



**Food Safety in Foodservice Establishments: Knowledge, Practices and Attitudes of Food  
Handlers in Gauteng and Eastern Cape Provinces of South Africa**

Submitted in fulfilment of the requirements of the degree of Master of Management Sciences:  
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Technology

by

Yondela Noxolo Tyabashe

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Supervisor: Dr K.M. Naidoo

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*Most importantly, I am thankful to the Lord Almighty for his faithfulness and making this work a success. "For I am the LORD your God who takes hold of your right hand and says to you, Do not fear; I will help you" Isaiah 41:13.*

## Dedications

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I dedicate this research project to my husband Mvuzo. The love you have for education and the support you have given me throughout my studies gave me strength and courage to persevere and complete this work.

## Abstract

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Poor food safety practices, limited knowledge and improper attitudes of food handlers have been revealed to exist in many foodservice establishments by a number of researchers. The high numbers of reported food poisoning cases across the world have raised concerns regarding food safety. At a base level, food is prepared under unhygienic conditions in which food handlers seem not to be complying with food safety regulations. Therefore, this study sought to examine the level of food handlers' knowledge toward compliance with food safety standards. Food handlers' attitudes and the extent of practice consistent with food safety regulations.

This study was conducted in both private and government foodservice establishments within South Africa. The sample frame comprised of private foodservice establishments such as commercial restaurants, while the government foodservice establishments included health care establishments. A 100% response rate was achieved from the 100 food handlers drawn from various foodservice establishments in Gauteng and Eastern Cape provinces of South Africa. Data were collected from sampled respondents by way of self-administered questionnaires that were specifically designed for food handlers in foodservice establishments. Data were quantitatively analysed in SPSS using bivariate techniques and correlation.

The results of quantitative analysis show primarily that despite food handlers possessing knowledge of food safety standards at different levels, only a limited number put their knowledge into practice. Topical to these food safety standards are proper handling of food, storage and preparation.

This investigation locates the gap in implementing, practising and enforcing food safety regulations. This study recommends that stakeholders in government, communities, foodservice industry owners, educators and researchers prioritise collective action to educate society in particular food handling in advancing, implementing and maintaining proper practices regarding food safety knowledge. Importantly, the study recommends the need for state organs to improve current ways of enforcement of food safety regulations in order to prevent food poisoning and ensure safe foods. One of the food safety enforcement improvements would be the training of staff who manage foodservice establishments and staff who handle food.

## Declaration

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I, Yondela Tyabashe, hereby declare that the work in this study represents my own work. I also declare that the sources that I have used and quoted have been indicated and acknowledged by means of complete referencing.

Student's Signature

Date

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This work is an original work and has not been previously accepted concurrently for any other degree.

Student Signature

Date

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## **List of Abbreviations**

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CCP	Critical Control Points
CF	Conceptual Framework
EHP	Environmental Health Practitioners
HACCP	Hazard Analysis Critical Control Points
KMO	Kaiser-Meyer Olkin
NHS	National Health Services
USA	United States of America
WHO	World Health Organisation

# CHAPTER 1

## Introduction

### 1.1 Introduction

It has been identified by researchers that most foodborne sickness outbreaks result from food handlers' lack of knowledge of food safety regulations, inappropriate practices and ignorance (Chen and Xie 2019:6). The focus of this study will accordingly be on food handlers in hospitality foodservice establishments as they are significant food preparers and foodservice providers to the community. It follows that the key elements of the study are knowledge, practices and attitudes of food handlers towards food safety standards and regulations.

Chapter One will locate the problem statement with a background and will feed into the aim and objectives of the study. The researcher will also state limitations and delimitations and the options available to overcome any possible limitations. The conceptual framework of this study will assist readers with understanding the linkages between food safety and food handlers.

### 1.2 Problem Statement

The foodservice industry is growing rapidly and is a significant contributor to the country's economy. It is one of the greatest contributors to employment and consequently to the economy of the country (Lester 2018:1). According to Galgamuwa *et al.* (2016:113), the foodservice industry has great influence in growing, sustaining or tormenting the country's economy. Therefore, shortcomings in providing safe foods to the society results in the foodservice industry suffering a great loss and society and the country at large are affected economically (Moreb *et al.* 2017:341; Kim and Kim 2018:1). Prior studies of food handlers' knowledge and attitudes towards food safety lament that most food handlers have little existing knowledge with respect to food safety standards (Abuchi *et al.* 2016:269). The *Listeria* food poisoning incidents that occurred in South Africa in 2017 and 2018 in one of the food production establishments proved that food safety is compromised during food handling in some food handling establishments (Allam *et al.* 2018:1). Nyarugwe *et al.* (2019:1) concur that the *Listeria* outbreak occurred during food processing in a food handling company in South Africa. This outbreak resulted in reported cases of 978 sicknesses and 183 mortalities. Dramowski *et al.* (2018:818) state that following the listeria food poisoning outbreak, the affected foodservice establishments had to recall their sold food products and the society was warned against consuming such food products. This incident had a great impact on the country's economy. The foodservice industry which expands the sources of foodservices that satisfy the needs and

expectations of the society is growing rapidly (Griffith *et al.* 2017:729). Thus, effective management, including ensuring food safety, benefits the foodservice businesses and the society in general. Nyarugwe *et al.* (2019:15) conducted a study in Zimbabwe on the prevailing food safety culture and the findings showed that there inadequate and unsatisfactory Food Safety Management Systems were implemented in the targeted food handling companies. Sousa *et al.* (2016:2) state that food handlers play a significant role in the prevention of foodborne sicknesses. Gordon-Davis and Cumberlege (2017:200) affirm that in South Africa, there are thousands of reported cases of foodborne illnesses every year. These illnesses are identified by certain symptoms such as severe diarrhoea, stomach pains and vomiting caused by consuming contaminated foods and drinks. Nyarugwe *et al.* (2019:1) state that the reported incidents of food poisoning outbreaks that occur in South Africa indicate that the Food Safety Management Systems in place within the South African food handling industry are not efficient and therefore lack efficacy.

### **1.2.1 Knowledge of food handlers**

The Foodstuffs, Cosmetics and Disinfectants Act, No. 54 of 1972 presents Regulation 638 which defines a food handler as an individual who works with or handles food directly or indirectly within the foodservice establishment. Regulation 638 further states that a food handler is expected to know and comply with food safety regulations (Government Gazette 6:2018). According to Ahmed *et al.* (2019:2), knowledge can be explained as being aware of and familiar with facts and information, as well as possessing skills acquired through learning or experience. This study seeks to assess the level of knowledge of food handlers towards food safety standards. Establishing this knowledge was relevant for this study in the sense that assessing food handlers of their knowledge could help identify problems that lead to food poisoning incidents.

The lack of food hygiene practices, according to Woh *et al.* (2016:73), can be traced to factors relating to the lack of knowledge due to poor training, education and language limitations. Moreover, the researcher observes that many hospitality establishments hire employees with little or no food training, resulting in poor food handling and ignorance. Such practices pose a problem of germs that spread as a result of poor food handling by food handlers in hospitality food establishments (Mahmoud and Ghanem 2016:139). Moreb *et al.* (2017:342) concur that many food handlers have basic or very little knowledge of food safety principles. This lack in knowledge is linked to a number of foodborne sickness outbreaks in the area of the Republic of Ireland.

### **1.2.2 Attitudes of food handlers**

Kroesen *et al.* (2017:190), state that attitudes are referred to as tendencies of people to respond either negatively or positively to instructions, ideas, other people, things and situations. Thus, food handlers' attitudes towards food safety regulations and standards influence their choices of action and how they respond to the instructions and principles stipulated in the food safety regulations. Sousa *et al.* (2016:2) state that it has been found that despite the call to food handlers to help promote food safety, there are food handlers who still ignore food safety principles. Yet again, there are foodservice owners and leaders who do not enforce and monitor the implementation of food safety systems in their foodservice establishments. Also, food handlers can either respond negatively and just ignore the food safety and health principles or they can respond positively and realise the importance of adhering to food safety hygienic practices (Kroesen *et al.* 2017:190).

### **1.2.3 Practices of food handlers**

According to Regulation 638, a practice is a method or procedure of handling food. Regulation 638, therefore, advises food handlers on the food handling principles in order to ensure that food cannot be contaminated or spoiled during handling (Government Gazette 2018:6). Moreb *et al.* (2017:341) assessed practices of food handlers in domestic foodservice establishments in the Republic of Ireland. The results showed that a number of foodborne sicknesses that occurred in this area were associated with improper food handling practices. These researchers also found out that domestic food handlers had basic food safety knowledge and their practices were not aligned with the knowledge they had. The conclusions made by these researchers were that domestic foodservice establishments could be home to various food poisoning bacteria. The power in food safety regulations in improving practices of food handlers as explained by Healy (2016:2), advances practices to ensure that safe foods are offered to the society.

## **1.3 Background and Justification**

According to Busra *et al.* (2017:594), the foodservice industry is comprised of two foodservice sectors which are the non-profit foodservice sector and commercial foodservice sector. Both sectors are responsible for ensuring that food served to consumers is safe. The global challenge of the rapid increase in foodborne illness incidents occurring in foodservice establishments calls for the attention of health authorities and people generally, to prevent the problem (Low *et al.* 2016:88). South Africa experienced a huge food poisoning outbreak in 2017 and 2018 (Allam *et al.* 2018:1). Dramowski *et al.* (2018:818) point out that outbreaks similar to the 2017



and 2018 outbreaks of *Listeria* food poisoning were also reported between 1977 and 1978 in the Gauteng province.

Reports regarding the recent incident revealed that there were about 14 victims infected by *listeria* bacteria after consuming *listeria* infected polony (Chersich *et al.* 2018:453). Nyarugwe *et al.* (2019:1) argue that there were in fact about 978 illnesses and 183 mortalities reported cases. According to Allam *et al.* (2018:1), the source of this bacteria was identified to be processed cold meat and polony produced by one of the largest processed meats company in South Africa. Lim *et al.* (2016:241) state that according to World Health Organisation (2007), food safety has a great impact on the country's economy and physical and mental wellness of humans, thus making it a major concern internationally. A study conducted in Johannesburg South Africa investigated the microbial quality of fast food sold to consumers. The findings of this study indicated that the safety of food sold to consumers is a matter of concern and there is a great need to implement and enforce food safety standards (Asiegbu *et al.* 2020:25). Moreb *et al.* (2017:341) state that research findings confirm that incidents such as *listeria* food poisoning that occurred in South Africa are a result of poor hygiene practices. Researchers Moreb *et al.* (2017:341) also explain that food handlers' practices prove that there is a lot of ignorance as food handlers still do not practice safety principles even though they do have knowledge. Low *et al.* (2016:88) concur that foodborne diseases have a negative impact on the economy and social lifestyle of people. Bormann *et al.* (2016:113) explain that previous studies have found out that many food establishments are breeding places for flies, rodents and insects which result from waste and refuse thrown near or within the areas. Thus, Mahmoud and Ghanem (2016:139) argue that consumers' demand for safe foods that are free from microbial, physical and chemical hazards are not met. Many food poisoning incidents over the past six years affected the world (Pouliot 2012:1). Darko *et al.* (2015:2664) further state that microbiological hazards and health risks are linked to the foodservice and production industry.

### **1.3.1 Knowledge of food handlers**

Investigations by Mukhopadhyay *et al.* (2016:4327) have shown that food handlers do not have sufficient knowledge of food safety and food hygiene and therefore their behaviours do not comply with the food safety practices. Foodborne illness outbreaks have been confirmed to be the major health issue in the world contributing to a significant and negative impact on the economy (Galgamuwa *et al.* 2016:113). Chefs, cooks and kitchen staff lacking awareness of safe hygiene standards could be the possible carriers of bad bacteria that contaminate food (Kubde *et al.* 2015:3). Low *et al.* (2016:88) concur that approximately 1.8 million people die

each year from diarrhoea associated illnesses caused by consuming contaminated foods and water. Consequently, there appear to be improper food handling practices and ignorance in the hospitality industry as presented below.

### **1.3.2 Attitudes of food handlers**

Nyarugwe *et al.* (2019:3) state that the attitude of food handlers has been identified as one of the indicators for non-compliance with food safety standards. Darko *et al.* (2015:2664) concur that many food handlers get food hygiene education, however, most foodborne illness outbreaks still occur due to ignorance, poor hygiene and improper food handling practices. According to Rayza *et al.* (2016:179), producing and selling food is a practice that has existed for years with the aim of earning money for survival. It is identified that about nine million consumers are affected by foodborne illnesses every year in the USA due to attitudes of food handlers influenced by their intention not to comply with food safety principles (Tshangela 2015:1). Food safety policies are necessary to prevent food contamination and thus food poisoning incidents; enforcement is, therefore, crucial to minimise the consumption of contaminated food (Giacomino *et al.* 2016:2). WHO's 2014 report shows that approximately 30% of the population is infected with foodborne diseases every year in industrialised countries (Woh *et al.* 2016:64).

### **1.3.3 Practices of food handlers**

Improper practices of food handlers have been identified as one of the major causes of foodborne sicknesses (Moreb *et al.* 2017:341). Improper practices are the bad and unethical ways of handling food by food handlers which result in the contamination of food by bacteria. Improper practices of food handlers can be identified in the preparation, storing and serving of food. Food handlers' practices are recognised as proper and acceptable when food handlers adhere to food safety principles. Woh *et al.* (2016:73) observe that findings from previous studies indicate the necessity for advancements in food hygiene development programmes to enhance knowledge and improve practices and attitudes of food handlers on food safety and hygiene. According to Darko *et al.* (2015:2664), a number of researchers have found that improper handling of food through preparation, storing, transporting and serving have been identified to be amongst the major causes of food contamination. Activities related to improper handling of food include storing food in wrong conditions and temperatures, inadequate cooking and use of leftovers, preparing food under bad conditions and using unsafe sources for raw materials or ingredients. Improper food practices are linked to bad attitudes of food

handlers such as ignoring basic hygienic principles including washing of hands, not touching of foods when having open wounds and not preparing food when infected (Woh *et al.* 2016:73).

## **1.4 Aim and Objectives**

### **1.4.1 Aim**

The aim of the study is to assess knowledge, attitudes and practices of food handlers with regards to food safety in South African food establishments.

### **1.4.2 Objectives**

In order to address the aim, the following study objectives will be pursued:

- To identify patterns in food safety knowledge and practices of food handlers in South African food establishments.
- To examine the attitudes of food handlers towards food safety.
- To locate categories of compliance of food safety management systems within foodservice establishments with the current food safety standards and regulations.

## **1.5 Significance of the study**

The conclusions and recommendations of this study will contribute to knowledge in the area of hygienically safe food supply chain management. The study holds particular significance in the fight against foodborne diseases caused by ignorance, lack of knowledge and non-compliance with food safety standards by food handlers. As suggested by Atis *et al.* (2020:30) the study will accordingly raise awareness of the importance of training food handlers on food safety standards and implementing and practising proper food safety principles. It is expected that the findings and recommendations will present practical applications to improve and enforce food safety and consumer protection legislation. It is furthermore expected that recommendations from this study, will guide relevant stakeholders in making strategic and improved decisions regarding food safety regulations, to ensure that food safety is prioritised by food handlers. This can be done to raise levels of human health, food safety and personal hygiene in the foodservice establishments. Lin & Roberts (2019:1) concur that research on food handlers' knowledge could be used to improve food safety principles in order to enhance safe food handling practices by food handlers.

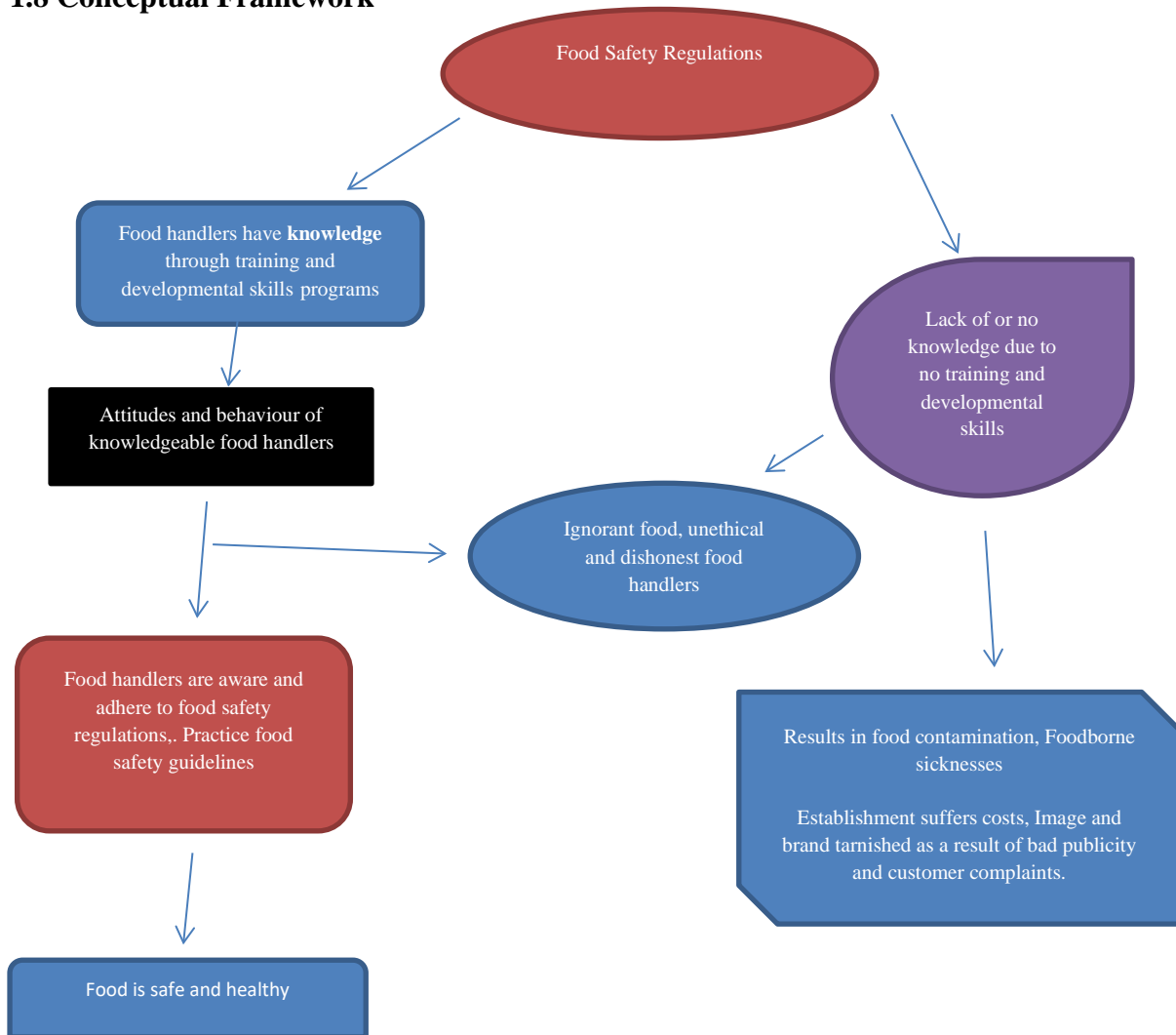
## **1.6 Limitations**

There are great chances that targeted respondents shall reject the proposal to participate in this study. This reservation is based on most research findings that reveal that foodservice establishments have been identified as areas where most food contamination incidents occur due to avoidable conditions (Nyarugwe *et al.* 2019:1); (Allam *et al.* 2018:1). To overcome this possible limitation, the researcher will motivate the importance of completing this study to help ensure that access is granted. The researcher may have limited time to distribute questionnaires due to work during weekdays. To overcome this limitation the researcher will take study leave and use weekends and public holidays to distribute and collect the questionnaires.

## **1.7 Delimitations**

This study was only carried out in hospitality foodservice establishments, therefore other foodservice establishments such as manufacturing, retail and domestic foodservice establishments were excluded from the study. Food handlers other than cooks and chefs were excluded to limit the scope of the study due to the focus of the researcher on only these selected food handlers as well as very limited resources. Conducting this study in all areas of the food supply chain would have yielded more profound results regarding the foodservice areas in which food poisoning often occur. However, this was overcome by conducting this study in various hospitality foodservice establishments including both commercial and non-commercial establishments.

## 1.8 Conceptual Framework



**Figure 1.1: Study Framework**

Figure 1.1 offers a summary of the variables of this study and how they are related. It clearly illustrates the food safety regulations and guidelines that are stipulated for food handlers to practice and adhere to in order to ensure that consumers are offered safe food. The cause for the end result of food safety levels is shown with all activities in between from the food safety guidelines. It is indicated that some food handlers are knowledgeable, and some are not. However, there are those who have been trained and are aware but choose to be ignorant and not practice good food safety principles. Some are failing to practice safety principles due to problems beyond their Food Safety Management System control in their foodservice establishment, such as financial constraints, water and electricity cut offs and lack of training programmes. There are food handlers who have little or no knowledge of food safety practices. The lack of or no food safety practising by food handlers can result in contaminated and unsafe

food for consumers, which then can cause foodborne diseases. The Conceptual Framework also shows the negative impact that foodborne disease outbreaks or cases can have on a particular food establishment. Foodservice establishments with reported foodborne sicknesses cases may incur additional costs as they may have to compensate the victims and lose business, for consumers will lose trust and be reluctant to buy food from that particular food establishment.

## **1.9 Conclusion**

This chapter introduced the focal areas of the study by presenting the problem statement, background, aim of the study and objectives. The significance of the study outlined the importance, potential outputs and summary of the study. A conceptual framework presenting variables of this study and their relationship was presented with a brief interpretation and explanation of the variables. In continuation of this study, the researcher will present the literature review in the next chapter in which references of consulted sources in supporting the views, findings, arguments and recommendations of the researcher shall be stated.

## CHAPTER 2

### Literature Review

#### 2.1 Introduction

In the previous chapter, this study was introduced along with the variables, background, problem statement, aims and objectives. In this chapter, the researcher will present views, arguments, critics and discussions from the literature regarding food safety in hospitality foodservice establishments. The researcher will seek to demonstrate the need for the implementation of food safety practices along with the need for the government to make it a priority to enforce food safety regulations. The researcher will apply the Theory of Planned Behaviour (TPB) to assess and explain the behaviours of food handlers during food preparation and serving, therefore this theory will be incorporated to understand and predict behaviours of food handlers based on their knowledge, attitudes and practices towards food safety standards (Zhang *et al.* 2019:3). TPB is a theory that analyses a person's beliefs together with their behaviour and it has been applied by researchers who were interested in assessing the behaviour and attitude of people Lin & Roberts (2019:2). TPB will, therefore, be applied in this study in the sense that it is believed by researchers that the attitude and behaviour of a person can lead to the practice or way of doing.

#### 2.2 Foodservice Industry

According to Busra *et al.* (2017:594), the foodservice industry can be divided into two main foodservice sectors namely, institutional foodservice sector and commercial foodservice sector. The institutional foodservice sector is also known as the non-commercial sector and is an umbrella to government and other non-profit foodservice institutions. The commercial sector is also referred to as the private sector and is a profit-making oriented sector covering restaurants, hotels and street vendors (Lee *et al.* 2016:1).

Busra *et al.* (2017:594) state that the foodservice industry is growing rapidly due to the great demand for foodservices. This growth means that this foodservice industry contributes greatly to the economy and is amongst the largest employment providers. So, it is crucial to ensure that this industry is well sustained and maintained, this includes maintaining food safety standards (Nyarugwe *et al.* 2019:1). The authors also state that when there are food poisoning incidents occurring in the foodservice establishments, citizens' jobs and the country's economy are negatively affected. Also, this rapid growth means that possibilities of massive and frequent

food poisoning outbreaks exist. Therefore, this industry requires attention in terms of enforcement and implementation of food safety standards and education of the society regarding food safety and related issues. In their argument, Jones *et al.* (2016:37) state that in the near future sustainability and implementation of food safety regulations will eventually be a great problem in the foodservice industry due to rapid growth in population and rapid decrease and loss of value of useful yet very scarce resources.

Foodservice institutions form a fraction of the hospitality industry which grows approximately by 5% every year and it owns approximately 14% of the entire employment statistics globally (Lee *et al.* 2016:1). These researchers also emphasise that hospitality foodservices offered by hotels and restaurants are perceived as friendly and welcoming services that are provided to guests. Tang and Tsaur (2017:2331) concur that the foodservice industry forms part of the hospitality industry that is amongst the greatest service providing industries in the world.

This significant growth in the foodservice industry is linked to the lifestyle of consumers that is changing drastically from consuming home cooked meals into eating out in restaurants, thus growing the foodservice industry. This behaviour indicates that the foodservice industry is growing due to high demand. Kandampully *et al.* (2016:158) concur by stating that foodservice industry has been experiencing great success and growing into an extraordinary business. Therefore, improving methods of controlling food hygiene is also a concern (Brunet 2016:910). As the industry grows, there should be an enhancement as well in the administration of laws regulating the foodservice industry so to prevent possible hazards.

The number of researchers showing interest in sustainability of the foodservice industry is increasing (Jones *et al.* 2017:37). Kandampully *et al.* (2016:157) further state that the foodservice industry continues to make effective decisions to catch up with advancing technology. Molz and Gibson (2016:1) claim that the foodservice industry is extraordinary in such a manner that even during failing times, effective decisions on how to continue offering great hospitality services will still be made. Jones *et al.* (2017:37) suggest that all future managers in this industry should study and understand the negative factors such as global warming, climate change, environment pollutions, and inflation for them to be able to make effective decisions to sustain this complex business industry. It is during these studies that foodservice establishment owners will learn about food safety being an important issue to consider when working towards sustaining the industry. Therefore, safe foods will contribute to customer satisfaction.



Academic research that focuses on food safety within the foodservice establishments is viewed as lacking coherency. To overcome this, academics and researchers who are interested in this industry should collaborate in developing effective research frameworks and agendas (Jones *et al.* 2017:46). This will ensure that gaps within the foodservice industry that lead to crises such as food poisoning outbreaks are closed.

Brunet (2016:908) outlines briefly a timeline of the foodservice industry by stating that in the past five decades, the majority of farmers in the United States of America were small businesses and sold food products within their villages and towns. This shows that the foodservice industry has been in existence for as long as people lived and contributes greatly to sustaining human living through providing jobs and business opportunities Galgamuwa *et al.* (2016:113). This timeline confirms the need for food safety regulations to be revised and updated accordingly to keep up with the growth of the foodservice industry and changing times (Nyarugwe *et al.* 2019:3). It is therefore very important that foodservice establishments are regarded as the most significant contributor to the country's economy that requires effective administration to ensure sustainability and growth (Moreb *et al.* 2017:341). This acknowledgement of the foodservice industry as one of the great contributors to economic sustainability will, therefore, lead to the relevant stakeholders setting and enforcing food safety regulations with the aim of ensuring that safe, good quality foods are supplied (Kim and Kim 2018:1). It is therefore important that food safety is ensured to maximise customer satisfaction which then guarantees profits and a great investment into the country's economy.

Gordon-Davis and Cumberlege (2017:200) explain that it is the responsibility of the foodservice industry to ensure that their customers are protected from foodborne illnesses by providing safe food and drinks. The inherent potential for foodservice businesses to be successful depends on effective management strategies which include ensuring safe, good quality foods (Galgamuwa *et al.* 2016:113). Therefore, failure to ensure safe foods are supplied to consumers may result in food poisoning outbreaks, dissatisfied consumers, tarnishing of the brand, negative perceptions, loss of business and negative impact on the country's economy.

### **2.3 Private Hospitality Food Establishments and Government Hospitality Food establishments**

Private hospitality foodservice establishments and government foodservice establishments differ in terms of their goals (Baser *et al.* 2016:1). Private or commercial hospitality food

establishments focus on profit maximisation, while the government food establishments' goal is to increase the welfare of society. Even though the focus of the two categories differ, the main service remains the same and this is providing food to people. Therefore, food safety regulations apply equally and should be implemented, practised, enforced and monitored on the same levels. Also, food safety research should be conducted in both foodservice categories at the same level to ensure that foods provided in these establishments are safe to consume. Government or public food establishments have no owners but are controlled by the government. According to Busra *et al.* (2017:594), the government does not strive to make profits but instead, they are more concerned with controlling the revenue and minimising costs to maintain the life span of the organisation. Examples of public or government food establishments are hospitals, correctional services, schools and old age homes. The hospitality private foodservice establishments include restaurants which can be free standing or part of the hotel and other hospitality establishments and food street vendors. This confirms that these foodservice establishments are the places where there is a great possibility of food poisoning incidents. Hence, they are identified as the relevant areas for this study.

### **2.3.1 Private Hospitality Food Establishments**

Hospitality food establishments are ordinarily referred to as fast foods restaurants, street vendors and hotels (Busra *et al.* 2017:594). Some of the hospitality food establishments have adopted higher food safety standards to meet the food safety standards requirements to enhance hygiene and food safety levels (Brunet 2016:910).

Baser *et al.* (2016:1) state that food handlers in the commercial industry including hospitality food establishments such as factories have been identified to be the major contaminators of food. Customers of hospitality foodservice businesses are also ambassadors of these organisations and so they are of great value to the organisations and special attention should be given to them to ensure their satisfaction is maximised (Kandampully *et al.* 2016:155). Therefore, customer satisfaction could be maximised by supplying customers with safe to eat foods. Whilst highlighting the case of street food vendors, Bormann *et al.* (2016:113) add that studies show that most food handlers in hospitality food businesses do not adhere to food safety and hygiene practices, are ignorant of these and prepare foods under very unhygienic conditions. Therefore, importantly, this study seeks to investigate knowledge, practices and attitudes of food handlers towards food safety principles.

### 2.3.1.1 Street Vendors

Samaphundo *et al.* (2015: 458) define foods prepared for consumption by street vendors particularly in streets as fast foods; thus, these foods are at risk of being contaminated by polluted air. Street food vending is observed by Cortese *et al.* (2016:178) to be practised in many countries and has been in existence for many years. The selling of foods in the streets has drawn the attention of society, government and relevant stakeholders due to the many cases of foodborne sicknesses that result from poor hygiene practices of food handlers (Qureshi *et al.* 2015:723). The current study is therefore in place to ensure that food offered to the society is safe. Asiegbu *et al.* (2020:18) conducted a study to assess the microbial quality and safety of ready to eat food sold by the street vendors of Johannesburg in South Africa. The results of this study showed that food sold by the sampled street vendors tested positive of various bad bacteria, therefore these researchers identified a problem and a necessity to improve, implement and enforce Food Safety Management Systems in the foodservice industry in South Africa.

The observation of Cortese *et al.* (2016:178) indicates that street food vending is an inexpensive way which may translate to lower income, low quality foods and poor food safety standards due to the unaffordability of purchasing health and safety equipment and proper facilities. Samaphundo *et al.* (2015:458) estimate that 2.5 billion people in the world eat food from street vendors every day; in America alone, about 30% of the urban population buy street foods. This practice is common especially in developing countries and towns, but there are very few studies done on the safety of these foods. According to Samaphundo *et al.* (2015:458), food supplied by street vendors may be common especially in developing countries and towns, but there are very few studies done on the safety of these foods. Qureshi *et al.* (2015:723) find street vending common in public places using trolleys and tables and from caravans.

According to Asiegbu *et al.* (2016:422), in most cases, street vendors do not implement food safety rules and regulations passed by the relevant authorities and do not receive any relevant monitoring. This poor practice and handling of food results from a lack of knowledge and carelessness of food handlers in the street vendor sector. This behaviour is usually linked to very poor education levels and financial status or income levels of street vendor food handlers (Samaphundo *et al.* 2015: 458). Foods supplied by street vendors have been suspected to have caused many foodborne illness outbreaks reported internationally. Stakeholders responsible for ensuring food safety and healthy lifestyles of citizens together with the rest of the citizens in

different countries are faced with challenges of implementing, monitoring and ensuring food safety especially of street vended foods (Asiegbu *et al.* 2016:422).

### **2.3.1.2 Restaurants**

In the United States of America, restaurants are governed by the relevant food safety legislation and periodically inspected by health authorities to check compliance with health and safety standards (Harris *et al.* 2017:1274). This should be practised and maintained internationally to ensure that safe foods are consumed. According to Bernstein and Sheen (2016:2389), research findings indicate that restaurants tend to improve their practices and implement food safety standards after being acquired by investors. After a restaurant has been inspected by health authorities, a report is compiled from which recommendations are drawn and decisions are made with the aim of ensuring accepted health and safety standards in restaurants. Improvements in the health and safety standards in restaurants are also influenced by quality grading rewards. This study envisions to motivate foodservice sites to implement and enforce food safety principles to gain the recognition by grading councils as the safest food providers.

Harris' *et al.* (2017:1274) assertion that restaurant consumers have safety and quality food concerns, which means that the standard of a restaurant's food safety and hygiene, significantly influences customer choice of a restaurant and their buying decision. The authors also suggest that bad publicity of the restaurants due to food poisoning incidents have a negative impact on the customer buying behaviour and attitude towards restaurants. These elements are particularly relevant to the current study of the level of food handlers' knowledge, attitudes and practices towards food safety standards in South African restaurants.

Research findings show that high levels of poor food safety standards are linked to well-developed restaurants as compared to small restaurants (Bernstein and Sheen 2016:2390). This supports this study and the researcher's view that there is a gap in the implementation and practising of food safety principles within restaurants in South Africa. Harris *et al.* (2017:1274) state that poor food safety and hygiene standards contribute greatly to the failure and shutting down of restaurants, therefore poor food safety practices and implementation can lead to poor profit making. The authors further mention that following lost sales, a restaurant may still recover and continue with the business but regaining their market share and trust of customers and investors can be costly.

According to Bernstein and Sheen (2016:2390), safe food that is free from bacteria is also linked to the quality of food and service. Thus, providing food handlers with food safety

education and training and ensuring that these standards are implemented and controlled, guarantee the restaurant maximised customer satisfaction. This will help prevent the possibility of food poisoning outbreaks occurring in the restaurant.

In their discussion, Harris *et al.* (2017:1274) mention that restaurants have been found to be significant areas in which many food poisoning incidents occur internationally. The authors also explain that these incidents follow cases where food handlers fail to hold, cook, prepare, store and serve food under hygienic conditions. These improper practices and bad behaviours of food handlers are amongst the top factors that compromise food safety in restaurants.

An Asian family got infected with food poisoning after consuming rice meals in a certain restaurant in Asia (Osimani *et al.* 2018:148). This was declared an outbreak and led to investigations that were conducted through rice samples collected from various restaurants in the area. The authors state that the results showed that almost 50% of rice samples were infected with *Bacillus cereus* bacteria. The presence of this bacteria in rice that was served to customers proves that food contamination occurred. Food contamination occurs as a result of bad food handling, storage and holding practices. Amongst others, the present study seeks to establish the extent to which food handlers do practice food safety principles to prevent food contamination and ensure safe food is served to society.

### **2.3.2 Government Hospitality Food Establishments**

Government or public food establishments include government hospitals, correctional services, foster homes and government schools. When food handlers who prepare food for patients and staff in hospitals fail to adhere to hygienic standards during food handling, this may result in food contamination and food poisoning to every consumer, including patients and staff (Ucar *et al.* 2016:1226). Zahid *et al.* (2018:97) state that food handlers in institutional foodservice establishments have great knowledge of food safety standards, however, this knowledge still needs to be complemented with implementation and enforcement.

#### **2.3.2.1 Hospitals**

Busra *et al.* (2017:594) state that hospitals fall under the umbrella of institutional or non-commercial foodservice providers. Hospitals as a foodservice sector are faced with high demands for foodservices, hence the institutional foodservice sector is continuously and rapidly growing. This growth implies that this sector is also faced with increasing challenges of implementing and enforcing food safety principles. Osaili *et al.* (2017:280) assert that problems related to food safety affect consumers, foodservice establishments and the government. Unlike

the commercial foodservice establishments, hospitals as a foodservice establishment focus mainly on the patients' satisfaction towards the food provided to them in the hospital. According to Busra *et al.* (2017:594), the National Health Services (2015) reports that it is crucial to provide safe and good quality food to patients. To achieve this, hospital foodservice establishments must follow ethical foodservice principles. Busra *et al.* (2017:594) state that food safety is very much linked with food quality for in the effort of ensuring good quality, food safety is automatically guaranteed. According to Osaili *et al.* (2017:280), food safety in hospitals means providing patients with quality food. This quality of food can be achieved by measures to assure bacteria-free food that is safe to consume.

### **2.3.2.2 Correctional Services and Military**

In an account of categorisation of the foodservice industry, Busra *et al.* (2017:594) locate correctional services in the institutional or government foodservice establishments. The authors explain that the purpose of foodservice providers at correctional services is to satisfy the needs of convicted criminals in jails and the rest of the staff members by providing food.

### **2.3.2.3 Educational Institutions**

According to Majowicz *et al.* (2015:520), research findings indicate that lack of food safety knowledge is pervasive at schools amongst food preparers, educators and pupils. It is therefore crucial that food safety is also taught in schools to help ensure that students consume safe foods in schools. Busra *et al.* (2017:594), refer to educational institutions as non-commercial foodservice sectors that focus on providing foodservices to students and staff within the institution. Majowicz *et al.* (2015:520) declare that all pupils are perceived as food handlers whether they handle food at home or school while preparing or eating. It was discovered that many pupils in schools have never been taught or trained in food safety and hygienic food handling practices. Luo *et al.* (2019:181) concur that research conclusions determine that students have inadequate knowledge toward food safety which then leads to very bad food handling practices. This is based on the results that showed that students who were also selling food products in schools and other foodservice providers selling foods to students and staff, could not determine that they know some of the food safety principles presented to them during a study (Majowicz *et al.* 2015:520). This study therefore seeks to close this gap in knowledge of pupils as food handlers as well as food preparers and providers of food to pupils and staff in schools. This will help protect the pupils from consuming contaminated and unsafe foods as this group is more at risk than other age groups due to great lack of knowledge and immature behaviours that lead to great chances of unhygienic handling of food (Busra *et al.* 2017:594).

According to Luo *et al.* (2019:181) students at tertiary institutions are the most ignorant and lazy groups of food handlers; they ignore instructions and food safety principles thus exposing them to risks of foodborne sicknesses. Hence these researchers recommend that students should be educated and encouraged to follow food safety regulations in order for them to become responsible food handlers. Students cook food for themselves in their school residencies or eat food prepared for them, any of these still make them food handlers as there are food safety principles for consumers and food preparers to follow to ensure that safe foods are consumed (Majowicz *et al.* 2015:520). This study, therefore, seeks to promote food safety education across foodservice establishments.

Luo *et al.* (2019:181) also state that the various levels of food safety knowledge and different behaviours and practices of students were linked to gender and other areas of study. This explains the fact that the students who study nutrition, foodservice management, health and safety will have gone through food safety related lessons as compared to those who study mathematics and accounting. Therefore, these researchers support the purpose of this study that the government and other relevant stakeholders in food safety should design, implement and enforce effective food safety regulations and education among the entire society and within foodservice establishments.

#### **2.3.2.4 Old Age Homes**

According to Busra *et al.* (2017:594), old age homes are non-commercial institutions with the most critical aspect being providing foodservice to very old citizens who are accommodated in these homes. Griffith *et al.* (2017:729) state that unlike eating food prepared in their homes, consumers eating in care homes are more vulnerable and at risk of consuming contaminated foods. This is based on the fact that foods prepared in private homes are mostly prepared under controlled conditions, generally with a lesser risk of contracting food poisoning. It is therefore of great importance to ensure that food handlers within old age homes are appropriately trained to implement food safety standards.

#### **2.4 Consumers**

Osaili *et al.* (2017:280) state that consumers are affected by the issue of food safety in the sense that if they consume contaminated food, they fall victim to food poisoning. According to Harris *et al.* (2017:1274), consumers expect food that is safe to eat, which means foods that are free of any poisonous organisms. Therefore, it of great importance that consumers' needs and expectations are met by foodservice providers. According to Lelieveld *et al.* (2016:2),

consumers use their sensory evaluations such as taste, smell and sight to evaluate the safety of food before consumption. Harris *et al.* (2017:1274) concur by stating that consumers are looking for safe food products and services but life-threatening health situations such as food poisoning that can be prevented still occur. Researchers concluded that it is essential for consumers to know about food safety and healthy procedures in order to prevent foodborne diseases (Low *et al.* 2016:88). Consumers put their trust in relevant health authorities for inspection of restaurants to ensure food safety (Djekic *et al.* 2014:34). Their relationships with food handlers are based on the fact that both make up the main resources of hospitality foodservice establishments (Kandampully *et al.* 2016:155). Therefore, it is important to ensure that this relationship is maintained through providing safe foods. Djekic *et al.* (2014:34); Harris *et al.* (2017:1274) concur that consumers spend their time and money eating outside their homes, therefore, they have high expectations of getting the best service, high quality food products and acceptable food safety and hygiene levels. It is thus the responsibility of food handlers through the food supply chain to ensure that food is delivered to consumers in acceptable and safe standards.

#### **2.4.1 Impact of Food Safety on Consumer Satisfaction**

Customers of foodservice businesses are also ambassadors of these organisations and so they are of great value to the organisations and special attention should be given to ensure their satisfaction is maximised (Kandampully *et al.* 2016:155). If customer satisfaction is not met due to unsafe foods being offered to customers, the foodservice businesses might lose their businesses (Harris *et al.* 2017:1275). This could be due to a tarnished brand name and regulators deciding to temporarily or even permanently shut the enterprise. Thus, it is of great importance to ensure that food is safe for consumption and that food safety regulations are adhered to ensure safe food for consumption and to maintain the businesses. As the foodservice industry contributes greatly to the travelling and leisure experiences of citizens (Lee *et al.* (2016:1), loss of patronage due to food poisoning incidents affects not only the foodservice establishments but also the customers.

#### **2.5 Food Safety**

Regulation 638 of South Africa as stated in the Government Gazette (2018:6) define food safety as the assurance that food is free of bad bacteria, safe to eat and that it will not cause harm to consumers. The need for serious attention to food safety was emphasised by the World Health Organisation (WHO), declaring that food safety should be part of World Health Day



(Qureshi *et al.* 2015:723). Food safety supervision is shifting progressively from government to private sector food safety certification (Zheng and Bar 2016:20).

According to Qureshi *et al.* (2015:723), the Codex Code of Ethics for International Trade in Food outlines that consumers are entitled to safe and wholesome foods. Therefore, the Codex Code of Ethics prohibits all food establishments from trading food that is not safe for human consumption. This study envisages that the Codex Code of Ethics for International Trade is adopted and enforced internationally. According to Chen (2016:145), research findings indicate that consumers are concerned about food safety hazards and this fear shakes their trust in the foodservice system.

Food safety is one of the concepts that constitute food hygiene, the second concept being food suitability throughout the food supply chain (Lelieveld *et al.* 2016:1). Low *et al.* (2016:88) suggest that further research needs to be done on the knowledge, attitudes and practices related to food safety based on the findings that there is certainly a lack of the awareness on the importance of food safety procedures. This follows reports on food poisoning incidents still occurring despite food safety guidelines existing. In their conclusion, Zheng and Bar (2016:20) mention that there are very few research studies that have focused on the empirical investigation of the provision of regulation of food safety. Back in the days, food safety was ensured through preservations and storages that were based on empirical experiences and not on the knowledge of the scientific procedure of ensuring food safety (Lelieveld *et al.* 2016:2). According to Brunet (2016:908), it is difficult or even impossible for foodservice establishments to guarantee food safety at the time of providing food to consumers, this is because it is hard or impossible to see bacteria with a naked eye. Another reason is that food could be contaminated but still look, taste and smell good and it is possible to unknowingly eat contaminated food.

According to Brunet (2016: 908), being concerned about the safety of food has been a tradition for many generations, as John Fagan says that in the past, “When grandmother went shopping, she would look the farmer or butcher in the eye and ask, “Is this fresh and flavourful?”. Then this conversation between the buyer and the seller would build good relations and trust. Some countries have been experiencing a number of issues imposing risk on food safety because of globalisation, industrialisation, evolution of food chains into food chains that are more complex and outside home eating (Chen 2016:145). In addition to issues imposing risk on food safety,

food advertisements are also perceived as contributors to increasing food safety issues faced in many countries.

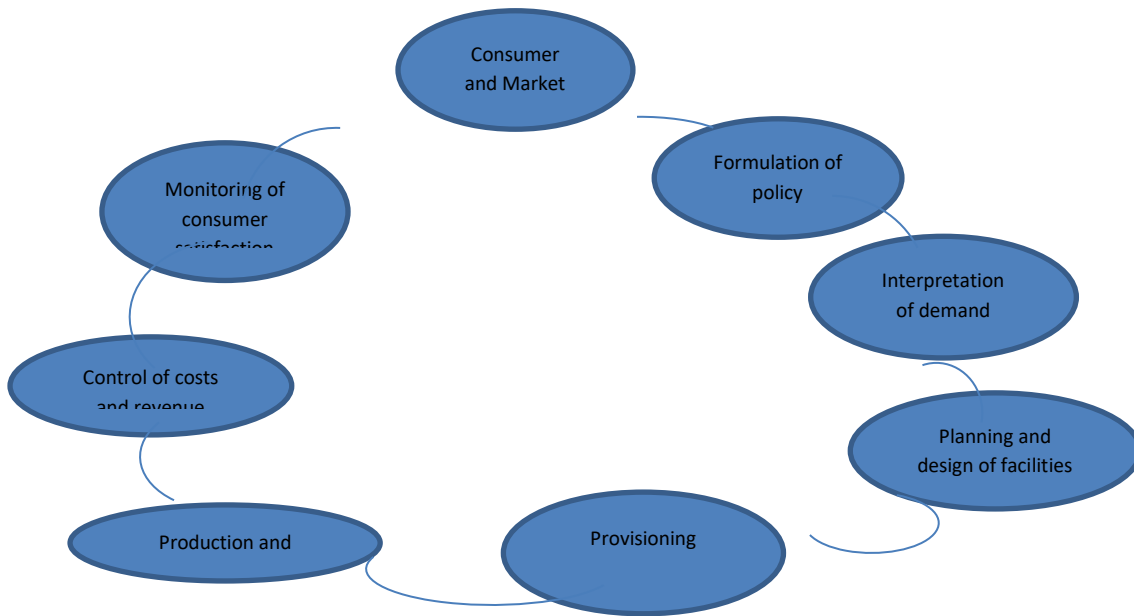
According to Lelieveld *et al.* (2016:1), food safety ensures that food is free of harmful organisms and is safe for consumption. During the 1990s measures to ensure food safety and hygiene were essential however not sufficient, later on, these measures were amended and enhanced to a more science-based risks analysis and control guidelines (Lelieveld *et al.* 2016:1). The concerns of food safety intensify as the supply chains grow bigger, as foodservice business competition is growing and so are the needs for better food safety regulation implementation and enforcement (Brunet 2016:910). Upton Sinclair's 1906 novel called "The Jungle" featured a narrative of a linkage between working conditions in poor food industry and food safety (Clayton *et al.* 2017:600). In his novel, Sinclair described a very strong connection between unhygienic food production, low-income and lack of resources. Thus, the implication is that in poor foodservice establishments with very low-incomes and lack of resources, the risk of food poisoning is very high due to unsafe and unhygienic food preparation and service conditions.

Poor- or low-income foodservice establishments may not afford to pay for facilities, equipment and even basic water and electricity bills which may lead to using contaminated water from the lakes or rivers. Therefore, having no options, these poor food establishments try to save scarce resources and by doing so exclude some of the important health and hygiene practices creating great hazards (Clayton *et al.* 2017:600).

Honesty and trust about the food that is safe for consumption do not exist anymore in the food industry due to lack of food safety practices Brunet (2016:909). The author asserts that if the seller cannot guarantee the quality and safety of the food being sold, chances are very high that the buyer will switch to a different food vendor (Brunet 2016:908). Food safety is a discipline that ensures that food is safe for consumption and free of harmful microorganisms that could cause sicknesses and even deaths (Lelieveld *et al.* 2016:4).

Almansour *et al.* (2016:442), state that food safety can be ensured by implementing hygienic control measures during food preparation, storage and serving. Lelieveld *et al.* (2016:2) further explain that food safety can also be ensured in hot environments, in which foods are cooked on heat to release nutrients and kill bacteria. Another method of ensuring food safety was discovered in the Middle East, this method is fermentation which preserves certain kinds of foods such as bread, alcoholic beverages and some dairy products (Lelieveld *et al.* 2016:2).

According to Almansour *et al.* (2016:442), food is one of the predominant sources of the spread of diseases, therefore food preparation in hotels needs great surveillance and adherence by food handlers to food safety and hygiene practices.



**Figure 2.1: Foodservice cycle (Payne-Palacio and Theis 2016:91)**

### 2.5.1 Relevance of Foodservice Cycle to Food Safety

Figure 2.1 presents a summary of stages in the foodservice provision to consumers. This illustration indicates the stages through which food suppliers go through to supply the consumer with foods. First, the foodservice providers will identify a need for food. Following the identification of the need for food will be the planning and design of facilities. This means that foodservice providers will plan on how this need can be satisfied (Payne-Palacio and Theis 2016:91) and how the food can be made available to consumers. The food suppliers plan the foodservice facilities that will be relevant to the supply of food to consumers. Then the food will be made available to the consumers in order to satisfy the needs of consumers. To satisfy the need of consumers with food, the foodservice providers incorporate both service and food products to supply to the consumers. Figure 2.1 also shows that the process of supplying food to consumers involves costs and monitoring of the whole foodservice and supply process. It is, therefore, relevant to this study in that it gives clear illustrations of areas where food safety principles should be planned, controlled, implemented, practised and monitored. The provisioning stage presents foodservices provided to consumers. Thus, this is the most critical

stage in which food handlers are found and in which real food handling is happening. This is, therefore, the critical stage in which this study is aimed at assessing knowledge, attitudes and practices of food handlers.

## **2.6 Food Safety Regulations**

Food Safety Alerts and Official Food Products Recalls in South Africa outlines that Foodstuffs Cosmetics and Disinfectants Act No 54 of 1972 prohibits any person or food establishment from offering food for sale that does not meet the required standards of quality and safe foods. The Government Gazette No 41730 presents regulations governing general hygiene requirements for food premises and other food handling related matter, this regulation is referred to as Regulation 638 (Government Gazette 2018:4). According to Moza *et al.* (2015:652), despite major concerns regarding food safety generally, some researchers argue for the higher importance of food safety standards. Their argument is based on the perception that food safety standards are barriers to hospitality businesses, blocking disadvantaged countries from entering profitable hospitality markets. This is clearly indicative of the lack of knowledge on the purpose of food safety standards. For example, it is this reason that some food handlers and foodservice establishments' owners perceive food safety standards as a mere barrier thwarting their businesses. This perception indicates a lack of knowledge as the implementation of a food safety system ensures safe foods which then guarantees business growth. The implementation of food safety standards will have a financial impact on the business but this factor is envisioned to be an investment for foodservice businesses. Food safety regulations are prescribed, enforced and put into practice with the aim of regulating food handlers' behaviour and practices during food handling (Healy 2016:2). Some food safety regulating standards require the purchase of expensive materials, training of staff and require that there should be inspections of the premises before the business can actually start operating. Food safety regulations are passed by the government to improve the country's economy and society. Food safety regulations are meant to control activities that are valued and performed by people in the foodservice industry (Healy 2016:2). This results in the disadvantaged groups not gaining access due to lack of resources to pass the inspection and meeting the requirements stipulated by food safety regulations for food establishments (Moza *et al.* 2015:652). Therefore, this gap in knowledge of food handlers towards food safety standards and improper food handling practices exist due to various reasons. These reasons could be the lack of resources to implement and enforce food safety regulations and ignorance based on attitudes of food

handlers. Brunet (2016:910) concur and suggest that this gap in knowledge results in a need to revise and improve food safety regulations worldwide

According to Gordon-Davis and Cumberlege (2017:200), South African legislative established a framework aimed at regulating and guiding food establishments into practising safe food handling. Thus, all food establishments are bound by these regulations to prepare food within the standards prescribed in the food control framework. However, the authors add that as there is no regulatory enforcement behind the implementation and certification of the Hazard Analysis and Critical Control Point (HACCP) system; there is no compulsion for its adoption in the hospitality industry, even though many food establishments have embraced it. This adds to the problem that food handlers ignore food safety principles. In this regard and notably so, it was only after Sinclair's novel about the relationship between poor foodservice organisations and food safety, that the US government set new food safety regulations, which represented the start of federal regulation of food and drugs (Clayton *et al.* 2017:600).

Brunet (2016:910) states that massive budget cuts by the authorities reduce the capacity of health authorities to inspect and assess whether foodservice organisations and food handlers comply with the set food safety standards. For example, the earlier mentioned Foodstuffs Cosmetics and Disinfectant Act 54 of 1972 outline that food establishments must comply with the governing health and food safety regulations among which is food establishments should be inspected by qualified Environmental Health Practitioners (EHP) regularly. When the budget is cut, the food establishment inspections performed by EHPs are reduced accordingly, which increase the risk of food handlers not practising food safety and personal hygiene principles. According to Djekic *et al.* (2014:38), food safety and personal hygiene standards in all food establishments should be improved and implemented in order to reduce foodborne illnesses related to poor hygiene practices.

In another vein, Zheng and Bar (2016:20) assert that food safety regulations followed by certification can create complex competitive disadvantages for those lacking resources, thus making it a great competitive advantage for those with fair resources. It remains nonetheless, necessary for owners and managers of foodservice establishments to fulfil their obligation of implementing food safety regulations passed by relevant authorities (Gkana *et al.* 2017:52). According to Healy (2016:2), food safety regulations are derived from certain laws that were promulgated to form new laws and are also perceived as the prerogative of the government. Brunet (2016:907) unfolds that food safety is a significant and increasing health concern in the

whole world, but despite this fact, the law still does not sufficiently address the current food safety needs and concerns. Healy (2016:2) concurs that food safety regulations are set to improve the behaviour of food handlers with the aim of preventing food poisoning. In the past two decades, the European government have enhanced its food safety regulations, however food poisoning outbreaks have been reported recently (Gkana *et al.* 2017:52).

Healy (2016:2) argues by stating that health regulations do not really work for practitioners in some industries due to the fact that they are perceived as imposing constraints and reducing the time available for work. The author adds that these difficulties are linked with personnel perceptions, attitudes, and availability of health and safety materials required to ensure that safety measures are achieved. According to Brunet (2016:910), countries are under pressure to improve and enforce food safety standards and unfortunately, there are great challenges and difficulties due to limited regulatory options. In their recommendations, Al-Busaidi *et al.* (2017:914) state that there is poor supervision and enforcement of food safety regulations, therefore relevant authorities need to improve their governing strategies to help improve food safety and quality standards.

Brunet (2016:907) further points out that regulations and principles passed by the authorities to regulate and protect food safety do not fulfil what they are set for due to lack of implementation enforcement and or assessments and monitoring. Therefore, this may result in food handlers not being aware of or knowing but ignoring food safety regulations. Clayton *et al.* (2017:601), argue that food safety regulations focus on the food production system more than food handlers, hence the ignorance and less adherence to food safety standards by food handlers. Therefore, it is crucial to connect food production systems with food handlers and ensure that the regulations are not just binding to food handlers' compliance during food production but also to food handlers themselves having to meet certain standards to qualify as food handlers within commercial foodservice establishments.

Healy (2016:2) further states that as food safety falls within the ambit of health and safety, it has been identified that health regulations need to be reviewed following an increase in the number of reported food safety issues. Food safety regulations are relevant and applicable in all stages of the food supply chain (Gkana *et al.* 2017:52). Implementing food safety regulations and monitoring the practices of food handlers in educational institutions is still a great global challenge (Sibanyoni *et al.* 2016:1397). The scarce resources in the educational

institutions that are required in storing, preparing and serving food in the right conditions contribute to the lack of implementing and practising food safety systems.

According to Mohos (2017:21), Hazard Analysis Critical Control Points and the International Organisation for Standardisation 9000 systems are implemented in food establishments to ensure food safety and quality in order to maintain maximised customer satisfaction. It is, therefore, crucial to ensure food safety principles are followed within foodservice establishments to prevent customers from consuming unsafe foods that could lead to food poisoning.

Zheng and Bar (2016:20) state that in 2011, the American government signed the food safety regulation into law, to ensure even more safe food supply and thus preventing food contamination. This study seeks to recommend to the government of South Africa that food safety regulations be prioritised and enforced in order to prevent food poisoning incidents from occurring.

### **2.6.1 Hazard Analysis and Critical Control Point**

The Hazard Analysis and Critical Control Point (HACCP) system is recognised internationally within the foodservice industry as a system for identifying and controlling the risks of potential hazards in food (Payne-Palacio and Theis 2016:97). The authors elaborate that the first of the seven principles of the HACCP require the identification, analysis and assessment of hazards and their severity. Tseng *et al.* (2016:60) concur that HACCP system is recognised and practised internationally; this food safety regulating system is implemented throughout the food supply chain as a safety measure to ensure that food is safe and free of harmful organisms. Djekic *et al.* (2014:38) explain the HACCP systems as a guideline for food handlers to identify the critical control points during the process of food preparation. In their explanation of HACCP system, Payne-Palacio and Theis (2016:97) state that the fourth principle stipulates that there should be procedures established to monitor the Critical Control Points. There is a call to hospitality establishments, in particular the foodservice establishments to introduce, and implement the HACCP system to ensure that food is safe for consumption (Tseng *et al.* 2016:60). This study seeks to investigate the implementation and practising of the HACCP.

Payne-Palacio and Theis (2016:97), state that it is required that all foodservice establishments should develop and apply a HACCP plan that includes all products that are produced within that particular establishment. Gordon-Davis and Cumberlege (2017:200) argue that HACCP system is not yet applicable to the hospitality industry in particular, South Africa. The

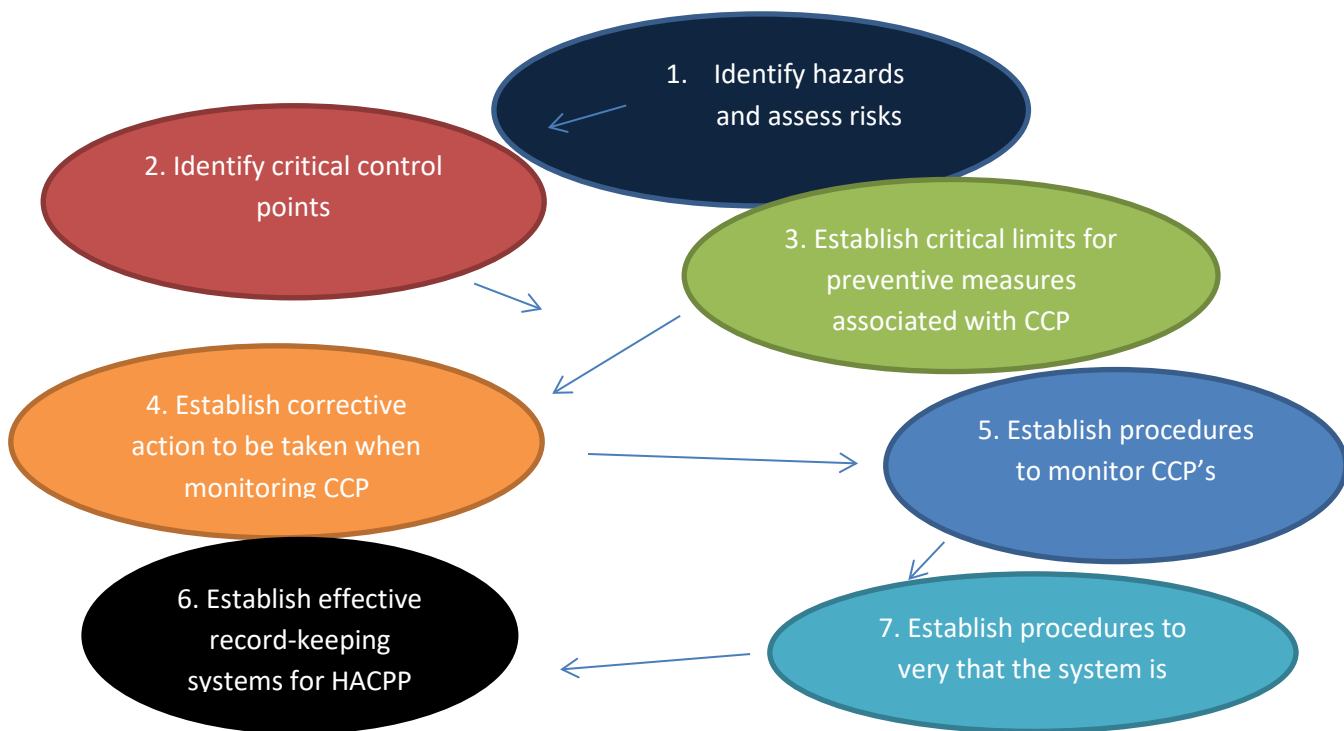
researchers further state that however, the Department of Health and relevant authorities may enforce the implementation of this control system in the future should it be of the public's interest. The lack of enforcement of the HACCP system by the government links to improper food handling practices of food handlers in the foodservice establishments. Tseng *et al.* (2016:61), state that implementing and practising the HACCP will reduce the chances of food poisoning and this will help reduce costs thus improve profits, enhance brand reputation, increase customer satisfaction and boost happy working environments for staff. The third step of the HACCP implies that critical limits for each identified Critical Control Points are established (Gordon-Davis and Cumberlege 2017:200). Hazard Analysis Critical Control Point is a system implemented in foodservice establishments to ensure food safety. According to Wallace *et al.* (2018:28), to implement the HACCP system successfully and effectively, there should be prescribed prerequisite programmes and a clear plan to follow. Tseng *et al.* (2016:67) mention that research findings show that international hotels experience difficulties with introducing the HACCP system. Gordon-Davis and Cumberlege (2017:200), further state that the HACCP principles are not applicable in the hospitality industry, but some food establishments have opted to implement the system. When the HACCP is introduced at a hotel, it does not apply only to foodservice department but the entire departments of a hotel (Tseng *et al.* 2016:62). This study is aimed at investigating whether food handlers have the knowledge and do practice the HACCP principles.

After the establishment of monitoring procedures, corrective action is taken if the critical limits are not being met (Payne-Palacio and Theis 2016:97). Al-Busaidi *et al.* (2017:914), contend that researchers found that lack of knowledge and guidelines that are not easy to read and understand, cause the implementation of the HACCP to be very complex. This complexity of HACCP implementation leads to ignorance of food handlers. Payne-Palacio and Theis (2016:97) urge that prerequisite programmes are put in the place where food supply chain moves. This is to control hazards with the aim of preventing food contamination. These prerequisite programmes are also to ensure that the environment in which food is handled is hygienic. The sixth principle states that the procedures to verify and confirm that the HACCP system is working effectively must be established (Wallace *et al.* 2018:68). There are different HACCP plans for different processes and products that identify any hazards that could be possible. The concept and status of the HACCP are very important in forming differentiation amongst foodservice establishments. The cleanliness, safety and hygienic levels rather than type and size of foodservice establishment have a strong influence on customers (Djekic *et al.*



2014:38). The HACCP system requires that there should be records for future referrals, therefore all documents should be kept and recorded (Payne-Palacio and Theis 2016:97). Mohos (2017:21), concurs that the HACCP system is implemented to ensure that foods produced are safe for consumption.

Gordon-Davis and Cumberlege (2017:200), also support this view by mentioning that HACCP system was established with the aim of ensuring food safety and it was designed for the foodservice industry in the early 1960s to maximise food safety for food that was prepared for astronauts. HACCP is a system that ensures food safety during the production process and on how to carry out safety controls to prevent illnesses and injuries (Qianqian and Harasawa 2016:1).



**Figure 2.2: HACCP System (Payne-Palacio and Theis 2016:97); (Wallace *et al.* 2018:68).**

Figure 2.2 presents the seven principles of the HACCP system. Payne-Palacio and Theis (2016:97), state that in the first stage of the HACCP system food handlers analyse the food chain and try to identify the points where hazards could be present and come up with strategies of controlling them. This principle considers all stages in the flow of food from production to consumption. The areas and processes that could allow the growth and multiplication of

bacteria and toxins are determined. Foods are inspected and checked whether they meet accepted food safety standards. Food handlers' personal hygiene standard is monitored to ensure that bacteria growth, accidents and injuries do not occur (Wallace *et al.* 2018:15). According to Chen *et al.* (2018:165), foodservice establishments should conduct a hazard analysis to establish food safety hazards that may be present throughout the food production process. After the hazard analysis, preventive measures should be in place in order to control the hazards identified. This will ensure safe foods are prepared in a hygienic facility under safe and hygienic conditions.

In the second stage, control measures are applied to prevent and or eliminate food safety hazards. This is a point where food handlers apply control measures such as cooking, drying, fermentation, pasteurization and preservation to reduce or eliminate bacteria in food (Wallace *et al.* 2018:15). The third stage requires that maximum and minimum cooking times and temperatures are established to prevent and reduce the hazard during cooking. This is the stage where critical limits are met at each of the CCPs identified (Wallace *et al.* 2018:68). Monitoring procedures including observation and evaluations to assess whether CCPs are within the control limits are presented in the fourth stage of the HACCP (Chen *et al.* 2018:166). These procedures must be established to control hazards at the identified critical control points (Chen *et al.* 2018:167). After the monitoring procedure, corrective actions are established when there are deviations or hazards that were not identified. The entire HACCP plan may be modified should there be hazards that were not properly controlled (Payne-Palacio and Theis 2016:97). This is the correction stage where errors are corrected if monitoring indicates that critical limits have been exceeded.

Record-keeping is the sixth stage and it requires that all evidence and summary of HACCP be documented and kept for future reference and evaluation of the plan (Wallace *et al.* 2018:68). The recorded information should include values and observations that were obtained during monitoring. Lastly, the entire system of HACCP is verified to check if it is effective. Verifications are done periodically or continuously. This study seeks to investigate whether foodservice establishments practice HACCP principles in order to ensure that safe foods are offered to consumers. Records are reviewed regularly to ensure that HACCP is working (Wallace *et al.* 2018:168).

### **2.6.2 Poor Food Safety Standards**

Poor food safety standards, deaths and increasing numbers of reported food poisoning cases became a wakeup call for health authorities to take action to fight health issues related to products and services offered to people (Chen 2016:146). According to Lelieveld *et al.* (2016:2), as science and technology improved in the past 20 decades new improved food preservation methods were discovered, which food handlers are practising to reduce the risks of food poisoning and ensure food safety. Despite the improvement of science, technology and infrastructure to enhance Food Safety Management Systems, the occurrence of food poisoning incidents remains a serious concern (Nyarugwe *et al.* 2019:1).

### **2.7 Food Handlers**

Angelos *et al.* (2016:29) state that producing food is a difficult task, which requires food handlers to be trained in food safety, security, health, food production, food hygiene practices and ecosystem health. According to Woh *et al.* (2016:64), ignorance and carelessness of food handlers towards food safety and hygiene can facilitate the transference of foodborne infections throughout the food supply chain process. Food handlers may carry germs in their bodies with the potential to transfer these germs to the food they are preparing (Toth *et al.* 2017:644).

Food handlers are responsible for ensuring that food is safe for consumption, by monitoring proper food storage, preparation and handling (Gkana *et al.* 2017:52). Mukhopadhyay *et al.* (2016:4327), recommend that it should be a principle and implemented in foodservice establishments that food handlers should undergo medical check-ups periodically as means of fighting food contamination and ensuring food safety. In several countries such as Denmark, United States, New Zealand, Singapore and Canada, authorities introduced food hygiene rating with the aim of improving food handler's attitudes and practices (Djekic *et al.* 2014:38). The researcher, therefore, imagines a future with the South African government also introducing this factor to help encourage the implementation and monitoring of food safety regulations within foodservice establishments in order for them to be rated as the best food safety standards compliers. Three factors such as knowledge, attitudes and practices of food handlers have been identified to have a significant impact on triggering food poisoning outbreaks (Al-Shabib *et al.* 2016.2012). Maughan *et al.* (2016:914) express their recommendation that it is very important for food handlers to follow food safety management systems with the aim of protecting consumers and foodservice business internationally. Caterers are identified to be the sources of most cases of the food poisoning incidents reported globally (Vo *et al.* 2017:14).

## **2.8 Food Handlers' Knowledge of Food Safety Standards**

Lack of knowledge of food safety standards by food handlers has resulted in many countries experiencing a decline in the hospitality and tourism sector. This is due to the great number of foodborne sickness outbreaks' publicity, which resulted in a loss of customers, investors and other related expenses (Abuchi *et al.* 2016:269). Griffith *et al.* (2017:729) state that research findings on knowledge of food safety amongst food handlers in South Africa show that there is still lack of knowledge of food safety standards due to inefficient and ineffective food safety control, communication, implementation and enforcement strategies. The researcher, therefore, confirms that the current status of food safety standards' knowledge amongst food handlers within South Africa shows that there is still a gap in the enhancement of food safety standards, education and communication programmes. Mukhopadhyay *et al.* (2016:4327), concur by stating that the food handler's lack of knowledge and awareness of food safety and hygiene contributes greatly to the transmission of foodborne sicknesses. Griffith *et al.* (2017:729) also point out that the reason for the current status in food handlers' knowledge is that food safety principles exist and are known by the majority but there is still lack of motivation, implementation and enforcement of these food safety standards.

## **2.9 Practices of Food Handlers towards Food Safety Standards**

Poor handling of food relates to inappropriate cooking temperatures, especially when cooking pork, poultry and eggs (Maughan *et al.* 2016:901). A research study that was conducted in the USA found that improper practices of food handlers contributed greatly to foodborne sickness outbreaks that occurred in food service establishments (Clayton *et al.* 2017:600). It is very important that the good practices of food handlers during food handling are observed in order to close the gap should training and refresher food safety training be required (Abuchi *et al.* 2016:269). Poor hygiene practices during food handling from preparation to storage, and serving can cause bacteria such as campylobacter, salmonella, and other infectious agents to gain access more easily into foodservice areas (Mostafa *et al.* 2017:1). This means that food handlers might contaminate their hands during use of the toilets or bacteria might be contracted from raw foods in particular meat and spread to ready to eat food. Food safety practice principles include measures that are necessary to guide food handlers on how to ensure food safety throughout the food supply chain.

### **2.9.1 The Types of Improper Food Handling Practices that are Commonly Identified on Food Handlers**

According to Ovca *et al.* (2018:532), improper handling of food is one of the main causes of foodborne sicknesses. Such unethical and unsafe practice results in people being infected with food poisoning from consuming contaminated foods. There are various improper food handling practices that have been identified ranging from preparing food under unhygienic conditions such as not washing hands to storing foods at incorrect temperatures (Brennan 2016:109). These improper practices are linked to food contamination which then leads to food poisoning. Food safety researchers and inspectors mention improper cooling of food, infected food handlers and consumers, inadequate reheating for hot holding, improper cooking and heating temperatures, improper use of leftovers, inadequate cooking, unsafe food sources and using contaminated raw ingredients as the top improper food handling practices (Sternisa *et al.* 2018:1344).

Mukhopadhyay *et al.* (2016:4327), confirm that research findings show that poor food safety practices and hygiene and not just the common practices of not washing hands are associated with intestines being infected. Hence it is believed that the hands of food handlers can be carriers of bacteria that may contaminate food therefore it is important that food handlers practice food safety principles. Clayton *et al.* (2017:600), concur that personal hygiene and food handling practices are the basis in the controlling and prevention of food contamination. Clayton *et al.* (2017:601) state that foodservice jobs in the entire food system are the less desirable jobs in the US due to low- income that workers earn, yet the food system demands a lot of work especially that of ensuring food safety and quality. It is this low-income and lack of resources in less advantaged foodservice establishments that leads to unethical practices such as theft, and ignorance of health and safety regulations.

### **2.10 Attitudes of Food Handlers towards Food Safety Standards**

The attitudes of food handlers need to be assessed to identify areas where motivation can be done in order for them to adhere to food safety principles and be honest in practising food safety principles (Abuchi *et al.* 2016:269). According to Tshipamba's *et al.* (2018:1) study in Johannesburg, South Africa, the majority of food handlers with bad attitudes and improper food handling practices have been identified as mostly belonging to the street vending sector. Darko *et al.* (2015:2664), claim that despite many food handlers in hotels and other food establishments receiving food hygiene education, most foodborne illness outbreaks still occur as a result of ignorance, poor food hygiene and handling practices. The statement is indicative

of food handlers holding negative behaviour and attitudes towards food safety principles. The carelessness and ignorance of food handlers are identified as the major cause of foodborne disease outbreaks in Brazil and New Zealand. Food handlers respond negatively to food safety practices due to time constraints, poor communication, lack of resources and inefficient leadership (Sousa *et al.* 2016:2). Moreb *et al.* (2017:342) concur that most research that has been done on the knowledge, practices and attitudes of food handlers proves that food handlers in various foodservice establishments have different levels of knowledge of food safety principles. However, food handlers still do not implement and practice food safety principles.

### **2.11 Foodborne Sicknesses**

Foodborne illnesses are defined as infectious and toxic diseases caused by the consumption of foods contaminated by bacteria and viruses (Schlinkmann *et al.* 2017:1232). Al-Shabib *et al.* (2016:2012) state that according to the WHO, close to 1.8 million deaths of citizens were caused by diarrhoeal cases around the world, many of which were identified to have consumed contaminated foods. Schlinkmann *et al.* (2017:1232) state that reports by the European Food Safety Authority show that the majority of foodborne illnesses are linked to improper food handling practices. In agreement, Brunet (2016:909) points out that food contamination is a hazard that if not controlled can cause food poisoning. In this study, the researcher seeks to investigate the gap in the knowledge of food handlers towards food safety principles and to recommend effective methods of ensuring that food contamination is prevented. WHO also states that in developing countries more than  $\frac{1}{3}$  of the entire population suffer from foodborne infections yearly (Al-Shabib *et al.* 2016.2012).

Low *et al.* (2016:88) state that there are also unreported cases of foodborne illnesses that make the outbreaks even greater. Some of these cases are identified as diarrhoea outbreaks in developing countries. According to Galgamuwa *et al.* (2016:113), humans need healthy foods in adequate amounts for their survival, but still, humans get sick from consuming contaminated foods and water and this problem causes reduced economic productivity internationally. Failure to implement and practice hygienic standards in the kitchens of all foodservice establishments including schools, hospitals, restaurants and hotels is the cause of the spreading of infectious bacteria (Ucar *et al.* 2016:1226). Al-Shabib *et al.* (2016.2012) argue that research findings show that the majority of food poisoning outbreaks happen in educational institutions, rather than hotels and restaurants, as most people believe.

The increasing number of foods consumed in restaurants and pre-cooked and processed meals has drawn the attention of the European Commission into identifying the need for controlling foodborne sickness outbreaks. The World Health Organisation has identified that the major threats of international public health in the 21<sup>st</sup> century are mainly foodborne disease outbreaks that are caused by consumption of contaminated foods (Low *et al.* 2016:88). In the United States of America, records show that every year there are reported cases of approximately 9.4 million foodborne diseases, 55 961 reported hospitalisation that resulted in about 1 351 mortalities (Low *et al.* 2016:88). Brunet (2016:908), concur that fatal foodborne disease outbreaks have been experienced in every country in the past ten years. These outbreaks have been increased due to increasing food supply chains, international trade and distribution networks. In 1999 there were millions of foodborne sickness cases reported in the USA (Cock 2017:4). There are estimates that about 5000 food poisoning fatalities are reported every year in the USA. Research findings show strong evidence that food poisoning incidents caused by food handlers in the catering industry are more than any other incidents that occurred within the food supply chain industry (Vo *et al.* 2017:14). The researcher also states that the majority of foodborne sickness outbreaks in Southern Vietnam were linked to the food eaten by victims in the cafeterias.

International statistics show an increase in documented foodborne disease cases every year. In 2008, China had an infant formula poisoning outbreak, this outbreak can have significance when discussing global food disease outbreaks. Sibanyoni *et al.* (2016:1398) state that the information issued by the Department of Statistics in 2004 indicated that there were thousands of foodborne sicknesses reported in South Africa in 2011 and the majority of these were cases associated with educational institutions. Many of these food poisoning cases are linked to improper food storage and holding temperatures and poor personal hygiene of consumers and food handlers (Almansour *et al.* 2016:442). Baser *et al.* (2016:1) concur that many foodborne disease cases result from failure to implement and practice food safety regulations.

Research studies have found that despite food safety and personal hygiene training given to food handlers, there are still reported cases of foodborne diseases, mainly caused by food handlers' ignorance, thus not adhering to food safety regulations (Toth *et al.* 2017:644). In 2008, health officials and other relevant stakeholders of America found out that the Chinese manufacturers of infant formula that caused foodborne sickness in infants were not accredited to manufacture and sell infant formula in the USA (Brunet 2016:909). This act, although born out of ignorance, proves that food handlers in any phase of the supply chain could choose to

ignore and bypass laws for their own selfish satisfaction. Ignoring laws, in particular, food manufacturing, supply and service laws could lead to food poisoning incidents.

Food poisoning is caused by bacteria and viruses in foods swallowed (Mostafa *et al.* 2017:1). An individual who has been infected by food poisoning can be identified by mild to severe symptoms such as stomach aches, abdominal pains, diarrhoea, vomiting and loss of appetite. The symptoms of food poisoning may vary from mild to severe depending on the type of bacterium that has contaminated food. Abushelaibi *et al.* (2016:512) concur that according to the World Health Organisation report in 2005 about 1.8 million people died from diarrhoeal illnesses and the majority of these cases were connected to eating and drinking of contaminated food and water.

Galgamuwa *et al.* (2016:113) state that it is estimated that about 10 to 20% of foodborne disease outbreaks are caused by consumption of food and drinks that have been carelessly handled and contaminated by the food handlers. Brunet (2016:909) further explains that this infant formula poisoning outbreaks had a very negative impact on the economy, as it affected international trade contracts and caused America to lose their confidence in China as food manufacturers and suppliers. The international health and food safety organisations are faced with great challenges fighting foodborne diseases, which make this challenge one of their greatest objectives based on the aim of reducing or stopping foodborne sicknesses and deaths (Baser *et al.* 2016:1).

Gkana *et al.* (2017:52) state that in Europe reports show that approximately 90% of food poisoning cases have been identified to have happened in the foodservice industry due to poor food handling and hygiene. In the United Kingdom, there is a Food Hygiene Campaign undertaken by the UK food agency's prevention and control system aimed at reducing food poisoning. This campaign's success is measured by looking at the number of reported food poisoning cases and a reduction in the cases determines a successful activity (Baser *et al.* 2016:1). According to Toth *et al.* (2017:644), foodborne infections and harmful microorganisms spreading can be prevented by implementing personal hygiene practices in foodservice organisations. There are approximately 2 million deaths of which the majority are children that are caused by consuming contaminated food and water (Asiegbu *et al.* 2016:422). Baser *et al.* (2016:1) further state that contamination of food occurs mostly during preparation, storage, transportation and delivery times. Therefore, it is important to treat food handlers who



are infected with viruses or sick as common causes of foodborne sicknesses or hazards and to eliminate them from the food handling areas.

The majority of foodborne virus infections has been found to have occurred in the commercial foodservice systems more than in domestic homes. After contamination, microorganisms can survive during food processing for a day or more, thus food contamination spread risk is possible (Gkana *et al.* 2017:53). It is implied that a lack of resources may be contributing to poor hygiene and safe standards as the establishment may not have enough funds to install proper equipment and clean water. According to Mukhopadhyay *et al.* (2016:4327), big cities with tourist attraction destinations experience growth of foodservice establishments. According to Cock (2017:4), in the USA food poisoning has become an area of concern in the foodservice industry and there are new improved strategies designed to fight this problem. Most food poisoning outbreaks are caused by improper cooking time, inappropriate temperature control of food and cross-contamination (Sibanyoni *et al.* 2016:1398). These bad food handling and preparation practices are the result of a lack of food safety knowledge and negative attitudes of food handlers. The occurrence of foodborne sicknesses resulting from consuming contaminated foods is a sign that there is a problem within foodservice establishments.

### **2.12 Common Bacteria that Contaminates Food during Food Handling**

There have been several reported cases of food poisoning caused by certain bacteria found in food since 2000 in Italy (Osimani *et al.* 2018:148). Poor personal hygiene and ignorance of food handlers could be the cause of foodborne related infections and sicknesses, as studies on food poisoning incidents have shown that bacteria such as salmonella and *Escherichia coli* were found to be present in food handlers (Abuchi *et al.* 2016:269). Lack of knowledge of these food poisoning bacteria, their sources and how they contaminate food could lead to ignorant and improper handling of food. It is thus important that food handlers are educated on the types of food poisoning bacteria to help prevent food contamination. Mostafa *et al.* (2016:1) concur that food poisoning is a result of consuming food that is contaminated with microorganisms, which may be the result of improper food preservation methods, improper food handling or cross contamination from contaminated surfaces. According to Cock (2017:14), research findings show that bacteria causing food poisoning can be prevented by preserving food with extracts from certain leaves, such as *Acacia auriculiformis*, *Acacia disparrima* and *Acacia leptoloba*. Fourteen *Acacia* spp. extracts have been discovered to have a positive effect in preventing bacterial food spoilage and therefore prevent food poisoning (Cock 2017:14). Food handlers can acquire knowledge about food preservation through being educated and trained

in food safety. Mahmoud and Ghanem (2016:139) explain that the problem of food poisoning has been identified to have resulted from people consuming foods that are contaminated by bacteria.

Bacteria growth may be prevented by applying food safety principles (Cock 2017:4). Ucar *et al.* (2016:1226) concur that the presence of harmful bacteria in food is clear evidence that there is a lack of good hygiene in a particular foodservice area. Some foods are more likely to carry harmful bacteria, such foods include raw eggs, unpasteurized milk and raw or undercooked pork, chicken and seafood. Fresh produce foods that are prepared and packed in bulk are also risks of food contamination. Bacteria can be spread from one contaminated egg to the finished product made from eggs, even if the rest of the eggs were not contaminated when the food handler ignores food safety principles (Baser *et al.* 2017:439). This study seeks to close gaps in knowledge regarding food safety, thus educating food handlers of the foods that could be carriers of food poisoning bacteria. Food poisoning incidents caused by Salmonella, Listeria, and *Escherichia coli* have caused consumers to be sceptical of the food they buy and eat from foodservice establishments (Mostafa *et al.* 2016:1). There is a great concern of microbial induced food poisoning in the foodservice industry (Cock 2017:4). When food is not prepared under correct cooking temperatures, storage and holding temperatures and personal hygiene, there are possibilities of food poisoning (Baser *et al.* 2016:1). The researcher is, therefore, investigating the properness of food handling practices and levels of food safety knowledge within foodservice establishments.

Pathogens may be transmitted without it being realised from a contaminated surface or raw food to food that does not need cooking to be consumed. Food handlers may be carriers of microorganisms if they are ill or infected, even if they do not show out symptoms. The reason for the incubation period is mainly that some bacteria that cause food poisoning take time to multiply. The incubation period varies in length depending on the type of bacteria in food swallowed, it may be hours to even days. Bacteria can spoil food to a point that it cannot be consumed, this food loss is a big issue that the whole world is faced with (Cock 2017:4).

Food handlers who are ill should be regarded as hazards as they may carry harmful bacteria and must be released from work until they are cured. Harmful bacteria in food cannot always be easily noticed due to the fact that food does not always change in colour or taste but will still look normal (Mostafa *et al.* 2016:1). There are higher chances of food poisoning outbreaks during summer for under hot conditions food spoils easily and quicker (Vo *et al.* 2017:13).

There are certain events where humans are more likely to contaminate food, for example in outdoor picnics there might be no hygiene facilities available in the area to wash hands before touching food and after changing activities. Thus, educating food handlers of how food could become contaminated is important to help prevent food poisoning incidents. Food poisoning is caused by eating food or drinks contaminated with bacteria, the symptoms may take some time to show in that person. The food poisoning bacteria gets to the intestines then multiplies and produce toxins and kill cells in the intestine lining. The toxins produced by bacteria that were swallowed with contaminated food can spread to and damage other organs within the human body. After entering the body through the digestive system, the food poisoning symptoms will generally be noticed in the digestive system (Mirani *et al.* 2017:84). Moist and warm conditions are best conditions that enhance bacteria growth and multiplication. Hence, the authors add that warm temperatures are referred to as the danger zone and the perfect conditions in which bacteria can multiply into millions in a few hours.

Bacteria in food cannot be seen with a naked eye, tasted or smelt but can be prevented by handling and keeping food under correct conditions. Lelieveld *et al.* (2016:1), explain that food spoilage and contamination can be prevented by storing in cold environments. Food is preserved naturally under very cold conditions to ensure food safety; therefore, food establishments should have fridges and freezers for storing food that requires cold conditions to be free of bacteria. Food safety training and education should include educating food handlers about the following bacteria. Also, to educate food handlers of the food sources and carriers of these bacteria, favourable conditions they grow in and how poisonous they are to humans. This knowledge will assist in the implementation of food safety principles within foodservice establishments.

### **2.12.2 Salmonella**

Nakao *et al.* (2018:19) retrace two incidents illustrating Salmonella and Staphylococcus food poisoning outbreaks in the US that occurred at the same time after people consumed food at two events. Salmonella is known to be one of the most common foodborne bacteria and has negative health impacts (Mostafa *et al.* 2017:1). There are various types of Salmonella bacteria, however, not all are deadly and poisonous to humans. Salmonella is mainly found in human intestines and bowels and can be found in animals as well (Nakao *et al.* 2018:19). Unlike Staphylococcus which has to grow and produce toxins that cause sickness, Salmonella bacteria cause food poisoning themselves. Salmonella food poisoning symptoms can start showing after 48 hours from the time the food was consumed. Salmonella food poisoning symptoms may

show for three up to twenty-one days in a human being. Salmonella poisonings can be fatal and cause deaths in children, very old and unhealthy people. Salmonella common food carriers are pork and eggshells.

### **2.12.1 Staphylococcus Aureus**

*Staphylococcus aureus* is bacteria that is found on human skin, bruises, sores, eyes, throat, nose and saliva (Chen and Xie 2019:6); (Mirani *et al.* 2017:83). Byrd *et al.* (2017:1) concur that *Staphylococcus aureus* is linked to atopic dermatitis which is a skin disorder. It can be spread through coughing or breathing if the person has this bacterium in the lungs. Thus, *Staphylococcus aureus* can be transmitted to food when an infected person coughs, for example, if a person coughs in their hands and touches food without washing their hands they may transmit this bacterium *Staphylococcus aureus* does not trigger illness until it multiplies and grows in the substance. According to Hodille *et al.* (2017:888), during multiplication, this bacterium produces toxins which then causes severe infections resulting in poisoning and sickness. The toxins in food that are produced by the growth of staphylococcus can be killed by very high temperatures during cooking (Mirani *et al.* 2017:83). The presence of *Staphylococcus* in food can be identified by symptoms that usually show within eight hours in an individual who has consumed the infected food.

### **2.12.3 Clostridium Perfringens**

Clostridium is found in the soil as well as animal and human intestines, it may be found in very small amounts in certain foods (Finegold *et al.* 2017:134). Clostridium Perfringens is the most common bacterium in the environment (Athira *et al.* 2018:99). People can be infected with this bacterium by consuming food that is contaminated with it as a result of poor food handling practices in all types of foodservice establishments. Clostridium food poisoning symptoms can be noticed in humans approximately twelve hours after consuming contaminated food. Symptoms of clostridium food poisoning are usually less severe than Salmonella and Staphylococcus poisonings. Clostridium bacteria produces a very poisonous toxin called Clostridium Botulinum and it is this toxin that causes food poisoning sickness in humans who consume food that is contaminated with clostridium bacteria (Finegold *et al.* 2017:134). Approximately one out of three people infected with botulism, which is a very dangerous food poisoning disease, die if not treated properly within three to seven days. According to Athira *et al.* (2018:99), as these bacteria are mainly found in the intestines, they can cause diarrhoea, nausea and severe abdominal pain. Unlike other bacteria, toxins produced by clostridium cannot be killed by basic cooking of food, as they are heat resistant. Clostridium bacteria are

commonly found in foods that are cooked in large quantities very slowly and are usually put aside to stand at room temperature. Finegold *et al.* (2017:133) further state that researchers found that clostridium infections are linked to autism in children.

#### **2.12.4 Campylobacter**

Campylobacter is one of the most common bacteria that cause food poisoning (Yamazaki *et al.* 2017:691). According to Yoshikura and Takeuchi (2017:609) after the occurrence of food poisoning incidents in Japan during 2014 and 2015, tests were run on infected patients. The results showed that the victims consumed food contaminated with campylobacter. The statistics also proved that Campylobacter was identified to be one of the two most regular causes of food poisoning, the first one being the norovirus. Yamazaki *et al.* (2017:691) concur that in Japan it was confirmed that based on the reported food poisoning incidents Campylobacter is the second most infectious bacteria. Poultry, red meat, unpasteurised milk and water that is not purified have been identified to be the carriers of campylobacter (Yamazaki *et al.* 2017:691; Yoshikura and Takeuchi 2017:609).

#### **2.12.5 Listeria**

According to Allam *et al.* (2018:1), *Listeria monocytogenes* can be found everywhere and can be found in small amounts in certain foods and high amounts in other foods. *Listeria monocytogenes* is bacteria that cause a foodborne disease known as *listeriosis*. The foods that will usually have *listeria* in high amounts are cheeses and pates (Chersich *et al.* 2018:453). According to Dramowski *et al.* (2018:818), *Listeria* foodborne sicknesses and death are caused by consuming foods that contain a high number of *Listeria*. After swallowing, food is passed through to the intestines and in this way, the bacteria are transported into the body (Chersich *et al.* 2018:453). The bacteria in the food is absorbed by the intestines and spreads in the body and later the symptoms start to be visible as the person gets ill (Allam *et al.* 2018:1). Children, very old people, pregnant women and people with poor immune systems are the most vulnerable groups that are easily infected with these bacteria. Dramowski *et al.* (2018:818) state that a person affected by *Listeriosis* can suffer from severe illnesses such as an infected nervous central system. *Listeriosis* could result in fatalities and this fact is evident after there were reported fatalities caused by *listeria* food poisoning in South Africa, Limpopo (Chersich *et al.* 2018:453). It is of great importance that food handlers have knowledge of these types of bacteria and their food sources to understand the importance of preventing their growth and spreading in the foodservice areas (Massot *et al.* 2016:643).

### **2.12.6 *Escherichia coli* 0157**

*Escherichia coli* are bacteria that are normally found in the intestines of humans and animals (Mostafa *et al.* 2017:1). According to Massot *et al.* (2016:63), *Escherichia coli* was found resist some antibiotics, this raised concerns about the safety and cure of victims. This is a great issue as customers infected with this bacterium might not be cured or may require more expensive treatment leading to great losses of money and the reputation of the foodservice establishment where infected customers might have consumed contaminated food. Most strains of these bacteria are not poisonous and therefore not harmful however some *Escherichia coli* bacteria can produce toxins that can cause illness (Mostafa *et al.* 2017:1).

### **2.13 *Listeria* Outbreak in Southern Africa**

In the years 2017 and 2018, there was a huge food poisoning outbreak experienced in South Africa (Allam *et al.* 2018:1). Dramowski *et al.* (2018:818) concur and give a brief history regarding *listeria* food poisoning outbreaks in South Africa. *Listeria* food poisoning outbreaks were last reported between 1977 and 1978 in the Gauteng province. The reports indicated that 14 individuals were found to be infected and there were also deaths reported which resulted from consuming *listeria* infected foods. Chersich *et al.* (2018:453) concur that this enormous food poisoning outbreak was investigated and was found to have been caused by *listeria* bacteria. According to Allam *et al.* (2018:1), the source of this bacteria was identified to be the processed cold meat and polony produced by one of the largest processed meats company in South Africa. The Health Minister, Dr Aaron Motswaledi made an official announcement to the public that the *Listeria* source was traced and was identified to be the Enterprise food production facility in the area of Polokwane, South Africa (Dramowski *et al.* 2018:818); (Chersich *et al.* 2018:453). This official statement was made in the offices of the National Institute of Communicable Diseases (Allam *et al.* 2018:1). The other food production facilities in which *listeria* was also traced were Rainbow chicken food production located in the Free State and the branch of the Enterprise food production facility located in the East Rand of Gauteng Province. According to Chersich *et al.* (2018:453), the National Institute for Communicable Diseases confirmed that 945 cases were recorded as food poisoning cases caused by *Listeria* and of these cases about 180 cases were later confirmed to be fatalities. These reported cases represented the people who consumed processed meat products that were contaminated with *Listeria* (Dramowski *et al.* 2018:818). The majority of the reported *listeria* food cases were identified in Gauteng. The government officials from the relevant food safety and public health and consumer rights departments such as the National Consumer

Commission ordered the food production facilities to withdraw their products that were made available for supply for consumption (Chersich *et al.* 2018:453). The community was also warned to stop buying and consuming any of these products to prevent the spread of *listeria* food poisoning. Researchers have confirmed that between 2017 and 2018 South Africa was identified as the country with the majority of *listeria* food poisoning cases in the world (Allam *et al.* 2018:1). Even though, researchers also confirmed that it is however not the only country as there were cases reported in countries such as the United Kingdom and Austria. The Minister of Health, Dr Aaron Motswaledi said that this *listeria* food poisoning was discovered after a number of children in Soweto were diagnosed with gastroenteritis (Dramowski *et al.* 2018:818). Then it was evident from the test results that all these children were infected with *listeria* which was found to have contaminated some of the dairy products such as post-pasteurised milk. This enormous outbreak has left the country's government with a huge task of having to find ways of fighting and preventing food poisoning in the future. Besides the challenges the government is facing, another huge problem is that they should come up with effective strategies of solving this problem without having to order the food production facilities that were identified as sources of *listeria* to close down (Chersich *et al.* 2018:453). The fear of closing down these facilities results from the facts that the action will certainly affect the country's economy, a lot of citizens will be out of jobs and this will raise other issues from another angle.

Allam *et al.* (2018:1), confirm the possibilities of the spread of *listeria* bacteria to other countries and even across the provinces within South Africa due to exported and distributed food products that could have been already contaminated with the bacteria. Dramowski *et al.* (2018:818) confirmed that *listeria* food poisoning outbreak had been discovered in other parts of South Africa besides the Limpopo and Gauteng provinces. This confirmation is related to *listeria* bacterial infection cases that were reported in the province of the Western Cape. Researchers have confirmed that there were reported cases of *listeria* infections that affected new-born children in Cape Town, the children infected were taken care of at the Tygerberg Hospital in Cape Town. The story of *listeria* food poisoning outbreak that occurred in South Africa proves that there is a lack of correct food handling principles in the foodservice establishments. This study seeks to close the gaps in the knowledge of food handlers to help ensure that safe foods are produced for consumption. Although the *listeria* food poisoning outbreak did not occur in the restaurants and hotels, but in the production part of the food supply chain, the findings of research studies on the outbreak suggest that consumer protection

regulation based on safe food supply was not fulfilled due to improper food handling practices during the production, serving, transportation and storage of food.

The outbreak of *listeria* in South Africa relates to this study in the sense that food handling establishments such as the food processing establishment in which the *listeria* outbreak occurred would benefit from the results and recommendations of this study. Again, it indicates the existence of poor and inappropriate food handling practices within the food industry, hence this study seeks to assess the knowledge and practices of food handlers.

#### **2.14 Conclusion**

In this chapter, the researcher discussed food safety, food handlers and foodservice establishment variables. The views, ideas, recommendations, arguments and discussions of researchers from relevant literature regarding knowledge, practices and attitudes of food handlers towards food safety standards were presented. Significant food safety systems and regulations were discussed and motivated by way of diagrams. Chapter 3 will discuss the methodology that followed to conduct this study.



## **CHAPTER 3**

### **Research Methodology**

#### **3.1 Introduction**

This study aims to assess knowledge, attitudes and practices of food handlers in the South African food establishments with regard to food safety. Therefore, this study locates the compliance of food handlers within foodservice establishments with the current food safety standards and regulations. In the previous chapter, the researcher conducted a critical review of the relevant literature. In this chapter, the researcher will discuss the methods that were used to conduct this study. Here the researcher presents the research design, research area of study, target population and its sampling, data collection, validation and administration of the data collection instrument and method of analysis. The explanation of the research method will offer a clear picture of how the research study was designed and carried out. This chapter will be presented in the sequence of the broad plan of the research design in Table 3.1

**Table 3.1: Summary of the Research Design (by researcher)**

<b>DESIGN ELEMENT</b>	<b>TECHNIQUE</b>
Method	Survey research: Quantitative
Purpose	Descriptive
Extent of interference	Minimal
Population/Target population	Food handlers (Chefs and Cooks)
Sampling method	Non-probability sampling
Measuring method	Self-administered questionnaires
Data analysis	Quantitative analysis using SPSS version 25.0
Pretesting	Pilot group of trainee cooks from staff cafeteria in an educational institution in Gauteng
Delimitations	Hospitality foodservice establishments, chefs and cooks in private and public foodservice establishments.
Limitations	Insecurity among participants leading to rejections and refusals to participate. The researcher had limited time for data collection because of full-time employment commitments.
Validity	Face and content validity
Reliability	Cronbach Alpha

### **3.2 Research Design**

According to Rubin and Babbie (2016:244), a research design is a pattern that shows how research has been planned. The research design will be presented as it is in Table 3.1. Brennen (2017:32) concur that a research design shows how data collection, interpretation and analysis will be done in order to reach the research aim and answer the research questions of the study.

In their discussion about research design, Sekaran and Bougie (2016:95) also mention that there are various issues that affect the decisions on the elements of research design such as the purpose of the study, research strategy, location and time horizon. According to Babbie (2016:113), a research design is very important in helping to ensure that the research problem is addressed effectively. As adopted in Table 3.1, a researcher according to Halperin and Heath (2016:146) plans strategically and decides on the best components of the study, which will assist in conducting a successful study. The present study will adopt the Patten and Newhart (2018:13) view for a survey as a non-experimental study in which researchers study participants with the aim of describing them in their natural setting.

### **3.2.1 Purpose of Research**

Babbie (2016:115) outlines the three types of research purposes which are exploratory, descriptive and causal. This explains that a research study can be either exploratory, descriptive or causal. The purpose of this study is considered descriptive as it attempted to describe, by the use of correlations various dimensions of attitude and level of knowledge of food handlers in selected foodservice establishments. This is descriptive research thus per the study objective, describes certain characteristics of people or events and even situations (Rubin and Babbie 2016:529). In their explanation of the concept of descriptive study, Bougie and Sekaran (2016:93) further mention that a descriptive study can be either quantitative or qualitative in nature and that descriptive research can generate both qualitative and quantitative information. Halperin and Heath (2016:262) add that survey research studies can be descriptive, and that the researcher is trying to gather data and provide information about what humans do and how they behave. In this study, the researcher collected quantitative data using self-administered questionnaires. This is a descriptive study as the researcher was aiming to and obtained information about the current status of food handlers regarding knowledge of food safety standards, practices and attitudes towards food safety standards.

### **3.2.2 Extent of Researcher Interference**

The researcher interference was minimal. Sekaran and Bougie (2016:96) explain minimal extent of interference by a researcher as the one in which a researcher conducts a correlational study through questionnaires without interfering much with the target respondents normal work activities.

### **3.2.3 Study Setting**

The study environment suitable for this study and in which this study was conducted was a non-contrived setting. The researcher collected data from a natural setting which is the food establishments within the Gauteng and Eastern Cape provinces, therefore no artificial setting was specifically made for this study (Maheesha and Perera 2018:16). Sekaran and Bougie (2016:100), concur that a correlational study is conducted in a non-contrived environment as opposed to studies of causal or exploratory studies that are conducted in contrived settings such as laboratories.

### **3.2.4 Unit of Analysis**

The unit analysis in a study is key in indicating the level at which the study is being administered (Kumar 2018:76). The unit of analysis in the present study comprises of individuals, namely cooks and chefs. This group is the most relevant unit to analyse, assess and define variables and aspects of this study. Data were collected from each of the cooks and chefs as individuals. This group was analysed to assess and define variables and aspects of this study as it constituted the most relevant unit. Data were collected from each individual unit from the group of cooks and chefs in their various ranks.

### **3.2.5 Time Horizon: Cross-sectional Study**

A research study in which data is collected only once over a specific length of time such as days, weeks and even months is referred to as a cross-sectional study (Sekaran and Bougie 2016:106). With reference to Babbie's (2016:106) explanation, this study is a cross-sectional study as the researcher collected data only once in every study area. The researcher collected data within a period of at least one week from each foodservice establishment. This means that questionnaires that were delivered in the foodservice establishments were collected at least after one week and the data collection process was a once-off activity. Sekaran and Bougie (2016:106) guided the researcher in adopting a cross-sectional study for the researcher planned to collect data over a once-off short period.

### **3.2.6 Selection of Research Technique: Quantitative Technique**

The research method selected for this study was a survey research method. This method was identified to be suitable for this study as the researcher was seeking opinions, attitudes, behaviours and emotions from the target respondents (Babbie 2016:248). Also, the variables are best defined with the use of a survey research through questionnaires. The researcher conducted a survey for it was suitable to obtain answers to the research questions and achieve

the aim of this study. A survey research strategy is used when a group of individuals are studied by collecting and analysing data from a selected sample that will represent the entire population group (Rubin and Babbie 2016:378). This study as a survey research is therefore quantitative as the analysis will be numerical (Sekaran and Bougie 2016:93).

### **3.3 Target Population**

According to Etikan *et al.* (2016:1), a population is the total number of inhabitants, events or things that a researcher is interested in conducting a study on. The population frame from which the sample of 100 respondents was extracted from comprised of cooks and chefs in both commercial and non-commercial foodservice establishments in the Gauteng and Eastern Cape provinces of South Africa. Data collection was conducted at specific foodservice establishments, which were selected based on the accessibility of the area and funds available for travelling. The researcher selected cooks and chefs from foodservice establishments on the basis that they are the most suitable target respondents for this study as it was seeking information on knowledge, attitudes and practices of food handlers towards food safety standards. This selection was also based on the researchers' view that food safety Regulation 638 states that cooks and chefs are expected to comply with food safety standards (Government Gazette 2018:6). The available target population for this study was very large as the study was spread across South Africa. Some members of the target population have been working as food handlers in their current establishments for many years whilst some were fairly new, hence a cohort of cooks and chefs with different work experience time frames were identified to be the best respondents to provide the researcher with the information needed. This study excluded food handlers from other sections of the food supply chain as it focussed on the hospitality foodservice establishments.

#### **3.3.1 Sample of the Target Population**

A sample population is a number or portion made up of population elements that are extracted from the entire population (Etikan *et al.* 2016:1; Hinton 2014:42). Rubin and Babbie (2016:359) concur that the population sample is selected from a target population relevant to the purpose of the study. This principle was applied in this study and cooks and chefs were selected amongst a large population of food handlers, excluding the storage, supply and transportation areas of the food supply chain.

### **3.3.1.1 Determination of Sample Size**

The part of the entire population frame that is extracted by researchers is known as the sample of the target population (Patten and Newhart 2018:27). The total population frame of respondents which comprise of cooks and chefs was extracted from the total number of employees of the food and beverage industry as presented in Annexure I as well as from the government foodservice sector. Annexure I shows that in the quarter of March 2017, the commercial foodservice industry consisted of approximately 270 000 employees. The statistics only include registered restaurants and hotels that had their employee statistics reported by the South African Food and Beverage sector excluding the government sector.

Of the 270 000 employees, about 20% are cooks and chefs. Of the total employees at each restaurant or hotel, 10% to 20% are cooks and chefs (South African Market Insights: Food and Beverage Sector 2019:17). This means that the estimated number of total cook and chef employees in South African restaurants and hotels is 54 000. How many respondents this survey required was based on the desired minimum 95% confidence level within the scarce available resources of the researcher. The confidence was calculated using Check Market online sample size calculator (<https://www.checkmarket.com/sample-size-calculator/>), based on population size determined in Annexure I and the number of respondents. The elements of the calculation included population size  $n=54000$ , margin of error 5% and a confidence level of 95%. The required sample size given was 382 with an estimated response rate of 80%.

Whilst the desired confidence level could be achieved with more than 100 respondents, the researcher was however compelled to limit the sampling size to 100 for financial, logistical and access reasons. Being limited to Gauteng and Eastern Cape provinces ( $N=54000$ ), the adoption of area sampling was, however, reduced to two provinces namely Gauteng and Eastern Cape due to unavailability of financial resources. The negative implications discovered after limiting the sample size were that the margin of error was increased.

This study recruited 100 respondents per the limitations and aforementioned statistics. The researcher targeted to distribute 10 questionnaires to each consenting establishment. This number was initially selected based on the estimated average number of cooks and chefs employed in each foodservice establishment. However, in some establishments, more than 10 respondents were willing to participate, while in some establishments less than 10 food handlers were willing to participate. Even though data were collected from about 25 foodservice establishments, for this study only data collected from eight foodservice

establishments were analysed and reported in this study. The reason for this was that only eight establishments were identified to be covered by the three gatekeepers' letters and these eight establishments provided the 100 targeted participants as follows:

Eastern Cape (Gate Keepers' letter attached as Annexure L)	Gauteng (Gate Keepers Letter attached as Annexure J &K)
1. Foodservice establishment 20	1. Foodservice establishment 10
2. Foodservice establishment 12	
3. Foodservice establishment 16	2. Foodservice establishment 10
4. Foodservice establishment 18	
5. Foodservice establishment 6	
6. Foodservice establishment 8	

While the researcher experienced limitations in obtaining a larger sample, the data collected was exceptionally valuable. Vasileiou *et al.* (2018:10) state that a sample size between 20 and 30 that is derived from a homogeneous population is viewed to be adequate especially when new data seem to be repeating responses. These researchers also suggest that a smaller sample opens opportunities for further research to be conducted on the same phenomenon but in a more expanded population frame. These researchers found that whilst large samples are viewed to be achieving richer results, there were a number of instances where the large samples were discovered to be more problematic than was expected. Therefore, especially in a homogeneous population valuable data collected come from fewer respondents.

The two provinces were assigned as representative research sites as the researcher could only access these provinces and the researcher could only get access to respondents within these provinces. Limitations such as time and travelling costs to other provinces prevented the researcher from being able to distribute questionnaires to other provinces.

### **3.4 Sampling Method**

In this study, the researcher used non-probability purposive sampling for it helps researchers to select samples purposively (Harding 2013:17; Sekaran and Bougie 2016:253). According to Vasileiou *et al.* (2018:2), in purposive sampling the sample sizes are much smaller than in probability samples, non-probability sampling is suitable for research studies that require only the relevant population. The latter are specific groups that the researcher selected knowing that they are the right respondents to give the required information during the survey (Babbie 2016:187). The sample was selected on the basis that respondents met specific requirements of this study; hence the sampling was not done randomly. Hinton (2014:42) states that purposive

means that the researcher has the purpose of selecting a specific group and is not necessary to select the sample randomly from a wider population and environment. The sampling used for this study was qualitative even though the study and data analysis are quantitative (Kumar 2018:76). Consistent with Babbie (2016:187), purposive non-probability sampling excluded kitchen personnel who are not food handlers.

Purposive sampling was selected on the basis that the researcher was targeting respondents who are cooks and chefs on the basis of personal judgement that they are the most suitable for this study. The researcher's judgement for sample inclusion was informed by the research problem and research objectives. The problem clearly states that the cause of foodborne diseases is associated with food poisoning which is then associated with poor handling of food. Hence, the researcher believed that cooks and chefs as food handlers were the perfect participants to provide the required information that can be used to solve the problem. The study was limited to two South African provinces as per Sekaran and Bougie's (2016:258) definition of area sampling, which explains that this sampling is often used where there are geographic sections of the population such as provinces, city blocks or municipality areas.

### **3.5 Data Collection**

The researcher obtained permission from the foodservice establishments before collecting data. In some establishments, permission was granted and confirmed in the form of a gatekeepers' letter. For data collection, the researcher used self-administered questionnaires. The researcher delivered hard copy questionnaires in person to the selected study sites. The researcher ensured that prior arrangements were made with the participants and managers on how long the questionnaires would be left for completion and when they would be collected.

The researcher gave managers detailed instructions regarding the successful completion of questionnaires. The information, consent letter and questionnaire were read through and explained to the managers so they could be able to explain the instruction to the respondents. Managers were specifically advised that respondents are to read through the information letter, consent letter and specific instructions given for each section in the questionnaire and thereafter sign and provide feedback as requested.

The researcher collected completed consent and questionnaires from the foodservice establishment as per prior agreement with the participants. The targeted length of time from dropping off the questionnaires to collection was one week for each foodservice establishment. However, due to unforeseen circumstances, the researcher had to extend the period and



collected questionnaires in 12 establishments after more than the one week that was planned, and some questionnaires were collected within a shorter period.

### **3.5.1 Measuring Instrument**

The researcher used a quantitative data instrument in the form of self-administered questionnaires. Babbie (2016:248) defines a questionnaire as questions presented in a form of a document. The questions in this document are aimed at collecting data in survey research and experiments. Sekaran and Bougie (2016:148) concur that questionnaires are documents that present written questions specifically set to collect data. The questionnaires were designed in a manner that would provide data relevant to the research questions and that would enable the findings to address the research problem (Rubin and Babbie 2016:219). The questionnaire was designed for completion by only cooks and chefs in their various ranks at the foodservice establishment. Self-administered questions were most suitable for this study and were selected on the basis that this is a survey research study, hence the study method is described as quantitative. AS this is a descriptive research study, the questionnaire was the best instrument to include closed-ended questions to measure the respondents' demographical traits, attitudes, behaviour and opinions. The questionnaire consisted of 54 items, comprising measures at the nominal and ordinal levels. The questionnaire was divided into 5 sections which measured various themes necessary for the study.

1. Biographical data
2. Knowledge of food handlers
3. Practices
4. Attitudes
5. Level of food safety in food safety establishments

#### **3.5.1.1 Design of Questionnaire**

The questions were set to assess respondents' attitudes, practices and knowledge of food safety standards and were separated into the five sections mentioned earlier. The research objectives of this study were each addressed in the questionnaire. The questionnaire was designed by the researcher, hence referred to as a self-administered questionnaire and consisted of the following 5 sections:

1. Section 1 consisted of a total number of 3 questions requiring the demographic characteristics of respondents,
2. Section 2 presented a total number of 10 questions on the knowledge of food handlers,
3. Section 3 presented a total number of 20 questions on practices by respondents,
4. Section 4 presented a total number of 10 questions on attitudes of respondents, and
5. Section 5 presented a total number of 11 questions on the level of food safety in food safety establishments.

The questionnaire consisted of 51 plus 3 separate personal data questions which give a total of 54 questions and 2 pages in total. Out of the 54 questions, there were 3 nominal scale questions which required demographic information of the respondents, 2 open-ended questions and 39 closed questions. The questionnaire also comprised different scaling such as 10 interval or Likert scale questions, 3 nominal scaling questions, 11 dichotomous scale questions and 3 graphic rating scale questions. Research objective number one was addressed in section two and three with a total number of 31 questions. The second objective was addressed by 10 questions in section 4 of the questionnaire. All questions in the instrument were presented in English only. The third and last objective were addressed by 31 questions in sections three and five. The expected time to complete the questionnaires was estimated to be between 15 to 20 minutes

### **3.5.2 Questionnaire Administration**

After conducting the pilot study detailed in 3.6, all the necessary editing based on the pilot study results and oral comments were done. There were 100 copies of questionnaires distributed among the respondents. The questionnaires were distributed in March 2018 and were collected in parts until July 2018. The researcher personally distributed some of the questionnaires in each foodservice establishment within the targeted area in which access was granted. The collection of questionnaires was done by the researcher but due to limited time, the researcher also requested someone to collect and distribute some of the questionnaires. The researcher was not available during the completion of questionnaires. In order to ensure that participants could reach her telephonically for further information, the researcher's contact details were included in the information letter. Pens were made available to participants. As the researcher had planned to leave the questionnaires for at least one week in each foodservice establishment for respondents to complete at any time within that week. No specific venue was

planned for the process. The questionnaires were given to each cook or chef who was willing to participate in the survey. To minimise the chances of rejections, the researcher explained to respondents the value of their contribution to this study and assured them that their participation will be protected by ensuring that questionnaires are kept as confidential documents.

The researcher personally collected some of the completed questionnaires directly from the foodservice establishment and trusted someone to collect some due to work and time constraints. Prior to collection, the researcher contacted the relevant persons to check if there were any questionnaires ready to be collected.

### **3.5.3 Data Analysis**

In quantitative data analysis, data is coded and captured on a software system. Collected data also requires interpretation in order to be understandable (Rubin and Babbie 2016:505; Hinton 2014:20). Bestley and Noble (2016:92) define quantitative analysis as the approach of presenting data in a numerical form that makes it easy to perform mathematical data analyses. Halperin and Heath (2016:13) concur by stating that quantitative research expresses data as the descriptive explanation with numbers. With guidance from Hinton (2014:7), data collected for this study were coded and captured in a SPSS version 25.0 software system with the chi-square test and was interpreted and represented by graphs, bar and pie charts in Excel. Data analysis was performed with the use of bivariate analyses.

Quantitative methods of inquiry were applied in order to achieve the objectives. If the research problem is clearly stated and research questions require answers from specific respondents, a quantitative method such as questionnaires are suitable to collect data (Brannen 2016:4). Hence data that was analysed was collected with the use of questionnaires.

#### **3.5.3.1 Correlations**

The present investigation is a correlational study that analyses and describes relationships between practices and knowledge of food handlers towards food safety regulations and principles. The Spearman Rank Correlation was used based on Hinton's (2014:301) guidelines to measure the strength of association between the two variables.

#### **3.5.3.2 Factor Analysis**

According to Hancock *et al.* (2018:98), factor analysis is a statistical technique whose main goal is data reduction. A typical use of factor analysis is in survey research, where a researcher wishes to represent a number of questions with a small number of hypothetical factors. For example, as part of a national survey on political opinions, participants may answer three

separate questions regarding environmental policy, reflecting issues at the local, state and national level. Each question, by itself, would be an inadequate measure of attitude towards environmental policy, but together they may provide a better measure of the attitude. The researcher adopted this technique to reduce and group some questions that were meant to establish the same variable. Researchers further state that factor analysis can be used to establish whether the three measures do, in fact, measure the same thing. If so, they can then be combined to create a new variable; a factor score variable that contains a score for each respondent on the factor (Hinton 2014:190). Factor techniques are applicable to a variety of situations. A researcher may want to know if the skills required to be a decathlete are as varied as the ten events, or if a small number of core skills are needed to be successful in a decathlon. An investigator need not believe that factors actually exist in order to perform factor analysis, but in practice, the factors are usually interpreted, given names, and spoken of as real things (Sardinha and Pinto 2019:100).

### **3.6 Pretesting**

A pilot study was conducted with 10 respondents from the ranks of professional chefs, cooks and hospitality and foodservice specialists such as food technologists, food scientists, dietitians and lecturers in one of the South African Universities in the Gauteng Province. The purpose for conducting a pilot study was to ascertain whether the survey instrument and data collection method were suitable and if it required to be adjusted or edited. The pilot study was undertaken with the aim of assessing the reliability, validity and quality of the questions as well as ensuring that the wording is clear, understandable and relevant to the research questions (Rubin and Babbie 2016:129). The pretesting was performed with the aim of ensuring content validity as well as face validity. Content validity may be tested by checking whether the instrument adequately measures the main concept or theme of the study (Bernard 2017:41). Test-retest reliability was achieved by conducting a pilot study with the same questionnaires in the same establishments twice. The revised questionnaire was retested with respondents from the same establishments with minimal further amendments.

Respondents selected for the pretesting were not included in the final sample of respondents for the actual study. The initial questionnaire was edited following the pilot study. The researcher added more questions in order to get more precise results for the final study. During the pilot study, the researcher established the need to reword some questions to make them clearer and easily understood by the reader. The editing of the questionnaire involved rearranging questions according to sections referring to each variable.

The purpose of a pilot study was to test the compatibility and relevance of the questions to the respondents and check ability to answer the research questions and accomplish the aim and objectives. Rubin and Babbie (2016:129) emphasise the importance of undertaking a pilot test on the questionnaire before conducting the actual survey, to test the validity and quality of the questions. Sekaran and Bougie (2013:158) further explain that pretesting the questionnaires helps to ensure that the questions are error free, clear, and understandable by participants. It is then from the findings and further refining of the questionnaire after the pilot study that a final questionnaire will be finalised.

### **3.7 Validity and Reliability**

Reliability and validity describe correctness, genuineness, well-founded, certainty and trustworthiness of a condition, information or anything in any environment (Bernard 2017:41). The questionnaire developed by the researcher for this study was tested for both face and content validity. Reliability and validity describe the soundness and goodness of the study and that its results can be relied upon to be replicated when similar situations arise (Babbie 2016:344). According to Sekaran and Bougie (2016:221) validity indicates the ability of the instrument used to measure accurately.

#### **3.7.1 Reliability**

Internal consistency aspect of reliability was ensured per the intent of Sekaran and Bougie (2016:349) who explain reliability as the consistency in measurement and relying on the same findings to solve problems in the case of similar issues that may arise and require the same study to be conducted. The reliability of the research instrument was ensured by conducting a pilot study and similar or related questions were asked and checked if they give similar answers. With the guidance from Bernard (2017:42), internal reliability of questionnaires was ensured with reference to the Theory of Planned Behaviour. This theory was adopted to ensure that questions assessed attitudes, behaviours and knowledge of food safety practices and regulations.

According to Taber (2018:1275), Cronbach's alpha statistic is used to determine the internal reliability of a measuring instrument. This tool is regarded as the most effective tool to measure reliability of research instrument. Cronbach's alpha coefficient values for this research met the minimum scores of 0.60 suggested by (Hinton *et al.* 2014:351). Babbie (2016:344) states that reliability is the extent to which the study and the findings can be used repeatedly in similar cases. During the pilot study, the researcher gave the same questionnaires twice at different

intervals to the same foodservice professional bodies to test if they gave the same results or questions were understood. The results, however, had slight differences when compared to the first attempt of piloting, this explained the change in attitudes, knowledge and even honesty levels of the respondents. At the same time, it could be there were improvements and updates in their foodservice establishments, knowledge and practices.

### **3.7.2 Face Validity**

Sekaran and Bougie (2016:228) and Bernard (2017:43) explain face validity as how an instrument appears to test what it is meant to. Face validity was ensured by pre-testing the questionnaires on 10 food handlers comprising of well experienced professional chefs, and foodservice and hospitality specialists and lecturers.

### **3.7.3 Content Validity**

The foodservice technologists, professional chefs and hospitality specialists assessed the questionnaire to verify the suitability of the instrument, thereafter the questionnaire was updated based on the feedback and comments. The researcher had to first establish if participants understood and could read English as the pre-testing questionnaires were written in English only. This assisted in identifying difficulties that could possibly arise during the actual study and the questionnaire was edited accordingly. Content validity was also ensured by a review of the instrument by three experienced researchers in the Department of Life and Consumer Sciences, including Hospitality Management Science, at the selected higher education institution (Bernard 2017:44).

## **3.8 Anonymity and Confidentiality**

Bernard (2017:167) emphasises the importance of giving assurance of anonymity and confidentiality to respondents before conducting surveys and interviews. The researcher reminded respondents in the letter of information that anonymity and confidentiality will be maintained. As stated in the letter of information, confidentiality and anonymity of records identifying the participants will be retained by the Durban University of Technology at the Department of Hospitality and Tourism.

### **3.8.1 Anonymity**

Anonymity was ensured by giving the participants an option of not putting their names or any personal information on the questionnaires or even engaging directly with the researcher so they could not be identified. There were food handlers who were willing to participate but not willing to make their identity known, therefore arrangements were made with the respondents

not to meet or engage directly with the researcher and not to include their personal identification information. Babbie (2016:65) concurs that researchers ensure anonymity when they and any other bodies that will read the findings and results of the study cannot identify who gave a certain response during a survey or interviews. The respondents' right for their participation to be private was accordingly assured. The researcher allowed participants who did not feel comfortable with being identified not to include their personal information. According to Bernard (2017:167), anonymity is described as preventing personal identification of the participants by allowing them to participate in the survey without them having to disclose their identity.

### **3.8.2 Confidentiality**

The researcher distributed to participants a consent form stating that the information provided by participants would be anonymously processed into the study report. Despite some participants' willingness to write their personal identification details, the researcher will still continue to ensure confidentiality. Researchers ensure confidentiality when they know the respondents' personal information or can identify them and know who gave a particular response (Babbie 2016:65). Then they promise respondents that the information they provided is safe and will not be published. Completed questionnaires will be disposed of after being stored privately until the study is fully completed and they are not required anymore. The researcher would still ensure that identifiable information such as the names of the foodservice establishments and the respondents shall not be disclosed (Brennen 2017:186). The identities of respondents who included their names and any other confidential information shall be protected during the entire process of the study and even after it has been completed. Confidentiality refers to maintaining confidential data and ensuring that private information is protected and stored appropriately that no unauthorised subjects may have access to it (Bernard 2017:167). Confidentiality was assured by not using the food establishments' names during the discussions and will be ensured even during presentation of the research findings and results. The researcher will be bound liable for any breach of agreement that is written and signed on the consent letter with regards to ensuring anonymity and confidentiality.

### **3.9 Ethical Considerations**

Ethical clearance for this study was obtained from the Durban University of Technology that issued ethics clearance number 206/16FREC. In keeping with the University ethics research protocol, the researcher issued information and consent letters to all participants to furnish respondents with research information and guarantee the maintenance of confidentiality and

anonymity. The researcher also obtained permission to collect data from the foodservice establishments and the confirmation for granted permission was obtained in the form of the gatekeeper's letters.

### **3.10 Conclusion**

In this chapter, the research methodology that was followed and the research techniques used for this study were justified. These incorporated the methods that the researcher used in collecting data to affirm the congruence of the research design with the study objectives. The research study area where this study was conducted, and details of data collection were explained. The chapter ended with presenting information on obtaining ethical clearance for the study. The next chapter will present the presentation, interpretation and discussion of results of the study.



## CHAPTER 4

### Statement of Findings, Presentation, Interpretation and Discussion of the Data

#### 4.1 Introduction

Chapter 3 presented the methodology applied in this study. In this chapter, the researcher will present a report on primary and secondary investigations. In so doing, the chapter will discuss statistical results and specific interpretations as gleaned from literature and respondents' views.

#### 4.2 Presentation

The collected data were analysed with SPSS version 25.0. The results will be presented as descriptive statistics in the form of graphs, cross tabulations and other figures as Hinton *et al.* (2014:35) suggest. Inferential techniques include the use of correlations between variables and chi-square test values, which are interpreted using the p-values. The Kaiser-Meyer Olkin (KMO) and Bartlett's Tests will also be presented to indicate the suitability of data.

#### 4.3 Sample Response

In total, 100 questionnaires were despatched and 100 were returned which gave a 100% response rate. Some questionnaires were collected partially complete, therefore, the researcher had to record the unanswered questions. This recording technique is recommended by Kuha *et al.* (2017:1) who state that missing responses in surveys are commonly perceived as not existing or sometimes as those respondents do not have or know the answers. The response summary is presented in the Table 4.1.

**Table 4.1: Response summary**

<b>Total target number of respondents</b>	<b>100</b>
<b>Actual number of respondents</b>	<b>100</b>
<b>Rate of response</b>	<b>100%</b>

#### 4.4 Reliability Statistics

The two most important aspects of precision are reliability and validity (Rubin and Babbie 2016:129). Hinton *et al.* (2014:351) suggest that reliability is computed by taking several measurements on the same subjects and the reliability coefficient of 0.60 or higher is considered as "acceptable" for a newly developed construct. Table 4.2 reflects the Cronbach's

alpha score for 8 items included in the questionnaire. According to Taber (2018:1275), Cronbach's alpha statistic is commonly used by researchers to determine that research instruments have been tested for reliability.

**Table: 4.2: Reliability Statistics**

Cronbach's Alpha	N of Items
0.616	8

Item-Total Statistics				
	Scale Mean if Deleted	Scale Variance if Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Deleted
Foodborne sicknesses are caused by the ignorance and not complying with food safety management system by food handlers.	7.6700	2.203	0.234	0.659
Safe and proper food handling is an important part of my job responsibilities as a food handler.	7.8500	2.715	0.211	0.615
Food handling relates to food safety.	7.8300	2.264	0.565	0.502
Raw foods should be kept separately from cooked foods.	7.8500	2.513	0.356	0.571
Food handlers should use cap, masks, protective gloves, and adequate clothing to reduce the risk of food contamination.	7.8500	2.513	0.426	0.552
It is important to know the temperature of the refrigerator to reduce the risk of bacteria growth in food.	7.9100	2.871	0.297	0.592
Improper storage of foods may be hazardous and cause food poisoning.	7.9400	2.946	0.396	0.588
Food handlers (chefs) with cuts on hands should not touch unwrapped foods.	7.9600	2.988	0.502	0.589

The reliability scores exceed the recommended Cronbach's alpha value. This indicates a degree of acceptable, consistent scoring for these sections of the data collection instrument (Hinton *et al.* (2014:351).

**4.4.1 KMO and Bartlett's Tests**

Table 4.3 represents **Kaiser-Meyer-Olkin Measure of Sampling Adequacy and Bartlett's Test of Sphericity** tests that indicate the suitability of data and results on Principal Component Analysis's relevance for variables. The **KMO quantitative results** indicate the proportion of variance in the examined variables that might exist (Vitasari 2018:3). The Kaiser-Meyer-Olkin Measure of Sampling Adequacy value should be greater than 0.500 and closer to 1.0 to indicate that factor analysis may be regarded as effective.

**According to** Vitasari (2018:3), **Bartlett's test of sphericity** measures the hypothesis that a correlation matrix is an identity matrix. It tests if there are relationships existing between variables. Therefore, determining whether those relationships are not useful for structure detection or requirements for variable relationships are met. The significance level of 0.05 indicates that factor analysis may be useful with the data. Therefore, Bartlett's test of Sphericity significant value should not be less than 0.05.

**Table 4.3: KMO and Bartlett's Test**

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.588
Bartlett's Test of Sphericity	Approx. Chi-Square	238.837
	Df	45
	Sig.	0.000

Table 4.3 indicates a KMO value of 0.588 for the results of factor analysis obtained by using KMO Measure of Sampling. This confirms that the results of the factor analysis are useful (Hinton 2014:277). Bartlett's test of Sphericity also indicates that the significance level .000 indicates that factor analysis may be useful with data.

#### **4.4.2 Rotated Component Matrix**

According to Lubis *et al.* (2018:1041), rotated component matrix is also known as loadings and it provides estimates on the correlations between variables. Researchers add that reporting of all loadings is crucial to enable the audience to understand the findings analysis better. The matrix tables are preceded by a summarised table that reflects the results of KMO and Bartlett's Tests. The requirement is that Kaiser-Meyer-Olkin Measure of Sampling Adequacy should be greater than 0.50 and Bartlett's Test of Sphericity less than 0.05 (Approx. Chi-Square). In all instances, the conditions are satisfied which allows for the factor analysis procedure. Factor analysis is done only for the Likert scale items. Certain components were divided into finer components. This is explained below in the rotated component matrix. The factor loadings reported are presented in Table 4.4. The highlighted values in Table 4.4 show only factor loadings that are moderate to very good. However, only factors with three or more variables presented as those that are good.

**Table 4.4 Rotated Component Matrix**

	Component			
	1	2	3	4
Foodborne sicknesses are caused by the ignorance and not complying with food safety management system by food handlers.	0.039	0.633	-0.110	-0.319
I often feel it is not necessary to wash my hands every time I prepare foods or change activities due to high pressure and workload. I therefore ignore and just do my work. Rate your level of attitude.	-0.061	-0.046	-0.163	0.767
Safe and proper food handling is an important part of my job responsibilities as a food handler.	0.270	-0.005	0.697	-0.007
Undergoing food safety training is important to me.	-0.147	0.045	0.861	-0.065
Food handling relates to food safety.	0.650	0.497	0.225	-0.071
Raw foods should be kept separately from cooked foods.	-0.043	0.805	0.097	0.225
Food handlers should use cap, masks, protective gloves, and adequate clothing to reduce the risk of food contamination.	0.338	0.572	0.028	0.082
It is important to know the temperature of the refrigerator to reduce the risk of bacteria growth in food.	0.418	0.174	0.157	0.597
Improper storage of foods may be hazardous and cause food poisoning.	0.883	-0.016	-0.008	0.185
Food handlers (chefs) with cuts on hands should not touch unwrapped foods.	0.875	0.113	0.028	-0.038

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 5 iterations.

According to Hinton (2014:277), factor analysis is a statistical technique whose main goal is data reduction. It is therefore used to decrease too many variables by combining highly correlated variables (Zhao *et al.* 2019:2). Thus, grouping of long series questions into short series questions. Researchers further explain that typical use of factor analysis is in survey research, where a researcher wishes to represent a number of questions with a small number of hypothetical factors. With reference to Table 4.4:

- The principle component analysis was used as the extraction method, and the rotation method was Varimax with Kaiser Normalization. This is an orthogonal rotation method that minimises the number of variables that have high loadings on each factor. It simplifies the interpretation of the factors.
- Factor analysis/loading show inter-correlations between variables.
- Items of questions that loaded similarly imply measurement along a similar factor. An examination of the content of items loading at or above 0.5 and using the higher or highest loading in instances where items cross-loaded at greater than this value effectively measured along the various components.
- Correlations are described as either trivial or trivially small, this means that all correlations less than 0.3 are trivial and those that are negative or at 0.0 are trivially small.

It is noted that the variables that constituted Question 4 loaded along 4 components sub-themes. This means that respondents identified different trends within the section. Within the section, the splits are colour coded.

Table 4.4 shows that there is strong to very strong correlations between “Food handling relates to food safety”; “Improper storage of foods may be hazardous and cause food poisoning”; “Food handlers (chefs) with cuts on hands should not touch unwrapped foods” and component 1. Thus, the composition of component 1 seems to be a measure of the knowledge of food handlers regarding food safety standards.

There also seems to be a strong correlation between “Foodborne sicknesses are caused by the ignorance and not complying with food safety management system by food handlers”; “Raw foods should be kept separately from cooked foods” ; “Food handlers should use caps, masks, protective gloves, and adequate clothing to reduce the risk of food contamination” and component 2. Thus, the composition of component 2 seems to be measures of practices and attitude of food handlers towards food safety.

The two components were named accordingly as follows:

➤ *Factor 1: Food safety principles*

Abuchi *et al.* (2016:269) state that the gap in knowledge of food handlers towards food safety principles has been identified to have a negative impact on foodservice business industry. The great numbers of food poisoning outbreaks’ publicity have been identified to have resulted in bad publicity which then resulted in loss of customers, investors and other associated setbacks.

Griffith *et al.* (2017:729) state that some previous research results on food safety have proven that there is a great lack of knowledge amongst food handlers within South African foodservice establishments. This lack of knowledge explained by the results is likely to be associated with inefficient and ineffective food safety management principles and systems. Food safety principles are meant to control food handlers' practices, and behaviour during food handling in order to prevent food contamination.

➤ *Factor 2: Food safety practices*

Improper handling of food has been identified to be amongst the major causes of food contamination. According to Darko *et al.* (2015:2664), improper food handling practices comprise preparing, storing, transporting and serving food under unhygienic conditions and incorrect temperatures. Woh *et al.* (2016:73) state that improper food practices are associated with bad attitudes of food handlers such as ignoring basic hygienic principles.

## **4.5 Sections Analysis**

The sections that follow will analyse the scoring patterns of the respondents per variable per section of the questionnaire (Annexure C). The results are first presented using summarised percentages for the variables that constitute each section. Results are then further analysed according to the importance of the statements.

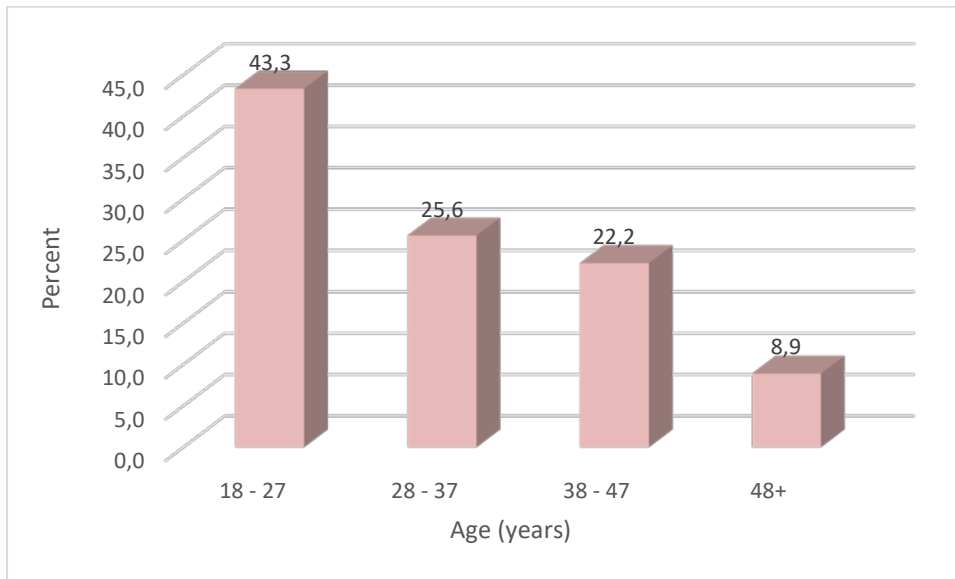
### **4.5.1 Section 1: Socio-Demographic Data**

This section summarises the biographical characteristics of the respondents per responses in Annexure C. It was found to be essential to know some biographical information of respondents, for example, occupation. As this survey targeted specific respondents, some of the biographical categorisations allowed the researcher to determine whether the questionnaires were completed by the target sample population. Knowing this information also facilitates effective studying and provides certainty that data collected relevant as it is provided by the right respondents (Tuominen *et al.* 2017:59).

#### **4.5.1.1 Overall distribution by age**

Figure 4.1 describes the overall distribution by age. The ages of cooks and chefs employed or working in foodservice industry may be used to evaluate their level of knowledge, skill and commitment towards food safety. Significance of age of respondents in this study is based on

a view that age is one of the crucial characteristics in understanding respondents' ideas, perceptions and views (Ardelt *et al.* 2018:1340).

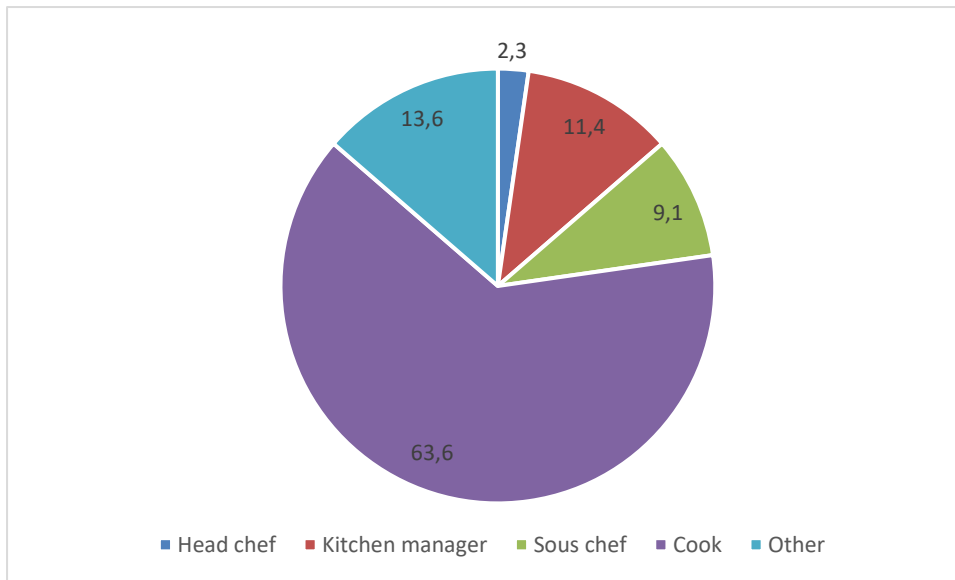


**Figure 4.1: Age**

Age of respondents can be used to assess the level of maturity of the respondents (Ardelt *et al.* 2018:1340). Therefore, knowing the age of respondents helps to examine responses for trustworthiness and relevancy. Figure 4.1 shows the different ages of food handlers who participated in this survey. There were 8.9% of food handlers who belonged to the age group of 48 years and above. Between the ages of 38 and 47, there were 22.2% respondents who belonged to this age group. Figure 4.1 also indicates that only 25.65% of respondents were between the ages of 28 and 37. The majority of respondents are represented by 43.3% that belonged to ages between and 18 and 27. There were significantly younger respondents in the sample ( $p < 0.001$ ). The ages of respondents depicted in Figure 4.1 show that all respondents can be perceived as adults and therefore their responses and views in this study can be declared as valid, relevant and trustworthy based on maturity level. Literature supports the assumption that the fraction of respondents 43.3% were employed in the foodservice establishments directly after matric (Romero *et al.* 2018:3). This assumption is based on the South African age standards of education that learners should complete matric at the age of 18 years. The majority (43.3%) is generally considered as being the most with little knowledge towards food safety standards and therefore poor food handling practices.

#### 4.5.1.2 Occupation of Food handlers

Figure 4.2 below indicates the occupational title of respondents. Occupational title as directly related to education level is one of the most important factors that affect food handlers' attitudes, the way they perceive and understand food safety standards and the importance of implementing and practising them (Susilowati 2018:415). Hence "Position of Food Handlers" was investigated and data pertaining to this variable is presented in Figure 4.2.



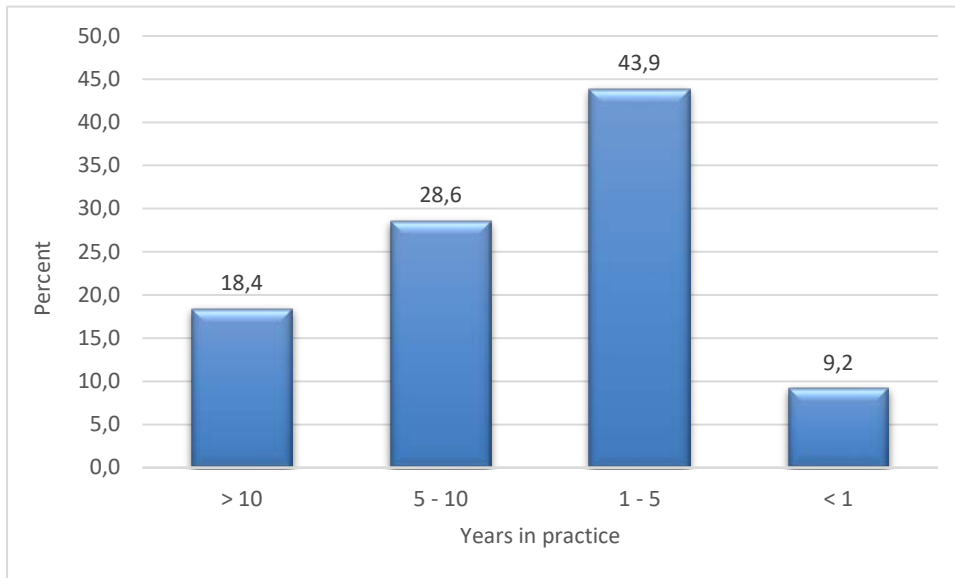
**Figure 4.2: Position**

Nearly two-thirds of the sample were cooks ( $p < 0.001$ ) represented by 63.6%. The smallest grouping was that of head chefs (2.3%), this is keeping with ratios in the industry for a site is expected to have one head chef for the entire site or a particular shift. It is also given that there were 9.1% sous chefs. The respondents who selected "other" (13.6 %) for their response were identified to have been belonging to student chef trainees and chef interns. These results are in keeping with the food industry ratios of employment as the majority of food handlers comprise of cooks and student chefs (Losekoot *et al.* 2018:156). These findings are confirmed in the literature that food handlers are promoted as they gain more years in experience and improvement in education levels (Susilowati 2018:415). The lack of work experience and low levels of education determining the occupation levels are directly linked to food handlers' poor food safety knowledge.



### 4.5.1.3 Length of Service

Figure 4.3 indicates the length of service of the respondents. The reason for obtaining respondents' work experience length was to establish a relationship between their level of work experience and the levels of knowledge towards food safety standards.



**Figure 4.3: Years in Practice**

Approximately half of the respondents (47.0%) had been in employment for more than 5 years ( $p < 0.001$ ). This implies that respondents had been employed for a while and this is also a useful fact as it indicates responses from experienced workers. Newly employed respondents were found to be the minority of 9.2%; these are respondents who could be perceived to still need training and skills development in the industry. This analysis clearly indicates that foodservice industry employees do not last long in their positions within the industry as the graph indicates that the majority (53.1%) are new in their employment. Thus, a high staff turnover rate may be inferred from Figure 4.3. Abo-Murad *et al.* (2019:2) concur that the staff turnover is high within foodservice industry. It was observed that even though some respondents had worked in the foodservice industry for more than 5 years, they still lacked knowledge and did not practice food safety principles. Work experience of respondents is linked to the age of respondents in the sense that age can determine how long the respondent could have been employed and vice versa.

## 4.5.2 Section 2: Knowledge of Respondents

Much of the data collection instrument (Annexure C) was specifically designed to collect data on the knowledge of food handlers towards food safety standards. According to McFarland *et al.* (2019:1242), results of prior studies on food safety training, knowledge and attitudes of food handlers towards food safety standards show that overall knowledge of food handlers is limited to very basic hygiene practices.

### 4.5.2.1 Level of Food Hygiene Training

Table 4.5 below indicates the level of the food hygiene training respondents had received. This question holds relevance to the aim of study objective one that seeks to investigate food safety knowledge and practices. Food hygiene training has the potential to respond to attitudes of food handlers towards food safety in objective two.

**Table 4.5: Food hygiene training**

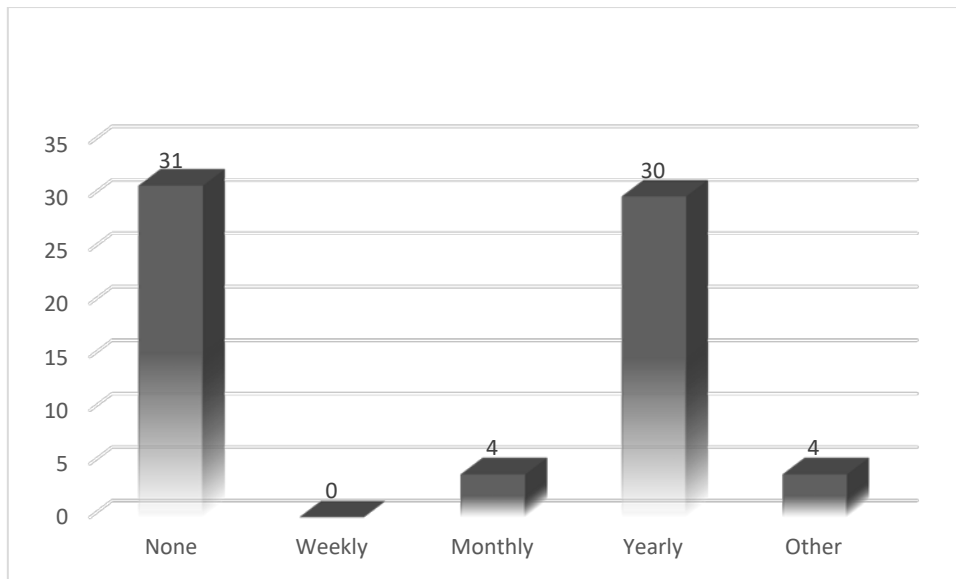
			Have you received basic food hygiene training?
			Yes
Please rate the level of your food hygiene training	Foundation food hygiene	Count	54
		% within Have you received basic food hygiene training?	58.7%
	Advanced food hygiene	Count	29
		% within Have you received basic food hygiene training?	31.5%
	Any other relevant food hygiene	Count	9
		% within Have you received basic food hygiene training?	9.8%
Total		Count	92
		% within Have you received basic food hygiene training?	100.0%

According to Yu *et al.* (2018:72), repeated food poisoning incidents occur within the foodservice industry. Hence the researchers correctly suggest that the level of food safety training that food handlers possess be investigated. Baluka *et al.* (2015:31) recommend that

food safety training for food handlers should be improved and controlled in foodservice facilities where food tested positive of bad bacteria. McFarland *et al.* (2019:1239) concur and suggest that examining the effectiveness and level of food safety training is crucial in order to ensure food handlers are properly trained. Of the 92 respondents who indicated that they had received training, the majority (58.7%) had received foundational food hygiene training. The 29 respondents who indicated that they received food hygiene training confirmed that their level of training is advanced which means they have more in-depth food safety knowledge as compared to those who received foundation training. There were 9.8% of respondents who did not identify the specific level of food hygiene training but indicated that they have received food safety and hygiene training. These results are alarming as it is clear that not all food handlers have received proper training. The analysis also indicates that 8 respondents did not give their feedback and this raises a concern. Food safety training forms part of the training and development activities for employees and it has numerous benefits to the foodservice businesses, such as improved food safety, growth, survival in this complex competitive industry and reaching objectives (McFarland *et al.* 2019:1239). Choi *et al.* (2016:200) identifies at least 5 important food safety topics on which food handlers should be trained on; these topics include personal hygiene, time and temperature controls, cross-contamination, cleaning and sanitising of surfaces and equipment, and micro-organisms.

#### **4.5.2.2 Frequency of Food Safety and Hygiene Development Refresher Training**

Food handlers were asked about the frequency of food safety and hygiene development refresher training. The refresher training is undertaken to keep up with and ensure that food handlers do not forget the food safety practices and standards; also, to remind them of the importance of ensuring that these food safety standards are implemented and practiced continuously.



**Figure 4.4: Frequency of refresher training**

McFarland *et al.* (2019:1245) state that learning and training on food safety should be supplemented with continuous refresher training to allow food handlers' memories and knowledge to be up to date always. Researchers further state that even though learning happens successfully, knowledge and skills deteriorate as memory fades over time. The responses presented in Figure 4.4 represent answers to the question regarding the frequency of food safety and hygiene development and refresher training. This question sought to find how often the employer provides training for its existing employees to keep up with food safety regulations and their knowledge and practices. 31% of respondents stated that there is no training offered to refresh their knowledge of food safety. There were zero responses to the option "weekly" for the frequency of refresher training. Only 4% of the respondents indicated that they do receive refresher training every month. A significant 30% of respondents confirmed that they do get refresher food safety training every year. There were 4 respondents who indicated that none of the options provided was relevant to their responses and therefore they selected the "other" option. This means that these 4 respondents do receive refresher training but times or frequencies were not stated in the options. According to food safety standards, foodservice establishments should provide refresher training on food safety every 12 months (McFarland *et al.* 2019:1245). Therefore, 31% that indicated they did not receive food safety refresher training in the past 12 months, and this raises concerns regarding food safety in foodservice establishments.

#### 4.5.2.3 Food Safety Training in the Past 12 months

Respondents were asked if they had participated in food safety training in the past year. Food safety regulations require food handlers to be trained on food safety immediately after being hired as cooks or chefs and retrained after 12 months (McFarland *et al.* 2019:1243).

**Table 4.6: Most recent food safety training**

	Frequency	Percent
Yes	75	80.6
No	18	19.4
Total	93	100.0

A significant number (80.6%) of respondents indicated that they had received training in the past year ( $p < 0.001$ ). The 19.4% of respondents who indicated that they have never received food safety training in the past year confirm the lack of food safety knowledge which results in bad food handling and hygiene practices. It would be interesting to find out the reasons for the 19.4% that did not receive food safety training in the 12 months (McFarland *et al.* 2019:1245). This is based on a food safety training principle that food safety training should be conducted and refreshed every 12 months (Yu *et al.* 2018:72). Therefore, in a period of 12 months all food handlers' food safety training reports ought to be up to date. This is so even whether the food handler has been employed for less than 12 months, food safety training should start immediately on employment. Some studies have assessed the efficacy of food safety training and the results were fair in terms of improvement in respondents' knowledge (McFarland *et al.* 2019:1245). Therefore, it is essential that food safety training is assessed to check if it serves its purpose, this can be done with assessing and getting feedback from trainees.

#### 4.5.2.4 Knowledge of Chemical, Biological and Physical Hazards

Table 4.7 indicates the knowledge of respondents on chemical, biological and physical hazards. A knowledge of these hazards is essential in the process of preventing food poisoning incidents.

**Table 4.7: Potential harmful hazards**

	Frequency	Percent
Yes	71	74.0
No	13	13.5
Not sure	12	12.5
Total	96	100.0

A food safety hazard can be described as a substance, object, or contaminants that when come into contact or exposed to food can cause foodborne illness (Fels-Klerx *et al.* 2018:1172). According to Khairani (2018:270), ISO 22000 a food safety management system outlines the three types of potential food safety hazards and these are biological, chemical and physical hazards. Three quarters (74.0%) of the respondents indicated that they understood what was meant by the different types of hazards ( $p < 0.001$ ), while 13.5% confirmed that they had no knowledge and 12.5% were uncertain. This lack of knowledge is a great hazard on its own towards consumers as this proves that food hygiene practices are compromised. Knowledge of potential food safety hazards is essential for food handlers to be able to identify when these hazards exist in the food handling areas. Even though Table 4.7 suggests that the majority of respondents (74.0%) were educated about food safety, 13.5% and 12.5% that indicated they did not have sufficient knowledge raise concerns. The 26% indicating that they have no knowledge is raising questions. For if they cannot identify potential hazards it is possible that they would not know when to prevent food poisoning incidents from happening. These results confirm a gap in knowledge exists which can be directly linked to improper food handling practices.

#### **4.5.2.5 Food Safety Management Systems**

Respondents were asked to indicate whether they have knowledge and understanding of the HACCP systems. Responses provided by respondents are presented in Table 4.8.

**Table 4.8: HACCP Knowledge**

	Frequency	Percent
Yes	73	73.7
No	26	26.3
Total	99	100.0

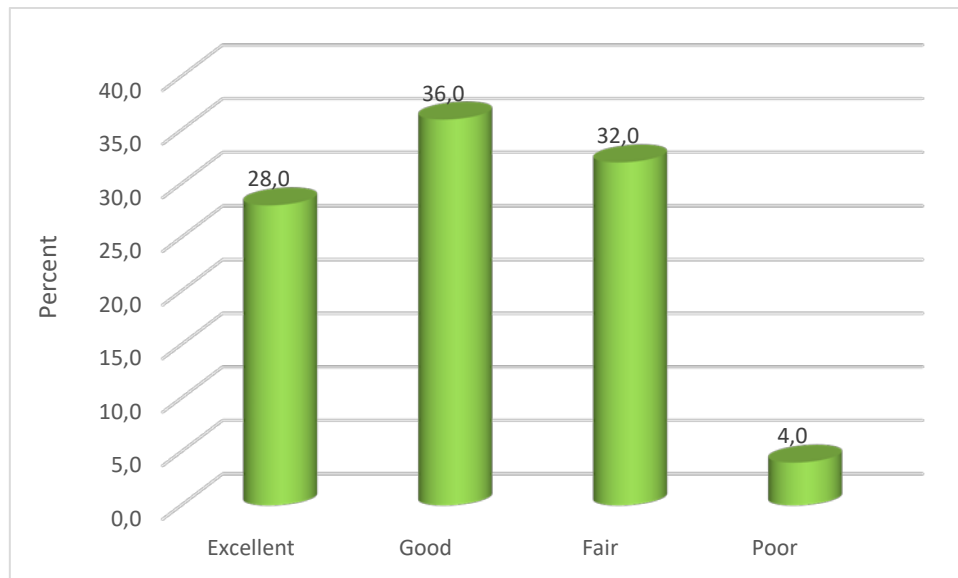
Hazard Analysis Critical Control Points is one of the Food Safety Management Systems available in the foodservice industry to prevent incidents that could cause sicknesses, injuries and death (Payne-Palacio and Theis 2016:97). Muhammed and Sekharan (2018:37) describe food safety management systems as a system designed to establish guidelines to prevent and fight sickness, injuries and death that could be caused by food poisoning. In their study on food safety management systems, these researchers also state that when foodservice establishments seek to meet customer satisfaction with safe food, they should adopt a number of Food Safety Management Systems. A similar proportion of respondents were also aware of the management systems ( $p < 0.001$ ) as those who were aware of hazards. The analysis in Table 4.6 indicates a majority (73%) of respondents had knowledge of the HACCP system in place while only 26.3% indicated that they had no idea of the HACCP system. This minority (26.3%) proves the lack of knowledge of food handlers towards food safety standards. This also indicates the presence of improper food handling practices within foodservice sites. The lack of knowledge confirmed by 26.3% of respondents creates problems since the customers depend on knowledgeable and ethical food handlers for safe foods. Khairani (2018:270) observes multiple options in the choice of a safety management system.

**Table 4.9 HACCP and Potential Hazards**

		Do you understand what is meant by chemical, biological and physical hazards?			Total	
		Yes	No	Not sure		
Do you have knowledge and understanding of food safety management systems e.g. HACCP?	Yes	Count	52	11	10	73
		% of Total	54.7%	11.6%	10.5%	76.8%
	No	Count	18	2	2	22
		% of Total	18.9%	2.1%	2.1%	23.2%
Total		Count	70	13	12	95
		% of Total	73.7%	13.7%	12.6%	100.0%

#### 4.5.2.6 Food Safety and Personal Hygiene Rating

The respondents were required to rate the level of their knowledge towards food safety and personal hygiene standards. The results are presented in Figure 4.5 below.



**Figure 4.5: Rating of food safety and personal hygiene knowledge**

Food safety knowledge is regarded as good to excellent when food handlers have been trained and show evident knowledge on the following food safety: personal hygiene, time and temperature controls, cross-contamination, cleaning and sanitising and micro-organisms (Choi *et al.* 2016:200). Hence, it is essential to always assess the level of knowledge of food handlers to ensure that training is provided accordingly (Yu *et al.* 2018:72). Less than 5% of the respondents indicated that their knowledge was poor ( $p < 0.001$ ). This implies that respondents were fairly confident regarding their level of knowledge. The respondents who showed confidence in the level of their knowledge are represented by 28.0%, hence pointing to a great gap in knowledge. Respondents who indicated that they had good and fair knowledge made 68% of the total respondents. This implies that the majority have limited self-confidence in knowledge of food safety standards. The very low percentage 28.0% of food handlers that rated their food safety and personal hygiene knowledge as excellent is alarming since ensuring food safety within the industry requires excellent food safety skills and knowledge (Rahman *et al.* 2018:2477)



#### 4.5.2.7 Personal Hygiene

Table 4.10 presents an analysis of “I understand what is meant by personal hygiene”. Assessing knowledge of food handlers on personal hygiene was relevant for this as personal hygiene forms part of the food safety standards (Lee *et al.* 2018:2).

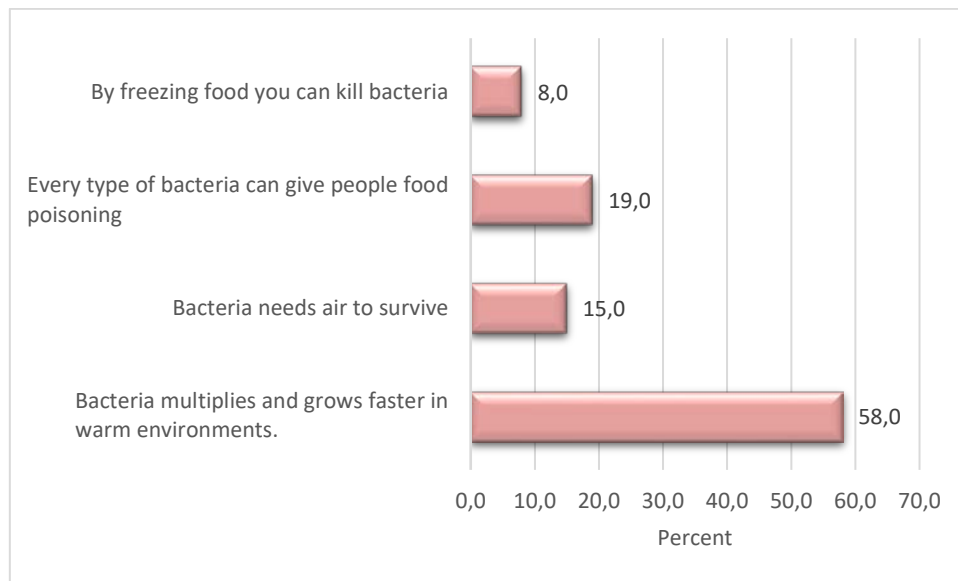
**Table 4.10: Personal Health and Hygiene**

	Frequency (%)
Yes	94.0
No	6.0
Total	100.0

Lee *et al.* (2018:2) state that personal hygiene is amongst effective preventive measures taken against sicknesses. Hence it is very important that food hygiene training is included in the food safety training package for food handlers. Researchers further describe personal hygiene as activities such as washing hands with soap, sanitising, bathing every day, keeping hair and nails clean and wearing clean clothes (Lee *et al.* 2018:2). There were 6% of respondents who indicated that they do not understand the concept of personal hygiene ( $p < 0.001$ ). The majority is represented in Table 4.9 by 94% that indicated that they have an understanding of what personal hygiene is. Such understanding, however, does not automatically imply that personal hygiene is practised. Rahman *et al.* (2018:2477) study focussed on assessing personal hygiene, sanitation and food safety knowledge of food handlers at the canteen in University of Indonesia. The results showed that about 15% of respondents had poor personal hygiene and all food preparers had good knowledge of food safety. This indicates that it is crucial that every food handler within foodservice establishments are trained on personal hygiene, therefore the focus should not just be on strictly cooks and chefs. In Table 4.9, 6% of respondents indicate that they do not understand what is meant by personal hygiene is interesting. Although seemingly small, it only takes one uninformed food handler to cause widespread food poisoning.

#### 4.5.2.8 Bacteria causing Food Poisoning

Figure 4.6 indicates the responses to “Which of the following is true about bacteria?”.

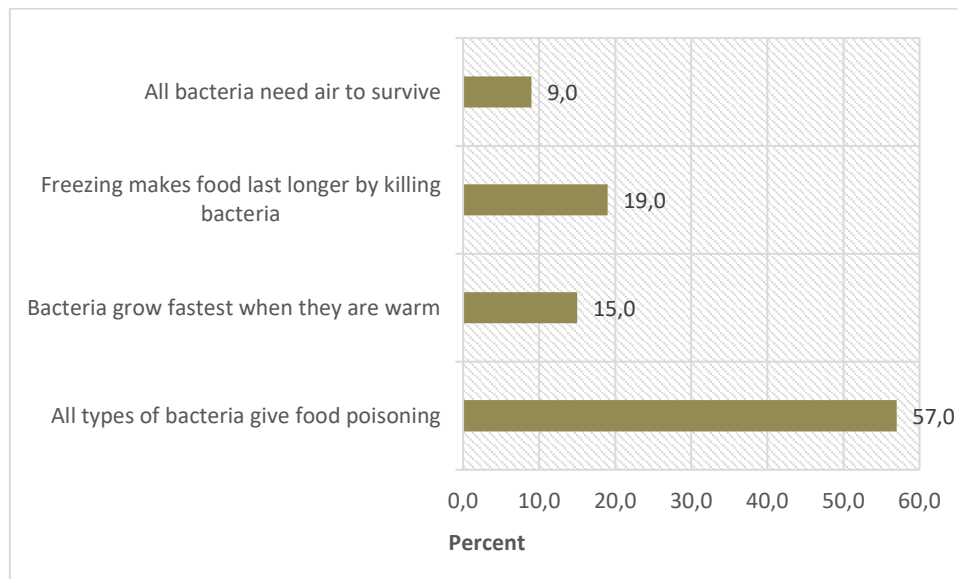


**Figure 4.6: Harmful Bacteria**

According to Edalati *et al.* (2019:65) bacteria causing food poisoning is also known as bad or harmful bacteria, for example, *Staphylococcus aureus*. It is harmful bacteria for it produces toxins which then cause food poisoning that results in sicknesses and even death. Significantly more respondents chose the last statement as being correct ( $p < 0.001$ ). The scoring pattern indicates various levels of food safety practice knowledge. The last two options are the most correct and the first two are incorrect for bacteria only becomes dormant in cold temperatures and do not really die. These results indicate that food handlers lack food safety practice skills and knowledge. Edalati's *et al.* (2019:66) study focussed on investigating the effects of bacteria causing food poisoning on raw camel's milk. This study specifically removed good bacteria from the raw milk in order to establish how quick the harmful bacteria will be present in the milk. The results showed that the milk contained harmful *Staphylococcus aureus* bacteria. These results clearly suggest that it is, therefore, cheaper to prevent harmful bacteria from gaining access to food than having to cure sicknesses as a result of food poisoning infections. The literature supports that the suggestion that food handlers should learn and understand both good and bad bacteria as well as sources of especially bad bacteria in order to prevent these from contaminating food (Osimani *et al.* 2018:148).

#### 4.5.2.9 Conditions for Bad Bacteria Growth

Figure 4.7 also presents results obtained by measuring respondents' knowledge. This information is an extension of the themes in Figure 4.6.



**Figure 4.7: Food poisoning bacteria**

Bacteria need favourable conditions to grow namely food, correct temperatures, enough time and moisture (Vo *et al.* 2017:13). It is essential that food handlers know about bacteria that cause food poisoning, the conditions that they become active and dormant in. This knowledge will be useful to food handlers to know how to prevent bad bacteria from gaining access to food or from multiplying if they already exist. Figure 4.7 presents an analysis of the feedback that was given by respondents to the question asking them to identify statements that were true facts about bacteria. There is a significant difference in the scoring pattern ( $p < 0.001$ ).

Again, as stated in Figure 4.6, the scoring pattern indicates various knowledge levels of respondents. This figure represents a more similar question to one analysed in Figure 4.6, this was to test the confidence of respondents in answers they provided above and to mainly measure understanding. The majority of respondents (57.0%) indicated that all bacteria cause food poisoning. This is in fact an incorrect statement and this analysis indicates once again lack of knowledge of food safety standards. The analysis also proves a lack of food safety training as this knowledge is supposed to be obtained from this training. The two most correct answers were identified by a minority of respondents (24%). This implies that there is still a real gap in the knowledge of food safety practices and principles. In their discussion Edalati *et al.* (2019:66), state that infections caused by bad bacteria can be cured by certain good bacteria or

probiotics. Researchers further state that there are cases where bad bacteria infections cannot be cured due to drug resistance. This clearly suggests that prevention is better and cheaper than cure, therefore food handlers should be trained on how to prevent food poisoning caused by bad bacteria.

### 4.5.3 Section 3: Practices

This section reports on practices of food handlers during food handling. Figure 4.11 below indicates the ranked frequencies to the statements therein.

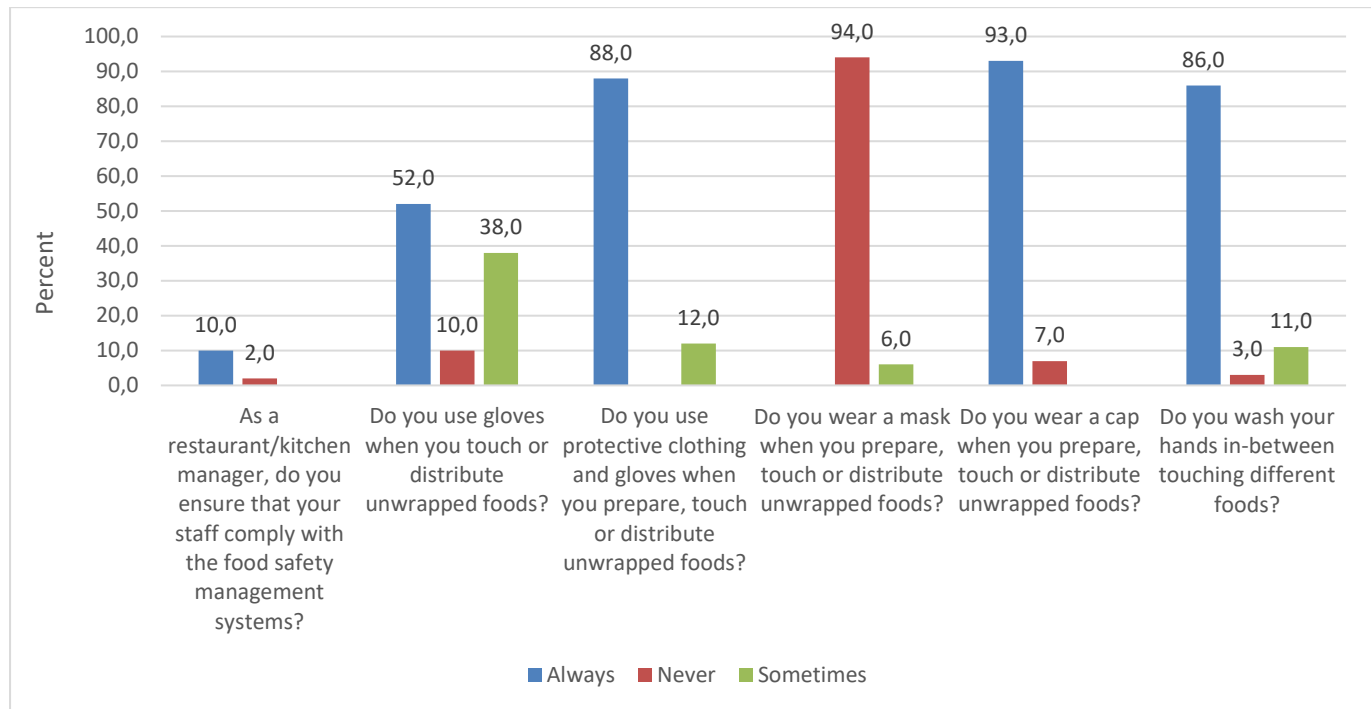
<b>Table 4.11: Summary responses</b>	Always	Never	Sometimes	Chi-Square p-value
As a restaurant/kitchen manager, do you ensure that your staff comply with the food safety management systems?	10.0	2.0		0.021
Do you use gloves when you touch or distribute unwrapped foods?	52.0	10.0	38.0	0.000
Do you use protective clothing and gloves when you prepare, touch or distribute unwrapped foods?	88.0		12.0	0.000
Do you wear a mask when you prepare, touch or distribute unwrapped foods?		94.0	6.0	0.000
Do you wear a cap when you prepare, touch or distribute unwrapped foods?	93.0	7.0		0.000
Do you wash your hands in-between touching different foods?	86.0	3.0	11.0	0.000

Table 4.11 presents a summary of responses to questions that assessed the practices of food handlers. Practices were assessed to determine if food handlers’ food handling practices were proper and aligned with food safety standards or not. The minority (3.0%) indicated that they do not wash hands when changing activities raises concern. This minority could be a source of a very big food poisoning outbreak. There were missing responses to the question that asked whether food handlers use personal protective equipment such as gloves when touching unwrapped foods. All responses that indicated “never” prove that there is a great concern regarding food safety practices, in fact, they prove that bad food practices do exist.

#### 4.5.3.1 Implementation, Adherence and Supervision of Compliance Food Safety Management System

As cooks and chefs participated in this study in their various ranks, kitchen managers and owners who are also chefs or cooks were asked if they ensure the implementation of food safety management systems. They were also asked if after implementation they supervise their staff to ensure that food safety principles are practiced and complied with during food handling.

Figure 4.8 below presents results obtained from measuring practising, compliance and supervision levels of food handlers towards food safety principles.



**Figure 4.8: Food Safety Management System Practice and Supervision**

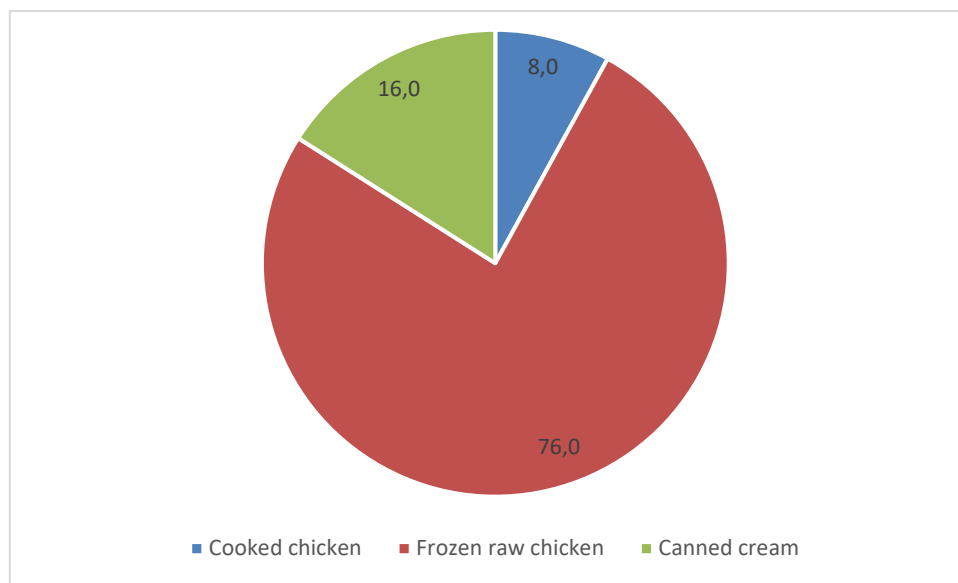
Zwietering *et al.* (2016:31) describe a food safety management system as measures put in place to control, monitor and ensure that food consumed is safe and free of any harmful foreign substances. In their study, Baluka *et al.* (2015:31) suggest that food safety management plans and procedures should be improved and monitored. This question was specifically asked in this study to establish whether food handlers understand and follow food safety management principles. Researchers also state that if food handlers know and follow food management systems, they will be able to prevent or reduce food contamination incidents (Zwietering *et al.* 2016:31; Baluka *et al.* 2015:31). Figure 4.8 shows that the following patterns were observed: Some statements show significantly higher levels of positive scoring (Always) whilst other levels of agreement are lower but still greater than levels of disagreement (Never). One statement indicates higher levels of no practice (Never).

A chi-square test determined whether the scoring patterns per statement were significantly different per option. The null hypothesis claims that similar numbers of respondents scored across each option for each statement (one statement at a time). The alternate states that there is a significant difference between the levels of Always and Never. As the highlighted

significance values (p-values) are less than 0.05, it implies that the distributions were not similar; that is, the differences between the way respondents scored (Always, Sometimes, Never) were significant.

#### 4.5.3.2 Bacteria Containing Foods

Figure 4.9 presents results obtained from asking respondents the following question: “Which one of these foods is likely to contain the most bacteria”. This specific question was aimed at assessing the knowledge of respondents towards food safety principles.

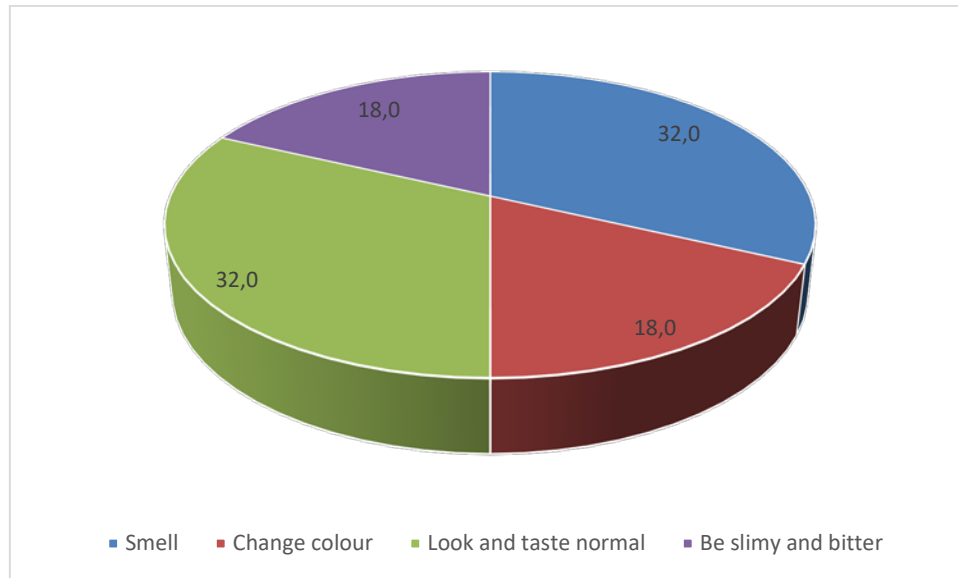


**Figure 4.9: Easily contaminated foods**

Edalati *et al.* (2019:64), indicate that harmful bacteria can grow in food items such as milk. It follows that food handlers know about high-risk foods as well as the favourable conditions bacteria need to be active in. Knowing these foods will help food handlers to handle food in a manner that is more likely to prevent access to or starve already existing bad bacteria. Figure 4.9 shows that significantly more respondents (76.0%) indicated that this would occur in frozen raw chicken ( $p < 0.001$ ). The scoring pattern indicates the knowledge levels of food handlers. The knowledge levels measured here to establish food safety knowledge indicate again lack of knowledge of food handlers. The results, however, show that the majority (76.0%) have knowledge. Baluka *et al.* (2015:31) assessed hygiene practices and food contamination in foodservice establishments in Uganda. A few samples of different foods such as rice, potatoes, fried chicken and soups to mention a few were tested for bad bacteria. The results showed that the majority of foods contained Salmonella.

### 4.5.3.3 Food Contaminated with Harmful Bacteria

The respondents were asked to identify characteristics of foods contaminated with bad bacteria and the results are presented below. This question also sought to assess the level of knowledge of basic food safety. According to Edalati *et al.* (2019:64), it is important that food handlers know how to identify food that has been contaminated with bad bacteria.



**Figure 4.10: Characteristics of contaminated food**

Food handlers should be able to identify contaminated food characteristics so that they can prevent consumption and contact of this food with other food, thus preventing the spread of bad bacteria. The p-value ( $p = 0.049$ ) is only marginal. Figure 4.10 shows that 32% of respondents indicated that food that came into contact with bad bacteria would still look and taste normal. This is, in fact, correct as bacteria needs times to grow for food to actually change smell, colour and taste (Chen and Xie 2019:1). These results indicate that (68%) of the respondents believe that food is only containing bad bacteria at the time it starts to smell off, change colour and taste. According to Baluka *et al.* (2015:31), the majority of foodservice facilities in which food tested positive for Salmonella did not practice hygiene.

### 4.5.3.4 Food Poisoning Occurrence

Respondents were asked to identify foodservice areas in which food poisoning incidents occur. Food incidents can occur anywhere where food is handled improperly. Knowledge of dominant sites of food poisoning outbreaks indicates an understanding of the causes of food contamination.

**Table 4.12: Foodservice sites where food poisoning outbreaks often occur**

	Frequency	Percent
Restaurants	21	21.0
Retail shops	4	4.0
Home or domestic kitchens	15	15.0
Any of the above	60	60.0
Total	100	100.0

Significantly more respondents (60%) indicated a combination of the first three statements ( $p < 0.001$ ). Fact is a food poisoning outbreak can occur in any foodservice area including commercial or domestic. This statement indicates that the respondents who selected certain food preparation areas lack knowledge or accountability. As researchers Edalati *et al.* (2019:64) and Baluka *et al.* (2015:31) indicate that bacteria need food to grow, it means that any place where food is handled and favourable conditions for bacteria to be active are present bacteria will be present regardless of the type of foodservice facility. 40% of respondents who indicated that food poisoning incidents often occur in certain places raises concerns.

#### **4.5.3.5 Cleaning of Food Preparation Areas**

“What is the most important reason for cleaning a food preparation area?” Respondents' answers are presented in Table 4.13. This question sought to assess basic hygiene and food safety knowledge.

**Table 4.13: Food preparation surface cleaning**

	Frequency	Percent
So it looks really smart and tidy	26	26.5
To prevent food contamination	72	73.5
Total	98	100.0

Significantly more respondents (73.5%) chose the prevention of food contamination ( $p < 0.001$ ). The 26.5 % represents respondents who chose “so it looks really smart and tidy”. This also confirms a lack of food safety and hygiene knowledge. This knowledge is essential so that staff in foodservice establishments may know why the establishment seeks to adopt effective



cleaning and sanitation plans to prevent bad bacteria growth and food contamination (Healy 2016:2). Table 4.13 shows 26.5% of respondents confirm that there is still a gap in knowledge concerning food safety standards.

#### 4.5.3.6 The Main Reason for Wearing Protective Gear

Table 4.14 presents answers provided by respondents to the question. “What is the main reason for wearing protective clothing?” This question assessed if food handlers understood the special protective clothing they wear or are supposed to wear during food handling. It is important that food handlers understand the purpose of their apparel, so they always have it on when handling food to prevent bad bacteria from gaining access to food.

**Table 4.14: Protective gear**

	Frequency	Percent
It protects food from contamination	88	90.7
It looks groovy	9	9.3
Total	97	100.0

Significantly more respondents chose the prevention of food contamination ( $p < 0.001$ ). The minimum respondents (9.3%) represent a lack of food safety and occupational health and safety knowledge. Protective clothing is specifically designed to protect food handlers and consumers from any hazard during food handling and consumption that could result in their injury, illness or even death as well preventing transmission of bacteria from the human body into food (McLellan and Havenith 2016:124). The authors further state that it is, therefore, essential that protective gear is kept clean as much as possible in order to prevent it from carrying bacteria.

#### 4.5.3.7 Raw Meat Storage

Respondents were asked to select the most suitable answer regarding the proper storage for raw meat. The responses provided by respondents were used to judge their practices and knowledge.

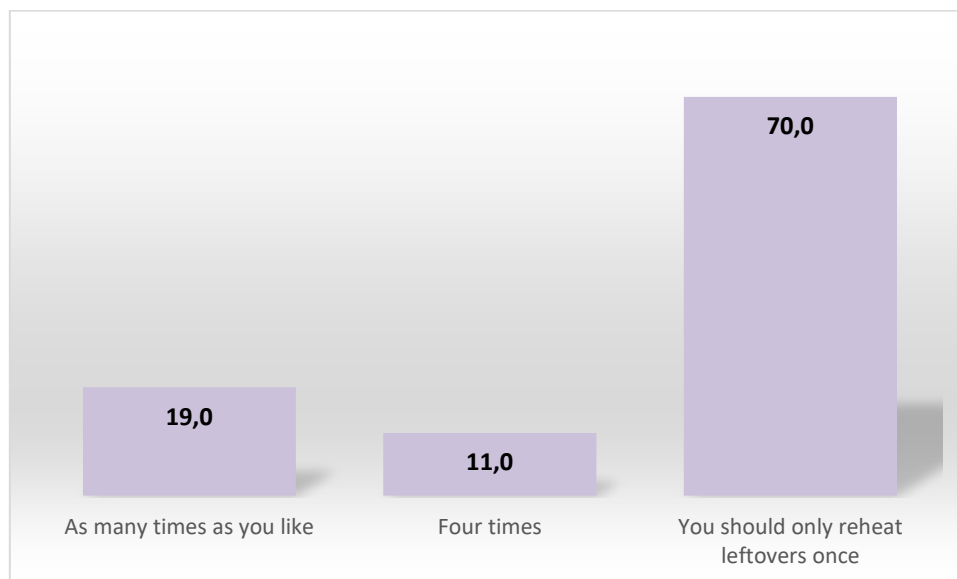
**Table 4.15: Proper storage of raw meat**

	Frequency	Percent
In the middle	4	4.2
At the bottom, below all other food	92	95.8
Total	96	100.0

Food handlers should know how to store food to prevent cross contamination as some foods are high carriers of bad bacteria than other food. It is, therefore, essential to store food properly, for example, by separating them. All samples of raw commercial meat have been found by Ahmad (2016:13) to contain multiple harmful bacteria namely, *Escherichia coli*, *Bacilluseureus*, *Salmonella* and *Staphylococcus*. Significantly more respondents (95.8) chose the bottom position ( $p < 0.001$ ). Even though the majority chose the correct answer, 4.2% still indicate the need to close the lack of appropriate food safety practices and knowledge within the foodservice industry. Raw meat is among high carriers of harmful bacteria and should be stored correctly to prevent cross contamination .

#### **4.5.3.8 Leftovers Handling**

“How many times can you reheat leftovers? This is the question that respondents were also asked to assess their degree of knowledge regarding food poisoning and the responses are analysed in the table below.



**Figure 4.11: Re-Heating of leftovers**

Significantly more respondents (70.0%) indicated that food should only be reheated once ( $p < 0.001$ ). The rest of the respondents indicated that foods can be reheated as many times or more than once. The responses given by 30% of respondents indicate poor food handling and lack of knowledge. Leftover food should be kept out of danger temperature zone as best as possible to prevent bacteria growth and multiplication (Wallace *et al.* 2018:139).

#### 4.5.3.9 Meats Safe to Eat when Undercooked or Raw

Respondents were asked to identify meats that are safer to consume when raw or undercooked and their responses are presented in Table 4.16 below.

**Table 4.16: Safe temperatures of meat**

	Frequency	Percent
Minced meat	10	10.3
Lamb	87	89.7
Total	97	100.0

Significantly more respondents (89.7%) chose lamb ( $p < 0.001$ ). The scoring pattern indicates fair knowledge levels of respondents regarding food safety temperatures. White meat especially raw chicken is known to carry large amounts of bacteria (Al-Adawi *et al.* 2016:356). Hence health guidelines encourage that chicken and pork be well cooked as compared to red meat which does not carry as much bacteria and white meat. Food handlers should know which meats are high-risk meats so they would handle them appropriately in order to avoid cross contamination (Al-Adawi *et al.* 2016:356).

#### 4.5.3.10 Hand Washing Practice

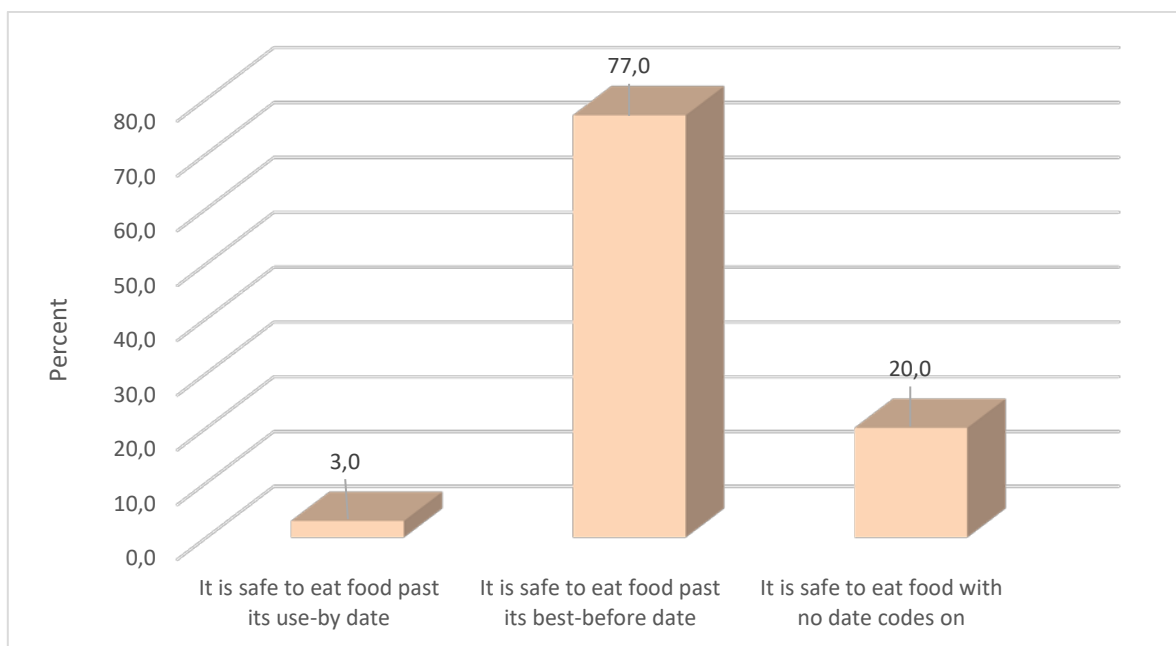
Table 4.17 presents findings on the question: “What are the basic steps for washing hands? Respondents were required to arrange the hand washing steps as prescribed by the food safety principles.

<b>Table 4.17: Hand washing steps</b>	Frequency	Percent
Wash thoroughly with water and dry	3	3.0
Apply soap, wash thoroughly, rinse and use paper towels	96	96.0
Apply soap, wash thoroughly	1	1.0
Total	100	100.0

Significantly more respondents chose “Apply soap, wash thoroughly, rinse and use paper towels” ( $p < 0.001$ ). The analysis indicates a fair level of food safety and personal hygiene practices. However, the scoring pattern also indicates a minority that lacks knowledge of appropriate and safe food practices. Washing hands before, during and even after handling food has always been a principle believed to be effective in ensuring the prevention and spread of infections and sickness (Brennen 2016:110).

#### 4.5.3.11 Use-by, Best-before and Expiry dates

Respondents indicated the times when foods are safe to eat when the dates above have passed by. Establishing this information is necessary for this study in order to determine the lack of knowledge regarding basic food safety principles. In this regard, food handlers’ knowledge of dates for safe consumption and appropriate practice such as the first-in first-out system, are crucial to ensuring that all food is served safe.



**Figure 4.12: Date codes and safety of foods**

Most respondents chose “it is safe to eat food past its best-before date” as true ( $p < 0.001$ ). The most alarming group (20%) that indicated that according to their knowledge it is still safe to consume foods with no date codes to confirm the existence of unhealthy food handling practices and food safety principles knowledge. In a study conducted in Kunge Community in

China following food-related issues, it was found that ignoring the expiry date was one of the main problems associated with food poisoning (Chan *et al.* 2019:13)

#### 4.5.3.12 Identification of High-risk foods

Respondents were given a list of various foods to identify those that are regarded as the riskiest foods in terms of food safety. These foods are more susceptible to those harmful bacteria that grow fast and can cause food poisoning.

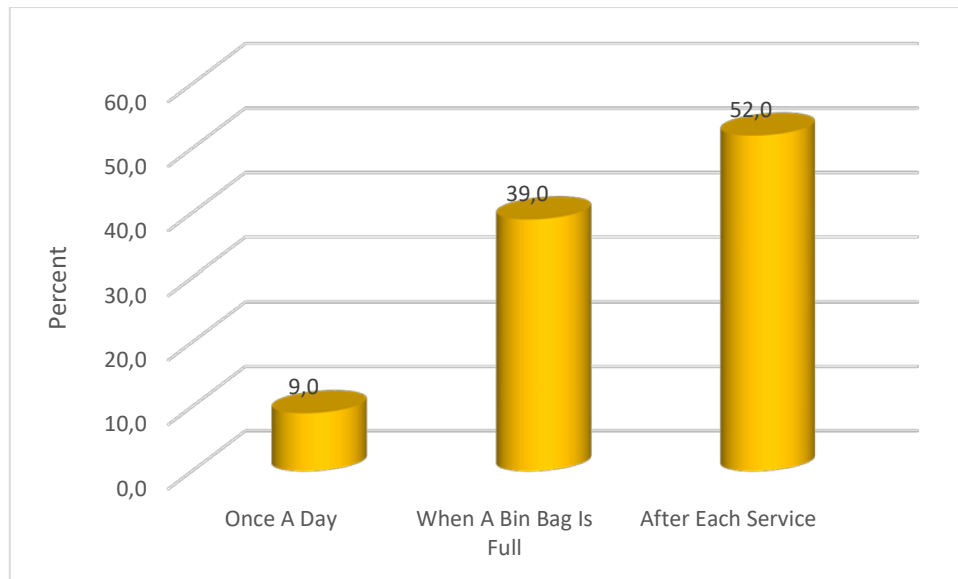
**Table 4.18: High-risk foods**

	Frequency	Percent
Cooked Meats, Dairy Products, Shell-Fish, Cooked Rice	78	78.0
Biscuits, Cakes, Bread	12	12.0
Pasta, Fruit, Vegetables	10	10.0
Total	100	100.0

Significantly more respondents chose the first option ( $p < 0.001$ ). 78% choosing the first option confirms a fair level of food safety handling practices, however, the few (22%) indicate a gap in knowledge towards food safety principles. Bacteria grow easier and faster in raw and moist foods such as milk and chicken as discussed in (Al-Adawi *et al.* 2016: 356; Edalati *et al.* (2019:64) studies. In their study, Gaikwad *et al.* (2017:1493) discussed that bread and sweet potato tested negative of *Escherichia.coli* due to bread having no moisture and sweet potato with very little content of water. Therefore, it is important that food safety training should cover an aspect on high-risk foods and how to handle them in order to prevent the growth and spread of bacteria. Food safety guidelines advise that high-risk and low-risk foods such as dry cupboard items should be stored separately.

#### 4.5.3.13 Handling of Waste Removal in a Kitchen

Figure 4.13 illustrate an analysis of data collected from respondents for responses to the question: How often should waste be removed from a kitchen area? Waste is one of the carriers of harmful bacteria and it also provides favourable conditions for bacteria to grow. It is, therefore, necessary that it is removed more frequently to avoid allowing bacteria time and warmth to grow.



**Figure 4.13: Frequency of waste removal**

More than half of the respondents (52.0%) indicated that this should be done after each service ( $p < 0.001$ ). This majority indicates very low levels of appropriate food safety practices and knowledge. The remaining 48 % indicates a great hazard in the foodservice industry due to food handlers' lack food safety and hygiene practices' knowledge. Gaikwad *et al.* (2017:1490) analysis of the microbial load of bacteria in food finds that waste bins were found to be amongst many sources of bacteria that contaminated food. Hence food safety principles suggest that food be handled away from dust bins. This means that dust bins should be emptied as frequently as possible even if they are not filled up to prevent bacteria from having enough time to multiply.

#### **4.5.4 Section 4: Attitudes**

This section reports on attitudes of food handlers who participated in this survey. Abuchi *et al.* (2016:269) suggest that assessing the attitudes of food handlers helps to identify the need to motivate food handlers to comply with food safety principles with honesty.

##### **4.5.4.1 Attitudes of Respondents towards Food Safety Standards**

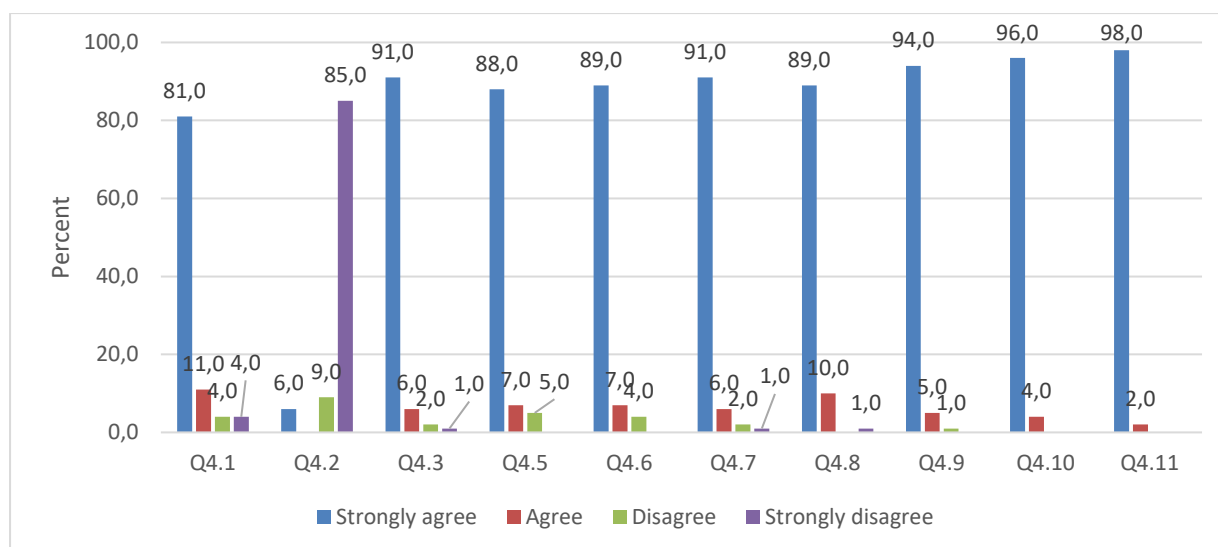
This section of the survey assessed the attitudes of respondents towards food safety principles. Attitudes were assessed by judging perceptions, views and food handling practices of respondents to indicate whether they find food safety standards necessary, practical and effective. The following patterns are observed:

**Table 4.19: Attitudes of food handlers**

		Strongly agree		Agree		Disagree		Strongly disagree		Chi-Square p-value
		Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	
Foodborne sicknesses are caused by the ignorance and not complying with food safety management system by food handlers.	Q4.1	81	81.0 %	11	11.0 %	4	4.0 %	4	4.0 %	0.000
I often feel it is not necessary to wash my hands every time I prepare foods or change activities due to high pressure and workload. I therefore ignore and just do my work. Rate your level of attitude.	Q4.2	6	6.0 %	0	0.0 %	9	9.0 %	85	85.0 %	0.000
Safe and proper food handling is an important part of my job responsibilities as a food handler.	Q4.3	91	91.0 %	6	6.0 %	2	2.0 %	1	1.0 %	0.000
Undergoing food safety training is important to me.	Q4.5	88	88.0 %	7	7.0 %	5	5.0 %	0	0.0 %	0.000
Food handling relates to food safety.	Q4.6	89	89.0 %	7	7.0 %	4	4.0 %	0	0.0 %	0.000
Raw foods should be kept separately from cooked foods.	Q4.7	91	91.0 %	6	6.0 %	2	2.0 %	1	1.0 %	0.000
Food handlers should use cap, masks, protective	Q4.8	89	89.0 %	10	10.0 %	0	0.0 %	1	1.0 %	0.000

gloves, and adequate clothing to reduce the risk of food contamination.										
It is important to know the temperature of the refrigerator to reduce the risk of bacteria growth in food.	Q4.9	94	94.0 %	5	5.0 %	1	1.0 %	0	0.0 %	0.000
Improper storage of foods may be hazardous and cause food poisoning.	Q4.10	96	96.0 %	4	4.0 %	0	0.0 %	0	0.0 %	0.000
Food handlers (chefs) with cuts on hands should not touch unwrapped foods.	Q4.11	98	98.0 %	2	2.0 %	0	0.0 %	0	0.0 %	0.000

Table 4.19 presents findings based on respondents' answers. A significant number of respondents indicated that they strongly agree with some food safety principles. The few respondents who indicated that they strongly disagree with described food safety principles is indicative of the existence of bad food handling practices in the foodservice establishments. The minority that disagreed also indicated negative attitudes towards food safety principles.



**Figure 4.14: Attitudes towards food safety standards**



Figure 4.14 is an alternate version of the results shown in Table 4.18. It incorporates results obtained from Section 4 of Annexure C. Respondents were asked to indicate if they agreed or not to the given food safety principles. This was to assess if food handlers' perceptions and attitude towards these food safety principles. Interestingly, there were respondents who indicated that they did not agree with some food safety principles. Perhaps, they did not find these principles worth practising due to ineffectiveness or impossibility to practice them. Also, the results show that for the majority of the principles there were respondents who indicated that they disagreed. This is interesting as all food safety principles shown in Table 4.18 and Figure 4.14 are essential in ensuring food safety.

Khan *et al.* (2018:118) assessed attitudes of food handlers towards food safety handling practices. The study was conducted in Nishter Hospital in Multan and shows that a minority of respondents had bad attitudes and did not practice food safety principles. Assessing attitudes of food handlers is crucial as attitude is linked to behaviour and therefore practices. Food handlers need to be motivated and encouraged to practise food safety principles to improve their attitudes. There are high levels of agreement with all statements except Q4.2 which has a high level of disagreement. The rotated component matrix for this section indicates that there were four components. For example, the following two statements formed a component.

- Safe and proper food handling is an important part of my job responsibilities as a food handler.
- Undergoing food safety training is important to me.

#### **4.5.5 Section 5 - Food Safety Standard in Foodservice Establishments**

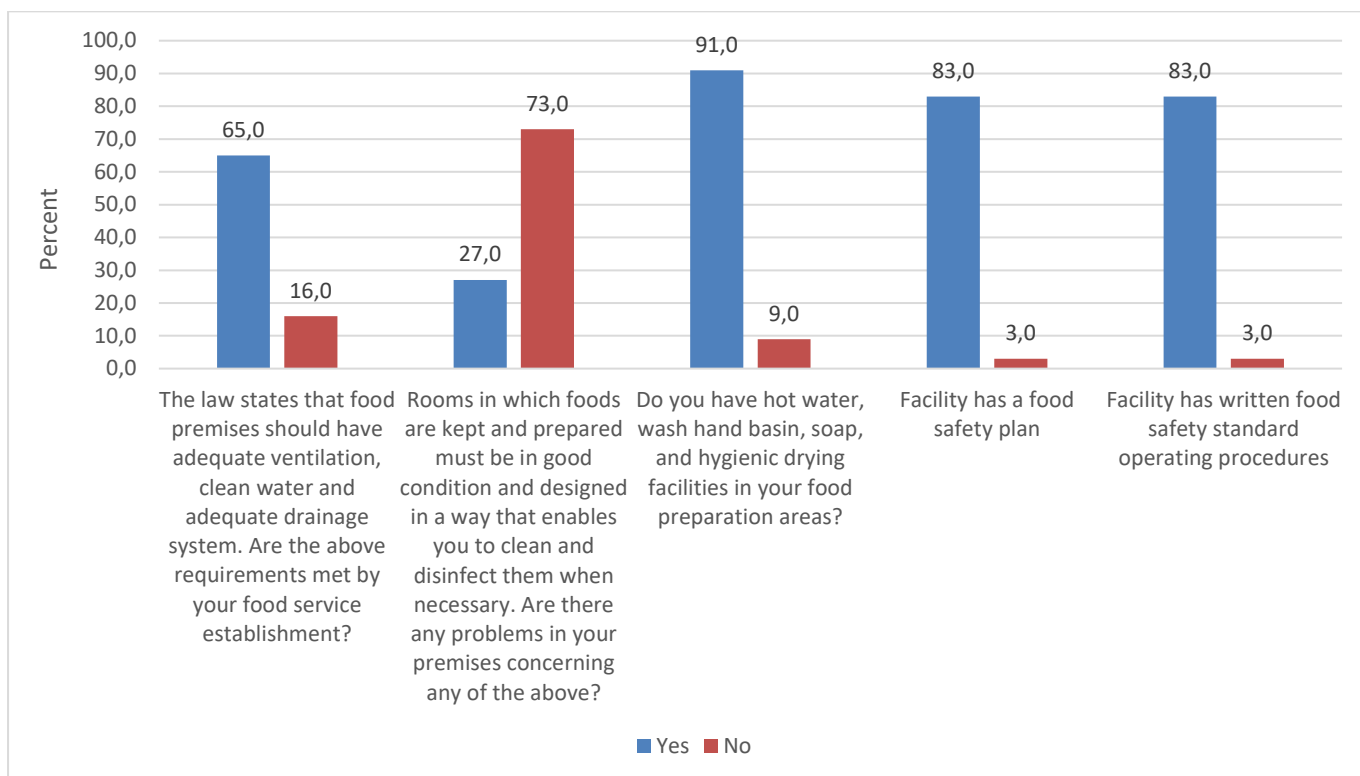
This section will examine findings associated with the level of food safety within foodservice establishments that respondents work at. Respondents were required to assess and indicate if the level of food safety standard in their establishments was satisfactory or unsatisfactory

##### **4.5.5.1 Level of Food Safety in Foodservice Establishments**

Respondents were asked to rate the level of food safety standards in terms of site cleanliness, compliance with food safety regulations and food handling practices. The following patterns were observed. Table 4.20 presents a summary of answers provided by respondents to questions 5.1, 5.2, 5.3, 5.5 and 5.6 which measured food safety regulations' adherence at foodservice establishments.

**Table 4.20: Hygiene, cleanliness and Food safety standards within the foodservice establishment**

	Yes	No	Chi-Square p-value
The law states that food premises should have adequate ventilation, clean water and adequate drainage system. Are the above requirements met by your foodservice establishment?	65.0	16.0	0.000
Rooms in which foods are kept and prepared must be in good condition and designed in a way that enables you to clean and disinfect them when necessary. Are there any problems in your premises concerning any of the above?	27.0	73.0	0.000
Do you have hot water, wash hand basin, soap, and hygienic drying facilities in your food preparation areas?	91.0	9.0	0.000
Facility has a food safety plan	83.0	3.0	0.000
Facility has written food safety standard operating procedures	83.0	3.0	0.000



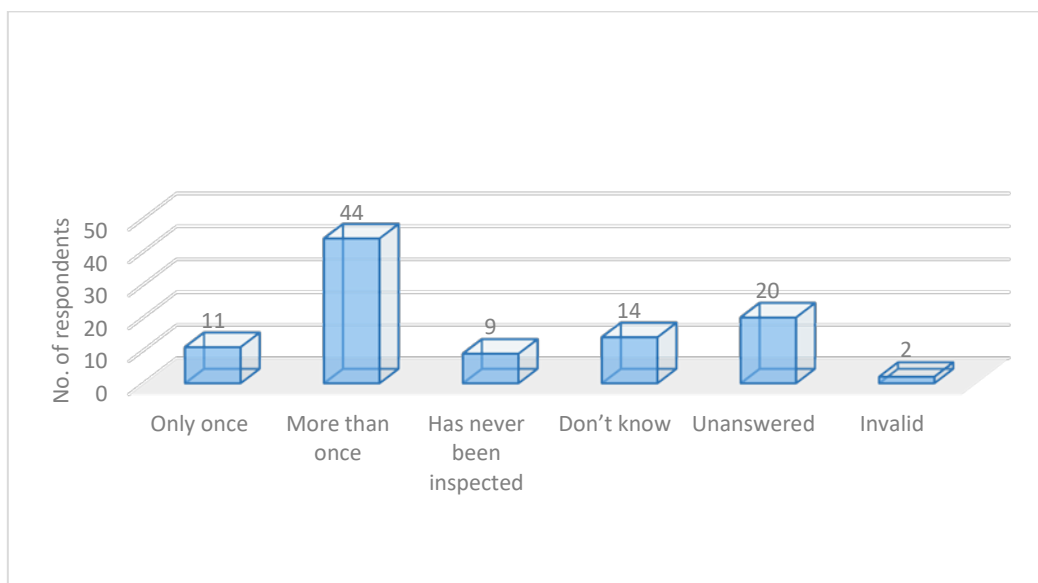
**Figure 4.15: Compliance of foodservice establishments with food safety regulations.**

Healy (2016:2) suggest that food safety regulations should be implemented and enforced in foodservice establishments in order to encourage food handlers to practice safe food handling

measures. The findings are analysed in Figure 4.15 which shows that a majority of respondents indicated that their foodservice sites meet and comply with food safety regulations. A minority of respondents indicated lack of food safety regulations compliance within their foodservice sites, these responses are presented by 16%, 27%, 9%, 3% and 3% from the different statements given. The responses given by a few respondents confirm that there is a degree of non-compliance with food safety laws within foodservice establishments.

#### 4.5.5.2 Frequency of Premises Inspection in the Past 12 Months

The researcher asked respondents to rate the frequency of premises' inspection in the past 12 months. With this question, the researcher assessed the level of knowledge and attitudes.



**Figure 4.16: Frequency of premises inspection**

Kotsanopoulos and Arvanitoyannis (2017:760) observe that food safety audits are adopted worldwide in the foodservice industry to control compliance and assess effectiveness. These audits make an invaluable contribution to the implementation of food safety regulations and standards. Food safety audits directly link to this study in the sense that they help identify knowledge, attitudes and practices of food handlers and the overall compliance to food safety regulations. Respondents were accordingly asked to rate the frequency of foodservice premises' inspection in the past 12 months prior to completing the questionnaires. Figure 4.16 shows that 11 participants stated that their foodservice premises have been inspected only once in the past 12 months. The majority of participants indicated that inspections were done more than once and 9 indicated that there have never been any inspections done in the past 12 months

at their foodservice establishments. Figure 4.6 also shows that 14 participants indicated that they had no idea whether any inspections conducted at their foodservice premises.

#### 4.5.5.3 Standards of Cleanliness and Hygiene in Food Preparation and Storage places

Respondents gave their responses to the following statement: “Please rate the cleanliness and hygiene standards of food preparation and storage areas (storeroom and kitchen) of your restaurant”. This information is essential for this study to address the aim by assessing compliance of foodservice owners towards food safety regulations.

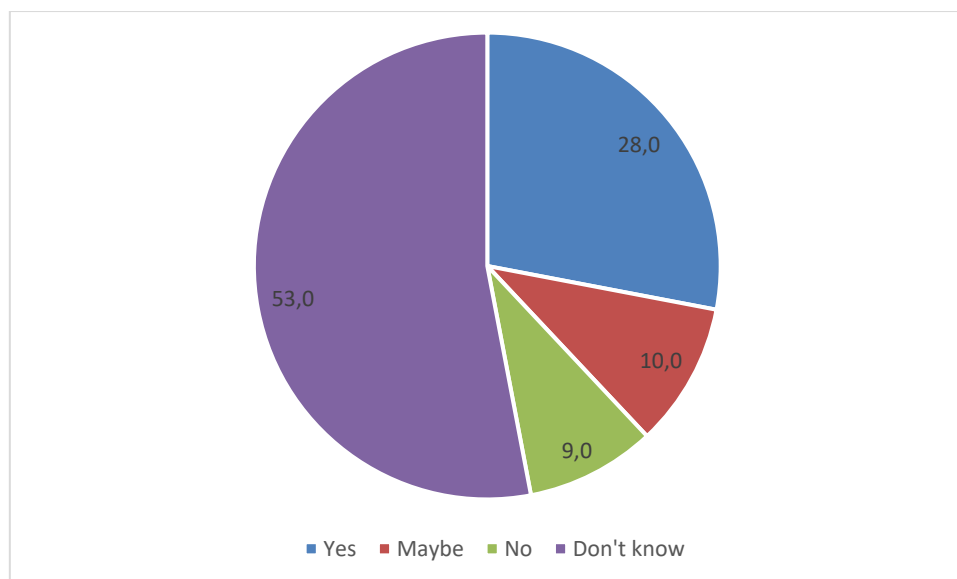
**Table 4.21: Cleanliness and hygiene in food handling areas**

	Frequency	Percent
Excellent	33	33.0
Good	56	56.0
Fair	8	8.0
Poor	3	3.0
Total	100	100.0

Significantly more respondents (89%) rated their restaurants at the higher end ( $p < 0.001$ ). This feedback is positive, however, the few respondents (11%) that rated their restaurants at the lower end indicate a great hazard in terms of bad food handling and storing practices. Cleanliness and hygiene are concepts of food safety that are followed to ensure that food is safe for consumption and free of harmful bacteria (Lelieveld *et al.* 2016:4). The role of cleanliness and hygiene is therefor to prevent harmful bacteria from gaining access to food.

#### 4.5.5.4 Standard of Foodservice Site in Terms of Food Safety Regulations

Respondents were asked to assess their establishments and provide their feedback. The question required ideas and perceptions and was stated as follows: “Do you think that the standard of your foodservice site meets the requirements of food preparation areas as governed by legislation?”



**Figure 4.17: Implementation of food safety laws with foodservice establishment**

Foodservice establishments are obliged to implement food safety principles as guided by relevant statutes and bylaws (Gkana *et al.* 2017:52). More than half (53%) of the respondents were not sure ( $p < 0.001$ ). Figure 4.17 shows that 9% of the respondents confirmed that their foodservice establishments did not meet the requirements of foodservice areas as prescribed by food safety laws. The respondents who answered “maybe, no and do not know” clearly indicate that some foodservice establishments are very likely to not comply with food establishment safety regulations. According to Healy (2016:2), food safety regulations are laws passed to manage and regulate the conduct of food handlers during food handling.

#### 4.5.5.5 Food Safety Training for Staff

This question: “If you are the owner/manager/head chef, do you ensure that your staff get food safety training?” was referring to owners, managers and other relevant heads. Respondents in these categories were asked to indicate whether their staff do undergo food safety training as the law requires.

**Table 4.22: Food safety training for food handlers**

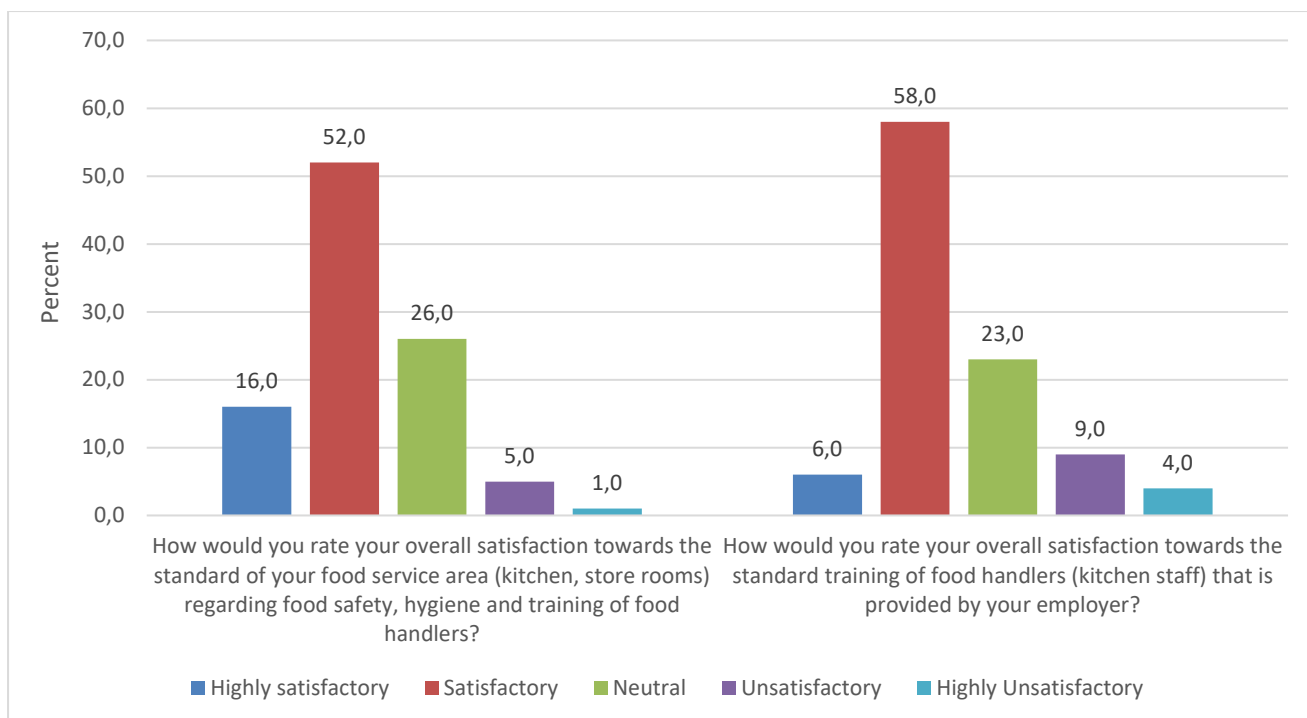
	Frequency	Percent	Valid Percent
Most of the time	3	3.0	75.0
Some of the time	1	1.0	25.0
Total	4	4.0	100.0

There are only 4 responses, so it is not wise to make a generalisation. This indicates that about 8% of respondents belonged to the management positions. 25 % of the respondents indicated that they ensure that their staff undergo food safety training most of the time. McFarland *et al.* 2019:1239) states that well-trained food handlers contribute to the minimisation of foodborne sickness outbreak. Researchers, therefore, suggest that owners and managers of foodservice establishments should control food safety training programmes to ensure that they are effective (Gkana *et al.* 2017:52).

#### 4.5.5.6 Overall Satisfaction towards Kitchen Standards in Terms of Food Safety, Hygiene and Training of Food Handlers

Respondents gave their perceptions regarding the hygiene, food safety and food safety training levels within their foodservice sites. The following is a summary of the scoring patterns.

<b>Table 4.23: Overall satisfaction of respondents</b>	Highly satisfactory	Satisfactory	Neutral	Unsatisfactory	Highly Unsatisfactory	Chi-Square p-value
How would you rate your overall satisfaction towards the standard of your foodservice area (kitchen, storerooms) regarding food safety, hygiene and training of food handlers?	16.0	52.0	26.0	5.0	1.0	0.000
How would you rate your overall satisfaction towards the standard training of food handlers (kitchen staff) that is provided by your employer?	6.0	58.0	23.0	9.0	4.0	0.000



**Figure 4.18: Overall satisfaction of respondents towards foodservice establishments' hygiene, food safety training and cleanliness standards**

Patterns are similar and show significantly higher levels (52%; 58%) of satisfaction. The lower levels (1%; 4%) indicating a highly unsatisfactory call for attention in terms of food safety regulations enforcement. According to Harris *et al.* (2017:1274), consumers expect safe and best quality food in a clean, safe and friendly environment and providing safe food is one the effective measures of ensuring that customer satisfaction is met.

#### 4.6 Cross Tabulations by Variables

In the methodology, the researcher stated that questionnaires were issued to respondents in various foodservice establishments. The questionnaire was designed to collect quantitative data from the respondents. Responses were then presented and analysed in this chapter. Cross tabulations were used to analyse certain responses against age, position and years in practice. This comparison was done to establish whether these variables had an influence on the respondents' views, perceptions and ideas on food safety.

The traditional approach to reporting a result requires a statement of statistical significance. A **p-value** is generated from a **test statistic**. A significant result is indicated with " $p < 0.05$ ". A second chi-square test was performed to determine whether there was a statistically significant

relationship between the variables (rows vs columns). The null hypothesis states that there is no association between the two. The alternate hypothesis indicates that there is an association.

#### 4.6.1 Cross Tabulation by Age

The following questions were cross tabulated by age of respondents in order to establish whether this variable had an influence on responses. The questions cross tabulated by age were:

##### 4.6.1.1 Have You Received Basic Food Hygiene Training?

Table 4.24 presents a cross tabulation of the question stated above, cross tabulated by age of respondents. A majority of respondents (88) answered this question and this means that there were 12 missing responses.

**Table 4.24: Cross Tabulation for “Have you received basic food hygiene training?”**

		Age				Total	
		18 - 27	28 - 37	38 - 47	48+		
Have you received basic food hygiene training?	Yes	Count	32	23	20	8	83
		% within Age	86.5%	100.0 %	100.0 %	100.0 %	94.3%
	No	Count	5	0	0	0	5
		% within Age	13.5%	0.0%	0.0%	0.0%	5.7%
Total	Count	37	23	20	8	88	
	% within Age	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	

Table 4.24 shows that in the age groups between 28 and 37, all (100%) n=23 respondents indicated that they have received basic food hygiene training. In the category of 18-27 years, a significant (86.5%) n=32 respondents answered yes to the question and a minority of 13.5% n=5 respondents answered no. The category with the oldest respondents (48+) shows that all (100%) n=8 respondents have received basic food hygiene training. Alqurash *et al.* (2019:5) evaluated food safety knowledge and practices amongst food handlers in Saudi Arabia hospitals and the results showed that about 31.0% of food handlers indicated that they had never received food safety training.

##### 4.6.1.2 Please Rate the Level of Your Food Hygiene Training

Table 4.25 presents a cross tabulation of the question “Please rate the level of your food hygiene training”, cross tabulated by age of respondents. A majority of respondents (83) answered this question with only 17 missing responses.



**Table: 4.25: Cross Tabulation for “Please rate the level of your food hygiene training”**

			Age				Total
			18 - 27	28 - 37	38 - 47	48+	
Please rate the level of your food hygiene training	Foundation food hygiene	Count	23	13	9	1	46
		% within Age	71.9%	56.5%	45.0%	12.5%	55.4%
	Advanced food hygiene	Count	2	10	10	7	29
		% within Age	6.3%	43.5%	50.0%	87.5%	34.9%
	Any other relevant food hygiene	Count	7	0	1	0	8
		% within Age	21.9%	0.0%	5.0%	0.0%	9.6%
Total	Count	32	23	20	8	83	
	% within Age	100.0%	100.0%	100.0%	100.0%	100.0%	

Table 4.25 shows that (71.9%) n=23 of respondents in the age category 18-27 years rated their level of hygiene training as a foundation level and a minority of 6.3% n=2 rated their training level as advanced. In the age groups 38-47, a significant (50%) n=10 respondents rated their hygiene training level as advanced while (5.0%) n=1 rated their training as any other relevant food hygiene training. In the study on food safety knowledge and practices conducted by Alqurashi *et al.* (2019:6), it was found that there were food handlers who could not give correct answers to basic food safety questions. This confirms that there are food handlers whose level of knowledge is worryingly limited.

#### 4.6.1.3 Have you participated in food safety training in the past year?

Table 4.26 presents a cross tabulation of the question stated above, cross tabulated by age of respondents. A total of 84 responses was recorded as shown in Table 4.26.

**Table 4.26: Cross Tabulation for “Have you participated in food safety training in the past year?”**

			Age				Total
			18 - 27	28 - 37	38 - 47	48+	
Have you participated in food safety training in the past year?	Yes	Count	23	21	18	6	68
		% within Age	69.7%	91.3%	90.0%	75.0%	81.0%
	No	Count	10	2	2	2	16
		% within Age	30.3%	8.7%	10.0%	25.0%	19.0%

Total	Count	33	23	20	8	84
	% within Age	100.0%	100.0%	100.0%	100.0%	100.0%

Table 4.26 shows that a majority (81.0%) n=68 respondents answered yes to the question while 19.0% answered no. In the category “18-27” years, a significant majority (69.7%) n=23 answered yes to the question and 30.3% n=33 answered no. The majority of respondents (91.3%) n=21 in the category 28-37 years have participated in food safety training in the past year and (8.7%) n=2 have not. According to Ovca *et al.* (2018:42), the training of food handlers on food safety is a great concern in ensuring that consumers are offered safe food and in terms of sustaining the economy.

#### 4.6.1.4 Frequency of Food Hygiene Development and Refresher Food Safety Training

Respondents were asked to indicate the frequency of food hygiene and refresher training for food safety. The responses were cross tabulated by age as shown in Table 4.27.

**Table 4.27: Cross Tabulation for How often as an employee and food handlers do you receive food hygiene development and refresher food safety training?**

			Age	Total
			48+	
How often as an employee and food handlers do you receive food hygiene development and refresher food safety training?	Monthly	Count	1	1
		% within Age	100.0%	100.0%
Total		Count	1	1
		% within Age	100.0%	100.0%

Table 4.27 shows a very low response rate to this question. Only on age category (48+) answered this question and they indicated that they receive refresher training monthly.

#### 4.6.1.5 Chemical, Biological and Physical Hazards.

Table 4.28 is a cross tabulation for the question “Do you understand what is meant by chemical, biological and physical hazards?” by the age of respondents. 88 respondents answered this question with only 12 missing responses.

**Table 4.28: Cross Tabulation for what is meant by chemical, biological and physical hazards?\* Age**

		Age				Total	
		18 - 27	28 - 37	38 - 47	48+		
Do you understand what is meant by chemical, biological and physical hazards?	Yes	Count	23	20	17	5	65
		% within Age	62.2%	87.0%	85.0%	62.5%	73.9%
	No	Count	8	1	2	1	12
		% within Age	21.6%	4.3%	10.0%	12.5%	13.6%
	Not sure	Count	6	2	1	2	11
		% within Age	16.2%	8.7%	5.0%	25.0%	12.5%
Total	Count	37	23	20	8	88	
	% within Age	100.0%	100.0%	100.0%	100.0%	100.0%	

Table 4.28 shows that in category of ages 18-27, (62.2%) n=23 respondents understand what is meant by chemical, biological and physical hazards and (16.2%) n=6 indicated that they were not sure if they do understand. The majority (87.0%) n=20 of respondents in the age group 28-37 years indicated that they understand what is meant by chemical, biological and physical hazards while a minority (4.3%) n=1 answered no. Alqurashi *et al.* (2018:1) state that food safety knowledge levels of food handlers varied based on different ages of the food handlers. This was observed during an analysis of findings obtained when the researchers evaluated food safety knowledge and practices of food handlers in some Saudi Arabian hospitals.

#### 4.6.1.6 Do you have knowledge and understanding of food safety management systems e.g. HACCP?

Table 4.29 is a cross tabulation for the question “Do you have knowledge and understanding of food safety management systems?” by age of respondents. 89 respondents answered this question with only 11 missing responses.

**Table 4.29: Cross Tabulation for Do you have knowledge and understanding of food safety management systems e.g. HACCP? \*Age**

		Age				Total	
		18 - 27	28 - 37	38 - 47	48+		
Do you have knowledge and understanding of food safety management systems e.g. HACCP?	Yes	Count	22	18	19	7	66
		% within Age	57.9%	78.3%	95.0%	87.5%	74.2%
	No	Count	16	5	1	1	23
		% within Age	42.1%	21.7%	5.0%	12.5%	25.8%
Total	Count	38	23	20	8	89	
	% within Age	100.0%	100.0%	100.0%	100.0%	100.0%	

Table 4.29 shows that in the category of ages 18-27, (57.9%) n=22 respondents understand the HACCP system and (42.1%) n=16 indicated that they do not understand. The (95.0%) n=19 of respondents in the age groups 38-47 years indicated that they know what the HACCP system while an interesting (5.0%) n=1 answered no. Research findings indicate that there are food handlers who have no knowledge of what the HACCP system is (Alqurash *et al.* 2019:5). Also, Ovca *et al.* (2018:49) state that this lack of knowledge on HACCP is a result of lack of food safety training programmes and it is a great concern.

#### 4.6.1.7 How would you rate your level of knowledge of food safety and personal hygiene principles?

Respondents were asked to rate their level of knowledge towards food safety and personal hygiene principles. Their responses were compared on the basis of age and cross tabulations are presented in Table 4.30.

**Table 4. 30: Cross Tabulation for “rate your level of knowledge of food safety and personal hygiene principle” \* Age**

		Age				Total	
		18 - 27	28 - 37	38 - 47	48+		
How would you rate your level of knowledge of food safety and personal hygiene principles?	Excellent	Count	10	3	11	3	27
		% within Age	25.6%	13.0%	55.0%	37.5%	30.0%
	Good	Count	13	12	7	2	34
		% within Age	33.3%	52.2%	35.0%	25.0%	37.8%

	Fair	Count	14	6	2	3	25
		% within Age	35.9%	26.1%	10.0%	37.5%	27.8%
	Poor	Count	2	2	0	0	4
		% within Age	5.1%	8.7%	0.0%	0.0%	4.4%
Total	Count	39	23	20	8	90	
	% within Age	100.0%	100.0%	100.0%	100.0%	100.0%	

The highest number (55.0%) n=11 of respondents who rated their level of knowledge of safety and personal hygiene principles as excellent belonged to the age group 38-47. Table 4.30 shows that (25.6%) n=10 respondents in age category 18-27 rated their level of knowledge as excellent and (5.1%) n=2 rated their level of knowledge as poor. Table 4.29 also shows that an overall total of 90 respondents answered this question and only 10 respondents did not answer. Researchers explained the association between age and level of knowledge of food handlers. This association analysis showed that knowledge of food handlers varied with the age of respondents (Alqurashi *et al.* 2019:9).

#### 4.6.1.8 I understand what is meant by personal hygiene.

Table 4.31 shows an overall actual response rate of 90% against the expected response rate of 100%. This means that there were 10 missing responses from the total 100 expected in this particular question.

**Table 4.31: Cross Tabulation for “I understand what is meant by personal hygiene” \*Age**

			Age				Total
			18 - 27	28 - 37	38 - 47	48+	
I understand what is meant by personal hygiene.	Yes	Count	35	23	19	8	85
		% within Age	89.7%	100.0%	95.0%	100.0%	94.4%
	No	Count	4	0	1	0	5
		% within Age	10.3%	0.0%	5.0%	0.0%	5.6%
Total	Count	39	23	20	8	90	
	% within Age	100.0%	100.0%	100.0%	100.0%	100.0%	

In age category 18-27 a significant (89.7%) n=35 respondents responded with yes to confirm that they do understand what is meant by personal hygiene and (10.3%) n=4 responded that they do not understand the concept of personal hygiene. The majority (95.0%) n=19 in age category 38-47 understand what is meant by personal hygiene while in the same category (5.0%) n=1 indicated that they do not understand the personal hygiene concept. A study assessing personal hygiene of food handlers produced results that showed a significant number of food handlers had poor personal hygiene (Pradhan *et al.* 2018:4822).

#### 4.6.1.9 In a few words please explain (optional) the above (What is meant by personal hygiene?)

Table 4.32 presents cross tabulation for the above-mentioned question compared with the age of respondents. Table 4.32 shows that a total number of 90 responses were recorded with 10 responses to this particular question missing.

**Table 4.32: Cross Tabulation for, In a few words please explain (optional) the above (What is meant by personal hygiene?) \* Age**

		Age				Total
		18 - 27	28 - 37	38 - 47	48+	
In a few words please explain (optional)the above	Count	38	21	16	6	81
	% within Age	97.4%	91.3%	80.0%	75.0%	90.0%
Bath everyday	Count	0	0	0	1	1
	% within Age	0.0%	0.0%	0.0%	12.5%	1.1%
Be clean at all times; Wash hands regularly	Count	0	0	0	1	1
	% within Age	0.0%	0.0%	0.0%	12.5%	1.1%
Brush teeth twice a day	Count	0	0	1	0	1
	% within Age	0.0%	0.0%	5.0%	0.0%	1.1%
Cut beard when working as a chef/cook	Count	0	0	1	0	1
	% within Age	0.0%	0.0%	5.0%	0.0%	1.1%
Keep nails clean and short	Count	0	1	0	0	1
	% within Age	0.0%	4.3%	0.0%	0.0%	1.1%
Keep yourself clean at all times	Count	0	0	1	0	1
	% within Age	0.0%	0.0%	5.0%	0.0%	1.1%

	Wear clean chef gear	Count	0	1	0	0	1
		% within Age	0.0%	4.3%	0.0%	0.0%	1.1%
	Wear clean clothes	Count	0	0	1	0	1
		% within Age	0.0%	0.0%	5.0%	0.0%	1.1%
	Wear gloves when touching food	Count	1	0	0	0	1
		% within Age	2.6%	0.0%	0.0%	0.0%	1.1%
Total	Count	39	23	20	8	90	
	% within Age	100.0%	100.0%	100.0%	100.0%	100.0%	

Table 4.32 shows that respondents gave their different explanations regarding personal hygiene. One (12.5%) n=1 respondent in the age category 48+ stated that “bathing everyday” is one of the personal hygiene principles. Age category 18-27 included a (2.6%) n=1 respondent who stated that personal hygiene principle is wearing gloves when touching food. According to Pradhan *et al.* (2018:4824), personal hygiene principles should be followed by food handlers during food handling. These researchers also state that the findings of their study on personal hygiene among food handlers in Panaji city showed that personal hygiene levels of food handlers varied from good, fair to poor.

#### 4.6.2 Cross Tabulation by Position

The following questions were cross tabulated by positions of respondents in order to establish whether this variable had an influence on responses. The researcher cross tabulated some questions by the position of respondents to compare responses based on their position. This was done to determine whether the variable “position” had any influence on respondents’ responses.

##### 4.6.2.1 Have you received basic food hygiene training? \* Position / title

Table 4.33 represents a cross tabulation of the above question by respondents’ positions. Out of the 100 responses that were expected, only 85 were received.

**Table 4.33: Cross Tabulation for Have you received basic food hygiene training? \***

**Position / title**

		Position / title					Total	
			Head chef	Kitchen manager	Sous chef	Cook	Other	
Have you received basic food hygiene training?	Yes	Count	2	10	8	53	8	81
		% within Position / title	100.0%	100.0%	100.0%	98.1%	72.7%	95.3%
	No	Count	0	0	0	1	3	4
		% within Position / title	0.0%	0.0%	0.0%	1.9%	27.3%	4.7%
Total	Count	2	10	8	54	11	85	
	% within Position / title	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	

Of the total (95.3%) n=81 who had received basic food hygiene training, the majority are the n=53 respondents in the cook's category. In the head chef category, only (100%) n=2 respondents indicated that they have received basic food hygiene training. The overall total (100%) n= 85 of respondents shows that there was n=15 missing responses to this question. The head chef, kitchen manager and sous chef categories had no respondents who answered no to the question. However, a total count of (4.7%) n=4 stated that they have not received basic training on hygiene and food safety. Researchers suggest that there is a significant association between position and food safety knowledge of food handlers (Alqurashi *et al* 2019:9). Thus, food handlers in higher positions are assumed to have more work experience or better education and therefore have fair or good food safety knowledge.

**4.6.2.2 Please rate the level of your food hygiene training \* Position / title**

Respondents were asked to rate the level of their food and hygiene training. A total of 81 respondents answered this question. Table 4.34 shows cross tabulation for the question compared with the position of respondents.

**Table 4.34 Cross Tabulation for Please rate the level of your food hygiene training \***

**Position / title**

		Position / title					Total	
			Head chef	Kitchen manager	Sous chef	Cook	Other	
Please rate the level of your food hygiene training	Foundation food hygiene	Count	1	7	2	32	5	47
		% within Position / title	50.0%	70.0%	25.0%	60.4%	62.5%	58.0%
		Count	1	3	3	16	3	26



	Advanced food hygiene	% within Position / title	50.0%	30.0%	37.5%	30.2%	37.5%	32.1%
	Any other relevant food hygiene	Count	0	0	3	5	0	8
		% within Position / title	0.0%	0.0%	37.5%	9.4%	0.0%	9.9%
Total		Count	2	10	8	53	8	81
		% within Position / title	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

The leading category with a majority of responses that rated their level of training as advanced was the cooks n=16. Only one head chef rated their training as advanced, while two other head chefs indicated that they could not rate their level of training but rather confirm that it was still food and hygiene training. In the category kitchen manager, a majority (70.0%) n=7 rated their level of training as foundational food hygiene training and the (30.0%) n=3 rated their level of training as advanced food hygiene training. In a study on food safety knowledge and practices among food handlers, researchers concluded that there was a significant association between receiving food safety training and food safety knowledge on food handlers (Alqurashi *et al.* 2019:10)

#### 4.6.2.3 Have you participated in food safety training in the past year? \* Position / title

Table 4.35 presents cross tabulation for the question “Have you participated in food safety training in the past year? \* Position / title”. The comparison of responses with the variable position was done with reference to stats presented in Table 4.35.

**Table 4.35: Cross Tabulation for Have you participated in food safety training in the past year? \* Position / title**

			Position / title					Total
			Head chef	Kitchen manager	Sous chef	Cook	Other	
Have you participated in food safety training in the past year?	Yes	Count	2	8	4	43	8	65
		% within Position / title	100.0%	80.0%	50.0%	81.1%	100.0%	80.2%
	No	Count	0	2	4	10	0	16
		% within Position / title	0.0%	20.0%	50.0%	18.9%	0.0%	19.8%
Total		Count	2	10	8	53	8	81
		% within Position / title	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

A (100%) n=2 respondents in the category head chef answered with yes. In the category kitchen manager, a significant (80.0%) n=8 respondents indicated that they have participated in food safety training in the past year and only (20%) n=2 respondents stated that they have not participated in food safety training in the past year. The overall majority (80.2%) n=65 respondents have participated in food safety training in the past 12 months and the minority (19.8%) n=16 have not. Previous research findings indicate that during personal hygiene and food safety studies, it was found that foodservice establishments had food handlers in different ranks who never had food safety training (Pradhan *et al.* 2018:4824; Alqurashi *et al.* 2019:9)

**4.6.2.4 How often as an employee and food handlers do you receive food hygiene development and refresher food safety training? \* Position / title**

The respondents were asked about the frequency of food safety refresher training in their foodservice establishments. Table 4.36 shows that only one respondent from the category kitchen manager answered this question indicating that they receive food safety refresher training monthly.

**Table 4.36: Cross Tabulation for How often as an employee and food handlers do you receive food hygiene development and refresher food safety training? \* Position / title**

		Position/Title Kitchen manager	Total
How often as an employee and food handlers do you receive food hygiene development and refresher food safety training?	Monthly	Count	1
		% within Position / title	100.0%
Total		Count	1
		% within Position / title	100.0%

The researcher expected a total of 100 responses but a total response rate to this question was only 1% n=1 respondent who belonged to category kitchen manager and therefore there were 99 missing responses. The (100%) n=1 kitchen manager respondent stated that they receive refresher training monthly. According to Pradhan *et al.* (2018:4825), it is essential to conduct food safety and personal hygiene training for all food handling staff within foodservice establishments. McFarland *et al.* (2019:1245) concur and suggest that food safety training should be provided continuously as refresher training to keep food handlers aware of the importance of food safety principles.

#### 4.6.2.5 Do you understand what is meant by chemical, biological and physical hazards? \*

##### Position / title

The respondents were asked if they know chemical, biological and physical food safety hazards. A total of 84 responded to this question. An overall majority (75.0%) n=63 respondents understand what is meant by the three mentioned food safety hazards.

**Table 4.37: Cross Tabulation for Do you understand what is meant by chemical, biological and physical hazards? \* Position / title**

		Position / title					Total	
		Head chef	Kitchen manager	Sous chef	Cook	Other		
Do you understand what is meant by chemical, biological and physical hazards?	Yes	Count	2	7	6	39	9	63
		% within Position / title	100.0%	70.0%	75.0%	72.2%	90.0%	75.0%
	No	Count	0	2	2	7	0	11
		% within Position / title	0.0%	20.0%	25.0%	13.0%	0.0%	13.1%
	Not sure	Count	0	1	0	8	1	10
		% within Position / title	0.0%	10.0%	0.0%	14.8%	10.0%	11.9%
Total	Count	2	10	8	54	10	84	
	% within Position / title	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	

In the category head chef, a total of n=2 respondents answered this question indicating that they do understand what is meant by these potential food safety hazards. In the kitchen manager category, a majority of respondents (70.0%) n=7 answered yes, (20.0%) n=2 answered no and (10.0%) n=1 was not sure if they do understand.

#### 4.6.2.6 Do you have knowledge and understanding of food safety management systems e.g. HACCP? \* Position / title

A total of 87 respondents answered this question. The respondents were given “yes and no” options to indicate whether they understand what food safety management systems are.

**Table 4.38 Cross Tabulation for Do you have knowledge and understanding of food safety management systems e.g. HACCP? \* Position / title**

		Position / title					Total	
			Head chef	Kitchen manager	Sous chef	Cook	Other	
Do you have knowledge and understanding of food safety management systems e.g. HACCP?	Yes	Count	1	8	4	43	7	63
		% within Position / title	50.0%	80.0%	50.0%	78.2%	58.3%	72.4%
	No	Count	1	2	4	12	5	24
		% within Position / title	50.0%	20.0%	50.0%	21.8%	41.7%	27.6%
Total		Count	2	10	8	55	12	87
		% within Position / title	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Of the overall total (100%) n=87 respondents who answered this question, a majority (72.4%) n=63 answered yes to this question while (27.6%) n=24 stated that they have no knowledge of food safety management systems. The HACCP management system principles address food safety by analysing and controlling physical, chemical and biological potential hazards throughout the food supply chain (Wallace *et al.* 2018:3).

#### **4.6.2.7 How would you rate your level of knowledge of food safety and personal hygiene principles? \* Position / title**

Table 4.39 shows that not all respondents answered this question, 12 responses were missing. The respondents were given four options to rate the level of their food safety and personal hygiene knowledge.

**Table 4.39: Cross Tabulation for How would you rate your level of knowledge of food safety and personal hygiene principles? \* Position / title**

		Position / title					Total	
			Head chef	Kitchen manager	Sous chef	Cook	Other	
How would you rate your level of knowledge of food safety and personal hygiene principles?	Excellent	Count	1	5	2	12	4	24
		% within Position / title	50.0%	50.0%	25.0%	21.4%	33.3%	27.3%
	Good	Count	1	2	2	25	3	33

	% within Position / title	50.0%	20.0%	25.0%	44.6%	25.0%	37.5%
Fair	Count	0	2	4	18	4	28
	% within Position / title	0.0%	20.0%	50.0%	32.1%	33.3%	31.8%
Poor	Count	0	1	0	1	1	3
	% within Position / title	0.0%	10.0%	0.0%	1.8%	8.3%	3.4%
Total	Count	2	10	8	56	12	88
	% within Position / title	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

The head chef category is represented by a total of only two respondents. In the kitchen manager category, a significant majority (50.0%) n=5 respondents rated their level of knowledge as excellent and one (10.0%) respondent rated their level of knowledge as poor. In the overall total column, it is shown that the majority (37.5%) n=33 respondents rated the level of their knowledge as good with a minority of (3.4%) n=3 respondents who rated their level of knowledge as poor. Researchers conducted a study on personal hygiene among food handlers in Panaji and results showed that a significant majority of the respondents showed fair to poor personal hygiene practices (Pradhan *et al.* 2018:4822).

#### **4.6.2.8 I understand what is meant by personal hygiene**

Respondents were asked if they understand the concept “personal hygiene and they were required to answer with a yes or no or not sure. Table 4.40 shows that 88 respondents answered this question.

**Table 4.40: Cross Tabulation for I understand what is meant by personal hygiene\*  
Position**

		Position / title					Total	
		Head chef	Kitchen manager	Sous chef	Cook	Other		
I understand what is meant by personal hygiene.	Yes	Count	2	10	7	53	11	83
		% within Position / title	100.0%	100.0%	87.5%	94.6%	91.7%	94.3%
	No	Count	0	0	1	3	1	5
		% within Position / title	0.0%	0.0%	12.5%	5.4%	8.3%	5.7%
Total	Count	2	10	8	56	12	88	
	% within Position / title	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	

A total of (94.3%) n=83 from the different categories answered with a yes and a minority answered with a no. A significant number (94.6%) n=53 of respondents in category cook confirmed that they understand what is meant by personal hygiene followed by (91.7%) n=11 from category other. According to Pradhan *et al.* (2018:4824), ensuring personal hygiene is one of the ways to prevent food contamination. The research findings prove that there are food handlers who do not practice personal hygiene principles are indicative of the presence of a problem within the foodservice industry.

**4.6.2.9 In a few words explain (personal hygiene)\* Position/Title**

Respondents were asked to briefly explain personal hygiene to prove that they indeed understand this concept.

**Table 4.41: Cross Tabulation for In a few words explain (personal hygiene)\*  
Position/Title**

		Position / title					Total
		Head chef	Kitchen manager	Sous chef	Cook	Other	
In a few words please explain (optional)the above	Count	0	9	6	52	12	79
	% within Position / title	0.0%	90.0%	75.0%	92.9%	100.0%	89.8%
Bath everyday	Count	0	0	1	0	0	1
	% within Position / title	0.0%	0.0%	12.5%	0.0%	0.0%	1.1%
Be clean at all times; Wash hands regularly	Count	0	1	0	0	0	1
	% within Position / title	0.0%	10.0%	0.0%	0.0%	0.0%	1.1%
Brush teeth twice a day	Count	0	0	1	0	0	1
	% within Position / title	0.0%	0.0%	12.5%	0.0%	0.0%	1.1%
Cut beard when working as a chef/cook	Count	0	0	0	1	0	1
	% within Position / title	0.0%	0.0%	0.0%	1.8%	0.0%	1.1%
Keep nails clean and short	Count	1	0	0	0	0	1
	% within Position / title	50.0%	0.0%	0.0%	0.0%	0.0%	1.1%
Keep yourself clean at all times	Count	1	0	0	0	0	1
	% within Position / title	50.0%	0.0%	0.0%	0.0%	0.0%	1.1%
Wear clean chef gear	Count	0	0	0	1	0	1
	% within Position / title	0.0%	0.0%	0.0%	1.8%	0.0%	1.1%
Wear clean clothes	Count	0	0	0	1	0	1
	% within Position / title	0.0%	0.0%	0.0%	1.8%	0.0%	1.1%
Wear gloves when touching food	Count	0	0	0	1	0	1
	% within Position / title	0.0%	0.0%	0.0%	1.8%	0.0%	1.1%
Total	Count	2	10	8	56	12	88
	% within Position / title	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 4.41 shows that respondents in various given categories gave their different explanations to illustrate their understanding. A total of 88 respondents answered this question, this confirms that there were 12 missing responses to this particular question. Pradhan *et al.* (2018:4822); (Alqurashi *et al.* 2019:8) conducted a study on personal hygiene among food handlers and they found that there were food handlers who stated that they did not always practice personal

hygiene standards. These researchers concluded that food handlers need to be provided with effective food safety and hygiene training followed by continuous refresher food safety training.

#### 4.6.3 Cross Tabulation by Years in Practice

The following questions were cross tabulated by years in practice of respondents in order to establish whether this variable had an influence on responses. The questions cross tabulated by position were:

##### 4.6.3.1 Have you received basic food hygiene training? \* Years in practice

The researcher cross tabulated some questions by the number of years the respondents had been working as food handlers in their respective foodservice establishments. The cross tabulations were done to compare responses given by the respondents based on their length of service.

**Table 4.42: Cross Tabulation for “Have you received basic food hygiene training?” \* Years in practice**

		Years in practice				Total	
		> 10	5 - 10	1 - 5	< 1		
Have you received basic food hygiene training?	Yes	Count	18	25	40	7	90
		% within Years in practice/ position	100.0%	96.2%	93.0%	87.5%	94.7%
	No	Count	0	1	3	1	5
		% within Years in practice/ position	0.0%	3.8%	7.0%	12.5%	5.3%
Total	Count	18	26	43	8	95	
	% within Years in practice/ position	100.0%	100.0%	100.0%	100.0%	100.0%	

Table 4.42 illustrates that (100%) n=18 respondents in category > 10 years have received basic food hygiene training. In category 1-5 years, a majority (96.2%) n=25 indicated that they have received basic food safety training and a minority (7.0%) n=3 in this category indicated that they have not received basic food safety training. In a study conducted by Alqurashi *et al* (2019:11), the discussion of variable association indicated a significant association between food safety practices and food safety training.

##### 4.6.3.2 Please rate the level of your food hygiene training \* Years in practice

Respondents were asked to rate the level of food safety training that they have received. A total of 90 respondents provided their responses.



**Table 4.43: Cross Tabulation for Please rate the level of your food hygiene training \*  
Years in practice**

		Years in practice				Total	
		> 10	5 - 10	1 - 5	< 1		
Please rate the level of your food hygiene training	Foundation food hygiene	Count	7	13	28	5	53
		% within Years in practice/ position	38.9%	52.0%	70.0%	71.4%	58.9%
	Advanced food hygiene	Count	10	10	7	1	28
		% within Years in practice/ position	55.6%	40.0%	17.5%	14.3%	31.1%
	Any other relevant food hygiene	Count	1	2	5	1	9
		% within Years in practice/ position	5.6%	8.0%	12.5%	14.3%	10.0%
Total	Count	18	25	40	7	90	
	% within Years in practice/ position	100.0%	100.0%	100.0%	100.0%	100.0%	

Table 4.43 shows that more than half (58.9%) n=53 of the total respondents rated their food safety training as the foundational level and only (31.1%) n=28 respondents rated their food safety training as advanced. In category >10, a majority (55.6%) n=10 of respondents has advanced food safety training and (38.9%) n=7 rated the level of food safety training as foundation. A significant association between length of service and food safety knowledge was established in a study of food safety knowledge among food handlers (Alqurashi *et al.* 2019:11).

#### **4.6.3.3 Have you participated in food safety training in the past year? \* Position**

Table 4.44 is a cross tabulation for the question stated above by length of service of respondents. Respondents were asked if they had participated in food safety training in the past 12 months.

**Table 4.44: Cross Tabulations for Have you participated in food safety training in the past year? \* Years in Practice**

			Years in practice				Total
			> 10	5 - 10	1 - 5	< 1	
Have you participated in food safety training in the past year?	Yes	Count	13	22	35	3	73
		% within Years in practice/ position	72.2%	88.0%	85.4%	42.9%	80.2%
	No	Count	5	3	6	4	18
		% within Years in practice/ position	27.8%	12.0%	14.6%	57.1%	19.8%
Total	Count	18	25	41	7	91	
	% within Years in practice/ position	100.0%	100.0%	100.0%	100.0%	100.0%	

Table 4.44 illustrates that in category >10, a significant number (72.2%) n=12 respondents answered yes and a minority (27.8%) n=5 answered no. In the category 5-10, a total count of 25 respondents answered comprising of (88.0%) n=22 respondents who have received food safety training in the past year and (12.0%) n=3 who have not received training in the past year. There is great association between receiving food safety training and the length of service as a food handler. The researcher, therefore, concludes that it is likely that food handlers who have been in service as food handlers for long have received food safety training as compared to those who have been in service for a shorter period. Therefore, it is likely that food handlers with longer years in service have better food safety knowledge than those with shorter years of service (Alqurashi *et al.* 2019:1).

#### **4.6.3.4 How often as an employee and food handlers do you receive food hygiene development and refresher food safety training? \* Years in practice**

Respondents were asked to indicate the frequency of food safety refresher training provided in their foodservice establishments. Table 4.45 shows that only one respondent answered this question.

**Table 4.45: Cross Tabulation for How often as an employee and food handlers do you receive food hygiene development and refresher food safety training? \* Years in practice**

			Years in practice > 10	Total
How often as an employee and food handlers do you receive food hygiene development and refresher food safety training?	Monthly	Count	1	1
		% within Years in practice/ position	100.0%	100.0%
Total		Count	1	1
		% within Years in practice/ position	100.0%	100.0%

Table 4.45 shows that (100%) n=1 respondent answered this question and stated that they receive refresher training only once. Pradhan *et al.* (2018:4824) attest that it is essential to provide food safety and hygiene training continuously to keep food handlers reminded of food safety principles. MacFarland *et al.* (2019:7) concur that food handlers should receive refresher training on food safety to help them keep up with food safety practices.

**4.6.3.5 Do you understand what is meant by chemical, biological and physical hazards? \* Years in practice**

Table 4.46 presents responses given by respondents to the question that was asking them if they understand the concepts food safety chemical, biological and physical hazards. A total of 94 respondents answered this question.

**Table 4.46: Cross Tabulation for Do you understand what is meant by chemical, biological and physical hazards? \* Years in practice**

		Years in practice				Total	
		> 10	5 - 10	1 - 5	< 1		
Do you understand what is meant by chemical, biological and physical hazards?	Yes	Count	12	22	32	3	69
		% within Years in practice/ position	66.7%	84.6%	76.2%	37.5%	73.4%
	No	Count	3	2	7	1	13
		% within Years in practice/ position	16.7%	7.7%	16.7%	12.5%	13.8%
	Not sure	Count	3	2	3	4	12
		% within Years in practice/ position	16.7%	7.7%	7.1%	50.0%	12.8%
Total	Count	18	26	42	8	94	
	% within Years in practice/ position	100.0%	100.0%	100.0%	100.0%	100.0%	

Table 4.46 shows that in category <1, an interesting (50.0%) n=4 had no understanding of what chemical, biological and physical hazards are and (76.2%) n=32 understand these concepts. In the category >10, the majority of (66.7%) n=12 respondents understand what chemical, biological and physical hazards are and an interesting (16.7%) n=3 respondents were not sure if they understand. Alqurashi *et al* (2019:1) state that food safety knowledge among food handlers vary based on the length of service as food handlers.

**4.6.3.6 Do you have knowledge and understanding of food safety management systems e.g. HACCP? \* Years in practice**

Table 4.47 presents cross tabulation for the question stated above by respondents' length of service as food handlers in their respective foodservice establishments. A total of 97 responses were received for this particular question. Respondents were required to answer with either a yes or a no.

**Table 4.47: Cross Tabulation for Do you have knowledge and understanding of food safety management systems e.g. HACCP? \* Years in practice**

			Years in practice				Total
			> 10	5 - 10	1 - 5	< 1	
Do you have knowledge and understanding of food safety management systems e.g. HACCP?	Yes	Count	16	18	31	6	71
		% within Years in practice/ position	88.9%	64.3%	72.1%	75.0%	73.2%
	No	Count	2	10	12	2	26
		% within Years in practice/ position	11.1%	35.7%	27.9%	25.0%	26.8%
Total	Count	18	28	43	8	97	
	% within Years in practice/ position	100.0%	100.0%	100.0%	100.0%	100.0%	

Table 4.47 shows that (88.9%) n=16 respondents in category >10 understand what food safety managements systems are and (11.1%) n=2 do not. Category 5-10 years is comprised of a significant (64.3%) n=18 that answered yes and interestingly (35.7%) n=10 who answered no. Ovca *et al* (2018:42); Alqurashi's *et al.* (2019:5) study to evaluate food safety knowledge and practices among food handlers similarly show that there were food handlers who did not know what food safety management systems are.

**4.6.3.7 How would you rate your level of knowledge of food safety and personal hygiene principles? \* Years in practice**

Respondents were asked to rate their level of knowledge towards food safety and personal hygiene guidelines. Table 4.48 shows that a total of 98 responses were recorded and there were 2 missing.

**Table 4.48: Cross Tabulation for How would you rate your level of knowledge of food safety and personal hygiene principles? \* Years in practice**

		Years in practice				Total	
		> 10	5 - 10	1 - 5	< 1		
How would you rate your level of knowledge of food safety and personal hygiene principles?	Excellent	Count	9	8	9	2	28
		% within Years in practice/ position	50.0%	28.6%	20.9%	22.2%	28.6%
	Good	Count	4	10	19	2	35
		% within Years in practice/ position	22.2%	35.7%	44.2%	22.2%	35.7%
	Fair	Count	5	10	13	4	32
		% within Years in practice/ position	27.8%	35.7%	30.2%	44.4%	32.7%
	Poor	Count	0	0	2	1	3
		% within Years in practice/ position	0.0%	0.0%	4.7%	11.1%	3.1%
Total	Count	18	28	43	9	98	
	% within Years in practice/ position	100.0%	100.0%	100.0%	100.0%	100.0%	

Table 4.48 shows that in category >10, (50.0%) n=9 respondents rated their level of knowledge as excellent and no respondents in this category rated their level of knowledge as poor. In category 5-10, (28.6%) n=8 respondents rated their level of knowledge as excellent and an interesting (35.7%) n=10 respondents rated theirs as fair. Ovca *et al.* (2018:42) describe the different levels of food safety training as elementary level and upper-secondary levels. Pradhan *et al.* (2018:4824) explain the results of their study findings on assessing knowledge and personal hygiene of food handlers. The results showed that a minority (16.3%) of respondents rated their level of food safety knowledge as good. These researchers suggested that it is important to train food handlers before they start working as food handlers and supplementing this pre-training with periodic refresher trainings.

**4.6.3.8 I understand what is meant by personal hygiene. \* Years in practice**

Table 4.49 represents responses and cross tabulation for “I understand what is meant by personal hygiene.” \* Years in practice. Respondents were required to answer with a yes or a no.

**Table 4.49: Cross Tabulation for I understand what is meant by personal hygiene. \* Years in practice**

			Crosstab				
			Years in practice				
			> 10	5 - 10	1 - 5	< 1	Total
I understand what is meant by personal hygiene.	Yes	Count	18	25	41	8	92
		% within Years in practice/ position	100.0%	89.3%	95.3%	88.9%	93.9%
	No	Count	0	3	2	1	6
		% within Years in practice/ position	0.0%	10.7%	4.7%	11.1%	6.1%
Total	Count	18	28	43	9	98	
	% within Years in practice/ position	100.0%	100.0%	100.0%	100.0%	100.0%	

The majority n=41 of respondents who indicated that they understand the concept of personal hygiene belonged in category 1-5 years. This category accounted for the highest percentage (95.3%) of respondents who confirmed that they understand what is meant by personal hygiene. An interesting (10.7%) n=3 respondents in category 5-10 years answered that they do not understand what is meant by personal hygiene. According to Pradhan *et al.* (2018:4822), food handlers are carriers of microbes and these could be transmitted to food they are handling. It is. Therefore, essential that food handlers are trained on practising personal hygiene principles to prevent bacteria they carry in their bodies from gaining access into food.

#### **4.6.3.9 In a few words please explain (optional) the above \* Years in practice**

Respondents were required to briefly explain personal hygiene to prove that they understand this concept. Table 4.50 shows the different explanations that were given by respondents. A total of 98 responses were received.

**Table 4.50: Cross Tabulation for n a few words please explain (optional) the above \***  
**Years in practice**

		Years in practice				Total
		> 10	5 - 10	1 - 5	< 1	
In a few words please explain (optional)the above	Count	15	23	42	9	89
	% within Years in practice/ position	83.3%	82.1%	97.7%	100.0%	90.8%
Bath everyday	Count	1	0	0	0	1
	% within Years in practice/ position	5.6%	0.0%	0.0%	0.0%	1.0%
Be clean at all times; Wash hands regularly	Count	1	0	0	0	1
	% within Years in practice/ position	5.6%	0.0%	0.0%	0.0%	1.0%
Brush teeth twice a day	Count	0	1	0	0	1
	% within Years in practice/ position	0.0%	3.6%	0.0%	0.0%	1.0%
Cut beard when working as a chef/cook	Count	1	0	0	0	1
	% within Years in practice/ position	5.6%	0.0%	0.0%	0.0%	1.0%
Keep nails clean and short	Count	0	1	0	0	1
	% within Years in practice/ position	0.0%	3.6%	0.0%	0.0%	1.0%
Keep yourself clean at all times	Count	0	1	0	0	1
	% within Years in practice/ position	0.0%	3.6%	0.0%	0.0%	1.0%
Wear clean chef gear	Count	0	1	0	0	1
	% within Years in practice/ position	0.0%	3.6%	0.0%	0.0%	1.0%
Wear clean clothes	Count	0	1	0	0	1
	% within Years in practice/ position	0.0%	3.6%	0.0%	0.0%	1.0%
Wear gloves when touching food	Count	0	0	1	0	1
	% within Years in practice/ position	0.0%	0.0%	2.3%	0.0%	1.0%
Total	Count	18	28	43	9	98
	% within Years in practice/ position	100.0%	100.0%	100.0%	100.0%	100.0%

Table 4.50 shows that all 98 respondents who answered this question gave different explanations of personal hygiene. The category which had the most respondents (43) is category 1-5 followed by category 5-10. Category <1 had the fewest respondents n=9 in it. There was no significant association between the length of service as food handlers and



knowledge of personal hygiene was observed following a study conducted by (Alqurashi *et al.* 2019:8). The results showed that food handlers who had been in the foodservice industry for longer years actually had less knowledge than food handlers who are newer as food handlers. Researchers made assumptions that this zero significance could be due to improvements of training instruments with the newer food handlers receiving much advanced training. Hence McFarland *et al.* (2018:1245) encourage that food safety training should be frequently refreshed to help food handlers keep updated as systems improve and laws change.

#### **4.7 Correlations**

Bivariate correlation in Annexure F was performed on the ordinal data in order to establish correlations between two variables to learn and understand situations better. There were a quite number of significant correlations that were observed. The results are interpreted in the following pattern: Positive values indicate a directly proportional relationship between the variables and a negative value indicates an inverse relationship. All significant relationships are indicated by a \* or \*\* ( $p < 0.01$ ;  $p < 0.05$ ).

##### **4.7.1 Correlation of Food Safety Knowledge and Practices**

The correlation value between “Safe and proper food handling is an important part of my job responsibilities as a food handler” and “Undergoing food safety training is important to me” is (.412;  $p < .01$ ). This is a directly related proportionality (McFarland *et al.* 2019:1239). Respondents indicate that the greater and better the training, the safer and better food handling would be, and vice versa.

Another relationship of interest was the significant negative correlation observed between “How would you rate your level of knowledge of food safety and personal hygiene principles?” and “Foodborne sicknesses are caused by the ignorance and not complying with food safety management system by food handlers” (-.289;  $p < .01$ ). This negative correlation value implies an inverse relationship between the two variables. That is, the better the knowledge of food safety and personal hygiene, the smaller the occurrence of foodborne diseases would be. A correlation value of (.291;  $p < .01$ ) between “Do you use gloves when you touch or distribute unwrapped foods?” and “Do you use protective clothing and gloves when you prepare, touch or distribute unwrapped foods?” depicts a weaker association between the two variables.

The correlation value between “Safe and proper food handling is an important part of my job responsibilities as a food handler.” and “How would you rate your overall satisfaction towards

the standard training of food handlers (kitchen staff) that is provided by your employer?” is (-.218;  $p < .05$ ). This is a negative correlation depicting that while safe and proper food handling is important to be practised by food handlers increased their overall satisfaction towards training decreases. A correlation (.245;  $p < .05$ ) between “Do you use gloves when you touch or distribute unwrapped foods?” and “Do you wear a cap when you prepare, touch or distribute unwrapped foods?” describes a positive but weak strength of relationship between the two variables.

Correlational analyses were used to examine the relationship between variables: “How would you rate your level of knowledge of food safety and personal hygiene principles?” and “Do you wash your hands in-between touching different foods?” Results (0.220;  $p < .05$ ) indicate a directly related proportionality but weak positive correlation between the variables. This suggests that the better the level of knowledge, the better the food handling practices of food handlers (McFarland *et al.* 2019:1239).

#### **4.8 Discussion of results**

The results obtained from data collection were processed in Excel and presented in the form of graphs, pie charts and tables. The discussion of these results is prefaced by the study objective; the ensuing discussion hopes to address.

##### **4.8.1 Knowledge of food handlers**

Objective: To identify patterns in food safety knowledge and practices of food handlers in South African food establishments.

The results in Figures 4.4, 4.5, 4.6, 4.7 and Tables 4.5, 4.6, 4.7, 4.8, 4.9, 4.10 “knowledge of respondents” are indicative of a gap in knowledge of food handlers. It is very crucial that food handlers have high level knowledge of food safety principles, foodservice legislation, food poisoning bacteria and sicknesses (Baluka *et al.* 2015:31; Brunet 2016:910). Such knowledge is crucial in its contribution to ensure proper foodservices and safe food. The different levels and lack of knowledge of food handlers towards food safety depicted clearly indicate that not all food handlers possess the requisite knowledge, this is indicated by the fact that there are food handlers who did not answer the questions and some confirmed their lack of knowledge in their responses (Khan *et al.* 2018:118; McFarland *et al.* 2019:1245). The respondents who did not provide their responses to the questions requiring information about their levels of knowledge, skipped and answered the next questions give an impression that they either have no knowledge or were uncertain. Uncertainty also confirms that food handlers have no

confidence in stating that they do have knowledge but poor levels or lack of knowledge. The results presented under the variable “knowledge of food handlers strongly concur with the statements and views of authors and researchers that are discussed in the literature review that some food handlers lack knowledge of food handlers regarding food safety standards, regulations and foodborne sicknesses. This lack of and little knowledge amongst food handlers has been identified as one of the major causes of food contamination and food poisoning (Kubde *et al.* 2015:3).

#### **4.8.2 Practices of food handlers**

Objective: To locate categories of compliance of food safety management systems within foodservice establishments with the current food safety standards and regulations.

All respondents who participated in this survey are food handlers in different ranks and positions in foodservice establishments. These include kitchen managers, head chefs, sous chefs and cooks, and therefore, they are all responsible to ensure that safe foods are provided. Even though the results indicate that there are food handlers who confirmed that they properly practice and implement food safety standards, the results prove that not all of them are compliant with the food safety standards. Improper practices exist in the foodservice establishments (Darko *et al.* 2015:2664). The results present a need to provide relevant stakeholders to establish effective controls to attain food safety regulations’ objectives. The results presented in the graphs under the “practices” variable also indicate that improper food handling practices occur in all different levels and departments of food handlers and across the food supply chain from production, preparation, storing and serving (Moreb *et al.* 2017:341).

#### **4.8.3 Attitudes of food handlers**

Objective: To examine the attitudes of food handlers towards food safety.

The results regarding the attitude of food handlers towards food safety standards caution that not all food handlers in the foodservice industry have attitudes that contribute to safe foods. A proportion of respondents confirmed that they disagree with some established food safety principles.

According to Darko *et al.* (2015:2664), research results indicate that negative attitudes amongst food handlers towards food safety regulations exist. It is clear in the results interpretation that there are food handlers with negative attitudes and who do not really see the need of complying with some food safety principles. A lack of knowledge and requisite skills are the reasons for

some food handlers to have negative attitudes towards food safety standards (Sousa *et al.* 2016:2). There are respondents who left questions aimed at assessing their attitudes unanswered, some indicated that they were uncertain. This indicates that food handlers tend to have negative attitudes towards food safety principles for they lack knowledge and understanding. This omission may translate to the tendency for negative attitude towards food safety principles as these food handlers lack the requisite knowledge and understanding. Therefore, the limiting attitudes of food handlers based on their perceptions, feeling and views may be attributed to a gap in their knowledge of food handling.

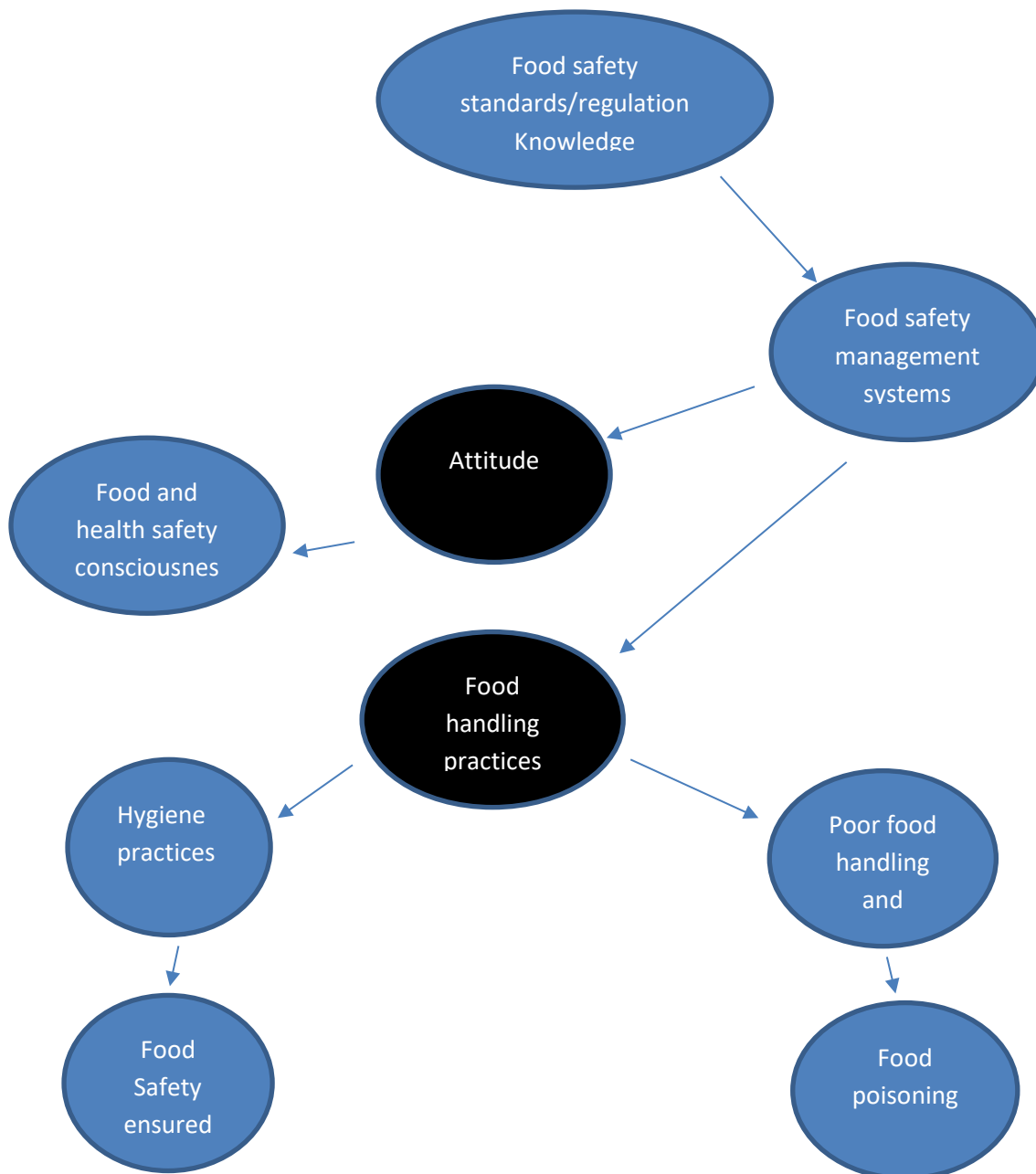
#### **4.8.4 Food safety**

Objective: To identify patterns in food safety knowledge and practices of food handlers in South African food establishments.

The primary results on food safety knowledge, practices and attitudes of food handlers find strong association to the literature. For example, that foodborne sicknesses result from improper handling of foods (Mohos 2017:21). The improper handling of food is linked to lack of knowledge and bad attitudes of food handlers. The respondents indicate that there is a great gap in their knowledge and lack of food safety regulations' implementation and compliance. These are linked to the food poisoning outbreak occurrences internationally (Clayton *et al.* 2017:600).

#### **4.9 Conceptual framework revision**

The original conceptual framework was revised to assist the researcher to make effective recommendations based on new knowledge derived from the study. The revised conceptual framework illustrates the variables of this study and how they are linked to the problem. The relationships of variables are clearly presented on Figure 4.19. These relationships and linkages are supported in the literature review (Clayton *et al.* 2017:600; Mohos 2017:21). The revised conceptual framework presents a summary of how the problem of foodborne sicknesses mostly occur. It is illustrated that food safety knowledge requires food handlers to have knowledge of food safety principles, food safety control systems and food poisoning causes, implications and prevention (McFarland *et al.* 2019:1240). The variable "attitude" of food handlers is directly linked to food handlers' consciousness and perceptions towards food safety standards. The third variable refers to food handling practices of food handlers, the framework clearly shows that there are good and bad practices.



**Figure 4.19: Revised Conceptual Framework**

#### **4.10 Conclusion**

In this chapter the researcher presented the results of the data collected. The data were processed in Excel and presented in the graphs, pie charts and tables, interpreted and discussed. The researcher also discussed the relationships between the variables and linked them to the objectives of this study as established in the literature review and data collection results. The next chapter will be presenting conclusions and discussions of recommendations by the researcher. The researcher will be giving recommendations to be applied as guidelines and

criteria for relevant stakeholders in solving the problem of foodborne sicknesses occurring as a result of improper food handling practices, lack of knowledge and bad attitudes of food handlers within foodservice establishments.

## **CHAPTER 5**

### **Conclusions and Recommendations**

#### **5.1 Introduction**

In the previous chapter, the researcher discussed results which were processed in Excel and presented in graphs, tables and charts. In presenting a summary of collective findings based on the study objectives, this chapter will also present conclusions from the literature review and the primary study. This chapter will show the study limitations as well as recommendations proposed by the researcher to help identify the implications and usefulness of this study for further research.

#### **5.2 Conclusions from the Primary and Secondary Studies**

The conclusions drawn from both the primary and secondary study are respectively discussed in this chapter. These conclusions will also be used as a guide to make recommendations.

##### **5.2.1 The First Objective**

To identify patterns in food safety knowledge and practices of food handlers in South African food establishments.

##### **5.2.1.1 Conclusions from the Secondary Study**

The findings from the literature review support the primary data that there is a gap in knowledge of food handlers. This lack of knowledge is linked to the improper practices of food handlers. The literature discusses the responsibilities and requirements of food handlers in ensuring safe foods are produced for consumption. The findings from the literature show that lack of knowledge and improper food handling practices by food handlers can facilitate the spread of food poisoning microorganisms. Moreover, the lack of knowledge towards food safety standards and bad attitudes of food handlers have been found to be the reasons for food contamination. Researchers have indicated that their studies reveal that some food handlers lacked knowledge due to not receiving training and skills development. Empirical findings also state that one of the reasons that food handlers are not receiving training and skills development courses is that owners and managers of foodservice facilities have no financial resources or are literally avoiding spending money on food safety training programmes for their staff.

### **5.2.1.2 Conclusions from the primary study**

The results presented in sections 4.5.2 and 4.5.3 support the literature findings that food handlers lack knowledge regarding food safety principles and standards. The food safety standards are supposed to guide food handlers in proper handling of foods to ensure that foods are safe to consume. In the findings from food handlers, it is evident that food handlers have different levels of knowledge of food safety principles. Responses to questions on food handlers' knowledge or understanding of food safety principles indicate that some respondents have no knowledge or understanding, and some indicated that they were unsure of their own knowledge while others even left the questions unanswered. The illustration of results presented in section 4.5.3 clearly points out that bad food handling practices exist in foodservice facilities. This is shown by the findings that some food handlers indicated that they have no knowledge of the questions asked, some did not answer, and some gave answers that are contradict basic food safety standards.

## **5.2.2 The second objective**

To examine the attitudes of food handlers towards food safety.

### **5.2.2.1 Conclusions from secondary study**

The findings of the literature review reveal that empirical studies on food handlers' attitudes towards food safety standards are in agreement that there is a problem. This problem is linked to a number of food poisoning incidents that have occurred in the world. The importance of assessing attitudes of food handlers in order to identify problems and establish effective ways of solving the existing problems is examined by researchers in the literature. The literature points out that food handlers' attitudes towards food safety standards can either be bad or good and are linked with knowledge and practices of food handlers as well. The good attitude is described in the literature as adhering to, understanding, and perceiving food safety standards as crucial. Conversely, bad attitudes of food handlers result from not understanding the impact of food contamination on society. Food handlers respond differently to training programmes, food safety courses and food safety principles based on their perceptions. Those who respond negatively fail to see the need for some food safety principles and therefore ignore those practices.

### **5.2.2.2 Conclusions from primary study**

The findings regarding food handlers' attitudes towards food safety standards obtained from the primary study are presented in section 4.5.4. To assess the attitudes of food handlers, the



questions required food handlers to indicate their perceptions and judgements by indicating whether they agreed or disagreed with the given points. The results show that there are food handlers who indicated that they do not really see the usefulness of some of the food safety principles indicated that were in disagreement with the statement. Principles not perceived as really necessary or important can be ignored or bypassed. These negative attitudes were also found to be related to the level of knowledge and resulted in improper food handling practices. The findings have indicated that there is a gap created by food handlers' lack of knowledge with results in bad attitudes and improper food handling practices.

### **5.2.3 The third objective**

To locate categories of compliance of food safety management systems within foodservice establishments with the current food safety standards and regulations.

#### **5.2.3.1 Conclusions from secondary study**

The literature review shows that there are food safety regulations that are passed by the legislature for their particular countries to ensure safe foods are produced for society. The deviation in the level of compliance by foodservice providers is described in the literature as varying. This is based on the empirical evidence following inspections of various foodservice establishments, confirming that not all foodservice establishments comply with food safety regulations. Findings from the secondary study also indicate that failure to comply with the food safety regulations have been identified as the cause of many food poisoning outbreaks that have occurred worldwide. The findings also indicate that some foodservice establishments have knowledge of food safety standards but still do not implement them due to lack of resources. The findings also show that failure to comply and implement food safety principles have a negative impact on the country's economy due to reported food poisoning cases. The literature clearly states that the management systems of various foodservice establishments lack effectiveness when it comes to implementing, enforcing and monitoring food safety standards.

#### **5.2.3.2 Conclusions from primary study**

The findings regarding compliance of food safety management are presented in sections 4.5.3; 4.5.4 and 4.5.5. The food handlers were required to assess their foodservice facilities and indicate whether they meet the food safety standards set by food safety legislation. The responses given prove that the management systems of the foodservice establishments do not all adhere to food safety and health and safety regulations. Findings indicate that food handlers

confirmed that they do understand foodservice facility safety standards; however, theirs do not meet these requirements. Some foodservice areas lack basic hygienic facilities such as hot water, hand, soap and drying towels. Other respondents indicated that their management does not provide them with food safety training, and some do undergo food safety and health and safety training, however, no refresher training is offered.

### **5.3 Limitations on the use of study results**

To fulfil the purpose of this study, the researcher collected data from food handlers from both commercial and non-commercial foodservice establishments. The results of the study cannot be generalised beyond the context of areas in which data were collected. This negative limitation is attributable to the small sample size. As the margin of error is relatively large, the results of this investigation may, therefore, be considered to be preliminary estimates. Even though the research is on food handlers' knowledge, attitudes and practices within government and private sector, this study has been confined only to hotels, restaurants and government hospitals. This excludes other foodservice establishments such as domestic homes, military and educational institutions and old age homes. The results, however, will be a useful guide to the entire foodservice sector.

### **5.4 Recommendations**

The researcher recommends the stakeholders responsible for conceptualising, formulation and debating laws should make it a priority that food safety laws are not just laws and structures for monitoring and enforcement of standards set but are implemented and practised. The government's Department of Health should also extend their own research and use existing research findings in order to establish the causes of foodborne sicknesses. There should be continuous research done by organs of government to assess compliance of food handlers towards food safety principles; this should not only be done when there is an outbreak. The foodservice establishment managers and owners need to invest in food safety promotion projects which involve educating people about food safety principles and consequences of not following principles when handling food. The literature indicated that some food safety systems while set just to guide, are not really enforced by the government. Therefore, the researcher recommends the enforcement of all health and safety regulations, in particular, the HACCP system, to minimise harmful bacteria in the microbial load of food. It should become law to educate and implement it in foodservice establishments and not just a guideline.

The government should also make it a priority to establish educational food safety programmes for all foodservice establishments ranging from domestic to commercial. The status of food safety should be raised to a daily warning to the society such as that of a road accident warning. People do not then only become aware of food safety principles when there is an outbreak of food poisoning. Such proactive position is likely to reduce the problems that the society is faced with. Educating people of food safety principles should be an ongoing process with specific objectives to prevent food poisoning. The government should also make it law that all profit and non-profit foodservice establishments should train their food handlers to a certain acceptable level. This will help in educating food handlers of the importance of practising food safety principles and shape their attitudes positively towards preventing food contamination. The researcher also recommends that there should be very strict consequences to be faced by those foodservice establishments that do not adhere to food safety legislation. This will help to encourage food handlers into implementing and practising the food safety regulations. According to the researcher's assumption on the knowledge and attitudes of food handlers, the findings depict that food handlers do not want to take the blame or even accept the fact that food poisoning can occur in any establishment where there is lack of knowledge and improper practices.

### **5.5 Opportunity of further research**

This study specifically excluded observation of food handlers' practices while preparing foods, personal interviews were not conducted, and the food handlers up the supply chain in manufacturing, transporting and storage of food were excluded. Possible future research is based on these limitations. Collecting data using more than one method may contribute greatly to the reliability and accuracy of the results, however, a separate study with observation or action research as methods for data collection may be done. The researcher also suggests that future research is needed to assess the effectiveness and enforcement of food safety regulations passed by the government. This research only focused on foodservice establishments and excluded manufacturing, transporting and storage of food. The additional research is also needed to expand this research to other food handling areas of the food supply chain with a larger sample size to increase the power of the study. The findings cannot be generalised to the entire food supply chain areas; therefore, expansion and replication are needed. Researchers can expand and replicate this research by targeting food handlers in manufacturing, transporting and storage of food. The future research topics to expand on this study may be as follows:

- Assessing food handlers' knowledge and practices during transporting of food and inspection of transportation vehicles.
- Inspecting food handling during manufacturing, preparing and packaging in factories, farms and abattoirs: A study on food safety handling principles.

## **5.5 Conclusion**

In this chapter, the researcher discussed conclusions drawn from the literature review with reference to each variable. The researcher also presented limitations depicted on the use of study results as well as recommendations and suggestions for future research.

This study aimed to assess knowledge, attitudes and practices of food handlers with regards to food safety in South African foodservice establishments. This study was also conducted in the interest of food handlers, customers and business sustainability. The findings show that assumed basic food safety knowledge among food handlers is misplaced. The results also reflect that even though some food handlers have been trained on food safety standards, their inappropriate attitudes discourage them from practising appropriate food handling principles. A single uninformed food handling practice may culminate in widespread food poisoning. The results clearly indicate the need for foodservice establishments' policy makers to be mindful of the impact the lack of knowledge and bad attitude of food handlers has on food safety management. Perhaps if they are, they could improve food safety policies and procedures. The researcher can conclude that there are shortcomings in the knowledge of food safety, improper attitudes towards food safety and inappropriate food handling practices that individually or collectively severely harm the success of the foodservice.

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## Annexure A: Consent form



### CONSENT

#### Statement of Agreement to Participate in the Research Study:

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

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

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

**Yondela Noxolo Tyabashe**                      **Date**                      **Signature Y.N. Tyabashe**

\_\_\_\_\_

## Annexure B: Letter of Information



### Letter of Information

DEPARTMENT OF HOSPITALITY AND TOURISM

MTECH RESEARCH PROJECT

**Title of the Research Study:** Food safety in food establishments: Knowledge and practices of food handlers in South Africa.

DEAR RESPONDENT

I am an Mtech student, at the Department of Hospitality and Tourism of the Durban University Technology. You are invited to participate in a research project entitled: **Food safety in food establishments: Knowledge and practices of food handlers in South Africa**. The aim of this study is to assess the knowledge, attitudes and practices of the food handlers in food establishments with regard to food hygiene, food safety and consumer protection. It also seeks to make recommendations that may help food establishments to make better decisions relating to consumer protection, safe foods and services offered to customers.

The information and rating you will provide me with will assist me to identify and understand knowledge, attitudes and compliance of food handlers towards food safety systems. Your participation will also assist in making recommendations with the aim of fighting foodborne diseases in hotels. The results are intended to contribute to help hospitality food establishments' owners and managers, government health authorities, all other food production and supply entities as well as consumers to prioritise consumer protection, food safety and make effective decisions to ensure they prevent foodborne sickness breakouts in their establishments. Your participation in this project is voluntary, there will be no monetary gain from participating in this survey. Confidentiality and anonymity of records identifying you as a participant will be maintained by the Durban University of technology, Department of Hospitality and Tourism. If you have any questions or concerns about completing this questionnaire or about participating in this study. You may contact me or my supervisor at the numbers listed below.

The questionnaires should take 15 to 20 minutes to complete. I hope you will take the time to participate.

**Persons to Contact in the Event of Any Problems or Queries:**

Please contact the researcher (063 1460 493), my supervisor, Dr K.M. Naidoo (031 3735 503) or the Institutional Research Ethics administrator on 031 373 2900. Complaints can be reported to the DVC: TIP, Prof F. Otieno on 031 373 2382 or [dvctip@dut.ac.za](mailto:dvctip@dut.ac.za).

Sincerely

Researcher's signature \_\_\_\_\_ Date \_\_\_\_\_

Respondent's signature \_\_\_\_\_ Date \_\_\_\_\_

## Annexure C: Questionnaire

### *Food safety self-assessment questionnaire*

#### **INSTRUCTIONS.**

*Please complete the following questions to reflect your perceptions, opinions, experiences, motives and to answer factual questions to the best of your knowledge. Please circle where possible, the best answer that is relevant to you in the*

- Kitchen manager
- Sous chef
- Cook
- Other please specify \_\_\_\_\_

#### 1.2 Years in practice/ position

- More than 10 years
- 5 to 10 years
- 1 to 5 years
- Less than 1 year

#### 1.3 Age

- 2.2 Please rate the level of your food hygiene training
- Foundation food hygiene
  - Advanced food hygiene
  - Any other relevant food hygiene

*following questions and write your response where appropriate*

### **1. Demographic Characteristics of Respondents**

Name (optional): \_\_\_\_\_

#### 1.1 Position / title

- Head chef
- 18 –
- 18-27
- 28-37
- 38-47
- 48+

### **2. Knowledge of food handlers**

- 2.1 Have you received basic food hygiene training?
- Yes
  - No

- 2.3 How often as an employee and food handlers do you receive food hygiene development and refresher food safety training?



- No refresher training is provided by the employer
- Weekly
- Monthly
- Yearly
- Other please specify \_\_\_\_\_

2.4 Have you participated in food safety training in the past year?

- Yes
- No

2.5 Do you understand what is meant by chemical, biological and physical hazards?

- Yes
- No
- Not sure
- Know only \_\_\_\_\_ hazards

2.5 Giving one example please explain how do you minimize the above risks? (Optional)

\_\_\_\_\_

\_\_\_\_\_

2.6 Do you have knowledge and understanding of food safety management systems e.g. HACCP?

- Yes
- No

2.8 How would you rate your level of knowledge of food safety and personal hygiene principles?

- Excellent
- Good
- Fair
- Poor

2.9 I understand what is meant by personal hygiene.

- Yes
- No

2.10 In a few words please explain (optional)the above\_\_\_\_\_

2.11 Which of the following is true about bacteria?

- Bacteria multiplies and grows faster in warm environments.
- Bacteria needs air to survive.
- Every type of bacteria can give people food poisoning.
- By freezing food you can kill bacteria.

2.12 Which one of these statements about bacteria is true?

- All types of bacteria give food poisoning
- Bacteria grow fastest when they are warm
- Freezing makes food last longer by killing bacteria
- All bacteria need air to survive

### ***3. Practices***

3.1 As a restaurant/kitchen manager, do you ensure that your staff comply with the food safety management systems?

- Always
- Never
- Sometimes

3.2 Do you use gloves when you touch or distribute unwrapped foods?

- Always
- Never
- Sometimes

3.3 Do you use protective clothing and gloves when you prepare, touch or distribute unwrapped foods?

- Always
- Never
- Sometimes

3.4 Do you wear a mask when you prepare, touch or distribute unwrapped foods?

- Always
- Never
- Sometimes

3.5 Do you wear a cap when you prepare, touch or distribute unwrapped foods?

- Always
- Never
- Sometimes

3.6 Do you wash your hands in-between touching different foods?

- Always
- Never
- Sometimes

3.7 Which one of these foods is likely to contain the most bacteria?

- Cooked chicken
- Frozen raw chicken
- Canned cream
- Bottled mayonnaise

3.8 Food contaminated with food poisoning bacteria would:

- Smell
- Change colour
- Look and taste normal
- Be slimy and bitter

3.9 Food poisoning only occurs because of bad practice in

- Restaurants
- Retail shops
- Home or domestic kitchens
- Any of the above

3.10 What is the most important reason for cleaning a food preparation area?

- So it looks really smart and tidy
- To prevent food contamination
- So people don't think you're lazy
- It's good exercise for your upper arms

3.11 What is the main reason for wearing protective clothing?

- It protects food from contamination
- It looks groovy
- It feels really comfy to wear
- It washes well at lower temperatures

3.12 Where should raw meat be stored in a refrigerator?

- At the top
- In the middle
- At the bottom, below all other food

3.13 How many times can you reheat leftovers?

- As many times as you like
- Twice
- Four times
- You should only reheat leftovers once

3.14 Which of the following meats are safe to eat when they are pink or raw?

- Chicken
- Pork
- Minced meat
- Lamb

3.15 What are the basic steps for washing hands?

- Wash thoroughly with water and dry
- Apply soap, wash thoroughly, rinse and use paper towels
- Apply soap, wash thoroughly

3.16 Which of the following is true?

- It is safe to eat food past its use-by date
- It is safe to eat food past its best-before date
- It is safe to eat food with no date codes on

3.17 High-risk foods are

- Cooked Meats, Dairy Products, Shell Fish, Cooked Rice
- Biscuits, Cakes, Bread
- Pasta, Fruit, Vegetables

3.18 How often should waste be removed from a kitchen area?

- Once A Day
- When A Bin Bag Is Full
- After Each Service

#### **4. Attitudes**

4.1 Foodborne sicknesses are caused by the ignorance and not complying with food safety management system by food handlers.

- Strongly agree
- Agree
- Disagree
- Strongly disagree

4.2 I often feel it is not necessary to wash my hands every time I prepare foods or change activities due to high pressure and workload. I therefore ignore and just do my work. Rate your level of attitude.

- Strongly agree
- Agree
- Disagree
- Strongly disagree

4.3 Safe and proper food handling is an important part of my job responsibilities as a food handler.

- Strongly agree

- Agree
- Disagree
- Strongly disagree

4.5 Undergoing food safety trainings is important to me.

- Strongly agree
- Agree
- Disagree
- Strongly disagree

4.6 Food handling relates to food safety.

- Strongly agree
- Agree
- Disagree
- Strongly disagree

4.7 Raw foods should be kept separately from cooked foods.

- Strongly agree
- Agree
- Disagree
- Strongly disagree

4.8 Food handlers should use cap, masks, protective gloves, and adequate clothing to reduce the risk of food contamination.

- Strongly agree
- Agree
- Disagree
- Strongly disagree

4.9 It is important to know the temperature of the refrigerator to reduce the risk of bacteria growth in food.

- Strongly agree
- Agree
- Disagree
- Strongly disagree

4.10 Improper storage of foods may be hazardous and cause food poisoning.

- Strongly agree
- Agree
- Disagree
- Strongly disagree

4.11 Food handlers (chefs) with cuts on hands should not touch unwrapped foods.

- Strongly agree
- Agree
- Disagree
- Strongly disagree

***5. Level of food safety in food safety establishments***

5.1 The law states that food premises should have adequate ventilation, clean water and adequate drainage system. Are the above requirements met by your foodservice establishment?

- Yes
- No
- Not sure

5.2 Rooms in which foods are kept and prepared must be in good condition and

designed in a way that enables you to clean and disinfect them when necessary. Are there any problems in your premises concerning any of the above?

- Yes
- No

5.3 Do you have hot water, wash hand basin, soap, and hygienic drying facilities in your food preparation areas?

- Yes
- No

5.4 Please rate the frequency of premises inspection in the past 12 months

- Only once
- More than once
- Has never been inspected
- Don't know

5.5 Facility has a food safety plan

- Yes
- No
- Don't know

5.6 Facility has written food safety standard operating procedures

- Yes
- No
- Don't know

5.7 Please rate the cleanliness and hygiene standards of food preparation and storage areas (storeroom and kitchen) of your restaurant?

- Excellent

- Good
- Fair
- Poor

5.8 Do you think that the standard of your foodservice site meets the requirements of food preparation areas as governed by legislation?

- Yes
- Maybe
- No
- Don't know

5.9 If you are the owner/ manager/ head chef, do you ensure that your staff get food safety training?

- Most of the time
- Some of the time
- Seldom
- Never

5.10 How would you rate your overall satisfaction towards the standard of your foodservice area (kitchen, store rooms) regarding food safety, hygiene and training of food handlers?

- Highly satisfactory
- Satisfactory
- Neutral
- Unsatisfactory
- Highly Unsatisfactory

5.11 How would you rate your overall satisfaction towards the standard training of food handlers (kitchen staff) that is provided by your employer?

- Highly satisfactory
- Satisfactory

- Neutral
- Unsatisfactory
- Highly Unsatisfactory

***End of Questionnaires. Thank you for your participation***

### Annexure D: Dimensions of the Study

Dimensions	Elements	Questions	No. of questions	Objectives
Knowledge of food handlers	<p>Food safety systems such as HACCP and Pathogen familiarity</p> <p>Symptoms of food allergy and illness</p> <p>Health and safety training</p>	1,2,3,4,5,6,7,8,9,10	10	To investigate understanding of food safety management systems and compliance with current food safety standards and to locate categories of compliance of food safety management systems with current food safety standards and regulations.
Practices	<p>Implementation of food safety systems</p> <p>Adherence to prescribed food safety regulations</p> <p>Handling of food</p>	11,12,13,14,15,16	6	To investigate understanding of food safety management systems and compliance with current food safety

				standards and to locate categories of compliance of food safety management systems with current food safety standards and regulations.
Attitudes	Ignore practising food safety  Perceptions of food handlers on food safety standards	17,18,19,20,21, 22,23,24,25,26	10	To examine the attitudes of food handlers towards food safety and application of HACCP principles of food safety.
Level of food safety in foodservice Establishment	Frequency of premises inspection  Food safety standards of the premises.  Compliance to food safety regulations by the food	27,28,29,30,31, 32,33,34,35,36, 37	11	To investigate understanding of food safety management systems and compliance with current food safety



	establishments owners and managers.			standards and regulations
Foodborne sicknesses and contamination.	Prevention of Contamination and common Bacteria causing food poisoning:	17,22,23,24,26	5	To identify patterns in food safety knowledge and practices of food handlers in South African food establishments .

### Annexure E: Chi-Square Tests

	Chi-Square	df	Asymp. Sig.		
Position / title	107.909 <sup>a</sup>	4	0.000		Q1.1
Years in practice/ position	26.000 <sup>b</sup>	3	0.000		Q1.2
Age	21.733 <sup>c</sup>	3	0.000		Q1.3
Have you received basic food hygiene training?	78.031 <sup>d</sup>	1	0.000		Q2.1
Please rate the level of your food hygiene training	33.152 <sup>e</sup>	2	0.000		Q2.2
Have you participated in food safety training in the past year?	34.935 <sup>f</sup>	1	0.000		Q2.4
Do you understand what is meant by chemical, biological and physical hazards?	71.313 <sup>g</sup>	2	0.000		Q2.5
Do you have knowledge and understanding of food safety management systems e.g. HACCP?	22.313 <sup>h</sup>	1	0.000		Q2.6
How would you rate your level of knowledge of food safety and personal hygiene principles?	24.800 <sup>i</sup>	3	0.000		Q2.8
I understand what is meant by personal hygiene.	77.440 <sup>j</sup>	1	0.000		Q2.9
Which of the following is true about bacteria?	60.560 <sup>i</sup>	3	0.000		Q2.1 1
Which one of these statements about bacteria is true?	56.640 <sup>i</sup>	3	0.000		Q2.1 2
As a restaurant/kitchen manager, do you ensure that your staff comply with the food safety management systems?	5.333 <sup>k</sup>	1	0.021		Q3.1
Do you use gloves when you touch or distribute unwrapped foods?	27.440 <sup>l</sup>	2	0.000		Q3.2
Do you use protective clothing and gloves when you prepare, touch or distribute unwrapped foods?	57.760 <sup>j</sup>	1	0.000		Q3.3
Do you wear a mask when you prepare, touch or distribute unwrapped foods?	77.440 <sup>j</sup>	1	0.000		Q3.4

Do you wear a cap when you prepare, touch or distribute unwrapped foods?	73.960 <sup>j</sup>	1	0.000		Q3.5
Do you wash your hands in-between touching different foods?	125.780 <sup>l</sup>	2	0.000		Q3.6
Which one of these foods is likely to contain the most bacteria?	82.880 <sup>l</sup>	2	0.000		Q3.7
Food contaminated with food poisoning bacteria would:	7.840 <sup>i</sup>	3	0.049		Q3.8
Food poisoning only occurs because of bad practice in	71.280 <sup>i</sup>	3	0.000		Q3.9
What is the most important reason for cleaning a food preparation area?	21.592 <sup>m</sup>	1	0.000		Q3.1 0
What is the main reason for wearing protective clothing?	64.340 <sup>d</sup>	1	0.000		Q3.1 1
Where should raw meat be stored in a refrigerator?	80.667 <sup>n</sup>	1	0.000		Q3.1 2
How many times can you reheat leftovers?	61.460 <sup>l</sup>	2	0.000		Q3.1 3
Which of the following meats are safe to eat when they are pink or raw?	61.124 <sup>d</sup>	1	0.000		Q3.1 4
What are the basic steps for washing hands?	176.780 <sup>l</sup>	2	0.000		Q3.1 5
Which of the following is true?	90.140 <sup>l</sup>	2	0.000		Q3.1 6
High-risk foods are	89.840 <sup>l</sup>	2	0.000		Q3.1 7
How often should waste be removed from a kitchen area?	29.180 <sup>l</sup>	2	0.000		Q3.1 8
Foodborne sicknesses are caused by the ignorance and not complying with food safety management system by food handlers.	168.560 <sup>i</sup>	3	0.000		Q4.1
I often feel it is not necessary to wash my hands every time I prepare foods or change activities due to high	120.260 <sup>l</sup>	2	0.000		Q4.2

pressure and workload. I therefore ignore and just do my work. Rate your level of attitude.					
Safe and proper food handling is an important part of my job responsibilities as a food handler.	232.880 <sup>i</sup>	3	0.000		Q4.3
Undergoing food safety training is important to me.	134.540 <sup>l</sup>	2	0.000		Q4.5
Food handling relates to food safety.	139.580 <sup>l</sup>	2	0.000		Q4.6
Raw foods should be kept separately from cooked foods.	232.880 <sup>i</sup>	3	0.000		Q4.7
Food handlers should use cap, masks, protective gloves, and adequate clothing to reduce the risk of food contamination.	140.660 <sup>l</sup>	2	0.000		Q4.8
It is important to know the temperature of the refrigerator to reduce the risk of bacteria growth in food.	165.860 <sup>l</sup>	2	0.000		Q4.9
Improper storage of foods may be hazardous and cause food poisoning.	84.640 <sup>j</sup>	1	0.000		Q4.10
Food handlers (chefs) with cuts on hands should not touch unwrapped foods.	92.160 <sup>j</sup>	1	0.000		Q4.11
The law states that food premises should have adequate ventilation, clean water and adequate drainage system. Are the above requirements met by your foodservice establishment?	45.260 <sup>l</sup>	2	0.000		Q5.1
Rooms in which foods are kept and prepared must be in good condition and designed in a way that enables you to clean and disinfect them when necessary. Are there any problems in your premises concerning any of the above?	21.160 <sup>j</sup>	1	0.000		Q5.2
Do you have hot water, wash hand basin, soap, and hygienic drying facilities in your food preparation areas?	67.240 <sup>j</sup>	1	0.000		Q5.3

Please rate the frequency of premises inspection in the past 12 months	146.000 <sup>i</sup>	3	0.000		Q5.4
Facility has a food safety plan	112.820 <sup>l</sup>	2	0.000		Q5.5
Facility has written food safety standard operating procedures	112.820 <sup>l</sup>	2	0.000		Q5.6
Please rate the cleanliness and hygiene standards of food preparation and storage areas (storeroom and kitchen) of your restaurant?	71.920 <sup>i</sup>	3	0.000		Q5.7
Do you think that the standard of your foodservice site meets the requirements of food preparation areas as governed by legislation?	50.960 <sup>i</sup>	3	0.000		Q5.8
If you are the owner/ manager/ head chef, do you ensure that your staff get food safety training?	1.000 <sup>o</sup>	1	0.317		Q5.9
How would you rate your overall satisfaction towards the standard of your foodservice area (kitchen, store rooms) regarding food safety, hygiene and training of food handlers?	83.100 <sup>p</sup>	4	0.000		Q5.1 0
How would you rate your overall satisfaction towards the standard training of food handlers (kitchen staff) that is provided by your employer?	101.300 <sup>p</sup>	4	0.000		Q5.1 1

At a significance level of 0.05, it can be concluded that the association between the variables is statistically significant. P-value (Asym p.Sig)  $\leq \alpha$  (0.05): The variables have a statistically significant association and where P-value (Asym p.Sig)  $> \alpha$  (0.05): There is no association between variables

## Annexure F: Correlations between Knowledge and Practices

		Correlations																				
	How would you rate your level of knowledge of food safety and personal hygiene principles?	As a restaurant/kitchen manager, do you ensure that your staff comply with the food safety management systems?	Do you use gloves when you touch or distribute unwrapped foods?	Do you use protective clothing and gloves when you prepare, touch or distribute unwrapped foods?	Do you wear a mask when you prepare, touch or distribute unwrapped foods?	Do you wear a cap when you prepare, touch or distribute unwrapped foods?	Do you wash your hands in-between touching different foods?	Food borne sicknesses are caused by the ignorance and not complying with food safety management system by food handlers.	I often feel it is not necessary to wash my hands every time I prepare foods or change activities due to high pressure and workload. I therefore ignore and just do my work. Rate your level of attitude.	Safe and proper food handling is an important part of my job responsibilities as a food handler.	Undergoing food safety training is important to me.	Food handling relates to food safety.	Raw foods should be kept separately from cooked foods.	Food handlers should use cap, masks, protective gloves, and adequate clothing to reduce the risk of food contamination.	It is important to know the temperature of the refrigerator to reduce the risk of bacteria growth in food.	Improper storage of foods may be hazardous and cause food poisoning.	Food handlers (chefs) with cuts on hands should not touch unwrapped foods.	Please rate the cleanliness and hygiene standards of food preparation and storage areas (storeroom and kitchen) of your restaurant?	If you are the owner/ manager/ head chef, do you ensure that your staff get food safety training?	How would you rate your overall satisfaction towards the standard of your food service area (kitchen, store rooms) regarding food safety, hygiene and training of food handlers?	How would you rate your overall satisfaction towards the standard training of food handlers (kitchen staff) that is provided by your employer?	
Spearman's	How would you rate your level of knowledge of food safety and personal hygiene principles?	Correlation	1.000																			
		Sig. (2-tailed)																				
	As a restaurant/kitchen manager, do you ensure that your staff comply with the food safety management systems?	Correlation	0.070	1.000																		
		Sig. (2-tailed)	0.829																			
	Do you use gloves when you touch or distribute unwrapped foods?	Correlation	0.091	0.036	1.000																	
		Sig. (2-tailed)	0.367	0.911																		
	Do you use protective clothing and gloves when you prepare, touch or distribute unwrapped foods?	Correlation	0.142	-0.135	0.291	1.000																
		Sig. (2-tailed)	0.160	0.676	0.003																	
	Do you wear a mask when you prepare, touch or distribute unwrapped foods?	Correlation	-0.135		-0.094	0.036	1.000															
		Sig. (2-tailed)	0.179		0.350	0.720																
	Do you wear a cap when you prepare, touch or distribute unwrapped foods?	Correlation	-0.037	-0.200	0.245	0.019	-0.069	1.000														
		Sig. (2-tailed)	0.713	0.533	0.014	0.849	0.493															
	Do you wash your hands in-between touching different foods?	Correlation	0.220		-0.091	0.112	0.006	0.106	1.000													
		Sig. (2-tailed)	0.028		0.365	0.265	0.952	0.294														
	Food borne sicknesses are caused by the ignorance and not complying with food safety management system by food handlers.	Correlation	-0.289	-0.135	0.036	-0.094	0.075	0.180	-0.055	1.000												
		Sig. (2-tailed)	0.004	0.676	0.722	0.350	0.460	0.073	0.586													
	I often feel it is not necessary to wash my hands every time I prepare foods or change activities due to high pressure and workload. I therefore ignore and just do my work. Rate your level of attitude.	Correlation	-0.117	0.200	-0.063	-0.007	-0.005	0.115	0.091	-0.009	1.000											
		Sig. (2-tailed)	0.245	0.533	0.531	0.946	0.963	0.255	0.368	0.926												
	Safe and proper food handling is an important part of my job responsibilities as a food handler.	Correlation	0.046		0.043	-0.116	-0.079	-0.086	-0.026	0.121	-0.060	1.000										
		Sig. (2-tailed)	0.652		0.671	0.250	0.432	0.394	0.796	0.231	0.551											
	Undergoing food safety training is important to me.	Correlation	0.001	-0.008	-0.035	-0.093	-0.101	-0.148	-0.024	-0.034	0.412	1.000										
		Sig. (2-tailed)	0.995	0.935	0.730	0.357	0.317	0.141	0.810	0.734	0.000											
	Food handling relates to food safety.	Correlation	-0.121	0.087	-0.035	0.055	0.024	-0.141	0.169	-0.050	0.222	0.162	1.000									
		Sig. (2-tailed)	0.232	0.387	0.727	0.586	0.814	0.161	0.093	0.620	0.026	0.108										
	Raw foods should be kept separately from cooked foods.	Correlation	-0.084		0.002	-0.116	0.063	0.047	-0.127	0.136	0.029	0.025	0.102	0.556	1.000							
		Sig. (2-tailed)	0.406		0.981	0.250	0.532	0.646	0.210	0.177	0.778	0.802	0.311	0.000								
	Food handlers should use cap, masks, protective gloves, and adequate clothing to reduce the risk of food contamination.	Correlation	-0.079		0.152	-0.032	0.044	0.151	-0.061	0.248	0.051	0.220	0.055	0.685	0.434	1.000						
		Sig. (2-tailed)	0.433		0.131	0.749	0.661	0.132	0.550	0.013	0.615	0.028	0.587	0.000	0.000							
	It is important to know the temperature of the refrigerator to reduce the risk of bacteria growth in food.	Correlation	0.018		0.125	0.035	-0.064	-0.069	-0.102	-0.024	0.106	0.215	0.029	0.437	0.226	0.438	1.000					
		Sig. (2-tailed)	0.860		0.214	0.730	0.528	0.493	0.314	0.809	0.295	0.032	0.778	0.000	0.024	0.000						
	Improper storage of foods may be hazardous and cause food poisoning.	Correlation	-0.090		0.136	-0.075	-0.052	-0.056	-0.082	0.140	0.085	0.123	-0.075	0.433	0.109	0.251	0.387	1.000				
		Sig. (2-tailed)	0.376		0.177	0.456	0.610	0.580	0.416	0.166	0.398	0.223	0.457	0.000	0.282	0.012	0.000					
	Food handlers (chefs) with cuts on hands should not touch unwrapped foods.	Correlation	-0.021		0.171	-0.053	-0.036	-0.039	-0.058	0.264	0.060	0.217	-0.053	0.438	0.197	0.402	0.262	0.700	1.000			
		Sig. (2-tailed)	0.837		0.089	0.602	0.721	0.699	0.570	0.008	0.554	0.030	0.603	0.000	0.049	0.000	0.009	0.000				
	Please rate the cleanliness and hygiene standards of food preparation and storage areas (storeroom and kitchen) of your restaurant?	Correlation	0.114	0.577	0.051	0.135	0.035	-0.086	0.063	-0.140	0.070	0.050	-0.051	0.136	0.102	0.135	0.108	-0.001	-0.063	1.000		
		Sig. (2-tailed)	0.259	0.050	0.616	0.180	0.727	0.393	0.537	0.166	0.490	0.620	0.615	0.177	0.311	0.179	0.283	0.992	0.535			
	If you are the owner/ manager/ head chef, do you ensure that your staff get food safety training?	Correlation	0.000	-0.333	-0.333	-0.333													-0.816	1.000		
		Sig. (2-tailed)	1.000	0.667	0.667	0.667													0.184			
	How would you rate your overall satisfaction towards the standard of your food service area (kitchen, store rooms) regarding food safety, hygiene and training of food handlers?	Correlation	0.121	0.035	-0.020	0.003	0.222	0.033	0.178	-0.091	-0.025	-0.183	-0.029	-0.079	-0.063	0.017	-0.069	-0.127	-0.135	0.146	1.000	
		Sig. (2-tailed)	0.230	0.915	0.842	0.977	0.027	0.747	0.077	0.366	0.805	0.068	0.777	0.437	0.532	0.869	0.498	0.206	0.180	0.147		
	How would you rate your overall satisfaction towards the standard training of food handlers (kitchen staff) that is provided by your employer?	Correlation	-0.014	-0.140	0.113	0.065	0.181	-0.012	-0.045	0.111	-0.018	-0.218	-0.051	-0.130	0.034	0.089	-0.148	-0.119	-0.083	-0.038	1.000	0.311
		Sig. (2-tailed)	0.892	0.665	0.263	0.519	0.071	0.904	0.656	0.270	0.863	0.029	0.615	0.198	0.741	0.380	0.143	0.237	0.409	0.710	0.002	0.002
		N	100	12	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	4	100

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

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

## Annexure G: Reliabilities

### RELIABILITY

```

/VARIABLES=Q4.1 Q4.3 Q4.6 Q4.7 Q4.8 Q4.9 Q4.10 Q4.11
/SCALE('ALL VARIABLES') ALL
/MODEL=ALPHA
/SUMMARY=TOTAL.
    
```

### Reliability

		Notes
Output Created		10-MAR-2019 17:54:26
Comments		
Input	Data	C:\Users\singh\OneDrive\Stats Analysis\1 - 2019\Yondela Noxolo Tyabashe\Yondela - Data - 2 - changed for 2.1.sav
	Active Dataset	DataSet2
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	100
	Matrix Input	
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the procedure.
Syntax		RELIABILITY /VARIABLES=Q4.1 Q4.3 Q4.6 Q4.7 Q4.8 Q4.9 Q4.10 Q4.11 /SCALE('ALL VARIABLES') ALL /MODEL=ALPHA /SUMMARY=TOTAL.
Resources	Process or Time	00:00:00.02
	Elapsed Time	00:00:00.01

**Scale: ALL VARIABLES**

### Case Processing Summary

		N	%
Cases	Valid	100	100.0

	Excluded a	0	0.0
	Total	100	100.0

a. Listwise deletion based on all variables in the procedure.

### Reliability Statistics

Cronbach's Alpha	N of Items
0.616	8

### Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Foodborne sicknesses are caused by the ignorance and not complying with food safety management system by food handlers.	7.6700	2.203	0.234	0.659
Safe and proper food handling is an important part of my job responsibilities as a food handler.	7.8500	2.715	0.211	0.615
Food handling relates to food safety.	7.8300	2.264	0.565	0.502
Raw foods should be kept separately from cooked foods.	7.8500	2.513	0.356	0.571
Food handlers should use cap, masks, protective gloves, and adequate clothing to reduce the risk of food contamination.	7.8500	2.513	0.426	0.552
It is important to know the temperature of the refrigerator to reduce the risk of bacteria growth in food.	7.9100	2.871	0.297	0.592
Improper storage of foods may be hazardous and cause food poisoning.	7.9400	2.946	0.396	0.588
Food handlers (chefs) with cuts on hands should not touch unwrapped foods.	7.9600	2.988	0.502	0.589



## Annexure H: Factor Analysis

FACTOR

```

/VARIABLES Q4.1 Q4.2 Q4.3 Q4.5 Q4.6 Q4.7 Q4.8 Q4.9 Q4.10 Q4.11
/MISSING LISTWISE
/ANALYSIS Q4.1 Q4.2 Q4.3 Q4.5 Q4.6 Q4.7 Q4.8 Q4.9 Q4.10 Q4.11
/PRINT INITIAL KMO EXTRACTION ROTATION
/CRITERIA MINEIGEN(1) ITERATE(25)
/EXTRACTION PC
/CRITERIA ITERATE(25)
/ROTATION VARIMAX
/METHOD=CORRELATION.
    
```

### Factor Analysis

### Notes

Output Created													
Comments													
Input	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="background-color: #e6e6fa;">Data</td> <td>C:\Users\singh\OneDrive\Stats Analysis\1 - 2019\Yondela Noxolo Tyabashe\Yondela - Data - 2 - changed for 2.1.sav</td> </tr> <tr> <td style="background-color: #e6e6fa;">Active Dataset</td> <td>DataSet2</td> </tr> <tr> <td style="background-color: #e6e6fa;">Filter</td> <td>&lt;none&gt;</td> </tr> <tr> <td style="background-color: #e6e6fa;">Weight</td> <td>&lt;none&gt;</td> </tr> <tr> <td style="background-color: #e6e6fa;">Split File</td> <td>&lt;none&gt;</td> </tr> <tr> <td style="background-color: #e6e6fa;">N of Rows in Working Data File</td> <td></td> </tr> </table>	Data	C:\Users\singh\OneDrive\Stats Analysis\1 - 2019\Yondela Noxolo Tyabashe\Yondela - Data - 2 - changed for 2.1.sav	Active Dataset	DataSet2	Filter	<none>	Weight	<none>	Split File	<none>	N of Rows in Working Data File	
Data	C:\Users\singh\OneDrive\Stats Analysis\1 - 2019\Yondela Noxolo Tyabashe\Yondela - Data - 2 - changed for 2.1.sav												
Active Dataset	DataSet2												
Filter	<none>												
Weight	<none>												
Split File	<none>												
N of Rows in Working Data File													

Missing Value Handling	Definition of Missing	MISSING=EXCLUDE: User-defined missing values are treated as missing.
	Cases Used	LISTWISE: Statistics are based on cases with no missing values for any variable used.
Syntax	<pre> FACTOR /VARIABLES Q4.1 Q4.2 Q4.3 Q4.5 Q4.6 Q4.7 Q4.8 Q4.9 Q4.10 Q4.11 /MISSING LISTWISE /ANALYSIS Q4.1 Q4.2 Q4.3 Q4.5 Q4.6 Q4.7 Q4.8 Q4.9 Q4.10 Q4.11 /PRINT INITIAL KMO EXTRACTION ROTATION /CRITERIA MINEIGEN(1) ITERATE(25) /EXTRACTION PC /CRITERIA ITERATE(25) /ROTATION VARIMAX /METHOD=CORRELATION. </pre>	
Resources	Processor Time	
	Elapsed Time	
	Maximum Memory Required	13480 (13.164K) bytes

### KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	
Bartlett's Test of Sphericity	Approx. Chi-Square
	df
	Sig.

### Communalities

	Initial	Extraction
Foodborne sicknesses are caused by the ignorance and not complying with food safety management system by food handlers.	1.000	
I often feel it is not necessary to wash my hands every time I prepare foods or change	1.000	

activities due to high pressure and workload. I therefore ignore and just do my work. Rate your level of attitude.	
Safe and proper food handling is an important part of my job responsibilities as a food handler.	1.000
Undergoing food safety training is important to me.	1.000
Food handling relates to food safety.	1.000
Raw foods should be kept separately from cooked foods.	1.000
Food handlers should use cap, masks, protective gloves, and adequate clothing to reduce the risk of food contamination.	1.000
It is important to know the temperature of the refrigerator to reduce the risk of bacteria growth in food.	1.000
Improper storage of foods may be hazardous and cause food poisoning.	1.000
Food handlers (chefs) with cuts on hands should not touch unwrapped foods.	1.000

Extraction Method: Principal Component Analysis.

### Total Variance Explained

Component	Initial Eigenvalues	
	Total	% of Variance
1	2.888	
2	1.384	
3	1.245	
4	1.013	
5	0.970	
6	0.764	
7	0.722	
8	0.536	

9	0.278
10	0.200

Extraction Method: Principal Component Analysis.

### Component Matrixa

	Component	2
	1	
Foodborne sicknesses are caused by the ignorance and not complying with food safety management system by food handlers.	0.271	
I often feel it is not necessary to wash my hands every time I prepare foods or change activities due to high pressure and workload. I therefore ignore and just do my work. Rate your level of attitude.	0.006	
Safe and proper food handling is an important part of my job responsibilities as a food handler.	0.376	
Undergoing food safety training is important to me.	0.083	
Food handling relates to food safety.	0.822	
Raw foods should be kept separately from cooked foods.	0.416	
Food handlers should use cap, masks, protective gloves, and adequate clothing to reduce the risk of food contamination.	0.580	
It is important to know the temperature of the refrigerator to reduce the risk of bacteria growth in food.	0.557	
Improper storage of foods may be hazardous and cause food poisoning.	0.749	
Food handlers (chefs) with cuts on hands should not touch unwrapped foods.	0.780	

Extraction Method: Principal Component Analysis.

a. 4 components extracted.

**Rotated Component Matrixa**

	Component 1	2
Foodborne sicknesses are caused by the ignorance and not complying with food safety management system by food handlers.	0.039	0.633
I often feel it is not necessary to wash my hands every time I prepare foods or change activities due to high pressure and workload. I therefore ignore and just do my work. Rate your level of attitude.	-0.061	-0.046
Safe and proper food handling is an important part of my job responsibilities as a food handler.	0.270	-0.005
Undergoing food safety training is important to me.	-0.147	0.045
Food handling relates to food safety.	0.650	0.497
Raw foods should be kept separately from cooked foods.	-0.043	0.805
Food handlers should use cap, masks, protective gloves, and adequate clothing to reduce the risk of food contamination.	0.338	0.572
It is important to know the temperature of the refrigerator to reduce the risk of bacteria growth in food.	0.418	0.174
Improper storage of foods may be hazardous and cause food poisoning.	0.883	-0.016
Food handlers (chefs) with cuts on hands should not touch unwrapped foods.	0.875	0.113

Extraction Method: Principal Component Analysis.  
 Rotation Method: Varimax with Kaiser Normalization.  
 a. Rotation converged in 5 iterations.

**Component Transformation Matrix**

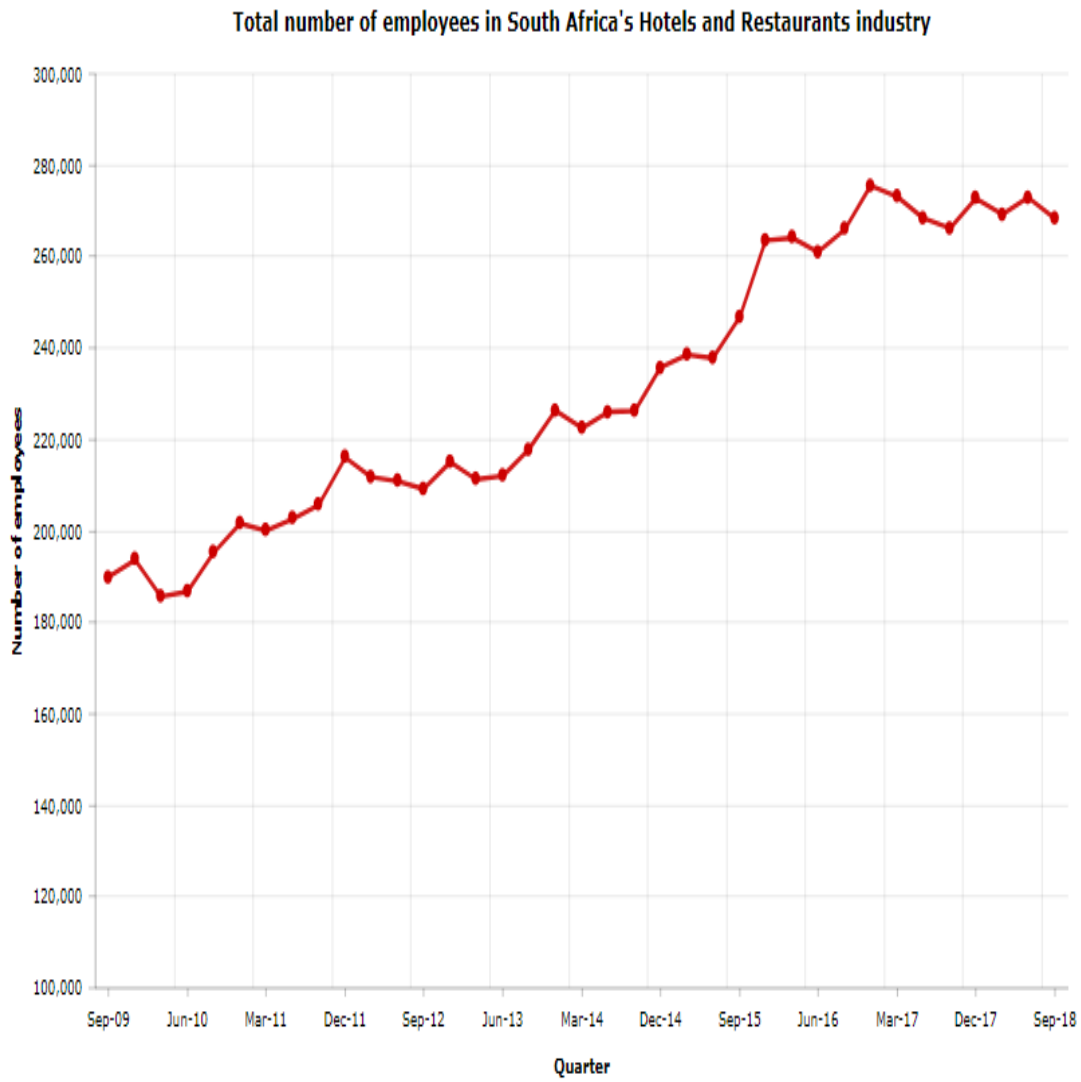
Component	1	2
1	0.828	
2	-0.370	

3	0.223
4	-0.358

Extraction Method: Principal Component Analysis.  
Rotation Method: Varimax with Kaiser Normalization.

## Annexure I: Employment Rates in the Hotels and Restaurants industry in South Africa

### South African Market Insights: Food and Beverage Sector (2019:17)



## Annexure J: Gatekeeper's Letter I

26 January 2017

Dear Ms Tyabashe

I would like to inform you that I am permitting you to conduct your research study in my restaurant.

Yours's Sincerely

Restaurant Manager Thamba



(011) 070-8394 / 472-1113

Shop 5C, Florida Junction

Cnr Ontdekkers & Christiaan de Wet Street

Florida



**Annexure K: Gatekeeper's Letter II**



25 January 2017

Dear Ms YN Tyabashe

The purpose of this letter is to inform you that I give you permission to conduct research study at Steers/Fishaways restaurant in Florida Junction.

Yours's Sincerely

Work 011 472 7825

Open Rubric

## Annexure L: Gatekeeper's Letter III



Enquiries: Zonwabele Merile Tel no: 083 378 1202  
Email: Zonwabele.Merile@echealth.gov.za Fax no: 043 642 1408  
Date: 05 March 2018

**RE: FOOD SAFETY IN FOOD ESTABLISHMENTS: KNOWLEDGE AND PRACTICES OF FOOD HANDLERS IN SOUTH AFRICA. (EC\_201803\_002).**

Dear Yondela N. Tyabashe

The department would like to inform you that your application on the abovementioned research topic has been approved based on the following conditions:

1. During your study, you will follow the submitted amended protocol with ethical approval and can only deviate from it after having a written approval from the Department of Health in writing.
2. You are advised to ensure, observe and respect the rights and culture of your research participants and maintain confidentiality of their identities and shall remove or not collect any information which can be used to link the participants.
3. The Department of Health expects you to provide a progress on your study every 3 months (from date you received this letter) in writing.
4. At the end of your study, you will be expected to send a full written report with your findings and implementable recommendations to the Eastern Cape Health Research Committee secretariat. You may also be invited to the department to come and present your research findings with your implementable recommendations.
5. Your results on the Eastern Cape will not be presented anywhere unless you have shared them with the Department of Health as indicated above.

Your compliance in this regard will be highly appreciated.

**SECRETARIAT: EASTERN CAPE HEALTH RESEARCH COMMITTEE**