Trochim, Donnelly and Arora 2016:312). The larger the difference between means, the lower the *p*-value and the lesser the sampling error (Patten and Newhart 2018:237). The means being compared must be from independent groups like females and males' averages (Wiid and Diggines 2015:286).

3:7:3 Analysis of variance (ANOVA)

Mellinger and Hanson (2017:24) are of the view that, ANOVA and *t*-Test are analysed using frequency tables and chi-square tests. ANOVA helps to analyse the difference between two or more groups involving independent and dependent variables (Wiid and Diggines 2015:315). In the study there are three age groups that require analyzing the three means of all the groups and two gender groups which require *t*-Tests (Knapp 2014:90). Pretesting is explained in the next section.

3:8 PRETESTING

Pretesting is very crucial in providing unknown information relating to; how long it takes to administer a questionnaire, survey problems, understandability, format, natural flow, and irrelevant information in a questionnaire (Wiid and Diggines 2015:174). In order to minimize errors, there is a need to do a pretest so that errors are detected before a

full-scale survey is undertaken (Trochim, Donnelly and Arora 2016:118). To avoid survey pitfalls, the researcher needs to test the feedback of respondents' experience and compatibility of data to statistical analysis (o'Leary 2017:229). After the pretest, adjustments are done to questions that are not clear or add new questions that were initially neglected but vital (Wiid and Diggines 2015:174). However, respondents in the test should be of similar characteristics with to the sample in order to match the layout, usefulness of questions, instructions, wording and length of statements (o'Leary 2017:229). The researcher seldom uses 10 participants for pretesting. The next section explains delimitation of the study.

3:9 DELIMITATION

The study is restricted to KwaZulu-Natal town of Durban located on the East coast. Subgroups are developed to include; North bound category (NB), South bound (SB), West bound (WB), and Central bound (CBD) with a population of 1,180,000 people (eThekwini municipality 2018:43) of which our target population covers 826,000 people. These categories are important during the analysis of the findings from these four regions selected. The next section discusses measures to ensure validity and reliability in this study.

3:10 VALIDITY AND RELIABILITY

Picardi and Masick (2014:55) define validity as the degree of accuracy of the measurement. Whenever there is a measuring scale, there is always a need to use a valid instrument that will produce dependable results (Patten and Newhart 2018:123). Gravetter and Forzano (2016:165) caution that, the quality of being true and accurate without flaws should be taken serious as poorly designed research lacks validity. Reliability refers to the consistence in repeated tests or any measurement (Trochim, Donnelly and Arora 2016:119).

Reliability ensures that results can be replicated with precision and stability (Pacardi and Masick 2014:43). Validity is more important than reliability as a questionnaire with high reliability may be invalid (Patten and Newhart 2018:137) but a questionnaire with high validity must never be unreliable. On the other hand, if a questionnaire measuring is unstable and inconsistent, it invalidates the entire research project (Gravetter and Forzano 2016:359). Internal validity is explained in the next sub-section.

3:10:1 Internal validity

Internal validity involves selecting the right sample and measuring the right thing (Picard and Masick 2014:70). Construct validity ensures that the instrument is measuring what theoretically it's supposed to measure (Trochim, Donnelly and Arora 2016:128). The capacity to capture the phenomenon of interest can be done by comparing other tools measuring similar studies (Mellinger and Hanson 2017:29). Picardi and Masick (2014:77) state that, constructs must relate to the literature with adequate explanation as they tend to be contaminated with other factors. Therefore, operationalization is fundamental for construct validity.

The study avoids extraneous variables that are in the literature but not investigated which is common in most research projects (Graretter and Forzano 2016:175). When operationalising constructs, errors may occur and affect both validity and reliability which can make a difference between what is measured and what the study is supposed to measure (Picardi and Masick 2014:172). The researcher also weeds out co-founding variables that are discovered during the research (Gravetter and Farzano 2016:175).

Content validity on the other hand is ensuring that the contents of the construct are specific to what the study intends to find (Trochim, Donnelly and Arora 2016:130). Content validity ensures whether the items (questions) fit in with the construct assigned to them (Picardi and Masick 2014:89). The disadvantage with construct validity and content validity is that, the researcher may mess up from construction of variables by ambitiously thinking better in concept mapping (Trochim, Donnelly and Arora 2016:136). The next sub-section relates to measure put in place to ensure external validity

3:10:2 External validity (Generalizability)

The threats to external validity start from; sample bias with inaccurate representation, volunteer bias, selecting participants from a party or congregation (Gravetter and Forzano 2016:170). External validity allows generalization of the sample results to the broader population by inferences (Trochim, Donelly and Arora 2016:83). The world is chaotic and uncontrollable in that trying to ensure external validity comprises extraneous and co-founding variables but similarly, tightly controlling research

internally hinders external validity by sticking to the point (Gravetta and Forzano 2016:181).

Statistical tests do not overcome validity and reliability issues (Mellinger and Hanson 2017:28). For validity test, the study uses face validity by focusing on the appearance of the variables (Picardi and Masick 2014:88). Judgement validity can also help by obtaining advise based on professional researchers (Patten and Newhart 2018:126). However, face validity resonates from the literature review by ensuring that questions in the construct reflect the literature review (Mellinger and Hanson 2017:29). Picardi and Masick (2014:88) are of the view that, face validity is a "paper-and-pencil-in-basket" test. However, face validity is acceptable although it's subjective. The study also uses factor analysis to determine the estimated correlation among variables (Mellinger and Hanson 2017:32). Sub-section 3:10:3 following explains how reliability is ensured in this study.

3:10:3 Ensuring reliability (Cronbach's alpha coefficient)

Ensuring internal consistency requires splitting the items into half but with Cronbach's coefficient, we split all items, average all the splits to obtain a value equivalent to Cronbach's alpha (Patten and Newhart 2018:144). However, Alpha (α) can also be obtained by dividing the number of items by the number of items minus one multiplied by standard deviation squared minus the sum of the variance divide by standard deviation squared (Gravetter and Forzano 2016:488). The answer for alpha ranges from zero to one, and the closer to one the more consistence. But since the study involves a large volume of data, the SPSS software package is used to calculate the alpha values. In the last section before the conclusion of this chapter, research ethics are explained.

3:11 RESEARCH ETHICS

Mellinger and Hanson (2017:14) warn that, ethics form part of research integrity and academic integrity by ensuring that human participation is safe, voluntary, and autonomous in respect for individuals. Ethics involve individuals, groups or society reaction to an act initiated by the researcher (Picard and Masick 2014:29). Gravetter and Forzano (2016:101) have the same view that, ethics are about being honest, respectful to all individuals affected by the research project. Informed consent about

the purpose of the project, right to withdraw from participation, anonymity and confidentiality form part of the Belmont report (Mellinger and Hanson 2017:15).

Omission of data, inaccuracy misrepresentation, misconduct, modification, distortion, improving statistical power, aligning with other findings, fabrication, and falsification are all ethical issues avoided in the study (Picardi and Masick 2014:35). Trochim, Donnelly and Arora (2016:47) caution that, research misconduct, fabrication by making up data, plagiarism, unfairness to publication, and conflict of interest should be avoided. Picardi and Masick (2014:35) affirm that, researchers should provide information on the weaknesses, flaws, limitations, and conflict of interest so that other future researchers can address the shortcomings.

3:12 CONCLUSION

The research methodology selected is designed to gather information regarding consumer perspective towards fortified food products focusing on awareness and knowledge of healthy nutrition. Ensuring valid and reliable information has been the focus in this chapter. Understanding consumer attitude, perception and opinion requires a well-designed questionnaire. The researcher has selected a research design basing on the quantitative paradigm with a sample of n=400 selected using non-probability convenience sampling. Data is analysed using SPSS and ANOVA with both descriptive and inferential techniques. Research ethics are considered throughout the study. After testing the questionnaire with a pilot survey, corrections have been made to the questionnaire for a full-scale survey. The subsequent chapter presents the findings, analysis and interpretation of the empirical study.

CHAPTER 4. FINDINGS, ANALYSIS AND INTERPRETATION

4:1 INTRODUCTION

From the preceding chapter, having selected the appropriate methodology for the study, the researcher collected data in line with the aims and objectives of the project. This chapter presents the findings and statistical analysis of the results for a guided discussion. The questionnaire was the tool used to collect data among consumers in the central region of Durban. Data was carefully captured on the spreadsheet and the version 25.0 of SPSS was successfully used for analysis. The results are presented in descriptive statistics using tables, graphs and cross tabulation. Furthermore, inferential techniques that include correlation and chi-square test values are interpreted using the p-values. This chapter also assesses the respondents' views, options and perceptions in relation to awareness and knowledge of food fortification basing on the consumer perspectives.

4:2 THE SAMPLE

In total, the population under study was approximately 823,000 people (eThekwini municipality IDP 2018:39) from which a sample of four hundred participants (n=400) were selected. Respondents were selected conveniently in South, East, West and Central Band of the area of study. During the survey, two field workers assisted the researcher in administering the questionnaire. The next section describes reliability statistics of the study.

4:3 RELIABILITY STATISTICS

Normally, in quantitative data analysis, the two most important aspects of precision are reliability and validity. According to Donnelly and Arora (2016:119), reliability refers to the degree of consistence in that repeated measurements produce similar results under similar conditions. Reliability was ensured using Cronbach alpha which ranges from zero to one, where the closer to one, the more consistent the scale of measurement (Gravetter and Forzano 2016:488). Table 4:1 reflects the summary of Cronbach's alpha score for the items that constituted the questionnaire that was used in the survey. A reliability coefficient of 0.60 or higher is considered as "acceptable"

for a newly developed construct. Therefore, the instrument used in the study is reliable.

Table 4:1 A summary of reliability tests

	Number of Items	Cronbach's Alpha
Merits	4	0.589
Demerits	4	0.599
Motivators	7	0.707
Barriers	6	0.623

The reliability score for all sections exceed or approximate the recommended Cronbach's alpha value. This indicates a degree of acceptable consistent scoring for all sections of the research. The research instrument and its sections are discussed in the next sections.

4:4 RESEARCH INSTRUMENT

The measuring instrument constituted five sections of 26 relevant items for the study. For the purpose of simplicity, from the definition of fortification (Hadebych *et al.* 2016:122), the instrument had the following instructions; "Fortified food products, enriched food products, and health food products mean the same for the study", and "Fortified products are processed products with added vitamins and minerals (nutrients) for example bread, dairy products, and cereals". A level of measurement at nominal and ordinal levels with a five-point Likert scale from extremely unfavourable options to extremely favourable options with a neutral point between the scale was used (Picardi and Masick 2014:46). The sections of the instrument measured different themes as illustrated subsequently.

4:4:1 BIOGRAPHICAL DATA

The sample selected had varying biographical data with a commonality of being residents surrounding central Durban. In the literature review, the significance of socio-demographic factors was emphasized in influencing consumer choice of fortified food products. Kaur and Singh (2017:169) articulate that, gender, age, education among other demographic factors, have a remarkable influence on consumer fortified food purchase intention. Therefore, gender, age, region and designation were

deemed relevant for this study. Table 4:2 summarises the biographical features of the respondents relating to gender and age. The age distribution has been applied on the gender data to detect the comparative information and establish the relations within the biographical data.

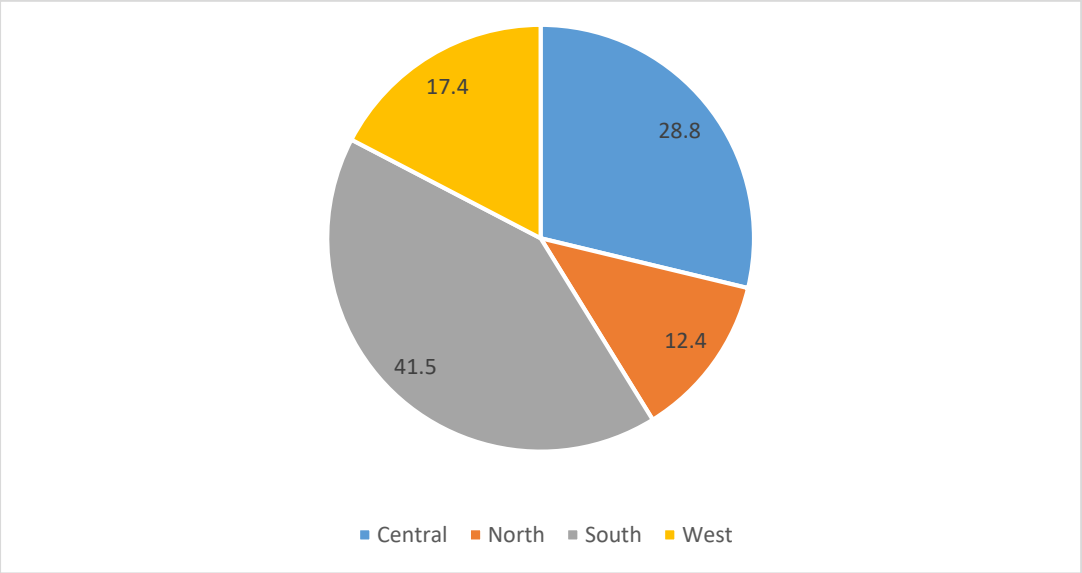
Table 4:2 Overall gender distribution by age

Age * Gender Crosstabulation					
			Gender		Total
			Female	Male	
Age	18 - 34	Count	144	90	234
		% within Age	61.5%	38.5%	100.0%
		% within Gender	59.0%	57.7%	58.5%
		% of Total	36.0%	22.5%	58.5%
	35 - 59	Count	71	51	122
		% within Age	58.2%	41.8%	100.0%
		% within Gender	29.1%	32.7%	30.5%
		% of Total	17.8%	12.8%	30.5%
	60 and over	Count	29	15	44
		% within Age	65.9%	34.1%	100.0%
		% within Gender	11.9%	9.6%	11.0%
		% of Total	7.3%	3.8%	11.0%
Total		Count	244	156	400
		% within Age	61.0%	39.0%	100.0%
		% within Gender	100.0%	100.0%	100.0%
		% of Total	61.0%	39.0%	100.0%

From Table 4:2, the overall ratio of males to females is approximately (39%:61%). This means that, for every five respondents, three were females. However, in the first age category of age 18-34 years 61.5% were females. Exactly 59% of the total females are in this category of 18-34 years. This brought 36% of the total sample of 400 participants being females in this category. Within the age category of 35-39 years 41.8% were male within the category of males (only). Approximately 33% were males between the ages of 35-59 years. This category is aware of the significance of fortification compared to the other two age groups. Likewise, within the last category of the age 60 and over, 34.1% were males and 65.9% were females. Older males over the age of 60 are less aware of the benefits of fortification than their female counterparts as reported by Kaur and Singh (2017:169). Therefore, individually gender and age are not evenly distributed ($p < 0.001$) in the study.

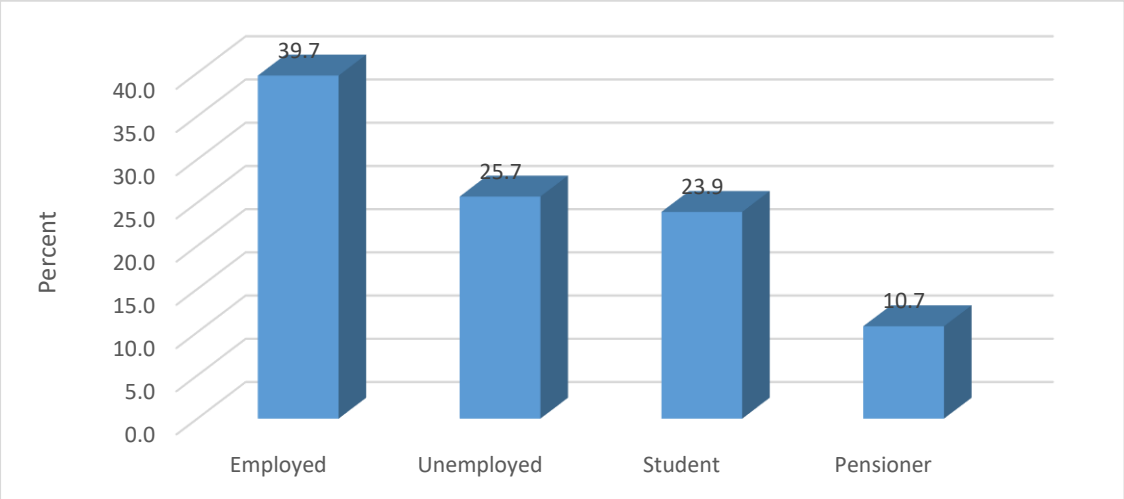
Moving to the regional distribution, there is a pattern of uneven distribution of respondents. Figure 4:1 shows the number of respondents from central, North, South and West.

Figure 4:1 Regional distribution of respondents



The scores in Figure 4:1 are presented in percentages with most respondents (41.5%) coming from the South ($p < 0.001$) which reflects the population distribution of Durban central region (eThekwini municipality IPD 2018:39). The last biographical factor in the study was the designation of respondents. Four options were presented in the questionnaire, which included; employed, unemployed, students and pensioner. Figure 4:2 shows the employment status of the respondents.

Figure 4:2 Employment status of respondents

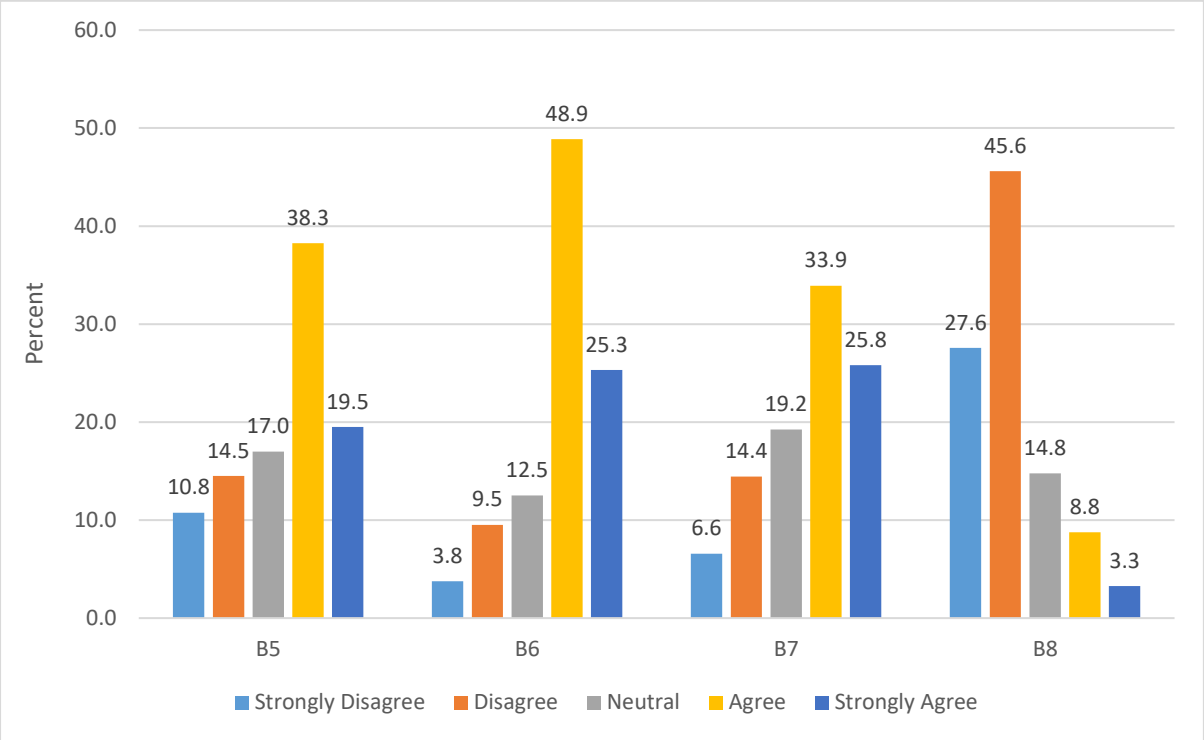


From Figure 4:2 it can be observed that approximately 40% of the respondents were employed, with the smallest grouping being pensioners (10.7%) ($p < 0.001$). The employed busy consumers as articulated by (de Pee 2017:82) opt for cheaper convenience unhealthy food which makes them less considerate to health fortified food products.

4:4:2 SECTION ANALYSIS (MERITS)

In this section the researcher analyses the scoring patterns of the respondents for consumer knowledge of the benefits of fortified food products. Figure 4:3 presents the results of respondents along with the percentage scores.

Figure 4:3 Graphical presentation for benefits of fortification awareness



		Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree		Chi Square
		Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	p-value
Fortified products are good for health	B5	43	10.8%	58	14.5%	68	17.0%	153	38.3%	78	19.5%	0.000
I know the benefits of vitamins	B6	15	3.8%	38	9.5%	50	12.5%	195	48.9%	101	25.3%	0.000
I consider health ingredients when buying food	B7	26	6.6%	57	14.4%	76	19.2%	134	33.9%	102	25.8%	0.000
Fortified food is for children only	B8	110	27.6%	182	45.6%	59	14.8%	35	8.8%	13	3.3%	0.000

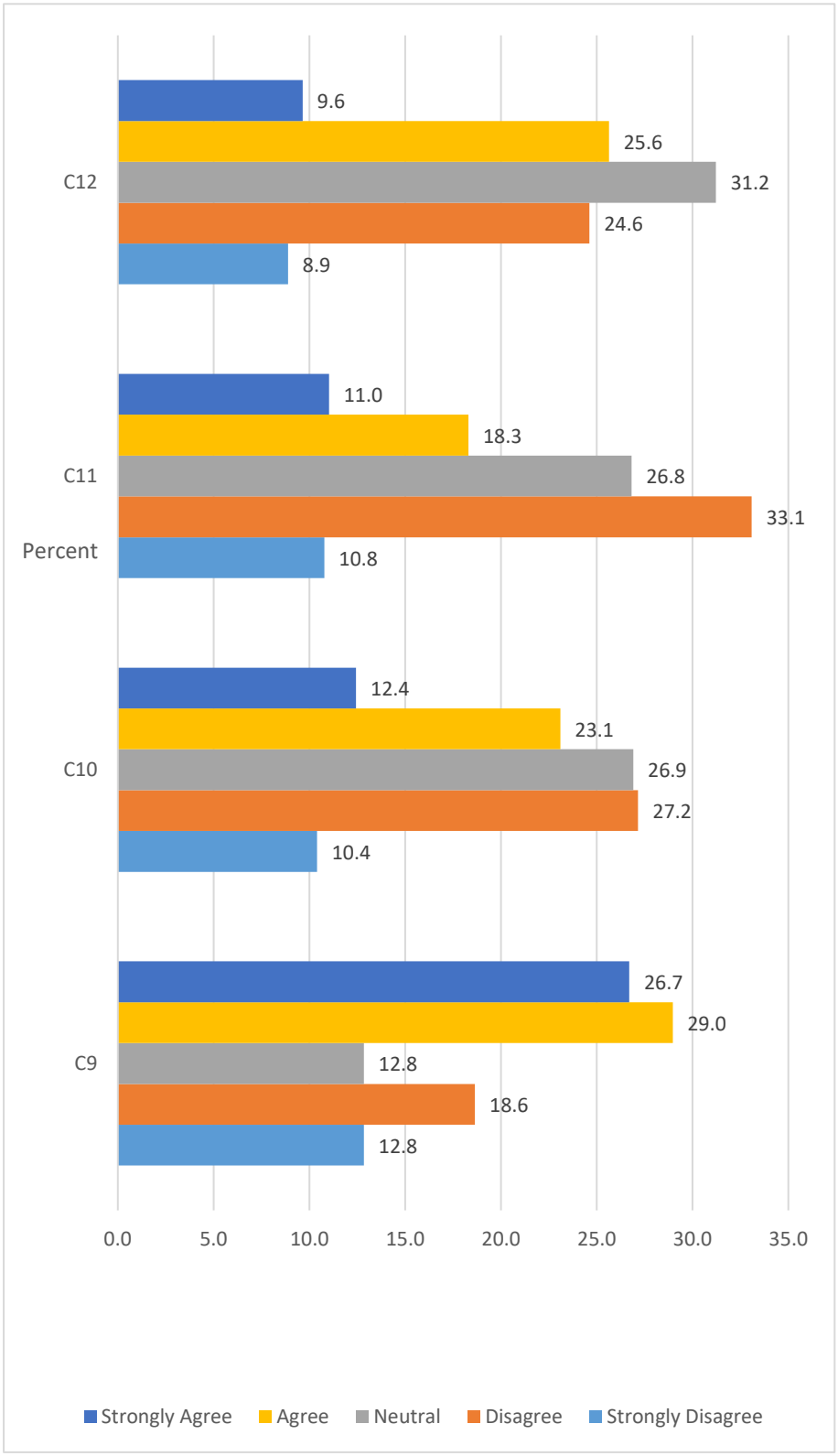
As seen from Figure 4:3, although more than half of the respondent are aware that fortified food products are good for health, approximately 72% of them believe that fortified products are for children only. Respondents are not aware that fortified products are beneficial to everyone. Detzel and Weiser (2015:36) assert that, child growth stands a high risk of nutrition deficiency but Baugreet *et al* (2017:111) insist that older people with declining body function also deserve food products that are fortified to enhance strength. While in another statement (B7) approximately 60% of the respondents consider health ingredients when buying food products but may not be aware of the benefits of fortified products.

Bazhan *et al*. (2017:254) contend that, consumers are lacking knowledge of the benefits fortified food products which corresponds with the findings. Although a considerable number of respondents are aware of fortification, some of the respondents have little or no knowledge of the benefits of fortified food products. The alternate statement proves that there is a significant difference between the levels of agreement and disagreement (Schumacker 2017:4) which shows the $p - value$ being less than 0.05 (level of significance). The findings imply that the distributions were not similar and the differences between the way respondents scored (agreed, neutral, disagree) were significant. The next section covers respondent's awareness of the demerits of food fortification.

4:4:3 SECTION ANALYSIS (DEMERITS)

This section analyses the scoring patterns of respondents. However, the analysis in this section reiterates respondents' knowledge of the dangers of fortified food products. As seen from Figure 4:4 there is a significant difference between the level of disagreement and agreement. A chi-square test was done and the (*p*-values) are less than 0.05 which is the level of significance. Therefore, the distribution was not even, implying that respondents' scores were significant. Figure 4.4 reflects a graphical presentation of the response from participants. The symbols; (C9), (C10), (C11), and (C12) are representing statements related to consumer knowledge of the demerits of food fortification. The corresponding scores of each statement are graphically presented in percentages obtained from the table on the right-hand side of the graph.

Figure 4:4 Awareness of the demerits of fortification



		Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree		Chi Square
		Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	p-value
Unprocessed Natural food is better than processed fortified food	C9	51	12.8%	74	18.6%	51	12.8%	115	29.0%	106	26.7%	0.000
Fortified food makes me obese	C10	41	10.4%	107	27.2%	106	26.9%	91	23.1%	49	12.4%	0.000
Eating fortified food is dangerous to my health	C11	43	10.8%	132	33.1%	107	26.8%	73	18.3%	44	11.0%	0.000
Added nutrients cause allergy	C12	35	8.9%	97	24.6%	123	31.2%	101	25.6%	38	9.6%	0.000

As seen in Figure 4.4, it's indicated that the naturalness is considered by respondents when purchasing fortified products. At least 56% of the respondents prefer unprocessed natural food to processed fortified products. The naturalness of fortified products was highly considered by the respondents with 12.8% unsure whether fortified products are natural or not. Scott and Rozin (2017:572) confirm that consumers look for products that are labelled "natural". On the other hand, approximately 63% are either not sure or disagree that fortified products can make them obese which means that consumers are not aware of the dangers of over consuming fortified foods. However, in the study concluded by du Plessis *et al*. (2016:37), it is reported that over consumption of fortified products may lead to overweight and obesity. Furthermore, although fortified bread protects consumers from contracting type-2 diabetes (Magalis, Giovanni and Silliman 2016:37), it has energy dense properties which can lead to obesity as articulated by (Guine *et al.* 2016:307). Nearly 44% disagree that fortified products are dangerous to their health.

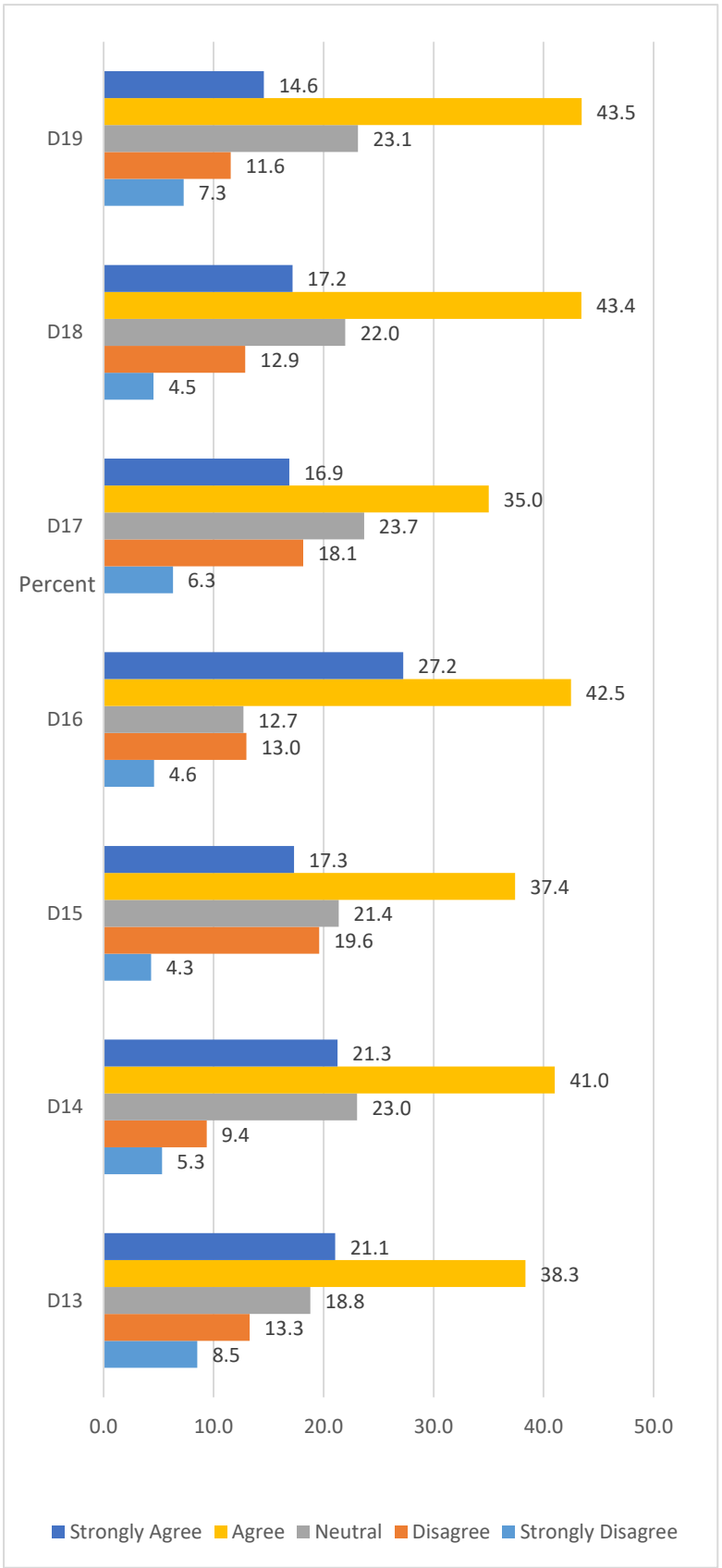
Over 33% of the respondents remained neutral or do not know and close to 34% disagree that fortified food products can cause allergy. Indeed allergies, nausea, hyperactivity are due to additives that preserve fortified food products (Deshpande and Deshpande 2017:293). Whitining *et al*. (2016:1103) state that excess vitamins can increase the risk of bone fracture which can be fatal to the elderly in most cases. A considerable number of 44% of respondents are not aware of the dangers of excess vitamins. Respondents agree that, unprocessed natural food is better than processed fortified food. However, most of the respondents disagree that eating fortified food is dangerous to their health. This means that, while consumers prefer natural unprocessed food products, they consider fortified products not to be dangerous to their health.

4:4:4 SECTION ANALYSIS (MOTIVATORS)

This section analyses the scoring trend of respondents per variable relating to the motivators of the respondents to purchase fortified products. The results are then analysed according to the importance of the statements.

Figure 4.4 presents a graphical data summary of the motivators of consumer choice of fortified food products.

Figure 4:5 Graph for respondents' motivators of fortified food purchase



		Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree		Chi Square
		Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	p-value
Fortified brown bread has a good taste	D13	34	8.5%	53	13.3%	75	18.8%	153	38.3%	84	21.1%	0.000
I buy products high in fibre	D14	21	5.3%	37	9.4%	91	23.0%	162	41.0%	84	21.3%	0.000
I eat enriched food to avoid poor health diseases	D15	17	4.3%	77	19.6%	84	21.4%	147	37.4%	68	17.3%	0.000
Family members encourage me to eat healthy food	D16	18	4.6%	51	13.0%	50	12.7%	167	42.5%	107	27.2%	0.000
I follow health eating advertisement	D17	25	6.3%	72	18.1%	94	23.7%	139	35.0%	67	16.9%	0.000
Food packages help me to make health food choices	D18	18	4.5%	51	12.9%	87	22.0%	172	43.4%	68	17.2%	0.000
Nutrition information influence my food purchase	D19	29	7.3%	46	11.6%	92	23.1%	173	43.5%	58	14.6%	0.000

As seen from Figure 4.5, the taste of fortified food greatly influences consumers motive to buy these enriched products. Respondents were asked whether fortified brown bread has a good taste, and slightly more than half of the respondents agreed and strongly agreed but nearly 23% of participants do not like the taste of fortified brown bread. The taste, colour, and aroma of fortified products motivate consumers purchase intention of fortified products as articulated by Guine *et al.* (2016:314).

Furthermore, approximately 62% of the respondents buy fortified products high in fibre. Magalis, Giovanni and Silliman (2016:489) contend that consumers buy fortified products with dietary fibre like cereals to neutralise the digestive system and prevention of heart diseases. Respondents are highly influenced to purchase fortified products which contain fibre.

In another statement, close to 70% of respondents agree that family members encourage them to eat healthy fortified food. This empirical evidence is in line with the works of Masterson, Phillips and Pickton (2017:315) who affirm that, word of mouth (WOM) conversations through families, peers, postings, and tweets on social media fuel viral marketing of health eating behaviour. Respondents are influenced by family members to buy fortified products.

About 53% of respondents are motivated by health eating advertisement. As stated by Lu (2015:1874), nutrition content advertisements motivate consumer demand for functional (fortified) food products. Furthermore, 60.6% of respondents are influenced by packages to make health food choices. Kaur and Singh (2017:168) assert that attractive packages containing labels like; rich in fibre, contains vital vitamins, and rich in mineral enhance perceived quality of the products. It is evident that, 58.1% of respondents are motivated by nutritional information to purchase fortified food products.

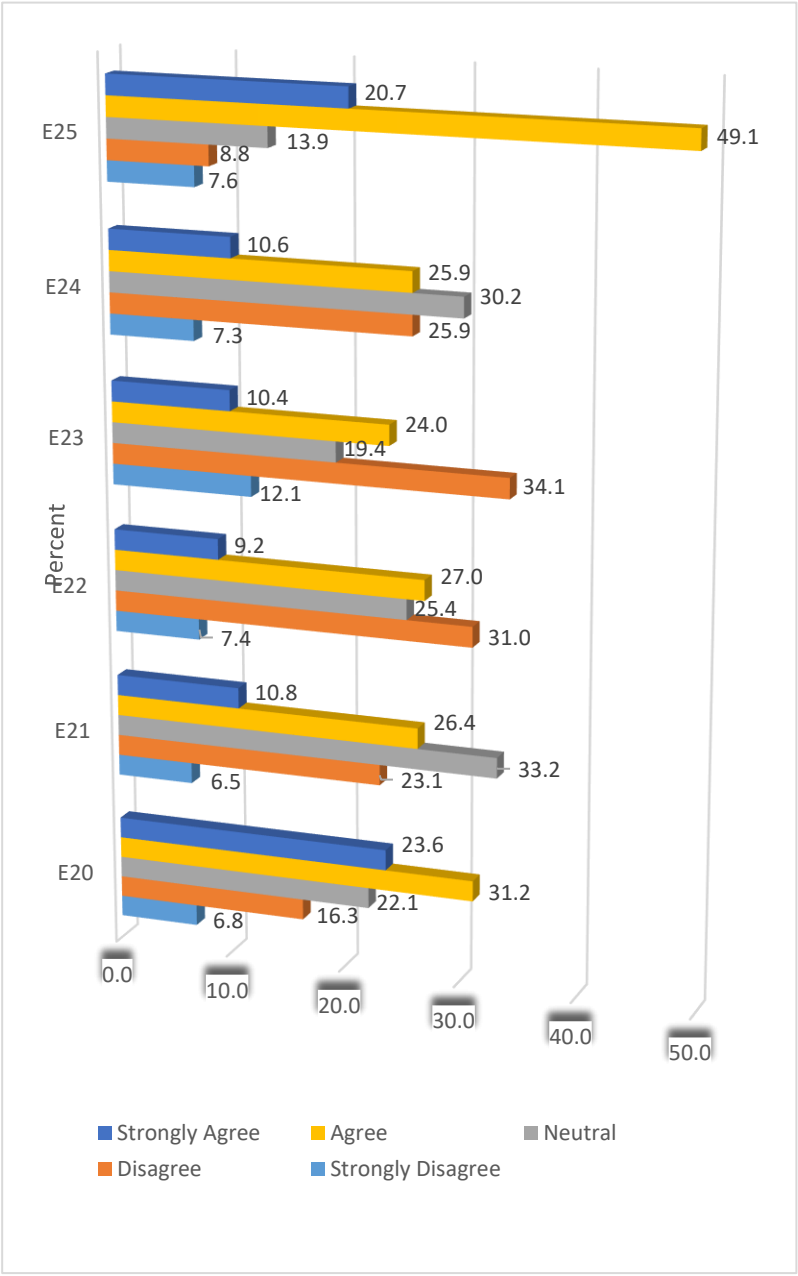
In Figure 4:5, some items depict significantly higher levels of agreement as well as low levels especially with (D14), (D16), while (D18) and (D19) have significantly high levels of agreement. Using chi-square tests, the (*p*- values) are less than 0.05 the maximum acceptable level of significance which implies that the frequencies were not uniform. There is a varied response regarding scores (agree, neutral, disagree) which is significant.

4:4:5 SECTION ANALYSIS (BARRIERS)

In this section, analysis is made regarding respondents scores in relation to barriers for consumer choice of fortified food products. The results are first presented using summarised percentage for the variables. The outcome is further analysed according to the importance of the statements as seen in Figure 4.6 below.

Figure 4:6 A graph presenting respondents' barriers for fortified food purchase

			Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree		Chi Square
			Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	p-value
Enriched food products are expensive	E20	E25	27	6.8%	65	16.3%	88	22.1%	124	31.2%	94	23.6%	0.000
Fortified food products are artificial	E21	E24	26	6.5%	92	23.1%	132	33.2%	105	26.4%	43	10.8%	0.000
I have no time to prepare fortified food	E22	E23	29	7.4%	122	31.0%	100	25.4%	106	27.0%	36	9.2%	0.000
I eat to get full without considering nutrients	E23	E22	48	12.1%	135	34.1%	77	19.4%	95	24.0%	41	10.4%	0.000
Processed fortified foods have harmful additives	E24	E21	29	7.3%	103	25.9%	120	30.2%	103	25.9%	42	10.6%	0.000
I have seen products with nutritional labels	E25	E20	30	7.6%	35	8.8%	55	13.9%	195	49.1%	82	20.7%	0.000



From Figure 4.6, participants response to the statement (E20) whether enriched (fortified) products are expensive received a score of 54.8% in agreement. Although some of respondents may be aware of fortified products, they are hindered by the price of these enriched products. Magalis, Giovanni and Silliman (2016:490) confirm that, fortified whole grain costs 33% more than refined unfortified cereals. White *et al*. (2017:7) articulate that, the process of food fortification involved additional costs which may turn away consumers.

In another instance, respondents were found to be skeptical of food fortification when they were asked whether fortified products are artificial (E21) statement. Over 37% agreed while 29% disagreed, while 33% remained neutral. Similarly, Sandmann *et al*. (2015:57) concluded that, consumers believe fortified products contain artificial additives. There is a perception that fortified foods have harmful substances compared to conventional food products (Bazhan *et al.* 2017:572).

Surprisingly approximately 70% of respondents agree that they have seen products with nutritional labels but 34.4% of respondents eat to get full without considering nutrients. This means that consumers know the products with nutrients but just eat any type of food to get to get satisfied. Since consumers have no time, they tend not to be mindful of what the labels are indicating in terms of health properties. Some respondents may have seen the products with nutritional labels but have not taken the effort to identify the fortified products from other food products that are not fortified. While others may have seen the labels but are reluctant to buy fortified products with nutrition labels.

Barriers hinder the consumers from purchasing fortified food. De and Garrigues (2015:560) contend that consumers are avoiding functional foods and are increasingly looking for products with natural properties. Respondents were skeptical of fortified food products regarding the naturalness and the side effects.

The following pattern was observed as reflected in Figure 4:6 relating to barriers for respondent's choice of fortified products; (E20) indicated high levels of agreement as well as (E25). The significance of the tables. While some levels portray lower levels of disagreement, (E22) shows a high level of disagreement compared to other variables in the same section. Looking at (E21), 33.2% of the respondents remained neutral or do not know whether fortified food products are artificial. In (E24), 30.2% of

the respondents remained neutral or don't know that processed fortified food has harmful additives. The patterns per statement were significantly different based on the chi-square tests. Approximately 50% of the respondent have seen products with nutritional labels but are not aware of the benefits of nutrients.

4:5 CROSS-TABULATION

The traditional approach to reporting a result requires a statement of statistical significance. A *p*-value is generated from a test statistic. Normally a significant result is indicated with "$p<0.05$" which means that the probability that the results were obtained by chance is 5% and the level of confidence is 95% (Schumacker 2017:6). A second chi-square test was performed to determine whether there was a statistically significant relationship between the variables (rows and columns).

The null hypothesis states that there is no association between two variables. The alternative hypothesis indicates that there is an association. If the *p*-value is greater than 0.05 then the relationship between two variables is poor or the relationship is nonsignificant, however if the *p*-value is less than 0.05, the null hypothesis is rejected meaning that, there is a significant relationship between the variables being tested (Wiid and Diggines 2015:264).

In the study, there are four categories that need to be tested along all the dependent variables. The four categories include; Gender, Age group, Region, and Designation. The researcher seeks to establish whether there is a relationship between any of the categories and all the variable statements relating to; Merits, Demerits, Motivators, and Barriers for food fortification to a consumer.

Bivariant tests were conducted as indicated in Table 4.3 on four categories and the statements in the measuring instrument to assess consumer level of awareness of the significance of food fortification to a consumer in relation to biographical data. The significant relationship values are marked by the asterisk * in Table 4.3 of chi-square tests. In the subsequent sub-sections, only the significant relationships are further discussed along with the relevant tables regarding the relationships between the categories and the statements.

Table 4:3 A summary of the results of the chi-square tests

Pearson Chi-Square Tests					
		Gender	Age	Region	Designation
Fortified products are good for health	Chi-square	2.680	18.324	20.574	21.813
	df	4	8	12	12
	Sig.	0.613	.019*	0.057	.040*
I know the benefits of vitamins	Chi-square	6.606	16.139	11.297	15.599
	df	4	8	12	12
	Sig.	0.158	.040*,b	.504b	.210b
I consider health ingredients when buying food	Chi-square	4.638	15.049	15.269	8.665
	df	4	8	12	12
	Sig.	0.326	0.058	0.227	0.731
Fortified food is for children only	Chi-square	0.632	13.946	26.078	15.007
	df	4	8	12	12
	Sig.	0.959	.083b	.010*,b	.241b
Unprocessed Natural food is better than processed fortified food	Chi-square	3.228	10.328	15.445	21.826
	df	4	8	12	12
	Sig.	0.520	0.243	0.218	.040*
Fortified food makes me obese	Chi-square	4.842	18.573	13.739	12.393
	df	4	8	12	12
	Sig.	0.304	.017*	0.318	0.415
Eating fortified food is dangerous to my health	Chi-square	4.849	2.322	14.193	6.741
	df	4	8	12	12
	Sig.	0.303	0.970	0.289	0.874
Added nutrients cause allergy	Chi-square	2.099	19.906	13.389	23.579
	df	4	8	12	12
	Sig.	0.717	.011*	0.341	.023*
Fortified brown bread has a good taste	Chi-square	7.813	24.679	5.627	33.156
	df	4	8	12	12
	Sig.	0.099	.002*	0.934	.001*
I buy products high in fibre	Chi-square	3.779	21.444	10.842	23.686
	df	4	8	12	12
	Sig.	0.437	.006*	0.543	.022*
I eat enriched food to avoid poor health diseases	Chi-square	2.217	13.003	11.967	19.098
	df	4	8	12	12
	Sig.	0.696	0.112	0.448	0.086
Family members encourage me to eat healthy food	Chi-square	6.068	5.333	14.027	8.998
	df	4	8	12	12
	Sig.	0.194	0.721	0.299	0.703
I follow health eating advertisement	Chi-square	1.629	20.617	10.803	23.179
	df	4	8	12	12
	Sig.	0.804	.008*	0.546	.026*
Food packages help me to make health food choices	Chi-square	6.556	10.273	9.632	17.135
	df	4	8	12	12
	Sig.	0.161	0.246	0.648	0.145
Nutrition information influence my food purchase	Chi-square	1.014	15.441	17.065	17.224
	df	4	8	12	12
	Sig.	0.908	0.051	0.147	0.141
Enriched food products are expensive	Chi-square	1.838	29.383	10.718	33.737
	df	4	8	12	12
	Sig.	0.766	.000*	0.553	.001*
Fortified food products are artificial	Chi-square	3.960	16.468	10.352	28.049
	df	4	8	12	12
	Sig.	0.411	.036*	0.585	.005*
I have no time to prepare fortified food	Chi-square	2.741	31.780	16.200	35.278
	df	4	8	12	12
	Sig.	0.602	.000*	0.182	.000*
I eat to get full without considering nutrients	Chi-square	3.228	9.661	11.283	20.810
	df	4	8	12	12
	Sig.	0.520	0.290	0.505	0.053
Processed fortified foods have harmful additives	Chi-square	3.020	2.208	8.610	8.110
	df	4	8	12	12
	Sig.	0.554	0.974	0.736	0.776
I have seen products with nutritional labels	Chi-square	2.397	25.088	19.295	17.330
	df	4	8	12	12
	Sig.	0.663	.002*	0.082	0.138

From table 4.3 all values without an asterisk (or *p*-values more than 0.05) do not have a significant relation. There is a significant relationship between age and awareness of food fortification as explained in sub-section 4:5:1.

4:5:1 Fortification awareness verses age

The *p*-value result between fortified products are good for health and "age" is 0.019. Since the (*p*-value) is less than 0.05, it means that there is a significant relationship between these two variables. Table 4.4 shows the scoring pattern for "Age" cross tabulation against the variables "fortified products are good for health".

Table: 4:4 Age against Fortified products are good for health

Fortified products are good for health * Age Crosstabulation						
			Age			
			18 - 34	35 - 59	60 and over	Total
Fortified products are good for health	Strongly Disagree	Count	26	17	0	43
		% within Fortified products are good for health	60.5%	39.5%	0.0%	100.0%
		% within Age	11.1%	13.9%	0.0%	10.8%
		% of Total	6.5%	4.3%	0.0%	10.8%
	Disagree	Count	38	17	3	58
		% within Fortified products are good for health	65.5%	29.3%	5.2%	100.0%
		% within Age	16.2%	13.9%	6.8%	14.5%
		% of Total	9.5%	4.3%	0.8%	14.5%
	Neutral	Count	48	14	6	68
		% within Fortified products are good for health	70.6%	20.6%	8.8%	100.0%
		% within Age	20.5%	11.5%	13.6%	17.0%
		% of Total	12.0%	3.5%	1.5%	17.0%
	Agree	Count	83	46	24	153
		% within Fortified products are good for health	54.2%	30.1%	15.7%	100.0%
		% within Age	35.5%	37.7%	54.5%	38.3%
		% of Total	20.8%	11.5%	6.0%	38.3%
	Strongly Agree	Count	39	28	11	78
		% within Fortified products are good for health	50.0%	35.9%	14.1%	100.0%
		% within Age	16.7%	23.0%	25.0%	19.5%
		% of Total	9.8%	7.0%	2.8%	19.5%
Total		Count	234	122	44	400
		% within Fortified products are good for health	58.5%	30.5%	11.0%	100.0%
		% within Age	100.0%	100.0%	100.0%	100.0%
		% of Total	58.5%	30.5%	11.0%	100.0%

From Table 4:4, age group 18-34 strongly agree that fortified products are good for health by 60.5%, with the age group 35-59, 39.5% and 60 and over 0%. This means that the generation between 18-34 years are aware of the benefits of fortified products. Kaur and Singh (2017:169) affirm that age motivates consumer choice of fortified food products.

The "Age" verses "fortified food makes me obese" has a *p*-value=0.017 which is less than $p<0.05$ level of significance. Table 4.5 indicates the summary of "Age" cross-tabulation against the statement "fortified food can make me obese.

Table 4:5 Age cross-tabulation and Fortified food can make me obese

Fortified food makes me obese * Age Crosstabulation						
			Age			
			18 - 34	35 - 59	60 and over	Total
Fortified food makes me obese	Strongly Disagree	Count	24	11	6	41
		% within Fortified food makes me obese	58.5%	26.8%	14.6%	100.0%
		% within Age	10.4%	9.2%	13.6%	10.4%
		% of Total	6.1%	2.8%	1.5%	10.4%
	Disagree	Count	75	22	10	107
		% within Fortified food makes me obese	70.1%	20.6%	9.3%	100.0%
		% within Age	32.5%	18.5%	22.7%	27.2%
		% of Total	19.0%	5.6%	2.5%	27.2%
	Neutral	Count	65	33	8	106
		% within Fortified food makes me obese	61.3%	31.1%	7.5%	100.0%
		% within Age	28.1%	27.7%	18.2%	26.9%
		% of Total	16.5%	8.4%	2.0%	26.9%
	Agree	Count	43	38	10	91
		% within Fortified food makes me obese	47.3%	41.8%	11.0%	100.0%
		% within Age	18.6%	31.9%	22.7%	23.1%
		% of Total	10.9%	9.6%	2.5%	23.1%
	Strongly Agree	Count	24	15	10	49
		% within Fortified food makes me obese	49.0%	30.6%	20.4%	100.0%
		% within Age	10.4%	12.6%	22.7%	12.4%
		% of Total	6.1%	3.8%	2.5%	12.4%
Total		Count	231	119	44	394
		% within Fortified food makes me obese	58.6%	30.2%	11.2%	100.0%
		% within Age	100.0%	100.0%	100.0%	100.0%
		% of Total	58.6%	30.2%	11.2%	100.0%

As indicated in Table 4.5, 70.1% of the respondents (18-34years) disagree that fortified food can make them obese, and within the age 32.5% and with the whole sample of *n*=400 19% disagree. This means that the young generation between the ages of 18-34 years are not aware of the dangers of fortified products. This is in line with the reporting of (The Argus 2017:19) about the habit among South Africans of eating low dietary products with excessive energy dense sugar and obesogenic food products.

Furthermore, the cross-tabulation between “Age” and “I follow health eating advertisement generated a (*p*-value) of 0.008. There is a significant relationship between age and following health eating advertisement because $p<0.05$. In summary 70.8% in the age group (18-34) disagree, 37.4% in the group (35-59) agree. This means that the age group between 18-34 years are not motivated by healthy eating advertisement while the middle age (35-39) follow the healthy food advertisement. Table 4:6 summarises the “Age” and “I follow health eating advertisement” crosstabulation.

Table 4:6 Age and I follow health eating advertisement

I follow health eating advertisement * Age Crosstabulation						
			Age			
			18 - 34	35 - 59	60 and over	Total
I follow health eating advertisement	Strongly Disagree	Count	17	4	4	25
		% within I follow health eating advertisement	68.0%	16.0%	16.0%	100.0%
		% within Age	7.3%	3.3%	9.1%	6.3%
		% of Total	4.3%	1.0%	1.0%	6.3%
	Disagree	Count	51	12	9	72
		% within I follow health eating advertisement	70.8%	16.7%	12.5%	100.0%
		% within Age	22.0%	9.9%	20.5%	18.1%
		% of Total	12.8%	3.0%	2.3%	18.1%
	Neutral	Count	62	26	6	94
		% within I follow health eating advertisement	66.0%	27.7%	6.4%	100.0%
		% within Age	26.7%	21.5%	13.6%	23.7%
		% of Total	15.6%	6.5%	1.5%	23.7%
	Agree	Count	72	52	15	139
		% within I follow health eating advertisement	51.8%	37.4%	10.8%	100.0%
		% within Age	31.0%	43.0%	34.1%	35.0%
		% of Total	18.1%	13.1%	3.8%	35.0%
	Strongly Agree	Count	30	27	10	67
		% within I follow health eating advertisement	44.8%	40.3%	14.9%	100.0%
		% within Age	12.9%	22.3%	22.7%	16.9%
		% of Total	7.6%	6.8%	2.5%	16.9%
Total		Count	232	121	44	397
		% within I follow health eating advertisement	58.4%	30.5%	11.1%	100.0%
		% within Age	100.0%	100.0%	100.0%	100.0%
		% of Total	58.4%	30.5%	11.1%	100.0%

In Table 4.6, 43% of respondents within the age group of 35-59 agree and 22.3% also within the age group 35-59 strongly agree that they follow health food advertisement. Whereas 31% of respondents within the age of 18-34 agree and only 12.9% of respondents within the same age group strongly agree that they follow health eating advertisement. However, comparing these two age groups, surprisingly 51.8% with the age group 18-34 agree 37.4% with the age group 35-59 agree in total that they follow health food advertisement. This may be because the age group between 18-34 has a count of 51.8% of respondents compared to the age group 35-59 with a count of 37.4% respondents who agree to the statement that they follow health eating advertisement.

The statement “fortified food products are artificial” against “Age” scored a (*p*-value) of .000 which is less than 0.05 which means that there is a relationship between respondents’ perception that fortified food are artificial and age.

Table 4:7 “Age” against “fortified food products are artificial” indicates the summary of the pattern. In the cross-tabulation frequencies it’s clear that 63.8% of the age group between 18-34 believe that fortified food products are artificial whereas 34.6% of the age group 35-59 years strongly disagree that fortified food products are artificial. De

and Garrigues (2015:560), are of the view that, consumers portray a negative attitude towards cereal based fortified oats containing artificial minerals added like potassium.

Table 4:7 Age against Fortified food products are artificial

Fortified food products are artificial * Age Crosstabulation						
			Age			
			18 - 34	35 - 59	60 and over	Total
Fortified food products are artificial	Strongly Disagree	Count	9	9	8	26
		% within Fortified food products are artificial	34.6%	34.6%	30.8%	100.0%
		% within Age	3.9%	7.4%	18.2%	6.5%
		% of Total	2.3%	2.3%	2.0%	6.5%
	Disagree	Count	49	31	12	92
		% within Fortified food products are artificial	53.3%	33.7%	13.0%	100.0%
		% within Age	21.1%	25.4%	27.3%	23.1%
		% of Total	12.3%	7.8%	3.0%	23.1%
	Neutral	Count	81	37	14	132
		% within Fortified food products are artificial	61.4%	28.0%	10.6%	100.0%
		% within Age	34.9%	30.3%	31.8%	33.2%
		% of Total	20.4%	9.3%	3.5%	33.2%
	Agree	Count	67	31	7	105
		% within Fortified food products are artificial	63.8%	29.5%	6.7%	100.0%
		% within Age	28.9%	25.4%	15.9%	26.4%
		% of Total	16.8%	7.8%	1.8%	26.4%
	Strongly Agree	Count	26	14	3	43
		% within Fortified food products are artificial	60.5%	32.6%	7.0%	100.0%
		% within Age	11.2%	11.5%	6.8%	10.8%
		% of Total	6.5%	3.5%	0.8%	10.8%
Total		Count	232	122	44	398
		% within Fortified food products are artificial	58.3%	30.7%	11.1%	100.0%
		% within Age	100.0%	100.0%	100.0%	100.0%
		% of Total	58.3%	30.7%	11.1%	100.0%

As reflected in Table 4.7 within the age group 18-34 years 3.9% and 7.4% of the age group 35-59, strongly disagree that fortified food products are artificial. Whereas within the age group 60 and over, 18.2%, strongly disagree that fortified food products are artificial. This means that older respondents do not perceive fortified food products to be artificial while the middle age follow the elder's perception, the generation between the age 18-34 believe that fortified products are artificial. In total, 58.3% of the respondents of the age 18-34 years, 30.7% of age group 35-59, and only 11.1% of age group 60 and over, strongly that fortified products are artificial.

4:5:2 Awareness of fortification in relation to designation

The *p*-value between “Designation” and “Fortified products are good for health” is 0.04. This means that there is a significant relationship between “Designation” and the statement “Fortified products are good for health”. Designation play an important role in how respondents view the health benefits of fortified food products since the (*p*-value) is less than 0.05. Table 4.8 shows the cross-tabulation frequencies between “Designation” and “Fortified products are good for health.

Table 4:8 Designation and Fortified products are good for health

Fortified products are good for health * Designation Crosstabulation							
			Designation				
			Employed	Unemployed	Student	Pensioner	Total
Fortified products are good for health	Strongly Disagree	Count	23	10	9	0	42
		% within Fortified products are good for health	54.8%	23.8%	21.4%	0.0%	100.0%
		% within Designation	14.7%	9.9%	9.6%	0.0%	10.7%
		% of Total	5.9%	2.5%	2.3%	0.0%	10.7%
	Disagree	Count	25	12	18	3	58
		% within Fortified products are good for health	43.1%	20.7%	31.0%	5.2%	100.0%
		% within Designation	16.0%	11.9%	19.1%	7.1%	14.8%
		% of Total	6.4%	3.1%	4.6%	0.8%	14.8%
	Neutral	Count	26	17	20	4	67
		% within Fortified products are good for health	38.8%	25.4%	29.9%	6.0%	100.0%
		% within Designation	16.7%	16.8%	21.3%	9.5%	17.0%
		% of Total	6.6%	4.3%	5.1%	1.0%	17.0%
	Agree	Count	51	43	35	23	152
		% within Fortified products are good for health	33.6%	28.3%	23.0%	15.1%	100.0%
		% within Designation	32.7%	42.6%	37.2%	54.8%	38.7%
		% of Total	13.0%	10.9%	8.9%	5.9%	38.7%
	Strongly Agree	Count	31	19	12	12	74
		% within Fortified products are good for health	41.9%	25.7%	16.2%	16.2%	100.0%
		% within Designation	19.9%	18.8%	12.8%	28.6%	18.8%
		% of Total	7.9%	4.8%	3.1%	3.1%	18.8%
Total		Count	156	101	94	42	393
		% within Fortified products are good for health	39.7%	25.7%	23.9%	10.7%	100.0%
		% within Designation	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	39.7%	25.7%	23.9%	10.7%	100.0%

Table 4.8 reflects respondents who are employed score 58% with strongly disagree option and unemployed 23.8% disagree. However, 37.2% of students agree and 54.8% of pensioner agree with their group. In total, 10.7% respondents are pensioners, 23.9% are students, 25.7% are the unemployed, and 39.7% are the employed who strongly agree that fortified food products are good for health and no respondent from “Pensioners” group strongly disagreed. This means that pensioners are more aware that fortified products are good for health than the other three groups with the “Employed” 54.8%, “Unemployed” 23.8%, and “Students” 21.4% strongly disagree that fortified products are good for health. Still within “Designation, 14.7% of the employed, 9.9% unemployed, and 9.6% students strongly disagree that fortified

products are good for health, meaning that the employed are the most strongly in disagreement compared to the other three categories of designation.

The statement “Unprocessed natural food is better than processed fortified food” against “Designation” scored a (*p*-value) of 0.04. The relationship between these two variables is significant because it’s less than 0.05. Therefore, designation was significant in determining the response as the employed strongly disagree by 36%, followed by students with 32% also in strong disagreement that unprocessed natural food is better than processed fortified products.

Table 4.9 indicates the cross-tabulation tests regarding “Destination” against “Unprocessed natural food is better than processed fortified food”.

Table 4.9 Designation and Unprocessed natural food is better than processed fortified food

Unprocessed Natural food is better than processed fortified food * Designation Crosstabulation							
			Designation				
			Employed	Unemployed	Student	Pensioner	Total
Unprocessed Natural food is better than processed fortified food	Strongly Disagree	Count	18	13	16	3	50
		% within Unprocessed Natural food is better than processed fortified food	36.0%	26.0%	32.0%	6.0%	100.0%
		% within Designation	11.6%	12.9%	17.4%	7.1%	12.8%
		% of Total	4.6%	3.3%	4.1%	0.8%	12.8%
	Disagree	Count	30	25	10	9	74
		% within Unprocessed Natural food is better than processed fortified food	40.5%	33.8%	13.5%	12.2%	100.0%
		% within Designation	19.4%	24.8%	10.9%	21.4%	19.0%
		% of Total	7.7%	6.4%	2.6%	2.3%	19.0%
	Neutral	Count	20	13	13	3	49
		% within Unprocessed Natural food is better than processed fortified food	40.8%	26.5%	26.5%	6.1%	100.0%
		% within Designation	12.9%	12.9%	14.1%	7.1%	12.6%
		% of Total	5.1%	3.3%	3.3%	0.8%	12.6%
	Agree	Count	36	36	29	13	114
		% within Unprocessed Natural food is better than processed fortified food	31.6%	31.6%	25.4%	11.4%	100.0%
		% within Designation	23.2%	35.6%	31.5%	31.0%	29.2%
		% of Total	9.2%	9.2%	7.4%	3.3%	29.2%
	Strongly Agree	Count	51	14	24	14	103
		% within Unprocessed Natural food is better than processed fortified food	49.5%	13.6%	23.3%	13.6%	100.0%
		% within Designation	32.9%	13.9%	26.1%	33.3%	26.4%
		% of Total	13.1%	3.6%	6.2%	3.6%	26.4%
Total		Count	155	101	92	42	390
		% within Unprocessed Natural food is better than processed fortified food	39.7%	25.9%	23.6%	10.8%	100.0%
		% within Designation	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	39.7%	25.9%	23.6%	10.8%	100.0%

Table 4.9 reflects 49.5% of the employed strongly agree that, unprocessed natural food is better than processed fortified products. With the unemployed 31.6% agree and 32% of the students strongly disagree. Most of the respondents agree that natural food products are better that processed fortified products. Consumers prefer unprocessed natural food with no added ingredients.

Within “Designation”, 33.3% of “Pensioners”, 32.9% of the “Employed”, 26.1% of the “Students”,13.9% of the “Unemployed”, strongly agree that, unprocessed natural food

products are better than processed fortified food products. In other words, by ranking, pensioners prefer unprocessed natural food products followed by the employed and then the students with the unemployed last. As much as the pensioners and the employed know the benefits of processed fortified products, they prefer unprocessed natural food products. This is evident also from the research of Shan *et al.* (2017:187) where consumers were questioning the naturalness of functional/fortified food products believed to be impure.

The statement "Food packages help me to make healthy food choices" against "Designation" received a (*p*-value) of 0.026 which is less than 0.05 acceptable level of significance. This means that the relationship between these two variables is significant.

Table 4:10 summarises the cross-tabulation between "Designation" and "Food packages help me to make health food choices".

Table 4:10 Food packages help to make health food choices

Food packages help me to make health food choices * Designation Crosstabulation							
			Designation				
			Employed	Unemployed	Student	Pensioner	Total
Food packages help me to make health food choices	Strongly Disagree	Count	5	4	4	5	18
		% within Food packages help me to make hea	27.8%	22.2%	22.2%	27.8%	100.0%
		% within Designation	3.2%	4.0%	4.3%	11.9%	4.6%
		% of Total	1.3%	1.0%	1.0%	1.3%	4.6%
	Disagree	Count	17	11	15	8	51
		% within Food packages help me to make hea	33.3%	21.6%	29.4%	15.7%	100.0%
		% within Designation	11.0%	11.0%	16.1%	19.0%	13.1%
		% of Total	4.4%	2.8%	3.9%	2.1%	13.1%
	Neutral	Count	30	24	22	10	86
		% within Food packages help me to make hea	34.9%	27.9%	25.6%	11.6%	100.0%
		% within Designation	19.5%	24.0%	23.7%	23.8%	22.1%
		% of Total	7.7%	6.2%	5.7%	2.6%	22.1%
	Agree	Count	79	44	31	13	167
		% within Food packages help me to make hea	47.3%	26.3%	18.6%	7.8%	100.0%
		% within Designation	51.3%	44.0%	33.3%	31.0%	42.9%
		% of Total	20.3%	11.3%	8.0%	3.3%	42.9%
	Strongly Agree	Count	23	17	21	6	67
		% within Food packages help me to make hea	34.3%	25.4%	31.3%	9.0%	100.0%
		% within Designation	14.9%	17.0%	22.6%	14.3%	17.2%
		% of Total	5.9%	4.4%	5.4%	1.5%	17.2%
Total		Count	154	100	93	42	389
		% within Food packages help me to make hea	39.6%	25.7%	23.9%	10.8%	100.0%
		% within Designation	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	39.6%	25.7%	23.9%	10.8%	100.0%

As reflected in Table 4.10, 47.3% of the employed group agree that packages help them to make healthy food choices. With the unemployed 44% of them also agree that packages help them make health food choices. Samaniego-Vaeskem, Alonso-Aperte and Varela-moreiras (2016:150) assert that nutritional information on packages

help consumers to make heath food choice. Respondents are influenced by the healthy food information that is labelled on the packages. It is evident that, 51.3% of the employed, 44% of the unemployed, 33.3% of students, and 31% of pensioners agree that food packages help them to make health food choices.

Packages carry nutritional information that may influence the consumer to make a purchase decision, but some respondents are not influenced by the packages as seen from table 4:14, 33.3% of the employed are not influenced by the packages to make health food choices, followed by students with 29.4% in disagreement that packages influence them to make healthy food choices. It is also clear that both the employed and the pensioners have the same percentage of 27.8% of respondents who strongly disagree in total that food packages help them to make health food choices. Shimp and Andrews (2014:641) state that, consumers associate packages with the content of the products such as yellow and white packages on fortified breakfast Kellog's cheerios is linked with purity and healthiness.

Finally, in designation cross-tabulation, the statement "I have no time to prepare fortified food" against "Designation" scored a (*p*-value) of 0.005 which is less than the significant level of 0.05 (*p*-value). This means that the response from participants vary according to their designation. Table 4:15 indicates crosstabulation.

Table 4:11 Preparation of fortified food

I have no time to prepare fortified food * Designation Crosstabulation							
			Designation				
			Employed	Unemployed	Student	Pensioner	Total
I have no time to prepare fortified food	Strongly Disagree	Count	10	7	2	10	29
		% within I have no time to prepare fortified food	34.5%	24.1%	6.9%	34.5%	100.0%
		% within Designation	6.5%	6.9%	2.2%	25.6%	7.5%
		% of Total	2.6%	1.8%	0.5%	2.6%	7.5%
	Disagree	Count	44	29	29	16	118
		% within I have no time to prepare fortified food	37.3%	24.6%	24.6%	13.6%	100.0%
		% within Designation	28.8%	28.7%	31.2%	41.0%	30.6%
		% of Total	11.4%	7.5%	7.5%	4.1%	30.6%
	Neutral	Count	48	21	26	4	99
		% within I have no time to prepare fortified food	48.5%	21.2%	26.3%	4.0%	100.0%
		% within Designation	31.4%	20.8%	28.0%	10.3%	25.6%
		% of Total	12.4%	5.4%	6.7%	1.0%	25.6%
	Agree	Count	35	35	27	8	105
		% within I have no time to prepare fortified food	33.3%	33.3%	25.7%	7.6%	100.0%
		% within Designation	22.9%	34.7%	29.0%	20.5%	27.2%
		% of Total	9.1%	9.1%	7.0%	2.1%	27.2%
	Strongly Agree	Count	16	9	9	1	35
		% within I have no time to prepare fortified food	45.7%	25.7%	25.7%	2.9%	100.0%
		% within Designation	10.5%	8.9%	9.7%	2.6%	9.1%
		% of Total	4.1%	2.3%	2.3%	0.3%	9.1%
Total		Count	153	101	93	39	386
		% within I have no time to prepare fortified food	39.6%	26.2%	24.1%	10.1%	100.0%
		% within Designation	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	39.6%	26.2%	24.1%	10.1%	100.0%

As reflected in Table 4:11, 45.7% of the employed strongly agree that they have no time to prepare fortified food and 33.3% of the unemployed agree to the statement as well. Bloem and De Pee (2017:82) also affirm that, consumers have little time to prepare fortified food and therefore buy convenience unhealthy street food from vendors. There is a significant relationship between "Designation" and "I have no time to prepare fortified food" statement.

4:6 CORRELATIONS

Bivariate correlation was also performed on the ordinal data. A bivariate correlation involves testing the relationship between two variables as asserted by (pattern and Newhart 2018:304). The results indicate that positive values have a directly proportional relationship between the variables and negative values indicate an inverse relationship. All significant relationships are indicated by an asterisk * or **. Mellinger and Hanson (2017:180) contend that if an increase in one continuous variable lead to an increase in another, there is a positive correlation and vice versa but correlation ranges from -1 to +1. The more positive the more relationship between the variables and the opposite is true. Again, only significant relationships are selected from the correlation sheet in the Annexure at the end of the report.

Looking at the correlation in the appendix, the value between "I know the benefits of vitamins" and "I consider health ingredients when buying food is 0.380. Since this is a positive value, there is a directly related proportionality. Respondents indicate that, the more aware they are of the benefits of vitamins the more they consider health ingredients when buying foods, and vice versa. In another instance, the correlation value between "I consider health ingredients when buying food" and "fortified food is for children only" is -0.144. Which is, the more respondents consider health ingredients, the less they perceive fortified foods are for only children.

Furthermore, the correlation value between "Unprocessed natural food is better than processed fortified food" and "fortified food makes me obese" is 0.132. This means that the more the respondents think that unprocessed natural food is better than processed fortified food, the more they believe that fortified food can make them obese. The correlation values between "Eating fortified food is dangerous to my health" and "Added nutrients cause allergy" is 0.294. This means that as respondents

take eating fortified food to be dangerous for their health, they tend to believe that the added nutrients in fortified products cause allergy.

The research questions; whether consumer awareness of benefits of fortified products motivates the consumers or shortcomings of fortification is a barrier to consumer choice, can be answered in the subsequent sections.

4:6:1 Respondents' knowledge of Benefits in relation to Motivators

In this section, statements in the category of motivators are compared with statements in the category of merits (pros) in the measuring instrument. Table 4.12 reflects a summary of the significant correlation values extracted from the appendix. The values are between "Fortified brown bread has a good taste" and merits (pros).

Table 4:12 Taste of fortified bread

Statements	Values
▪ Fortified products are good for health.	0.357**
▪ I know the benefits of vitamins.	0.151**
▪ I consider health ingredients when buying food.	0.189**
▪ Fortified food is for children only.	-0.187**

** All the values are significant at the 0.01 level (2-tailed) $(p \leq 0.01)$

All the positive values in Table 4.12 between "Fortified bread has a good taste" and "Merits (pros)" indicate that the more the fortified products are of good taste the more they are considering the fortified products. However, the correlation value between "Fortified bread has a good taste" and "Fortified food is for children only has an inverse relationship. That is, the more respondents consider fortified bread to have a good taste, the less importance that fortified foods are for children only. Therefore, taste is significant in determining knowledge and choice of fortified food products. Guine *et al*. (2016:314) have the same view that fortified whole bread purchase is purposely for taste and health properties.

Table 4.13 shows the correlation values between “I buy products high in fibre” and the four significant statements relating to consumer awareness of the merits (pros) of fortified products.

Table 4:13 High in fibre products

Statements	Values
▪ Fortified products are good for health.	0.207**
▪ I know the benefits of vitamins.	0.277**
▪ I consider health ingredients when buying food.	0.366**
▪ Unprocessed natural food is better than processed fortified food.	0.170**
▪ Fortified brown bread has a good taste.	0.199**

** All the values are significant at the 0.01 level (2–tailed) $p \leq 0.01$.

In Table 4.13, the more the respondents are aware that fortified food contains fibre, the more they consider fortified food to be good for health secondly the more respondent know the benefits of vitamins the more they buy products high in fibre. The more the respondents consider health ingredients, the more they buy products high in fibre. Longoria-Garcia *et al.* (2018:835) are of the same view that functional fibre products such as wheat or oat bran, command a high consumer demand due to the healthy properties of fibre.

Table 4.14 reflects the significant correlation value between “I eat enriched food to avoid poor health diseases” and consumer knowledge of the pros of fortified /enriched products. Consumers buy fortified food products due to fear of contracting dietary related diseases (Jacobsen 2014:42). However, respondents prefer unprocessed natural food products to processed fortified food products. This means that most respondents consider unprocessed food products with fibre than processed fortified food products with fibre. Therefore, the naturalness of food products is of great influence on respondents’ food purchase decisions.

Table 4:14 Enriched food and poor health diseases

Statements	Values
▪ Fortified products are good for health.	0.181**
▪ I know the benefits of vitamins.	0.271**
▪ Unprocessed natural food is better than processed fortified food.	0.139**
▪ Fortified brown bread has a good taste.	0.163**
▪ I buy products high in fibre.	0.357**

** All the values are significant at 0.01 level (2-tailed) $p \leq 0.01$.

From Table 4.14, as respondents get to know that fortified products are good for health, they tend to eat enriched/fortified products to avoid poor health diseases. Similarly, the more they are aware of the benefits of vitamins, the more they eat enriched food products to avoid poor health diseases. Also, the more the respondents eat enriched food products to avoid poor health diseases, the more they buy products high in fibre. This pattern is supported by Kaur and Singh (2017:171) who contend that perceived benefits and the risk of contracting poor health related diseases motivate consumers to buy fortified products.

Table 4.15 reflects the correlation values between “Family members encourage me to eat health food” and “Awareness of the pros of fortified products.

Table 4:15 Family members’ encouragement to eat healthy food

Statements	Values
▪ Fortified products are good for health.	0.169**
▪ I know the benefits of vitamins.	0.229**
▪ I consider health ingredients when buying food.	0.333**
▪ Fortified brown bread has a good taste.	0.176**
▪ I buy products high in fibre.	0.232**
▪ I eat enriched food to avoid poor health diseases.	0.223**

** All the values are significant at 0.01 level (2-tailed) $p \leq 0.01$.

Table 4.15 shows a directly related proportionality among all the statements and the statement, “Family members encourage me to eat health food”. The more fortified products are good for health, the more family members encourage respondents to eat health food. The more the respondents know the benefits of vitamins, the more they encourage their family members to eat health food. The more family members encourage them to eat health food, the more they eat enriched food to avoid poor health diseases. Jacobsen (2014:43) adds that, peers, family members and friends encourage each other to eat fortified food products for health reasons. Furthermore, sensory properties like taste influence consumer purchase of fortified food products (Kraus 2015:1630).

In Table 4.16, values of correlation between the statement “I follow health eating advertisement” and some significant statements relating to consumer awareness of the benefits of fortification are considered. Phillips and Pickton (2017:475) state that companies like Nestle are constantly embarking on nutritional promotional activities for the healthy benefit of consumers as a means of corporate social responsibility with has been profitable for survival.

Table 4:16 Following health eating advertisement

Statements	Values
▪ Fortified products are good for health.	0.103*
▪ I know the benefits of vitamins.	0.216**
▪ I consider health ingredients when buying food.	0.360**
▪ Fortified brown bread has a good taste.	0.100*
▪ I buy products high in fibre.	0.384**
▪ I eat enriched food to avoid poor health diseases.	0.424**
▪ Family members encourage me to eat healthy food.	0.280**

** All values are significant at 0.01 level (2-tailed) $p \leq 0.01$.

* All values are significant at 0.05 level (2-tailed) $p \leq 0.05$.

From Table 4.16, the correlation values between “I follow health eat advertisement” and “Fortified food products are good for health, I know the benefits of vitamins, I consider health ingredients when buying food are positive. This means the more respondents follow health eating advertisement the more they believe that fortified products are good for health. Also, respondents following health eating advertisement, become motivated to buy products high in fibre for the benefit of their health. So long as respondents continue to follow health eating advertisement, they are prompted to purchase enriched food to avoid poor health diseases and tell their family members to consider healthy food products. Lu (2015:1874) contend that, nutrition content advertising encourages consumers to consumer health fortified food products.

Table 4.17 shows the significant values of correlation between, “Food packages help me to make health food choices” and “Awareness of the benefits of fortified food products statements.

Table 4:17 Food packages role to make health food choices verses awareness of the merits of fortification

Statements	Values
▪ Fortified products are good for health.	0.104*
▪ I know the benefits of vitamins.	0.229**
▪ I consider health ingredients when buying food.	0.278**
▪ Fortified brown bread has a good taste.	0.113*
▪ I buy products high in fibre.	0.306**
▪ I eat enriched food to avoid poor health diseases.	0.303**
▪ Family members encourage me to eat healthy food.	0.242**
▪ I follow health eating advertisement.	0.272**

* All values are significant at 0.05 level (2-tailed) $p \leq 0.05$.

** All values are significant at 0.01 level (2-tailed) $p \leq 0.01$.

From Table 4.17, there is a directly related proportionality between the statement “Food packages help me to make health food choices and all the significant statements in the Table. Bazhan *et al.* (2018:52) contend that, most of the consumers

obtain nutritional information on product packages which influence their purchase decision as reflected in Table4.18.

Table 4:18 Nutrition information influence to purchase food verses awareness of the benefits of fortification

Statements	Values
▪ Fortified products are good for health.	0.142**
▪ I know the benefits of vitamins.	0.260**
▪ I consider health ingredients when buying food.	0.367**
▪ I buy products high in fibre.	0.307**
▪ I eat enriched food to avoid poor health diseases.	0.343**
▪ Family members encourage me to eat healthy food.	0.212**
▪ I follow health eating advertisement.	0.426**
▪ Food packages help me to make health food choices.	0.316**

** All values are significant at 0.01 level (2-tailed) $p \leq 0.01$.

Since all the value in table 4.18 are positive, there is a direct relation which is proportional between the statement “Nutrition information influence my food purchase” and all the statements in Table 4.18. For example, the value between “Nutrition information influence my food purchase” and “Fortified products are good for health” means that the more the respondents access nutrition information, the more they consider fortified products to be healthful. The more respondents see nutritional information the more they buy fortified products with fibre, the more respondents get influenced by nutrition information, the more they encourage family members to eat healthy food. The more they see health ingredients on packages, the more they get influenced by nutrition information. Phillips and Pickton (2017:449) are of the view that packages are a silent salesman encouraging consumers to buy products. Nutritional labelling that is regulated, helps consumers to buy products. Nutritional labelling that is regulated, helps consumers to make health food choices (Bazhan *et al*. 2018:50).

4:6:2 Awareness of the Shortcomings of fortification verses Barriers

The shortcomings of food fortification are a barrier to consumer choice of fortified products. Like in the preceding sections, significant correlation values were selected from correlation results in the Annexure at the end of this report. The selected statements relate to awareness of the shortcomings (cons) of fortified products against the statements about the barriers to consumer choice of fortified products. Table 4.19 presents the correlation values between "Enriched products are expensive" and the awareness of the shortcomings of fortification.

Tale 4:19 Enriched food products are expensive verses knowledge of the cons of fortification

Statements	Values
▪ Fortified products are good for health.	0.107*
▪ Unprocessed natural food is better than processed fortified food.	0.241**
▪ Fortified food makes me obese.	0.131**
▪ Eating fortified food is dangerous to my health.	0.131**
▪ Added nutrients cause allergy.	0.245**
▪ I buy products high in fibre.	0.99*

** All values are significant at 0.01 level (2-tailed) $p \leq 0.01$.

* All values are significant at 0.05 level (2-tailed) $p \leq 0.05$.

In Table 4.19 correlation values between "Enriched food products are expensive" and all the statements in the table, were significant and there is a positive relationship between all the statements in the table and the statement "Enriched food products are expensive".

For example, the more the respondents perceive that unprocessed natural for is better than processed fortified food, the more they are aware that fortified/enriched food products are expensive at (0.241) correlation value. The more the respondents believe that fortified food makes them obese, the more they think enriched food products are dangerous to their health, the more they believe enriched/fortified food products are expensive. Fortified food products have added cost on the final price

which affects consumers negatively (Shan *et al*. 2017:186). Poor households are price sensitive and buy less of fortified products (Detzel and Wieser 2015:40).

Table 4.20 indicate the correlation values between "Fortified food products are artificial" and statements relating to consumer awareness of fortification. All the values were selected form the correlation sheet in Annexure 6 at the end of this report. Only significant values have been selected from the correlation sheet as has been done in the previous sections.

Table 4:20 Fortified food products are artificial verses awareness of the cons of fortification

Statements	Values
▪ Fortified products are good for health.	0.199**
▪ Fortified food is for children only.	0.159**
▪ Unprocessed natural food is better than processed fortified food.	0.127*
▪ Fortified food makes me obese.	0.159**
▪ Eating fortified food is dangerous to my health.	0.236**
▪ Added nutrients cause allergy.	0.162**
▪ Family members encourage me to eat health food.	0.127**
▪ Food packages help me to make health food choices.	0.135**
▪ Enriched food products are expensive.	0.104*

** All values are significant at 0.01 level (2-tailed) $p \leq 0.01$.

* All values are significant at 0.05 level (2-tailed) $p \leq 0.05$.

In Table 4:20, the correlation values between "Fortified food products are artificial" and "Fortified products are good for health" is -0.199. That is, the more respondents consider fortified food products are artificial, the less they perceive fortified products are good for health. There is an inverse relationship among these two variables. The more the respondents believe that fortified products are artificial, the more they consider unprocessed natural food is better than processed fortified food. The findings are supported by Megalis, Giovanni and Silliman (2016:494) who contend that, consumers believe that, refined fortified grains contain bleach chemicals and are deprived of the naturalness during fortification processing. All positive figures in Table

4:20 indicate that there is a directly related proportionality between “Fortified food products are artificial” and all the positive value statement in Table 4:20 as indicated.

Table 4.21 indicate the correlation values extracted from the Annexure 6 at the end of this report. The values are between “I have no time to prepare fortified food” and statement related to awareness of fortification.

Table 4:21 Preparation of fortified food verses knowledge of the cons of fortification

Statements	Values
▪ Fortified products are good for health.	0.143**
▪ Fortified food is for children only.	0.223**
▪ Fortified food makes me obese.	0.127*
▪ Eating fortified food is dangerous to my health.	0.269**
▪ Food packages help me to make health food choices.	0.103*
▪ Fortified food products are artificial.	0.142**

** All values are significant at 0.01 level (2-tailed) $p \leq 0.01$.

* All values are significant at 0.05 level (2-tailed) $p \leq 0.05$.

From Table 4:21, correlation values between “I have no time to prepare fortified food” and “Fortified products are good for health is -0.143. This means that the more respondents have no time to prepare fortified food, the less they consider fortified products to be good for health. Bloem and de Pee (2017:82) also subscribe to the view that consumers are switching to cheaper unhealthy convenience food which needs little time to prepare than fortified products due to the busy lifestyle. The correlation values between “I have no time to prepare fortified food” and all the positive value statement in Table 4:21 present a directly proportionate relationship.

Table 4:22 indicates correlation values between “I eat to get full without considering nutrients” and statements relating to consumer awareness of fortification. Significant values have systematically been selected from the correlation sheet in the appendix at the end of this report.

Table 4:22 Eating food without considering nutrients against awareness of the demerits of fortification

Statements	Values
▪ Fortified products are good for health.	-0.137**
▪ I know the benefits of vitamins.	-0.143**
▪ I consider health ingredients when buying food.	-0.202**
▪ Fortified food is for children only.	-0.195**
▪ Fortified food makes me obese	0.122*
▪ Eating fortified food is dangerous to my health.	0.130**
▪ I eat enriched food to avoid poor health diseases.	-0.122*
▪ I follow health eating advertisement.	-0.176**
▪ Food packages help me to make health food choices.	-0.117*
▪ Nutrition information influence my food purchase.	-0.208**
▪ Enriched food products are expensive.	0.109*
▪ Fortified food products are artificial.	0.139**

** All values are significant at 0.01 level (2-tailed) $p \leq 0.01$.

* All values are significant at 0.05 level (2-tailed) $p \leq 0.05$.

The following analysis was made basing on the values in Table 4.22 relating to the correlation between “I eat to get full without considering nutrients” and the statements in the table. The more respondents eat to get full without considering nutrients the less they; consider fortified products to be good for health, consider health ingredients, know the benefits of vitamins, eat enriched food to avoid poor health diseases. In other words, all negative correlation values imply an inverse relationship between “I eat to get full without considering nutrients” and the statements in Table 4:22 with negative values. Contrary, the correlation between “I eat to get full without considering nutrients” and “Eating fortified food is dangerous to my health” has a positive value of 0.130. This means that, the more respondents eat food without considering nutrients, the more they believe that eating fortified food is dangerous of their lives. Also, the more the respondents just eat to get full without considering nutrients to be expensive, the more they believe that fortified products are artificial. Bazhan *et al.* (2017:261)

contend that consumers have little knowledge about the health benefits of functional food which is a true reflection of the respondents surveyed.

As reflected in Table 4.23, the significant correlation values in the table are between, “Processed fortified foods have harmful additives” and fortification awareness statement.

Table 4:23 Processed fortified foods have harmful additives verses awareness of fortification

Statements	Values
▪ Fortified products are good for health.	-0.108*
▪ I consider health ingredients when buying food.	0.130**
▪ Unprocessed natural food is better than processed fortified food.	0.195**
▪ Fortified food makes me obese	0.200**
▪ Eating fortified food is dangerous to my health.	0.471**
▪ Added nutrients cause allergy	0.168**
▪ Family members encourage me to eat healthy food.	0.116*
▪ I follow health eating advertisement.	0.109*
▪ Food packages help me to make health food choices.	0.162**
▪ Enriched food products are expensive.	0.157**
▪ Fortified food products are artificial.	0.286**
▪ I have no time to prepare fortified food.	0.255**

** All values are significant at 0.01 level (2-tailed) $p \leq 0.01$.

* All values are significant at 0.05 level (2-tailed) $p \leq 0.05$.

From table 4.23, the correlation value between the statements “processed fortified food have harmful additives” and “Fortified products are good for health is -0.108 with a $p \leq 0.05$ level of significance. The inverse of the relationship between these statements means that as respondents’ perception that processed fortified foods have harmful additives gets high, their belief that fortified products are good for health gets low. Sabliov, Chen and Yada (2015:348) caution that, the use of nanotechnology in fortified food products allows better dispersion of nutrients, preservation and masking

bad odour using nanoscale bioactive substances. On this note, some consumers are skeptical about fortified products thinking that they may hold harmful additives.

As per Table 4.23, the positive correlation values between "Processed fortified foods have harmful additives" and all the statements in the table with positive values means that there is a directly related proportionality. For example, the more respondents believe that fortified foods have harmful additives the more they consider, unprocessed natural food to be better than processed fortified food and that fortified food is dangerous to their health.

Furthermore, the correlation between "processed fortified foods have harmful additives" and "Added nutrients cause allergy is 0.168 at $p \leq 0.01$ level of significance. This means that as respondents tend to consider fortified foods to have harmful additives, they also tend to believe that added nutrients cause allergy. Guine *et al.* (2016:309) warn that, added nutrients in fortified wheat comprise of anti-bodies which can cause allergies and dermatitis especially to sensitive consumers.

Finally, about correlation, Table 4.24 indicate the significant correlation values between the statement that "I have seen products with nutritional labels" and statements relating to consumer awareness of fortification.

Table 4:24 Products with nutritional labels verses awareness of food fortification

Statements	Values
▪ I know the benefits of vitamins.	0.266**
▪ I consider health ingredients when buying food.	0.165**
▪ I buy products high in fibre.	0.125*
▪ I eat enriched food to avoid poor health diseases.	0.195**
▪ Family members encourage me to eat healthy food.	0.116*
▪ Food packages help me to make health food choices.	0.103*
▪ Nutrition information influence my food purchases.	0.228**
▪ Enriched food products are expensive.	0.128*
▪ Processed fortified foods have harmful additives.	0.123*

** All values are significant at 0.01 level (2-tailed) $p \leq 0.01$.

* All values are significant at 0.05 level (2-tailed) $p \leq 0.05$.

From Table 4.24 all correlation values are positive. This means there is a directly relationship between the statement "I have seen products with nutritional labels" and all the statements in the table. The more respondents see products with nutritional labels, the more they; get to know the benefits of vitamins, consider ingredients, buy products with fibre, eat enriched food to avoid poor health diseases. This is in line with the works of Kanama and Nakazawa (2017:129) who contend that, consumers are influenced by the package technology and information on the labels.

Masterson, Phillips and Pickton (2017:432) are also of the view that, brand association and brand authenticity is based on the labels of the products. Furthermore, respondents are influenced by nutritional information to purchase fortified food at a correlation value 0.228 in Table 4.24 at $p \leq 0.01$ level of significance. However, the correlation value between "I have seen products with nutritional labels" and "Enriched food products are expensive" is 0.128 at $p \leq 0.05$ level of significance. This means that, the more respondents see products with nutritional labels, the more they consider enriched food products to be expensive which acts as a barrier to consumers' choice of fortified food products. In the next section, respondents' opinions are discussed.

4:7 RESPONDENTS' OPINIONS ABOUT FORTIFIED FOOD PRODUCTS

An open-ended question was asked to the participants to allow respondents to provide their views that may not have been covered in the Likert scale structured questions. Respondents opinions are group according to the purposes of the study. The respondents' comments are identified into five categories as indicated in the subsequent sub-sections.

4:7:1 Comments relating to knowledge of the pros of food fortification

Precisely 38% of the respondents who gave their opinion know the pros of food fortification. The respondents had different opinions towards food fortification in relation to pros. Some of the respondents had the following response:

- As a diabetic person, I depend on healthy food all the time.
- Fortified food has vitamins and minerals, it very good for our health.
- Being an old person, I depend on foods which are healthy.

- Enriched food gives energy and it's okay and healthy.
- Fortified food and unprocessed food are both okay.
- Fortified food prevents sickness.
- Fortified products such as milk help me strengthen my old bones.
- Fortified food boost health.
- Fortified food has positive and negative effects.

The respondent's opinion about the pros of fortification, consumers lack adequate knowledge about the pros of food fortification. However, some of the consumers have some knowledge about the pros of fortification. Motadi, Mbhatsani, and Shilote (2016:3) affirm that most South Africans are not aware of fortification and its benefits.

4:7:2 Respondents' opinions relating to the cons of food fortification

Some respondents commented that, enriched food products are unstable and lead to high risk of health conditions. Approximately 45% of the respondents who gave their opinions about fortified products expressed a negative attitude about fortified food. The following opinions were noted:

- All kinds of foods make us sick these days.
- Enriched foods are not good for our health.
- Fortified food causes heart problems and obesity.
- Fortified food is good, but it puts allergies to our bodies.
- I don't see a problem about fortified food.
- I don't believe in processed food; I prefer natural food.
- Fortified food causes some diseases.
- I don't think fortified food is organic.
- I have issues with multiple ingredients due to allergies. So, I control what I eat.
- Fortified foods are unhealthy and contribute to obesity.
- Enriched food is harmful if you eat more.
- Enriched foods are bad in the long run.

Respondents had mixed opinion about the consumption and awareness of fortified/enriched foods. Meghwal and Goyal (2017:299) caution that, although fortified food products are beneficial to human health, they should not be substituted

for natural quality products with enough nutrition. Additives may cause side effects like heart defects, brain damage, diarrhea, and liver or kidney failure (Shaw 2017:3).

4:7:3 Opinions for respondents' motivation to purchase fortified products

In the preceding sub-section, some respondents portrayed a negative view about fortified food products. From these comments, it's obvious that many respondents are thinking that fortified food products are dangerous to their health. However, some of the respondents approve and compliment that fortified food products are good for health. Practically 58% of the respondents' opinions are motivators for the purchase of fortified food products:

- Fortified foods have a good taste.
- Fortified food products are good for health.
- Enriched products smell good.
- Fortified products are good for health due to added nutrition.
- Fortified food is good for kids.
- Fortified products have good and bad health issues. People need always to consider nutrition information.
- Fortified food is rich in vitamins and I encourage people to eat it.
- Enriched food has good and bad value.
- Enriched food can strengthen my health.

Still respondents have mixed opinion, some are embracing fortified food and other do not like fortified processed food. Fortified food purchase is sometimes influenced by flavour, appearance, and texture (Chandang, Chambers and Alavi 2016:1211). In other instances, consumers would like to improve their physical health and prevent the risks of poor health nutrition (Sabliov, Chen and Yada 2015:331).

4:7:4 Opinions relating to barriers for consumer choice of fortified products

Respondents have various reasons negatively affecting their choices to purchase and consume fortified food products. Some are influenced by the product itself, while others are hindered by economic factors, and others are influenced by social factors. Respondents are skeptical about the naturalness of fortified food products which

hinders them to purchase the enriched products. The following are respondents' opinions that are barriers to respondents' choice of fortified products:

- I don't believe in processed food; I prefer natural food.
- I don't know much about fortified products.
- I eat food, it doesn't matter whether its fortified or not.
- I don't pay attention to fortified food.
- Enriched food products are expensive.
- Fortified food is not healthy.
- Fortified food can be harmful to our health.
- We have no choice, but it makes me sick.
- Not good for elderly people.
- They are too expensive.
- I have doubts
- Causes some diseases.
- I don't know much about it.
- I haven't noticed fortified food, but I will since I take good care of my health.
- I prefer unprocessed natural food.
- I buy multivitamins because fortified food is expensive.

Respondents may not purchase fortified food products based on their opinion towards enriched food. Magalis, Giovanni and Silliman (2016:490) are of the view that since fortified whole grain cost 33% more than refined cereals, consumers tend to choose the cheaper alternative. Respondents may be skeptical about the naturalness since fortified products contain artificial additives that flavours and enhancers shelf life and these additives may be toxic and carcinogenic (Caleja *et al.* 2017:342).

4:7:5 Respondents' suggestions

Some of the opinions of the respondents seem to be suggestions as assessed by the researcher. The following are respondents' suggestions:

- We can use these products but not regularly.
- It is food but we must look at the expiry date.
- Decrease VAT on fortified food in South Africa.

- Fortified food must not be kept for long time
- It's important to look after your health and be aware of what you eat.
- Fortified food can be good or bad, but I drink a lot of water to flush out additives.
- Fortified food help with vitamin deficiency.

With these and comments like; healthy body needs healthy mind, and workshops should be conducted to educate people about healthy food, consumers are slowly but steadily becoming more knowledgeable of the importance of food fortification, but a lot should be done to create awareness.

4:8 CONCLUSION

From the results of the statistics, it can be deduced that many respondents are not aware of the benefits and the dangers of fortified food products. Most of the respondents do not know that fortified food products are good for health. Although fortified products are for everyone, about 72% of the respondents perceive fortified products to be only beneficial to children. Over 50% of the respondents have inadequate knowledge about the benefits of fortification. Looking at the demerits section, it can be inferred that nearly 44% of respondents are not aware that eating too much fortified food is dangerous to their health. Respondents are not aware that some additives in fortified products may cause side effects like allergies.

In the section of motivators of consumer choice to purchase fortified products, respondents are influenced by the taste of fortified products. On the other hand, 70% of the respondents are influenced by family members to buy fortified food products for health benefits. While over 60% of the respondents are motivated by the health information on the food packages. In the barriers section, 54.8% of the respondents perceive fortified food products to be more expensive which hinders their purchase. Respondents are also skeptical as to whether fortified products are artificial or organic. Some of the respondents do not know about fortified products while others think that enriched products are causing diseases.

Looking at the biographical statistical results, females are more aware of fortified/enriched food products than males, the generation in the age group 18-34 years has more information and knowledge of the benefits and shortcomings of food

fortification. The employed group among the unemployed, students and pensioners, are more informed about enriched/fortified food products and the employed follow health eating habits. However, older respondents are more careful about health issues. Albeit, the age group between 18-34 years believe that fortified food products are artificial, they follow the enriched food advertisement. It can also be observed that the benefits of fortification motivate consumers' fortified food purchase intention.

The relationships between the statements about consumer knowledge of the pros of fortification and statements about motivators for consumer purchase of fortified products are significant at $p<0.05$ acceptable level. On the other hand, basing on the correlation values, the cons of fortified food products and barriers to consumer choice of enriched/fortified food products have a $p<0.05$ acceptable level of significance as well. Therefore, the null hypotheses that knowledge of the benefits of food fortification doesn't motivate consumer purchase intention of fortified food and awareness of the shortcomings of food fortification isn't a barrier for consumer purchase of fortified food are rejected. Looking at the opinions of respondents, most of the respondent's comment that, fortified/enriched products are dangerous to their health although it has short term benefits. In some cases, some respondents are not aware of the benefits and dangers of food fortification and a big number of respondents did not give their opinion when they were asked to comment on fortified products. The next chapter that concludes this study relates to the discussion, recommendations and the summary of the study.

CHAPTER 5. RECOMMENDATIONS AND CONCLUSION

5:1 INTRODUCTION

The findings and analysis of the survey was conducted in the preceding chapter. This chapter commences with a summary of the theoretical study and a summary of the empirical study. The chapter is followed by addressing the achievement of the objectives of the study and suggesting some recommendations. This final chapter of the study sums up the entire study with a conclusion about fortification of food products focusing on the consumer perspective.

5:2 SUMMARY OF THE THEORETICAL STUDY

Mandatory food fortification was introduced in South Africa for the purpose of overcoming malnutrition (Van Jaarsveld, Faber and Stuijveberg 2015:15). Fortification is the addition of vitamins and minerals (nutrients) in the food products (Ndlovu 2017:50). Despite the South African government effort to overcome malnutrition through food fortification, a substantial number of consumers have little knowledge and awareness of food fortification (Motadi, Mbhatsani and Shilote 2016:3). There is a need to assess consumer level of awareness of the importance of the food fortification programme. There is also a need to understand the factors influencing consumer knowledge, choice and barrier to fortified food products purchase and utilisation.

The basic knowledge of the benefits of food fortification to a consumer is crucial in influencing consumer positive thinking regarding health eating habits. Magalis, Giovanni and Silliman (2016:489) are of the view that, knowledge of food fortification is significant in good healthy decision making of the consumer. Consumers have little knowledge that, inadequate nutrition suppresses mental performance (Sandmann *et al.* 2015:53). Secondly, the consumption of fortified products with essential nutrients reduces the number of consumers requiring medical attention as articulated by (Bazhan *et al.* 2018:46). Consumers benefits by saving on medical expenses and the government expenditure on health is greatly reduced. Detzel and Wieser (2016:210) assert that consumer health improves productivity due to physiological performance of a healthy community. Furthermore, fortified food consumption optimises the

wellbeing of consumers which reduces mortality and expand the market (Jacobsen 2014:42). Consumers have little knowledge of the benefits of food fortification.

Awareness of the products that are fortified is also lacking among consumers. Fortified bread prevents the incident of contracting type-2 diabetes which is common among consumers. The big health problem among consumers is that, they do not know the benefits of vitamins and minerals that are used in fortification (Kersick and Fox 2016:101) content that products fortified with vitamins A are essential for growth, right vision and boosting the immune system. On the other hand, dietary fibre added in fortified bread, prevents heart disease (Kimberly 2016:60).

Much as the fortified food products are beneficial to the consumer, it's imperative for the consumer to be conversant with the disadvantages fortified products. Studies indicate that, consumers are not aware of the short coming of food fortification. In the study by Guine *et al.* (2016:316), it was found that, products fortified with minerals can lead to high blood pressure as well as stroke. Added nutrients in fortified food may cause allergy, hyper-activity and attention disorder (Deshpande and Deshpande 2017:298). Consumers are also not aware that the nanoscale substances and synthetic materials added to fortified products for preservation and masking of bad odour, can be dangerous to health (Sabliov, Chen and Yada 2015:348). Consumers deserve to be aware of the dangers of fortified food products alongside the benefits in order to make good decisions about their health. Food fortification is not widely known by the consumers to whom it's intended.

While many consumers are not aware of the pros and cons of food fortification, some consumers are motivated to buy the fortified products. Perceived risk of contracting health related diseases (Kaur and Singh 2017:167), motivate consumers to buy fortified food products basing on the health benefits. Secondly, the sensory properties of fortified products motivate consumers to buy fortified food (Magilis Giovanni and Silliman 2016:489). Also, socio-cultural factors like, families, ethnicities and friends influence consumer choice of functional food products (Bazhan *et al.* 2017:255). Neophobic (fear of unfamiliar) food and traditional habits have a great influence on consumer choice of fortified products (Kaur and Sigh 2017:169). Consumers are motivated to purchase fortified products mainly to keep healthy among other factors.

Products fortified with whole grains cost 33% more of the retail price compared to refined products and therefore, the extra cost is a deterrent to consumer choice of these functional products (Magalis, Giovanni and Silliman 2016:490). Consumers refrain from buying fortified products which command a higher price due to the extra value added on the product.

Furthermore, the complexity and abundancy of label claims such as “high in fibre” has caused consumers to be skeptical about the honesty of these labels hence discouraging consumers from demanding fortified products (Buono 2017:42). Even if the product is fortified, consumers have lost trust in the label claims which hinders the purchase of fortified food products. In another instance, the naturalness of fortified food products is under question by some consumers (Shan *et al*. 2017:187). Caleja *et al*. (2017:342) affirm that, anti-browning and colourants are artificial with synthetic molecules that are toxic. Consumers who are aware of the ingredients of fortified products prefer unprocessed products. Adequate information should be provided to innocent consumers who are ignorant about food fortification.

5:3 SUMMARY OF EMPIRICAL STUDY

A sample of 400 participants was selected in eThekwini Municipality South, East, West and Central area of Durban. A questionnaire was administered with the assistance of two field workers. Respondents were conveniently selected from the precinct towards shopping centres. The instrument had a reliability coefficient higher than 0.60 which is acceptable. The questionnaire has sections of statements on the Likert scale which include; merits, demerits, motivators, and barriers. Four categorical variables were chosen.

These categories include; gender, age group, region, and designation. The overall gender distribution scores are as follows; out of the total sample of 400 participants 61% are female and 39% are males, 61.5% of the female fall in the age between 18-34 years, and 41.8% of the males are in the age bracket of 35-59 years. More women were willing to participate than men and women have some knowledge of enriched products than men. The regional distribution has a score of 41.5% of respondents coming from the Southern region. Most of the respondents are employed with a 39.7% score, followed by the unemployed with 25.7% and the students 23.9% and 10.75

being pensioners. The employed are more informed about food fortification. The next sb-section explains awareness of the pros of food fortification.

5:3:1 Merits of food fortification

This section related to respondents' knowledge of the benefits of food fortification. Although over 50% of the respondents know the benefits of vitamins, 25.3% of the respondents disagree that fortified products are good for health and over 20% do not consider health ingredients when buying food. This means that some respondents have inadequate knowledge about the benefits of food fortification. Some of the respondents are of the view that fortified products are beneficial to the children only not knowing that fortified food is for everyone with dietary deficiency. Food fortification also has shortcomings which are described in the next sub-section.

5:3:2 Demerits of food fortification

This section is concerned with respondents' knowledge of the shortcomings of food fortification exactly 31.2% of the respondents remained neutral and do not know whether fortified products can cause allergy, while 33.5% disagree that the nutrients added in fortified food can cause allergy. Furthermore, 37.6% of the respondents disagree that fortified food can make them obese and 43.9% of the respondents do not know that fortified food is dangerous to their health sometimes. Respondents are having little knowledge about the shortcomings of food fortification. Much as over 50% of the respondents have some knowledge of the benefits of food fortification, close to 50% of the respondents do not know the dangers of fortified food products. The next sub-section explains the motivators for respondents' fortified food purchase.

5:3:3 Motivators for fortified food purchase

This section of empirical study relates to respondents' factors that influence the purchase of fortified food products. Over 58% of the respondents are motivated to purchase fortified products due to taste. On the other hand, the added nutrients like fibre motivate 62.3% of respondents to buy fortified food products, while 23% of the respondents do remain neutral as to whether they buy products high in fibre. In most cases respondents are motivated to buy and consume fortified food in order to avoid contracting poor health diseases. Almost 54.3% of the respondents consume fortified

food products to prevent the diseases caused by malnutrition. Additionally, 69.7% of the respondents are influenced by family members to eat healthy functional foods. Packages and nutritional information play a role in motivating respondents to buy fortified food products. Over 60% of the respondents consider packages of healthy food and 58% of the respondents are motivated by nutritional information. A summary of respondents' barriers to fortified food purchase follows in the next sub-section.

5:3:4 Barriers to fortified food purchase

This section concerns itself with the factors that hinder respondents from purchasing fortified food products. Approximately 54% of the respondents perceive fortified food products to be expensive which hinders them from purchasing enriched products. Roughly 47% of the respondents believe that fortified food products are artificial which deters them from purchasing products that are fortified. Furthermore 40.5% of the respondents consider processed fortified foods to be containing harmful additives which scares them from purchasing these enriched products. Respondents are suspicious about the naturalness of fortified food products and are afraid to buy and consume products that have been enriched with vitamins and minerals using the food processing methods.

5:3:5 A summary of respondents' opinions

Towards the end of the measuring instrument, respondents were asked an open-ended question for them to give their comments about food fortification. Over 50% of those who responded believe that fortified food products are good for health. However, close to 40% of the respondents who gave their comments do not know much about food fortification. While 30% of the opinions were critical of the side effects of fortified food and do not believe that processed fortified food is natural. They believe that fortified products can make them sick because of the additives. However, some of the respondents advise that these foods should not be consumed regularly, and the government should remove VAT so that the price of fortified/enriched food products is affordable. The next section describes a summary of the attainment of research objectives.

5:4 ATTAINMENT OF THE RESEARCH OBJECTIVES

The aim of the study was to assess consumer level of awareness and knowledge of food fortification with the objectives of:

- Determining consumer knowledge of the pros and cons of food fortification,
- Assessing the motivators for consumer choice of fortified food purchase, and
- Identifying the barriers towards consumer fortified food purchase intention.

The attainment of these objectives is explained in detail in the sub-sections: 5:4:1, 5:4:2, 5:4:3 and 5:4:4 following.

5:4:1 Determining knowledge of the benefits of food fortification

Respondents had a 57.8% score in agreement that fortified food products are good for health. The rest of the respondents either do not know or disagree that fortified food is good for health. This is a clear sign that a considerable number of consumers are not aware of the benefits of fortification. Consumer low level of awareness of fortified products was also noted by Motadi, Mbhatsani and Shilote (2016:3) in their finding relating to fortification. Secondly, although 25.3% of the respondents strongly agreed that they know the benefits of vitamins (a key ingredient for fortification) 25.8% either disagree or do not know the benefits of vitamin. It can be assumed that since the respondents who do not know the benefits of vitamins are not aware of the benefits of food fortification.

On the same scale, 40.3% respondents were neutral, strongly disagreed, and disagreed that they consider health ingredients when buying food. If respondents do not consider ingredients it is presumed that they have less knowledge about the benefits of health ingredients added to food products. Close to three billion consumers have vitamin D deficiency which has led to an increase in heart diseases worldwide (Sandmann *et al.* 2015:53). This can be attributed to low levels of awareness and ignorance of vital vitamins.

On the other hand, awareness among educated respondents within the age bracket of 18-34 years mostly women are aware of the benefits of fortification. Doods and Chamberlain (2017:47) referred to in the literature review stress the need for literacy in interpreting nutritional information. Educated consumers are more aware of the

benefits of food fortification than the uneducated as seen from a sample of respondents. In another twist, older respondents most especially females are health concerned compared to their counterparts in the same age group of 60 years and over with 62.8% of females in this age group having a high level of awareness. The findings consider with the assertion that consumers are not familiar with and lack adequate knowledge of the benefits of fortification (Bekoglu, Ergen and Inci 2016:80).

Within the region central, North, South and West, North had 10.5% and South scored a percentage of 35.5%% regarding the awareness that fortified food is good for health. However, the South had the highest percentage of respondents and North had lowest percentage of respondents. It can therefore be noted that respondents in Durban North are more aware than respondents in all the regions surveyed. This can be attributed to the level of education in the northern region.

There was a 41.9% score of the employed who agree and are aware that fortified food is good for health. Most of the employed are educated which is why education forms and important role in awareness of the benefits of fortified food products. Guine *et al.* (2016:311) found the relationship between education and knowledge of the benefits of fortified bread to be significant. The more educated the society the more they become aware of nutritional values related to fortified products. Although awareness may not be equitable to a purchase intention, knowledge may to some extent influence consumers to buy fortified food products taking into consideration of the benefits sought.

5:4:2 Determining knowledge of shortcomings of food fortification

The naturalness of food products was significant for respondents. Fortified products are often processed food products. Over half of the respondents prefer unprocessed natural food as opposed to processed fortified food products. It is evident from the works of Scott and Rozin (2017:572) that consumers look for products labelled “natural”. This indicated that, most of the respondents are aware that fortified products are processed and therefore, they are deprived of the naturalness which discourage their purchase intention. In another instance it was realised that respondents’ excessive consumption of fortified/enriched products may lead to obesity. South Africa is among the countries with females being overweight which leads to obesity (Wirth 2014:5). This can be attributed to over consumption of fortified/enriched

products. Moderate consumption of fortified products is recommended. Respondents do not know that eating too much fortified products in dangerous as 70% strongly disagreed, disagreed, and remained neutral when they were asked whether excessive consumption is dangerous to their health.

Finally, about respondents' awareness of the shortcomings of fortified food products, most of the respondents either do not know or disagree that added nutrients cause allergy. Additives preserve and protect fortified food and fortifications can cause nausea, heart defects and diarrhea as articulated by (Deshpande and Deshpande 2017:293). The side effects of exposure to enriched food products is not known according to the results of the findings from the respondents.

There is a low level of awareness of the shortcomings of fortification which ought to be known by consumers. Although fortified products are good for health, sensitive consumers need some information regarding the exposure to ingredients used in fortification so that they can detect allergy associated elements. Consumers are entitled to know the dangers associated with the vitamins and minerals used in fortification which can assist in suitable food purchase decision to avoid the side effects of the healthful fortified products.

5:4:3 Assessing the motivators for fortified food purchase

There is a positive relationship between the benefits of fortification and consumer motive to purchase fortified food products. The more the respondents were aware of the benefits, the more they considered fortified products. Detzel and Wieser (2015:37) view fortified products as good for physiological and cognitive capacity especially in young children. Respondents who are aware of such benefits positively agreed that they buy fortified products for health reasons. However, apart from benefits, there are several factors that influence the motive to buy fortified food products. Majority of respondents buy enriched food to avoid poor health diseases, 50% of the respondents are influenced by family members to consume enriched food products.

Surprisingly, 68% of the respondents are influenced by the advertisements about health properties of enriched food products. Food packages influence 40% of the respondents to buy fortified food products and over half of the respondents are influenced by the nutritional information. Almost 65% of the respondents are

influenced by the taste of fortified brown bread. Taste also has a great role in the decision to purchase fortified food products. Consumers believe that, whole grain in fortified food reduces the risk of diabetes and heart diseases (Magalis, Giovanni and Silliman 2016:488). Most of the respondents approve fortified products high in fibre and they purchase products high in fibre. Therefore, the presence and indication on packages that fortified products are high in fibre influence the respondents to buy these enriched products.

To sum up, respondents who are aware of the vitamins and minerals regarding their importance, respond positively to fortified food purchase. Even when respondents were given a chance to give their opinion about fortified/enriched food, most of them who are aware of the health benefits accepted that they buy fortified products to improve their health wellbeing. Majority of the elderly and female had positive opinions related to health issues as far as fortification is concerned.

5:4:4 Identifying barriers for fortified food purchase intention

In chapter four, it was concluded that there is a significant relationship between the shortcomings of fortification and barriers. Respondents' awareness of the dangers of fortification undermines the purchase of fortified food. Many participants do not know that fortified food is good for health because they are expensive. Respondents just eat to get full without considering whether fortified food is good for health and considerable number of them do not know the benefits of vitamins. It was also noticed that some respondents do not consider health ingredients when buying food and just eat to get full.

Many respondents positively responded that they prefer unprocessed natural food compared to processed fortified food and consider processed fortified food to be harmful. Respondents believe that processed fortified food have harmful additives and are not good for health. Respondents were found to be skeptical of food fortification. Due to skeptics, a score of 55% of respondents believe that enriched food products are artificial which discourage them from purchasing products labelled "fortified". Likewise, in the study conducted by Sandmann *et al.* (2015:57), it was concluded that consumers believe that fortified food products contain artificial additives. There is a perception that fortified foods have harmful substances as compared to conventional food products (Bazhan *et al*. 2017:572).

Although 70% of the respondents in the study have seen products with nutritional labels, the labels should emphasize the benefits of nutrients. Nutritional labels may help consumers to buy functional food products as stipulated by (Lu 2015:1879). Respondents are positively influenced by health food packages if they see products with nutritional labels. Therefore, labels play an important part in influencing consumer choice of fortified food products. If respondents don't see the products with nutritional label, they don't consider packages to be helpful for them to make health food choices. Labels like; "Improves memory", "high on fibre", and "maintains body weight", may influence consumers (Krays 2015:1629). However, consumers nowadays do not trust label claims due to the clutter of false claims.

5:5 LIMITATIONS OF THE STUDY

Usually no study is concluded without limitations but due similarity of human phenomenon such as micro-nutrient malnutrition coupled with food fortification intervention, findings with minor limitations, can be generalized. The major limitation of this study starts from the theoretical framework. Most of the literature used to build up the theoretical framework for this study was conducted outside South Africa. There have been small pieces of literature to support consumer awareness of food fortification. The study was conducted in Durban municipality only and therefore the results cannot be representative of the views of the entire South African population. During the survey, some respondents needed time for explaining food fortification and ended declining to participate. Furthermore, the demographics of the age group of 60 years and over was difficult to obtain.

5:6 RECOMMENDATIONS

From the results of the findings in chapter four, it is evident that a remarkable number to respondent are not aware and or have little knowledge of the benefits and shortcomings of fortification. The question is whether the marketing intervention strategies can help to create awareness among consumers. Several strategies to overcome consumer low level of awareness are recommended by the researcher. The strategies recommended are consumer micro-nutritional marketing strategies CMMS and leadership strategies LS which are discussed in sub-section 5:6:1 and 5:6:2 respectively.

5:6:1 Consumer Micro-nutritional Marketing Strategies (CMMS)

The CMMS should emphasize the importance of vitamins on packages of fortified food products in order to create consumer awareness of benefits vitamins which can eventually influence the consumers' purchase intention of fortified products. Consumers should be informed about the benefits of the essential vitamins. Marketers should label products with the benefits of vitamins. For example, as seen on packages, margarine is fortified with vitamin A and D and therefore, marketers should focus on informing the consumers the benefits of these vitamins when promoting fortified products.

Marketers should design labels for fortified products that includes minerals like iron that it prevents diseases. As seen on packages; bread, yogurt and cheese are fortified with iron but there is no indication of the benefits of iron on these products as seen in this report. Therefore, CMMS should focus on advertising the benefits of vitamins and minerals because respondents follow health eating advertisement. Marketers should focus on micro-nutrients strategies CMMS that promote the health benefits. While marketers are promoting the benefits of fortified food products and food suppliers overcoming the dangers of fortified products, leaders should also have a role to play in creating awareness and sincerity.

5:6:2 Leadership strategies (LS)

Leadership strategies involve community leaders, family leaders and the government that should stand firm and educate consumers about the benefits of vitamins and minerals. The government should also advise on the required level of consumption regarding fortified products to avoid the side effects of excessive intake of vitamins and minerals. The government should overcome excess consumption with the introduction of recommended dietary needs that are necessary. The fortification logo of South Africa is so unpopular, and the government should promote it.

The leadership strategies should aim at powering the prices of fortified food and subsidizing food chain store and food processors. In South Africa the government should tax unhealthy food products to encourage the consumption of fortified health products. Leadership Strategies should strive to encourage awareness and

consumption of fortified products in order to overcome micro-nutrients malnutrition in the society.

Since marketers understand the consumer, they can collaborate with manufacturers, health professionals, and supermarkets to create awareness and influence the consumption of fortified products. However, leadership strategies can ensure that, marketers and food chain strategies of nutritional claims on labels, additives, pricing, and safety is enforced to protect the consumer. Leadership strategies can also focus on education campaigns and nutritional information pertaining to the consequences of vitamin deficiencies to a consumer. The next section explains the scope for future studies related to food fortification awareness.

5:7 SCOPE FOR FUTURE STUDY

According to the findings of the study, there is a relationship between the benefits of fortification and the motivators of consumer purchase intention for fortified food products. There is also a relationship between shortcoming and barriers against fortified food purchase. From the empirical data from respondents surveyed, there is inadequate awareness of the pros and cons of fortification. Although awareness is not synonymous with action, a degree of awareness of the pros and cons of food fortification may influence consumer purchase intention of fortified food products. A detailed mixed method with a wider geographical coverage and a larger sample is essential for further studies relating to food fortification awareness. Finally, for further studies, there should be a pattern of information flow from consumer to marketer, to food chain, to leadership, back and forth to consumers for awareness.

5:8 CONCLUSION

The purpose of the study was to assess consumer knowledge, familiarity, exposure and awareness of the significance of food fortification focusing on a consumer perspective. The study reveals that consumers have inadequate knowledge about the benefits and shortcomings of fortified food products. Furthermore, consumers are primarily motivated by health concerns among other factors and are hindered to purchase fortified products predominantly due to suspicion about the naturalness of fortified products. From the findings of the empirical study, it was found that there is little to no consumer awareness of the pros and cons of food fortification which is

aimed at overcoming micro-nutrient deficiencies. The findings also present that, there is a significant relationship (p<0.05) between consumer awareness of the benefits of fortification and the motivation to purchase fortified food products. It can also be concluded that, the relationship between consumer knowledge of the danger of fortification and the barriers for consumer choice of fortified food products is significant. Besides, it can be observed that consumers in age group of 18-34 and those who are 60 years and over are more aware of the benefits of fortification. Although age was noticed as a factor to influence awareness, the employed respondents were found to be aware of fortification, however, not to a large extent but better than the unemployed, students and pensioners. Some respondents were found to be consuming fortified products but were not aware of the benefits and shortcomings of food fortification. Consumer awareness of fortification in South Africa will require the adaptation of the consumer fortification awareness model which is aimed at creating awareness among consumers in order to eradicate micro-nutrient malnutrition which is a major problem facing the whole world according to the literature review of this study. Consumer studies are needed in order to widen the knowledge base of the benefits and dangers of food fortification.

REFERENCES

Abeshu, M.A. and Geleta, B. 2016. The role of fortification and supplementation in mitigating the "hidden hunger". *Nutrition and food Science*, 6(1):1-4 Available: https//: googlescholar.com (Accessed 11 February 2017).

Alkerwi, A. 2014. Diet quality concept. *Nutrition*, 30(6):613-618. Available: https://dx.doi.org/10.1016/j.nut.2013.10.001 (Accessed 30 August 2017).

Baba, M. D., Manga, T.A., Daniel, C. and Danrangi, J. 2015. Sensory evaluation of toasted bread fortified with banana flour: A preliminary study. *American journal of food science and nutrition*, 2(2): 9-12. Available: https://www.googlescholar.com (Accessed 17 October 2017).

Baugreet, S., Kerry, J.P., Allen, P. and Hamill, R.M. 2017. Optimization of protein-fortified beef patties targeted to the needs of older adults: a mixture design approach. *Meat science*, July:111-118. Available: http://dx.doi.org/10.1016/j.2017.07.023 (Accessed 11 March 2017).

Bazhan, M., Kalantari, N., Keshavarz-Mohammadi, N., Hosseini, H., Eini-Zinab, H. and Alavi-Majd, H. 2018. Applying social marketing mix to identify consumers' preferences towards functional dairy products in Iran. *Nutrition and food science*, 18(1):45-60. Available: https://doi.org/10.1108/NFS-04-2017-0067 (Accessed 19 March 2018).

Bazhan, M., Keshavarz-Mohammadi, N., Hosseini, H. and Kalantari, N. 2017. Consumers' awareness and perception regarding functional dairy products in Iran. A qualitative research. *British food journal,* 119(2):253-266. Available: http://doi.org/10.1108/BFJ-06-2016-0270 (Accessed 21 December 2017).

Behmadi, H., Eman-Djomeh, Z., Yarmand, M.S. and Kamalinejad, M. 2015. Formulation optimisation of functional yogurts fortified with almond, oat, honey and tart cherry extract. *An international peer-reviewed journal*, 4(4):752-762. Available: www.sciencejournal.in (Accessed 27 January 2017).

Bekele, A.D., Beuving, J. and Ruben, R. 2017. How do health information and sensory attributes influence consumer choice for dairy products? Evidence from a field experiment in Ethiopia. *International journal of quality and reliability*

management, 34(5):667-683. Available: www.emeraldinsight.com/0265-67/x.htm (Accessed 08 July 2018).

Bekoglu, F.B., Ergen, A. and Inci, B. 2016. The Impact of attitude, consumer innovativeness and interpersonal influence on functional food consumption. *International business research*, 9(4):79-87. Available: www.ccsenet.org/ibr (Accessed 7 February 2017).

Biesalski, H.K. and Tinz, J. 2017. Multivitamin/ mineral supplements: Rationale and safety. *Journal of nutrition*, June: 60-66. Available: http://dx.doi.org/10.1016/j.nut.2016.06.003 (Accessed 14 March 2018).

Bimbo, F., Bonanno, A., Nocella, G., Viscecchia R., Nardone, G., de Devitiis, B. and Carlucci D. 2017. Consumers' acceptance and preferences for nutrition-modified and functional dairy products: A systematic review. *Appetite*, February (113): 141-154. Available: http://dx.doi.org/10.1016/j.appet.2017.02.031 (Accessed 18 April 2018).

Bloem, S. and de Pee, S. 2016. Developing approaches to achieve adequate nutrition among urban populations requires an understanding of urban development. *Global food security*, (September):80-88. Available: http://dx.doi.org/10.1016/j.gfs.2016.09.001 (Accessed 06 March 2018).

Buono, A.D. 2017. Providing preventative maintenance. *Beverage industry*, 108(8):42-44. Available: https://www.web.a.ebscohost.com (Accessed 23 February 2018).

Caleja, C., Barros, L., Antonio, A.L., Oliveira, M.B.P.P. and Ferreira, I.C.F.R. 2017. A comparative study between natural and synthetic antioxidants: Evaluation of their performance after incorporation into biscuits. *Journal of food chemistry*, July/August: 342-346. Available: http://dx.doi.org/10.1016/j.foodchem.2016.08.075 (Accessed 20 March 2018).

Calvo, M.S. and Whiting, S.J. 2013. Survey of current vitamin D food fortification practices in the United State and Canada. *Journal of steroid biochemistry and molecular biology*, 136:211-213. Available: http://dx.doi.org/10.1016/j.jsbmb.2012.09.034 (Accessed 25 October 2017).

Campbell, N.R.C. and Train, E.J. 2017. A systematic review of fatalities related to acute ingestion of salt. A need for warning labels. *Nutrients*, 9(7):1-9. Available: https://www.mdpi.com/journal/nutrients (Accessed 07 March 2018).

Cashman, K.D. and Hayes, A. 2017. Red meat's role in addressing nutrients of public health concern. *Journal of meat science*, February/April: 196-203. Available: http://dx.doi.org/10/1016/j.meatsci.2017.04.011 (Accessed 21 February 2018).

Chanadang, S., Chambers, E. and Alavi, S. 2016. Tolerance testing for cooked porridge made from a sorghum based fortified blended food. *Journal of food science*, 81(5):1210-1221. Available: https://scholar.google.co.za (Accessed 14 January 2018).

Cumming, C. 2017. Cross-sectional Design. In: Allen, M. ed. *The SAGE encyclopedia of communication research methods.* Thousand oaks: Sage publication, 315-317. Available: http://dx.doi.org/10.4135/9781483381411 (Accessed 25 April 2018).

De, L.G.M. and Garrigues. S. 2015. *Handbook of mineral elements in food.* Hoboken: John Wiley and Sons. Available: https://www.ebookscentral.proquest.com (Accessed 05 December 2017).

Derkyi, N.S.A., Acheampong, M.A., Mwin, E., Calvo.N., Tetteh, P. and Aidoo, S.C. 2018. Product design for a functional non-alcoholic drink. *South African journal of chemical engineering,* February: 85-90. Available: http://www.sciencedirect.com (Accessed 17 March 2018).

Deshpande, A. and Deshpande, B. 2017. Food additives and preservation: A review. *Indian Journal of science research,* 13(2):219-225. Available: https://scholar.google.co.za (Accessed 18 February 2018).

Detzel, P. and Wieser, S. 2015. Food fortification for addressing iron deficiency in Filipino children: Benefits and cost-effectiveness. *Annals of nutrition and metabolism*, 66(2):35-42. Available: www.search.proquest.com (Accessed 07 February 2018).

Dodds, A. and Chamberlain, K. 2017. The problematic messages of nutritional discourse: A case-base critical media analysis. *Journal of Appetite*, August/September: 42-50.

Available:http://dx.doi.org/10.1016/j.appet.2016.09.0210195-6663/ (Accessed 22 January 2018).

du Plessis, L.M., Herselman, M.G., McLachlan, M.H. and Nel, J.H. 2016. Selected facets of nutrition during the first 1000 days of life in vulnerable South African communities. *South African journal of child health*, 10(1): 37-42. Available: https//.reference.sabinet.ac.za/dutlib/ (Accessed 07 April 2018).

Eden, J. 2017. Quantitative research, steps for. In: Allen. M. ed. *The SAGE encyclopedia of communication research methods*. Thousand Oaks: sage publication, 1381-1383. Available: http://dx.doi.org/10.4135/9781483381411 (Accessed 19 April 2018).

eThekwini municipality. 2018. *Integrated development plan IDP final* 2017/2018. Available: http://www.durban.gov.za>IDP>documents (Accessed 20 April 2018).

eThekwini public map viewer. 2018. Available: http://www.gis.durban.gov.za (Accessed 15 July 2018).

Florentine, H. 2016. Let's get smaller nanostructured compounds for food fortification. *Prepared foods,* 185(11):46. Available: https://web.ebscohost.com (accessed 09 January 2018).

Food advisory consumer service (FACS). 2017. *Food fortification.* Available: https://foodfacts.org.za/food-fortification/ (Accessed 16 April 2018).

Fortified food marketing (Pty) Ltd. 2016. *Fortified foods*. Available: https://fortifiedfoods.co.za (Accessed 29 January 2018).

Friesen, V.M., Aaron, G.J., Myatt, M. and Neufeld, L.M. 2017. Assessing coverage of population-based and targeted fortification programmes with the use of the fortification assessment coverage toolkit (FACT): Background, toolkit development, and supplement overview. *The journal of nutrition*, 147(5):981-983. Available: https://doi.org/10.3945/jn.116.242842 (Accessed 14 April 2018).

Gavaza, M. 2017. Food for thought: Zimbabwe's new fortification programme. News24, 23 June:1. Available: https://www.news24.com/myNews24/food-for-thought-Zimbabwes-new-fortification-programme-20170623 (Accessed 08 February 2018).

Gebretsadikan, T.M., Bultosa, G., Forsido, S.F. and Astatkie, T. 2015. Nutritional quality and acceptability of sweet potato-soybean-moringa composite porridge. *Nutrition and food science*, 45(6):845-858. Available: https://doi.org/10.1108/NFS-05-2015-0048 (Accessed 10 March 2018).

Gharibzahedi, S.M.T. and Jafari, S.M. 2017. The importance of minerals in human nutrition: Bioavailability, food fortification processing effects and nanoencapsulation. *Trends in food science and technology*, February/March: 119-132. Available: http://dx.doi.org/10.1016/j.tifs.2017.02.017 (Accessed 14 January 2018).

Giles-Smith; K. 2015. Gain an advantage with protein fortification. *Dairy foods journal*, 116(2):56-60. Available: https://www.scholar.google.co.za (Accessed 14 December 2017).

Goertzen, M.J. 2017. *Applying quantitative methods to E-book collections*. Chicago: ALA techsource. Available: http://www.alatechsource.org/subscribe (Accessed 14 April 2018).

Gravetter, F.J. and Forzano, L.B. 2016. *Research methods for the behavioral science.* 5th ed. Stamford: Cengage learning.

Guine, R., Matos, M., Henriques, C. and Correia, P. 2016. Preferences and consumer habits related to bread in the centre of Portugal. *Nutrition and food science*, 46(3):306-320. Available: www.emeraldinsight.com/0034-6659.htm (Accessed 10 March 2018).

Hadebych, E., Van Kogelenberg, V., Sagalowicz, L., Michel, M. and Galaffu, N. 2016. Strategies to limit colour changes when fortifying food products with iron. *Food research international*, May: 122-128. Available: http://dx.doi.org/10.1016/j.foodres.2016.05.017 (accessed 10 March 2018).

Hastings, G. and Domegan, C. 2014. *Social Marketing from Tunes to Symphonies.* 2nd ed. New York: Routledge.

Hibbeln, J.R. and Gow, R.V. 2014. The potential for military diets to reduce depression, suicide, and impulsive aggression: A review of current evidence for omega-3 and omega-6 Fatty acids. *Journal of military medicine,* 179(11):117-128. Available: http://doi:10.7205/MILMED-D-14-00153 (Accessed 21 December 2017).

Hill, J., Mchiza, Z., Fourie, J., Puoane, T. and Steyn, N. 2016. Consumption patterns of street food consumers in Cape Town. *Journal of family ecology and consumer sciences*, July/August: 25-35. Available: https//.reference.sabinet.co.za/dutlib/ (Accessed 10 March 2018).

Horton, S. 2016. The economics of food fortification. *Journal of nutrition*, 146(12): 1068-1071. Available: https://www.googlescholar.com (Accessed 09 May 2017).

Jacobsen, J. 2014. A healthy dose of fortification. *Beverage industry*, 105(12):42-44. Available: https://www.web.a.ebscohost.com (Accessed 03 March 2018).

Jacobsen, J. 2015. Keeping your machine running: Fortification helps beverages fuel consumers' needs. *Beverage industry*, 106(12):38-41. Available: https://web.a.ebscohost.com (Accessed 17 January 2018).

Jalal, C., Wuehler, S., Osendarp, S. and De-Regil, L.M. 2016. Estimating nutrient fortification levels in condiments and seasonings for public health programmes: considerations and adaptations. *Annals of the New York academy of sciences,* (1379)1: 28-37. Available: http://doi.10.1111/nyas.13227 (Accessed 06 March 2018).

Kam, K., Murray, J.M., Arcot, J. and Ward, R. 2012. Fortification of parboiled rice with folic acid: Consumer acceptance and sensory evaluation. *Food research international*, 49(1):354-363. Available: http://dx.doi.org/10/1016/j.foodres.2012.07.064 (Accessed 13 February 2018).

Kanama, D. and Nakazawa, N. 2017. The effects of ingredient branding in the food industry: Case studies on successful ingredient-branded food in Japan. *Journal of ethnic foods*, 4(2): 126-131. Available: http://dx.doi.org/10.1016/i.jef.2017.05.010 (Accessed 13 January 2018).

Kaur, N. and Singh, D.P. 2017. Deciphering the consumer bahaviour facets of functional foods: A literature review. *Appetite*, (January):167-187. Available: https://dx.doi.org/10.1016/j.appet.2017.01.0330195-66631 (Accessed 22 February 2018).

Kavoosi-Kalashami, M., Pourfarzad, A., Ghaibi, S., Allahyari, M.S., Surujlal, J. and Borsellino, V. 2017. Urban consumers' attitudes and willingness to pay for functional foods in Iran. A case of dietary sugar *Aims Agriculture and food*, 2(3):310-323.

Available: http://www.researchgate.net/publication/319532077 (Accessed 18 January 2018).

Kerksick, C.M. and Fox, E. 2016. *Sports nutrition needs for child and adolescent athletes*. New York: CRC press. Available: https://web.a.ebscohost.com/ehost/ebookdelivery (Accessed 19 December 2017).

Kimberly, D.J. 2016. Can functional ingredients find a place in a clean label world?. *Dairy foods*, 117(5):58-62. Available: https://search.proquest.com (Accessed 21 December 2017).

Knapp, H.2014. *Introductory statistics using SPSS.* Los Angeles: Sage publication.

Kotler, P. and Kotler, M 2013. *Market your way to growth: ways to win*. New Jersey: John Wiley and Sons.

Koen, N., Blaauw, R. and Wentzel-viljoen, E. 2016. Food and nutrition labelling: the past, present and the way forward. *South African journal of clinical nutrition*, 29(1): 13-21. Available: https//www.googlescholar.com (Accessed 20 February 2017).

Kraus, A. 2015. Factors influencing the decisions to buy and consume functional food. *British food journal*, 117(6):1622-1636. Available: www.emeraldinsight.com/0007-070x.htm (Accessed 08 January 2018).

Kujawska, M., Ewertowska, M., Ignatowicz, E., Adamska, T., Szaefer, H., Zielinska-Dawidziak, M., Piasecka-Kwiatkowska, D. and Jodynis-Liebert, J. 2016. Evaluation of safety of iron-fortified soybean sprouts, a potential component of functional food, in rat. *Plant foods human nutrition*, (7)1: 13-18. Available: http://doi.10.1007/s11130-016-0535-8 (Accessed 16 February 2018).

Lee, N.R. and Kotler, P. 2011. *Social marketing. Influencing behaviour for good* 4th ed. Washington D.C: Sage Publication.

Longoria-Garcia, S., Cruz-Hernandez, M.A., Flores-Verastegui, M.I.M., Contreras-Esquivel, J.C., Montanez-Saenzi, J.C. and Belmares-Cerda, R.E. 2018. Potential functional bakery products as delivery systems for prebiotics and probiotics health enhancer. *Journal of food science and technology,* 55(3):833-845. Available: https://doi.org/10.1007/s13197-017-2987-8 (Accessed 23 March 2018).

Lu, J. 2015. The effect of perceived carrier-ingredient fit on purchase intention of functional food moderated by nutrition knowledge and health claims. *British food journal*, 117(7):1872-1885. Available: https://doi.org/10.1108/BFJ-11-2014-0372 (accessed 19 March 2018).

Magalis, R.M., Giovanni, M. and Silliman, K. 2016. White grain foods: is sensory liking related to knowledge, attitude, or intake? *Nutrition and food science*, 46(4):488-503. Available: www.emeraldinsight.com/0034-6659-htm (Accessed 07 March 2018).

Marriott, B.P., Yu, K., Majchrzak-Hong, S., Johnson, J. and Hibbeln, J.R. 2014. Understanding diet and modeling changes in the omega-3 and omega-6 fatty acid composition of U.S. garrison foods for active duty personnel. *Journal of military medicine*, 179(11):168-179. Available: http://doi:10.7205/MILMED-D-14-00199 (Accessed 21 December 2017).

Masson, E., Debucquet, G., Fischler, C. and Merdji, M. 2016. French consumers' perceptions of nutrition and health claims: A psychosocial-anthropological approach. *Appetite*, June (105): 618-629. Available: https://www.sciencedirect.com (Accessed 29 November 2017).

Masterson, R., Phillips, N. and Pickton, D. 2017. *Marketing: an introduction*. 4th ed. London: sage.

Meghwal, M. and Goyal, M.R. eds. 2017. *Developing technologies in food science: status application and challenges*. Waretown: CRC press.

Mellinger, C.D. and Hanson, T.A. 2017. *Quantitative research methods in translation and interpreting studies*. New York: Routledge.

Mills, S.R., Wilcox, C.R., Ibrahim, K. and Roberts, H.C. 2018. Can fortified foods and snacks increase the energy and protein intake of hospitalized old patients? A systematic review. Journal of human nutrition and dietetics, January: 1-12. Available: http://onlinelibrary.wiley.com (Accessed 18 March 2018).

Montet, D. and Ray, R.C. 2016. *Fermented foods: part 1 biochemistry and biotechnology*. Boca Raton: CRC press.

Motadi, S.A., Mbhatsani, V. and Shilote, K.O. 2016. Food fortification knowledge in women of child-bearing age at Nkowankowa township in Mopani district, Limpopo province, South Africa. *African Journal of primary health care and family medicine,* 8(2):1-5. Available: http://www.prifm.org (Accessed 14 January 2017).

Ndlovu, N.P. 2017. Relationship between diet quality, nutrition status and academic performance of first and non-first-generation university students in Durban. Master of Applied Science, Durban University of Technology. Available: http://ir.dut.ac.za (Accessed 28 February 2018).

Nemeth, N. 2016. Consumer habits of food supplements from the perspective of food safety, Doctoral school of management and business administration. Available: https://googlescholar.com (Accessed 02 February 2017).

Nkala, I. 2018. Food fortification: combatting Zimbabwe's hidden hunger. *FarmBiz*, 4(1): 24-25. Available: https://www.sabinet.co.za/journals.html (Accessed 19 April 2018).

o'Leary, Z. 2017. *The essential guide to doing your research project*. 3rd ed. London: Sage publication.

Pandey, S., Asha M.R. and Jayadep, A. 2016. Changes in physical, cooking, textural properties and crystallinity upon iron fortification of red rice (Jyothi). *Journal of food science and technology*, 53(2):1014-1024. Available: http://doi:10.1007/s13197-015-2130-7 (Accessed 09 March 2018).

Pattern, M.L. and Newhart, M. 2018. *Understanding research methods: An overview of the essentials.* 10th ed. New York: Routledge.

Penaloza, L., Toulouse, N. and Visconti, L.M. 2012. *Marketing management: A cultural perspective.* London: Routledge.

Picardi, C.A. and Masick. 2014. *Research methods: Designing and conducting research with real-world focus.* Los Angeles: Sage publication.

Powner, L.C. 2017. Quantitative data collection and management. In: *Empirical research and writing: A political science students' practical guide*. 55 city road: Sage publication, 157-179. Available: http://dx.org/10.4135/9781483395906 (Accessed 17 April 2018).

Sabliov, C., Chen, H. and Yada, R. eds. 2015. *Nanotechnology and functional food: effective delivery of bioactive ingredients.* New York: John Wiley and Sons. Available: https://www.ebookscentral.proquest.com (Accessed 13 December 2017).

Samaniego-Vaeskem, M.L., Alonso-Aperte, E. and Varela-Moreiras, G. 2016. Voluntary fortification with folic acid in Spain: An updated food composition database. *Food chemistry*, June: 148-153. Available: http://dx.doi.org/10.1016/j.foodchem.2014.06.0460308-8146/ (Accessed 29 December 2017).

Sandmann, A., Brown, J., Mau, G., Saur, M., Amling, M. and Barvencik, F. 2015. Acceptance of vitamin D-fortified products in German- A representative consumer survey. *Food quality and preference*, (February):53-62. Available: https://dx.doi.org/10.1016/j.foodqual.2015.02.011 (Accessed 27 February 2018).

Schneider, M. 2017. *Introduction to public health.* 5th ed. Burlington: Jones and Barlett learning.

Schnettler, B., Sepulveda, N., Bravo, S., Grunert, K.G. and Hueche, C. 2018. Consumer acceptance of a functional processed meat product made with different meat sources. *British food journal*, 120 (2):424-440. Available: www.imeraldinsight.com/0007-070x.htm (accessed 03 March 2018).

Schreier, M. 2018. Sampling and generalization. In: *The SAGE handbook of qualitative data collection*. 55 city road: Sage publication, 84-97. Available: http://dx.doi.org/10.4135/9781526416070 (Accessed 30 April 2018).

Schumacker. R.E. 2017. Chi-Square test for categorical data. In: Learning statistics using R. 55 city road: sage publications. 1-17. Available: http://dx.doi.org/10.4135/9781506300160 (Accessed 05 April 2018).

Scott, H. and Sicherer, M.D. eds. 2014. *Food allergy practical diagnosis and management*. Florida Boca Raton: CRC Press.

Scott, S.E. and Rozin, P. 2017. Are additives unnatural? Generality and mechanisms of additivity dominance. *Judgement and decision making,* (12(6):572-583. Available: https://www.scholar.google.co.za (Accessed 17 January 2018).

Shamal, S. and Mohan, B.C. 2017. Consumer behaviour in fortified food choice decisions in India. *Nutrition and Food science*, 47(2):229-239. Available: http://dx.doi.org/10.1108/NFS-05-2016-0065 (Accessed 02 May 2017).

Shan, L.C., Henchion, M., de Brun, A., Murrin, C., Wall, P.G. and Monahan, F.J. 2017. Factors that predict consumer acceptance of enriched processed meats. *Journal of meat science*, July:185-193. Available: http://dx.doi.org/10.1016/j.meatsci.2017.07.006 (Accessed 23 January 2018).

Shaw, J.A. 2017. The influence of dietary factors on child food allergies. Human and clinical nutrition. University of New Hampshire. Available: http://scholar.unh.edu/honors/373 (Accessed 09 March 2018).

Shimp, T.A. and Andrews, T.C. 2014. *Advertising, promotion and aspects of integrated marketing communications.* Hampshire: Cengage learning.

Shukla, S., Haidorai, Y., Hwang, S.K., Bajpai, V.K., Huh, Y.S. and Han, Y. 2017. Current demands for food approved liposome nanoparticles in food and safety sector. *Frontiers in microbiology,* 8(1):1-12. Available: http://doi:10.3389/fmicb.2017.02398 (Accessed 18 March 2017)

Siegrist, M., Hartmann, C. and Sutterlin, B. 2016. Biased perception about gene technology: How perceived naturalness and affect distort benefit perception. *Appetite*, January (96):509-516. Available: http://dx.org/10.1016/j.appet.2015.10.021 (Accessed 09 May 2018).

Siegrist, M. and Sutterlin, B. 2017. Importance of perceived naturalness for acceptance of food additives and cultured meat. *Appetite*, March (113):320-326. Available: http://dx.doi.org/10.1016/j.appet.2017.03.019 (Accessed 18 June 2018)

Skolnik, R. 2016. *Global health*. 3rd ed. Burlington: Jones and Bartlett learning.

Steinhauser, J. and Hamm, U. 2018. Consumer and product-specific characteristics influencing the effect of nutrition, health and risk reduction claims on preference and purchase behavior – A systematic review. *Appetite*, April, May (127): 303-323. Available: https://doi.org/10.1016/j.appet.2018.05.012 (Accessed 30 June 2018).

Steyn, N.P., Jaffer, N., Nel, J., Levitt, N., Steyn, K., Lombard, C. and Peer. 2016. Dietary intake of the urban black population of Cape Town: The cardiovascular risk

in black South Africans (CRIBSA) study. *Nutrients*, 8 (285): 1-13. Available: https://www.googlescholar.com (Accessed 02 February 2018).

Tanumihardjo, S.A., 2015. Vitamin A fortification efforts require accurate monitoring of population vitamin A status to prevent excessive intakes. *Procedia chemistry*, 14:398-407. Available: www.sciencedirect.com (Accessed 30 January 2017).

The Argus. 2017. Food insecurity stunts South African growth. *The Argus; Cape Town*, 03 December. Available: http://www.proquest.com/news (Accessed 12 March 2018).

Trochim, W.M., Donnelly, J.P. and Arora, K. 2016. *Research methods: The essential knowledge base*. Boston: Cengage learning.

Tsikritzi, R., Wang, J., Collins, V.J., Allen, V.J., Mavrommatis, Y., Moynihan, P.J., Gosney, MA., Kennedy, O.B. and Methven, L. 2015. The effect of nutrients fortification of sauces on product stability, sensory properties and subsequent liking by older adults. *Journal of food science*, 80(5):1-10. Available: onlinelibrary.wiley.com.dutlib.dut.ac.za (Accessed 13 January 2017).

Turk, T., Spohrer, R., Manus, C., Van, T.K., Nga, T.T., Nguyen, M., Poonawala, A. and Garett, G.S. 2016. Using formative research to increase purchase intention of fortified foods to prevent micro-nutrients deficiencies in Vietnam. *Journal of nutrition and food sciences*, 6(4):1-7. Available: https://googlescholar.com (Accessed 27 January 2017).

Van Buul, V.J. and Brouns, F.J.P.H. 2015. Nutrition and health claims as marketing tools. *Critical reviews in food science and nutrition*, 55(11): 1552-1560. Available: http://doi.org/10.1080/10408398.2012.754738 (Accessed 29 March 2018).

Van Jaarsveld, P.J., Faber, M. and Van Stuijveberg, M.E. 2015. Vitamin A iron, and Zinc content of fortified maize meal and bread at the household level in 4 areas of South Africa. *Food and nutrition bulletin*, 36(3):315-326. Available: www.sage.com (Accessed 17 February 2017).

Verma, A. 2015. Food fortification: A complementary strategy for improving micro-nutrient malnutrition (MNM) status. *Food science research journal*, 6(2):38-389. Available: www.reseachjournal.co.in (Accessed 09 February 2017).

Vicentini, A., Liberatore, L. and Mastrocola, D. 2016. Functional foods: Trends and development of the global market. *Italian journal of food science* 28(1):338-351. Available: http://www.proquest.com (Accessed 27 January 2018).

Volpe, S.L. and Rawson E.S. 2016 *Nutrition for elite athletes.* Boca Raton: CRS press. Available: http://web.b.ebscohost.com (Accessed 28 December 2017).

White, M., Addison, C., Campbell, B.W.J., Henderson, F., McGill, D., Payton, M. and Antoine-La Vigne, D. 2017. Factors affecting dietary practices in a Mississippi African American community. *International journal of environmental research and public health*, 14(7):1-14. Available: https://doi:10.3390/ijerph14070718.

Whitining, S.J., Kohrt, W.M., Warren, M.P., Kraenzlin, M. and Bonjour, J.P. 2016. Food fortification for bone health in adulthood: a scoping review. *European Journal of clinical nutrition*, 70(10):1099-1105. Available: https://doi:10.1038/ejn,2016.42 (Accessed 24 February 2018).

Wirth, J.D. 2014. An assessment of dietary diversity and nutrition knowledge of student nurses at the Kwazulu-Natal college of nursing. MTech., Durban University of Technology. Available: http://ir.dut.ac.za/handle/10321/167 (Accessed 28 November 2017).

Withers, C.A., Lewis, M.J., Gosney, M.A and Methven, L. 2014. Potential sources of mouth drying in beverages fortified with diary proteins: A comparison of casein-and Whey-rich ingredients. *Journal of diary science*, 97(3):1233-1247. Available: http://dx.doi.org/10.3168/jds.2013-7273 (accessed 06 December 2017).

Wiid, J. and Diggines, C. 2015. *Market research.* 3rd ed. Cape Town: Juta.

World Health Organisation (WHO) 2018. *Weekly bulletin on outbreaks and other emergencies* (week 6). Available: https://www.scholar.google.co.za (Accessed 28 April 2018).

ANNEXURE 1. LETTER OF INFORMATION

Title of the Research Study: FORTIFICATION OF FOOD PRODUCTS: A CONSUMER PERSPECTIVE.
Principal Investigator/s/researcher: AYUB SERUBUGO (MASTERS: MARKETING.

Investigator/s/supervisor/s: PROFESSOR DARRY PENCELIAH (PhD)

Brief Introduction and Purpose of the Study: Many consumers have no knowledge and are not familiar with the importance of food fortification. The study seeks to assess the consumers' level of awareness of food fortification and its significance to the consumers.

Outline of the Procedures:
Participants will be approached outside the shopping centres around Durban Metro. A small tent will be erected on the sidewalk. The participants will be requested to feel free to answer the questionnaire which will take approximately 5 minutes after a brief explanation of the purpose of study.
Risks or Discomforts to the Participant:
There are no risks anticipated but the discomfort will be about time that the participants might not have to answer the questionnaire sufficiently.
Benefits:
Participants will voluntarily be asked to participate without any gifts or benefits but at the beginning of the survey, participants will be told about the benefits of the study to the society. To the researcher, the output will be published on DUT repository to contribute to future studies.
Reason/s why the Participant May Be Withdrawn from the Study:
The questionnaire will be administered in English and therefore, participants who can't read and write in English shall be withdrawn. Secondly, participants who don't have time will be withdrawn.
Remuneration:
Participants by no means will be entitled to a payment for participating in the survey.
Costs of the Study:
Participants will not incur any monetary cost to participate in the study, however the only cost that respondents will incur is the time taken to populate the questionnaire.
Confidentiality:
Respondents won't be asked any information relating to their addresses, contact details and other personal information revealing their privacy.
Research-related Injury:
No physical contact will be required during the survey and therefore no research related injuries are expected.
Persons to Contact in the Event of Any Problems or Queries:
Darry Penceliah Email: pencelid@dut.ac.za. Please contact the researcher (076 350 7722) my supervisor (tel no.) or the Institutional Research Ethics administrator on 031 373 2900. Complaints can be reported to the DVC: TIP, Prof S. Moyo on 031 373 2382 or dvctip@dut.ac.za.
General:
Participation is voluntary and 400 participants are expected for the whole study. Feel free to read a copy of a letter of information that is handed to you before the survey. Any questions, clarity and discomfort by the participants, will be addressed to the researcher.

ANNEXURE 2. LETTER OF CONSENT

Statement of Agreement to Participate in the Research Study:

- I hereby confirm that I have been informed by the researcher, AYUB **SERUBUGO**, about the nature, conduct, benefits and risks of this study - Research Ethics Clearance Number: _____,
- I have also received, read and understood the above written information (Participant Letter of Information) regarding the study.
- I am aware that the results of the study, including personal details regarding my sex, age, date of birth, initials and diagnosis will be anonymously processed into a study report.
- In view of the requirements of research, I agree that the data collected during this study can be processed in a computerised system by the researcher.
- I may, at any stage, without prejudice, withdraw my consent and participation in the study.
- I have had enough opportunity to ask questions and (of my own free will) declare myself prepared to participate in the study.
- I understand that significant new findings developed during this research which may relate to my participation will be made available to me.

_____ _____ _____ _____

Full Name of Participant **Date** **Time** **Signature / Right Thumbprint**

I, AYUB SERUBUGO herewith confirm that the above participant has been fully informed about the nature, conduct and risks of the above study.

AYUB SERUBUGO

_____ _____ _____

Full Name of Researcher **Date** **Signature**

_____ _____ _____

Full Name of Witness (If applicable) **Date** **Signature**

_____ _____ _____

Full Name of Legal Guardian (If applicable) **Date** **Signature**

ANNEXURE 3. MEASURING INSTRUMENT

QUESTIONNAIRE IN RESPECT OF FORTIFICATION OF FOOD PRODUCTS: A CONSUMER PERSPECTIVE

SECTION (A)

Please mark with X with the appropriate answer.

DEMOGRAPHICS

1.	**Gender:**	☐ Female	☐ Male		
2.	**Age group:**	☐ 18 – 34	☐ 35 – 59	☐ 60 – over	
3.	**Region:**	☐ Central	☐ North	☐ South	☐ West
4.	**Designation:**	☐ Employed	☐ Unemployed	☐ Student	☐ Pensioner

SECTION (B) INSTRUCTIONS

- ✓ Fortified food products, enriched food products, and health food products mean the same for this study.
- ✓ Fortified food are processed products with added vitamins and minerals (nutrients) for example bread, dairy products, and cereals.
- ✓ From the scale of; **"strongly disagree", "disagree", Neutral, "agree", "Strongly agree"**, feel free to tick one box that matches your opinion.

MERITS

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
5. Fortified products are good for health.					
6. I know the benefits of vitamins.					
7. I consider health ingredients when buying food.					
8. Fortified food is for children only.					

DEMERITS

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
9. Unprocessed Natural food is better than processed fortified food.					
10. Fortified food makes me obese.					
11. Eating fortified food is dangerous to my health.					
12. Added nutrients cause allergy.					

MOTIVATORS

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
13. Fortified brown bread has a good taste.					
14. I buy products high in fibre.					
15. I eat enriched food to avoid poor health diseases.					
16. Family members encourage me to eat healthy food.					
17. I follow health eating advertisement.					
18. Food packages help me to make health food choices.					
19. Nutrition information influence my food purchase.					

BARRIERS

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
20. Enriched food products are expensive.					
21. Fortified food products are artificial.					
22. I have no time to prepare fortified food.					
23. I eat to get full without considering nutrients.					
24. Processed fortified foods have harmful additives.					
25. I have seen products with nutritional labels.					

What is your opinion about fortified / enriched food products?

ANNEXURE 4. FREQUENCIES

Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	244	61.0	61.0	61.0
	Male	156	39.0	39.0	100.0
	Total	400	100.0	100.0	

Age

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18 - 34	234	58.5	58.5	58.5
	35 - 59	122	30.5	30.5	89.0
	60 and over	44	11.0	11.0	100.0
	Total	400	100.0	100.0	

Region

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Central	111	27.8	28.8	28.8
	North	48	12.0	12.4	41.2
	South	160	40.0	41.5	82.6
	West	67	16.8	17.4	100.0
	Total	386	96.5	100.0	
Missing	System	14	3.5		

Designation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Employed	156	39.0	39.7	39.7
	Unemployed	101	25.3	25.7	65.4
	Student	94	23.5	23.9	89.3
	Pensioner	42	10.5	10.7	100.0
	Total	393	98.3	100.0	
Missing	System	7	1.8		
Total		400	100.0		
Total		400	100.0		

Fortified products are good for health

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	43	10.8	10.8	10.8
	Disagree	58	14.5	14.5	25.3
	Neutral	68	17.0	17.0	42.3
	Agree	153	38.3	38.3	80.5
	Strongly Agree	78	19.5	19.5	100.0
	Total	400	100.0	100.0	

I know the benefits of vitamins

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	15	3.8	3.8	3.8
	Disagree	38	9.5	9.5	13.3
	Neutral	50	12.5	12.5	25.8
	Agree	195	48.8	48.9	74.7
	Strongly Agree	101	25.3	25.3	100.0
	Total	399	99.8	100.0	
Missing	System	1	0.3		
Total		400	100.0		

I consider health ingredients when buying food

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	26	6.5	6.6	6.6
	Disagree	57	14.3	14.4	21.0
	Neutral	76	19.0	19.2	40.3
	Agree	134	33.5	33.9	74.2
	Strongly Agree	102	25.5	25.8	100.0
	Total	395	98.8	100.0	
Missing	System	5	1.3		
Total		400	100.0		

Fortified food is for children only

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	110	27.5	27.6	27.6
	Disagree	182	45.5	45.6	73.2
	Neutral	59	14.8	14.8	88.0
	Agree	35	8.8	8.8	96.7
	Strongly Agree	13	3.3	3.3	100.0
	Total	399	99.8	100.0	
Missing	System	1	0.3		
Total		400	100.0		

Unprocessed Natural food is better than processed fortified food

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	51	12.8	12.8	12.8
	Disagree	74	18.5	18.6	31.5
	Neutral	51	12.8	12.8	44.3
	Agree	115	28.8	29.0	73.3
	Strongly Agree	106	26.5	26.7	100.0
	Total	397	99.3	100.0	
Missing	System	3	0.8		

Total		400	100.0		

Fortified food makes me obese

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	41	10.3	10.4	10.4
	Disagree	107	26.8	27.2	37.6
	Neutral	106	26.5	26.9	64.5
	Agree	91	22.8	23.1	87.6
	Strongly Agree	49	12.3	12.4	100.0
	Total	394	98.5	100.0	
Missing	System	6	1.5		
Total		400	100.0		

Eating fortified food is dangerous to my health

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	43	10.8	10.8	10.8
	Disagree	132	33.0	33.1	43.9
	Neutral	107	26.8	26.8	70.7
	Agree	73	18.3	18.3	89.0
	Strongly Agree	44	11.0	11.0	100.0
	Total	399	99.8	100.0	
Missing	System	1	0.3		
Total		400	100.0		

Added nutrients cause allergy

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	35	8.8	8.9	8.9
	Disagree	97	24.3	24.6	33.5
	Neutral	123	30.8	31.2	64.7
	Agree	101	25.3	25.6	90.4
	Strongly Agree	38	9.5	9.6	100.0
	Total	394	98.5	100.0	
Missing	System	6	1.5		
Total		400	100.0		

Fortified brown bread has a good taste

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	34	8.5	8.5	8.5
	Disagree	53	13.3	13.3	21.8
	Neutral	75	18.8	18.8	40.6
	Agree	153	38.3	38.3	78.9
	Strongly Agree	84	21.0	21.1	100.0

	Total	399	99.8	100.0	
Missing	System	1	0.3		
Total		400	100.0		

I buy products high in fibre

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	21	5.3	5.3	5.3
	Disagree	37	9.3	9.4	14.7
	Neutral	91	22.8	23.0	37.7
	Agree	162	40.5	41.0	78.7
	Strongly Agree	84	21.0	21.3	100.0
	Total	395	98.8	100.0	
Missing	System	5	1.3		
Total		400	100.0		

I eat enriched food to avoid poor health diseases

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	17	4.3	4.3	4.3
	Disagree	77	19.3	19.6	23.9
	Neutral	84	21.0	21.4	45.3
	Agree	147	36.8	37.4	82.7
	Strongly Agree	68	17.0	17.3	100.0
	Total	393	98.3	100.0	
Missing	System	7	1.8		
Total		400	100.0		

Family members encourage me to eat healthy food

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	18	4.5	4.6	4.6
	Disagree	51	12.8	13.0	17.6
	Neutral	50	12.5	12.7	30.3
	Agree	167	41.8	42.5	72.8
	Strongly Agree	107	26.8	27.2	100.0
	Total	393	98.3	100.0	
Missing	System	7	1.8		
Total		400	100.0		

I follow health eating advertisement

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	25	6.3	6.3	6.3
	Disagree	72	18.0	18.1	24.4
	Neutral	94	23.5	23.7	48.1

	Agree	139	34.8	35.0	83.1
	Strongly Agree	67	16.8	16.9	100.0
	Total	397	99.3	100.0	
Missing	System	3	0.8		
Total		400	100.0		

Food packages help me to make health food choices

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	18	4.5	4.5	4.5
	Disagree	51	12.8	12.9	17.4
	Neutral	87	21.8	22.0	39.4
	Agree	172	43.0	43.4	82.8
	Strongly Agree	68	17.0	17.2	100.0
	Total	396	99.0	100.0	
Missing	System	4	1.0		
Total		400	100.0		

Nutrition information influence my food purchase

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	29	7.3	7.3	7.3
	Disagree	46	11.5	11.6	18.8
	Neutral	92	23.0	23.1	42.0
	Agree	173	43.3	43.5	85.4
	Strongly Agree	58	14.5	14.6	100.0
	Total	398	99.5	100.0	
Missing	System	2	0.5		
Total		400	100.0		

Enriched food products are expensive

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	27	6.8	6.8	6.8
	Disagree	65	16.3	16.3	23.1
	Neutral	88	22.0	22.1	45.2
	Agree	124	31.0	31.2	76.4
	Strongly Agree	94	23.5	23.6	100.0
	Total	398	99.5	100.0	
Missing	System	2	0.5		
Total		400	100.0		

Fortified food products are artificial

	Frequency	Percent	Valid Percent	Cumulative Percent

Valid	Strongly Disagree	26	6.5	6.5	6.5
	Disagree	92	23.0	23.1	29.6
	Neutral	132	33.0	33.2	62.8
	Agree	105	26.3	26.4	89.2
	Strongly Agree	43	10.8	10.8	100.0
	Total	398	99.5	100.0	
Missing	System	2	0.5		
Total		400	100.0		

I have no time to prepare fortified food

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	29	7.3	7.4	7.4
	Disagree	122	30.5	31.0	38.4
	Neutral	100	25.0	25.4	63.9
	Agree	106	26.5	27.0	90.8
	Strongly Agree	36	9.0	9.2	100.0
	Total	393	98.3	100.0	
Missing	System	7	1.8		
Total		400	100.0		

I eat to get full without considering nutrients

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	48	12.0	12.1	12.1
	Disagree	135	33.8	34.1	46.2
	Neutral	77	19.3	19.4	65.7
	Agree	95	23.8	24.0	89.6
	Strongly Agree	41	10.3	10.4	100.0
	Total	396	99.0	100.0	
Missing	System	4	1.0		
Total		400	100.0		

Processed fortified foods have harmful additives

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	29	7.3	7.3	7.3
	Disagree	103	25.8	25.9	33.2
	Neutral	120	30.0	30.2	63.5
	Agree	103	25.8	25.9	89.4
	Strongly Agree	42	10.5	10.6	100.0
	Total	397	99.3	100.0	
Missing	System	3	0.8		
Total		400	100.0		

I have seen products with nutritional labels

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	30	7.5	7.6	7.6
	Disagree	35	8.8	8.8	16.4
	Neutral	55	13.8	13.9	30.2
	Agree	195	48.8	49.1	79.3
	Strongly Agree	82	20.5	20.7	100.0
	Total	397	99.3	100.0	
Missing	System	3	0.8		
Total		400	100.0		

What is your opinion about fortified / enriched food products?

100% good
All kinds of foods makes us sick these days.
As a diabetic person I depend on healthy foods all the time.
As an older person I depend on nowadays foods which are healthy.
Better than processed foods much healthier.
Decrease vat in fortified food in S.A.
Don't really care.
Eating fortified food as it has vitamins and minerals is very good for our health.
Enriched food are not good.
Enriched food products are expensive but better than natural food.
Enriched food products are good they us healthy the bad thing about them is that they are expensive especially at woolworths stores.
Enriched food products are not good for our bodies.
Enriched food taste very good but very expensive.
Enriched foods are best.
Enriches foods gives energy and its okay and healthy.
Excellent quick and fast
Foods added things.
Foods that have added vitamins.
Fortified and unprocessed foods are both ok.
Fortified food ables you to watch diet, whilst enriched food makes our diet unstable and lead to high risked health conditions.
Fortified food are healthy since it has nutrients and minerals.
Fortified food are healthy.
Fortified food are not good for our health as humans.
Fortified food cause heart problem. They cause obesity.
Fortified food consist of a lot of minerals, vitamins etc which is good for health.
fortified food good for kids
Fortified food is better because you find all kinds of nutrients in one products.
Fortified food is better than natural food.
Fortified food is good but it put allergies into our body

Fortified food is good for health
Fortified food is good for health living body.
Fortified food is good for people's heath.
Fortified food is good I don't see a problem about it.
Fortified food is good in our health sometimes.
Fortified food is health because it's added with vitamins.
Fortified food is healthy it doesn't cause any harm, speaking for my condition.
Fortified food is healthy.
Fortified food is not only quick to easy but nice to eat.
Fortified food is okay.
Fortified food makes us obese.
Fortified food must not kept for the long time at shops.
Fortified food products are healthy but they are too expensive and I don't like most of it.
Fortified food products are not healthy as said to be.
Fortified food products are very important in our health.
Fortified food products is good.
Fortified food taste very good.
Fortified foods are expensive at times but the added vitamins and minerals can be health.
Fortified foods are full of nutrients and help enhance health.
Fortified foods are good but enriched food products make me obese.
Fortified foods are good but I prefer unprocessed foods.
Fortified foods are good for our healthy.
Fortified foods are good though but I prefer unprocessed food.
Fortified foods are good though but it depends on one's healthy.
Fortified foods are good.
fortified foods are health.
Fortified foods are health.
Fortified foods are healthy.
Fortified foods are just ok.
Fortified foods are not as healthy as enriched food products.
Fortified foods are okay.
Fortified foods are the best.
Fortified foods are unhealthy natural foods are the best option
Fortified foods are very good.
Fortified foods can be harmful to other.
Fortified foods can be harmful to our bodies and our health.
Fortified foods can be harmful to people's healthy.
Fortified foods is alright but some of it is harmful to our healthy.
Fortified foods is good.
Fortified foods makes us sick sometimes.
Fortified foods makes us sick than unprocessed foods.
fortified foods they are just ok
Fortified is good but as elderly people it makes us sick yet we have no choice to choose.
Fortified is good though but it depends on one's healthy.
Fortified is important its prevent us from sickness.

Fortified makes us sick nowadays natural food is the best.
Fortified of foods has potential to contribute into obesity.
Fortified or not food is expensive . I go to the elders work out to keep my body health.
Fortified or not food is expensive so I buy multivitamins to live a health life.
Fortified product consist of nutrient mostly that are harmful to our health.
Fortified product some time is not good old people.
Fortified products are enriched with all the nutritional value most food products are not.
Fortified products are good for health.
Fortified products are good healthy body needs healthy mind.
Fortified products are good, but a good balance is also needed with un processed food.
Fortified products are not good for our bodies.
Fortified products can be good and bad for health that why people need to always consider nutrition info.
Fortified products may cause allergies to booble.
Fortified products sometimes is not good for elderly people.
fortified products such as milk help to strengthen my old bones.
God knows best.
Good
Good for health
Good for you & I love eating health.
Good for your health
Good to a certain degree.
Have no idea.
Health food closes or workshops should be conducted to educate people about health food.
Health food is good.
Healthy for your body and contains vitamins, calcium etc.
Healthy not all fortified foods are well balanced diet.
Help avoid bad health issues.
Helps people with vitamins deficiency.
Helps with minerals.
I am not very familiar about these food products.
I believe these products are good for my health.
I believe they healthy and have positive and negative effect however, not too good for young children as they are too rich for their system.
I didn't know much about fortified products but I learnt most of them I eat them on daily basis.
I do believe in processed foods, I prefer natural foods most.
I don't have one.
I don't pay attention to fortified food but I'm willing to do so now.
I don't really care much about nutrition I just check for expiry date.
I don't really like enriched products I mostly eat low fat.
I don't really like the food that we eat now, I prefer how we use to eat back in the days. Fish, meat, first vegetables. The food we eat today makes us sick.
I eat food it doesn't matter fortified or not.
I eat health food as much as possible.
I eat these products because they boost my health.
I go with natural foods but also eat fortified foods I have no choice at the end.
I have fortified food because it keeps me full

I have issues with multiple ingredients-allergies & so I control what I eat.
I have nothing much to say because I don't think there organic.
I have my own garden so I can eat health food, but I think these products are good because I eat some.
I have no comments on that because I buy these products.
I have nothing against it but I do prefer unprocessed natural food.
I have seen these fortified product they say for better health so I eat them, if I don't what will I eat.
I haven't noticed fortified foods but I will since I know to take good care of myself.
I hear it is to better my healthy so I'm going to continue eating it.
I honestly don't know much about it, but I do think it might be harmful since it's mostly artificial stuff.
I just eat what I want during that time.
I like eating enriched food cause it helps me to maintain my weight.
I like enriched food products for my health and the health of others, it's good food.
I like them too much.
I love natural food because no vitamins or nutrition are last because of processing. Most times I eat spinach, amadumbe and maize meal which is fortified.
I love the food we use to eat like bread made by mealie-meal and mix of flour.
I personally do not like enriched food products.
I prefer both.
I prefer fortified food they make is health because of nutrition.
I prefer them to add more vitamins.
I prefer unprocessed food is better than fortified food.
I prefer unprocessed foods yet I don't have a choice, we eat what we've been provided with at the shops.
I recommend parents to consider natural foods to fortified food.
I recommend that fortified food be limited to small packaging and increase the natural one.
I strongly think enriched food products are good for our health.
I think fortified food is good and helps our bodies stronger.
I think fortified food is good.
I think it can harm others and may cause allergy.
I think it's very good for our health and we should eat more of it.
I think some of them are not good for our health.

ANNEXURE 5. CHI-SQUARE

	Chi-Square	df	Asymp. Sig.
Gender	19.36	1	0.000
Age	136.82	2	0.000
Region	77.358	3	0.000
Designation	66.41	3	0.000
Fortified products are good for health	91.625	4	0.000
I know the benefits of vitamins	257.579	4	0.000
I consider health ingredients when buying food	86.785	4	0.000
Fortified food is for children only	228.807	4	0.000
Unprocessed Natural food is better than processed fortified food	45.557	4	0.000
Fortified food makes me obese	50.772	4	0.000
Eating fortified food is dangerous to my health	77.028	4	0.000
Added nutrients cause allergy	80.721	4	0.000
Fortified brown bread has a good taste	102.942	4	0.000
I buy products high in fibre	154.253	4	0.000
I eat enriched food to avoid poor health diseases	109.634	4	0.000
Family members encourage me to eat healthy food	176.504	4	0.000
I follow health eating advertisement	87.32	4	0.000
Food packages help me to make health food choices	168.419	4	0.000
Nutrition information influence my food purchase	163.734	4	0.000
Enriched food products are expensive	65.693	4	0.000
Fortified food products are artificial	97.452	4	0.000
I have no time to prepare fortified food	93.73	4	0.000
I eat to get full without considering nutrients	73.242	4	0.000
Processed fortified foods have harmful additives	84.398	4	0.000
I have seen products with nutritional labels	231.451	4	0.000

ANNEXURE 6. CORRELATIONS SHEET

		Fortified products are good for health	I know the benefits of vitamins	I consider health ingredients when buying food	Fortified food is for children only	Unprocessed Natural food is better than fortified food	Fortified food makes me obese	Eating fortified food is dangerous to my health	Added nutrients cause allergy	Fortified brown bread has a good taste	I buy products high in fibre	I eat enriched food to avoid poor health diseases	Family members encourage me to eat healthy food	I follow health eating advertisement	Food packages help me to make health food choices	Nutrition information influence my food purchase	Enriched food products are expensive	Fortified food products are artificial	I have no time to prepare fortified food	I eat to get full without considering nutrients	Processed fortified foods have harmful additives	I have seen products with nutrional labels
Fortified products are good for health	Correlation Coefficient	1.000																			
	Sig. (2-tailed)																				
	N	400																			
I know the benefits of vitamins	Correlation Coefficient	.253**	1.000																		
	Sig. (2-tailed)	0.000																			
	N	399	399																		
I consider health ingredients when buying food	Correlation Coefficient	.249**	.380**	1.000																	
	Sig. (2-tailed)	0.000	0.000																		
	N	395	394	395																	
Fortified food is for children only	Correlation Coefficient	-.218**	-.185**	-.144**	1.000																
	Sig. (2-tailed)	0.000	0.000	0.004																	
	N	399	398	394	399																
Unprocessed Natural food is better than processed fortified food	Correlation Coefficient	0.046	.114*	.159**	-0.090	1.000															
	Sig. (2-tailed)	0.358	0.023	0.002	0.074																
	N	397	396	392	396	397															
Fortified food makes me obese	Correlation Coefficient	-0.037	-0.030	0.045	0.086	.132**	1.000														
	Sig. (2-tailed)	0.460	0.554	0.380	0.090	0.009															
	N	394	393	389	393	391	394														
Eating fortified food is dangerous to my health	Correlation Coefficient	-.240**	0.006	0.090	0.096	.247**	.245**	1.000													
	Sig. (2-tailed)	0.000	0.903	0.075	0.056	0.000	0.000														
	N	399	398	394	398	396	393	399													
Added nutrients cause allergy	Correlation Coefficient	-0.027	0.002	-0.036	.110*	.108*	.272**	.294**	1.000												
	Sig. (2-tailed)	0.587	0.966	0.483	0.029	0.033	0.000	0.000													
	N	394	393	389	393	391	388	393	394												
Fortified brown bread has a good taste	Correlation Coefficient	.357**	.151**	.189**	-.187**	.249**	.106*	-0.008	0.065	1.000											
	Sig. (2-tailed)	0.000	0.002	0.000	0.000	0.000	0.033	0.871	0.197												
	N	399	398	394	398	396	393	398	394	399											
I buy products high in fibre	Correlation Coefficient	.207**	.277**	.366**	-0.012	.170**	0.074	0.091	0.036	.199**	1.000										
	Sig. (2-tailed)	0.000	0.000	0.000	0.811	0.001	0.144	0.070	0.482	0.000											
	N	395	394	390	394	392	390	394	389	394	395										
I eat enriched food to avoid poor health diseases	Correlation Coefficient	.181**	.271**	.390**	-0.044	.139**	0.044	-0.050	-0.066	.163**	.357**	1.000									
	Sig. (2-tailed)	0.000	0.000	0.000	0.382	0.006	0.388	0.320	0.194	0.001	0.000										
	N	393	392	388	392	390	388	392	387	392	388	393									
Family members encourage me to eat healthy food	Correlation Coefficient	.169**	.229**	.333**	-0.088	.249**	-0.015	0.058	0.021	.176**	.232**	.223**	1.000								
	Sig. (2-tailed)	0.001	0.000	0.000	0.081	0.000	0.770	0.255	0.678	0.000	0.000	0.000									
	N	393	392	388	392	390	387	392	388	392	388	387	393								
I follow health eating advertisement	Correlation Coefficient	.103*	.216**	.360**	-0.030	0.091	0.077	0.061	-0.004	.100*	.394**	.424**	.280**	1.000							
	Sig. (2-tailed)	0.041	0.000	0.000	0.550	0.071	0.130	0.224	0.945	0.046	0.000	0.000	0.000								
	N	397	396	392	396	394	391	396	391	396	392	390	390	397							
Food packages help me to make health food choices	Correlation Coefficient	.104*	.229**	.278**	-0.058	0.088	0.024	0.070	-0.044	.113*	.306**	.303**	.242**	.272**	1.000						
	Sig. (2-tailed)	0.038	0.000	0.000	0.250	0.083	0.637	0.163	0.390	0.025	0.000	0.000	0.000	0.000							
	N	396	395	391	395	393	390	395	390	395	391	389	390	394	396						
Nutrition information influence my food purchase	Correlation Coefficient	.142**	.260**	.367**	-0.022	0.092	-0.061	-0.016	0.002	0.072	.307**	.343**	.212**	.426**	.316**	1.000					
	Sig. (2-tailed)	0.005	0.000	0.000	0.668	0.069	0.230	0.751	0.964	0.155	0.000	0.000	0.000	0.000	0.000						
	N	398	397	393	397	395	392	397	392	397	393	391	391	395	394	398					
Enriched food products are expensive	Correlation Coefficient	.107*	0.098	0.067	-0.095	.241**	.131**	.131**	.245**	.186**	.099*	0.020	0.090	-0.017	0.034	0.041	1.000				
	Sig. (2-tailed)	0.032	0.050	0.185	0.057	0.000	0.009	0.009	0.000	0.000	0.050	0.696	0.074	0.730	0.502	0.421					
	N	398	397	393	397	395	392	397	392	397	393	391	391	395	394	396	398				
Fortified food products are artificial	Correlation Coefficient	-.199**	0.031	0.072	.159**	.127*	.159**	.236**	.162**	-0.079	0.039	0.045	.127*	0.033	.135**	0.026	.104*	1.000			
	Sig. (2-tailed)	0.000	0.543	0.157	0.001	0.012	0.002	0.000	0.001	0.117	0.439	0.373	0.012	0.519	0.007	0.610	0.038				
	N	398	397	393	397	395	393	397	392	397	393	393	391	395	394	396	396	398			
I have no time to prepare fortified food	Correlation Coefficient	-.143**	0.005	-0.024	.223**	0.049	.127*	.269**	.105*	0.008	0.070	-0.002	0.086	0.036	.103*	0.040	0.073	.142**	1.000		
	Sig. (2-tailed)	0.004	0.923	0.636	0.000	0.330	0.012	0.000	0.039	0.875	0.166	0.968	0.090	0.483	0.041	0.431	0.148	0.005			
	N	393	392	388	392	390	388	392	387	392	388	386	387	390	389	391	391	391	393		
I eat to get full without considering nutrients	Correlation Coefficient	-.137**	-.143**	-.202**	.195**	0.026	.122*	.130**	0.094	0.002	-.106*	-.122*	-0.091	-.176**	-.117*	-.208**	.109*	.139**	0.001	1.000	
	Sig. (2-tailed)	0.006	0.004	0.000	0.000	0.607	0.016	0.010	0.064	0.973	0.037	0.016	0.072	0.000	0.020	0.000	0.031	0.006	0.977		
	N	396	395	391	395	393	390	395	390	395	391	389	389	393	392	394	394	394	389	396	
Processed fortified foods have harmful additives	Correlation Coefficient	-.108*	0.009	.130**	0.084	.195**	.200**	.471**	.168**	0.039	0.070	-0.007	.116*	.109*	.162**	0.086	.157**	.286**	.255**	0.088	1.000
	Sig. (2-tailed)	0.031	0.855	0.010	0.097	0.000	0.000	0.000	0.001	0.433	0.167	0.889	0.022	0.031	0.001	0.086	0.002	0.000	0.000	0.083	
	N	397	396	392	396	394	391	396	391	396	393	390	390	394	393	395	395	395	390	393	397
I have seen products with nutrional labels	Correlation Coefficient	0.090	.266**	-0.013	0.097	0.073	0.031	0.013	0.039	.125*	.195**	.116*	0.022	0.089	.103*	.228**	.128*	0.078	0.037	-0.084	.123*
	Sig. (2-tailed)	0.073	0.000	0.797	0.053	0.148	0.541	0.797	0.441	0.013	0.000	0.889	0.669	0.077	0.042	0.000	0.011	0.120	0.461	0.097	0.014
	N	397	396	392	396	394	391	396	391	396	392	390	390	394	393	395	395	395	390	393	397

Spearman's rho

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).