

UNIVERSITY OF EDUCATION, WINNEBA

**CONSUMER AWARENESS OF FOOD ADULTERATION IN THE GHANAIAN
HOSPITALITY INDUSTRY: A CASE OF FOOD CONSUMERS WITHIN THE
KUMASI METROPOLIS**

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DEDICATION

This work is dedicated to my children, Vincent Benson Adongo, Annabel Felicia Adongo and Immaculate Anastasia Adongo



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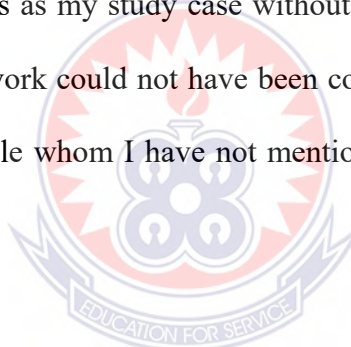


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ABSTRACT

Even though food becomes a key source of nutrients to humans nonetheless, its consumption when adulterated can lead to varied forms of diseases and infections. Generally, a highly nutritious meal can become unwholesome when its preparation, transportation and selling becomes adulterated. This study assessed the knowledge and perception of customers on food adulteration within the Kumasi Metropolis. The specific objectives were; to assess consumer level of awareness on food adulteration, to assess consumer level of knowledge and awareness on the health effect of food adulteration, to identify the commonest forms of food adulterations and their related adulterants among consumer and finally to identify the factors that predict consumers level of awareness towards food adulteration. The study population constituted consumers who purchased their foods from local and continental restaurants, food vendor, food from corner food shops and chop bars facilities within the Kumasi Metropolis. The study employed a cross-sectional design hence, distributed a total of 245 questionnaires to the selected participants within the Kumasi Metropolis. The study used the Statistical Package for Social Scientists to compute the descriptive and inferential analysis on the field data. Findings from the study suggest that the respondents' knowledge and awareness on food adulteration were above average with most of the respondents having a fair knowledge with regards to how food adulteration occurred, the adulterants used to adulterate certain kinds of foods and the foods that are often susceptible to food adulteration. Also, findings from the study suggest that the respondents had fair knowledge about the health implication associated with the consumption of adulterated food. Again, among all the factors that improved a consumer level of awareness on food adulteration the availability of information (i.e. making food adulteration information readily available to the public) had the most significant impact on consumer level of awareness towards food adulteration. On this point, it is recommended to the Public Health Directorate of the Ghana Health Service to have designated centres at the various local communities that can make information readily available to local indigenes on the dangers of food adulteration since its accessibility can improved the consumers awareness on food adulteration.

CHAPTER ONE

INTRODUCTION

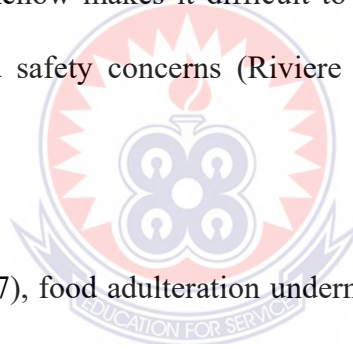
1.1 Background to the study

Food remains one of the most important things in human life. It serves as the number one source of nutrient to human beings (Antwi-Boasiako & Gyimah, 2018). According to Antwi-Boasiako and Gyimah (2018), even though food becomes a key source of nutrients to humans nonetheless, its consumption when adulterated can lead to varied forms of diseases and infections. Generally, a highly nutritious meal can become unwholesome when its preparation, transportation and selling becomes adulterated (Alauddin, 2012).

Adulterants in food may have adverse health ramification on the consumer with some resulting in stomach torment, asthma, spewing, headache, mental hindrance, cardiac arrest, inveterate ailments such as cancers and even in some cases lead to death (Alauddin, 2012; House of Commons Official Report, 2018). Moreover, even in instances where the adulteration does not cause any substantial negative effect to the user, it can at the long trigger damaging effect in the food supply chain (Esteki, Regueiro, & Simal-G'andara, 2019). For instance, adulteration could cause consumers, regulators, industry, and trading partners to distrust the food supply chain which in effect could result in some form of market and trade distractions (Spink, et al., 2016). A clear case of such occurrence is when the contamination of a Chinese milk by a melamine substance resulted in a severe boycott of the country's dairy products by its local users and its foreign consumers (Cartín-Rojas, 2017).

Food adulteration may arise from the need to compete with other more powerful businesses, manufacturers, food service establishments, and major food retailers (Manning, 2016). Hence, adulteration is used by a producer to either make it product appear more attractive or

appealing or less costly than that of the other competitor product offering (Esteki et al., 2019). Seldomly, the driving force for food adulteration could emanate from the scarcity of a given food component. A clear case of this phenomenon is the happening of the horsemeat scandal which in part was driven by a reduced European supply of beef and other meat products (Esteki et al., 2019). Another reason that could account for the increasing trend in food adulteration could be the growing complexity of the current global food supply system, the expansion of world trade across novel markets, and the steady rise in food prices (Huck, Pezzei, & Huck-Pezzei, 2016). According to Aung and Chang, (2014), international trade has increased the distance with which food moved from production space to the final consumer. Hence, with this arrangement, many product ingredients and inputs are obtained from a wide range of countries and this somehow makes it difficult to trace the source of unintentional contamination and related food safety concerns (Riviere & Buckley, 2012; Esteki et al., 2019).



According to Cartín-Rojas (2017), food adulteration undermines food safety by disregarding its composition, origin or side effects of adulterants on consumers' health. Generally, food adulteration constitutes the practice of mixing, substituting or hiding the quality of a food by either mislabelling the food product or adding unknown substances to the food to increase its quantity or give it a new identity (Nasreen & Ahmed, 2014). Arguably, food adulteration is an ancient and an anti-competitive criminal practice yet evidence in the food space suggests that its occurrence is still prevalent (Shears, 2010; Schell, Gallo, & Cook, 2012). Examples of recent happenings of food adulteration cases are the melamine substance found in milk products in the Republic of China (Lakshmi, Labs, & Pradesh, 2012), the horsemeat scandal in European Economic Community (EEC) (Khan, 2013), the Halal meat scandal (Smith, 2004), the Eurovet scandal (Smith, 2013), and the black fish scandal (Smith, 2015).

Again, figures available tend to suggest that at the global level more than 10 percent of world trade food substances are adulterated (Alauddin, 2012). Accordingly, in the last decade, food adulteration has emerged as a significant threat to various countries judging from the direct implications it has for both public health and international trade (Cartín-Rojas, 2017). This goes to suggest that food adulteration still forms part of most food producers and seller's business practices. As rightly suggested one of the optimal ways to prevent or minimize its occurrence is by building consumers ability to detect it whenever they see it (Moyer, DeVries, & Spink, 2017). Accordingly, this study seeks to assess consumers level of awareness towards food adulteration.

1.2 Problem Statement

With time consumers level of awareness about food safety has been identified as one of the most effective ways of strengthening the reliability and economic competitiveness of the structure of a specific food manufacturing and supply chain. Food adulteration is injurious to health and could lead to death in certain cases, this is because when consumers are ignorant or unaware of food adulteration practices it exposes them to potential health dangers. These include developing health complications arising from consuming adulterated food. Such health complications vary and may range from fatal to mild. Accordingly, many scholars have touted interventions aimed at increasing consumers awareness of food adulteration occurrence, traces and its health implications as one of the surest ways to minimize or avert its occurrences among food producers and suppliers.

Notwithstanding this realization, only few studies have sought to explore consumer level of awareness and understanding about food adulteration.

Food adulteration has the tendency of crippling certain aspects of an economy due to a reduced public trust in patronising certain food items suspected or proven to be adulterated. As a result, most of the studies in this area have significantly placed more emphasis on the economics of food adulteration and the predictors of food adulteration among producers, for us as a society to be able to fight this menace properly, it demands that consumers become actively involved and demand proper answers from the industry and authorities regarding food adulteration policies and strategies.

Surprisingly, in the case of Ghana the only study that comes to notice is the work of Antwi-Boasiako and Gyimah (2018) which primarily sought to assess consumer's awareness of food adulteration by randomly selecting one hundred (100) respondents within the Bolgatanga Metropolitan as their study sample. Even though, this study has in a way looked into consumers awareness of food adulteration in the Ghanaian context nevertheless, it has to be pointed out that merely selecting 100 individuals randomly within Bolgatanga township may not be exhaustive to expose all Ghanaians consumers level of awareness towards food adulteration. Hence, more studies will be required to add more breadth to the literature by undertaking the study within different regions or contexts to explore consumer level of awareness and understanding towards food adulteration. Accordingly, it is against this background that this study seeks to assess consumers awareness and understanding towards food adulteration by carrying out the enquiry within the Ashanti Region of Ghana.

1.3 Purpose of Study

To assess the knowledge and perception of consumers on food adulteration.

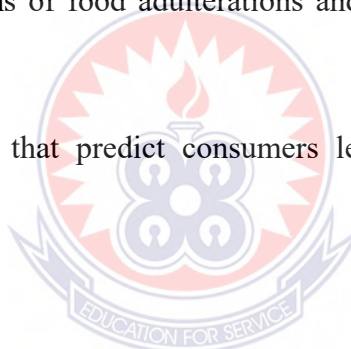
1.4 Specific Objectives

The study seeks to achieve the following specific objectives.

1. To assess consumer level of awareness on the health effect of food adulteration.
2. To identify the commonest forms of food adulterations and their related adulterants among consumer.
3. To identify the factors that predict consumers level of awareness towards food adulteration.

1.5 Research Questions

1. What is the consumer level of awareness on the health effect of food adulteration?
2. What is the commonest forms of food adulterations and their related adulterants among consumer?
3. What is the critical factors that predict consumers level of awareness towards food adulteration?



1.6 Significance of the Study

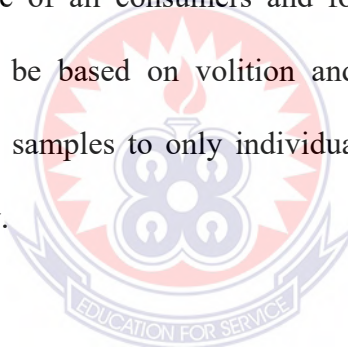
Results from this will add more breadth to the existing particularly with regards to consumer level of awareness towards food adulteration which has largely been given little attention by existing works. Again, results from this study will contribute to theory building by identifying the possible factors that determine consumer level of awareness and knowledge towards food adulteration. Accordingly, through this study results, we could be able to confirm the validity of the health belief theory in explaining the consumers awareness towards food adulteration.

1.7 Scope of the Study

This study is delimited in examining the knowledge and perception of consumers on food adulteration within the Kumasi Metropolis.

1.8 Limitation of the Study

One key limitation of the study emanates from how the study will assess respondent's knowledge and awareness about food adulteration, it will use a subjective approach that is a, questionnaire instrument and for that matter it may not be exhaustive in objectively assessing whether the respondents had sufficient knowledge on food adulteration. Again, the study samples may come from only consumers in the Kumasi Metropolis and for that results from the study will not representative of all consumers and food providers in Ghana. Finally, participation in this study will be based on volition and not on compulsion. With this approach it may limit the study samples to only individuals and institutions who are only willing to participate in the study.



1.9 Organization of the Study

This study is structured into six chapters. Chapter one, gives background information of the work and sets the topic of the study in context. It presents the aims and objectives of the study and explains the structure of the dissertation. Chapter Two is literature review. This chapter captures a review of related literature conducted in the area food adulteration. Chapter Three discusses research methodology. It focuses on the methodology used to arrive at the conclusions in the last chapter. Explanation and justification for the selection of methods used in analysis will be discussed focusing on their reliability, validity and effectiveness in realising the goals of the study. Chapter four deals with the results and analysis of the study. The outcome of the research is presented here. Chapter five discusses

the results in relation to the literature reviewed in chapter two. Also, significant and novel findings discovered are identified, interpreted and discussed here. The discussion highlights the major findings of the research and the inferences made from them in view of findings from related previous studies. The last chapter thus, Chapter Six presents the summary of findings, conclusions and recommendations. This section itemizes the major research findings and indicates how this research work has contributed to knowledge. This section also includes recommendations and any limitations of the study and also includes suggestions for future research work.



CHAPTER TWO

LITERATURE REVIEW

2.1 Conceptual Review

This section seeks to provide the definitions of the main concept used in this study. At this section comparison will be made as to how different scholars have described the main concepts and afterwards settle on the one that fit the study context and purpose.

2.1.1 Food Adulteration Definition

Food adulteration refers to the practice of mixing, substituting or hiding the quality of a food by either mislabelling the food product or adding unknown substances to the food to increase its quantity or give it a new identity (Nasreen & Ahmed, 2014). According to Cartín-Rojas (2017), this practice of mixing, substituting or hiding the quality of a food either by mislabelling the food product or by adding unknown substances to the food undermines food safety and wholesomeness. Consistent view was shared by Paul, Patel and Malik (2015) as they argued that the practice of food adulteration could result in the addition of a harmful substance or the removal of a vital component from the food.

In India, food adulteration as defined by the Food Safety and Standards Act (FSSA) 2006, becomes evident when there is a substandard quality, replacement by low-priced substance, abstraction of any component of article, preparation or storage in insanitary environments, presence of poisonous ingredients, use of colouring agents and/or preservatives in excess of prescribed limits or quantity or purity is below the prescribed standards. Hence, per the Food Safety and Standards Act (FSSA) 2006, food can be seen as adulterated when it passed through any of these processes. Similarly, Ishwar, Dudeja, Shankar, Swain and Mukherji (2018), described food adulteration as the addition or removal of any substance to or from a

food such that the natural composition and quality of food substance becomes affected. Bandal, Singh, Mangal, Mangal and Kumar (2017) on their part described food adulteration as the occurrence where a food quality is lowered either by an intentional or unintentional substitution or addition of food with low priced ingredient or by removal of some value-added food substitute from main food item. From the perspective of Bansal et al. (2017) the act of food adulteration can be either intentional or unintentional with the intentional often seeking higher financial gain. However, with unintentional adulteration, it usually comes as a result of the food seller or producer ignorance or lack of required facilities to maintain food quality.

2.1.1.1 Types of Food Adulteration

According to Bansal et al. (2017), food adulteration can be categorized into two groups namely; intentional adulteration and unintentional adulteration/natural adulteration. Often intentional adulteration is motivated by the desire to make more profit, reduce production cost or minimize the quality or quantity of ingredients used in the production of a particular food. Conceptually, intentional adulteration is the practice of replacing or adding a substandard ingredient to the preparation of a food (Ishwar et al., 2018). The U.S. Food and Drug Administration (FDA) called intentional adulteration as economical motivated adulteration (EMA). The US branch of FDA described it as “the fraudulent, intentional substitution or addition of a substance in a food product in order to increase the apparent value of the product or reduce the cost of its production, in order to have more economic gain” (Spink & Moyer, 2011; Grundy, et al., 2012). Intentional adulteration may arise from the need to compete with other more powerful businesses, manufacturers, food service establishments, and major food retailers (Manning, 2016). Hence, intentional adulteration is used by a producer to either make it product appear more attractive or appealing or less costly

than that of the competitor (Esteki, Regueiro, & Simal-G'andara, 2019). Usually, the included ingredients tend to exhibit the same properties of the replaced one. Among all the sources of food adulteration, intentional adulteration is regarded as the deadliest and the most difficult to detect by regulatory bodies (Awasthi, et al., 2014).

In an analysis done Lakshmi et al. (2012) on the U.S. public database on food fraud, foods such as olive oil, milk, honey, saffron, orange juice, coffee and apple juice were identified as the category of food substances that often go through intentional forms of adulteration. For instance, adding water to milk to increase its quantity may become very difficult to detect. Likewise, adding extraneous matter to ground spices, or removing or substituting milk solids from a natural product may become very difficult to detect both by the consumer and regulatory bodies (Bansal et al., 2017).

However, with unintentional adulteration, it is conceptually seen as the addition of unwanted substances to a food as a result of the producer unawareness, negligence or lack of proper facilities and sanitary conditions during processing of food (Asrat & Ermias, Food Adulteration: Its Challenges and Impacts, 2015). According to Bansal et al. (2017), intentional adulteration can be an acquired type like contamination of a food by bacteria or fungi, spoilage of food by rodents, entry of dust and stones, harmful residues from packing material, etc. or inherent type by virtue of the presence of certain chemicals, organic compounds, or radicals naturally occurring in foods like toxic varieties of pulses, mushrooms, green and other vegetables, fish and sea foods. This suggests that intentional adulteration may usually occur because of how a food is produced, handled, processed, stored, transported and marketed (Asrat & Zelalem, 2014; Narayan, 2014).

2.2 Theoretical Review

Over time behavioral scientists have spent considerable amount of time and resources in developing and evaluating number of models and theories designed specifically to appreciate human behaviour across different context. Notable among these theories are the Health Belief Model (HBM) (Becker, 1974), Theory of Reasoned Action Approach (TRAA) (Ajzen and Fishbein, 1980), Theory of Planned Behavior (TPB) (Ajzen & Madden, 1986), Social Cognitive Theory (SCT) (Bandura, 1986), etc. For purposes of this work some of these theories will be reviewed to understand how it explains individual health behaviour particularly with regards to consumers awareness and knowledge on food adulteration.

2.2.1 Reasoned Action Approach

The Reasoned Action Approach (RAA) is a social cognitive theory that has been used within several context to explain or predict individual behaviour (Fishbein & Ajzen, 2009). RAA has been identified as a more elaborate version of its predecessor, the theory of planned behavior (Rich, Brandes, Mullan, & Hagger, 2015), and differentiates between specific subcomponents of the TPB constructs. Similarly, with RAA intention remains central construct in the theory formation and conceptualization. It depicts the extent to which individuals are incentivized to perform a given behavior and it is hypothesised as the most prominent predictor of a person's behaviour.

According to Hagger, Polet and Lintunen (2018), intentions are a function of three sets of belief-based constructs namely; attitude, subjective norms, and perceived behavioral control (PBC). Attitudes are an individual's overall positive or negative evaluation of a behavior. The attitude construct is distinguished into experiential and instrumental subcomponents that

depicts the affective and utilitarian functions of attitudes, respectively (Lawton, Conner, & McEachan, 2009).

Subjective norms constitute an individual perception that significant others want them to perform or participate in a given behaviour. Often it is seen as the social pressure that comes from people an individual respect dearly or regard highly for them to perform a given behaviour (Sheeran & Orbell, 1999). Hence, the social influence that comes from highly respected personality in a person's social network tends to entice an individual perform a given task or in this case build his or her level of knowledge and awareness towards food adulteration (Sheeran & Orbell, 1999).

Perceived behaviour control as the subsequent construct under TRAA depicts the extent to which the behaviour is under the individual's control. It is usually categorized into autonomy and capacity subcomponents (Terry & O'Leary, 1995), which reflects perceptions of control over doing the behaviour and perceived confidence of performing a given task with ease. Hence, person having high perceive behavioural control is more likely to build their level of awareness and knowledge towards food adulteration. In contrast, person exhibiting lower perceive behaviour control that is, having lower self confidence in their ability to understand or learn about all the antecedents in food adulteration is less likely to build his level of knowledge or awareness towards food adulteration. Intentions are hypothesized to mediate relationship between the belief-based constructs and behavior.

According to Hagger et al. (2018), the explanatory validity of the individual antecedents of the RAA constructs has been confirmed and corroborated in several primary studies and meta-analytic reviews. For instance, studies distinguishing between instrumental and

experiential attitudes indicate that both subcomponents predict intentions directly, but also found it to have a direct effect of experiential attitudes on behaviour (Conner et al., 2015; Lawton et al., 2009). Moreover, studies assessing the effects of capacity and autonomy subcomponents of PBC have confirmed capacity as the most significant predictor of intentions and, directly, behaviour (Rodgers, Conner, & Murray, 2008; Terry & O'Leary, 1995). For instance, having self-belief in a person ability to read about food adulteration will entice one to build his knowledge about food adulteration.

Support for RAA validity in explaining a person behaviour particularly when it comes to building their knowledge base in order to improve their health condition have been confirmed in several meta-analysis studies (Rich, et al., 2015; McEachan, et al., 2016). For instance, McEachan et al. (2016) reported significant effects for all RAA subcomponents on behavioural intentions, with the exclusion of autonomy. Again, the study identified experiential attitudes and capacity as the next most significant predictors of intentions with small-to-medium effect sizes, with much smaller effects for instrumental attitude and the two normative constructs. Intention significantly predicted health behavior with a medium effect size, with smaller direct effects for descriptive norms, experiential attitudes, and capacity. McEachan and colleagues (2016) concluded that the direct effects of food adulteration on a person health may compelled him or her to act spontaneously in building their level of awareness or knowledge on its occurrence and its impact without the need for further deliberation.

2.2.2 Health Belief Model

The Health Belief Model (HBM) remains as one of the oldest and widely used behavioural models in the behavioural sciences. The model was conceptualized to help understand why

people did or did not use preventive services presented to them by public health institutions in the 1950's (Conner & Norman, 2015). Ever since its conception, it has been used across several fields to understand individual health behavioural outcome and health behaviour decisions. The HBM hypothesizes that people's beliefs about whether or not they are at risk for a particular disease, and their perceptions on the potential benefits preventive measures will have on their health will influence their readiness to take action (Becker & Maiman, 1975). Meaning, people beliefs about whether they are vulnerable to food adulteration could entice them to take measures to increase their awareness and knowledge about food adulteration in order for them to be able to identify or detect adulterants when they see it. HBM is theorized across these main constructs; perceived susceptibility and perceived severity, perceived benefits and perceived barriers, cues to action and self-efficacy (Conner & Norman, 2015).

The HBM argues that a person health behavior is influenced by two reasonings; perceptions of illness threat and evaluation of behaviors to counteract this threat. Threat perceptions are based on two beliefs: the perceived susceptibility of the individual to an illness (i.e. "How likely am I to purchase an adulterated food?") and the perceived severity of the consequences of the illness for the individual ("How serious will the consumption of adulterated food affect my health?") (Conner & Norman, 2015). With the next construct that is, potential benefits, it looks at the possible benefits that can be obtained from the performance or implementation of a preventive measure. Barrier or cost to action looks at the factors that may restrict a person from undertaking a certain decision or the potential cost that is attached to the performance of the particular health behaviour or intervention. Together these four beliefs are hypothesized to predict the probability of the individual taking an action.

Again, the exact action to be taken is informed by the assessment of the available alternatives, focusing on the benefits or usefulness of the health behaviour and the perceived costs or barriers of performing the behavior (Conner & Norman, 2015). This suggests that individuals are more likely to increase their level of awareness and knowledge about food adulteration if they regard themselves to be more vulnerable in purchasing or consuming an adulterated food, perceive that the consumption of adulterated food can adversely affect their health, and believe that learning more about food adulteration will help them to detect them and avoid them, then there will be a high probability for that individual to improve their knowledge or awareness about food adulteration. The contrary holds when they do not see themselves to be highly vulnerable to food adulteration, do not see the consumption of food to result in negative outcome, and see it as a waste of time to learn about it (Becker & Maiman, 1975).

Two additional reasonings often added to HBM are cues to action and health motivation (Conner & Norman, 2015). Cues to action are hypothesized to include wide array of triggers to the individual taking action which may be internal (e.g., observation from close environment) or external (e.g., mass media campaign, advice from others) to the individual. For instance, when an individual has ever seen a friend died as a result of consuming an adulterated food or got hospitalized because he consumed an adulterated food, that individual is more likely to take food adulteration seriously. With regards to external cues, reportage from media houses and medical professionals about the adverse effect food adulteration could have on their health could entice an individual to increase his or her level of awareness or knowledge towards food adulteration (Schell, Gallo, & Cook, 2012).

Hence, an individual's perception of about the presence these cues could prompt him or her to adopt a health behaviour if that the individual has already seen or heard a negative ramification about food adulteration cases. Health motivation on the other hand refers to more stable differences between the value a person attaches to his health and their propensity to be motivated to look after their health. Individuals with a high motivation to protect their health will appear more willing to improve or increase their level of understanding towards food adulteration (Shears, 2010).

Overtime, HBM has provided a very useful approach in understanding and predicting individual health behaviour across several contexts. It has been applied to several nutrition related behaviours including preventive nutrition (Schwarzer & Renner, 2000), low fat food intake (Renner, Knoll, & Schwarzer, 2000), adopting or maintaining a healthy diet (Schwarzer & Renner, 2000), and fruit and vegetable consumption (Luszczynska, Tryburcy, & Schwarzer, 2007). The HBM has also been successfully applied to other health behaviours to understand how drivers wear seat belt use (Schwarzer, et al., 2007).

2.2.3 Social cognitive theory (SCT)

Bandura's Social Cognitive Theory (SCT) outlines the supposed sources and mediators of behavior and behavior change (Bandura, Social cognitive theory of self-regulation, 1991). SCT explains how people attain and maintain definite behavioral patterns, for example eating behaviors, health behaviour, etc. (Anderson, Winett, & Wojcik, 2007; Reynolds, Hinton, Shewchuk, & Hickey, 1999; Van Zundert, Nijhof, & Engels, 2009). Self-efficacy, or one's perceived ability to bring about a specific course of action, is the main construct in SCT (Bandura, 2004). Efficacy beliefs are dynamic, affecting and being affected by many sub-components constructs in the SCT (Bandura, 2004). These sub-components include, outcome

expectations and barriers/facilitators of behaviour that may arise from both social relations and cultural forces.

Generally, a person with higher levels of self-efficacy for a particular behavior is likely to have higher expectations for associated outcomes (Clark & Janevic, 2014). They are also most likely to perceive greater support from the social and physical environment and engage in more favorable self-regulatory behaviors than those with low self-efficacy (Clark & Janevic, 2014). Likewise, success with behaviour increases self-efficacy, particularly when success occurs in the face of challenge. Also, help and inspiration from others and observing related peers or those with less skilled achieving some feat with a given behaviour happen to improve a person's self-efficacy. Lastly, a person's physiological state that is, the level of anxiety has an immediate influence on self-efficacy.

Accordingly, SCT suggest that determinants such as, personal factors, and environmental factors coordinate to explain and predict changes in a person behavior. Bandura called these relationships "reciprocal determinism", meaning as these three components interact, a change in one will produce a change in the other (Glanz, Rimer, & Viswanath, 2008). Environmental influences, such as social support (i.e. the perceived support for healthy behavior from important others, for example family and friends), create opportunities and provide reinforcement for behavior change. Personal factors, such as perceived self-efficacy (belief in one ability to change a behavior), outcome expectations (the perceived costs and benefits of increasing one knowledge about food adulteration) and outcome expectancies (perceived importance of the potential costs and benefits of knowing more about food adulteration) provide direct causal influences on behavior and are used to interpret information from the environment. Also, self-regulatory behavior (especially goal setting) has been associated with

health behavior as healthier eating (Anderson, Winett, & Wojcik, 2000; Pelletier, Dion, Slovinec-D'Angelo, & Reid, 2004).

2.3 Consumer Awareness on Food Adulteration

Frederick Accum is credited as the first man to draw the public attention to food adulteration. Accum's exposé was published in a seminal paper titled *Adulterations of Food and Culinary Poisons* (Wilson, 2008). By devising methods to detect chemical additives, he proved their common existence in a large variety of foods (Wilson, 2008). Among the problems he observed were the frequent use of metals to color or modify food, candies and sweets being marketed in bright colors, some of which were achieved using red lead or copper, pickles and many green vegetables being made greener with copper washes. Complaints of stomach ailments were often heard and fatalities were noted in newspaper accounts of the day. Although the free use of chemical additives was stared with repulsion in the 19th century by food consumers and modifiers of public opinion yet Accum's exposé seems to have not prevented the increasing rate of food adulteration in modern times (Schell, Gallo, & Cook, 2012).
What's NOT to eat- Food adulteration in the context of human biology, 2012).

Examples of recent happenings of food adulteration cases are the melamine substance found in milk products in the Republic of China (Lakshmi et al., 2012), the horsemeat scandal in European Economic Community (EEC) (Khan, 2013), the Halal meat scandal (Smith, 2004), the Eurovet scandal (Smith, 2013), and the black fish scandal (Smith, 2015). Accordingly, this section of the work seeks to explore consumer level of awareness towards food adulteration.

The study of Ishwar et al. (2018) assessed urban slum consumers awareness and knowledge about adulteration in India. The study used a cross-sectional approach where questionnaire were distributed to 100 consumers who were responsible for their household purchasing decisions. The mean age of the study subjects was 40.2-11.7 years and also when it came to the educational status of the respondents, only 7% of the respondents were identified as illiterate. Results from the study suggest that good practices such as the checking of Food Safety and Standards Authority of India (FSSAI) logo (90%), Agmark logo (76%) and nutrition label (65%) are lacking among the respondents. The most prominent source of knowledge about adulteration was mass media especially television (65%). Also, it was observed that almost half (43%) of the respondents had ever purchased an adulterated food at least once in the past six months. The study concluded that majority of slum consumers targeted in the study were unaware about the most common forms on food adulteration in their frequently purchased foods.

Findings reported in the study of Ishwar et al. (2018) tend to be consistent with the results found in the study of Baruah (2010) as the author's assessment about women awareness about food adulteration observed that even though women in Jorhat happen to be aware that certain foods can be easily adulterated but they had little knowledge about the common adulterants often used to adulterate these category of foods. Similarly, within the same country specifically, Karnataka state in India, a work done by Abidfaheem, Nayak and Andrade (2013) found out that Taluka dwellers within that state had lower level of awareness about food adulteration. Analogous results were found in the study of Gautam and Singh (2016) as their study results reported lower consumer awareness score on food adulteration assessments. Aside the respondent's lower awareness about food adulteration, it was also

observed that most of the respondents had limited knowledge on the harmful effect food adulteration tend to have on their health and wellbeing.

A study by Nasreen and Ahmed (2014) assessed the extent of food adulteration by using the period of 1995–2011 as their data points as well as explore consumers awareness about its occurrence in the Dhaka city of Bangladesh. Their study reviewed results of food sample testing by Public Health Food Laboratory of Dhaka City Corporation, Bangladesh Standards and Testing Institution, Consumers Association of Bangladesh publications as well as reports from lay press, including those on mobile magistrate court operations. With regards to the consumer level of awareness, the study surveyed a total of 96 residents of Dhaka city, using a structured questionnaire. Results from the review suggest that the overall proportion of food samples adulterated within the period of 2001-2005 decreased nonetheless, between the period of 1995-2011, assessment of the food review showed that 40-54% of daily-consumed foods in the country were adulterated. The foods found to be mostly adulterated in Bangladesh were milk products such as, dried milk powder, curd, ice cream, cheese, butter and edible oil and oil products such as, butter oil, soybean oil, mustard oil, palm oil, coconut oil and food grains and cereals products such as, rice, wheat, lentil/dal Beson (flour made of peas or chickpeas), Ata (course wheat flour), Suzi (semolina), etc.

However, only a small section of the respondents that is, 11 (12%) looked at the approval of regulatory authority before buying packaged food items. Shockingly, only 26(28%) of the respondents correctly knew how to test salt by adding it to rice and observing change in colour to purple after adding lemon juice to it. The study concluded that most of the consumers had limited knowledge and awareness on how to detect adulterants in foods they frequently purchased or used.

Also, a study done by Sachithanathan (2017) in Saudi Arabia explored the predictors of consumers awareness towards food adulteration. The study used a validated semi structured questionnaire to elicit information on the respondents' socioeconomic background, knowledge and attitude of consumers towards the use of packaged food. The study collected responses from 407 subjects that were selected in three different malls in Abha, Saudi Arabia. Results from the study showed that a substantial majority of respondents (i.e. 54.3%) of the average income group did not find any fungus or adulterants in the packaged food, while 25.8% of the subjects of the same group found adulterants and fungus in the packaged food.

Likewise, a study done in Bangladesh by Hossain (2018) assessed consumers level of awareness towards food adulteration and observed that many of study consumers had limited awareness and knowledge about food adulteration. The study distributed a total of 950 questionnaires to respondents in Dhaka. The study data was analysed on the basis of frequency distribution, cross tabulation, correlation and regression analysis.

Finally, in the case of Ghana, a study by Antwi-Boasiako and Gyimah (2018) investigated consumers awareness about food adulteration. It randomly selected one hundred (100) respondents within the Bolgatanga Metropolis as their study sample. Questionnaire was used as the study main data collection instrument. Results from the study found out that 51% of the respondents were aware of the common food adulterants that are used to increase the volume of food products. In contrast, 49% of the respondents did not know of the common food adulterants used to increase the volume of foods. Again, most of the respondents (51%) were aware of the common food adulterants often used to increase the volume and they listed adulterants such as, chalk, water, flour, palm oil, colour, sugar, soya beans flour, olive oil etc. as the most often used in the Bolgatanga market. Also, 52% of the respondents indicated that they have ever detected adulterants in food products they recently purchased. The study

concluded that the respondents had fair knowledge on food adulterants and have detected some in food products they often purchased.

2.4 Consumer Level of Knowledge and Awareness on the Health Implication of Food Adulteration

Food adulteration poses various forms of health risk and hazard to the consumer and the society as a whole. For instance, consuming oils which has been adulterated with argemone oil, mineral oil, karanja or castor oil has been found to result in loss of eyesight, damage to liver, heart problem, stomach infections, or lead to cancer (Sharma, Batra, & Garg, 2017). Other works have found mustard oil which are often adulterated with argemone oil and butter yellow to cause the consumer gall bladder cancer and even cause a consumer epidemic dropsy, glaucoma and loss of eyesight (Smithson, Fakayode, & Henderson, 2018; Yadav, 2018). This suggests that food adulteration though may bring economic gains to the producer or culprit but will impact negatively on the consumer health. On this premise, this section of the work seeks to explore consumer level of awareness and knowledge on the effect of food adulteration on their health and general wellbeing.

A study done by Hossain (2018) assessed consumers level of awareness towards food adulteration in the city of Dhaka Bangladesh and came to the conclusion that most of the respondents surveyed in the study had adequate knowledge on the potential health defects they a consumer will suffer from if they consumed adulterated foods. Specifically, the respondents identified health risk such as, acute and chronic diseases as some of the health ramifications associated with the consumption of adulterated foods.

Also, Aleksandra (2018) work sought to assess students' understanding of food adulteration and food fraud and their implications for consumers and producers (processors and / or farmers). With the theoretical section of the work, the cognitive-critical analysis of the world's literature was used whereas on the empirical part, questionnaire survey was conducted among students of Economics Faculty at Polish university in 2016. Results from the study showed that 35.4% of the respondents agreed that consuming adulterated foods could adversely affect their health most especially for consumers with allergic disorders. Moreover, with regards to their understanding about food adulteration, it was revealed that most of the respondents knew what food adulteration as 30-40% of the respondents described it as the practice where food producers lower their costs of production (e.g. by substitution) in order to make higher profits. However, to the rest of the respondents, they regard food adulteration as the practice whereby a food producer replaces his or her food ingredients with lower quality substitutes causing a difference in taste and nutritional value.

Similarly, in a study done by Anita and Neetu (2013), it was established that consumers were very much aware of the incidence of food adulteration in the market as well as the related consequence its occurrence could have on a consumer health. For instance, they observed that most of the consumers were well aware that the various chemicals and colors used in fruits and vegetables could be very poisonous to the consumer. Specifically, most of the consumers were able to list chemicals such as calcium carbide as the most frequently used chemical to speed up mango and bananas ripening, copper sulphate as the most used to ripen fruits faster, oxytocin a hormone used for faster growth of pumpkin, watermelon, brinjal, gourds, cucumber. Also, some of the consumers were found to be much aware of the cheap green colors containing chemicals such as metallic lead applied to bitter gourd and leafy vegetables to give fresh color. According to Anita and Neetu (2013), most of the respondents agreed that

eating foods or vegetables that have been contaminated with these chemicals can cause a consumer nausea and diarrhea particularly among children.

Anita and Neetu (2013) findings are comparable to that of Faraz et al. (2013) and Lakshmi et al. (2012) as in their respective studies, it was observed that most consumers had a strong perception that consuming foods that have been contaminated chemically or naturally can result in health implications such as diarrhea, abdominal pain, nausea, vomiting, eyesight problem, headache, cancer, anemia, insomnia, muscular paralysis and brain damage, stomach disorder, giddiness, joint pain, liver disorder, dropsy, gastrointestinal problems, respiratory distress, edema, cardiac arrest, glaucoma, carcinogenic effects, kidney failure, digestive system disorders, etc. Additionally, in another study done by Harsha, Jha and Taneja (2013) in South India, it was found that a majority of subjects (52.5%) were aware of food adulteration and its associated effect on a consumer's health. However, around 38.3 per cent did not know anything about food adulteration, the foods that are often adulterated and the contaminants often used as well as its associated implications on their health.

More so, in a study done by Nasreen and Ahmed (2014) which sought to explore consumers' awareness about food adulteration occurrence in the Dhaka city of Bangladesh, the conclusion was that even though food adulteration has received considerable attention in the country's media, nevertheless, most of the respondents in the study still lacked adequate knowledge on what comprises food adulteration, the commonly adulterated food items, and the adulterants used. For instance, the study observed that most of the respondents thought that food adulteration has decreased merely because of the increase in mobile court raids in the country. The study concluded that even though the respondents had a general awareness about food adulteration but lacked sufficient knowledge on what constituted food

adulteration, commonly adulterated food items in their market, and the adulterants often used by producers. Gautam and Singh (2016) confirmed similar results in their study as their work observed that majority of the respondents in their study had lower awareness score about adulteration in food items as well as its damaging effect it can have on a person body.

2.5 The Commonest Forms of Food Adulterations and their Related Adulterants

In the study of Jumhawan et al. (2013), coffee products were identified as one of the frequently adulterated food products in the food and beverage industry. For instance, their study observed that ground coffee may be cut with other ground and roasted plant materials to increase its quantity and reduce its production cost. In the Southern part of Ethiopia, a study done by Asrat and Zelalem (2014) observed that in attempt for coffee makers to make coffee appear bulky and colorful, chicory, roasted barley powder and tamarind seeds were added to coffee products.

Other food spices such as, ground black pepper, vanilla extract, turmeric, star anise, paprika, and chili powder are some of the culinary spices that are prone to food adulteration (Black, Haughey, Chevallier, Galvin-King, & Elliott, 2016). Specifically, Black et al. (2016) observed that adulterants such as dyes are often used to color paprika, chili powders, and curries. More so, with other product like honey, adulterants such as, molasses, cane sugar, other natural sweeteners were added to it to increase its volume (Awasthi et al., 2014).

According to Galvin-King, Haughey and Elliott (2018), papaya seeds have been used to adulterate and bulk black pepper. Lakshmi (2012) observed that using papaya seeds to adulterate black pepper can become very deadly to the human body as it can cause consumers liver and stomach problems, and can become a major source of health risk to consumer. Nallappan, Dash, Ray and Pesala (2013) observed in their study that yellow chalk powder

was frequently added to turmeric to make it look bulky and heavier to the consumer. This adulterated product however can cause swelling of the face, loss of appetite, nausea and vomiting (Nallappan et al., 2013).

Another food product that is often adulterated is cooking oil. For instance, olive oil is often adulterated with a lower-cost substitute, such as olive oil from a different origin or any other type of oil (Pérez-Jiménez, Besnard, Dorado, Hernandez, & Bakkali, 2013). In a study done by Pal and Jain (2018) in Kolkata, India it was revealed that adulterants such as argemone oil, mineral oil, karanja oil and cyanide were often used to contaminate both package and unpackage soyabean oil and mustard oil.

The increasing demand for milk both in homes and catering facilities has contributed to the increasing rate of milk adulteration by milk producers. Often times, milk adulteration constitutes the practice of adding water to milk or removing the beneficial fats from milk. In certain times, soya milk starch, groundnut milk, and wheat flour are added to milk to increase its quantity (ESA, 2012). Others too tend to add other chemical such as, urea, starch, flour, cane sugar, vegetable oils, detergents to either to promote the level of some essential nutrients in the milk after the reduction of a given amount and/or to mislead the consumers to increase their profit margin (Faraz et al., 2013). Also, other preservatives like formalin and some antibiotics are added to milk to increase its shelf life (Awan et al., 2014). This addition of substances decrease the nutritional value of milk and even pose as a major health risk to the consumer or user (El-loly et al., 2013). In certain instances, milk adulteration could be caused unintentional acts such as, by bacteria, yeast, fungi and dust contamination, water, animal hair due to livestock keepers' unhygienic milking, handling and storage practices, etc. (Singuluri & Sukumaran, 2014). According to Asrat and Ermias (2015), food grain

adulteration constitute the practice whereby sand or crushed stones are added to food grains to increase its weight. In other practices, cereal grains and pulses are mixed with plastic beads that resemble grains in color and size.

In using the United States Pharmacopeia Convention (USP) global database as their study data source, the study of Moore et al (2012) analyzed the reported cases in the database to ascertain the kinds of food ingredients that are very susceptible to global food fraud. Results from the analysis showed that food substances such as, olive oil, milk, honey, saffron, orange juice and coffee were found to be the most common targets for adulteration. In all, milk adulterations contributed 14% of all records from 1980 to 2010 and also identified as the second highest adulterated food substances, after olive oil which scores 16% (Moore et al., 2012; Spink, 2014; European Commission, 2016). Also, oil total cases of adulteration stood at 24%, milk at 14%, and spices at 11% (Food Chemical Codex, 2014). Renee (2014) corroborated similar food ingredients in their study as their results identified food substances such as honey, meat, milk, grain-based foods, fruit juices, organic foods, coffee and some highly processed foods as the highly adulterated food substances.

According to Tola (2018), olive oil has become one of the major targets for food adulteration. Usually, olive oil may be replaced with a lower cost substitute, whether it is regular olive oil instead of higher priced extra virgin olive oil or a less expensive variety from Greece or Turkey, instead of from Italy as the label claims. In certain times too, an alternative seed or nut oil may be sold as or thinned out with hazelnut, soybean, corn, peanut, sunflower, safflower, walnut, vegetable, canola, or palm oil, and lard (Tola, 2018). This practice is not only bad but could be very deadly to consumers who have allergies to certain food substances

such as nut or legume oils (Busta & Kennedy, 2011). Olive oil diluted with hazelnut oil is a common form of economically motivated adulteration (Jeffrey, 2016).

More so, fruit juice has been found as one of commonest target of beverage adulteration. Often extra water may be added to juice to water it down or in other instances, a more expensive juice such as the ones from the pomegranates or other “super” fruit might be cut with a cheaper juice such as apple or grape juice (Tola, 2018). Some juice may be only water, dye, and sugary flavorings, although fruit is the listed ingredient on the label. Orange juice has been shown to sometimes contain added unlisted lemon juice, mandarin juice, grapefruit juice, high fructose corn syrup, paprika extract, and beet sugar. Apple juice has been shown to have added unlisted grape juice, high fructose corn syrup, pear juice, pineapple juice, raisin sweetener, fig juice, fructose, and malic acid (Global Food Safety Initiative, 2014).

Again, when it comes honey, adulterants such as sugar syrup, corn syrup, fructose, glucose, high-fructose corn syrup, and beet sugar are often added to it to make it thicker without being disclosed on the label (Renée, 2014). Additionally, honey coming from an unauthentic region such as the phenomenon where honey from China is transshipped through another route and falsely sold as honey from the second country usually to avoid higher customs duties and tariffs that would be imposed on honey from China (Renée, 2014). Lastly, a 2012 report on food fraud in US restaurants and retail outlets observed that 58% of the eighty-one retail outlets sampled, sold mislabeled fish with small markets having a higher incidence of fraud (40%) than national chain grocery stores (12%). Furthermore, all of the sushi bars (n=16) tested sold mislabeled fish and 94% of the “white tuna” tested was not tuna at all (Warner et al. 2012).

2.6 Factors that Predict/Increases Consumer level of Awareness and Knowledge towards Food Adulteration

The work of Pal and Jain (2018) assessed the awareness and perception of consumers towards adulteration in commonly used cooking oils of Kolkata. In the same study how a person's income level predicted their level of awareness of food adulteration in commonly used cooking oils was also explored. Results from the study showed that the level of awareness of the respondents belonging to high income group was comparatively higher than those in low-income group and adulteration was practiced in both the categories of oil samples. This means that a person income level has a significant relationship on their level of awareness or knowledge towards food adulteration. Accordingly, as a person income increases so as his or her level of awareness towards food adulteration increases. Similarly, in the study done by Ishwar et al. (2018), it was established that personal factors such as, a consumer income level or status, age and educational background had a significant relationship in predicting their level of awareness on food adulteration as well as its related impact on the body when such foods were consumed.

However, results from the study of Sachithanathan (2017) disagree to the results of Pal and Jain (2018) and that of Ishwar et al. (2018). Particularly, in the case of Sachithanathan (2017) consumers from the higher income bracket had lower level of knowledge on how to detect potential sources of food adulteration in package foods. For instance, those within high income bracket associated quality and wholesomeness to all package foods. Meaning, the higher a person income increases the less likely the consumer will regard package foods as a potential source of food adulteration. Also, in the case of Shuchi, Sheendra and Anita (2012), it was established that the only personal characteristics that influenced a person level of awareness and knowledge on food adulteration was their educational level. Hence, other

personal characteristics such as, age, income and religion were found to have significant impact in predicting a person food adulteration awareness and knowledge.

On the other hand, the work of Hossain (2018) assessed 950 consumers in Dhaka to ascertain their level of awareness on food adulteration. The study used questionnaire items as its data collection instrument and analysed the data on the basis of descriptive and inferential statistics. Apparently, result from the study showed that the main factors that predicted or increased consumer awareness and knowledge on food adulteration were sources of information ($r=0.93$, $p<.001$) and awareness of chemical booths ($r=0.88$, $p<.001$) and awareness of laws ($r=0.82$, $p<.001$).

Hoque, Alam and Nahid (2018) on their part sought to look at the impact these antecedents namely; consumers' health consciousness (HC), perceived knowledge (PK) and beliefs affected attitude in improving their understanding towards food adulteration. The study sampled 712 households who frequently purchased liquid milk (LM) in the cities of Dhaka and Chittagong in Bangladesh. The study used structured questionnaire as its data collection instruments. With regards to the data analysis tools, descriptive statistics, Confirmatory Factor Analysis, and Structural Equation Modelling were used for the study analysis. Results from the study showed the factors that a significant influence in predicting a consumer level of awareness about food adulteration is their level of health consciousness. For instance, those who score high on health consciousness were more likely to read about the food label, check for proper certification to confirm the food wholesomeness, check the origin of the food, etc. Again, in the same study it was revealed that other personal characteristics such as the monthly income of the family, age, and labeling preference recorded a significant relationship on consumer level of awareness on food adulteration.

Alam and Nahid (2018) study results happen to be consistent with the work of Dong (2015), as a person health consciousness and availability of information sources were found to be the main predictor of consumers level of awareness and knowledge on food adulteration. Accordingly, DiPietro, Remar and Parsa (2016) and Kapoor and Munjal (2017) assert that health consciousness remains critical in shaping or improving a person's level of awareness towards a health problem or consequence. However, health consciousness emanates from a personal experience or awareness about the potential harm that comes from the usage or consumption of certain food products (Mesanovic, Kadic-Maglajlic, & Cicic, 2013). This thinking is consistent with the health belief model, where cues from a person's immediate environment was found to be strong predictor in increasing an individual consciousness about a health condition. For instance, when an individual has a friend who has died as a result of consuming an adulterated food or had a friend who got hospitalized because he took in an adulterated food, that individual is more likely to take food adulteration seriously. Likewise, external cues that is, report from media houses and medical professionals about the negative implication of food adulteration on a person health have found to entice an individual to learn more about food adulteration (Schell et al., 2012). Meaning, the presence of cues to action would prompt an individual to increase his level of awareness and knowledge on food adulteration when that individual has a past experience about the potential adverse effect adulterated foods could have on their personal health. Ishida, Law and Aita (2003) confirmed this same view in their study as their results observed that past experiences that individual gather from different sources with regards to the potential impact a condition or occurrence could have on their health tend to shape their willingness to increase their awareness or knowledge in that area.

Gould (1988) conceptualized health consciousness into four propositions: greater concerns to health, caring about health, strong desire in looking for health information, and valuing healthy conditions. Hence, a person scoring high on consciousness is more likely to search for unadulterated foods when shopping, build his or her knowledge of food adulterations, identify common foods that are often adulterated and adulterants that are often used in contaminating foods and the health impact that comes from the consumption of adulterated foods. Accordingly, to Gould's (1988), health-conscious will increase or predict an individual level of awareness or knowledge on food adulteration.

More so, a person access to information has been found to be strong predictor of an individual awareness and knowledge about a health condition. For instance, in the study of Chae and Quick (2015), it was established that people who are frequent users of the media such as the internet, mass media, and interpersonal communication are able to gather more information on a health condition. Accordingly, to Chae and Quick (2015) access to information become one of the main avenues that enable an individual to increase their level of awareness or knowledge on food adulteration.

Additionally, in the study of Kayisoglu and Coskun (2016) which sought to explore the determinants of consumer awareness on food additives observed a significant relationship between a respondent's profession and their level of knowledge and awareness towards food additives. They concluded that consumers who often worked in the health-related field tend to have high level of awareness and knowledge about food adulteration as well as its related impact on their health. Again, in the same study, a significant relationship was established between a respondent educational status and their level of awareness on food additives and its corresponding impact on their health.

Also, the kind of perception an individual has about food and health tends to moderate their health behavior in various ways (Drichoutis, Lazaridis, & Nayga, 2005). For instance, persons who see food as critical to their health are more likely to improve their knowledge on nutrition and its related consequences (Kim, Kang, Kwon, & Kim, 2010). An earlier study by Kim, Nayga and Capps (2000) corroborated this claim in their study as their work observed that the level of severity associated with a particular food on a person health limit a person intake of that particular food. Similarly, Lin, Lee and Yen (2004) observed that consumers who attached significant importance on healthy diet were the most likely to check the source of their food intake and also to search for more information about the food to improve their food selection decision. This suggests that the level of importance a person attaches to nutrition will predict their level of awareness and knowledge about food adulteration.

Again, many works have reported a significant relationship between special diet intake, diet-related chronic diseases and health behaviour. For instance, individuals with special dietary needs or diet related chronic diseases have been found to be more likely to improve their knowledge on food contaminants (Lewis, et al., 2009; Post, Mainous, Diaz, Matheson, & Everett, 2010). Specifically, a study done Lewis et al. (2009) established that persons who had chronic ailments or susceptible to chronic ailments such as heart disease, diabetes, overweight, etc. tend to have higher tendency in building their knowledge on sources of food and its impact on their chronic ailments. Consistent results were produced in the study of Post, et al. (2010) as their results observed that consumers who suffered from type 2 diabetes, hypertension, and/or hyperlipidemia showed keen interest in building or improving their knowledge in food contaminants. Accordingly, to Loureiro, Gracia and Nayga (2006), consumers with diet related health problems may have a greater value for nutrition information, food sources, food contaminants and food adulterations because their failure to

spend adequate time on this nutrition related issues could adversely affect their health conditions.

2.7 Conceptual Framework

According to Cartín-Rojas (2017), food adulteration undermines food safety by disregarding the composition, origin or side effects of adulterants on consumers' health. Generally, food adulteration constitutes the practice of mixing, substituting or hiding the quality of a food by either mislabelling the food product or adding unknown substances to the food to increase its quantity or give it a new identity (Nasreen & Ahmed, 2014). Even though, food adulteration is an ancient and an anti-competitive criminal practice yet recent evidence seems to suggest that its occurrence is still not ending (Shears, 2010; Schell, et al., 2012). For instance, the melamine substance found in milk products in the Republic of China was eventually found to have resulted in the death of several children that had consumed the milk product (Lakshmi, Labs, & Pradesh, 2012). Also, the horsemeat scandal in European Economic Community (EEC) was found to have been widely distributed and shipped across most European Countries (Khan, 2013). Again, the Halal meat scandal (Smith, 2004), the Eurovet scandal (Smith, 2013), and the black fish scandal (Smith, 2015) are all some of the notable cases of food adulteration. Also, figures available tends to suggest that at the global level more than 10 percent of world trade food substances are adulterated (Alauddin, 2012). Accordingly, in the last decade, food adulteration has emerged as a significant threat to various countries judging from the direct implications it has for both public health and international trade (Cartín-Rojas, 2017). This goes to suggest that food adulteration still forms part of most food producers and seller's business practices. As rightly suggested one of the optimal ways to prevent or minimize its occurrence is by building consumers ability to detect it whenever ever they see it (Moyer, et al., 2017). Hence, increasing consumers levels of awareness and

knowledge about a health condition has been identified as one of the best ways to address a health issue.

According to Pal and Jain (2018), consumers level of awareness of food adulteration happens to be shaped by endogenous factors. These endogenous constitute the personal factors of the individual that is, age, gender, level of educational qualification, income level, program read at school, etc. Hence, these personal factors tend to influence an individual level of awareness towards food adulteration. Particularly, in their study, it was established that persons belonging to high income group had higher level of awareness regarding oil adulteration than those from a lower income group. Again, in the same study, it was revealed that an individual level of academic qualification influenced their awareness level towards food adulteration. Similarly, in the study of Wazaa (2018) a significant positive relationship was established a person academic qualification and their level of awareness towards food adulteration.

Moreover, it is not only endogenous (i.e. personal) factors that have been found to predict a person's level of awareness towards food adulteration. For instance, in a study by Hossain (2018), it was revealed that the availability and accessibility to information on food adulteration increases a person level of awareness towards its occurrence and detection. Hence, the study reported a significant relationship between availability and accessibility of information and awareness of food adulteration ($r=0.93$, $p<.001$). Again, individual perception about health tends to increase their level of awareness towards food adulteration. For instance, in the studies of Kim et al. (2010) it was established that individuals who regard food as a key factor in their lives tend to have a higher level of awareness about food adulteration. Same observation was confirmed in the studies of Drichoutis et al. (2005) as

their results found a significant relationship between individuals who had good attitude to diet and health and their level of awareness towards food adulteration.

Additionally, persons on special diet needs as well as those with chronic ailments have been identified to have higher level of awareness on food adulteration. For instance, in the studies of Lewis et al. (2009) and Post et al. (2010) a significant positive relationship was established between persons with special diet status and chronic diseases and higher food adulteration awareness. Lastly, persons with healthy practices like healthy eating and exercising have been identified to have higher level of awareness towards food adulteration. Specifically, Satia, Galanko and Neuhouser (2005) found persons who favoured healthy eating diets to have higher level of awareness on food adulteration. Similarly, within the countries of Turkey and the US, Bayar (2009) study found a strong correlation between regular exercise and one level of awareness towards food adulteration. For instance, in the case of Turkey, the sample that engaged in regular exercise was also found to have high level of awareness about food adulteration.

Evidently, these reviews suggest that an individual level of awareness about food adulteration could be shaped by both their personal factors and other environmental factors. Hence, within this context, it is equally expected that a person's level of awareness about food adulteration will be moderated by these endogenous factors such as, his level of education, the job they do or profession, course read at school, age, gender as well as these external factors. Accordingly, the key concepts or variables this study seeks to investigate has graphical been represented in Figure 1.



CHAPTER THREE

METHODOLOGY

3.1 Research Design

The study used a cross sectional research design. As this study collected a large pool of information from customers within the Kumasi Metropolis to understand their level of awareness about food adulteration, cross sectional design gave the best approach to achieve this objective.

Also, since the study was interested in understanding the factors that accounted for the respondents' level of awareness and knowledge about food adulteration, cross sectional design gave the best logistical means to achieve this specific objective. For instance, Saunders *et al.* (2009) assert that data gathered through cross sectional design can be used to propose the probable reasons that accounted for the connection between two given variables.

Notwithstanding this research design ability to enable this study to achieve its stated objectives in a more valid and economical manner, it is still not void of deficiencies. For instance, Kumar (2011) underscore that they cannot measure change. To measure change it is important to have at least two data collection points that is, at least two cross sectional studies, at two points in time, on the same population but this study design cannot ensure this outcome.

3.3 Study Population

The study population came from consumers who patronize any of the catering facilities within the Kumasi Metropolis. Per the Ghana Tourist Board categorization, the food service sector can be grouped into the following businesses; local and continental restaurants, food

vendors, chop bars and one corner shop (Ghana Statistical Service, 2017). Guided by a weekly recall by the various food services, 100 customers were targeted from restaurant operators, 50 consumers were targeted from food vendors, 150 consumers were targeted from 150 consumers and lastly 100 customers were targeted from one corner shop food joints. In total, 400 customers along these food service providers constituted the study population size. The breakdown of the study population in reference to each food cluster has been presented in Table 3.1.

Table 3.1 Population Size

Cluster of food service providers	Population Size
Chop Bar operators	150
Restaurant	100
One corner eating Places	100
Food vendors	50
Total	400



3.4 Sampling Strategy and Sample Size

With this study, a probability sampling technique that is, multi-cluster sampling method was used. Since the Ghanaian food service industry is characterised with different groups of catering facilities; chop bar operators, one corner shop eating places, food vendors, it became proper to use the multi-cluster sampling method since it ensured the customers selected mirrored the different customer groups within the food service industry. According to Babbie (2007), multi-cluster sampling becomes ideal when it is impossible or unfeasible to gather information or data from all the list of the units forming the population. Guided by the multi-cluster sampling method, the population was first divided along the identified customer groups; restaurant, food vendors, chop bar and one corner eating places customers. However,

to determine the sample size for each customer group, the Cochran's sample size formula for continuous data as cited in Bartlett et al. (2001) was used to calculate the sample size for each identified cluster. Hence, with an estimated alpha value of 0.01, t-test value of 2.58 and error of margin of 0.03 the calculated sample size for Restaurants is 79, Food vendors stands at 44, chop bar operators also stood as 108 and then One corner eating places is 79. This means that in all 310 customers along the different categorization of food service providers were selected. The breakdown of the population size and sample size of the respective cluster has been presented in Table 3.2.

Table 3.2: Description of Population Size and Sample Size

Cluster of Sample of Customers along the different catering facilities	Population size	Sample size
Chop Bar	150	108
Restaurant	100	79
One corner shop eating places	100	79
Food vendors	50	44
Total	400	310

3.5 Data Collection instrument

The study used the questionnaire instrument as its main data collection tool. Specifically, the study adapted Nasreen & Ahmed (2014), Pal & Jain (2018) and Cartín-Rojas (2017) measuring scale to assess the respondents level of awareness and knowledge about food adulteration. In all the knowledge and awareness scale had 13 items and it assessed consumers level of awareness and knowledge on food adulteration. The items were measured on a 3-likert scale; 1- certainly not, 2- am not sure and 3- certainly yes. However, with factors

that predict a respondent awareness or knowledge on food adulteration, the study adapted the measuring scale of Kayisoglu and Coskun (2016) and Chae and Quick (2015). The scale had separate items for endogenous, health consciousness, susceptibility to chronic ailments, special diet constructs. The items were all assessed on a five-point Likert scale from 1 strongly disagree to 5 strongly agree.

3.6 Data Collection Procedures

A personal visit was made to the targeted catering facilities where these different groups of customers can be identified. Subsequently, discussions were held with the respective head about the purpose of the study. In order to ease these discussions, an introductory letter was sourced from the Graduate School and given to selected catering facilities to prove to them that this study is purely for academic purpose and nothing else. Decisions about when the researcher can commence the collection of data from an eating facility were all done in the first part of the discussions. Moreover, the data collection dates for each selected facility were based on the approved dates and time given by a facility. The entire administration of the questionnaire was done by the researcher and it took a period of three to four weeks to finish.

3.7 Reliability and Validity

Saunders, Lewis, and Thornhill (2007) described reliability as the extent to which data collection technique used in a study are able to produce consistent results or observations gained in a study could be linked to prior studies or there is an assurance of transparency in how sense is made out of the raw data. Validity on the other hand is the degree to which an instrument measures what it is intended to measure and whether it measures the concept accurately (Saunders et al., 2007). In this study, what previous studies used to assess

construct such as consumer awareness and knowledge of food adulteration and predictors of consumer awareness and knowledge of food adulteration were adapted and modified to suit the present study context. Content validity can be determined by expert judgement. In this study, experts in the field of food adulteration were approached to evaluate the validity of the questionnaire. Equally the reliability (internal consistency) of the items comprising each construct will be further examined using Cronbach's alpha. A Cronbach Alpha value of 0.70 or more will be used as a criterion to ascertain the reliability of each measuring scale. Nunnally and Bemstein (1994) added that the reliability scores for all the constructs that ranges between 0.70 and 0.90 proves that the instrument is highly reliable. Kline (2005) affirms Nunnally and Bemstein view, when the author argues that coefficient alpha values within the ranges of 0.7 and 0.8 are usually the acceptable indicator that a scale is reliable. However, when dealing with psychological constructs, values less than 0.7 (but more than 0.6) are acceptable because of the diversity of the measured constructs (Kline, 2005).

3.8 Ethical considerations

Ethical consideration places enormous responsibility on the researcher to assess carefully the possibility of any harm that could affect the study participants and also to provide appropriate measures to control these effects (Bryman & Bell, 2007). This suggests that in the research process it becomes important to communicate to participants the reasons why a study is being carried out, and what will be done with the information they provide. If this is not made explicitly clear, the information given may not be entirely truthful or may be slanted towards a certain direction which at the end could affect the study results (Bryman, 2012). Hence, it is important to inform respondents that their identities will not be shared and that there is full confidentiality. It is also important that in quantitative research, investigators must be completely objective and try not to influence a study with their own values and perceptions

(Bryman, 2012). In order to address these issues firstly, permission was sought from managers from the selected catering facilities before the researcher distribute the questionnaires to the participants to complete. It is likewise required that a study always seek the consent of the respondents' before distributing questionnaires to them to complete, hence the researcher will seek the consent of respondents before the questionnaires will be finally distributed to them. Moreover, every questionnaire that was sent out had a cover letter explaining the purpose of the study to the participants. Likewise, in order to ensure respondents anonymity, the questionnaire did not require the names of the respondents.

3.9 Data Analysis

Kumar (2011) underscored that data obtained from a research is meaningless unless it is changed for the purpose of decision-making. Data analysis usually involves reducing the raw data into a manageable size, developing summaries and applying statistical inferences. The data collected were keyed into The IBM Statistical Package for Social Sciences (SPSS) version 20.0 and the result of the study was analysed on the basis of descriptive statistics. Since the purpose of descriptive statistics is to give a detail account as how an event or phenomenon occurred, the data were analyzed using descriptive statistics (i.e., frequencies, percentages).

For instance, to assess consumer level of awareness towards food adulteration, data on this questionnaire was first be analyzed on the basis of descriptive statistics thus, mean and standard deviation to identify the trend in the respondent's responses. Again, to identify the factors that predict consumer level of awareness towards food adulteration, descriptive statistics was first used to identify the trend in the respondent's responses. Afterwards, a

multiple linear regression analysis will be performed to establish the impact the predicting variables had on the respondent's food adulteration awareness.



CHAPTER FOUR

RESULTS AND ANALYSIS

4.1 Demographic Profile of Customers

The demographic profile of the customers of the respective food service providers have been presented in Table 4.1.

Table 4.1: Demographic Profile of Customers

Demographic variable	Category	Frequency	Percentage
Gender	Male	165	67.3
	Female	80	32.7
	Total	245	100%
Where they patronize their food from	Restaurant	30	12.2
	Food vendors	50	20.4
	Chop bar operators	75	30.6
	one corner shop eating places	35	14.3
	Others	55	22.4
	Total	245	100%
Educational qualification	No formal education	45	18.4
	Basic education	50	20.4
	Secondary education	40	16.3
	National vocational Training certificate	15	6.1
	Diploma/HND	15	6.1
	Bachelor's degree	65	26.5
	Master's degree	5	2.0
	Total	245	100%
Diagnosed of any chronic ailment (i.e. diabetes, high blood pressure, cancer, etc.)	Yes	25	10.2
	No	190	77.6
	Am not aware	30	12.2

On special diet	Yes	15	6.1
	No	220	89.8
	Am not aware	10	4.1
Average monthly income	Below ₵1,000	55	22.4%
	₵1,500-1,900	40	16.3%
	₵2,000-2,500	35	14.3%
	₵2,600-3000	75	30.6%
	₵3100-3,500	15	6.1%
	Above ₵3,600	25	10.2%

With the customers, the study distributed a total of 310 questionnaires to the selected customers of the various food service providers. From the distributed questionnaire, a total of 285 of them were received, 40 of them were unusable because of their incompleteness and 245 were used for the analysis giving a response rate of 85.9%. Going by the recommendation of Babbie (2002) having a response rate of over 85% suggests that the received questionnaire is sufficient for the study analysis.

The demographic profile of the surveyed customers of the identified food service providers in Table 4.1 showed that 165(67.3%) were males and the remaining, 80(32.7%) were females. This suggests that most of the customers were males confirming the long-held view that men are more likely to have their meals outside from home than women. Moreover, with reference to the ages of the respondents, 15(6.1%) of the respondents had their ages within the 50 years and above category. On the other hand, 155(63.3%) of the respondents had their ages within the age bracket of 21-40 years' and 55(22.4%) of the respondents had their ages within the age bracket of 41-50 years.

With reference to the catering facility the respondents took their food from during the time of the study, it was established that 30(12.2%) of the respondents took their meal from

restaurants, 50(20.4%) took their meals from food chop bar operators, 75(30.6%) took their meals from food vendors, 35(14.3%) had their meal at corner shop food joints and the rest that is 55(22.4%) had their meals at other food joints.

When it comes to the educational qualification of the respondents, results from Table 4.1 suggest that 45(18.4%) of the respondents had no formal educational qualification, 50(20.4%) had their education up to the basic level, 40(16.3%) had their educational qualification up to the secondary level, 15(6.1%) of the respondents respectively had National Vocational Training Certificate and diploma/HND as their highest form of qualification, 65(26.5%) on the other hand had bachelor's degree as their highest level of academic qualification and the rest that is, 5(2.0%) had master's degree as their highest level of academic qualification.

More so, as to whether the respondents had been diagnosed of any chronic ailments, result from the study suggest that more than half of the respondents 190(77.6%) had no history of chronic ailment. In contrast, 2(10.2%) had a chronic disease and lastly 30(12.2%) of the respondents had no knowledge of whether they are suffering from a chronic ailment or not. Moreover, as to whether the respondents were on any special diet, results from Table 4.1 show that majority of the respondents that is, 220(89.8%) were not on any special diet. In contrast, only a small section of the respondents that is 15(6.1%) were on special diet with the rest that is 10(4.1%) not having any idea whether they are on special diet or not.

Lastly, when it comes to the respondent's average monthly income, results from the study suggest that most of the respondent's that is, 30.6% have their average monthly income within the range of ₵2,600-3000. Also, only, 6.1% had a monthly income within the range of ₵3100-3500. Again, 22.4% of the respondent's average monthly income was below ₵1000, 16.3% of the respondents had their average monthly income within the range of ₵1500-1900,

14.3% had their monthly income within the range of ₵2,000-2500 and finally 10.2% of the respondent's average monthly income was 3,600 at each given month.

4.2 Consumers Knowledge and Awareness on Food Adulteration

This study sought to assess consumers level of awareness and knowledge on food adulteration. Therefore, the respondents' responses with regards to how they answered the given questions either correctly or incorrectly have been presented in Table 4.2.

Table 4.2: Consumers Awareness on Food Adulteration

Items	True Freq (%)	False Freq (%)
1. Food adulteration could result in the addition of a harmful substance or the removal of a vital component from a food.	200(81.6%)	45(18.3%)
2. Food adulteration could occur unintentionally by preparing or storing food in unsanitary conditions.	180(73.5%)	65(26.6%)
3. Food adulteration could occur intentionally by adding a substance in a food product to increase its quantity or reduce the cost of its production (e.g. adding water to milk to increase its quantity, or adding sugar to honey to increase its quantity or sweetness).	190(77.6%)	55(22.5%)
4. Generally, it is very difficult to adulterate package foods.	55(22.4)	190(77.6%)
5. Ground black pepper, vanilla extract, turmeric, star anise, paprika, and chili powder are spices prone to food adulteration.	90(36.7%)	155(63.3%)
6. Juices may be diluted with water or adulterated with a cheaper juice.	185(75.5%)	60(24.5%)
7. In some cases, juices may be only water, dye,		

sugar, and flavors.	135(55.1%)	110(44.9%)
8. Olive oil can be adulterated with a lower-cost substitute, such as olive oil from a different origin or any other type of oil.	145(59.2%)	100(40.8%)
9. Tea can contain leaves from other plants, and colored saw dust to increase its quantity.	105(42.9%)	140(57.2%)
10. Mark all the foods (may be more than 1) that are vulnerable to food adulteration practices.	45(18.4%)	200(81.6%)

Evidently, results from Table 4.2 show that question one was the question with the highest percentage of correct answers. The correct answer to this question is “Certainly Yes”. Specifically, out of the total of 245 consumers, 81.6% responded correctly to this question. Conversely, only, a small section of the consumers that is, 18.3% couldn’t identify the correct answer on this question. Clearly, this goes to suggest that most of the consumers were very well aware that food adulteration could result in the addition of a harmful substance or the removal of a vital component from a food.

Moreover, question three became the question with the second highest percentage of correct score. Specifically, 77.6% of the consumers responded correctly on this question. The answer to this question is ‘True’. In contrast, 22.5% of the respondents responded wrongly.

The question with the next highest answers or correct responses went to question six, With this question the correct response is ‘True’. Results from Table 4.2 suggest that 75.5% of the respondents responded correctly whereas 24.5% responded incorrectly. Question two became the item with fourth highest correction score of 73.5%. This means that 73.5%. On the other hand, 26.6% of the consumers responded incorrectly.

However, the question with lowest rate of correct answers went to question ten. With this question only 18.4% of the consumers were able to select all the foods that are highly vulnerable to food adulteration. Conversely, 81.6% of consumers were not able to select all the foods that are highly susceptible to food adulteration. Likewise, question four received the second lowest rate of correct responses (generally, it is very difficult to adulterate package foods). With this question, the correct answer is certainly not however, most of the respondents that is, 77.6% of the consumers felt that it is very difficult to adulterate package foods which tend not to be the case. This presupposes that only 22.4% of consumers were able to realize that it is not very difficult to adulterate package foods. Again, the next question with the lowest rate of correct answers for the understudied consumers went to question five . With this question, the correct response was “True” however, only 36.7% of consumers were able to respond correctly to this question. In contrast, 63.3% of consumers responded wrongly as they selected “False”.

Results from the study suggest that generally the respondents’ knowledge and awareness on food adulteration were above average with most of them having a fair knowledge as to how food adulteration occurs and what food adulteration mean. Again, results from the study show that a significant number of the consumers knew that food adulteration could occur unintentionally by preparing or storing food in unsanitary conditions. Similarly, most of the respondents were well aware that adulteration could result in the addition of a harmful substance or the removal of a vital component from a food.

Also, findings from the study suggest that the only areas most of the respondents had little or less knowledge about food adulteration were their inability to tell whether package foods

constituted the categories of foods that were difficult to adulterate. Again, it was also established that most of the respondents could not select all the foods that were highly adulterated in the Ghanaian market. Lastly, it was established that most of the respondents could not tell whether spices such as, ground black pepper, vanilla extract, turmeric, star anise, paprika, and chili powder are the spices prone to food adulteration in Ghana.

4.3 Consumer Level of Knowledge and Awareness on the Health Effect of Food

Adulteration

This objective sought to assess respondents' level of knowledge and awareness on the health consequence associated with food adulteration. Accordingly, the respondent's responses on their level of knowledge and awareness on the health consequence of food adulteration has been presented in Table 4.3.

Table 4.3: Level of Knowledge and Awareness on the Health Effect of Food Adulteration

Items	True Freq (%)	False Freq (%)
1. Food adulteration could cause the individual eye itching, eyes redness and watering of the nose.	165(67.3)	80(32.7%)
2. Eating foods that have been adulterated with artificial sweetener could cause the individual sleeping disorder, and indigestion.	125(51.0%)	120(48.9%)
3. Eating foods high in excessive additives could cause infertility in women.	70(28.6%)	175(71.4%)
4. Consuming adulterated foods could trigger recurrent vomiting and nausea.	135(55.1%)	110(44.9%)
5. Melamine which is noted for adulterating milk is known to pose a public health threat.	100(40.8%)	145(59.2%)
6. Consuming oil that has been adulterated with nut or legume oils pose a problem for consumers with allergy.	155(63.3%)	90(36.7%)

7. Eating fruits that have been adulterated with ripener could expose someone to liver problems and respiratory difficulty.	100(40.8%)	145(59.2%)
8. Consuming adulterated foods can result in serious consequences, and possibly lead to the person death.	170(69.4%)	75(30.6%)
9. Fish products injected with formalin or dip in water treated with chemicals, such as chlorofluoro carbon and DDT powder can cause kidney failure.	65(26.5%)	180(73.5%)
10. Eating foods that have been adulterated with artificial sweetener could cause the individual nervous system disorder and depression.	15(6.1%)	230(93.9%)
11. Consuming adulterated foods for a prolong time will in the extreme case result in hypotension, cardiac problem and multiple organ failure.	135(55.1%)	110(44.9%)
12. Adulterated foods can result into adverse health condition such as abdominal pain and even in some cases result into breathing difficulty.	140(57.1%)	105(42.9%)

Results from Table 4.3 suggest that the item with the highest percentage of correct response is item 8. The correct response to this item is 'True'. Apparently 69.4% of the respondents answered this question correctly while 30.6% responded to this question incorrectly. Again, the item with the second highest percentage of correct response went to item 1. On this question the correct response is 'True'. With this item 67.3% responded correctly by selecting True whereas 32.7% responded incorrectly. The item with the third highest percentage of correct score went to item 6. On this item, 63.3% answered it correctly by selecting 'True' whereas 36.7% answered it incorrectly by selecting 'False'.

Item 12 became the item with the fourth highest percentage of correct answers. Particularly, on this item, nearly 60% of the respondents were able to respond correctly to this question. In

contrast, 42.9% of the respondents could not respond correctly to this question. The correct answer to this question is 'True'.

Moreover, among the 12 items here, it was with item 3 and item 10 where most of the respondents answered these questions incorrectly. Apparently on item 10, (eating foods that have been adulterated with artificial sweetener could cause the individual nervous system disorder and depression) 93.9% of the consumers answered this question wrongly. Meaning, it was only 6.1% of consumers that knew that eating foods that have been adulterated with artificial sweetener could cause nervous system disorder and depression. Also, with item 3 (eating foods high in excessive additives could cause infertility in women) results from Table 4.3 suggest that 71.4% of the respondents answered this question incorrectly. Interestingly, it was only 28.6% of the respondents who answered this question correctly. This suggests there was more incorrect answer to this question than correct responses.

Results from the study suggest that the understudied consumers had average knowledge about the health implication of food adulteration. For instance, their knowledge was mostly limited on how food adulteration could trigger recurrent vomiting and nausea and how adulterated food could result into adverse health condition such as abdominal pain as well as how adulterated food could cause sleeping disorder, and indigestion. However, when it comes to how food adulteration could trigger specific health condition such as hypotension, cardiac problem and multiple organ failure, nervous system disorder and depression, kidney failure and infertility in women, it was revealed that only a small section of food providers and consumers knew that continuous consumption of adulterated food could result into these health problems.



had no idea on the common forms of adulterants often used to adulterate black pepper in the Ghanaian market. Even though, most of the respondents were able to identify the common forms of adulterants used to contaminate black pepper nonetheless, having 14% of the respondents not knowing black pepper contaminants ought to be great cause of worry since their lack of awareness on the adulterants used on this food item could affect their ability to detect it when they see it in the market. Results from the study suggest that most of the consumers chose papaya seed as the ingredient used in the most Ghanaian markets to contaminate black pepper. Conversely, millet was found to be the least used ingredient to adulterate black pepper in the context of Ghana.

4.4.2 Commonest Forms of Culinary Spices Adulterants

This item sought to establish from the respondents the adulterants often used to contaminate culinary spices in the Ghanaian market. Accordingly, the respondent's responses on the substances often used to adulterate culinary spices has been presented in Table 4.4.

Table 4.4: Commonest Forms of Culinary Spices Adulterants

Culinary spices adulterants	Frequency	Percent
Ground black pepper	48	19.8
Chili powder	43	17.5
Turmeric	26	10.5
Paprika	21	8.4
Sawdust	11	4.7
Have no idea	96	39.1
Total	245	100.0

Results from Table 4.4 suggest that most of the respondents thus, 168(39.1%) had no idea on the kinds of adulterants often used to contaminate culinary spices in the Ghanaian market. Meaning, they were not able to identify any of the common source of ingredients used by the market women in adulterating culinary spices. However, to 19.8% of the respondents ground black pepper was the common source of material used in adulterating culinary spices. Also, to 17.5% of the respondent's chili powder constituted the common ingredient often used to adulterate culinary spices in most Ghanaian markets. Again, 10.5% of the respondents identified turmeric as the common source of additive used in adulterating culinary spices in most Ghanaian markets. Also, 8.4% of the respondents identified paprika whereas 4.7% of the respondents identified sawdust as the additives often used to contaminate culinary spices. What this result suggests is that nearly 40% of the respondents had no idea on the kind of items often used by the market women to adulterate culinary spices.

4.4.3 Commonest Forms of Fruits Adulterants

This item sought to establish from the respondents the adulterants often used to increase the ripening time of fruits such as mango, banana, pineapple and oranges. Accordingly, the respondent's responses on the substances mostly used to increase the ripening time of these fruits have been presented in Figure 4.2.





had no idea on the kinds of chemicals or substances used in the market to adulterate meat or preserve meat products.

4.4.5 Commonest Forms of Fruits Juice Adulterants

With this item it sought to establish from the respondents the most common adulterants used to adulterate fruit juice products in the various catering facilities. Accordingly, the respondent's responses on the substances mostly used to adulterate fruit juice have been presented in Table 4.5.

Table 4.5: Commonest Forms of Fruits Juice Adulterants

Fruit juice adulterants	Frequency	Percent
Sugar	105	42.9
Water	26	10.5
Colour	71	29.1
Flavour	43	17.5
Total	245	100.0

Results from Table 4.5 suggests that most of the respondents thus, 42.9% identified sugar as the substance often used to adulterate fruit juice products to make it sweeter and tastier to the consumer. Again, colour was identified as the second highly used substance to adulterate fruit juice products. Specifically, 29.1% of the respondents identified it as the substance commonly used to adulterate fruit juice. Also, flavour was identified by 17.5% of the respondents as the commonly used substance to adulterate fruit juice. However, water was identified as the least substance often used to adulterate fruit juice. It was listed by 10.5% of the respondents as the substance commonly used in adulterating fruit juice. Results from the

study suggest that sugar became the most used substance to adulterate fruit juice whereas water became the least used substance to contaminate fruit juice products.

4.4.6 Commonest Forms of Palm Oil Adulterants

Results on the substances often used to adulterate palm oil products within the Ghanaian market have been presented in Table 4.6.

Table 4.6: Commonest Forms of Palm Oil Adulterants

Palm oil adulterants	Frequency	Percent
Colour	148	60.6
Textile dye	74	30.3
Have no idea	23	9.1
Total	245	74.7

Results from Table 4.6 show that a little over 60% of the respondents identified colour as the main contaminant often used to adulterate palm oil products in Ghana. Moreover, textile dye was identified as the second highly used substance often used to adulterate palm oil products in Ghana. It was identified by 30.3% of the respondents as the substance often used by the market women to contaminate palm oil. However, to 9.1% of the respondents they had no idea as to the kind or types of substances often used to contaminate palm oil products in Ghana. Results from the study suggest that most of the respondents knew about the main adulterants often used by the market women or palm oil sellers when it comes to adulterating palm oil. Hence, colour and textile dye were identified as the main substances often used in Ghana to contaminate palm oil.





4.4.9 Commonest Forms of Olive Oil Adulterants

Results on the substances often used to adulterate olive oil products in Ghana have been presented in Table 4.7.

Table 4.7: Commonest Forms of Olive Oil Adulterants

Olive oil adulterants	Frequency	Percent
Lower-cost substitute, such as olive oil from a different origin	117	47.8
Soya bean oil	83	33.8
Legume oil	8	3.3
Have no idea	37	15.1
Total	245	100.0

Results from Table 4.7 suggest that nearly half of the respondents that is 47.8% identified lower-cost substitute, such as olive oil from different origin as the most used material to adulterate olive oil products. Also, 33.8% of the respondents listed soya bean oil as the number one substance often used to adulterate olive oil products. Again, a small section of the respondents that is, 3.3% listed legume oil as the alternative oil that is often used to adulterate olive oil products. More so, it was established that a little over 15% of the respondents had no idea on the substances that are often used to adulterate olive oil product. Their lack of knowledge or awareness about the substances used to adulterate olive oil suggest that they may not be able to identify an adulterated olive oil when they see one in the market. Generally, results from the study suggest that lower-cost substitute, such as olive oil from a different origin and soya bean oil constituted the main substances that were often to use to adulterate olive oil products in Ghana.

4.4.10 Commonest Forms of Ground Coffee Adulterants

Results on the substances commonly used to adulterate ground coffee products in Ghana have been presented in Table 4.8.

Table 4.8: Commonest Forms of Ground Coffee Adulterants

Ground coffee adulterants	Frequency	Percent
Roasted corn	49	19.8
Sawdust	15	6.1
Ground roasted barley	35	14.2
Other plants	10	4.0
Have no idea	136	55.9
Total	245	100.0

Results from Table 4.8 suggest that majority of the respondents that is, 55.9% had no idea on the kind of substances often used to adulterate ground coffee products in Ghana. However, to 19.8% of the respondents, roasted corn constituted the product often used to adulterate ground coffee products in Ghana. Again, to 14.2% of the respondents, ground roasted barley were usually used to adulterate most ground coffee products. However, 6.1% and 4.0% of the respondents respectively identified sawdust and other plants roots as the substances frequently used to adulterate ground coffee products. Results from the study suggest that even though materials such as roasted corn, ground roasted barley, sawdust and plants roots were identified by 44.1% of the respondents as the substances often used to adulterate ground coffee products yet a substantial number of the respondents thus, 55.9% could not tell whether these substances formed part of the materials often used to adulterate ground coffee products in Ghana.

4.5 Descriptive Analysis of the Factors that Predict Respondent Level of Awareness and Knowledge on Food Adulteration

The descriptive statistics on the factors that are likely to contribute to respondents' level of awareness on food adulteration have been presented in Table 4.9.

Table 4.9: Factors that Predict Respondent Level of Awareness and Knowledge on Food Adulteration

Rating	Min	Max	Mean	Std. Dev
1. As a person age increases his or her awareness and knowledge about food adulteration increases in the same direction.	1	5	2.84	1.391
2. The aged has more knowledge and awareness about food interaction.	1	5	3.51	.814
3. A person suffering from chronic sickness has more knowledge and awareness about food adulteration.	1	5	3.73	1.017
4. A person on special diet has more knowledge and awareness about food adulteration.	2	5	4.03	.890
5. People found to be more concern about their personal health tend to exhibit more awareness and knowledge on food adulteration.	2	5	3.99	.945
6. A person susceptibility to chronic ailment increases their level of awareness and knowledge about food adulteration.	2	5	4.05	.757
7. A person self-belief in his/her learning abilities will increase their level of awareness and knowledge about food adulteration.	2	5	3.85	.971
8. A person disbelief in his/her abilities to learn all the information about food adulteration will reduce their level of awareness and knowledge about food adulteration.	2	5	3.66	.975
9. A person ability to learn all the information about food adulteration will increase their level of awareness and knowledge about food adulteration.	2	5	3.87	.959
10. The severity of food adulteration consequence on a person's health will increase their level of awareness and knowledge about food adulteration.	2	5	3.99	.858
11. Seeing someone suffer from food adulteration occurrence entice an individual to learn more about food adulteration.	2	5	4.13	.878
12. Hearing/watching how a person has suffered from food adulteration condition entice an individual to learn more about food adulteration.	2	5	4.02	.931

The descriptive analysis shows that all the items under this construct had their mean values above 2.8 score suggesting that most of the respondent's ratings on these items were between neutral and agreed score. Predominantly, 'item 11' labelled (*Seeing someone suffer from food adulteration*) was the highest rated item under this construct with mean value of 4.13 and SD

of 0.878. What this means is that most of the respondents agreed that seeing someone suffer from adulteration consequence could increase an individual level of awareness about food adulteration. The second highly rated items under this construct went to item 6 (i.e. *a person's susceptibility to chronic*). This item had a mean value of 4.05 indicating that on this item the respondents' level of agreement fell within the agreed score. Again, what this rating suggest is that most of the respondents agreed that a person's vulnerability to chronic ailment will encourage them to increase their level of awareness on food adulteration.

Equally, the third highest rated item under this construct was 'item 4' (i.e. *a person on special diet has more knowledge and awareness about food adulteration*) which recorded a mean value of 4.03 and SD of 0.890. The fourth highest rated item went to item 12 (*hearing/watching how a person has suffered from food adulteration condition*) where the respondents' agreed that hearing or seeing someone suffer from food adulteration condition entice someone to improve their knowledge and awareness on food adulteration. The mean value on this item is 4.02 and the SD of 0.931. The next highest rated items went to item 5 (i.e. *people found to be more concern about their personal health*) and item 10 (i.e. *the severity of food adulteration consequence on a person's health*). These items had a mean value of 3.99 respectively suggesting that on these items the respondents rating fell within the agreed score.

Moreover, even on the least rated item thus, 'item 1' (i.e. *a person age increases his or her awareness and knowledge about food adulteration increases in the same direction*) results from Table 4.9 show this item recorded a mean value above 2.81 suggesting that on this item most of the respondents neither agree nor disagree as to whether a person age increases his or her awareness and knowledge about food adulteration. Results from the study suggest that

items that proxied factors such as, availability and accessibility of information, health consciousness, susceptibility to chronic ailment and special diet constituted the factors that increase a person awareness and knowledge on food adulteration.

4.5.1 Regression Analysis

The regression analysis on the impact the identified factors (age, availability and accessibility of information, health consciousness, susceptibility to chronic ailment and special diet) had on the respondent level of awareness and knowledge on food adulteration has been presented in Table 4.10.

Table 4.10: Factors that Predict Respondent Level of Awareness towards Food Adulteration

Predictors	Stand. β_i	Std. Error	p-value
Constant	55.095	4.155	.000***
Ag.	-.262	.313	.405
Gend.	-1.290	1.037	.216
Educ. quali	1.151	.232	.000***
Income	1.248	.256	.000***
Chron.ail	-.314	.585	.593
Spec.diet	.685	.340	.046**
Health.cons	.853	.271	.002***
Avail.infor	1.887	.540	.001***
R	.601		
R²	.362		
Adjusted R²	.320		

a. Dependent Variable: Knowledge and awareness on food adulteration

Note: Ag. (Age), Gend. (Gender), Educ.quali (educational qualification), Chron.ail (susceptibility to chronic ailment), Spec.diet (on special diet), Health.cons (health consciousness), Avail.infor (Availability and accessibility of information)

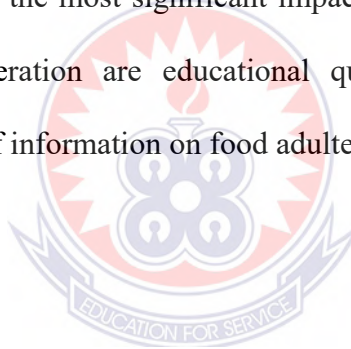
* depicts significance at 10% level; ** depicts significance at 5% level, *** depicts significance at 1% level and β_i stands for standardized beta coefficients

Results from Table 4.10 show that the predictors that is, age, gender, educational qualification, income level, susceptibility to chronic ailment, special diet, health consciousness and availability of information had a significant relationship on the respondents' level of awareness and knowledge towards food adulteration since its p value was < 0.05 . The model recorded a correlation coefficient value of 0.601 suggesting that there is a perfect relationship between these predictors and consumer level of awareness and knowledge towards food adulteration. Moreover, the entire model recorded an Adjusted R square value of 0.320 suggesting that only 32.0% of the respondent's level of awareness and knowledge towards food adulteration could be explained by age, gender, educational qualification, income level, susceptibility to chronic ailment, special diet, health consciousness and availability of information.

On the individual effect the predicting variables had on the dependent variable, results from Table 4.10 suggest that educational qualification, income level, special diet, health consciousness and availability of information on food adulteration had the most significant impact on the respondents' level of awareness and knowledge on food adulteration. Specifically, availability of information had the highest beta coefficient value of 1.887. This suggests that seeing a 1% change in the availability and accessibility of information on food adulteration will result in a concurrent increase in the respondent's awareness and knowledge level by the percentage points of 1.887. Income level recorded the second highest beta-coefficient value of 1.248 suggesting as a person income increases their level of awareness and knowledge on food adulteration increase in that same direction. Also, educational qualification recorded a positive beta coefficient value of 1.151 indicating that witnessing a 1% change in a person's educational qualification will result in a simultaneous increase in the respondent knowledge and awareness on food adulteration by the percentage points of 1.151.

Again, health consciousness recorded a positive beta value of 0.853 suggesting that witnessing a 1% change in the respondent health consciousness will result in a concurrent increase in their knowledge and awareness about food adulteration by the percentage points of 0.685. Lastly, special diet recorded a positive beta value of 0.685 hinting that seeing a 1% increase in the consumption of special diet will result in a recurrent increase in their level of knowledge and awareness about food adulteration by the percentage points of 0.685.

In contrast, variables such as, age, gender and one susceptibility to chronic ailment recorded an insignificant impact on the respondents' knowledge and awareness on food adulteration since the recorded p values on these variables were more than 0.05. Results from the study suggest that the factors that had the most significant impact on the respondent's knowledge and awareness on food adulteration are educational qualification, special diet, health consciousness and availability of information on food adulteration.



CHAPTER FIVE

DISCUSSION OF RESULTS

5.1 Consumer Knowledge and Awareness on Food Adulteration

This objective sought to examine consumers level of awareness on food adulteration. Under this objective, results from the study showed that generally the respondents' knowledge and awareness on food adulteration were above average with most of the respondents having a fair knowledge as to how food adulteration occurs, the things used to adulterate certain foods and the foods that are often susceptible to food adulteration. Also, findings from the study seem to suggest that the only areas that most of the respondents had little or less knowledge with regards to food adulteration were their inability to tell whether package foods constituted the categories of foods that were difficult to adulterate. Again, results suggest that most of the respondents could not select all the foods that were highly adulterated in the Ghanaian market. Lastly, it was established that most of the respondents could not tell whether spices such as, ground black pepper, vanilla extract, turmeric, star anise, paprika, and chili powder are the spices prone to food adulteration in Ghana.

Results from this study is consistent with the work of Nasreen and Ahmed (2014) as their study observed that only small section of the respondents correctly knew how to test for an adulterated salt. In this study, it was observed that most of the respondents (i.e. consumers and food providers) had scant knowledge on how to detect food adulteration in commonly purchased spices such as chili powder and ground black pepper. Again, results found in this study happen to be similar to what is reported in the work of Hossain (2018) as their work observed that most of the consumers examined in their study mostly knew about what food adulteration is but had limited understanding on what accounted food adulteration. In this context, it was observed that most of the respondents knew that food adulteration either result

from the addition of a harmful substance or the removal of a vital component from a food study.

Again, results from this study corroborate that of Baruah (2010) as their assessment of consumers level of awareness on food adulteration suggest that even though most of the consumers were aware that certain foods can be easily adulterated but were not able to identify all the foods that were mostly adulterated in their markets. Similarly, in this study it was observed that respondents could not select all the foods that were highly adulterated in the Ghanaian market.

Additionally, results from the study bring a new dimension to what was reported in the studies of Abidfaheem et al. (2013) and that of Gautam and Singh (2016) as in their study it was revealed that most of the consumers were naïve that food adulteration could occur unintentionally by preparing or storing food in unsanitary conditions. In this study it was observed that 70.7% of food providers and 73.5% of consumers knew that food adulteration could occur unintentionally by preparing or storing food in unsanitary conditions.

5.2 Consumer Level of Knowledge and Awareness on the Health Effect of Food

Adulteration

On this objective, it sought to assess respondents' level of knowledge and awareness on the health consequence associated with food adulteration. Results from the study suggest that the understudied consumers had fair knowledge about the health implication of food adulteration. For instance, the respondents knew that consuming adulterated food could trigger recurrent vomiting and nausea. Again, it was observed that most of the respondents were aware that consuming adulterated food could result into adverse health condition such as abdominal

pain, breathing difficulty, sleeping disorder, and indigestion. For instance, 55.1% of the respondents knew that consuming adulterated foods continuously could result in health conditions such as hypotension, cardiac problem and multiple organ failure

As indicated earlier, it was not in cases that the respondents knew about all the health consequence associated with the consumption of adulterated foods. For instance, results from the study show that only 6.1% of the respondents knew that eating foods that have been adulterated with artificial sweetener could cause nervous system disorder and depression. Again, only 26.5% of the respondents knew that fish products injected with formalin or dip in water treated with chemicals, such as chlorofluoro carbon and DDT powder can cause kidney failure.

The study respondents' level of knowledge on the health consequence associated with the consumption of adulterated food tend not to be very different from the results found in the study of Aleksandra (2018). For instance, in the case of Aleksandra (2018), close to half of the respondents knew that consuming adulterated foods could adversely affect a person's health especially for consumers with allergic disorders. Similarly, in this study context, it was observed that a little over half of the respondents knew that consuming oil that has been adulterated with nut or legume oils could pose a health problem to the consumer especially those with allergic reactions.

Also, results in this study align with the findings of Anita and Neetu (2013), as in their study it was observed that almost half of the consumers were very much aware that the various chemicals and colors used to speed up fruits ripening and preserve vegetables could pose a dangerous harm to the consumer. In this study, it was observed that 40.8% of the consumers

knew that eating fruits that have been adulterated with ripener could expose them to liver conditions problems and respiratory difficulty. Similarly, result from this study affirm the earlier work of Faraz et al. (2013) and that of Lakshmi et al. (2012) as in their respective studies, it was observed that most consumers had a strong perception that consuming foods that have been contaminated chemically or naturally can result in health implications such as diarrhea, abdominal pain, nausea, vomiting, eyesight problem, headache, cancer, kidney failure, digestive system disorders, etc. Likewise result from the study is in line with the work of Harsha et al. (2013) as their results identified that a little over 50% of their respondents were aware of food adulteration and its associated effect on a consumer health. Conversely, findings from this study is inconsistent with the work of Gautam and Singh (2016) and that of Nasreen and Ahmed (2014) as their work observed that most of the consumers in their study had lower awareness about adulteration as well as its damaging effect it tends to have on a person health.

5.3 Commonest Forms of Food Adulterations and their Related Adulterants

This objective sought to identify the common forms of food adulterations in the Ghanaian market and the related materials used in adulterating these foods items. On this objective, it was observed that the main substance used to adulterate black pepper was papaya seed. On black pepper, 52.4% identified papaya seed as the ingredients mostly used to adulterate black pepper in most of the Ghanaian markets. Also, to 32.4% of the respondent, chili powder was the most used substance to adulterate black pepper in Ghana. A small section of the respondents that is, 1.4% identified millet as the ingredient often used to adulterate black pepper.

Additionally, when it came to adulterants often used to adulterate culinary spices, 39.1% of the respondent could not identify the kinds of items used to adulterate culinary spices. However, 19.8% of the respondents listed ground black pepper as the item often used to adulterate culinary spices. Also, to 17.5% of the respondent's chili powder constituted the common ingredient often used to adulterate culinary spices in most Ghanaian markets. Again, 10.5% of the respondents identified Turmeric as the common source of additive used to adulterate culinary spices.

Again, when came to the kind of items used to adulterate fruit, it was established that 65.0% of the respondents identified calcium carbide as the item used to increase the ripening rate of fruits especially when it comes to fruits like mango, banana, pear and pineapple. Again, it was revealed that 17.5% of the respondents said most of the fruit sellers used sand that is, buried the fruits in sand to increase its ripening rate. Also, 11.7% of the respondents identified DDT as the contaminant often used in the Ghanaian market to increase fruit ripening.

Also, when it comes to the substances used to preserve fish and other meat products from rotten, 62.9% of the respondents identified formalin as the product often used to prolong the life span of fresh fish. This revelation is quite horrifying since this chemical is mostly used to disinfect dead bodies and other biological specimen from decaying. Again, 18.9% of the respondents identified DDT as the other chemical substances used by most meat sellers to preserve their meat and fish products for decaying.

When it came to fruit juice adulterants, 42.9% of the respondents identified sugar whereas 17.5% identified flavour as the substances often used to adulterate fruit juice products. Again, colour was identified as the second highly used substance to adulterate fruit juice products.

More so, on the substances used to adulterate palm oil, a little over 60% of the respondents identified colour as the main contaminant often used to adulterate palm oil products in Ghana. On the other hand, 30.3% of the respondents identified textile dye as the second highly used substance to adulterate palm oil products in Ghana.

The adulterants established to use in their Ghanaian market by the market women happens not to very different from the one listed in the study of Black et al. (2016) and Awasthi et al. (2014) as items such as, sugar and natural sweeteners were found to be often added to honey to increase its volume. Even though, results from the study affirm the work of Galvin-King et al. (2018) as their results identified papaya seeds to be the most used item to adulterate black pepper it has to be added that other new items such as chili powder and grinded millet were also identified in this study as part of the items used to adulterate black pepper.

Moreover, as established in the study of Lakshmi (2012) using papaya seeds to adulterate black pepper can become very deadly to the human body as it can cause consumers liver and stomach problems, and can become a major source of health risk to consumer hence, having most of the respondents having full knowledge on this adulterant is a great sign of relieve as their high level of awareness about this practice could enable them to notice it when they see it in their food. Likewise, results from this study corroborate that of P'erez-Jim'ene et al. (2013) as their work found lower-cost substitute, such as olive oil from a different origin or any other type of oil as the food products often used to adulterate olive oil. Specifically, in this study lower-cost substitute, such as olive oil from a different origin and soya bean oil

were found to as the mostly used items to adulterate olive oil in Ghana. Again, result from this study is consistent with the work of Tola (2018) as items such as sugar, sweetener and flavours were identified as the adulterants mostly used to adulterate fruit juice products.

5.4 Factors that Predict Respondent Level of Awareness towards Food Adulteration

This objective sought to examine the impact factors such as age, gender, educational qualification, income level, availability and accessibility of information, health consciousness, susceptibility to chronic ailment and special diet have on the respondent level of awareness and knowledge on food adulteration. On this objective, it was revealed that educational qualification, income level, special diet, health consciousness and availability of information on food adulteration had the most significant impact on the respondents' level of awareness and knowledge on food adulteration. Specifically, availability of information had the highest beta coefficient value of 1.887. This suggests that seeing a 1% change in the availability and accessibility of information on food adulteration will result in a concurrent increase in the respondent's awareness and knowledge level by the percentage points of 1.887. Income level recorded the second highest beta-coefficient value of 1.248 suggesting as a person income increases their level of awareness and knowledge on food adulteration increase in that same direction. Also, educational qualification recorded a positive beta coefficient value of 1.151 indicating that witnessing a 1% change in a person educational qualification will result in a simultaneous increase in the respondent knowledge and awareness on food adulteration by the percentage points of 1.151. Again, health consciousness recorded a positive beta value of 0.853 suggesting that witnessing a 1% change in the respondent health consciousness will result in a concurrent increase in their knowledge and awareness about food adulteration by the percentage points of 0.685. Lastly, special diet recorded a positive beta value of 0.685 hinting that seeing a 1% increase in the consumption

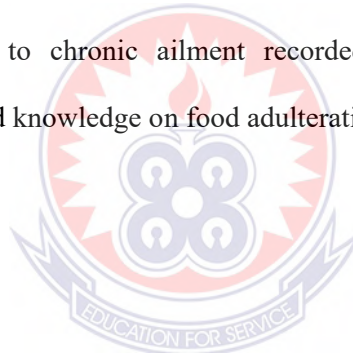
of special diet will result in a recurrent increase in their level of knowledge and awareness about food adulteration by the percentage points of 0.685. In contrast, variables such as, age, gender and one susceptibility to chronic ailment recorded an insignificant impact on the respondents' knowledge and awareness on food adulteration since the recorded p values on these variables were more than 0.05.

Results from this study corroborate that of Ishwar et al. (2018) as in their study it was established that educational qualification had a significant relationship in predicting a respondent level of awareness and knowledge on food adulteration. Again, findings from this study affirm the work of Shuchi et al. (2012) as similar to this study results the only personal characteristics found to influence a person level of awareness and knowledge on food adulteration was educational qualification. Likewise, results in this study corroborate that of Shuchi et al. (2012) as their results found no significant relationship between gender, age and a respondent level of awareness and knowledge on food adulteration. More so, the significant relationship recorded between health consciousness happen to be consistent with the results of Hoque et al. (2018) as in their study health-conscious consumers were found to have more awareness and knowledge on food adulteration.

Health consciousness emanates from a personal experience or awareness about the potential harm that comes from the usage or consumption of certain food products (Mesanovic et al., 2013). This thinking is consistent with the health belief model, where cues from a person's immediate environment was found to be strong predictor in increasing an individual consciousness about a health condition. For instance, when an individual has a friend as a result of consuming of adulterated food or had a friend who got hospitalized because he took in an adulterated food, that individual is more likely to take food adulteration seriously.

Likewise, external cues that is, report from media houses and medical professionals about the negative implication of food adulteration on a person health have found to entice an individual to learn more about food adulteration (Schell et al., 2012). Results obtained in this study confirm this theoretical thinking as availability and accessibility of information and health conscious both recorded a significant positive impact on respondent awareness about food adulteration.

Conversely, result from this study is inconsistent with the works of Lewis et al. (2009) and that of Post et al. (2010) as their works established that persons who had chronic ailments or highly vulnerable to chronic ailments such as heart disease, diabetes, overweight, etc. had a higher tendency in building their knowledge on sources of food and its impact on their chronic ailments. In this context, individual susceptibility to chronic ailment recorded an insignificant relationship on respondents' level of awareness and knowledge on food adulteration.



CHAPTER SIX

CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

The following conclusions were drawn based on the major findings of the study. The study results showed that generally the respondents' knowledge and awareness on food adulteration were above average with most of the respondents having a fair knowledge as to how food adulteration occurs, the things used to adulterate certain foods and the foods that are often susceptible to food adulteration. Also, the study results suggested that most of the respondents could not select all the foods that were highly adulterated in the Ghanaian market. Lastly, it was established that most of the respondents could not tell whether spices such as, ground black pepper, vanilla extract, turmeric, star anise, paprika, and chili powder are the spices prone to food adulteration in Ghana.

Again, results from the study suggest that the understudied consumers had fair knowledge about the health implication of food adulteration. For instance, the respondents knew that consuming adulterated food could trigger recurrent vomiting and nausea.

results from the study show that only 6.1% of the respondents knew that eating foods that have been adulterated with artificial sweetener could cause nervous system disorder and depression.

Results from the study suggests that most of the respondents knew about most of the substances often used in the Ghanaian market to adulterate food, where as few respondents could not identify the substances used in adulterating food.

Findings from the study suggest that the main factors that could determine a consumer level of awareness about food adulteration are; educational qualification, income level, special diet, health consciousness and availability of information on food adulteration.

6.2 Recommendations

The following recommendations were made based on the major findings and conclusions of the study:

- Even though, majority of the respondents knew about some of the health implications of food adulteration as most of them knew that consuming food adulteration could cause abdominal pain, breathing difficulty, sleeping disorder, and indigestion however, most of the respondents still did not know that consuming foods that have been adulterated with artificial sweetener could cause nervous system disorder and depression. Again, most of the respondents did not know that eating fish products injected with formalin or dip in water treated with chemicals, such as chlorofluoro carbon and DDT powder could cause kidney failure. On this point, it is recommended to the Public Health Directorate of the Ghana Health Service to have a policy that resource health facilities across the country with relevant document on food adulteration that can be freely given to the local people. Also, the Ministry of Health to do an intensive public training particularly with reference to the health consequences associated with the consumption of adulterated foods.
- Again, among all the factors that improved a consumer level of awareness on food adulteration it was revealed that the availability of information (i.e. making food adulteration information readily available to the public) had the most significant impact on consumer level of awareness on food adulteration. This means that making information on food adulteration readily available particularly with regards to the

health consequence of food adulteration as well as the common adulterants used to adulterate foods could improve consumers awareness about food adulteration. On this point, it is recommended to the Public Health Directorate of the Ghana Health Service to have designated centres at the various local communities across the country that can make information readily available to the community members on the dangers of food adulteration. Again, the Public Health Directorate of the Ghana Health Service at the various district can team up with the district information service department by giving education to the local people via their native language to increase information adoption by the local community.

- Also, it was observed that most of the consumers did not know that package foods can be easily adulterated by food sellers. On this point it becomes important to increase consumers level of awareness on how package foods are adulterated by food sellers and subsequently request consumers to be very vigilant by always checking the quality traces on package foods. Accordingly, consumers should always check on food labels to be ensured that they are coming from the real manufacturers. It is recommended to the Ministry of Health to have a policy document that directs public hospitals within the country to help food and nutrition unit to regularly educate patients that comes to the hospitals on the health consequences of food adulteration
- Finally, this study was only interested in assessing consumers level of awareness on food adulteration in the Kumasi Metropolis hence, results from this study may not be exhaustive in covering all the pertinent issues about food adulteration. Accordingly, it is recommended that further studies should look at food producers and manufacturers level of awareness on food adulteration at different regions and again compare it to that of consumers to see the differences and similarities in their level of awareness.

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APPENDIX

UNIVERSITY OF EDUCATION WINNEBA- KUMASI CAMPUS

Master of Philosophy Catering and Hospitality

Questionnaire Items

Dear Sir/Madam,

The aim of this study is to assess both food service providers and consumer level of awareness on food adulteration. The results of the study will enable the relevant state agencies know the knowledge level of both food service providers and consumers towards food adulteration and organize relevant policies and programs to address same. Your responses, though voluntary, are greatly appreciated and would be treated with utmost confidentiality. Thank you.

Definition of Concept: Food adulteration refers to the practice of mixing, substituting or hiding the quality of a food by either mislabelling the food product or adding unknown substances to the food to increase its quantity or give it a new identity.

Instructions: Please tick (v) the response that best describe your view.

Section A: Background

1. Age [Please tick one]

I. 20 and below [] II. 21-30 [] III. 31-40 [] IV. 41-50 [] V. above 50 []

2. Gender [Please tick one]

I. Male [] II. Female []

3. Educational qualification [Please tick one]

I). No formal education [] II). B.E.C.E. [] III). S.S.S/W.A.S.S.C.E. [] IV). National Vocational Training [] V). Higher National Diploma [] VI). Degree [] VII). Masters' degree VII) Others please specify

4. Have you been diagnosed of any chronic ailment (i.e. diabetes, high blood pressure, cancer etc).

I. Yes II. No III. Am not aware Prefer not to say

5. What range best describes your average monthly income?

I). Below 1,000 II). 1,000-1,500 III). 1,600-1,900 IV). 2,000-2,300 V). 2,400-2700 VI). 2,800 and above

6. Are you on any special diet?

I. Yes II. No III. Am not aware Prefer not to say

7. Where do you often patronized your favourite food?

I. Restaurants II. Chop bars III. Food vendors IV. Corner shop food joints V.

Others please specify

Section B: Knowledge and Awareness about Food Adulteration

The following questions seek to test your general understanding about food adulteration.

Tick (v) the correct answer.

8. Food adulteration could result in the addition of a harmful substance or the removal of a vital component from a food.

I. Certainly Not II. Am not aware III. Certainly Yes

9. Food adulteration could occur unintentionally by preparing or by storing food in unsanitary conditions.

I. Certainly Not II. Am not aware III. Certainly Yes

10. Food adulteration could occur intentionally by adding a substance in a food product to increase its quantity or reduce the cost of its production (e.g. adding water to milk to increase its quantity, or adding sugar to honey to increase its quantity or sweetness). True False

11. Generally, it is very difficult to adulterate package foods. I. Certainly Not II. Am not aware III. Certainly Yes

12. Ground black pepper, vanilla extract, turmeric, star anise, paprika, and chili powder are spices prone to food adulteration. True [] False []

13. Juices may be diluted with water or adulterated with a cheaper fruits or substitute.
True [] False []

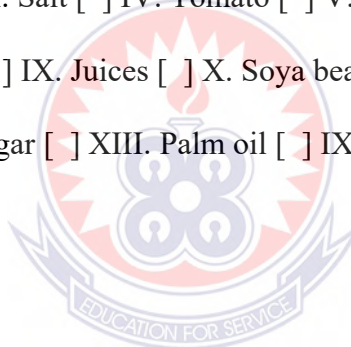
15. In some cases, juices may be only water, dye, sugar, and flavors. True [] False []

16. Olive oil can be adulterated with a lower-cost substitute, such as olive oil from a different origin or any other type of oil. True [] False []

17. Tea can contain leaves from other plants, and colored saw dust to increase its quantity.
True [] False []

18. Mark all the foods (may be more than 1) that are vulnerable to food adulteration practices.

I. Honey [] II. Seafoods [] III. Salt [] IV. Tomato [] V. Milk/diary [] VI. Egg [] VII. Chocolate [] VIII. Coffee/tea [] IX. Juices [] X. Soya bean and olive oil [] XI. Herbs, spices and seasoning [] XII. Sugar [] XIII. Palm oil [] IXX. Bush meat [] XX. Poultry and meat products []



Section C: Awareness about the Potential Health Consequences on Food Adulteration

The following questions seek to test your general knowledge about the health consequence of food adulteration. Tick the correct answer.

19. Food adulteration could cause the individual eye itching, eyes redness and watering of the nose. True [] False []

20. Eating foods that have been adulterated with artificial sweetener could cause the individual sleeping disorder, and indigestion.

I. Certainly Not [] II. Am not aware [] III. Certainly Yes []

21. Eating foods high in excessive additives could cause infertility in women.

True [] False [] Am not aware []

22. Consuming adulterated foods could trigger recurrent vomiting and nausea. True False
[] Am not aware []
23. Melamine which is noted for adulterating milk is known to pose a public health threat.
True False Am not aware []
24. Consuming oil that has been adulterated with nut or legume oils could pose a problem for consumers with allergic reactions. True False Am not aware []
25. Eating fruits that have been adulterated with ripener could expose someone to liver problems and respiratory difficulty. I. Certainly Not II. Am not aware III. Certainly Yes
26. Consuming adulterated foods can result in serious consequences, and possibly lead to a person death. True False
27. Fish products injected with formalin or dip in water treated with chemicals, such as chlorofluoro carbon and DDT powder can cause kidney failure. True False
28. Eating foods that have been adulterated with artificial sweetener could cause the individual nervous system disorder and depression. I. Certainly Not II. Am not aware
III. Certainly Yes
29. Consuming adulterated foods for a prolong time will in the extreme case result in hypotension, cardiac problem and multiple organ failure. True False
30. Adulterated foods can result into adverse health condition such as abdominal pain and even in some cases result into breathing difficulty. True False

Section D: Commonest Forms of Food Adulterations and their Related Adulterants

With reference to your experience within the food industry, indicate the foods that are most vulnerable to food adulteration and their associated adulterants.

31. Mark all the foods (may be more than 1) that are vulnerable to food adulteration practices.

- I. Honey [] II. Seafoods [] III. Salt [] IV. Tomato [] V. Milk/diary [] VI. Egg [] VII. Chocolate [] VIII. Coffee/tea [] IX. Juices [] X. Soya bean and olive oil [] XI. Herbs, spices and seasoning [] XII. Sugar [] XIII. Palm oil [] XIX. Bush meat [] XX. Poultry and meat products []

Questions 32-41 seeks to identify the adulterants that are often used to contaminate certain category of food within Ghanaian markets. With your experience within the food industry tick the adulterants that are often used to adulterate an enlisted food (You can circle more than one if applicable).

32. Black pepper are often adulterated with what substances

- [] Chili powder
[] Papaya seed
[] Buckwheat
[] Millet
[] Saw dust



33. Culinary spices are usually adulterated with?

- [] Ground black pepper
[] Chili powder
[] Turmeric
[] Paprika
[] Saw dust

34. Fruit and fruit products (e.g. mango, banana, pineapple, etc.) are often adulterated with substance to increase its ripening.

- [] DDT
[] Calcium carbide
[] Water

Sand

35. Fish and other meat products may be adulterated with to increase its lifespan.

Formalin

DDT

Coal Tar

Sugar

36. Fruit juice are often be adulterated with

Sugar

Water

colour

Flavour

37. Palm oil are often adulterated with

Colour

Textile dye

Water

Artificial powder

38. Honey are often adulterated with

Sugar

Corn syrup

Natural sweeteners

Water

39. Milk from cows are often adulterated with

Goat milk

Melamine



Water

Sugar

40. Olive oil are adulterated with

lower-cost substitute, such as olive oil from a different origin

Soya bean oil

Legume oil

41. Ground coffee may be adulterated with

Roasted corn

Saw dust

Ground roasted barley

Other plants



Section D: Factors that Predict Respondent Level of Awareness and Knowledge towards Food Adulteration

Please indicate the extent to which you agree or disagree with the following statements about how these factors increase your awareness or knowledge about food adulteration. Use this scale: (5 – Strongly Agree, 4 – Agree, 3 – Neutral, 2 – Disagree, 1– Strongly Disagree). Circle/Tick where is applicable to you.

	Factors	SA	A	N	D	SD
42.	As a person age increases his or her awareness and knowledge about food adulteration increases in the same direction.	5	4	3	2	1
43.	The aged has more knowledge and awareness about food adulteration.	5	4	3	2	1
44.	As a person remain younger his or her awareness and knowledge about food adulteration increases.	5	4	3	2	1
45.	A person suffering from chronic sickness has more knowledge and awareness about food adulteration.	5	4	3	2	1
46.	A person on special diet has more knowledge and awareness about food adulteration.	5	4	3	2	1
47.	People found to be more concern about their personal health tend to exhibit more awareness and knowledge on food adulteration.	5	4	3	2	1
48.	A person susceptibility to chronic ailment increase their level of awareness and knowledge about food adulteration.	5	4	3	2	1
49.	A person self-belief in his/her learning abilities will increase their level of awareness and knowledge about food adulteration.	5	4	3	2	1
50.	A person disbelief in his/her abilities to learn all the information about food adulteration will reduce their level of awareness and	5	4	3	2	1

	knowledge about food adulteration.					
51.	A person ability to learn all the information about food adulteration will increase their level of awareness and knowledge about food adulteration.	5	4	3	2	1
52.	The severity of food adulteration consequence on a person's health will increase their level of awareness and knowledge about food adulteration.	5	4	3	2	1
53.	Seeing someone suffer from food adulteration occurrence entice an individual to learn more about food adulteration.	5	4	3	2	1
54.	Hearing/watching how a person has suffered from food adulteration condition entice an individual to learn more about food adulteration.					

