THE FOOD SAFETY KNOWLEDGE OF STREET FOOD VENDORS AND THE FOOD SAFETY COMPLIANCE OF THEIR FOOD SERVICE FACILITIES, JOHANNESBURG, SOUTH AFRICA

by

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DECLARATION

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I declare that the above dissertation is my own work and that all the sources that I have used or quoted have been indicated and acknowledged using complete references. I further declare that I have not previously submitted this work, or part of it, for any degree or examination in any other higher education institution.

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DEDICATION

This study is dedicated to my husband, who has been a pillar of support. Thank you for loving me.

ABSTRACT

The inadequate food safety knowledge by street food vendors have been a challenge encountered in ensuring safety of street foods. The aim of this study was to assess the food safety knowledge of street food vendors in the Johannesburg metropolis and to evaluate the conformance and monitoring of their street food vending facilities in accordance to regulations governing general hygiene requirements for food premises in South Africa. A cross sectional survey was conducted in which 315 street food vendors and 155 street food vending facilities were observed using a questionnaire instrument and observational checklist, respectively.

The majority (61.3%) of the street food vendors were females and most (64.1%) of them had not attended a food safety training course. Only a few (12.1%) street food vendors knew the correct minimum internal cooking temperature for stuffed chicken, while less than half knew the correct temperature for cold and hot holding of ready-to-eat foods, 40% and 39% respectively. The majority of them have never heard of *Salmonella* (92.7%), *Campylobacter* (95.2%), *Listeria* (57.1%), *Clostridium* (94.3%), or *Staphylococcus* (87.6%). Up to 52% street food vendors had moderate food safety knowledge. Most of the street food vending facilities (68.3%) had been inspected by health inspectors and only 17% of street food vending facilities had low level of compliance to regulations governing general hygiene requirements for food premises and the transport of food in South Africa.

The overall food safety knowledge of street food vendors in Johannesburg metropolis was moderate. The level of compliance and monitoring of street food vending facilities to regulations governing general hygiene requirements for food premises in South Africa was satisfactory.

Street food vendors should be trained on internal cooking temperature, hot and cold storage temperature of ready-to-eat foods, and food pathogens such as *Salmonella, Campylobacter*, *Listeria*, *Clostridium*, and *Staphylococcus*.

KEYWORDS: Food safety knowledge, street food vendors, food safety, facilities, microbial, compliance, monitoring.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ACRONYMS

ANOVA: Analysis of Variance

DOH: Department of Health

FAO: Food and Agriculture Organisation

NICD: National Institute for Communicable Diseases

SPSS: Statistical Package for the Social Sciences

STATS SA: Statistic South Africa

WHO: World Health Organisation

CHAPTER 1: INTRODUCTION

1.1 BACKGROUND

Street foods represent a significant part of daily urban food consumption for millions of consumers in developing countries (Muyanja et al., 2011; Alimi, 2016; Singh et al., 2016), and may be the least expensive and most convenient way of obtaining a meal outside the home (WHO, 2010; Mckay et al., 2016; Sneh et al., 2016). Street food vending plays a vital socio-economic role in developing countries as regards job creation and revenue generation, and often serves as the main source of income for a considerable number of street food vendors (Muzaffar et al., 2009; Da Silva et al., 2014; Imathiu, 2017; Martinez et al., 2017).

Ensuring safety of street vended food is crucial in safeguarding the health of consumers, considering that most of these consumers are often not aware of the food safety risks associated with street vended foods, but rather focuses on its affordability and convenience (Asiegbu et al., 2015; Liu et al., 2015; Singh et al., 2016). Many street food vendors were found to possess insufficient food safety knowledge and skill, and are thus unable to handle foods in a hygienic manner (Sun et al., 2012; Samapundo et al., 2016; Uyttendaele et al., 2016). Unhygienic practices predispose consumers to unsafe food, which can lead to food disease outbreak and pose serious health problems to the consumers (Mamun et al., 2013; Aluko et al., 2014; Patel et al., 2014; Alimi, 2016; Mjoka and Selepe, 2017). Many street food vendors have also been found not to have undergone any formal training on food safety (Aluko et al., 2014; Samapundo et al., 2015) hence, the training of street food vendors is essential in ensuring the safety of street vended foods (Choudhury et al., 2011; Liu et al., 2015). The training of street food vendors has been proven to be effective in improving their food safety knowledge and practices to prevent foodborne hazards (Da Cunha et al., 2014; Paudyal et al., 2017).

In developing countries, many informal food service facilities do not comply with most food hygiene standards and regulations (Trafialek et al., 2017). Considering that some of these food outlets are situated in areas with poor sanitary resources such as potable water, toilets, dedicated storage systems, and appropriate garbage disposal systems (Muyanja et al., 2011; Oladoyinbo et al., 2015; Samapundo et al., 2015), unhygienic conditions are no surprise. As an informal food business sector, street food vendors often evade formal inspection and supervision (FAO, 2017).

Food safety principles require proper regulations and enforcement with continuous and intensive workshops for street food vendors (Proietti et al., 2014; Ababio and Lovatt, 2015), as regulations are poorly enforced in most countries in the developing world (Singh et al., 2016; Uyttendaele et al., 2016). Enforcement of food regulation plays a key role in compelling street food vendors to practice the knowledge they have acquired (Gaungoo and Jeewon, 2013). Limited studies have evaluated the food safety knowledge and behaviour of street food vendors in Johannesburg metropolis, and no study has yet addressed the degree of compliance of their informal food service facilities to regulations governing general hygiene requirements for food premises and the transport of food (R962) in South Africa. Similarly, the level of monitoring and enforcement of this regulation in the informal food vending facilities has not been investigated thus, it is important for this study to be conducted.

1.2 PROBLEM STATEMENT

Food borne diseases and food contamination continues to be significant public health issues in both developed and developing countries, approximately 30% of the population of industrialised countries suffer from foodborne diseases annually (WHO, 2012). Unsafe food handling practices of street food vendors result in foodborne diseases and hence, an increased morbidity and mortality rate, and serves as a major obstacle to socio-economic development (WHO, 2015).

Many acute and life-threatening diseases are caused by unsafe food handling practices (Carbas et al., 2013). The risk of food poisoning outbreaks associated with street food remains a global threat. Lack of knowledge on the causes of foodborne diseases among street food vendors is a major risk factor (FAO, 2009). Most street food vendors lack knowledge in food storage and holding temperature, leading to microbial proliferation in food (Sani and Siow, 2014).

Inadequate resources like good potable water, toilets, hand washing facilities, and proper waste disposal facilities contribute significantly to food contamination in informal food service facilities (Bhattacharjya and Reang, 2014; Samapundo et al., 2015). Improper waste accumulation by street food vendors in large amounts provide harborage for pests and rodents associated with transmission of enteric diseases (Singh et al., 2016). Additionally, food policies and regulations might be more poorly enforced in this sector than in the formal food service sector, leading to a rise in the risk of street food consumption. If these problems are not addressed, there will doubtless be a continuous increase in foodborne diseases outbreak.

1.3 IMPORTANCE OF THE STUDY

This research is important in order to gain significant insight in the knowledge of food safety acquired by street food vendors, and their level of awareness on the microbial hazards which the food they prepare can have to consumers if not handled hygienically. This research aims to provide clarity on the conformance of street food vending facilities to food safety regulations. Information generated from this research will be given to relevant authorities for actions, proper monitoring, and enforcement of the informal food service sector to reduce food contamination.

1.4 AIMS AND OBJECTIVES

The aims of this study are to evaluate the food safety knowledge among street food vendors in the Johannesburg metropolis, as well as to assess the conformance of their street food vending facilities in the Johannesburg municipality.

The objectives are:

1) To investigate the food safety knowledge and microbial hazard awareness of street food vendors in Johannesburg, South Africa.

2) Evaluate the degree of compliance of informal street food service facilities to the regulations governing general hygiene requirements for food premises in South Africa.

3) To investigate the level of monitoring and enforcement of the regulations governing general hygiene requirements for food premises in South Africa.

1.5 CONCEPTUAL FRAMEWORK

The conceptual framework for this study captures how street food vendors' food safety knowledge, street food vendors' practices and non-compliance of their informal food service facilities can result in food contamination. If street food vendors lack food safety knowledge, they undoubtedly handle food in an unhygienic manner and their compliance to food safety regulations may be compromised. Consequently, there will be incidences of food borne diseases, increase in mortality, and socio-economic losses. Figure 1.1 shows the conceptual framework for understanding the cause and effect relationship between the variables of street food vendors' food safety knowledge, lack of monitoring, and enforcement of informal food service facilities and food contamination.

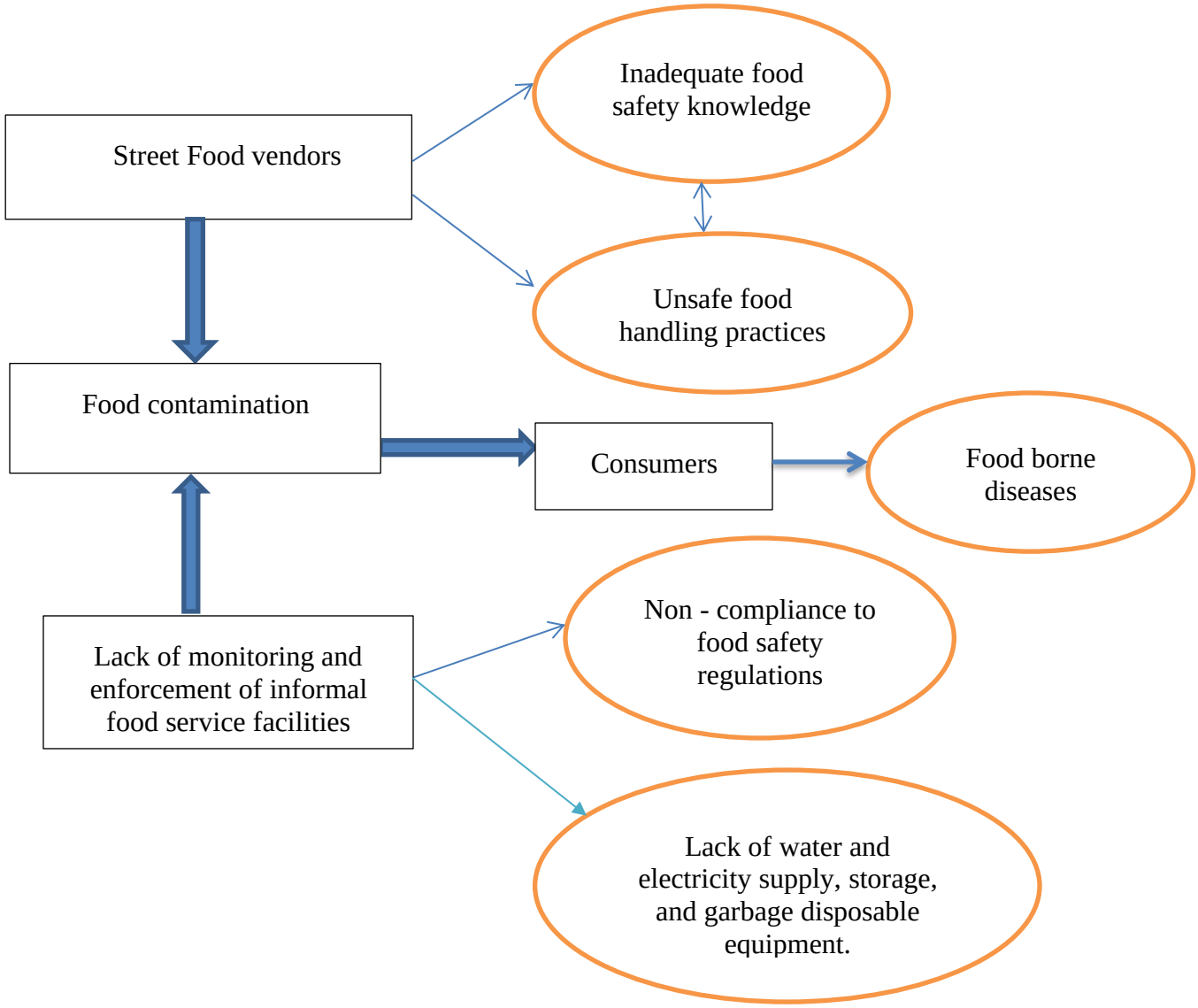


Figure 1.1: Conceptual framework.

1.6 DISSERTATION LAYOUT

This study is made up of six (6) chapters, organised as follows:

Chapter 1: Introduction

This introductory chapter will give the background of the research and the problem statement, importance of the study, aims and objectives, conceptual framework, and dissertation layout.

Chapter 2: Literature review

This chapter gives an overview of existing literature on the challenges and perspectives in ensuring the safety of street vended foods in suburban communities in developing countries.

Chapter 3: Research methodology

In this chapter, details of the research area, data collection, and the outline of the research instrument employed in the study will be outlined. The ethical principles and the limitations of the research will also be discussed.

Chapter 4: Results

The chapter clearly outlines the results of this research study.

Chapter 5: Discussion

This chapter discusses the results obtained in detail.

Chapter 6: Conclusions and recommendations

This chapter concludes the findings, discussions, and makes recommendations.

CHAPTER 2: LITERATURE REVIEW

2.1. FOOD SAFETY CHALLENGES ASSOCIATED WITH STREET FOOD VENDING

2.1.1. General literacy of street food vendors

Low level of formal education possessed by most street food vendors have contributed to poor food handling. Muyanja et al. (2011), Da Silver et al. (2014), Mckay et al. (2016) and Martinez et al. (2017) respectively reported that the majority of the street food vendors had low level of formal education in their studies, which reflected in their poor understanding of food safety. Liu et al. (2014) in a study in Salvador, Brazil observed that street food vendors with low level of formal education did not readily yield to food safety education and hence hampering the implementation of food safety among them. Lack or low level of formal education among street food vendors has constituted a challenge in street vended foods. Fasoyiro et al. (2010) likewise reported that about 43% of street food vendors have no formal education. Formal education of street food vendors and hygiene practices were reported to be statistically significant in a study conducted by Franklyn and Bandrie (2015). Conversely, the report of the study conducted by Monney et al. (2013) unveiled that level of education does not influence good hygienic practices among street food vendors when the researchers discovered that there was no significant statistical difference between education level and food safety practices among the respondents studied. It was otherwise concluded that street food vendors' training significantly influences the good hygienic practices of the respondents studied.

2.1.2. Inadequate food safety knowledge

Inadequate food safety knowledge and proper understanding of food safety principles of street food vendors are predominant challenges encountered in street food vending (Samapundo et al.,

2016; Uyttendaele et al., 2016). This was reflected in the low level of hygiene displayed during the course of food handling and its vending (Sun et al., 2012; Liu et al., 2014) hence, posing a significant risk to consumer's health (Mamun et al., 2013; Aluko et al., 2014; Alimi, 2016). A finding uncovered by Bormann et al. (2016) revealed cross contamination of food via wrapping and packaging of ready-to-eat snacks with used newspaper and cement bags by street food vendors, a practice which endangers consumer's health. Lack of food safety knowledge by street food vendors has been a challenge encountered in ensuring street food safety (Bhattacharjya and Reang, 2014). Lues et al. (2006) noticed a situation in which most street food vendors wash their hands using only water, and further mentioned that only 4% of the respondents used both soap and water, which is the most potent and hygienic way to eliminate pathogens on hand surfaces. Some street food vendors strangely often ascribe use of soap in hand washing as extra expenses (Omemu and Aderoju, 2008). Inadequate food safety knowledge was one of the food safety challenges mentioned by Sun et al. (2012) in a study, after it was discovered that only 19.2% of the population surveyed had ever heard of good manufacturing practices or hazard analysis and critical control, pointing to lack of food safety information among the population studied. Results of the study carried out by Alamo-Tonelada et al. (2018) likewise reported that 80% of the street food vendors studied had no previous food safety training.

Equally observed is the lack of knowledge about correct temperature and time for food storage, which can promote microbial proliferation; this was reported by Da Silva et al. (2014). Some street food vendors stored ready-to-eat food at ground level (Omemu and Aderoju, 2008), exposing it to diverse forms of contamination such as dust, insects, and rodents (Muyanja et al., 2011). Kwiri et al. (2014) attributed microbial contamination of street foods to improper holding temperature when it was discovered that food was kept and sold at ambient temperature.

Street food vendors' personal hygiene was implicated in the quality and microbiological safety of street vended foods by Campos et al. (2015), when a report unfolded poor microbiological quality of street vended foods. A study by Mamun et al. (2013) indicated high coliform count in a large proportion of school-based street vended foods in Dhaka Bangladesh, with coliform count exceeding the standard acceptable limit, indicating a foodborne hazard and therefore, presenting a health risk to the consumers. Unacceptable levels of *Escherichia coli* in some food samples analysed by Kwiri et al. (2014) were imputed to unhygienic packaging of food and consistent hand contact with food products sold. Street food safety is largely dependent on the food safety knowledge and practices of street food vendors because the main risk factors are associated with them.

2.1.3. Consumers perceptions of street vended foods

The different reasons consumers prefer street vended foods vary from convenience, low price, taste, and prompt service, despite their awareness of the risk posed by its consumption (Long-Solis, 2007). Food aesthetics and personal relationship with vendors were emphasised by consumers when purchasing street food, rather than food safety (Rheinlander et al., 2008). This is evident in the study carried out by Gurudasani and Sheth (2009) which revealed that some consumers regarded government regulations of street foods as important interventions in improving its quality; however, some consumers believed that regulations of street vended foods will affect its affordability.

2.1.4. Authorities/legislations

Lack of regulations implementation and inadequate inspections of street food facilities by designated government authorities have made enormous contributions to food safety issues in

most developing nations (Singh et al., 2016). Singh et al. (2016) revealed that street food vendors have never been visited for inspection by government authorities and consequently, could not be registered under relevant government regulations. Atter et al. (2015) equally described the preparation of a locally fermented street vended beverage (ice-kenkey) in Ghana under condition that could contaminate the drink while the vendors failed to comply with good hygienic practices requirements, a situation that could be averted by periodic and stringent inspections.

For instance, Monney et al. (2013) revealed that non availability of funds and provision of adequate resources deterred the environmental health officers in being effective at monitoring and supervision of street food vendors. Monney et al. (2014) also stressed that environmental health officers were ill equipped in relation to logistics and human resources which deters effective monitoring. It is vital that the health inspectors be properly equipped with necessary tools, skills, and have adequate technical knowledge through mandatory training to facilitate effective monitoring of street food vendors (Liu et al., 2014; Abbabio and Lovatt, 2015; Singh et al., 2016).

2.1.5. Lack of sanitary resources

Lack of provision of sanitary resources by the government was identified by Omemu and Aderoju (2018) as the fundamental reason why the knowledge acquired by street food vendors on good hand washing routines was not translated to practices. In addition, reports showed that a lack of basic infrastructure at a vending site in Harare Zimbabwe, led to an unacceptable level of bacteria in the food samples and hand swab samples analysed (Gadaga et al., 2008). Another author highlighted that food safety compliance of street food vendors was hampered by lack of sanitary facilities (Trafialek et al., 2018). Franklyn and Badrie (2015) also reported that 48% of

the respondents were faced with water constraints in a research conducted in West Indies. Street food vendors' challenge on water availability led vendors to sourcing water from unhygienic sources (Lues et al., 2006).

A water re-use system was a common practice as observed among street food vendors in washing dishes due to water unavailability and cost of purchasing water (Bormann et al., 2016). Rinsed water was used repeatedly until very dirty, before being replaced (Pokhrel and Sharma, 2016). A similar situation was observed with street food vendors defecating in nearby bushes with zero access to soap and water because of the lack of toilet facilities at vending site, thereby cross contaminating the food they sell (Bormann et al., 2016).

2.1.6. Inadequate food service facilities

Street vended foods in developing countries have been reported to be linked with lots of food safety challenges as mentioned in different studies. Street food vending facilities were assessed to be of poor quality, unhygienic, and generally unacceptable when Lues et al. (2006) reported that approximately 98% of street food vending sites were without adequate facilities, with only 2% considered acceptable to the safety of food being prepared and served on these sites. Detection of food pathogens in street food analysed by Lues et al. (2006) was ascribed to lack of adequate sanitary facilities as well as a level of ignorance in relation to good hygienic practices. The majority of street food vendors lack appropriate food service facilities and structures that can assist them to hygienically handle and prepare food and also comply with food safety regulations (Mathaulula et al., 2016).

Furthermore, street vended foods are oftentimes prepared under poor environmental conditions, such as roadsides, and near drainages, which can impact on the safety of the food prepared

(Muyanja et al., 2011). Street food vendors clustering in densely and high traffic areas like bus terminals, transport hubs, and street corners (Hill et al., 2018) due to inadequate food facilities and structures, impact negatively on food safety. Moreover, the majority of the street food vendors lacked the financial capabilities in acquiring the appropriate and standardised facilities required for safe and high quality food vending operations hence, posing a challenge in complying with food sanitation rules (Mathaulula et al., 2015).

2.1.7. Profit maximisation

To make maximum profits, street food vendors purchase unwholesome raw materials for food preparation, posing serious health risk to the consumers (Carvalho, 2006; Rane, 2011). Street food vendors sourced food items that are cheap and harmful to consumers' health (Muyanja et al., 2011). Cortese et al. (2016) and Omemu and Aderoju (2018) stated that the preference street food vendors gave to raw material volume and price as opposed to freshness when purchasing raw materials were alarming. They considered the use of cheaper raw materials to minimise cost of the food sold and maximise their profits (Azanza et al., 2000). Azanza et al. (2000) further revealed that profit maximisation was one of the reasons deterring the translation of food safety knowledge into actual practices in most of the street food vendors studied in Philippines, thereby considering their financial needs ahead of consumer's safety. In agreement, Bhattacharjya and Reang (2014) in a study also added that about 86% of the street food vendors surveyed, used low quality oil for food preparation in order to maximise profits.

Furthermore, in a bid to attract customers and optimise profits, street food vendors oftentimes position their vending facilities close to high human traffic zone, where basic amenities could not be assessed and also exposing the food to contaminants and environmental pollution (Rane,

2011; Singh et al., 2016).

2.2. BARRIERS AND CHALLENGES TO FOOD SAFETY IMPLEMENTATION BY STREET FOOD VENDORS

2.2.1. Poor sanitary condition

The operational condition at which street food vendors prepare food contributes a great challenge to safety of street vended foods (Trafialek et al., 2018). Mathaulula et al. (2016) reported in a survey on street food vendors' complaints on non-availability of sanitary resources like water and toilet facilities as one of the primary issues encountered during food vending that can possibly lead to food contamination. As a result of lack of proper waste disposal system, waste generated by street food vendors were discarded near vending sites, serving as nutrient source for vectors of foodborne diseases (Liu et al., 2014; Singh et al., 2016). Additionally, non-provision of enough vending space predisposes street food vendors to prepare food in unhygienic outlets (Sun et al., 2012) where foods are exposed to flies, fumes, dust, and insects (Liu et al., 2014).

2.2.2. Infrastructural issues

Non availability of basic infrastructure is the most challenging issue street vendors are faced with (Martinez et al., 2017; Mjoka and Selepe, 2017; Stephen and Grace, 2018), and is one of the most critical barriers affecting the safety of street vended foods. As reported in various studies, the majority of street food vendors face infrastructural constraints, basic resources like good potable water, a waste disposal system, and toilets are lacking in securing a hygienic condition for food preparation and handling (Acquino et al., 2015; Baluka et al., 2015; Samapundo et al., 2015; Ghatak and Chatterjee, 2018). Da Silva et al. (2014) highlighted lack of basic

infrastructure as one of the major food safety challenges by reporting that street food vending sanitary conditions at the beachfront of Salvador, Brazil was aggravated by lack of sanitary facilities. Sun et al. (2012) equally observed that due to low availability of good potable water at a night market in Tainan city in Taiwan, street food vendors were cited using tissue paper to clean their hands as opposed to soap and water and this was attributed to low level of hygienic practices displayed by the street food vendors. Studies have revealed non-availability of potable running water and waste disposal system as among the challenges affecting effective food safety implementation system by street food vendors (Sun et al., 2012; Singh et al., 2016).

Moreover, due to non-availability of potable running water, Singh et al. (2016) reported washing of utensils in bucket of water by street food vendors which were prone to repeated use, a practice that endangers food safety. It was also discovered that street food vendors' poor hand washing practices was due to non-availability of potable water at their vending sites. This was further observed to have a negative impact on the low score obtained by the food vendors in their food safety knowledge training intervention. A related finding was revealed by Muyanja et al. (2011) that street food vendors had to walk for about five minutes to assess potable water for washing consequently, water was recycled until cloudy and soapy. In some instances, irregular flow of water from the tap results to storage of water under unfavourable conditions. Provision of basic infrastructure is required to enhance street food vendors' provision of quality and safe food for consumers and to bridge the gap between knowledge acquired by street food vendors and their food safety practices (Bhattacharjya and Reang 2014).

2.3. WAYS OF ENSURING THE SAFETY OF STREET VENDED FOODS

Several literature sources have identified different ways of mitigating challenges and ensuring

the safety of street vended foods and are discussed below.

2.3.1. Provision of infrastructure

Improvement of environmental conditions through provision of basic infrastructure like sanitary facilities, good potable water, and waste disposal facilities will greatly assist street food vendors in producing safe food (Mamun et al., 2013; Uyttendaele et al., 2016). Street food vendors in Uganda advocated for improvement and provision of more sanitary facilities to enable their good hygienic practices and reduce food contamination (Muyanja et al., 2011). Similar findings also noted street food vendors' complaints on challenges hampering their food vending activities as low level of infrastructure, non-availability of potable water, and electricity. The researcher added that they requested for government support in provision of such basic amenities at their vending sites to enhance the safety of the food being sold (Gadaga et al., 2014). Azanza et al. (2000) recommended the provision of definite structures with basic sanitary provision as a vital tool that can assist in the translation of food safety knowledge into practices among street food vendors. It was noted that hand washing knowledge was translated into practices among street food vendors due to availability and adequate hand washing facilities within the food vending sites (Azanza et al., 2000). Adequate and timely provisions of infrastructure from authorities will be a positive intervention of annihilating foodborne diseases associated with street food vending (Lues et al., 2006).

2.3.2. Education and training of street food vendors

Education and training of street food vendors have been found to boost street vendors food handling practices (Mamun et al., 2013; Liu et al., 2014). According to studies by Buted and Ylagan (2014) and Gadaga et al. (2014), the provision of training for impartation of knowledge

in food safety and hygienic practices is fundamental to ensuring safer food. Street food vendors who participated in prior training exhibited good food safety and hygienic practices as reported by Franklyn and Bandrie (2015). Monney et al. (2014) reported a statistically significant association between street food vendors training and their food safety practices, and recommended training of vendors at low to zero cost to the vendors. Borman et al. (2016) in a study likewise disclosed that foods were prepared in unhygienic environments due to street food vendors' low educational status and inadequate training.

Choudhury et al. (2011) concluded in a study that training of street food vendors had significant impact on their food safety knowledge and practices (p-value <0.01). This was observed after a group of street food vendors in Guwahati, India were trained to evaluate their existing knowledge, attitude, and practices in relation to food safety, hygiene, and the effect after training intervention. Notable improvement in the knowledge of food safety practices of street food vendors after training intervention was observed during a study which exemplified the importance of training as a key factor in good hygienic practices (Fasoyiro et al., 2010). Similarly, Singh et al. (2016) noted a significant advancement in street food vendors' food handling practices and personal hygiene after training intervention in a pilot study conducted in India. A similar trend also revealed that training and intervention strategies employed for food handlers in school meal services in Brazil resulted in good improvement in the area of hygienic food handling practices (Da Cunha et al., 2013).

Rahman et al. (2012) discovered in a study that food safety training affects street food vendors' food safety attitudes positively and influence their practices significantly. It was reported that street food vendors showed significant interest in the food safety training attended since the

majority of them just had the privilege of such training for the first time in their profession (Choudhury et al., 2011). Such training interventions should be consistently organised by designated arm of government to minimise the prevalence of food borne disease and improve safety of street vended foods. In agreement, Mafune et al. (2017) stressed that regular training to ensure food standards should continuously be maintained.

Education of street food vendors on good hygienic practices and principles of food safety is perhaps the most cost effective medium in assuring the safety of food and hence reducing disease prevalence (Campos et al., 2015; Mjoka and Selepe, 2017; Paudiyal et al., 2017). Consistent and interactive training on food safety will improve their knowledge, attitude, and practice to food safety and subsequently ensure the safety of street vended foods (Choudhury et al., 2011; Webb and Morancie, 2015). Adequate education of street food vendors on the effect of food hygiene and personal hygiene in disease transmission will help in minimising the risk associated with street food consumption (Sani and Siow, 2014).

2.3.3. Inspection

Several authors emphasised that regular and stringent inspection by health practitioners to street food vendors' sites for compliance with food safety regulations will improve safety of street foods and minimise the risks posed by street vended foods (Adjrah et al., 2013; Proietti et al., 2014; Campos et al., 2017; Stephen and Grace, 2018). Da Cunha et al. (2013) identified that street food vendors were motivated by consistent inspection by health officers, thereby enhancing street food vendors' good hygiene practices. Long-Solis (2007) in a study highlighted the importance of street food regulations by relevant authorities as one of the keys to enhance food safety and minimise foodborne infections. According to the research conducted by Loukieh

et al. (2018), it was observed that street food vendors' personal hygiene practices were unacceptable and did not conform to hygiene regulations. Most often, the majority of street food vendors served ready-to-eat food with bare hands, cleaned food contact surfaces with dirty cloths, exposed utensils to contaminants, and failed to wash their hands prior to serving food. The importance of periodic audits and inspections of street food vendors by health officials in reducing foodborne infections was stressed by the authors.

2.3.4. Awareness raising programmes

Awareness raising programmes from government agencies, non-governmental organisations, street food vendors, and consumer organisations may help improve safety of street food (Moreaux et al., 2018). Choudhury et al. (2011) reported that street food vendors expressed positive responses in participating in programmes that can impact positively on their street food vending. Moreaux et al. (2018) in a study equally expressed some displeasure on how street vended foods were handled in an unhygienic manner and suggested that food regulatory authorities and consumer advocacy organisations should sensitise the public and street food vendors, to acceptable food safety attitudes and thereby ensuring the safety of street vended foods. The authors are of the opinion that such interventions should be disseminated via various media programmes (Moreaux et al., 2018).

Consumers should be sensitised to their right to demand safe food through observation of street food vendors' hygienic food handling, rather than emphasising on taste and quantity. This will invariably assist street food vendors to improve their food hygienic practices (Singh et al., 2016). Results of the study conducted by Liu et al. (2014) on different factors that motivated consumers to purchase street vended foods revealed that 41% of the respondents selected sensory appeal,

33% low price, 15% convenience of purchase, and 8% familiarity with street food vendors, while they pay little or no attention to hygienic handling of the food purchased. It was further mentioned that 74% of the consumers reported lack of awareness on food safety thus, necessitating education of consumers on this subject matter. Even though some street food vendors are aware of the need for personal hygiene, a greater awareness is required on the need for personal hygiene, food hygiene practices, and food safety to prevent outbreak and spread of foodborne diseases to consumers (Ismail et al., 2016).

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Description of study area

The city of Johannesburg metropolis is the commercial and business centre of the city, located in the Gauteng Province of South Africa. It covers an area of 1 645 km^2 and has a population of 4 434 827 (STATS SA, 2011). Informal trading is an integral part of the City of Johannesburg as is one of the various other forms of economic activities. There were 1 517 000 informal businesses recorded in Johannesburg in 2013 (STATS SA, 2013). The study was conducted in selected areas of the Johannesburg metropolis in which there are high levels of informal street food vending. These areas include Braamfontein, Johannesburg CBD, Hillbrow, Berea, Joubert park, Newtown, Marshallstown, and Parktown as shown in Figure 3.1.

Figure 3.1: Map of Johannesburg, showing the different regions (Adapted from SA-Venues, 2017).

3.2 Research design and sampling

A cross sectional survey study was conducted to obtain data from the population. A stratified random sampling approach was used to select vending sites. Each area in the Johannesburg metropolis was divided into five sections: north, south, east, west, and centre. Vending sites were randomly selected from a compiled list of vending sites within each of the sections. From each vending site, street food vendors were selected purposefully depending on the type of street food they sell. The facilities of street food vendors were also selected randomly from the list of vending sites within each of the sections for the observation study. A total of 315 street food vendors and 155 street food vending facilities were subjected to the study.

3.3 Data collection instruments

The research instruments consist of structured questionnaires and observational checklists using information from previous publications on food safety and quality assurance (Betts and Hinsz, 2015; Courtney et al., 2016; Akabanda et al., 2017). Data collection was by means of face-to-face interviews with respondents.

The questionnaires instrument consists of four sections (Appendix 1):

Section 1: questions relating to the socio-demographics of respondents.

Section 2: questions relating to the details of the location and service types of street food vending facilities.

Section 3: questions relating to the food safety knowledge of street food vendors.

Section 4: questions relating to the monitoring and enforcement of South African food hygiene regulations.

Section 5: the observational checklist items pertaining to the availability of safe food handling equipment and resources, as well as the sanitary conditions of street food vending sites (see Appendix 2).

The reliability of the questionnaire and observation instruments were tested in a pilot study using 20 street food vendors and 10 street food vending facilities. The instruments were evaluated under face and content validity by a panel of experts with experience in food safety and quality assurance. This helps to ensure that the instruments were valid for their intended purpose and the contents were appropriate to collect the relevant data. The validity of the different sections of the research instrument were determined by adopting Cronbach's α ranging from 0.689 to 0.821 for the different constructs.

3.4 Data collection

The data collection was conducted over a period of five months, from June until November 2018, after obtaining permission from the Johannesburg municipality and ethics clearance from the University of South Africa. Data collection using the questionnaire was carried out by means of face-to-face interviews conducted by the principal researcher and a research assistant who was fluent in the South African local languages. The questions were read out to respondents and explained to them as required, and their answers were captured by the principal researcher. Each interview session lasted approximately 25 minutes. The principal researcher was equally engaged with the data collection, using the observation sheet to observe the facilities and the activities at the street food vending sites. Each observation session lasted approximately 30 minutes, during peak hours.

3.5 Statistical analysis

The data collected were statistically analysed using statistical package for the social sciences (SPSS) software version 23. Descriptive statistics were used to summarise the variables of interest, while the regression and analysis of variance (ANOVA) was used to determine the relationship between food safety knowledge variables and demographic factors. The assessment of food safety knowledge (FSK) scores out of 20 was conducted as follows: Scores of 1-9 = low FSK, Scores of 10-15 = moderate FSK and Scores of 16-20 = High FSK. Similarly, the assessment of compliance scores out of 31 was conducted as follows: Scores of 1-14 = Low compliance, Scores of 15-20 = Moderate compliance and Scores of 21-31= High compliance. Statistical significance was identified at a 95% confidence level (p-value ≤ 0.05).

3.6 Ethical consideration

Permission to conduct this research was obtained from the Johannesburg municipality. Prospective participants were asked to sign a consent form to give their consent to participate or withdraw voluntarily from the study if they so desired. Respondents were assured of confidentiality and the purpose of the study was explained to them prior to the signing of the consent form.

3.7 Limitations of the research

The fact that some of the respondents did not understand English language, necessitates the translation of the questionnaire into South African local languages, when necessary, in order to complete the questionnaires during the interviews. This interrupted some participants' apt interest and hence, the information of such street food vendors who could not be interviewed are

lacking. An additional limitation includes bias that may arise from self-reported claims of their food safety knowledge.

CHAPTER 4: RESULTS

4.1 Socio-demographic characteristics of respondents

The majority (61.3%) of the respondents were females while the males account for only 38.7%. Most (68.3%) of the respondents were 26 to 45 years old. An immense majority (97.8%) of the respondents were black, followed by only 2.2% Asians, and white or coloured respondents. Less than half (43.2%) of the respondents were married and one-third (33.3%) were unmarried and living without a partner, 15.2% were unmarried but living with a partner and the rest (8.3%) were separated, divorced, or widowed. Most respondents (66.4%) had grade 1 to 6 as their highest level of education, followed by 14.9% with no formal education. Only 14.6% had attained grade 7 to 12, and lastly only 4.1% had attained tertiary education (Table 4.1).

4.2 Food service history and training credentials of respondents

About 59% of respondents indicated that they had been selling food at their current vending site for less than five years, while up to 41% had been doing so for more than five years. The large majority (76.8%) of respondents had no foodservice/hospitality diploma/degree and the majority (64.1%) had not attended a food safety-training course, while 35.9% had attended a food safety-training course. The majority (67.9%) indicated that their current vending site was the first place they had worked as street food vendors. Many of the respondents (82.9%) generated an average monthly income of less than R5 000 ($358) from street-food vending and street-food vending was the main source of income for the vast majority (88.3%) of them (Table 4.2).

Table 4.1: Biographic information of respondents (N=315)

Variables		Frequency (%)
Gender	Female	193 (61.3)
	Male	122 (38.7)
Age (Years)	18-25 years	45 (14.3)
	26-35 years	103 (32.7)
	36-45 years	112 (35.6)
	46-55 years	45 (14.3)
	56-65 years	7 (2.2)
	66-75 years	3 (1)
Ethnicity	Black	398 (97.8)
	White	0 (0)
	Coloured	0 (0)
	Asian/others	7 (2.2)
Marital status	Married	136 (43.2)
	Unmarried and living with a partner	48 (15.2)
	Unmarried and living without a partner	105 (33.3)
	Separated	11 (3.5)
	Divorced	6 (1.9)
	Widowed	9 (2.9)
Highest level of education	Tertiary level	13 (4.1)
	High school level (grade 10-12)	16 (5.1)
	Secondary school level (grade 7-9)	30 (9.5)
	Senior primary (grade 4-6)	67 (21.3)
	Junior primary (grade 1-3)	142 (45.1)
	No formal education	47 (14.9)

Table 4.2: Food service history and training credentials (N=315)

Variables		Frequency (%)
Number of years in business?	Less than 5 years	186 (59)
	5-10 years	72 (22.9)
	11-15 years	29 (9.2)
	More than 15 years	28 (8.9)
Possession of foodservice/hospitality diploma/degree?	No	242 (76.8)
	Yes	73 (23.2)
Food safety training?	No	202 (64.1)
	Yes	113 (35.9)
First place working as a street food vendor?	No	101 (32.1)
	Yes	214 (67.9)
Average monthly income?	Less than R5 000	261 (82.9)
	R5 001 - 10 000	44 (14)
	R10 001 -15 000	6 (1.9)
	Above R15 000	4 (1.3)
Selling of street food as main source of income?	No	37 (11.7)
	Yes	278 (88.3)

4.3 Characteristics of street food vending facilities

The number of street food vendors selected varies within the regions: Joubert Park (20.3%) and Johannesburg CBD (18.4%), having the highest number of street food vendors selected and the other regions had from 8.9% to 11.7% of the selected vendors. Less than half (48.3%) of the respondents sold street food in a permanent facility/premise and 30% sold food in makeshift shelters, while 21.3% sold food on roadsides without shelters. The vast majority (89.8%)

prepared food onsite in their street food vending facility/premise while the rest (10.2%) prepare food at home. The large majority (76.2%) of street food vendors rendered takeaway and eat on site food services, while 23.8% rendered only take away services (Table 4.3).

4.4 Personal hygiene knowledge of street food vendors

A large majority (72.4%) of respondents knew the correct approach to wash their hands during the preparation and serving of foods and the immense majority (92.1%) also knew they are compelled to wash their hands after visiting the toilet and after picking their nose when they are involved in the preparation and serving of food. The vast majority (85.1%) of respondents knew that they must not handle food when they have diarrhea, even if they wash their hands regularly and when they have flu, colds, cough, or catarrh (80%). The large majority (67%) of respondents knew that wiping, using a clean and dry dishcloth, is the correct way to dry their hands after washing them properly. The vast majority (89.5%) of respondents equally knew the correct thing to do if they have a wound on their hands during food preparation (Table 4.4).

Table 4.3: Location and characteristics of street food vending facilities of respondents (N=315)

Variables		Frequency (%)
Location of street food vending facility?	Braamfontein	28 (8.9)
	Johannesburg CBD	58 (18.4)
	Parktown	35 (11.1)
	Hillbrow	37 (11.7)
	Berea	31 (9.8)
	Joubert park	64 (20.3)
	Newtown	32 (10.2)
	Marshallstown	30 (9.5)
Type of street food-vending facility?	Roadside with no shelter/premise	67 (21.3)
	Roadside with makeshift shelter	96 (30.5)
	In a permanent facility/premise	152 (48.3)
Where are the foods prepared?	Prepare food at home	32 (10.2)
	Prepare food onsite, in this vending facility	283 (89.8)
Food service types provided?	Takeaway foods	75 (23.8)
	Both takeaway and eating on site	240 (76.2)

Table 4.4: The personal hygiene knowledge of street food vendors (N=315)

Variables		Frequency (%)
Which of the following is the correct way to wash your hands during the preparation and serving of foods?	Wash hands with warm running water and wipe dry with a clean cloth	6 (1.9)
	Wash hands with cold running water and wipe dry with a clean cloth	2 (0.6)
	Wash hands with soap and cold running water and then wipe dry with a clean cloth	46 (14.6)
	Wash hands with soap and warm running water and then wipe dry with a clean cloth	228 (72.4)
	Both 3 and 4 above are correct	33 (10.5)
Which of the following compels you to wash your hands when you are involved in the preparation and serving of food?	After visiting the toilet only	14 (4.4)
	After picking your nose	11 (3.5)
	None of the above	0 (0)
	All of the above	290 (92.1)
I must not handle food when I have diarrhea, even if I wash my hands regularly	False	47 (14.9)
	True	268 (85.1)
I must not handle food and money when I have flu, colds, cough or catarrh.	False	63 (20)
	True	252 (80)
Which of the following is the correct way to dry your hands after you have washed them properly	Wipe using an apron	1 (0.3)
	Wipe using a clean and dry handkerchief/serviette or tissue	56 (17.8)
	Wipe using a clean and dry dish cloth	211 (67)
	All of the above	36 (11.4)
	None of the above	11 (3.5)
Which of the following is the correct thing to do if you have a wound on your hands?	Dress the wound with waterproof dressings (bandage or gloves)	282 (89.5)
	Do nothing, if it is not painful	9 (2.9)
	None of the above	24 (7.6)

4.5 Food hygiene knowledge of street food vendors

Less than half (44.1%) of respondents knew that a clean display container free from both dust and rust were the correct qualities of a display container where prepared foods should be stored prior to selling. Only a few (23.5%) respondents knew that the discarding of perishable food is the correct thing to do if protein rich foods made from milk, meat, and fish were exposed to non-refrigeration temperatures for more than two hours. Equally, only a few (26.3%) respondents knew that the safest way to thaw perishable foods such as meat, fish, dairy, and poultry products was to allow them thaw on the lower shelve of the refrigerator. Larger number (61.9%) of respondents also knew that the usage of separate cutting boards for meat and salad but washing each of them in between usage was the safest way to use cutting boards to avoid cross contamination between them (Table 4.5).

4.6 Microbial hazard knowledge of street food vendors

The vast majority (85.4%) of respondents were aware that microorganisms could cause foodborne diseases that may lead to death. However, most of them have never heard of *Salmonella* (92.7%), *Campylobacter* (95.2%), *Listeria* (57.1%), *Clostridium* (94.3%), and *Staphylococcus* (87.6%) (Table 4.6).

Table 4.5: Food hygiene knowledge of street food vendors (N=315)

Variables		Frequency (%)
Which of the following best describe the correct quality of a display container where prepared foods should be stored prior to selling?	A clean display container free from dust	132 (41.9)
	In a clean and rust–free display container	24 (7.6)
	In a clean display container in direct contact with the floor	1 (0.3)
	All of the above	19 (6)
	Only 1 and 2 are correct	139 (44.1)
Which of the following is the correct thing to do if protein rich foods made from milk, meat, and fish are exposed to non-refrigeration temperatures for more than two hours?	Quickly put perishable food back into the refrigerator	88 (27.9)
	Discard perishable food	74 (23.5)
	Quickly cook the perishable food	120 (38.1)
	Both 1 and 2 are correct	18 (5.7)
	All of them are correct	15 (4.8)
Which of the following is the safest way to thaw frozen perishable foods such as meat, fish, dairy, and poultry products?	Allow perishable foods to thaw on a table	56 (17.8)
	Allow perishable foods to thaw in hot water	128 (40.6)
	Allow to thaw on the lower shelve of the refrigerator	83 (26.3)
	Both 2 and 3 are correct	33(10.5)
	None of the above is safe	15(4.8)
Which of the following is the safest way to use cutting boards to avoid cross contamination between them?	Use separate cutting boards for meat and salad but wash each of them in between usage.	195 (61.9)
	Use any cutting boards for meat and salad but wash them in between usage	30 (9.5)
	Use the same cutting board for meat and salad but wash them in between usage	59 (18.7)
	All of the above ways are correct	31 (9.8)

Table 4.6: The microbial hazard knowledge of street food vendors (N=315)

Variables		Frequency (%)
Do you know that some microorganisms can cause foodborne diseases to humans that may lead to death?	No	46 (14.6)
	Yes	269 (85.4)
Have you ever heard of *Salmonella*?	No	292 (92.7)
	Yes	23 (7.3)
Have you ever heard of *Campylobacter*?	No	300 (95.2)
	Yes	15 (4.8)
Have you ever heard of *Listeria*?	No	180 (57.1)
	Yes	135 (42.9)
Have you ever heard of *Clostridium*?	No	297 (94.3)
	Yes	18 (5.7)
Have you ever heard of *Staphylococcus*?	No	276 (87.6)
	Yes	39 (12.4)

4.7 Knowledge on internal food cooking and handling temperatures of street food vendors

Only few (12.1%) respondents knew that 78°C is the correct minimum internal cooking temperature for stuffed chicken, while just above half (58.4%) of them knew that 57°C is the correct minimum internal cooking temperature for vegetables and fruits. Less than half (40%) of the respondents knew that the correct temperature guideline for cold holding of ready-to-eat foods, such as salad, during serving is at about 5°C. Similarly, less than half (39%) of the respondents knew that the correct temperature for hot holding of ready-to-eat foods, such as beef and chicken stew, during serving is at about 63°C (Table 4.7).

Table 4.7: Knowledge on internal food cooking and handling temperatures of street food vendors (N=315)

Variables		Frequency (%)
Which of the following is the correct minimum internal cooking temperature for stuffed chicken?	90°C	106 (33.7)
	65°C	103 (32.7)
	100°C	68 (21.6)
	78°C	38 (12.1)
Which of the following is the correct minimum internal cooking temperature for vegetables and fruits?	87°C	33 (10.5)
	77°C	26 (8.3)
	67°C	72 (22.9)
	57°C	184 (58.4)
Which of the following is the correct temperature guideline for cold holding of ready-to-eat foods, such as salad, during serving?	At about 25°C.	62 (19.7)
	At about 10°C	127 (40.3)
	At about 5°C	126 (40)
Which of the following is the correct temperature for hot holding of ready- to- eat foods, such as beef and chicken stew, during serving?	At about 100°C	76 (24.1)
	At about 63°C	123 (39)
	At about 25°C	116 (36.8)

4.8 Monitoring of street food vending sites by health inspectors

More than half (56.5%) of the street food vendors did not hold a license to sell food at their current street food vending sites and the large majority (76.5%) of them had not registered their street food vending business with the Companies and Intellectual Property Commission (CIPC) of South Africa. A health inspector had inspected the majority (68.3%) of the street food vending facilities. A few (31.6%) respondents indicated that their facility was inspected on a monthly

basis, while 48.8% quarterly, and 19.5% on a yearly basis. No penalty/warning for non-compliance was issued to the large majority (71.6%) of those facilities that have been inspected before (Table 4.8).

Table 4.8: The monitoring and enforcement of food hygiene regulations at the food service sites of street food vendors (N=315)

Variables		Frequency (%)
Has this street-food vending facility been authorised or issued with a license to sell foods?	No	178 (56.5)
	Yes	137 (43.5)
Has this street food vending business been registered with Companies and Intellectual Property Commission (CIPC) of South Africa?	No	241 (76.5)
	Yes	74 (23.5)
Has this street food vending facility been inspected by a health inspector as of now?	No	100 (31.7)
	Yes	215 (68.3)
If your facility has been inspected before, how often is your facility being inspected?	Monthly	68 (31.6)
	Quarterly	105 (48.8)
	Yearly	42 (19.5)
If your facility has been inspected before; have you ever receive a penalty/warning for non-compliance?	No	154 (71.6)
	Yes	61 (28.4)

4.9 ANOVA of the food safety knowledge score of respondents across different socio-demographic parameters

Respondents in the different subgroups within the age, level of education, and location where vended foods were prepared differed significantly ($p \leq 0.05$) in their food safety knowledge (Table 4.9).

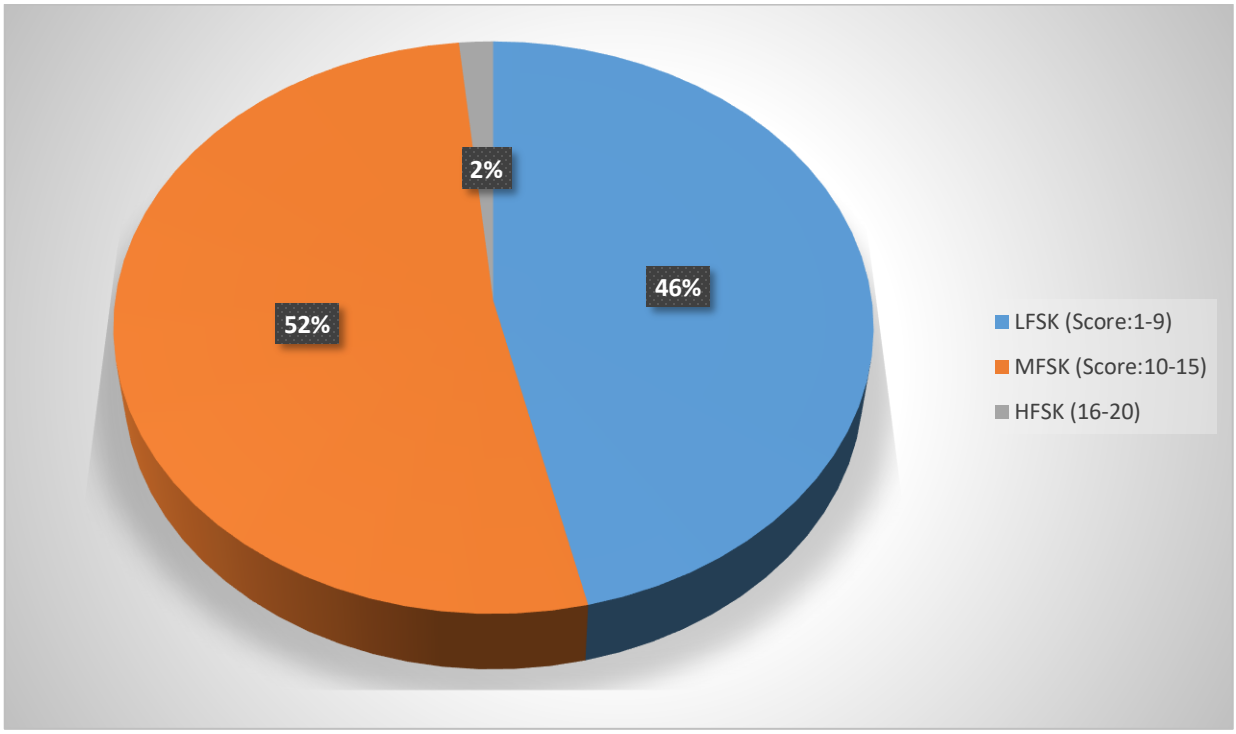
Table 4.9: Socio-demographic variables for which there was significance in the food safety knowledge scores of respondents

Socio-demographic variables		LFSK (%)	MFSK (%)	HFSK (%)	P-values
Age (years)	18-25	53.3	46.7	0	0.035
	26-35	47.6	52.4	0	
	36-45	43.8	53.6	2.7	
	46-55	34.4	59.1	4.5	
	56-65	33.3	60.4	6.3	
	66-75	33.3	66.7	0	
Highest level of education	Tertiary level	84.6	15.4	0	0.000
	High school level (grade 10-12)	50	50	0	
	Secondary school level (grade 7-9)	66.7	33.3	0	
	Senior primary (grade 4-6)	48.5	51.5	0	
	Junior primary (grade 1-3)	45.1	54.9	0	
	No formal education	23.4	66	10.6	
Where are the foods prepared?	Prepare food at home	21.9,	75	3.1	0.005
	Prepare food onsite	49.3	51.9	1.6	

*****LFSK = Low food safety knowledge (Score of 1-9), MFSK = Moderate food safety knowledge (score of 10-15), HFSK = High food safety knowledge (score of 16-20)

4.10 An assessment of the food safety knowledge of street food vendors (N=315)

Regarding the overall assessment of food safety knowledge of street food vendors, less than half (46%) of the respondents possessed low food safety knowledge. More than half (52%) of respondents had moderate food safety knowledge, while interestingly, few respondents (2%) possessed high food safety knowledge (Figure 4.1).



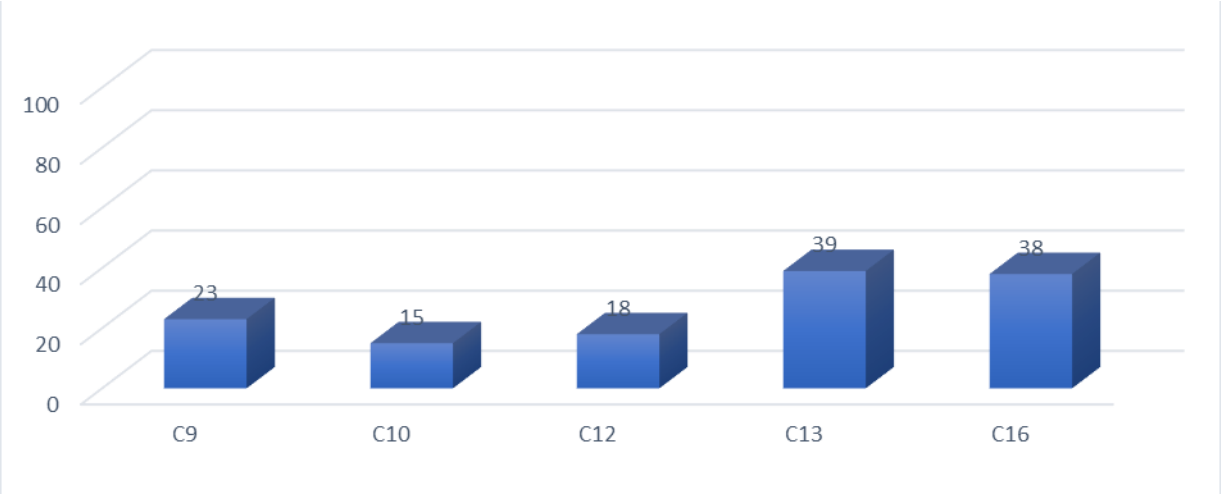
*LFSK = Low food safety knowledge (Score of 1-9), MFSK = Moderate food safety knowledge (score of 10-15), HFSK = High food safety knowledge (score of 16-20)

Figure 4.1. Overall assessment of the food safety knowledge of street food vendors

4.11 Food safety knowledge questions for which street food vendors scored less than 50%

Street food vendors' food safety knowledge was below 50% in the following areas: knowledge about *Staphylococcus* (39%), knowledge about correct minimum internal cooking temperature for stuffed chicken (38%), knowledge about *Salmonella* (23%), knowledge about *Clostridium*

(18%), and knowledge about *Campylobacter* (15%) was the least knowledge score obtained by respondents (Figure 4.2).



* C9: Have you ever heard of *Salmonella*? C10: Have you ever heard of *Campylobacter*? C12: Have you ever heard of *Clostridium*? C13: Have you ever heard of *Staphylococcus*? & C16: Which of the following is the correct minimum internal cooking temperature for stuffed chicken?).

Figure 4.2. Food safety knowledge questions for which street food vendors had a score of less than 50%

4.12 ANOVA of compliance of street food vending facilities to South Africa food safety regulations

Street food vending facilities' compliance in the different subgroups regarding the location of street food vending facilities in Johannesburg metropole, type of the street food vending facilities, where vended foods are prepared, and food service type offered differed significantly ($p \leq 0.05$) in the level of their compliance to food safety regulations (Table 4.10).

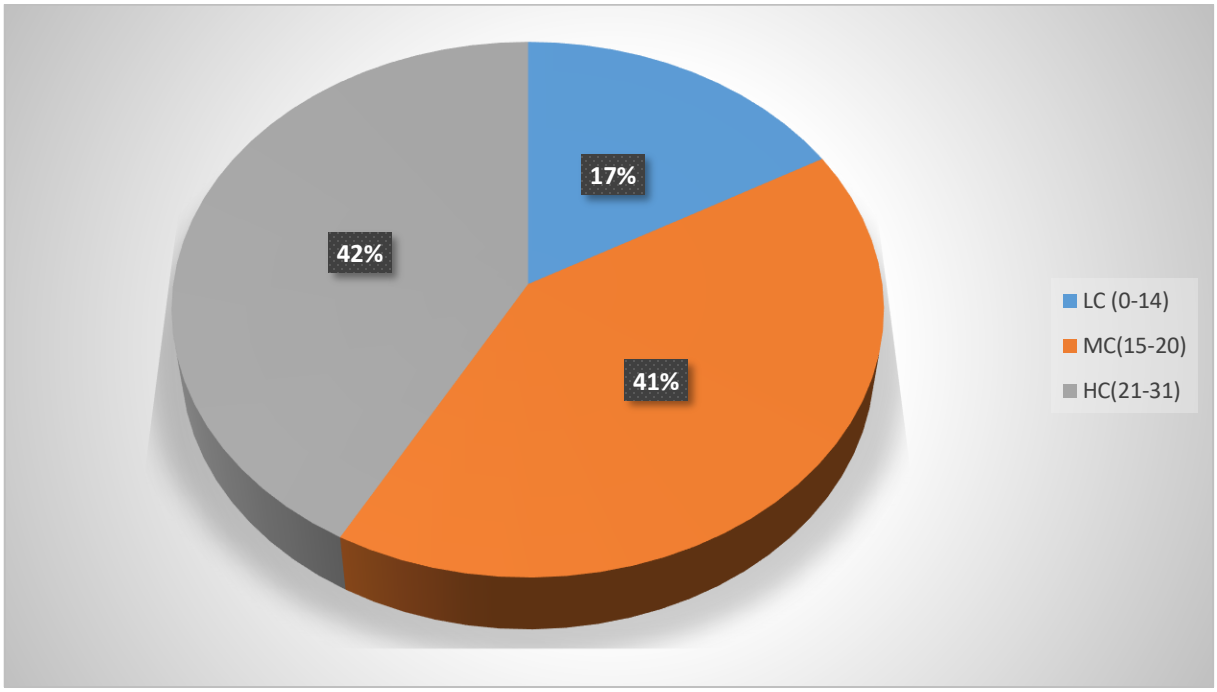
Table 4.10: ANOVA of compliance of street food vending facilities to regulations governing general hygiene requirements for food premises and the transport of food (R962)

Variables		Low compliance (%)	Moderate compliance (%)	High compliance (%)	p-value
Location of street food vending facility?	Braamfontein	1 (6.3)	1 (6.3)	14 (87.5)	0.001
	Johannesburg CBD	3 (10.7)	19 (67.9)	69 (21.4)	
	Parktown	1 (5.9)	8 (47.1)	8 (47.1)	
	Hillbrow	1 (5.6)	7 (38.9)	10 (55.6)	
	Berea	3 (20)	6 (40)	6 (40)	
	Joubert Park	9 (31)	8 (27.6)	12 (41.4)	
	Newtown	1 (6.3)	3 (18.8)	12 (75)	
	Marshalltown	7 (43.8)	5 (31.3)	4 (25)	
	Total	26 (16.8)	57 (36.8)	72 (46.5)	
Type of street food-vending facility?	Roadside with no shelter/premise	9 (42.9)	10 (47.6)	2 (9.5)	0.000
	Roadside with makeshift shelter	15 (31.9)	31 (66)	1 (2.1)	
	In a permanent facility/premise	2 (2.3)	16 (18.4)	69 (79.3)	
	Total	26 (16.8)	57 (36.8)	72 (46.5)	
Where are the foods prepared?	Prepare food at home	5 (38.5)	7 (53.8)	1 (7.7)	0.002
	Prepare food onsite in this vending facility	21 (14.8)	7 (35.2)	71 (50)	
	Total	26 (16.8)	57 (36.8)	72 (46.5)	
Food service types provided?	Take away foods	10 (47.6)	11 (52.4)	0 (0)	0.001
	Both take away and eating on site	16 (11.9)	46 (34.3)	72 (53.7)	
	Total	26 (16.8)	57 (36.8)	72 (46.5)	

*LC = Low compliance (Score of 1-14), MC = Moderate compliance (score of 15-20), HC = High compliance (score of 21-31)

4.13 Compliance of street food vending facilities per food safety criteria

Only a few (17%) street food vending facilities have low level of compliance to food safety regulations, with less than half (41%) of the facilities having moderate level of compliance. High compliance level to food safety regulations was however, observed in the remaining 42% of the street food vending facilities (Figure 4.3).



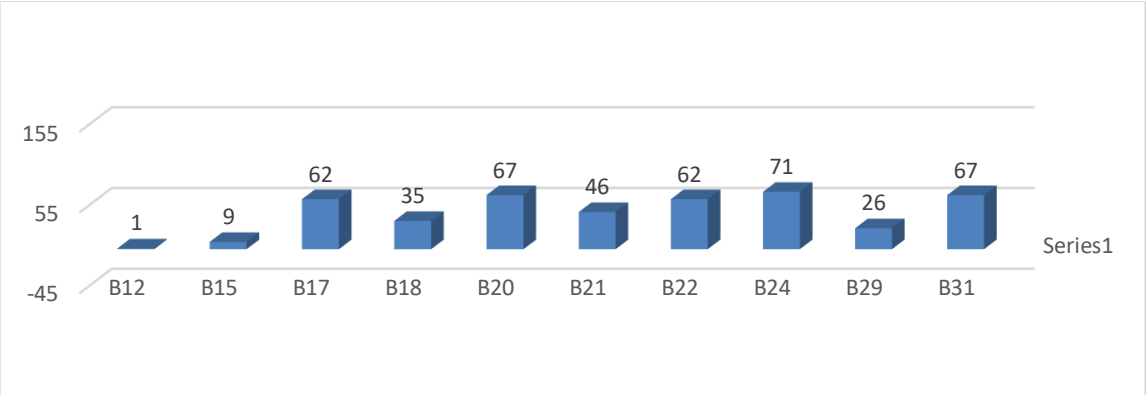
*LC = Low compliance (Score of 1-14), MC = Moderate compliance (score of 15-20), HC = High compliance (score of 21-31)).

Figure 4.3. Distribution of the compliance levels of street food vending facilities

4.14 The bottom 10-food safety sanitary criteria in terms of compliance by street food vending facilities

The bottom 10-food sanitary criteria for which street food vending facilities exhibited least compliance level to food safety regulations are as follows: sufficient space for hygienic storage

of food utensils and separate area for storage of refuse (71%), water supply availability in the facilities and proper waste removal mechanism on the vending sites compliance were both 67%. Compliance to cooling and freezing storage equipment and toilet facilities availability at vending sites constituted 62% each. Compliance regarding the use of dedicated garbage disposal bin with lid was 46%, ready to eat hot food-holding equipment availability was 35%, windows and doors cleaned and free from dirt or damage was 26%, rusted and damaged food storage containers was 9%, and the least level of compliance was where food was displayed in direct contact with floor or ground level 1% (Figure 4.4).



***B12:** Are displayed foods in direct contact with floor or ground surface?, **B15:** Are food storage damaged or rusted?, **B17:** Is there any cooling and freezing storage equipment at the vending site?, **B18:** Is there any ready-to-eat hot holding equipment at the vending site?, **B20:** Is there a proper waste water removal mechanism on the vending site?, **B21:** Are there dedicated garbage disposal bins with lid at the vending site?, **B22:** Toilet facilities are available around vending sites?, **B24:** Is there sufficient space for hygienic storage of food, utensils and separate area for storage of refuse?, **B29:** Are the windows and doors cleaned and free from dirt or damage?, & **B31:** Is there a tap water supply in the facility?

Figure 4.4. Bottom 10-food safety sanitary criteria in terms of compliance by street food vending facilities

CHAPTER 5: DISCUSSION

5.1 Socio-demographic characteristics of respondents

Most of the respondents were females, and this could be attributed to the fact that food preparation is fundamental in the upbringing of a female child in the African society (Okojie and Isah, 2014). This agrees with the findings in South Africa that females were found to be introduced to food handling and preparation early in life compared to males (Mukhola, 2014; Mathaulula et al., 2015; Hill et al., 2018). Previous studies conducted in Togo, Ethiopia and Nigeria have equally reported involvement of more females than males in street food vending activities based on women's capacity to integrate family life with street food vending (Adjrah et al., 2013; Gizaw et al., 2014; Afolaranmi et al., 2015).

Most of the respondents were 26 to 45 years and this could be attributed to the fact that these age groups are the most energised and the active working population in any society (Da Silver et al., 2014). High level of unemployment has also contributed to the involvement and participation of women of these age groups in street food vending (Mathaulula et al., 2016). Studies carried out by Bormann et al. (2016), and Monney et al. (2014) in Ghana also revealed this age group bracket (26-45 years) participated tremendously in street food vending.

Less than half of the respondents were married, and this is because the rate of marriage in South Africa has declined over the years (Posel et al., 2011; STATS SA, 2018).

Many respondents had primary school as their highest level of education and this could be attributed to the fact that they were possibly underprivileged and lack financial capabilities to further their education (Alamo-Tonelada et al., 2018). This is consistent with the findings by Oladoyinbo et al. (2015) in Nigeria and Apanga et al. (2014) in Ghana, in which low level of

education among street food vendors were attributed to lack of funds. Low level of formal education has been a common profile observed among street food vendors because street food vending is an easier means of self-employment with low input capital requirements (Da Silver et al., 2014; Mckay et al., 2016; Pokhrel and Sharma, 2016; Martinez et al., 2017). Low level of education may have significant impact on street food vendors' food safety knowledge and hence adversely affect consumers' health (Franklyn and Badrie, 2015).

5.2. Food service history and training credentials of respondents

The majority of respondents indicated that they had been selling food at their current vending site for less than five years and this could be accredited to the fact that respondents did not have a permanent site for food vending and changed their vending locations regularly (Hill et al., 2018). Gadaga et al. (2014) in Lesotho reported a similar finding where most respondents were observed vending at a location for a short duration.

The vast majority of respondents had no foodservice/hospitality diploma/degree, nor had attended a food safety training course, and this could be due to the lack of awareness on requirements of food vending regulations (Mnyone et al., 2018). A study in Lome, Togo also found that most street food vendors had not received any food safety training due to lack of funds to pay for these trainings on an individual basis. The lack of food safety knowledge by street food vendors limit their ability to handle and produce safe food (Bhattacharjya and Reang, 2014; Guraza, 2016). Many respondents indicated that their current vending site was the first place they had worked as street food vendors. This is because most of the street food vendors operated informally, and did not need prior street food vending experience before they could commence with the business (Isara et al., 2018). This agrees with the report by Rahman et al.

(2012) where many respondents had no prior street food vending experience because street food vendors could be operated without any formal training or work experience.

Most of the respondents generated an average monthly income less than R5 000 ($358) from street-food vending. The reason is because street food vending is a low capital and low profit business often used for subsistence lifestyles (Carol et al., 2013). This is consistent with the study by Mckay et al. (2016) who revealed that the income earned in street food vending was meager as it only served as a means of survival for the poor populace. Street-food vending was the main source of income for most respondents. This is because street food vending activities is labour intensive, involves lots of time and therefore, occupies most of the productive time of the street food vendors (Gamieldien and Niekerk, 2017). Street food vending is the principal means of employment by individuals who struggle to get work in the formal job market due to the possession of no formal qualification (Mathaulula et al., 2015; Mramba, 2015). Adhikari (2012) in Nepal reported that street food vendors engaged in street food vending as their only source of revenue due to lack of opportunities and privileges for them in other sectors.

5.3 Characteristics of street food vending facilities

Less than half of the respondents sold food in a permanent facility/premise while the majority used makeshift shelters or setup along roadsides without shelters. The reason why most respondents sell food along the roadside might be due to financial constraints to acquire prescribed structures needed for safe food production and services (Mathaulula et al., 2015). The selling of food at the roadside by most of the respondents is also consistent with the findings by Kwiri et al. (2014) in Zimbabwe due to cost implications of renting a permanent structure.

Most street food vendors indicated that they prepare food onsite in their vending facilities. This is because of its ease and convenience (Gadaga et al., 2014). This finding is consistent with a study performed by Hill et al. (2018) who reported that most of the respondents prepared their food at the vending site to reduce cost of transporting prepared food to the vending facility.

5.4. Personal hygiene knowledge of street food vendors

Most respondents knew that washing their hands with soap and warm running water and then wiping them dry with a clean cloth is the correct way to wash their hands during the preparation and serving of food. Furthermore, the vast majority also knew that they are compelled to wash their hands after visiting the toilet and after picking their nose, as well as that they must not handle food when they have diarrhea, even if they wash their hands regularly and also not to handle food and money simultaneously when they have flu, cold, or catarrh. This is because the hand washing process is widely understood as fundamental practice in preventing foodborne disease (Afreen et al., 2019). This agrees with the study by Reang and Bhattacharjya (2013) and Aquino et al. (2015) who reported that street food vendors with low formal education exhibited good knowledge in hand washing procedures, which was attributed to the fact that hand washing knowledge is acquired naturally and does not require special education or training before it is understood.

The picking of nose with fingers during food handling is widely considered a bad personal hygiene habit hence, street food vendors understood such practice should be avoided during the preparation and serving of food (Ologhobo et al., 2010). In a study conducted in Ghana, Apanga et al. (2014) revealed that most of the street food vendors had good knowledge in hand washing procedures and understood the consequences associated with poor hand washing practices. Baluka et al. (2015) also reported that respondents in a study conducted in Uganda understood

that the handling of food when they have diarrhea may lead to the cross contamination of food by pathogens. Most respondents equally knew the correct thing to do if they have a wound on their hands during food preparation. This could be due to their desire to prevent contact of food with their wounds thus, preventing the contamination of food (Ackah et al., 2011). Street food vendors' knowledge on personal hygiene can influence the safety of food and consumers' health safety (Rahman et al., 2012). Good personal hygiene will help to minimise hazards associated with food handling and guarantee safer food (Iwu et al., 2017).

5.5 Food hygiene knowledge of street food vendors

Most respondents did not know that a display container where prepared foods should be stored prior to selling must be free from both dust as well as rust. This is attributed to lack of knowledge on the food safety hazards associated with rusted food holding containers (Pokhrel and Sharma, 2016). This is in agreement with the study by Phyu et al. (2019) who also reported poor understanding on cross contamination of food utensils due to lack of knowledge of street food vendors. Only a few respondents knew that protein rich foods made from milk, meat, and fish which have been exposed to non-refrigeration temperatures for more than two hours should be discarded. This is because of lack of formal food safety training on food that need time and temperature control to ensure its safety (Adjrah et al., 2013).

Equally, only a few respondents knew that the safest way to thaw perishable foods such as meat, fish, dairy, and poultry products is to allow it to thaw on the lower shelf of the refrigerator. This is attributed to lack of food safety training on the 'Danger Zone' bacteria growth temperature range (5°C - 60°C) (Sani and Siow, 2014). Akabanda et al. (2017) in a study equally agreed that most of the street food vendors did not understand the correct way to thaw perishable food due to lack of food safety training before commencing street food vending activities. Most respondents

also knew that the usage of separate cutting boards for meat and salad but washing each of them in between usage is the safest way to use cutting boards to avoid cross contamination between them. This can be attributed to their awareness of microbial cross contamination that may occur if ready-to-eat food is prepared on a cutting board previously used for raw meat without proper washing (Mazengia et al., 2015). Aquino et al. (2015) equally agreed that cross contamination of food could occur from raw food to cooked food if proper sanitary procedures are not followed.

5.6. Microbial hazard knowledge of street food vendors

Most respondents were aware that microorganisms could cause foodborne diseases that may lead to death. This could be attributed to information respondents gathered from various media channels and in food safety awareness programmes from health officials (Dun-Dery and Addo, 2016). Furthermore, personal experiences of contracting or knowing someone who has contracted food borne diseases in the past might be responsible for microbial hazard knowledge of street food vendors (NICD, 2014). A similar study by Apanga et al. (2014) reported that most respondents exhibited a good understanding of food borne diseases due to awareness received from health officials during outbreaks.

However, most of them have never heard of *Salmonella, Campylobacter*, *Listeria*, *Clostridium,* and *Staphylococcus*. This is because street food vendors are not familiar with biological names of food pathogens and lack training in food safety that could accustom them to these names (Samapundo et al., 2015). A study conducted by Phyu et al. (2019) also observed lack of food safety knowledge of food pathogens among the street food vendors which was attributed to inadequate food safety training. *Listeria* was the only pathogen well recognised by vendors and this can be attributed to the recent Listeriosis outbreak that occurred from 2017-2018 in South Africa. The cause of the outbreak was due to an infected ready-to-eat processed meat product

which resulted in the loss of 183 individual lives. It affected the entire cold meat industry in South Africa and its economic impact was estimated at about 12 million rand (NICD, 2018). The severity of Listeriosis could be fatal and thus, good food hygienic practices were recommended as crucial in preventing Listeriosis (Manganye et al., 2018).

5.7. Knowledge on internal food cooking and handling temperatures of street food vendors

Most respondents did not indicate 78°C and 57°C as the correct minimum internal cooking temperature for stuffed chicken and vegetable/fruits respectively. Furthermore, the majority of them did not indicate 5°C and 63°C as the correct temperature for cold holding of ready-to-eat foods such as salad and hot holding of ready-to-eat foods such as beef and chicken stew respectively during serving. This can be attributed to the lack of training on the correct internal cooking and holding temperatures for different food types (Moutz et al., 2012). Lack of understanding the correct internal cooking temperatures and holding temperature of food during serving can lead to microbial survival in street foods and is a key factor adding to foodborne illnesses (Ologhobo et al., 2010). Cooking time and temperature of food must be enough to prevent microbial proliferation in food (Lamin-Boima, 2017).

5.8. Monitoring of street food vending sites by health inspectors

Most of the street food vendors did not possess a license or were not authorised to sell food at their current street food vending sites. This is due to a lack of awareness by street food vendors to register their street food businesses (Mnyone et al., 2018), and ineffective monitoring and enforcement by health inspectors (Danikuu et al., 2015). Similar findings were reported in a study conducted in Cape Town, South Africa by Hill et al. (2018) where the majority of respondents were found to have no certification or license to sell food due to lack of proper

enforcement by health officials. Dun-Dery and Addo (2016) and Galapia-Andoy and Valmorida (2017) also reported the lack of awareness by respondents on relevance of food licensing before operating as a street food vendor. According to South African regulations governing general hygiene requirements for food premises and transport of food, no food business owner is permitted to handle food without possessing a valid certificate of acceptability (Department of Health, 2012). Licensing of street food vendors is vital in ensuring safer food for consumers (FAO, 2013).

Most respondents indicated that their street food vending facilities have undergone quarterly inspections by health inspectors. Furthermore, no penalty/warning for non-compliance was issued to the majority of those whose street food vending sites have been inspected. Despite this, many respondents did not comply in obtaining a license to sell food. This can be due to inadequate enforcement of the regulations governing general hygiene requirements for food premises and transport of food by health inspectors during their visits (Dwumfour-Asare, 2015).

5.9 Assessment of the food safety knowledge scores

5.9.1 The effect of socio-demographic parameters on food safety knowledge scores

Respondents in the different subgroups, with special reference to age, differed significantly ($p \leq 0.05$) in their responses regarding their food safety knowledge. The cross-tabulation trends indicate that respondents who are older had relatively better food safety knowledge scores. This is because age, at times, influence food safety knowledge due to acquired experience overtime in food handling (Chekol et al., 2019). This is evidenced in the study conducted by Gruenfeldova et al. (2019) who reported high food safety knowledge among respondents which was attributed to years of working experience and level of training acquired by respondents. Respondents in the

different subgroups within the level of education differed significantly ($p \leq 0.05$) in their responses regarding their food safety knowledge. The cross-tabulation trends indicate that respondents with higher level of education did not necessarily have better food safety knowledge scores compared to those with lower levels of education. This is because the level of education acquired by respondents does not have a significant impact on their level of food safety knowledge but rather specific training and experience in food safety practices (Choudhury et al., 2011).

5.9.2 An overall assessment of the food safety knowledge of street food vendors

Regarding the overall assessment of the food safety knowledge of street food vendors, the majority of respondents possessed moderate food safety knowledge, and this was closely followed by those with high food safety knowledge. This might be attributed to individual possessions of personal and food hygiene knowledge imposed by society hygiene standard and experience gained in safe food handling practices (Reang and Bhattacharjya, 2013). A similar study by Ezenwoko et al. (2017) reported good food safety knowledge among street food vendors because of the natural understanding of hygiene requirements. High food safety knowledge among street food vendors will help minimise the risk of food contamination by microbial hazards during food handling (Buted and Ylagan, 2014).

5.9.3 Food safety knowledge questions where respondents obtained a score of less than 50%

More than 50% of street food vendors indicated they have not heard about *Staphylococcus*, *Salmonella, Clostridium,* and *Campylobacter*. This can be attributed to lack of awareness and training on food borne pathogens as discussed earlier (Lee et al., 2017) hence, the low knowledge on microbial pathogens is a concern. Similarly, more than 50% of the respondents did

not correctly indicate the correct minimum internal cooking temperature for stuffed chicken. This can be attributed to lack of awareness and training on internal cooking temperature of different food groups (Kwiri et al., 2014). Faremi et al. (2018) in a study also reported lack of knowledge on temperature control which was attributed to lack of awareness and education on cooking temperatures. Inadequate knowledge on internal cooking temperature by street food vendors could lead to the growth of bacteria in under cooked food (Sani and Siow, 2014).

5.10 Compliance of street food vending facilities to the regulation governing the general hygiene requirements for food premises and the transport of food

5.10.1 Effect of types of street food vending premises on compliance

Street food vending facilities within different locations in the Johannesburg metropolis differed significantly in their level of compliance to the hygiene requirements for food premises and the transport of food. This can be attributed to the fact that locations such as Braamfointein and Newtown with availability and provision of infrastructure will have a high level of compliance to food safety regulations than locations without availability of resources like Johannesburg CBD and Marshalltown (Bormann et al., 2016). Furthermore, street food vending facilities with no shelter/premise or a makeshift shelter differed significantly in their level of compliance to hygiene requirements for food premises and the transport of food when compared to those in permanent facilities. This can be attributed to the fact that most street food vending facilities with no shelter or with a makeshift shelter have no access to basic sanitary infrastructure such as water supply, toilet facilities, and waste disposal facilities (Baluka et al., 2015). Acquino et al. (2015) in a study revealed the rudimentary nature of vending sites without basic infrastructure required for safe food handling. Street food vendors in permanent facilities have more access to infrastructures and can easily comply with relevant hygiene regulations (Soon, 2019).

The street food vending facilities where food is prepared at home and those where food is prepared onsite, differed significantly in their level of compliance to hygiene requirements for food premises and the transport of food. Cross-tabulation indicated that those who prepare food onsite had the highest compliance and this is because those with access to infrastructures were more likely to possess food preparation and holding resources at their street food vending sites (Azanza et al., 2000). Bormann et al. (2016) equally reported the preparation of food on vending site, by street food vendors operating on permanent facilities due to availability of basic amenities.

The street food vending facilities with takeaway food services and those with both takeaway and eating on site differed significantly in their level of compliance to hygiene requirements for food premises and the transport of food. Cross-tabulation indicated that those providing both takeaway and eating onsite street food vending services were more compliant. Eating on site seems to have prompted the compliance because individuals who offer eat on site services are compelled to practice some level of hygiene to attract and satisfy customers who visited their facilities (Aquino et al., 2015). Faremi et al. (2018) noted that customer satisfaction was the key reason that compelled the compliance of street food vendors in a study conducted at Ile-Ife, Nigeria.

5.10.2 Overall compliance of street food vending facilities to the general hygiene requirements

Most of the street food vending sites observed had high compliance to the general hygiene requirements for food premises and the transport of food. The reason for this is due to the effort of frequent and routine inspection by health inspectors (Da Cunha et al., 2013). Self-regulation due to competition and customer demand for quality and safe food to improve patronage was

also reported by (Mnyone et al., 2018). This correlated with a study by Monney et al. (2014) who equally reported high level of compliance to food safety requirements in a study carried out in Ghana because of regular inspection by health inspectors. High compliance to food regulations observed among street food vendors studied in Benin City, Nigeria was attributed to enhancement of consumers' confidence and increased sales (Okojie and Isah, 2014). To ensure the safety of street vended foods, street food vending facilities must comply with applicable food safety regulations. Continuous monitoring and enforcement of the general hygiene requirements for food premises and the transport of food by relevant authorities will ensure the compliance of street food vending facilities to the regulation and prevent food safety hazards (Trafialek et al., 2018).

5.10.3 Hygiene requirements for which there was low compliance

General hygiene requirements for which less than 50% of street food vending sites complied to were: lack of dedicated garbage disposal bin with lid, no available hot food-holding equipment, windows and doors not cleaned and free from dirt or damage, usage of rusted and damaged food storage containers, and displayed food in direct contact with floor or ground level. The lack of these resources can be attributed to lack of awareness and poor food safety culture in these vending facilities (Dwumfour-Asare, 2015). Furthermore, the lack of financial capital to equip their street food vending sites with relevant food serving equipment hinders their compliance to food safety regulations (Mckay et al., 2016). The reason for non-availability of hot food-holding equipment can be attributed to lack of provision of infrastructure (Ghatak and Chatterjee, 2018). This finding correlates with a study by Hill et al. (2018) where respondents' lack of food holding equipment was due to non-availability of resources.

The reason for dirty or damaged windows and doors can be attributed to lack of regular cleaning and disinfection of surfaces within the food service facility, since street food vendors did not see the need, as they consider it only has an indirect effect on hygienic handling of food (Omemu and Aderoju, 2008). Other hygiene requirements for which there was low compliance were: lack of sufficient space for hygienic storage of food utensils and separate area for storage of refuse, lack of tap water supply at vending sites, lack of proper waste removal mechanism, lack of cooling and freezing storage equipment, and lack of sanitary facilities. This can be attributed to lack of appropriate food service facilities and structures that enable them to comply with food safety regulations (Mathaulula et al., 2016). The compliance of street food vendors to food hygiene regulations have been found to be hampered by lack of sanitary facilities at their vending sites (Trafialek et al., 2018). Lack of appropriate facilities to prepare and serve food will affect food safety compliance of street food vendors and increase risk of food contamination (Samapundo et al., 2016**).** Kariuki et al. (2017) reported risk of food contamination in vending facilities with lack of toilet facilities and potable water, a condition which endangers consumers' health.

CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS

6.1. CONCLUSIONS

In this research study, the food safety knowledge of street food vendors in the Johannesburg metropolis and the conformance and monitoring of their street food vending facilities in accordance to regulations governing general hygiene requirements for food premises and the transport of food in South Africa was investigated**.** This study revealed that the overall food safety knowledge of street food vendors in Johannesburg metropolis was moderate. Street food vendors possessed inadequate knowledge on food hygiene, internal cooking temperature and on hot and cold storage temperature of ready-to-eat foods. Most street food vendors were aware that microorganisms could lead to foodborne diseases and possibly death. However, the majority of them have never heard of pathogens. Most street food vending sites had been inspected by health officials and the majority had moderate to high level of compliance to regulations governing general hygiene requirements for food premises and the transport of food in South Africa.

6.2. RECOMMENDATIONS

It is recommended that street food vendors should be trained on food hygiene practices, internal cooking temperature, hot and cold storage temperature of ready-to-eat foods and on food pathogens such as *Salmonella*, *Campylobacter*, *Listeria*, *Clostridium*, and *Staphylococcus*. This will enhance street food vendors' knowledge in this critical aspect of food safety.

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APPENDIX 1: QUESTIONNAIRE

QUESTIONNAIRE INSTRUMENT

SECTION A: SOCIO-DEMOGRAPHICS OF RESPONDENTS

Please mark the appropriate box with X

1. Gender

Male	Female
(1)	(2)
☐	☐

2. Age (Years)

18-25	26-35	36-45	46-55	56-65	66-75
1	2	3	4	5	6

3. Ethnicity

Black	White	Coloured	Indian/Asian
(1)	(2)	(3)	(4)
☐	☐	☐	☐

4. Marital status

Married	(1)	☐
Unmarried living with a partner	(2)	☐
Unmarried living without a partner	(3)	☐
Separated	(4)	☐
Divorced	(5)	☐
Widowed	(6)	☐

5. Which of the following best describes your education level?

No formal education	1	☐
Junior primary (grade 1-3)	2	☐
Senior primary (grade 4-6)	3	☐
Secondary school (grade 7-9)	4	☐
High school (grade 10-12)	5	☐
Tertiary education	6	☐

6. How long have you been selling food at this place (years)?

Less than 5 years	(1)	☐
5–10 years	(2)	☐
11–15 years	(3)	☐
More than 15 years	(4)	☐

7. Have you obtained any food service/hospitality diploma/degree?

Yes	No
(1)	(2)
☐	☐

8. Have you ever attended any food safety-training course?

Yes	No
(1)	(2)
☐	☐

NB: if your answer is yes to question 8, proceed to question 9 & 10. Otherwise, proceed

to question 11.

9. If your answer was yes to question 8, when last did you attend the food safety training?

Less than 6 months ago	(1)	☐
Between 7months and 1 year	(2)	☐
> 1 year ago	(3)	☐

10. If your answer was yes to question 8, have you ever received food safety-training while selling food at this street food vending site?

Yes	No
(1)	(2)
☐	☐

11. Is this the first place you have worked as a street food vendor?

Yes	No
(1)	(2)
☐	☐

12. Which of the following represent your average monthly income generated from street food vending?

Less than R5000	R5001-10000	R10001-15000	Above R15000
(1)	(2)	(3)	(4)
☐	☐	☐	☐

13. Is the selling of street food your main source of income?

Yes	No
(1)	(2)
☐	☐

SECTION B: DETAILS ON THE LOCATION AND SERVICE TYPE OF STREET FOOD VENDING FACILITIES

1. In which of the following areas is your food vending facility located?

Braamfointein	(1)	☐
Johannesburg innercity	(2)	☐
Parktown	(3)	☐
Hillbrow	(4)	☐
Berea	(5)	☐
Joubert park	(6)	☐
Newtown	(7)	☐
Marshallstown	(8)	☐

2. Which of the following best define your street food-vending facility?

Road side with no shelter/facility/premise	(1)	☐
Roadside with makeshift shelter	(2)	☐
In a facility/ permanent building	(3)	☐

3. Where are the foods you sell at this vending facility being prepared?

Prepare them at home	(1)	☐
Buy and sell precooked foods	(2)	☐
Prepare them on this vending facility	(3)	☐
Other	(4)	☐

4. Which of the following types of food service do you provide at this street food-vending facility?

Food service type		
Takeaway	(1)	☐
Eating on sites	(2)	☐
Both takeaway & eating on site	(3)	☐

SECTION C: FOOD SAFETY KNOWLEDGE OF STREET FOOD VENDORS

Part 1. Personal hygiene

1. Which of the following is the correct way to wash your hands during the preparation and serving of foods?

1 Wash hands with warm running water and wipe dry with a clean cloth	(1)	☐
2 Wash hands with cold running water and wipe dry with a clean cloth	(2)	☐
3 Wash hands with soap and cold running water and then wipe dry with a clean cloth	(3)	☐
4 Wash hands with soap and warm running water and then wipe dry with a clean cloth	(4)	☐
5 Both **3** and **4** above are correct	(4)	☐

2. As a food handler, which of the following compels you to wash your hands when you are involved in the preparation and serving of food?

After visiting the toilet only	(1)	☐
After picking your nose	(2)	☐
None of the above	(3)	☐
All of the above	(4)	☐

3. True or false, food handlers are compelled to do the following when they are involved in the preparation and serving of food.

		TRUE	**FALSE**
3.1	As a food handler, I must not handle food when I have diarrhea, even if I wash my hands regularly	1 ☐	2 ☐
3.2	As a food handler, I must not handle food and money when I have flu, colds, cough or catarrh.	1 ☐	2 ☐

4. As a food handler, which of the following is the correct way to dry your hands after you have washed them properly?

Wipe using an apron	(1)	☐
Wipe using a clean and dry handkerchief/serviette or tissue	(2)	☐
Wipe using a clean and dry dish cloth	(3)	☐
All of the above	(4)	☐
None of the above	(5)	☐

5. As a food handler, which of the following is the correct thing to do if you have a wound on your hands?

Cover the wound with bandage	(1)	☐
Wear gloves to cover the wound	(2)	☐
Do nothing, if it is not painful	(3)	☐
Dress the wound with water proof dressings	(4)	☐
None of the above	(5)	☐

Part 2. Knowledge on food storage

6. Which of the following best describe a <u>correct display container</u> where prepared foods should be stored prior to selling?

1 In a clean display container free from dust	(1)	☐
2 In a clean and rust–free display container	(2)	☐
3 In a clean display container in direct contact with the floor	(3)	☐
4 All of the above	(4)	☐
5 Only 1 and 2 are correct	(5)	☐

7. Which of the following is the <u>correct thing to do</u> if protein rich foods made from milk, meat and fish are exposed to non-refrigeration temperatures (below 5 ºC) for more than 2 hours?

1 Quickly put perishable food back into the refrigerator	(1)	☐
2 Discard perishable food	(2)	☐
3 Quickly cook the perishable food	(3)	☐
4 Both 1 and 2 are correct	(4)	☐
5 All of them are correct	(5)	☐

Part 3. Knowledge on microbial hazards

Variables		Yes (1)	No (2)
8	Are you aware that some microorganisms can cause foodborne diseases to you that may lead to death?	☐	☐
If your answered is **Yes, continue to b, c, d, e & f.**			
9	Have you ever heard of *Salmonella*?	☐	☐
10	Have you ever heard of *Campylobacter*?	☐	☐
11	Have you ever heard of *Listeria*?	☐	☐
12	Have you ever heard of *Clostridium*?	☐	☐
13	Have you ever heard of *Staphylococcus*?	☐	☐

Part 4. Knowledge on safe food handling practices during the preparation and serving of food

14. Which of the following is the safest way to thaw perishable foods such as meat, fish, dairy and poultry products?

1 Allow perishable foods to thaw on a table	(1)	☐
2 Allow perishable foods to thaw in hot water	(2)	☐
3 Allow to thaw on the lower shelve of the refrigerator	(3)	☐
4 Both **2** and **3** are correct	(4)	☐
5 None of the above is safe	(5)	☐

15. Which of the following is the safest way to use cutting boards to avoid cross contamination between them?

1 Use separate cutting boards for meat and salad but wash them in between usage.	(1)	☐
3 Use any cutting boards for meat and salad but wash them in between usage	(2)	☐
4 Use the same cutting board for meat and salad but wash them in between usage	(3)	☐
5 All of the above ways are correct	(4)	☐

16. Which of the following is the correct minimum internal cooking temperature for stuffed chicken?

90°C	(1)	☐
65 °C	(2)	☐
100 °C	(3)	☐
78 °C	(4)	☐

17. Which of the following is the correct minimum internal cooking temperature for vegetables and fruits?

87°C	(1)	☐
77 °C	(2)	☐
67 °C	(3)	☐
57 °C	(4)	☐

18. Which of the following is the correct temperature guideline for cold holding of ready- to- eat foods such as salad during serving?

At about 25 °C.	(1)	☐
At about 10 °C	(2)	☐
At about 5 °C	(3)	☐

19. Which of the following is the correct temperature for hot holding of ready- to-eat foods such as beef and chicken stew during serving?

At about 100 °C	(1)	☐
At about 63 °C	(2)	☐
At about 25 °C	(3)	☐

SECTION D: MONITORING AND ENFORCEMENT OF SOUTH AFRICAN FOOD HYGIENE REGULATIONS OF INFORMAL FOOD SERVICE FACILITIES

Part 1. Registration details

		(1)Yes	**(2)No**
1	Has this street food vending facility been authorised or issued with a license to sell foods?	☐	☐
2	Has this street food vending business been registered with Companies and Intellectual Property Commission (CIPC) of South Africa?	☐	☐

Part 2. Inspection and monitoring

3. Has this street food vending facility been inspected by a health inspector before?

Yes	No
(1)	(2)
☐	☐

NB: If your answer is yes to question 3 above, please proceed to question 4 and 5 below.

4. If your facility has been inspected before, how often is your facility being inspected?

Monthly	Quarterly	Yearly
(1)	(2)	(3)
☐	☐	☐

5. If your facility has been inspected before, have you ever received a penalty/warning for non-compliance?

Yes	No
(1)	(2)
☐	☐

APPENDIX 2: SANITARY CHECKLIST

OBSERVATIONAL CHECKLIST

Part A: Details of street food vending facilities

1. In which of the following areas is your food vending facility located?

Braamfointein	(1)	☐
Johannesburg innercity	(2)	☐
Parktown	(3)	☐
Hillbrow	(4)	☐
Berea	(5)	☐
Joubert park	(6)	☐
Newtown	(7)	☐
Marshallstown	(8)	☐

2. Which of the following best define your street food-vending facility?

Road side with no shelter/facility/premise	(1)	☐
Roadside with makeshift shelter	(2)	☐
In a facility/ permanent building	(3)	☐

3. Where are the foods you sell at this vending facility being prepared?

Prepare them at home	(1)	☐
Buy and sell precooked foods	(2)	☐
Prepare them on this vending facility	(3)	☐
Other	(4)	☐

4. Which of the following types of food service do you provide at this street food-vending facility?

Food service type		
Takeaway	(1)	☐
Eating on sites	(2)	☐
Both takeaway & eating on site	(3)	☐

Part B

S/N	**Variables**	Yes	No
		(1)	(2)
	FOOD HANDLERS' PERSONAL HYGIENE		
1.	Are Personnel wearing neat protective clothing dedicated for food service?	☐	☐
2.	Do food handlers wash their hands in clean water each time before the handling, preparation and serving of food?	☐	☐
3.	Do food handlers use an apron when handling, preparing and serving food?	☐	☐
4.	Do food handlers handle money while serving food?	☐	☐
5.	Are food handler's hair covered when handling, preparing and serving food?	☐	☐
6.	Are finger nails clean, cut short and without varnish?	☐	☐
	UTENSILS		
7.	Are utensils cleaned and without cracks?	☐	☐
8.	Are utensils cleaned adequately every time after use?	☐	☐
9.	Are utensils stored in a dust free container until used?	☐	☐
10	Do food handlers use the same utensils, knives and boards to	☐	☐

	prepare raw and cooked food?		
11	Do food holding containers have proper lids or seals to protect food from dust?	☐	☐
	FOOD STORAGE		
12	Are displayed foods in direct contact with floor or ground surface?	☐	☐
13	Are foods on sale displayed in suitable containers (e.g. glass display) to prevent droplet contamination?	☐	☐
14	Are displayed case or food storage containers free of dust or any other impurity?	☐	☐
15	Are food storage containers damaged or rusted?	☐	☐
16	Are food containers clean and free from any toxic substance liable to contaminate the food?	☐	☐
17	Is there any cooling and freezing storage equipment at the vending site?	☐	☐
18	Is there any ready-to-eat hot food-holding equipment at the vending site?	☐	☐
	LAYOUT OF FOOD PREMISES AND WORKSPACE		
19	Are vending site free of insects?	☐	☐
20	Is there a proper wastewater removal mechanism on the vending site?	☐	☐
21	Are there a dedicated garbage disposal bins with lid at the vending site	☐	☐
22	Toilet facilities are available around vending sites?	☐	☐
23	Hand washing basins are available at vending sites?	☐	☐
24	Is there sufficient space for hygienic storage of food, utensils and separate area for storage of refuse?	☐	☐
25	Is food preparation site effectively cross-ventilated?	☐	☐
26	Is there sufficient illumination for all food handling areas?	☐	☐

27	Are storage rooms separated from food service area?	☐	☐
28	Is the floor non-porous, non-slippery and easy to clean?	☐	☐
29	Are the windows and doors cleaned and free from dirt or damage?	☐	☐
30	Is there electricity power supply at your vending facility?	☐	☐
31	Is there a tap water supply in the facility?	☐	☐

APPENDIX 3: CONSENT FORM

04-03-2018

PARTICIPANT INFORMATION SHEET

Title: Food safety knowledge of street food vendors and the food safety compliance of their food service facilities

Dear Prospective Participant,

My name is Oladipo Adekeye Oluwakemi Taiwo, I am doing my masters research at the Department of Life and Consumer Sciences, University of South Africa. The title of my research project is: *Food safety knowledge of street food vendors and the food safety compliance of their food service facilities*. My supervisor for this research project is Prof Frederick Tabit.

WHAT IS THE PURPOSE OF THE STUDY?

The aim of this study is to evaluate the food safety knowledge among street food vendors in the Johannesburg metropolis as well as to assess the conformance of their street food vending facilities in accordance to the South Africa food safety regulations.

WHY AM I BEING INVITED TO PARTICIPATE?

You are being invited to participate in this research because pertinent information regarding your food safety knowledge and details of your street food vending facility will be gathered. Your information will be analyzed together with those of other participants to produce scientific data that will assist relevant government departments to make relevant interventions that may benefit street food vending business.

WHAT IS THE NATURE OF MY PARTICIPATION IN THIS STUDY?

You will be providing answers to questions pertaining to your socio-demographics, location and type of services offer by your street food vending facility and your food safety knowledge. Data on the sanitary condition of your street food vending facility will also be collected. You will be spending approximately 25 minutes in answering these questions.

CAN I WITHDRAW FROM THIS STUDY EVEN AFTER HAVING AGREED TO PARTICIPATE?

You may withdraw from this study at any time because your participation is voluntary.

WHAT ARE THE POTENTIAL BENEFITS OF TAKING PART IN THIS STUDY?

The outcome of this research will be made available to relevant government authorities which may assist them in making decisions that can improve the safety of street vended foods and which may in turn boost consumers' confidence in purchasing street vended foods.

ARE THEIR ANY NEGATIVE CONSEQUENCES FOR ME IF I PARTICIPATE IN THE RESEARCH PROJECT?

No negative consequences will result from your participation in this project.

WILL THE INFORMATION THAT I CONVEY TO THE RESEARCHER AND MY IDENTITY BE KEPT CONFIDENTIAL?

Your response to questions and your opinions will be viewed as strictly confidential, and only members of the research team will have access to such information. No data published in dissertations and journals will contain any information by means of which you may be identified hence, your anonymity is therefore ensured.

HOW WILL THE RESEARCHER(S) PROTECT THE SECURITY OF DATA?

The researcher will store hard copies of your answers for a period of five years at the Department of Life and Consumer Science at UNISA for future research or academic purposes. Electronic information will be stored on a password-protected computer.

WILL I RECEIVE PAYMENT OR ANY INCENTIVES FOR PARTICIPATING IN THIS STUDY?

No incentive will be given for your participation.

HAS THE STUDY RECEIVED ETHICS APPROVAL

This study has received written approval from the Research Ethics Review Committee of Unisa. A copy of the approval letter can be obtained from the researcher if you so wish.

HOW WILL I BE INFORMED OF THE FINDINGS/RESULTS OF THE RESEARCH?

If you are interested in the final findings of this study, you may contact O.T Oladipo-Adekeye at 0629046813, kemiadekeye@gmail.com or you may contact Prof FT Tabit, 0114712080, Tabitft@unisa.ac.za.

Thank you for taking time to read this information sheet and for participating in this study.

Oladipo Adekeye O.T

CONSENT TO PARTICIPATE IN THIS STUDY

I, _____, confirm that the person asking my consent to take part in this research has told me about the nature, procedure, potential benefits and anticipated inconvenience of participation.

I have read (or had explained to me) and understood the study as explained in the information sheet.

I have had sufficient opportunity to ask questions and am prepared to participate in the study.

I understand that my participation is voluntary and that I am free to withdraw at any time without penalty (if applicable).

I am aware that the findings of this study will be processed into a research report, journal publications and/or conference proceedings, but that my participation will be kept confidential unless otherwise specified.

I have received a signed copy of the informed consent agreement.

Participant Name & Surname……. (Please print)

Participant Signature……..Date……

Researcher's Name & Surname…… (Please print)

Researcher's signature……..Date……

APPENDIX 4: PERMISSION LETTER

GAUTENG PROVINCE
REPUBLIC OF SOUTH AFRICA

Joburg
a world class African city

JOHANNESBURG HEALTH DISTRICT

Faculty Of Health Sciences
Research Ethics Committee
University of South Africa
Johannesburg, South Africa
kemiadekeye@gmail.com

Enquiries: Dr EM Ohaju
Tel: 011 694 3888 Cell: 076 8831659
Email: Elizabeth.Ohaju@gauteng.gov.za

Hillbrow CHC: Administration Building
Cr Smith Str. & Klein Street
Private Bag X21, Johannesburg
South Africa, 2017

DRC Ref: 2018-05-001

Dear: Oladipo-Adekeye Oluwakemi Taiwo

Re: ***Food safety knowledge of street food vendors and food safety compliance of their food service***

Your application for Research Approval refers

The District Research Committee has reviewed your application. This letter serves in principle as approval to access the Districts Health facilities (mentioned below) for the above project subject to following conditions:

- The Area to be visited: **Region F (Braamfontein, Johannesburg inner city, Hillbrow, Joubert park, Newtown, Marshalltown and Parktown)**
- These areas will be visited from **17/05/2018 to 17/05/2019**
- The research can only commence after you submit an ethics clearance certificate from a recognized institution.

The following conditions must be observed:

- Participants' rights and confidentiality will be maintained all the time.
- No resources (Financial, material and human resources) from the above facilities will be used for the study. Neither the District nor the facility will incur any additional cost for this study.
- The study will comply with **Publicly Financed Research and Development Act, 2008 (Act 51 of 2008) and its related Regulations**.
- You will submit a copy (electronic and hard copy) of your final report. In addition, you will submit a six-monthly progress report to the District Research Committee.
- Your supervisor and University of South Africa will ensure that these reports are being submitted timeously to the District Research Committee.

- The District must be acknowledged in all the reports/publications generated from the research and a copy of these reports/publications must be submitted to the District Research Committee.

We reserve our right to withdraw our approval, if you breach any of the conditions mentioned above.

Please feel free to contact us, if you have any further queries. On behalf of the District Research Committee, we would like to thank you for choosing our District to conduct such an important study.

Regards,

Dr EM Ohaju
Chairperson: District Research Committee
Johannesburg Health District
Date 17/05/2018

Mrs M. Morewane
Chief Director
Johannesburg Health District
Date: 23/05/2018

APPENDIX 5: ETHICS CLEARANCE LETTER

UNISA university of south africa

UNISA GENERAL RESEARCH ETHICS REVIEW COMMITTEE

Date: 19/03/2018

NHREC Registration # : REC-170616-051
ERC Reference # : 2018/CAES/037
Name : Ms OT Oladipo-Adekeye
Student #: 61564605

Dear Ms Oladipo-Adekeye

Decision: Ethics Approval from 16/03/2018 to 31/03/2019

Researcher(s): Ms OT Oladipo-Adekeye
kemiadekeye@gmail.com

Supervisor (s): Prof FT Tabit
tabitft@unisa.ac.za; 011-471-2080

Working title of research:

Food safety knowledge of street food vendors and the food safety compliance of their food service facilities

Qualification: M Consumer Science

Thank you for the application for research ethics clearance by the Unisa CAES General Research Ethics Review Committee for the above mentioned research. Ethics approval is granted for a one-year period, **subject to submission of the permission letter from the relevant municipality**. After one year the researcher is required to submit a progress report, upon which the ethics clearance may be renewed for another year.

Due date for progress report: 31 March 2019

Please note the points below for further action:

1. The permission letter from the municipality must be submitted to the Committee for record purposes once obtained.

*The **low risk application** was **reviewed** by the CAES General Research Ethics Review Committee on 16 March 2018 in compliance with the Unisa Policy on Research Ethics and the Standard Operating Procedure on Research Ethics Risk Assessment.*

University of South Africa
Preller Street, Muckleneuk Ridge, City of Tshwane
PO Box 392 UNISA 0003 South Africa
Telephone: +27 12 429 3111 Facsimile: +27 12 429 4150
www.unisa.ac.za

The proposed research may now commence with the provisions that:

1. The researcher(s) will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.
2. Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study should be communicated in writing to the Committee.
3. The researcher(s) will conduct the study according to the methods and procedures set out in the approved application.
4. Any changes that can affect the study-related risks for the research participants, particularly in terms of assurances made with regards to the protection of participants' privacy and the confidentiality of the data, should be reported to the Committee in writing, accompanied by a progress report.
5. The researcher will ensure that the research project adheres to any applicable national legislation, professional codes of conduct, institutional guidelines and scientific standards relevant to the specific field of study. Adherence to the following South African legislation is important, if applicable: Protection of Personal Information Act, no 4 of 2013; Children's act no 38 of 2005 and the National Health Act, no 61 of 2003.
6. Only de-identified research data may be used for secondary research purposes in future on condition that the research objectives are similar to those of the original research. Secondary use of identifiable human research data require additional ethics clearance.
7. No field work activities may continue after the expiry date. Submission of a completed research ethics progress report will constitute an application for renewal of Ethics Research Committee approval.

Note:

*The reference number **2018/CAES/037** should be clearly indicated on all forms of communication with the intended research participants, as well as with the Committee.*

Yours sincerely,

Prof EL Kempen
Chair of CAES General Research ERC
E-mail: kempeel@unisa.ac.za
Tel: (011) 471-2241

Prof MJ Linington
Executive Dean : CAES
E-mail: lininmj@unisa.ac.za
Tel: (011) 471-3806

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APPENDIX 6: PROPOSAL APPROVAL LETTER

UNISA university of south africa

Department of Life and Consumer Sciences
School of Agriculture and Life Sciences
College of agriculture and Environmental Sciences
Private Bag X6
Florida
1710

To: OT Oladipo-Adekeye (Student no: **615-646-05**)

Subject: Outcome of your research proposal

It gives me great pleasure to inform you that your MCS research proposal titled: **Food safety knowledge of street food vendors and the food safety compliance of their food service facilities** has been approved.

Comments and suggested improvements were provided by the review committee. These comments will be communicated to you by your supervisor.

Good luck with the rest of your studies.

Best regards

Lebelo Date 21/02/2019

Prof SL Lebelo
COD: Department of Life and Consumer Sciences

Open Rubric