

**THE FOOD SAFETY KNOWLEDGE OF STREET FOOD VENDORS AND THE  
SANITARY CONDITIONS OF THEIR STREET FOOD VENDING ENVIRONMENT,  
ZULULAND DISTRICT, SOUTH AFRICA**

**by**

**NELLY VIRGINIA NKOSI**

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**SUPERVISOR: PROF. F.T. TABIT**

**January 2020**

## **DECLARATION**

Name: Nkosi, Nelly Virginia  
Student number: 60869666  
Degree: Master of Consumer Science (Full Dissertation)  
Title of thesis: The food safety knowledge of street food vendors and the sanitary conditions of their street food vending environment, Zululand District, South Africa.

I declare that the above thesis is my work and that all the sources that I have used or quoted have been indicated and acknowledged by means of 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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Signed by: N.V Nkosi

Student No: 60869666

Date: 31 January 2020

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## **DEDICATION**

I dedicate this dissertation to the gracious God for the wisdom and strength that propelled me forward making everything possible. This work is also dedicated to my parents who never got the opportunity to study, yet they were able to lay an educational foundation in my career from the beginning till now. *Bo- Nkosi, Ndlangamandla Ngiyabonga* (Thank you).

## **ABSTRACT**

Street-vended foods are convenient and cheap meals, but their contamination can lead to foodborne illness. This study aimed to evaluate food safety knowledge of street food vendors in Ulundi and AbaQulusi local municipalities of Zululand District, South Africa and compliance of their street food vending environment to sanitary requirements. A cross sectional survey design was utilised to gather data from 400 street food vendors using interviews. A piloted checklist was used to collect data on the sanitary characteristics from 200 randomly selected street food vending facilities. Most of the street food vendors were black (99%), females (73%), and above 35 years (55%). Only the minority of street food vendors had attended a high school (47%) and the vast majority (77%) of them had not attended any food safety training course. The majority (64.7%) of respondents knew that food should not be handled when they have diarrhoea, even if their hands were washed regularly, neither when they have flu, colds, cough, or catarrh. The minority (43%) of street food vendors knew that the use of separate cutting boards for meat and salad, and washing them between uses are the safest ways to avoid cross-contamination. The majority (79.4%) of street food vendors were aware that microorganisms could cause foodborne diseases that may lead to death. The vast majority (76%) of street food vendors had low food safety knowledge and only 14% of the street food vending sites had high compliance with sanitary conditions. In conclusion, most street food vendors possessed inadequate food safety knowledge in key food safety parameters and most of the street food vending facilities were non-compliant. Furthermore, most of them operate under poor sanitary conditions. Street food vendors should be provided with compliant waste disposal and standard kitchen facilities with water resources to ensure hygienic preparation and serving of food.

**Keywords:** Street food vendors, street-vended, food contamination, food safety, sanitary conditions.

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## **LIST OF ACRONYMS**

<b>ANOVA</b>	Analysis of Variance
<b>CIPC- SA</b>	Companies and Intellectual Property Commission of South Africa
<b>DAFF</b>	Department of Agriculture, Forestry and Fisheries
<b>DoH</b>	Department of Health
<b>DTI</b>	Department of Trade and Industry
<b>FAO</b>	Food Agricultural Organization
<b>FAO</b>	Food and Agriculture Organization
<b>HACCP</b>	Hazard Analysis Critical Control Point
<b>SPSS</b>	Statistical Package for the Social Sciences
<b>STATS SA, QLFS</b>	Statistics South Africa, Quarterly Labour Force Survey
<b>WHO</b>	World Health Organization

## **CHAPTER 1: INTRODUCTION**

### **1.1. Background**

Street-vended foods are defined as consumables such as beverages and foods sold in public places, which may be eaten elsewhere (Bhattacharjya and Reang, 2014). The street food vending is mostly of informal nature and is often not regulated by any relevant authority (Samapundo et al., 2016; Lues et al., 2006). Street-vended foods support the dietary diversity of most people in the informal sector because they serve as easy access to inexpensive, affordable food items (Alimi, 2016; Rane, 2011). The street food vending businesses contribute significantly to income generation for many individuals from low income households involved in the street food vending trade (Choudhury et al., 2011a).

Most street food vendors possess low educational training and often lack adequate food safety knowledge and skills (Samapundo et al., 2015). They are likely not to execute food safety procedures during handling and preparation of food (Noor, 2016), and this could lead to the contamination of food. The occurrence of food contamination is intertwined with various factors such as lack of good hygiene, incorrect food temperatures, and inability to follow proper food preparation techniques (Monney et al., 2013). Furthermore, most street food vendors have been found to possess inadequate equipment resources such as refrigerators, potable water, and electricity supply (Farahat et al., 2015). Inadequate resources such as no electricity and contaminated water may hamper the implementation of safe food practices, hence exposing food to spoilage and contamination (Monney et al., 2013).

Street-vended foods have been considered as a food safety hazard to consumers, since vendors often lack basic food service infrastructure and equipment such as storage facilities, food reheating equipment, refrigerators, and waste disposal facilities (Rane, 2011). The lack of adequate food service equipment hampers effective implementation of safe food storage practices at street food vending sites (Muyanja et al., 2011). The possession of adequate food safety knowledge and skills, adequate infrastructure, and equipment is essential to effectively implement food safety measures at street food vending sites (Aluko et al., 2014; Cortese et al., 2016).

In South Africa, street-vended foods are often prepared on busy street corners and sold in taxi ranks and railway stations. These sites are usually located outdoors or within makeshift shelters (Kubheka et al., 2001). The consumption of street foods among young, black African males was found to be very common due to its convenience, availability, and affordability. Even though consumers have been found to lack confidence in the safety of these foods, their preference for these foods is often not hampered (Asiegbu et al., 2016). Currently there is little researched information regarding street food vendors' food safety knowledge and the sanitary conditions of their street food vending sites.

## **1.2. The problem statement**

Problems relating to the safety of street-vended foods stem from inadequate food safety knowledge and poor safe-food handling practices by vendors, as well as inadequate sanitary environment conditions of street food vending sites. Lack of food safety knowledge pertaining to cross-contamination, cooking temperature, food storage temperature, and personal hygiene may

compromise the quality and safety of the food sold by street food vendors (Rahman et al., 2012; Rane, 2011; Abdul-Mutalib et al., 2012; Aluko, 2014). The possession of insufficient food safety knowledge has been found to hamper safe food handling practices such as defrosting perishable food. Hence, increasing the likelihood of food contamination by microorganisms (Kunadu-Hanson et al., 2016; Soares et al., 2012).

Similarly, inadequate infrastructure and poorly constructed facilities to carry out daily routine activities can negatively influence the food safety and quality of street-vended food (Vo et al, 2015). Examples of infrastructure that is requisite to the implementation of food safety measures include: suitable disposal bins, electricity supply, potable water supply, and access to proper sanitation (Cortese et al., 2016; Monney., et al 2013; Samapundo et al., 2016).

The consumption of contaminated food sold on streets by consumers may increase the likelihood of contracting foodborne diseases which account for 30% of deaths within the vulnerable groups such as children, immune-compromised individuals, and pregnant women annually (WHO, 2014; Webb and Morancie, 2015). Extreme cases of food poisoning may lead to death (Nyenje et al, 2012) hence, it is necessary for street food vendors to minimise the contamination of food with pathogens (Khairuzzaman et al., 2014).

### **1.3. Importance of the study**

The findings of this study will contribute to providing new information regarding street vendors' food safety knowledge and safe food handling practices. The study will further provide clarity on current issues associated with the sanitary conditions of their vending environments. It is critical to note that street foods form an integral part of many people's diet (Joo et al., 2015), and its

safety is of utmost importance. Recommendations from the findings of this study will be provided to authorities liable for food safety regulation and it will assist them to make decisions that will improve the safety of street-vended food and the sanitary conditions of street food vending sites.

#### **1.4. The aim and objectives**

The primary aim of this study is to evaluate the food safety knowledge of street food vendors, and analyse sanitary conditions of the street food vending environment in Ulundi and AbaQulusi local municipalities of Zululand District, South Africa. Further, the study will investigate the level of monitoring and enforcement of the rules governing hygiene requirements for food premises in South Africa.

The objectives are:

1. To evaluate food safety knowledge of street food vendors in the Ulundi and AbaQulusi local municipalities of Zululand District, South Africa.
2. To analyse the sanitary conditions of the street food vending environment in the Ulundi and AbaQulusi local municipalities of Zululand District, South Africa.
3. To investigate the level of monitoring and enforcement of the regulations governing hygiene requirements for food premises in South Africa.

#### **1.5 Research questions**

- Do the street food vendors have adequate food safety knowledge and practices?

- Do sanitary conditions of the street food vending environment adhere to the South African food safety regulation act?
- Are local authorities involved in street food trade monitoring and enforcement of the regulations governing hygiene requirements for food premises in South Africa?

## **1.6 Research conceptual framework**

In developing countries, the notified foodborne disease occurrences have increased significantly, making food-borne diseases a public health concern. The link between the variables of street food safety significantly contribute to foodborne illness occurrence (Moreb et al., 2017), see Figure 1.1. In most cases food safety knowledge positively influences food safety practices, the gist is: if a street food handler has adequate food safety knowledge, she/he may provide safe food to customers. This knowledge further affects the behaviour or attitude of a street food handler to be cautious about safety of food; however, it has become clear that street food vendors usually have insufficient information about food safety because, they often lack satisfactory food safety practices, which negatively affects food safety implementation (Samapundo et al., 2015).

Food safety attitudes and behaviour could be a critical point in controlling foodborne disease outbreaks because the safety of food and quality mainly relies on maintained hygiene by the street food handler (Singh et al., 2016; Moreaux et al., 2018). Therefore, the role played by street food vendors throughout food preparation is essential to control sanitary hygiene to prevent food-borne disease episodes.

Samapundo et al. (2016), note that implementing food safety measures is a complex chain of activities requiring a food handler to adhere and comply with the set standards. Inadequate

resources, and a poor sanitary environment at street food vending sites hinders effective implementation of food safety. Street food vending locations that do not have access to potable water or means for acceptable sanitary practices in their business environment, toilet facilities, and refrigeration are relatively linked to the production of unsafe food. The potential benefits of the street food trade, such as employment opportunities and availability of convenient food types to millions of people from lower income backgrounds can be overshadowed/reduced if implementation of food safety measures is not considered (Singh et al., 2016).

According to Cortese et al., (2016), many influencing factors that draw a public health risk of foodborne diseases due to food contamination. These factors include: inadequate food storage at the point of sale, handling food and money, lack of hand wash, lack of clean water supply, and lack of waste disposal/sanitary facilities. Street food safety health problems can be caused by unawareness of proper practices, poor food safety knowledge by street food handlers, poor sanitary conditions at street food vending site, as well as inadequate facilities, resources, or infrastructures (Ghatak and Chatterjee, 2018). Inadvertent food contamination can create a risk for consumers to contract foodborne illness, leading to medical expenses and reduced income, and therefore a negative impact on economic productivity (Sun et al, 2012). The provision of medical care resultant from foodborne infection is expensive therefore, assuring food safety at the street food vending sites can greatly reduce the negative impact of foodborne illness on the economy (Fleetwood et al., 2019).

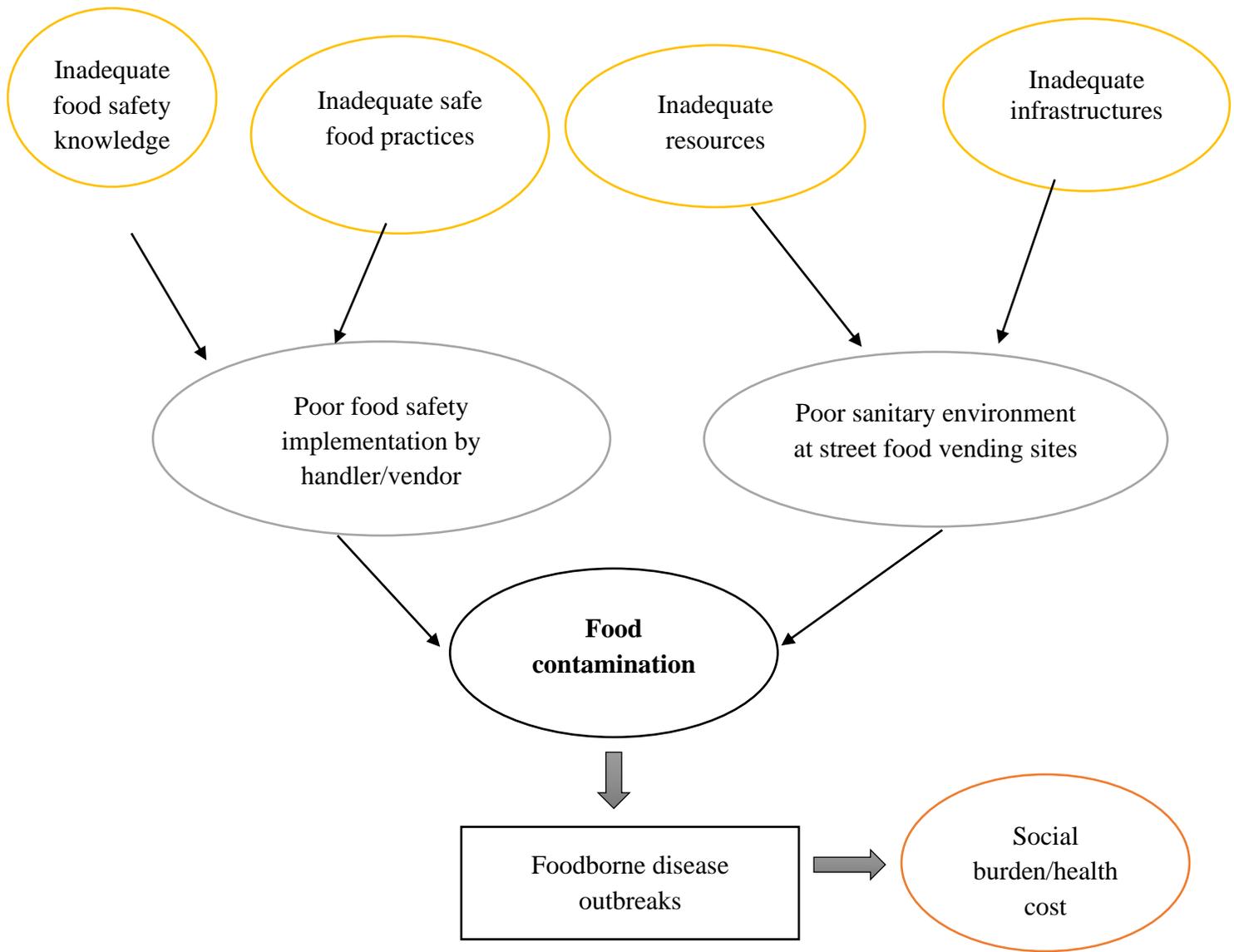


Figure 1.1: Conceptual framework showing the different variables, demonstrating relationship between the concepts of the study.

## **1.8. Dissertation layout**

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

**Chapter 1 (Introduction):** The introductory chapter gives the background and overview of the research. Included in this chapter are the problem statement and the purpose of the study, aims and objectives, dissertation layout, and research question.

**Chapter 2 (Literature review):** The literature review provides an overview of existing literature on street-vended food safety, sanitary conditions, and regulation policies of street-vended foods.

**Chapter 3 (Research methodology):** The research methodology outlines the research area, data collections, and the research instruments that were used. The limitations of the research are briefly discussed.

**Chapter 4 (Results):** This chapter outlines the research output derived from the different research study objectives.

**Chapter 5 (Discussion):** This chapter provides a comprehensive discussion of the results on the socio-demographic information of respondents, food safety knowledge, food handling practices of respondents, sanitary conditions of the street food vending environment, and street food vendors' compliance. Further discussion on results of analysis of variance (ANOVA) is also provided in this chapter.

**Chapter 6 (Conclusion and recommendations):** In this chapter, conclusion on the research findings and recommendations for improvements and future studies' recommendations are provided.

## **CHAPTER 2: LITERATURE REVIEW**

### **2.1. Challenges and perspectives in ensuring the safety of street-vended foods in suburban communities within developing countries**

#### **2.1.1 Introduction**

Street food originated from Asia, Latin America, and Africa has become an essential measure of the ready to eat food and beverage scene (Winarno and Allain, 2000). The remarkable expansion of the fast food industry cannot be ignored in low-income developing countries because these foods illustrate the great variation in terms of consumption, processing, selection of ingredients, and additionally, it is a fundamental human right to have access to safe food (Aluko et al., 2014). Street food provides a diverse, attractive experience encompassing meals, drinks, and snacks to tourists (Privitera and Nesci, 2015).

Generally, street-vended foods are prepared daily, to follow a local taste and demand from a variety of ingredients. It is therefore, supplied for instant consumption or far along use without further production or preparation (McKay et al., 2016). In countries like Nigeria, it is found that preparing these meals at home, is more expensive than to buying it (Omemu and Aderoju, 2008).

The study carried out by Stratev et al. (2017), identified that in various parts of the world widespread foodborne disease is mostly because of the consumption of contaminated food items due to inadequate food storage units, the lack of food safety awareness, potable water, and reduced personal and sanitary hygiene. Furthermore, despite global food safety research measures, people are still prone to foodborne diseases, especially children and vulnerable

individuals (Ayaz et al., 2018), in such a way that 1 in 10 people who suffer from foodborne diseases, die annually worldwide (Stratev et al., 2017).

Patronage consumption of street food is increasing in large low-income populations, simply because these foods are cheap and convenient, especially in developing countries such as South Africa, Haiti, and India (McKay et al., 2016; Franz et al., 2018).

### **2.1.2 Street food: definition and significance**

The definition of street-vended foods are types of beverages and food items that are sold in public places, which may be eaten elsewhere (Bhattacharjya and Reang, 2014). Street foods greatly vary in the preparation methods, this creates diversity in raw materials to be used as well as places where these foods are prepared or found (Habib, 2016).

Street-vended foods are differentiated by their own-components, which enhance these foods to be unique. These components include: their informality in nature, diversity, mobile and temporal nature, and due to the mentioned components street food vending is therefore not strongly regulated by any relevant authority (Samapundo et al., 2016; Lues et al., 2006).

Street food vending is an important sector because it creates a means of employment for deprived women without skills and education (Kok and Balkaran, 2014). Most of the street food vendors' principal household income is from street vending businesses (Martinez et al., 2017). Street food vending is recognised as a sector that contributes to significant income generation for the low-income households involved in the street food vending trade (Choudhury et al., 2011b).

In developing countries, a great public health concern is street food safety (Agüeria et al., 2018), whereas environmental conditions of street food vending businesses subject food to unfavorable

conditions, hence an increased likelihood of food contamination (Habib, 2016). For this reason, health risks associated with street-vended foods outweigh its benefits. The inadequate facilities and infrastructure such as cold and hot storage space and potable water supply result in recurring food safety problems (Pswarayi et. al, 2014). The contaminated food may escalate the peril of foodborne disease outbreak, or even cause death to the ones with compromised immune systems; elderly people, pregnant women and infants (Burke et al., 2016; World Health Organization, 2015). Another feature of street food is that, generally in developing countries, street food vending has limited control policies and poor surveillance, leading to a high burden of foodborne illnesses (Osaili et al, 2018).

### **2.1.3 Street food vendor profile**

The street food vending business trade is a very common, old-ancient practice. In well-established countries like Brazil, literature has predominantly uncovered that the male gender dominates street food vending businesses (Cortese et al., 2016), while in developing countries street food vending is dominated by the female gender. Not surprisingly, in Africa, women are taught how to cook at a very young age (Okojie and Isah, 2014). For instance, a study conducted in Nigeria showed that about 91.9% of street food vendors were females (Aluko et al., 2014). Like any informal business sector, street food vending is categorised by the low scale operating activity, little investment costs that meaningfully permits quick access into the business sector. Street food vendors do not comply with hygienic practices this creates a breeding ground for food to be contaminated (Trafialek et al., 2018).

Often street food vendors work long hours for income-generating and providing for their families (McKay et al., 2016). Although street food vendors meaningfully contribute to ensure food availability, as well as positively impact the economy in developing countries, street food vendors are, in many cases, recognised as inappropriate and a sign of disorder, especially in urban settings (Boonjubun, 2017). They remain restricted in urban centers and marginalised due to the restrictive governance approaches adopted by local authorities. The general belief of street food vendors being seen as a nuisance has led the authorities to frequently carry out clearing, stall destruction, and seizure of goods on the streets. The review by the World Health Organization, mentions that the nature of the street food vending governing system is fragmented and poorly structured to address street food related issues, countries (WHO, 2015).

#### **2.1.4 Factors influencing consumption of street food**

According to Sun et al (2015), the intake of food sold on the street is a common practice for approximately 2.5 billion people worldwide, especially in disadvantaged locations where there are low employment opportunities. However, Steyn et al. (2011), recognised low socio-economic standing as a central factor that intensifies the consumption of street-vended foods, together with fast foods in South Africa. The consumption of these foods is directly attributed to their convenience (readily available nature) and affordable nutrition supplement patronage (Kibret and Tadesse, 2013; Kothe et al., 2016). Furthermore, some tend to appreciate these foods for their uniqueness of flavor, freshness, and the variety (Rane, 2011).

Street food is an alternative eating trend largely consumed in day to day life, these foods are therefore, sold in busy public areas like pavements, busy corners, school premises, beaches, railways, and bus stations on a stand or carts (McKay et al., 2016; Kharel, et al., 2016).

Food safety, quality, and hygiene do not affect customers' perception to buy street food. Most consumers are often attracted by the characteristics offered by these foods (Atter et al., 2015). However, this is in contrast with Omari et al. (2018), who concluded that consumers of street-vended foods were in fact concerned more about the visibility of food spoilt due to uncovered foods and unhygienic cooking (Omari et al., 2018). Normally these locations lack adequate infrastructures, which affects food safety at critical points, such as the vendor's criteria applied when purchasing raw food ingredients, food storage points, or even food temperatures (Cortese et al., 2016). These foods are located directly on the street side, they are either prepared at the vendor's operation site, or home and transported to the vending site (Trafialek et al., 2017). Multiple previous studies have uncovered factors influencing the consumption of street-vended foods: nutritional status of the populations, and street foods are valued for their convenience and unique taste (Rane, 2011, Alimi, 2016).

### **2.1.5 Socio-economic aspects of street food vendors**

Wen-Hwa (2015), notes that food safety is vitally important because it contributes to the wellbeing, social stability, economic development, general health, and also the identity of a nation and its government. Street food vending makes it possible for a vendor to establish a business from tax-free capital outlays where they can benefit from positive cash income (Kubheka et al., 2001). The socio-economic impact of street food has been documented (Singh et

al., 2016), making street food vending important in developing countries. The informal sector is a growing phenomenon, offering both lessons and opportunities to the community.

### **2.1.6 An overview of street food vendors in South Africa and its associated challenges**

Street food vendors in Africa face numerous challenges, despite the increased number of people depending on these foods as their main source of nutrition. In South Africa, vendors congregate in places where the potential number of customers is high (Kubheka et al, 2001). Many street food vendors are located outdoors and they all sell similar food items (Steyn et al., 2011). According to data obtained by Steyn et al. (2011), the intake pattern of street foods in South Africa is not well known or recorded, nevertheless consumption of these foods is widespread among young, black males (Africans), due to its affordability and accessibility. It is important to note that consumers voluntarily choose to indulge in street foods, regardless of the quality of these foods (Asiegbu et al., 2016; Steyn et al., 2011).

Literature shows that to successfully improve the safety of street-vended foods in developing countries is a global challenge (Von-Holy and Makhoane 2006). In South Africa, street food vending is significant, ever growing, and regarded as a significant employer (Von-Holy and Makhoane, 2006; Lues et al., 2006), this is mainly because of increased substantial unemployment rate (Stats SA, 2014). The warm temperature climate and environmental conditions in South Africa provide favorable conditions for microbial growth; dusty streets, limited vending space, and the heat (Kok and Balkaran, 2014). In South Africa, the street food vending environment does not have access to basic sanitary facilities such as clean toilets, garbage disposal, and potable water. The food safety hazards may affect street foods are: water

availability, street-vended foods pH level, food preparation method, handling, exposure temperature, and holding time. Food prepared under unfavorable conditions may be at risk to be contaminated (Kubheka et al, 2001).

### **2.1.7 Operational policies and regulations of street food in South Africa**

South Africa has strict food safety regulations, aiming to enhance and promote food safety, making the occurrence of food contamination and foodborne illness unjustifiable. However, the South African National Government has dedicated devotion to ensure an enabling environment for informal economic activities, which include street vending (Mitullah, 2003). For instance, in South Africa, street vendors are allocated specific areas to operate in, street food vendors are required to receive obtain an operating license or a certificate of acceptability by the relevant authority. Additionally, street food vending regulations in South Africa are micro-managed at the local municipality level where the governing bylaws are specifically developed to control food vending premises (Social Law Project., 2014). In South Africa, food control regulations are placed for customer protection from being affected by foodborne disease and to give food manufacturers rules to operate within that will prevent any confronting legal issues (Department of Health, 2012). Through bylaws and regulations, the following three government departments regulate food safety, namely: Department of Health (DOH), Department of Agriculture Forestry and Fisheries (DAFF), and Department of Trade and Industry (DTI). During the training, control and compliance regulation of street foods, (DAFF) and (DOH) directly involve the Environmental Health Professional.

Under these departments, there are several acts and regulations enacted to control food safety and which are applicable in street food vending in South Africa, these include:

#### **2.1.8 The Department of Health Foodstuffs, Cosmetics, and Disinfectants Act No: 54 of 1972**

This act regulates ‘sale, manufacture, and importation of foodstuffs, cosmetics, and disinfectants and provides for incidental matters’ (DOH, 2012). The act is supplemented by a comprehensive set of regulations published by the Department of Health, aimed at setting the minimum standards and requirements all foodstuffs should comply with, including the correct labeling thereof. The act regulates the manufacture, sale, and importation of prohibited substances, contaminated food products, and substances that increase the mass or volume of foodstuff. It also prevents the use of products that conceal damage or inferior quality. The Foodstuffs, Cosmetics and Disinfectants Act is very relevant to ethnic food markets, as some of the ingredients are imported from neighboring countries. Under this act, eight regulations are relevant to ethnic food markets. Furthermore, to ensure street food safety the vendors are required to follow this Department of Health set of regulations, especially in preventing any person from consuming unfit food.

#### **2.1.9 The Health Act, 1977 (Act 63 of 1977):**

There is an extensive set of regulations applicable to all food handling. The relevance of the above regulation to street food vending involves the fact that street food vendors prepare, sell, and transport food to the customers. The regulation governs that street food handlers should have a certification obtained from authorised inspectors before selling any food. Street food handlers

should comply with the regulation when transporting food, considering all hygienic aspects. Imperative aspects relating to the requirements for the handling of food (DOH, 2012) are as follows: prohibition of storage, transportation of food standards, standards for food premises, and specifications for food premises facilities.

#### **2.1.10 Standards Act 1993 (Act 29 of 1993) of the Department of Trade and Industry**

The Department of Trade and Industry has at least one Act which is relevant to ethnic food markets. The Consumer Protection Act No 68 of 2008, establishes national norms and standards to protect consumers and to improve consumer information to prevent unfair business practices (Republic of South Africa, 2009). Therefore, immigrant entrepreneurs need to familiarise and align their businesses with this Act, as they conduct business in South Africa.

### **2.2 Food safety challenges associated with street-vended foods**

The food safety challenges related to street food vending are types of hindrances which involve food safety concerns, the significance of food contamination, foodborne diseases, and inadequate access to operational facilities

#### **2.2.1 Food safety definition**

Food safety concerns comes a long way (Moreb et al., 2017), this is heightened by consumers' perception towards healthy food. Takeaway meals play a significant role in consumers' food consumption patterns in South Africa, for instance, "private households spend around 4.3 million rands on food bought for consumption away from home, and more than 47% of that amount is spent on meals and snacks bought from hotels, restaurants and street food vendors" (von Holy and Makhoane, 2006). Defining what is safe or unsafe food is a key issue due to the chain of

events involved in food production from preparation until food reaches the consumer. Food safety in definition expands on: specific certainty and surety that food will not cause any health hazard to consumers, however; it recognises that it is not feasible to assure zero-tolerance risk to the majority of food items (Barlow et al., 2015).

### **2.2.2 Food safety concerns**

Street food safety concerns cannot be ignored since they form part of food contamination and foodborne disease. The major objective of a food service establishment is to produce safe food that possesses no health risk, and to prevent consequences of not producing safe food, given the set of health and organisational costs of food contamination issues (Hinsz and Nickell, 2015). Various factors such as: storage practices, preparation of food, and the quality of raw material affect the quality of street foods (Ghatak and Chatterjee, 2018; Manguiat and Fang, 2013). Normally the transmission conduit of pathogens via foods to food handlers is caused by improper personal hygiene, poor sanitation, untreated water use, and contaminated utensils (Paudyal et al., 2017). According to Uyttendaele et al. (2016), the street food safety related issues vary from place to place across the globe, however; the core challenges include: lack of food safety knowledge, limited access to basic infrastructure in the street vending environment, poor operational conditions, and poor close monitoring by relevant authorities. Particularly in the African region, there is a disorganised utilisation of resources due to fragmented food safety programmes (Paudyal et al., 2017).

Globally, the increase in street food vending consumption has given rise to safe food production (Franz et al., 2018). The likelihood of not producing and selling safe food is customers' great

concern and this may result in contaminated food, leading to foodborne illnesses such as diarrhoea, which is recognised to account for many deaths, especially in developing countries (Hiamey and Hiamey, 2018). A study conducted in Ghana reported that diarrhoea has remained renowned as the main reason of hospital attendance and 16% of deaths in African children younger than five years (Feglo and Sakyi, 2012).

The mode in which food is prepared can influence the contamination of food. A study conducted in Ghana shows that street food handlers did not pre-wash food ingredients and they subjected food to long hours of boiling (Feglo and Sakyi, 2012). A similar study conducted by Woh et al. (2016) shows that recorded food poisoning cases were linked to unsanitary hygiene food handling. According to Ismail et al. (2016), street food vendors lack adequate knowledge in aspects of personal hygiene, including food temperature control and cleaning work surfaces while preparing the food. Educating street food vendors is recommended to reduce food contamination and cases of foodborne illnesses (Ismail et al., 2016).

### **2.2.3 Significance of food contamination**

In food service establishments, various factors may cause food to be contaminated and lead to foodborne disease outbreaks (Sayeed et al., 2016). These factors include: unsatisfactory personal hygiene, insufficient cooking temperature controls, improper food holding times, and usage of unclean utensils (Temesgen et al., 2016, Zanin, et al., 2017).

In most cases, the increased risk of contracting foodborne illnesses transmitted by food handlers is directly associated with increased consumer expenditure on food (Choi et al., 2016). Food sold in streets have been known as the possible carriers of microorganisms that result in foodborne

illnesses (e.g. *Salmonella*, *Listeria monocytogenes*, entero-pathogenic *Escherichia coli*), this involves products made from meat or salads (Campos et al., 2015). Consumption of contaminated water or food, either by bacteria or chemicals, can cause food poisoning, leading to death or even disability (Tomaszewska et al., 2018).

In some cases, practices such as preparing food in advance and by subjecting food to unfavourable temperature, may lead to increased bacterial growth on food (Sani and Siow, 2014). In some incidents, street food vendors may have a good knowledge based on food safety, however; they do not adhere to the practices, thus increasing the chances of food contamination which may result in a prevalence of foodborne disease (Moreb et al., 2017). A study conducted by Rahman et al. (2012), revealed that trained street food vendors did not translate food safety knowledge into safe food practices. The inhibition of food contamination is better and more cost-effective as compared to the social burden imposed by food contamination, taking into consideration medicinal expenses and loss of income due to foodborne illnesses (Cortese et al., 2016). Therefore street food vendors should comply in preventing contamination of food, taking responsibility for their food, thus protecting their customers.

#### **2.2.4 Foodborne diseases**

According to Ayaz et al. (2018), in definition foodborne disease is food poisoning or foodborne infection that is commonly caused by eating contaminated food. Inadequate food safety education, poor food handling and preparation, absence of potable water, unsuitable food storage-units, raw food contamination, time and temperature abuse, or even infected food handlers are major factors contributing to prevalence of foodborne infection in developing

countries (Stratev et al.,2017). The global impact of foodborne illness remains uneasy to estimate, given that there remains a number of unreported illnesses (Nyenje et al., 2012). The most common reported microorganism causing foodborne disease illness is *Salmonella* (Webb and Morancie, 2015).

Foodborne diseases affect millions of people's lives worldwide, leading to many deaths yearly (WHO, 2015). According to the World Health Organization, Africa region, reported diarrheal accounts for 70% foodborne outbreak burden, the burden is estimated at 1/3 of the global death toll due to foodborne illnesses. South Africa lacks reliable statistical data as only a limited number of reported cases are linked to foodborne diseases that resulted from street food consumption.

Foodborne illnesses include an extensive range of diseases caused by consumption of foods tainted with chemicals or microorganisms and/or their toxins (Bou-Mitri et al., 2018). Nausea, vomiting, strokes, and diarrhoea are symptoms caused by the intake of contaminated foods.

Most cases of foodborne infection worldwide are caused by street-vended foods and beverages, accounting for 70% of reported cases (Bou-Mitri et al., 2018). The health risk and economic burden posed by contaminated food, irrespective of microorganism's acceptability or minimal hazard, is completely unacceptable to the community (Oguttu et al., 2014). The practices of street food vendors contribute to foodborne disease occurrences, for instance, temperature control measure and bacterial growth are interconnected in causing food contamination if attention is not paid thereto (Agüeria et al., 2018). Contaminated hands of street food handlers may transmit pathogens to food, which may be a source of foodborne disease infection (Liu et

al., 2015). The prevention of foodborne illnesses may be carried out by ensuring good food hygiene, correct food preparation methods, and distribution (Balzaretto and Marzano, 2013). According to Odeyemi et al. (2019), 50% of a foodborne disease outbreak is attributed to poor food hygiene.

### **2.2.5 Street food environment**

Most developing countries' street food challenges include street food safety operational facilities and poor environmental conditions (Hiamey and Hiamey, 2018). The environmental conditions which street food vendors operate in, are reported as unsuitable for safe food selling and preparation, for instance street food vendors never wipe off residues accumulated during food preparation (Trafialek et al., 2017). The street food vending environment provides a breeding ground for food contaminants such as vermin, dust, or even microorganisms, leading to food contamination (Okojie and Isah, 2014). The street food vending environment conditions feasibly contributes to food contamination, leading to foodborne illnesses (Liu et al., (2014).

Sighn et al. (2016), associates food contamination with unhygienic surroundings found at street vending sites such as inadequate water supply and disposal waste systems. Inadequate facilities and infrastructures such as the shortage of safe water supply, the absence of safe food storage facilities including both hot or cold stores, and electricity are some of the problems that occur in the vending environment which lead to poor quality food (Pswarayi et al., 2014, Monney et al., 2013, Farahat et al., 2014).

Street foods are considered a major food safety risk to those who consume them because generally the lack of basic infrastructures and equipment such as storage facilities, food

reheating, sanitary water connections, refrigeration equipment, and waste disposal facilities may compromise the quality of food sold and thus become a risk to consumers and their health (Cortese et al., 2016, Rane, 2011). Furthermore, the lack of these street food infrastructures and equipment hamper effective implementation of safe food handling practices as well as the ability to procure quality raw materials (Muyanja et al., 2011).

Maintenance of food safety measures in street vending is very important because any incidence can affect a high number of consumers. Adequate food safety knowledge, safe food handling practices, skills, resources, and infrastructures are prerequisites for effective implementation of food safety in street food vending businesses (Aluko et al., 2014; Cortese et al., 2016). According to Martins (2006), this is partly due to relatively limited infrastructural development in some marginalised places, limiting access to basic infrastructure and equipment (refrigeration, waste disposal facilities, separated storages for raw/prepared food) restricted access to resources (water and electricity), inadequately cleaned equipment, and an unsafe environment where food is subjected to dust and flies.

### **2.3 Food safety challenges: implementation challenges faced by street food vendors**

Not much research has been conducted to determine barriers that hinder the implementation of street food safety, however; barriers to implementing food safety in a street food vending setting can be: exclusion of street food vendors, poor sanitary conditions, and limited access to basic facilities. Everyone has a right to adequate access to safe food, similarly food safety forms part of the basis of public health security (Cruz et al., 2013). Not limited to facilities and resources, the ambient temperatures to which street food vendors are exposing their ready-made food is a

reason to suspect that there might be more foodborne cases that have gone unreported (Sun et al., 2012).

### **2.3.1 Exclusion of street food vendors**

Street food vendors are usually associated with the encroachment of public spaces, the challenges they encounter at their stations include: traffic congestion (dusty areas), and inadequate hygiene due to lack of facilities such as waste disposal and water supply. Therefore, the safety of these foods has increasingly become a concern. Street food consumers are the most susceptible individuals and should be protected (Hiamey and Hiamey, 2018). Paudyal et al. (2017) concluded by stating that the poor food safety governance system and the presence of vectors near the food service area/preparation area are contributing factors to food contamination, leading to foodborne illness outbreaks.

Street food vendors are excluded by the general conception that includes: Street food vendors are associated with poor education levels, most had never to formal school experience or are even untrained to effect proper food practices and hygiene (Singh et al., 2016). Street food vendors with low educational background/no formal education are greatly assumed to possess a poor level of food safety knowledge, unhygienic practices, and a bad attitude towards safe food practices (Samapundo et al., 2016). Street food vendors' notion to operate unlicensed has led to their vulnerability, exposing them to hostile environments (Apaassongo et al., 2016).

### **2.3.2 Limited access: sanitary conditions and basic facilities**

Street food vending environmental conditions pose barriers to street food vendors by not providing adequate access to water, consequently it is very difficult to pre-wash their food

ingredients such as vegetables. Trafialek et al (2018), note that street food handler aspects such as personal hygiene, clean and washed utensils, food preparation, and serving may strongly influence requirements to a hygienic fulfillment level. The street vending environment has inadequate access to sanitary services such as hygienic toilets, clean running water, and garbage disposal facilities (Kubheka et al., 2001). Some risk factors that affect food include the preparation method of food, food handling, and food temperature/pH controls.

Previous studies have shown that the street food vending environment can harbor a group of foodborne microorganisms that are linked to an increase of foodborne illness, as a result of improper food safety practices conducted in homes (Moreb et al., 2017). The most common food handling errors made by street food vendors include: inadequate food temperature controlling, reheating of foods, consumption of food from unsafe sources, and cooling food inappropriately. From the food safety point of view, it is recommended that the street food vending environment conditions should be acceptable and clean through means of developed infrastructures and facilities (Samapundo et al., 2015). According to Choudhury et al. (2011a) unless basic infrastructures are available in vending sites, food safety cannot be assured no matter the quality of training. The lack of water supply, and the improper storage of perishable food are barriers to food safety in the street food vending environment (Alimi et al., 2017).

### **2.3.3 Street food safety knowledge and practices: food handling and display**

Food safety information goes a long way making food safety knowledge and food safety practices to be very comprehensive and important, street food safety knowledge has become a challenge in the following ways:

Knowledge about food safety relates to conditions and procedures that improve food quality to ensure that products are not infected with foodborne diseases (WHO, 2015). Previous research studies uncovered that food safety knowledge influences street food handler behavior and practices (Ababio and Lovatt 2015; Kunadu- Hanson et al., 2016). A challenge posed by the inability to translate food safety knowledge into practices is negatively affecting street food safety, yet unsafe food, related to the cause of foodborne disease is still being sold. Frequent observation of street food vendors uncovers that they practice improper food preparation methods (Samapundo et al., 2016).

Food handling and food safety is part of a global critical issue, especially to consumers because these two expose consumers to be at risk of foodborne illnesses (Aluko et al., 2014). The challenges encountered by street food vendors due to lack of food safety knowledge points out to food contamination and results in foodborne illnesses. Inadequate food safety knowledge and related practices to ensure food is safe to consumers, is a huge challenge especially in developing countries where most of the population depends on it. Previous reports mention that street food handlers often have limited food safety knowledge (Monney et al., 2013). Poor knowledge of safety practices primarily results in food contamination and increase the risk of foodborne illnesses (Moreb et al., 2017). Atter et al. (2015), note that the safety of street food mainly depends on street food handlers' good hygiene and food practices. Street food handlers have a big role to prevent food contamination since they have direct contact with food (Smigic et al., 2016)

Habib (2016), identified that a lack of education based on food safety may be a barrier for street food handlers, as they are not aware of food contamination. Infected food handlers, cross-

contamination of food (mostly raw food items), time, and temperature abuse are major factors that contribute to foodborne diseases. It is widely acknowledged that street food vendors usually have poor educational background and often lack good food safety knowledge and skills (Samapundo, et al., 2015). They are likely not to enforce food safety measures during the planning, handling, and serving of food sold on the street (Noor, 2016).

Lack of adequate knowledge of food temperatures and storage of ready-to-eat foods may lead to increased microbial growth and cross-contamination of food (Sani and Siow, 2014). Similarly, street food vendors may contaminate food by poor personal hygiene, inadequate cooking, and improper storage of food (Monney et al., 2013), and these factors directly affect street food safety. Most street food handlers increase food contamination by not following the correct food safety hygienic practices. For instance, microorganisms can be transmitted to food by the hands of the food handler (Kothe et al., 2016).

## **2.4 Ways to mitigate barriers and challenges in street food vending**

Street food operation in developing countries is very difficult and complex to control, however; it is necessary to improve the implementation of food safety measures in street food vending (Liu et al., 2014). Proper food handler techniques are essential elements in food safety, but the translation of information into action is a difficult process. (Liu et al., 2015).

Below are a few tactics to ensure safe food from street food vendors.

### **2.4.1 Acceptable food safety practices**

A precautionary measure to prevent food contamination from initial preparation to the customer, requires a street food handler to have good personal hygiene practices (Smigic et al., 2016).

According to Lui et al. (2015), as difficult as it is for a street food vendor to translate knowledge into a daily run-through practice, these practices are key factors in ensuring safe food production. The adoption of hygienic practices, and routine supervision of street food vendors can help to eliminate poor hygienic practices (Trafialek et al., 2018). In a study by Balzaretto and Marzano (2013), results show that coliforms, *Enterococcus* spp. and coagulase positive *Staphylococcus* sp. were found, this shows that street food handlers should carefully review and eliminate the risk of food safety by implementing hygienic practices during cleaning or disinfection of the work space.

To ensure food safety, street food vendors should be prudent with every hygienic practice, such as washing of hands and wearing gloves, in this regard food contamination can be minimised (Akabanda et al., 2017). Disinfection of critical surfaces of the street food workstation can be an effective method to ensure food is safe. The habit of undercooking food (meat or vegetables) can be a source of food contamination (Tomaszewska et al., 2018). Additionally, good food safety hygiene and sanitary handling practices are found to be the useful prevention programme of risks involved in the process of ensuring food is safe (Soares et al., 2012).

The street food vendors should uphold sanitary responsibilities to prevent foodborne illness, for example by wearing food production clothing such as hand gloves and hair nets. In addition, food vendors should wash their hands frequently with clean water. To control foodborne illnesses, it is important to first understand the gap occurring in street food handlers where their practices and food safety knowledge are not the same, according to Moreaux et al. (2018) behaviour and attitude of food handlers may positively influence practices.

Nerin et al. (2015), note that the highest concern for customers is food contamination either from microbiological or chemical origin. For this reason, there is a need for street food patrons to be aware of good hygiene and food safety practices before purchasing street food, regardless of aesthetic attributes offered by street-vended foods (Ababio and Lovatt, 2015). In this way, a driving force to produce safe and quality food can be created, and by so doing food safety may be achieved in developing countries. Nevertheless, the informal food service sector still requires strong regulation and enforcement of good hygiene principles.

#### **2.4.2 Adequate food exposure to temperatures**

Microorganisms can multiply when food is exposed to inadequate food temperatures during food production and food cooling (Kothe et al., 2016). Various studies attest that the inadequate cooking temperature for meat (chicken) or even vegetables cause foodborne disease outbreaks (Stratev et al., 2017). Similarly, another efficient way to ensure food is safe, especially meat products, is to use standard and adequate temperatures for cooking and cooling of these food types (Hennekinne et al., 2015). The habit of tasting food by unprotected hands is unacceptable, cross contamination of food can occur (Stratev et al., 2017). The limited facilities and ambient temperatures that street food vending is exposed to, it is reasonable to suspect that there might be more cases unreported (Sun et al., 2012). The magnitudes of foodborne illnesses comprise not only the health treatment expenditure, but then again it induces a sum of deposited problems that includes abridged income within the families involved in the street food trade and negative impact on economic output.

#### **2.4.3 Street vendors**

The street vending environment requires adequate resources and infrastructures to successfully implement food safety measures. Smoke, dust, and even the hands of customers (Kibret and Tadesse, 2013) can easily contaminate open work areas where street foods are displayed, therefore a protective shelter is a prerequisite to ensure food safety. To maintain food safety at street food level, access to basic infrastructure should be included and this involves: availability of sanitary facilities, good waste disposal systems, water supply, and monitoring by authorities (Cortesea et al., 2016). In cases where tap water is not readily available to wash hands or utensils, a street food vendor may store water in a clean bucket, use a bowl, and frequently change the water to prevent any cross-contamination (Kibret and Tadesse, 2013).

#### **2.4.4 Control of food safety hazards in street food vending level**

Relevant microbial, physical, or chemical hazard identification by street food vendors can have a positive impact concerning reduced food contamination chances. It can further allow street food vendors to develop a precautionary sense about the whole food safety concept (Uyttendaele et al., 2016). Literature has described three categories to improve safety of street foods, which requires control (Alimi, 2016). The categories are expressed as risks to public health because they cause food contamination leading to foodborne illness infection.

**Biological contamination:** Recently, food contamination through biological agents associated with street food is branded as a major community well-being issue all over the world (Akinbode et al., 2011). The frequent reported microbial agents on street-vended foods in Africa are: *Enterobacteriaceae*, *Escherichia coli*, *Salmonella*, *Staphylococcus aureus*, and *Listeria monocytogenes* (Paudyal et al., 2017). For example, a study conducted in Windhoek, Namibia

identified unsatisfactory levels of microbial hazards such as *L. monocytogenes* and *Salmonella* (Trafialek et al., 2017). In a street food vending setting, microbial contamination is harbored by inappropriate food holding temperatures, poor personal hygiene, and inadequate food preparation procedures. Furthermore, a hygiene status rendered by contaminated food preparation facilities promotes contact surfaces to harbour microorganisms (Sibanyoni and Tabit, 2019).

**Chemical contamination:** The chemical quantity present in food indicate how safe the food is for human consumption, another possible health risk associated with street food is hazardous chemicals such as copper or cadmium (Rane, 2011). The high percentage of agrochemicals used from initial stages of raw food processing increases the risk of contamination (Nerin et al., 2015). In general, the source of chemical contamination in the street food vending site can be obtained on utensils or facilities (equipment's), this includes disinfection products used, air, water and food packaging materials involved in street food vending establishment's (Rather et al., 2017).

Furthermore, in a street food vending environment chemical food contamination occurs due to improper storage and low-temperature conditions, for example histamine bacteria (normally found in fish products) is produced in large amounts in such conditions, which could lead to food poisoning (Proietti et al., 2014).

### **Physical (environmental) contaminants**

Dangerous bacteria can be harbored by a physical contaminant, this happens when a physical object comes in contact with the food. For instance, a speck of dust from unwashed vegetables/fruits may contaminate food, or even street food handler uncovered hair may contaminate food, which is why street food vendors should always wear their hair neatly tied

back and use a hair net if possible. In a study by Kothe et al. (2016), it was observed that about 90% of handlers did not have protection for their hair during food preparation. Samapundo et al. (2015), found that physical food contaminants such as flies and rodents were evident around the stalls, this should be controlled by the street food handler because flies often leave droppings, which may lead to food contamination.

#### **2.4.5 Training of people involved in street food trade**

According to Jeinie et al. (2015), teaching street food vendors the importance of food hygiene and food safety is a tool to successfully implement a food safety culture among street food vendors and increase the hygienic conditions. According to Agüeria et al. (2018), to receive positive results street food handlers should be exposed to a strategised training programme, containing different features contextualised to promote food safety. Moreaux et al. (2018), conclude that formal education exposure may positively influence behaviour and attitude, which in turn may lead to improved food safety knowledge amongst street food vendors. Furthermore, Samapundo et al. (2015) point out that street food vendors require formal, well-organised food hygiene and food safety training which will detail critical areas of concern like cooking and reheating, temperature control during food storage, health problems that may affect food safety, and thawing (Osaili et al., 2018). There are various approaches to ensure food is safe, such as the provision of cost-effective basic training to street food vendors before starting a business. Similar emphasises can be made to food safety inspectors whereby relevant authorities must ensure that the inspectors have all the required skills to carry out food inspection tasks (Liu et al., 2014).

#### **2.5 Conclusion**

Street food vending is experiencing exponential growth, as this informal sector is the main source of income for many households (especially those who support many dependents), supplies employment opportunities, and street food vending maintains food security, particularly in the developing countries (Habib, 2016). Therefore, ensuring food safety may reduce food losses and enhance competitiveness amongst street food vendors (Pswarayi et al., 2014). To prevent the spread of foodborne diseases, street food handlers should be encouraged to maintain good personal hygiene (Stratev et al., 2017). Since most cases of foodborne disease are caused by poor knowledge of good food hygiene and the whole concept of food safety (Bsadjo-Tchamba et al., 2016), food safety training can elicit a favorable attitude and behaviour amongst street food vendors.

Woh et al., (2016) emphasise that there is a need for food safety training and educational exposure for food handlers to improve areas such as: knowledge application on microbiological food hazards, importance of environmental sanitation, optimal food storage temperatures (including the holding of cooked food), risks of cross-contamination, and the importance of personal hygiene. The booming street food industry is an important sector affected by several factors starting from the quality of the raw materials until the food reaches the customer (Muyanja et al, 2011). Food safety awareness should be promoted using an integrative, collaborative approach between all involved stakeholders such as governments, food handlers, and consumers.

The street food vending sector plays a very important part in the economic environment of small-scale farmers, as they are the main consumers of their fresh products. With increased street food

vendors, this is raising a discourse about government response in supporting informal street food vending.

To conclude, it is evident that the relevant authorities must regulate the street vending sector to maintain and ensure the quality of street-vended foods. According to Paudyal et al (2017), poor food safety governance systems and the presence of vectors near the food service areas or preparation areas are significant contributing factors to food contamination, causing many foodborne illness outbreaks.

## CHAPTER 3: RESEARCH METHODOLOGY

### 3.1 Brief description of study area



Figure 3.1: Zululand District map (Adapted from <https://goo.gl/maps/7ftFxQwGruwNhDCy9>)

The Zululand District is one of the most populated districts in the KwaZulu-Natal Province with an estimated population size of about 892 310 people (STATS SA, 2011). The Zululand District is located in the northern region of KwaZulu-Natal Province with about 77% of its population living in rural areas. The district has five local municipalities: Ulundi, eDumbe, uPhongolo, AbaQulusi, and Nongoma. The Ulundi municipality has a population size of 205 762 (Municipalities of South Africa). Ulundi has a larger population but a narrower economic base, relying heavily on government services, commerce, and informal trading. The AbaQulusi municipality has a population of 243 795. AbaQulusi mainly depends on mines, commercial

farming, and informal economy (KZN-Department of Local Government, 2013). The Zululand District was chosen based on its high concentration of informal trading; the data is easily accessible due to the concentration of street food vendors in the major municipal towns.

### **3.2 Research design and sampling**

A cross sectional survey design was utilised to gather information from the study population. A quantitative research technique was applied whereby a questionnaire and a checklist was used to collect data. The study population comprised of street food vendors and their street food vending facilities in the Ulundi and AbaQulusi local municipalities in the Zululand District. To select street food vending sites, a stratified sampling technique was applied in which the major towns, informal settlements, and villages, where street food vending takes place, was divided into five zones; North zone, South zone, West zone, East zone, and Central zone.

Thereafter, a list of street food vending sites were compiled for each zone from which street food vending sites were sampled randomly. Within each street food vending site, purposeful sampling was used to sample vendors and their street food vending facilities according to the type of food they sell. A total of 200 street food vending facilities was observed in the study: 100 from major towns, 75 from informal settlements, and 25 from villages. Similarly, a total of 400 respondents of 18 years and above were selected from both municipalities: 200 from major towns, 150 from informal settlements, and 50 from villages.

### **3.3 Data collection instruments**

The data collection instrument consisted of a questionnaire and a checklist purposefully designed for this study using information gathered from literature. The questionnaire consisted of four sections: socio-demographics, details on the location and service type of street food vending facility, food safety knowledge of street food vendors, and monitoring and enforcement of the South African food hygiene regulations. The checklist was used to gather data on the sanitary conditions of street food vending sites.

The reliability of the questionnaire and observation instruments was 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 ensured 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 was determined by adopting Cronbach's  $\alpha$  ranging from 0.689 to 0.821 for the different constructs.

### **3.4 Data collection**

The questionnaire was used to collect data using a face-to-face structure interview with respondents. The questions were read out to the respondents and their response was recorded. Each interview session lasted 20 minutes. The criteria for data collection using the checklist was followed by observing the street food vending facilities and ticking the relevant sections. Each observation session lasted approximately 15 minutes.

### **3.5 Statistical analysis**

The data collected were statistically analysed using SPSS software version 23. Descriptive statistics were used to summarise the variables of interest, while the logistic regression and analysis of variance (ANOVA) were used to determine the relationship between food safety knowledge variables and demographic factors. Statistical significance was identified at a 95% confidence level ( $p \leq 0.05$ ).

### **3.6 Ethical consideration**

Permission to conduct this research study was obtained from the Ulundi and AbaQulusi local municipalities which are under Zululand District, South Africa and from the ethics committee of the College of Agriculture and Environmental Sciences, University of South Africa (2018/CAES/034) see attached appendix 4 and 5. Prospective participants in the study survey were issued with an informed consent letter explaining the research purpose of the study, the expected role of interviewees. The participants voluntary right were explained, detailing that they have a right to withdraw from the study if they so desire.

### **3.7 Limitation of the research**

This study was limited to Ulundi and AbaQulusi local municipalities of Zululand District, South Africa street food vendors who participated on the study, this means that the results do not provide information about other street food vendors that were not participating in the study. The number of interviewed street food vendors decreased during data collection period as some respondents lacked cooperation and refused to answer all questions(such as the average monthly

income they generate from street food vending).Although respondents provided potential explanatory answers, it is possible that inadequate knowledge and understanding of food safety measures could affect the quality of responses.

The study is based on self-reported food safety knowledge and researcher observations are subjective to the visited street food vending sites; the present results should not be generalized. Further studies on street food safety require a careful plan and validation so that more information can be collected. Nevertheless, the present study provided important information that can be utilized to promote street food safety education and awareness.

## CHAPTER 4: RESULTS

### 4.1 Socio-demographic characteristics of respondents

The majority of the respondents were females (73.4%), compared to 26.6% males. The majority (55.2%) of the respondents were above 35 years and up to 99.7% of them were black. Most (39.3%) of the respondents were married, followed by those who were unmarried but lived with a partner (25.8%), those who were unmarried and lived without a partner (23.1), and the rest (11.9%) were separated, divorced, or widowed. Most (45.6%) of the respondents have attained high school as their highest level of education, while only a few (16.5%) has attained the tertiary level of education. The rest of the respondents (37.8%) did not obtain any high school education (Table 4.1).

**Table 4. 1: Biographic information of respondents (N=399)**

<b>Variables</b>		<b>Frequency (%)</b>
S1.1. Gender	Male	106 (26.6)
	Female	293 (73.4)
S1.2. Age (Years)	18-25 years	43 (10.8)
	26-35 years	136 (34.1)
	36-45 years	109 (27.3)
	46-55 years	71 (17.8)
	56-65 years	39 (9.8)
	66-75 years	1 (0.3)
S1.3. Ethnicity	Black	398 (99.7)
	White	0 (0)
	Coloured	1 (0.3)
	Asian/others	0 (0)
S1.4. Marital status	Married	157 (39.3)
	Unmarried but living with a partner	103 (25.8)
	Unmarried but living without a partner	92 (23.1)
	Separated	11 (2.8)
	Divorced	1 (0.3)

	Widowed	35 (8.8)
S1.5. Level of education	Tertiary level	66 (16.5)
	High school level (grade 10-12)	182 (45.6)
	Secondary school level (grade 7-9)	36 (9.0)
	Senior primary (grade 4-6)	37 (9.3)
	Junior primary (grade 1-3)	28 (7.0)
	No formal education	50 (12.5)

#### **4.2 Food service training credential of respondents**

The majority (46.6%) of the respondents have been selling street-vended food in the current street food vending site for less than five years similarly, this was followed by (31.8%) of the respondents who have been selling street-vended food in the current street food vending site for more than five years. The vast majority (77.9%) of respondents were not in possession of a food service/hospitality qualification and the majority (77%) of them had not attended any food safety training courses. Most (71.6%) of the few who have attended a food safety training course did so more than a year ago. The majority (69.4%) of street food vendors indicated that their current street food vending site is the first they have ever had and many (59.1%) of them generated an average monthly income of less than R5 000 from street food vending, followed by 38.1% who generated an average monthly income in the range of R5 001 - R10 000. Street food vending was the main source of income for the vast majority (87.2%) of respondents (Table 4.2).

**Table 4. 2: Food service training credentials of respondents (N=399)**

<b>Variables</b>	<b>Answer options</b>	<b>Frequency (%)</b>
S1.6. How long have you been selling food at this place (years)?	Less than 5 years	186 (46.6)
	5-10 years	127 (31.8)
	11-15 years	55 (13.8)
	More than 15 years	29 (7.8)
S1.7. Possession of food service/hospitality diploma/degree?	Yes	92 (23.1)
	No	311 (77.9)
S1.8. Have you ever attended any food safety training course?	Yes	88 (22.1)
	No	311 (77.9)
S1.9. If yes, when last did you attend the food safety training?	Less than 6 months ago	7 (8.0)
	Between 7 months and 1 year	18 (20.5)
	More than a year	63 (71.6)
S1.10. Have you ever received food safety training while selling at this street food vending site?	Yes	80 (20.1)
	No	319 (79.9)
S1.11. Is this the first place you have worked as a street food vendor?	Yes	277 (69.4)
	No	122 (30.6)
S1.12. Which of the following represent your average monthly income generated from street food vending?	Less than R5000	236 (59.1)
	R5001-10000	152 (38.1)
	R10001-15000	3 (0.8)
	Above R15000	8 (2)
S1.13. Is the selling of street food your main source of income?	Yes	348 (87.2)
	No	51 (2.8)

#### **4.3. Location and characteristics of the street food service vending facilities of respondents**

There was an equal number of street food vending sites sampled in the Ulundi (50.1%) and AbaQulusi (49.9%) regions. Only a few (34.6%) respondents sold food in a permanent facility/premise while 47.4% sold their food in a makeshift shelter, and 17.8% sold theirs in the open with no shelter/premise. The majority (52.9%) of street food vendors prepared food at their vending site and most (64.90%) of them rendered both take way and eating on site food services (Table 4.3).

**Table 4. 3: Location and characteristics of food service vending facilities of respondents (N=399)**

<b>Variables</b>		<b>Frequency (%)</b>
S2.1. In which of the following areas is your food vending facility located?	Ulundi	200 (50.1)
	AbaQulusi	199 (49.9)
S2.2. Which of the following best define your street food-vending facility?	Roadside in the open with no shelter/premise	71 (17.8)
	Roadside with makeshift shelter	189 (47.6)
	In a permanent facility/premise	138 (34.6)
S2.3. Where is the food you sell at this vending facility being prepared?	Prepare food at home	79 (19.8)
	Buy and sell pre-cooked foods	27 (6.8)
	Prepare food at the vending facilities	211 (52.9)
	Both 1 and 3	82 (20.6)
S2.4. Which of the following types of food service do you provide at this street food vending facility?	Take way foods	124 (31.1)
	Eating on site	16 (4)
	Both take away and eating on site	259 (64.9)

#### **4.4. Personal hygiene knowledge of street food vendors**

Only a few (30.8%) of the respondents correctly indicated the washing of hands with soap, warm running water, and wiping them dry as the correct procedure for the washing of hands during the preparation and serving of food. The majority (66.4 %) of respondents correctly identified that food handlers are compelled to wash their hands when they have visited toilet or after they have picked their noses. The majority of respondents correctly indicated that it is true not to handle food when they have diarrhoea even if their hands were washed regularly (64.7%), and that is true not to handle food and money when they have flu, colds, cough, or catarrh (76.2 %). The vast majority of respondents (73.4%) correctly indicated the correct way to dry their hands after washing, is to wipe them using a clean and dry dishcloth. The vast majority (93.7%) of

respondents correctly indicated that the correct thing to do if you have a wound on your hands is to cover the wound with waterproof dressings/bandage (Table 4.4).

**Table 4. 4: The personal hygiene knowledge of street food vendors (N=399)**

<b>Variables</b>	<b>Answer options</b>	<b>Frequency (%)</b>
S3.1. 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	97 (24.3)
	Wash hands with cold running water and wipe dry with a clean cloth	65 (16.3)
	Wash hands with soap and cold running water and then wipe dry with a clean cloth	31 (7.8)
	<b>Wash hands with soap and warm running water and then wipe dry with a clean cloth</b>	<b>123 (30.8)</b>
	Both 3 and 4 above are correct	83 (20.8)
S3.2. 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	74 (18.5)
	After picking your nose	58 (14.5)
	None of the above	2 (0.5)
	<b>All of the above</b>	<b>265 (66.4)</b>
S2.3.1 As a food handler, I must not handle food when I have diarrhoea, even if I wash my hands regularly?	<b>True</b>	<b>258 (64.7)</b>
	False	141 (35.3)
S3.3.2 As a food handler, I must not handle food and money when I have flu, colds, cough, or catarrh?	<b>True</b>	<b>304 (76.2)</b>
	False	95 (23.8)
S.3.4. 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	10 (2.5)
	Wipe using a clean and dry handkerchief/serviette or tissue	65 (16.3)
	<b>Wipe using a clean and dry dish cloth</b>	<b>293 (73.4)</b>
	All of the above	31 (7.8)
S3.5. As a food handler, which of the following is the correct thing to do if you have a wound on your hands?	<b>Cover the wound with water proof dressings/bandage</b>	<b>374 (93.7)</b>
	Do nothing, if it is not painful	25 (6.3)

#### 4.5. General food hygiene knowledge of street food vendors

Only a few (25.1%) of the respondents correctly indicated that a food display container should be clean, dust, and rust free while only a small percentage (4%) of them correctly indicated 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. Similarly, only a few (17%) of the respondents knew that the safest way to thaw frozen perishable protein rich foods such as meat, fish, dairy, and poultry products is to thaw them in the refrigerator. Only the minority (43.1%) of the respondents correctly indicated that the safest way to use cutting boards, to avoid cross contamination between them, is to use separate cutting boards for meat and salad and wash them in between usage (see Table 4.5).

**Table 4. 5: The microbial hygiene knowledge of street food vendors (N=399)**

<b>Variables</b>	<b>Answer options</b>	<b>Frequency (%)</b>
S3.6. Which of the following best describe correct qualities of a display container where prepared foods should be stored prior to selling?	Clean display container, dust free	126 (31.6)
	Clean display container, rust free	58 (14.5)
	Clean display container in direct contact with the floor	29 (7.3)
	All of the above	86 (21.6)
	<b>Only 1 and 2 are correct</b>	<b>100 (25.1)</b>
S3.7. 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 (below 5°C) for more than 2 hours?	Quickly put perishable food back into the refrigerator	162 (40.6)
	<b>Discard perishable food</b>	<b>16 (4)</b>
	Quickly cook the perishable food	83 (20.8)
	Both 1 and 2 are correct	79 (19.8)
	All of them are correct	59 (14.8)
S3.9. Which of the following is the safest way to thaw perishable foods such as meat, fish, dairy and poultry products?	Allow perishable foods to thaw on a table	72 (18)
	Allow perishable foods to thaw in hot water	130 (32.6)
	<b>Allow to thaw on the upper shelf of the refrigerator</b>	<b>68 (17)</b>

	Both 2 and 3 are correct	128 (32.1)
	None of the above is safe	1 (0.3)
S3.10. Which of the following is the safest way to use cutting boards to avoid cross contamination between them?	<b>Use separate cutting boards for meat and salad and wash them in between usage</b>	<b>172 (43.1)</b>
	Use any cutting boards for meat and salad but wash them in between usage	68 (17)
	Use the same cutting board for meat and salad but wash them in between usage	66 (16.5)
	All of the above ways are correct	90 (22.6)

#### 4.6. The microbial hazard knowledge of street food vendors

The majority (79.4%) of respondents were aware that microorganisms could cause foodborne diseases that may lead to death. *Listeria* was the best known of the pathogens in which only 36.3% indicated that they have heard about it. More than 84% of the respondents had not heard about *Salmonella* (84.5%), *Campylobacter* (88%), *Clostridium* (93.2%), and *Staphylococcus* (87.7%) (Table 4.6).

Table 4. 6: The microbial hazard knowledge of street food vendors (N=399)

Variables	Answer options	Frequency (%)
S3.8.1. Are you aware that some microorganisms can cause foodborne diseases to you may lead to death?	Yes	317(79.4)
	No	82(20.6)
<i>If your answered is Yes, continue to the following</i>		
S3.8.2. Have you ever heard of Salmonella?	Yes	62(15.5)
	No	337(84.5)
S3.8.3. Have you ever heard of Campylobacter?	Yes	48(12)
	No	351(88)
S3.8.4. Have you ever heard of Listeria?	Yes	145(36.3)
	No	254(63.7)
S3.8.5. Have you ever heard of Clostridium?	Yes	27(6.8)
	No	372(93.2)

S3.8.6. Have you ever heard of Staphylococcus?	Yes	49(12.3)
	No	350(87.7)

#### 4.7. The knowledge of cooking and handling temperatures of street vendors

Only a quarter (25.1%) of the respondents correctly indicated 78°C as the correct minimum internal cooking temperature for stuffed chicken, while only the minority (33.8%) of them correctly indicated 57°C as the correct minimum internal cooking temperature for vegetables and fruits. Only the minority (41.1%) of respondents correctly indicated that the holding temperature of ready-to-eat foods such as salad during serving is at about 5°C, while only the minority (35.6%), correctly indicated the temperature for the 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: The knowledge of food cooking and handling temperatures of street food vendors (N=399)

Variables	Answer options	Frequency (%)
S3.11. Which of the following is the correct minimum internal cooking temperature for stuffed chicken?	90°C	69 (17.3)
	65°C	142 (35.6)
	100°C	88 (22.1)
	<b>78°C</b>	<b>100 (25.1)</b>
S3.12. Which of the following is the correct minimum internal cooking temperature for vegetables and fruits?	87°C	69 (17.3)
	77°C	69 (17.3)
	67°C	126 (31.6)
	<b>57°C</b>	<b>135 (33.8)</b>
S3.13. 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	76 (19)
	At about 10°C	158 (39.8)
	<b>At about 5°C</b>	<b>159 (41.1)</b>
S3.14. 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	102 (25.6)
	<b>At about 63°C</b>	<b>143 (35.6)</b>
	At about 25°C	153 (38.8)

#### 4.8. The monitoring and enforcement of food hygiene regulations

The majority of respondents (55.9%) indicated that their street food vending facilities have been authorised or issued with an operating license to sell food on street sites by local authorities. However, only a few (26.8%) of them indicated that their street food vending businesses have been registered with Companies and Intellectual Property Commission (CIPC) of South Africa (Table 4.8). Many (64.7%) of the respondents indicated that health inspectors had inspected their street food vending sites. Out of those whose street food vending sites had been inspected, 54.7% were inspected quarterly, while 34.1% were inspected yearly, and 11.2% were inspected monthly. Furthermore, out of inspected street food vending facilities only 31.1 % of the respondents received a non-compliance penalty/warning, while most (68.9%) did not receive any non-compliance penalty/warning (Table 4.8).

**Table 4. 8: The monitoring and enforcement of food hygiene regulations at the food service sites of street food vendors (N=399)**

Variables	Answer options	Frequency (%)
S4.1.1 Has this street food vending facility been authorised or issued with a license to sell foods by local authorities.	Yes	223 (55.9)
	No	176 (44.1)
S4.1.2. Has this street food vending business been registered with Companies and Intellectual Property Commission (CIPC) of South Africa?	Yes	107 (26.8)
	No	292 (73.2)
S4.2. Has this street food vending facility been inspected by a health inspector before?	Yes	258 (64.7)
	No	141 (35.3)
S4.3. If your facility has been inspected before, how often is your facility being inspected?	Monthly	29 (11.2)
	Quarterly	141 (54.7)
	Yearly	88 (34.1)
S4.4 If your facility has been inspected before, have you ever received a penalty/warning for non-compliance?	Yes	124 (31.1)
	No	275 (68.9)

#### 4.9. An assessment of the food safety knowledge of street food vendors

The vast majority (76%) of street food vendors had low food safety knowledge, while a few of them had moderate food safety knowledge (23%), and high food safety knowledge (1%), respectively (Figure 4.1). The ANOVA results indicated that, the food safety knowledge assessment outcome of street food vendors from Ulundi and AbaQulusi was not significantly ( $p > 0.05$ ) different (Table 4.9).

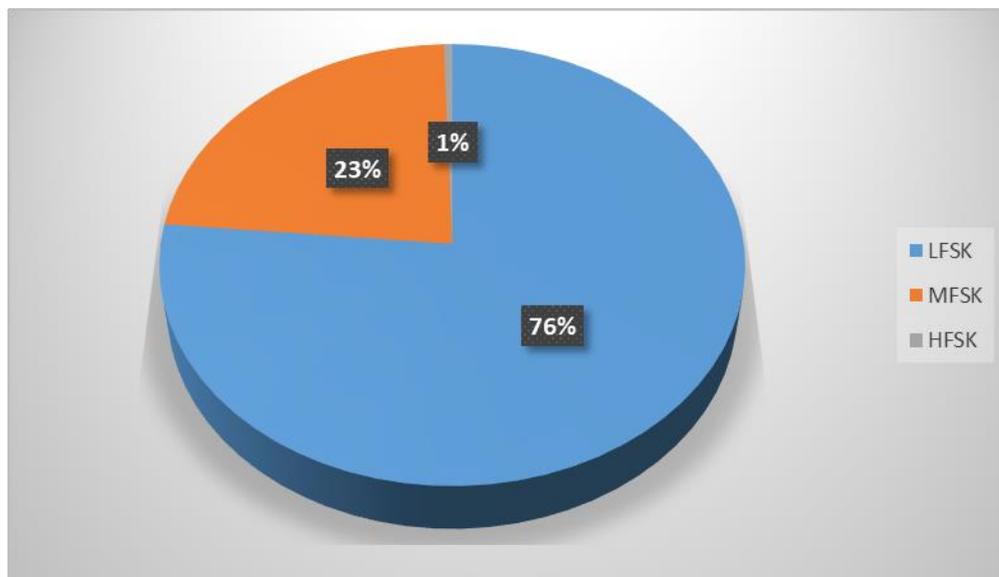


Figure 4. 1: Overall assessment of the food safety knowledge of street food vendors (n=399).

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

**Table 4. 9: ANOVA of the food safety knowledge assessment of street food vendor from two regions using Kruskal-Wallis test**

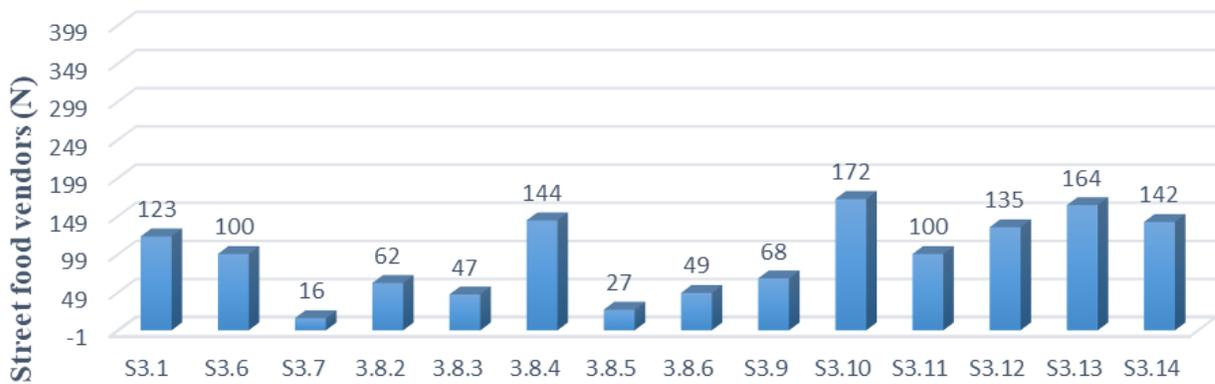
Location	Region	Food safety knowledge assessment (%)			Total	P-value
		Low Food Safety Knowledge	Moderate Food Safety Knowledge	High Food Safety Knowledge		
	Ulundi (1)	85 (80.20)	21 (19.80)	0 (0)	106 (100)	1.181
	AbaQulusi (2)	220 (75.10)	71 (24.20)	2 (0.70)	293 (100)	

**N.B:** LFSK = Low food safety knowledge (score: 1-9), MFSK = Moderate food safety knowledge (score: 10-15), HFSK = High food safety knowledge (score: 16-20).

#### 4.10. Low food safety knowledge areas

Food safety knowledge concepts for which less than 25% of the street food vendors had the correct responses were (starting with the lowest): temperature control (S3.7), only 16 street food vendors had the correct response to the question on the correct thing to do if protein rich foods made from milk, meat, and fish are exposed to non-refrigeration temperatures (below 5°C) for more than two hours. With the exception of *Listeria*, in which up to 144 of them had awareness, less than 25% of the street food vendors had microbial awareness (S3.8.5, S3.8.3, S3.8.6, SS3.S3.8.2) on the following: *Clostridium* (27), *Campylobacter* (47), *Staphylococcus* (49), and *Salmonella* (62). Regarding food safety knowledge concepts for which less than 50% of the street food vendors had the correct response, only 67 street food vendors indicated the correct response regarding the safest way to thaw perishable foods such as meat, fish, dairy, and poultry products (S3.9). Regarding minimum internal cooking temperatures (S3.10 and S3.11), only 172 street food vendors indicated the correct response regarding the correct minimum internal

cooking temperature for stuffed chicken, while only 100 of them indicated the correct minimum internal cooking temperature for vegetables and fruits. Regarding temperature for hot holding of ready-to-eat foods (S3.12, S3.14), only 135 street food vendors indicated the correct temperature for hot holding of ready-to-eat foods such as beef and chicken stew during serving, while only 142 of them indicated the correct temperature for hot holding of ready-to-eat foods such as beef and chicken stew during serving. Regarding temperature guidelines for cold holding of ready-to-eat foods (S3.13), only 164 street food vendors indicated the correct temperature guidelines for cold holding of ready-to-eat foods such as salad during serving (Figure 4.2).



**Frequency distribution of correct scores**

Figure 4. 2: The food safety knowledge questions for which less than 50% of street food vendors had correct scores.

NB: **S3.1:** Which of the following is the correct way to wash your hands during the preparation and serving of foods? **S3.6:** Which of the following best describe a correct display container where prepared foods should be stored prior to selling? **S3.7:** 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 (below 5°C) for more than 2 hours? **S3.8.2:** Have you ever heard of *Salmonella*? **S3.8.3:** Have you ever heard of *Campylobacter*? **S3.8.4:** Have you ever heard of *Listeria*? **S3.8.5:** Have you ever heard of *Clostridium*? **S3.8.6:** Have you ever heard of *Staphylococcus*? **S3.9:** Which of the following is the safest way to thaw perishable foods such as meat, fish, dairy and poultry products? **S3.10:** Which of the following is the correct minimum internal cooking temperature for stuffed chicken?

**S3.11:** Which of the following is the correct minimum internal cooking temperature for vegetables and fruits? **S3.12:** Which of the following is the correct temperature for hot holding of ready- to- eat foods such as beef and chicken stew during serving? **S3.13:** Which of the following is the correct temperature guideline for cold holding of ready- to- eat foods such as salad during serving? **S3.14:** Which of the following is the correct temperature for hot holding of ready- to- eat foods such as beef and chicken stew during serving?

#### 4.11. Compliance of street food vending sites to sanitary conditions

Only 14% of the street food vending sites had high compliance to sanitary conditions, while just over half (50%) of them had moderate compliance to sanitary conditions, followed by 36% with low compliance to sanitary conditions (Figure 4.3). The ANOVA results indicated that, the compliance assessment outcome of street food vending sites from Ulundi and AbaQulusi was not significantly ( $p > 0.05$ ) different (Table 4.11).

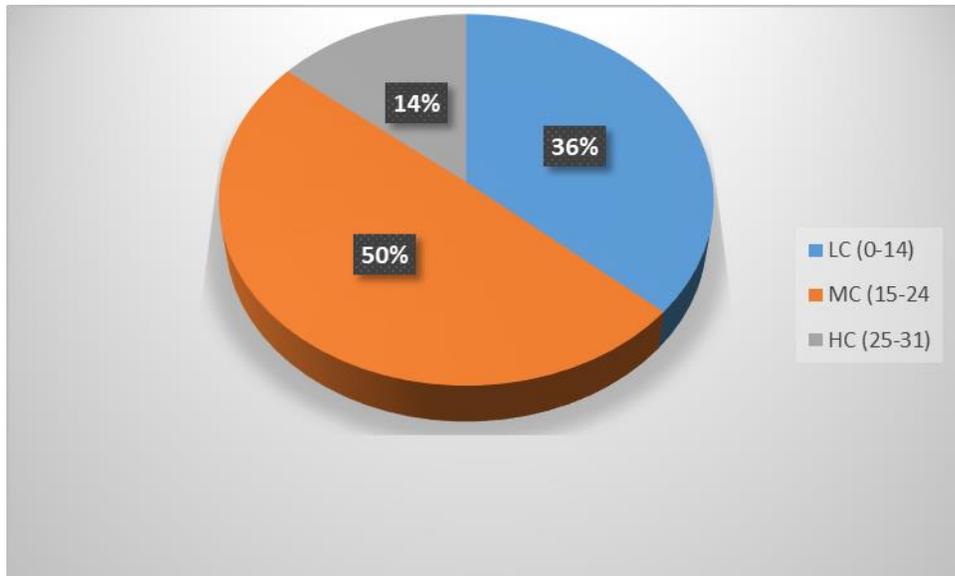


Figure 4. 3: Overall assessment of the compliance of street food vending sites to sanitary conditions as prescribed by South African National Department of Health (2012).

LC = Low food safety compliance (Score of 1-14), MC = Moderate food safety compliance (score of 15-24), HC = High food safety compliance (score of 25-31).

**Table 4. 11: ANOVA of the compliance of street food vending site to sanitary conditions prescribed by South African National Department of Health (2012) using Kruskal-Wallis test.**

		Compliance Assessment Outcome			Total	P-value
		Low Compliance (%)	Moderate Compliance	High Compliance		
<b>Location</b>	Ulundi (1)	31 (31)	56 (56)	13 (13)	100 (100)	0.2
	AbaQulusi (2)	42 (42)	43 (43)	15 (15)	100 (100)	

LC = Low compliance (score: 1-14), MC = Moderate compliance (score: 14-24), HC = High compliance (score: 25-31).

#### **4.12 Sanitary requirements with low compliance**

The sanitary requirements in which less than 50% of the street food vending sites had complied with were as follows (starting with the highest): layout premises and workspace (Q27, Q29, Q31, and Q26), food storage resources (Q12, Q15), layout premises and workspace (Q25, Q21, Q24), and hand washing by food handler (Q2) (Figure 4.4).



Figure 4. 4: The sanitary conditions for which there was compliance by less than 50% of street food vending sites (n=200) as prescribed by (National Department of Health, 2012).

NB: **Q2**: Do food handlers wash their hands in clean water each time before the handling, preparation and serving of food? **Q12**: Are displayed foods in direct contact with floor or ground surface?, **Q15**: Are food storage containers damaged or prone to rusted?, **Q21**: Are there a dedicated garbage disposal bins with lid at the vending site? **Q24**: Is there sufficient space for hygienic storage of food, utensils and separate area for storage of refuse?, **Q25**: Is food preparation site effectively cross-ventilated? **Q26**: Is there sufficient illumination for all food handling areas?, **Q27**: Are storage rooms separated from food service area?, **Q29**: Are the windows and doors cleaned and free from dirt or damage?, **Q30**: Is there electricity power supply at your vending facility?, **Q31**: Is there a tap water supply in the facility?

## **CHAPTER 5: DISCUSSION**

### **5.1. Socio-demographics**

The fact that the majority of respondents were females is a reflection on the demographics of the KwaZulu Natal Province in which 86.3% of the population is female (Zululand District Municipality, 2018). Generally, in developing countries, the traditional duties of women are to prepare the food at home hence, they dominate the street food vending activities (Katiyo, et al., 2019). This finding corroborated with a study by Martins (2006), conducted in Gauteng, who reported that a 90.5% proportion of street food vendors were females. Another study conducted in Cape-town South Africa, reported that 52.9% of interviewed street food vendors were female (Hill et al., 2019). Similarly, Okojie and Isah (2019), found that a study group in Benin City, Nigeria was predominated by females (89%).

The majority of the respondents were above 35 years and up to 99.7% of them were black. The reason why the majority of respondents were above 35 years because that most street food vendors are bread winners of families who have resorted to street food vending as their source of income (Martins, 2006). The dominance of black street food vendors can be attributed to the predominance of the black ethnicity group in the KwaZulu-Natal Province (Stats SA, 2018; Zululand District Municipality IDP Review, 2018). A large proportion of vendors were married (39.3%), confirming findings from other studies that most street food vendors were married (Aluko et al., 2014), suggesting that in some household's street food vending is a livelihood strategy that boosts financial resource (Muyanja et al., 2011).

The educational level of street food vendors was much higher as opposed to other studies conducted in South Africa. In a study in Cape Town, Western Cape Province, it was reported that 74.1% of the sampled street food vendors' population had attained education below grade 12 level (Hill et al, 2019). The low number of street food vendors who had attained a high school level is as a result of inadequate equal access to education opportunities to the black majority during the post 1994 apartheid era in South Africa, for example only 3.3% of Africans were able to return to school during mid-1975 (Salisbury, 2016).

## **5.2 Food service training credential of respondents**

The vast majority of street food vendors have been selling street-vended food in the current street food vending sites for less than five years and their current street food vending site is the first they have ever had. An explanation for this might be that the street food vending business is a small-scale business and temporal with regard to its nature of operation, and it has low start-up costs which ensure ease of entry for first-time street food vendors into the marketplace (Imathiu, 2017). Street food vending through its supply of ready meals, offers a flexible self-employment opportunity for individuals who cannot afford the high cost of operating a formal store (Soon, 2019; Ghatak and Chatterjee, 2018). The majority of respondents were not in possession of a food service/hospitality qualification and many of them had not attended any food safety training course, nor received food safety training while selling at the street food vending site. This might be explained through the fact that street food safety training is not offered at high school level. It is therefore recommended that street food vendors should undergo training before they verge in the street food vending business (Apanga et al., 2014).

An explanation for street food vendors having attended a food safety training course more than a year ago is the low frequency of available training courses and the high costs associated with it (Webb and Morancie, 2015; Madaki and Bavorova., 2019).

This suggests that relevant authorities should prioritise street food safety training by designing a HACCP inclusive training manual targeting to protect customers from food hazards involved in a street vending environment (Ma et al., 2019; McKay et al., 2016). For example, trained street food vendors demonstrated increased food safety knowledge with 66.96% in a study conducted in Dhaka, Bangladesh (Al-Mamun et al., 2013). Furthermore, it is suggested relevant authorities should freely distribute good quality food safety information to street food vendors (Madaki and Bavorova, 2019).

Regarding monthly income, many of the street food vendors generated low average monthly income which was below R5 000. The reason for this finding can be attributed to street food vending businesses only generating marginal profits, but for many it is their only income on which to sustain a household (McKay et al. 2019; Lucan et al., 2013).

### **5.3. Location and characteristics of the street food services' vending facilities**

The majority of street food vendors sold their food in a makeshift shelter or in the open with no shelter/premise. The street food vendors' choice of vending facility was influenced by the availability of financial resources that allows them to acquire a formal structure to open a street vending business (McKay et al., 2016; Sekhani et al., 2019). Many street food vendors included in this study have limited skills to secure formal employment, and as a result they opt for the ease access of street food vending as it is a low capital start-up investment (Hill et al., 2019;

Sekhani et al., 2019). Most of the street food vendors prepare food at their vending sites, rendering both take way and eating on-site food services, which can be comparable with a study conducted in Port-au-Prince, Haiti where 85% of the street-vended food was prepared on-site (Samapundo et al., 2015). However with respect to food safety, such practice attributes to food contamination due to improper hygiene practices and food storages. For example, a study conducted in South Africa indicated that 10% of food prepared on-site had microorganisms such as *Escherichia coli*, *Staphylococcus aureus*, and *Salmonella* (Lues et al., 2006). Furthermore, in this study, most street food vendors were from poor communities, hence they are incapable to secure required food storage and transportation facilities (Choudhury et al., 2011a).

#### **5.4. Personal hygiene knowledge**

Only a few street food vendors correctly indicated the washing of hands with soap, warm running water, and wiping them dry as the correct procedure for the washing of hands during the preparation and serving of food. This can be reasoned by that many street food vendors often have low literacy levels and are untrained, and as a result they lack adequate food safety knowledge (Singh et al., 2016; Al-Mamun et al., 2013). In addition, lack of access to clean running water makes it difficult for street food vendors to follow an acceptable hand washing procedure.

Like any other street food preparation and serving area, inadequate personal hygiene knowledge or unsafe food handling procedures can result in food contamination which may lead to food borne diseases in consumers (Trafialek et al., 2018; Liu et al., (2014). The majority of street food vendors reflected a good personal hygiene knowledge in the washing of hands after toilet visits

or nose-picking, as well as to avoid handling cash when they are ill with diarrhoea, flu, cold, or catarrh. Furthermore, the majority of street food vendors reflected a relatively good personal hygiene knowledge on the correct way to dry their hands after washing and the correct thing to do if they have a wound or abrasion on the hands. The reason is that these are basic domestic personal hygiene practices that should be practiced to avoid the contamination of food by pathogens such as *Salmonella* (Samapundo et al., 2015). The possession of good personal hygiene knowledge will enable street vendors to prevent the transmission of spoilage, as well as pathogenic microorganisms to food that is being prepared or served (Kothe et al., 2016).

### **5.5. General food hygiene knowledge**

Only a few respondents were knowledgeable on the fact that a food display container should be clean, dust, and rust free. This is a matter of concern, given that the usage of containers that are dirty and not sterile, can harbour microbial growth, leading to foodborne diseases among patrons of street-vended food (Samapundo et al., 2016; Ghatak and Chatterjee, 2018). In addition, multiplication of microorganisms such as *Staphylococcus aureus* on food may cause spoilage, which can lead to the alteration of the sensory attributes of food sold on streets (Loukieh et al., 2018).

Only few street food vendors were knowledgeable on temperature control, given that the majority of them did not know 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 can be attributed to the lack of education on temperature control of foods, which leads to unintentional behaviour that may negatively affect food safety (Akabanda et al., 2017).

Furthermore, the majority of street food vendors did not know that that the safest way to thaw frozen perishable protein-rich foods such as meat, fish, dairy and poultry products is to thaw them in the refrigerator. This finding highlights that street food vendors require training on safe food handling temperatures (Akabanda et al., 2017; Ma et al., 2019). A similar finding in a study conducted in the Republic of Ireland was observed by Moreb et al., (2017) who reported thawing of raw meat (43.5%) as the lowest food safety knowledge among food handlers.

Only the minority of street food vendors correctly indicated that the safest way to use cutting boards to avoid cross-contamination between them is to use separate cutting boards for meat and salad, and wash them in between usage. This can be attributed to the insufficient knowledge on the use of chopping boards and the prevention of cross-contamination between food preparation surfaces (Moreb et al., 2017). It is important to note that cross contamination can lead to the transmission of microorganism from one food material to another (Bou-Mitri et al, 2018; Christison et al., 2008).

## **5.6. The microbial hazard knowledge**

Most of the street food vendors were aware that microorganisms could cause foodborne diseases that may lead to death. This implies that street food vendors possessed some foundational knowledge on the health risk of microbial foodborne contaminants (Moreb et al., 2017). The majority of respondents had not heard of *Listeria*, *Salmonella*, *Campylobacter*, *Clostridium*, and *Staphylococcus*. The reason for this could be the fact that street food vendors were not familiar with specific names of each enlisted food microorganism, possibly due to the lack of any form of formal training on foodborne pathogens or foodborne diseases (Al-Kandari et al., 2019; Woh et

al., 2016; Abdullah Sani and Siow, 2014). The reason why *Listeria* was the best known of the pathogens by street food vendors can be attributed to the extensive media coverage regarding the Listeriosis outbreak in South Africa in the year 01 January 2017- 20 June 2018 during which more than 1000 laboratory cases of *Listeria* were reported (Department of Health., 2018).

### **5.7. Knowledge of cooking and holding temperatures of food**

The majority of street food vendors were not knowledgeable about the following cooking and handling temperature parameters. They could not indicate 78°C and 57°C as the correct minimum internal cooking temperature for stuffed chicken and vegetables/fruits respectively and that 5°C and 63°C respectively, as the holding temperatures for salad and beef and chicken stew during serving. The reason why the majority of street food vendors had inadequate knowledge of cooking and holding temperatures are attributed to the lack of any form of formal training on internal cooking and holding temperatures for temperature control-for-safety (TCS) foods (Akabanda et al., 2017). Many street-vended food products are highly perishable and can easily be contaminated if not produced following controlled food temperatures, given that temperature control is considered as critical point in any food service establishment (Okumus et al., 2019).

The above data study finding parallels with the findings of (Abdullah Sani and Siow, 2014) who reported that 82% of food handlers did not know the critical temperature of holding hot food.

## **5.8. The monitoring and enforcement of food hygiene regulations**

The study results indicated that the majority of street food vendors have been authorised or issued with an operating license to sell food. This is often not the case, as many reported cases show that street food vendors do not have operating licenses, appraising authorities for the lack of enforcement and regulation of food safety standards in South Africa (Boatema et al., 2019). However, many of these street food vendors' businesses were not registered with Companies and Intellectual Property Commission of South Africa. This highlights the need for interaction between statutory authorities and respondents, since many indicated that they were unaware of how a CIPC-SA license could improve the credibility of their products to their customers in relation to safety and hygiene (Department of Health, 2012).

Only a few street food vendors indicated that health inspectors had inspected their street food vending sites, and very few received a non-compliance penalty. An explanation for this is reasoned by the fact that street food vending is part of the informal sector, local municipalities have many street food vending stations and an inadequate number of inspectors involved in street food trade inspections, making it difficult to examine their activities (Hiamey and Hiamey, 2018; Boatema et al., 2019). In addition, local inspectors are lacking resources such as transportation and suitable equipment, such as pH meters to conduct appropriate food safety tests (Liu et al., 2014). Inspection by skilled food and health inspectors can be an effective tool to monitor street food safety, but must be implemented in a workable manner (Czarniecka-Skubina et al., 2018).

### **5.9. An assessment of the food safety knowledge of street food vendors**

The vast majority of street food vendors had low food safety knowledge, while a few of them had moderate food safety knowledge. This can be attributed to a lack of continuous training updates on food safety measures (Yu et al., 2018). This inadequate level of food safety knowledge implies that street food vendors are unlikely to produce safe food to consumers (Webb and Morancie, 2015). The study suggests that continuous food safety training will create awareness and improve favourable food safety practices among street food vendors this, in turn, will result in the delivery of safe food to consumers (Trafialek et al., 2017).

The findings of this study are consistent with that of a study conducted in Cotonou City and its outskirts, Benin that in which the food safety knowledge levels amongst street food vendors were low (Ohin et al., 2018). The food safety knowledge assessment outcome of street food vendors from Ulundi and AbaQulusi was not significantly different. An explanation for that is because most of the street food vendors have the same historical and socio-economic background (Woh et al., 2016). Food safety knowledge areas for which less than 50% of street food vendors replied with the correct responses were temperature control, and microbial awareness. These aspects require specialised high-level of training by a professional aiming to improve the knowledge of street food vendors (Young, et al., 2020; Singh et al., 2016). It is suggested that local authorities include an inclusive food safety training programme in their budget (Liu et al., 2014).

### **5.10 Sanitary requirements for which there was low compliance by street food vending sites**

Only a few street food vending sites had high compliance with sanitary requirements and just over half of them had moderate compliance. The low sanitary compliance of street food vending

facilities can be attributed to the fact that most of the vendors were using makeshift facilities and most of them did not have the financial capital to start their businesses in formal structures (Cortese et al, 2016). The compliance assessment outcome of street food vending sites from Ulundi and Abaqulusi was not significantly different. An explanation for this might be because these regions are under the same rural district that has limited development in terms of infrastructure and facilities (Zululand District Municipality IDP Review, 2018).

In this study, less than 50% of the street food vending sites had complied in their layout premises and workspace, food storage resources, and handwashing facilities by a food handler. This can be attributed to two factors: the street food vendors' reach, and the responsibility of relevant authorities. The onus of good sanitary conditions that improve the quality of vended foods rests with government authorities (Singh et al., 2016), while the ability to secure safe and formal vending sites depends on street food vendor capital availability.

Considering an urgent need to enforce quality control measures, as well as to review food safety food legislation, the relevant authorities should take the initiative to improve street food sanitary conditions. Firstly, by addressing existing setbacks since street vending compliance might never be assured, unless there is open access to basic infrastructure and services. These include supply of waste disposal services, permanent space with shade, good drainage, toilets, potable water, and electricity. The availability of these resources would lead to safe food production, resulting in a reduced incidence of foodborne outbreaks (Ghatak and Chatterjee., 2018; Singh et al., 2016).

Furthermore, the relevant authorities may enforce food safety legislation in the street food vending environment by conducting regular monitoring and supervision of street food vending

sites (Ma et al., 2019). In addition, an outreach meeting between street food vendors and health inspectors is required to discuss appropriate monitoring criteria suitable for each municipal geographic division, as non-compliance by street food vendors present food safety risks to consumers (McKay et al., 2016).

## CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

### 6.1 CONCLUSION

This research investigated the food safety knowledge of street food vendors and the sanitary conditions of their street food vending environment, Zululand District, South Africa. The findings from this study indicated that most of the street food vendors were black females who were above 35 years and have attended high school. The majority of the street food vendors have been selling street food on their current street food vending site for more than five years and their current street food-vending site is the first they have ever had. The vast majority of respondents did not have food service/hospitality qualification and most of them had not attended any food safety-training course.

The majority of respondents did not know that the washing of hands with soap, warm running water, and wiping them dry was the correct procedure for washing of hands during the preparation and serving of food. The majority of respondents knew that food should not be handled when they have diarrhea, even if their hands were washed regularly, also when they have flu, colds, cough, or catarrh. The majority of respondents did not know 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. Only the minority of street food vendors knew that the safest way to use cutting boards, to avoid cross-contamination between them, is to use separate cutting boards for meat and salad and wash them in between usage. The majority of respondents were aware that microorganisms could cause foodborne diseases that may lead to death and *Listeria* was the best known of the pathogens.

Only the minority of respondents knew the correct cold holding temperature of ready-to-eat foods such as salad during serving (approximately 5 °C), and the hot holding temperature of ready-to-eat foods such as beef and chicken stew during serving. The vast majority of street food vendors had low food safety knowledge and only 14% of the street food vending sites had high compliance with sanitary conditions.

## **6.2 RECOMMENDATIONS**

Regular training on food safety practices is recommended for street food vendors and food safety educational information should be made available through a range of social media sources. This is essential to ensure that food safety measures are routinely put in place and standards are upheld continuously in the preparation of food sold on the street.

It is further recommended that, food regulatory authorities should increase the focus on preparation, implementation, and quality assessment methods of food safety training programmes that aim to improve food safety knowledge of street food vendors.

Due to great variability in food safety practices and street food vending facilities, it is recommended that health inspectors should conduct further inspections covering a greater number of street food vendors because research results indicated that only a few street food vending sites were inspected by a health inspector.

To implement street food vendors' high sanitary compliance, it recommended that food regulatory authorities equip street food vending sites with proper and well-designed infrastructure with resources as prescribed by South African Government Regulation Number

R638 of 2018 that prohibits the selling or serving of unhealthy foods and the sale of foods under poor sanitary conditions.

In addition, relevant government authorities should continuously monitor and inspect street food vendors' kitchens and the vending environment, especially in areas of personal hygiene, food storage, and entire sanitary conditions. This is substantial to prevent noncompliance with street food vending sites to sanitary regulations.

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## APPENDIX 1: QUESTIONNAIRE



### APPENDIX A1: DATA COLLECTION INSTRUMENT

Research Title: Food safety knowledge and practices of street food vendors as well as the sanitary conditions of their vending environments, Zululand District, South Africa

#### SECTION 1: SOCIO-DEMOGRAPHICS OF RESPONDENTS

Please mark the appropriate box with X

##### S1\*1. Gender

Male	Female
(1)	(2)
<input type="checkbox"/>	<input type="checkbox"/>

##### S1\*2. Age (Years)

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

##### S1\*3. Ethnicity

Black	White	Coloured	Indian/Asian
(1)	(2)	(3)	(4)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

##### S1\*4. Marital status

Married	(1)	<input type="checkbox"/>
Unmarried living with a partner	(2)	<input type="checkbox"/>
Unmarried living without a partner	(3)	
Separated	(4)	

		<input type="checkbox"/>
Divorced	(5)	
Widowed	(6)	<input type="checkbox"/>

**S1\*5. Which of the following best describes your education level?**

No formal education	6	<input type="checkbox"/>
Junior primary education (grade 1-3)	5	<input type="checkbox"/>
Senior primary (grade 4-6)	4	<input type="checkbox"/>
Secondary education (grade 7-9)	3	<input type="checkbox"/>
High school education (grade 10-12)	2	<input type="checkbox"/>
Tertiary education	1	<input type="checkbox"/>

**S1\*6. How long have you been selling food at this place (years)?**

Less than 5 years	(1)	<input type="checkbox"/>
5–10 years	(2)	<input type="checkbox"/>
11–15 years	(3)	<input type="checkbox"/>
More than 15 years	(4)	<input type="checkbox"/>

**S6\*7 Have you obtained any food service/hospitality diploma/degree?**

Yes	No
(1)	(2)
<input type="checkbox"/>	<input type="checkbox"/>

**S7\*8 Have you ever attended any food safety-training course?**

Yes	No
(1)	(2)
<input type="checkbox"/>	<input type="checkbox"/>

**S1\*.9 If yes, when last did you attend the food safety training?**

Less than 6 months ago	(1)	<input type="checkbox"/>
Between 7 months and 1 year	(2)	<input type="checkbox"/>
> 1 year ago	(3)	<input type="checkbox"/>

**S1\*10. Have you ever received food safety-training while selling food at this street food vending site?**

Yes	No
(1)	(2)
<input type="checkbox"/>	<input type="checkbox"/>

**S1\*11. Is this the first place you have worked as a street food vendor?**

Yes	No
(1)	(2)
<input type="checkbox"/>	<input type="checkbox"/>

**S1\*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)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**S1\* 13. Is the selling street food your main source of income?**

Yes	No
(1)	(2)
<input type="checkbox"/>	<input type="checkbox"/>

**SECTION 2: DETAILS ON THE LOCATION AND SERVICE TYPE OF STREET FOOD VENDING FACILITIES**

**S2\*1. In which of the following areas is your food vending facility located?**

Ulundi	(1)	<input type="checkbox"/>
AbaQulusi	(2)	<input type="checkbox"/>

**S2\*2. Which of the following best define your street food-vending facility?**

1. Road side with no shelter/facility/premise	(1)	<input type="checkbox"/>
2. Roadside with makeshift shelter	(2)	<input type="checkbox"/>
3. In a facility/ permanent building	(3)	<input type="checkbox"/>

**S2\*3. Where is the food you sell at this vending facility being prepared?**

1. Prepare them at home	(1)	<input type="checkbox"/>
2. Buy and sell precooked foods	(2)	<input type="checkbox"/>
3. Prepare them on this vending facility	(3)	<input type="checkbox"/>
4. Both 1 and 3 are correct	(4)	<input type="checkbox"/>

**S2\*4. Which of the following types of food service do you provide at this street food vending facility?**

<b>Food service type</b>		
1. Take away	(1)	<input type="checkbox"/>
2. Eating on sites	(2)	<input type="checkbox"/>
3. Both take away & eating on site	(3)	<input type="checkbox"/>

### SECTION 3: FOOD SAFETY KNOWLEDGE OF STREET FOOD

VENDORS (Akabanda et al., 2017; Betts & Hinsz, 2014, Courtney et al., 2016).

#### Part 1. Personal hygiene

**S3\*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)	<input type="checkbox"/>
2. Wash hands with cold running water and wipe dry with a clean cloth	(2)	<input type="checkbox"/>
3. Wash hands with soap and cold running water and then wipe dry with a clean cloth	(3)	<input type="checkbox"/>
4. <b>Wash hands with soap and warm running water and then wipe dry with a clean cloth</b>	(4)	<input type="checkbox"/>
5. Both 3 and 4 above are correct	(5)	<input type="checkbox"/>

**S3\*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?**

1. After visiting the toilet only	(1)	<input type="checkbox"/>
2. After picking your nose	(2)	<input type="checkbox"/>
3. None of the above	(3)	<input type="checkbox"/>
4. <b>All of the above</b>	(4)	<input type="checkbox"/>

**S3. True or false, food handlers are compelled to do the following when they are involved in the preparation and serving of food.**

		TRUE	FALSE
<b>S3.3.1</b>	As a food handler, I must not handle food when I have diarrhoea, even if I wash my hands regularly	<input type="checkbox"/> 1	<input type="checkbox"/> 2
<b>S3.3.2</b>	As a food handler, I must not handle food and money when I have flu, colds, cough or catarrh.	<input type="checkbox"/> 1	<input type="checkbox"/> 2

**S3\*4. As a food handler, which of the following is the correct way to dry your hands after you have washed them properly?**

1. Wipe using an apron	(1)	<input type="checkbox"/>
2. Wipe using a clean and dry handkerchief/serviette or tissue	(2)	<input type="checkbox"/>
<b>3. Wipe using a clean and dry dish cloth</b>	(3)	<input type="checkbox"/>
4. All of the above	(4)	<input type="checkbox"/>
5. None of the above	(5)	<input type="checkbox"/>

**S3\*5. As a food handler, which of the following is the correct thing to do if you have a wound on your hands?**

1. Cover the wound with bandage	(1)	<input type="checkbox"/>
2. Wear gloves to cover the wound	(2)	<input type="checkbox"/>
3. Do nothing, if it is not painful	(3)	<input type="checkbox"/>
<b>4. Dress the wound with water proof dressings</b>	(4)	<input type="checkbox"/>
5. None of the above	(5)	<input type="checkbox"/>

**Part 2. Knowledge on food storage**

**S3\*6. Which of the following best describe a correct display container where prepared foods should be stored prior to selling?**

1. a clean display container free from dust	(1)	<input type="checkbox"/>
2. In a clean and rust-free display container	(2)	<input type="checkbox"/>

3. In a clean display container in direct contact with the floor	(3)	<input type="checkbox"/>
4. All of the above	(4)	<input type="checkbox"/>
5. <b>Only 1 and 2 are correct</b>	(5)	<input type="checkbox"/>

**S3\*7. 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 (below 5°C) for more than 2 hours?**

1. Quickly put perishable food back into the refrigerator	(1)	<input type="checkbox"/>
2. <b>Discard perishable food</b>	(2)	<input type="checkbox"/>
3. Quickly cook the perishable food	(3)	<input type="checkbox"/>
4. Both 1 and 2 are correct	(4)	<input type="checkbox"/>
5. All of them are correct	(5)	<input type="checkbox"/>

**Part 3. Knowledge on microbial hazards**

Variables		Yes (1)	No (2)
<b>S3*8.1</b>	Are you aware that some microorganisms can cause foodborne diseases to you that may lead to death?	<input type="checkbox"/>	<input type="checkbox"/>
If your answered is <b>Yes, continue to the following</b>			
<b>S3*8.2</b>	Have you ever heard of <i>Salmonella</i> ?	<input type="checkbox"/>	<input type="checkbox"/>
<b>S3*8.3</b>	Have you ever heard of <i>Campylobacter</i> ?	<input type="checkbox"/>	<input type="checkbox"/>
<b>S3*8.4</b>	Have you ever heard of <i>Listeria</i> ?	<input type="checkbox"/>	<input type="checkbox"/>
<b>S3*8.5</b>	Have you ever heard of <i>Clostridium</i> ?	<input type="checkbox"/>	<input type="checkbox"/>
<b>S3*8.6</b>	Have you ever heard of <i>Staphylococcus</i> ?	<input type="checkbox"/>	<input type="checkbox"/>

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

**S3\*9. 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)	<input type="checkbox"/>
2. Allow perishable foods to thaw in hot water	(2)	<input type="checkbox"/>
<b>3. Allow to thaw on the upper shelves of the refrigerator</b>	(3)	<input type="checkbox"/>
4. Both <b>2</b> and <b>3</b> are correct	(4)	<input type="checkbox"/>
5. None of the above is safe	(5)	<input type="checkbox"/>

**S3\*10. Which of the following is the safest way to use cutting boards to avoid cross contamination between them?**

1. Use <u>separate cutting</u> boards for meat and salad but wash them in between usage.	(1)	<input type="checkbox"/>
2. Use <u>any cutting boards</u> for meat and salad but wash them in between usage	(2)	<input type="checkbox"/>
3. Use <u>the same cutting board</u> for meat and salad but wash them in between usage	(3)	<input type="checkbox"/>
4. All of the above ways are correct	(4)	<input type="checkbox"/>

**S3\*11. Which of the following is the correct minimum internal cooking temperature for stuffed chicken?**

1. 90°C	(1)	<input type="checkbox"/>
2. 65 °C	(2)	<input type="checkbox"/>
3. 100 °C	(3)	<input type="checkbox"/>
4. <b>78 °C</b>	(4)	<input type="checkbox"/>

**S3\*12. Which of the following is the correct minimum internal cooking temperature for vegetables and fruits?**

1. 87°C	(1)	<input type="checkbox"/>
2. 77 °C	(2)	<input type="checkbox"/>
3. 67 °C	(3)	<input type="checkbox"/>

4. 57 °C	(4)	<input type="checkbox"/>
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**S3\*13. Which of the following is the correct temperature guideline for cold holding of ready- to- eat foods such as salad during serving?**

1. At about 25 °C.	(1)	<input type="checkbox"/>
2. At about 10 °C	(2)	<input type="checkbox"/>
3. At about 5 °C	(3)	<input type="checkbox"/>

**S3\*14. Which of the following is the correct temperature for hot holding of ready- to- eat foods such as beef and chicken stew during serving?**

1. At about 100 °C	(1)	<input type="checkbox"/>
2. At about 63 °C	(2)	<input type="checkbox"/>
3. At about 25 °C	(3)	<input type="checkbox"/>

**SECTION 4: MONITORING AND ENFORCEMENT OF SOUTH AFRICAN FOOD HYGIENE REGULATIONS OF INFORMAL FOOD SERVICE FACILITIES (Campbell, 2011).**

**Part 1. Registration details**

		Yes	No
<b>S4*1.1</b>	Has this street food vending facility been authorised or issued with a license to sell foods?	<input type="checkbox"/>	<input type="checkbox"/>
<b>S4*1.2</b>	Has this street food vending business been registered with Companies and Intellectual Property Commission (CIPC) of South Africa?	<input type="checkbox"/>	<input type="checkbox"/>

**Part 2 Inspection and monitoring**

**S4\*2. Has this street food vending facility been inspected by a health inspector before?**

Yes	No
(1)	(2)
<input type="checkbox"/>	<input type="checkbox"/>

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

**S4\* 3.** If your facility has been inspected before, how often is your facility being inspected?

Monthly	Quarterly	Yearly
(1)	(2)	(3)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**S4\*4.** If your facility has been inspected before, have you ever receive a penalty/warning for non-compliance?

Yes	No
(1)	(2)
<input type="checkbox"/>	<input type="checkbox"/>

## APPENDIX 2: SANITARY OBSERVATION CHECKLIST



### APPENDIX A2: DATA COLLECTION INSTRUMENT

*Research Title: Food safety knowledge and practices of street food vendors as well as the sanitary conditions of their vending environments, Zululand District, South Africa*

#### SECTION 5: OBSERVATIONAL CHECKLIST

##### Part 2: Sanitary conditions of street food vending sites (National Department of Health, 2012).

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

10.	Do food handlers use the same utensils, knives and boards to prepare raw and cooked food?	<input type="checkbox"/>	<input type="checkbox"/>
11.	Do food holding containers have proper lids or seals to protect food from dust?	<input type="checkbox"/>	<input type="checkbox"/>
<b>FOOD STORAGE</b>			
12.	Are displayed foods in direct contact with floor or ground surface?	<input type="checkbox"/>	<input type="checkbox"/>
13.	Are foods on sale displayed in suitable containers (e.g. glass display) to prevent droplet contamination?	<input type="checkbox"/>	<input type="checkbox"/>
14.	Are displayed case or food storage containers free of dust or any other impurity?	<input type="checkbox"/>	<input type="checkbox"/>
15.	Are food storage containers damaged or prone to rusted?	<input type="checkbox"/>	<input type="checkbox"/>
16.	Are food containers clean and free from any toxic substance liable to contaminate the food?	<input type="checkbox"/>	<input type="checkbox"/>
17.	Is there any cooling and freezing storage equipment at the vending site?	<input type="checkbox"/>	<input type="checkbox"/>
18.	Is there any ready-to-eat hot food-holding equipment at the vending site?	<input type="checkbox"/>	<input type="checkbox"/>
<b>LAYOUT OF FOOD PREMISES AND WORKSPACE</b>			
19.	Are vending site free of insects?	<input type="checkbox"/>	<input type="checkbox"/>
20.	Is there a proper wastewater removal mechanism on the vending site?	<input type="checkbox"/>	<input type="checkbox"/>
21.	Are there a dedicated garbage disposal bins with lid at the vending site	<input type="checkbox"/>	<input type="checkbox"/>
22.	Toilet facilities are available around vending sites?	<input type="checkbox"/>	<input type="checkbox"/>

23.	Hand washing basins are available at vending sites?	<input type="checkbox"/>	<input type="checkbox"/>
24.	Is there sufficient space for hygienic storage of food, utensils and separate area for storage of refuse?	<input type="checkbox"/>	<input type="checkbox"/>
25.	Is food preparation site effectively cross-ventilated?	<input type="checkbox"/>	<input type="checkbox"/>
26.	Is there sufficient illumination for all food handling areas?	<input type="checkbox"/>	<input type="checkbox"/>
27.	Are storage rooms separated from food service area?	<input type="checkbox"/>	<input type="checkbox"/>
28.	Is the floor non-porous, non-slippery and easy to clean?	<input type="checkbox"/>	<input type="checkbox"/>
29.	Are the windows and doors cleaned and free from dirt or damage?	<input type="checkbox"/>	<input type="checkbox"/>
30.	Is there electricity power supply at your vending facility?	<input type="checkbox"/>	<input type="checkbox"/>
31.	Is there a tap water supply in the facility?	<input type="checkbox"/>	<input type="checkbox"/>

## APPENDIX 3: CONSENT FORM



04-03-2018

### PARTICIPANT INFORMATION SHEET

**Title: Food safety knowledge of street food vendors as well as the sanitary conditions of their vending environments, Zululand District, South Africa**

**Dear Prospective Participant,**

My name is Nelly Virginia Nkosi and I am doing my masters research in the Department of Life and Consumer Sciences at the University of South Africa. I am inviting you to participate in the study entitled: *Food safety knowledge of street food vendors as well as the sanitary conditions of their vending environments, Zululand District, South Africa.*

**WHAT IS THE PURPOSE OF THE STUDY?**

The purpose of the study is to collect important information on the knowledge of street food vendors and the sanitary conditions of their street food vending sites.

**WHY AM I BEING INVITED TO PARTICIPATE?**

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

**WHAT IS THE NATURE OF MY PARTICIPATION IN THIS STUDY?**

You will be required to answer questions pertaining to your socio-demographics, location and service types of your street food vending facility, your food safety knowledge, the monitoring of your street food vending facility. Data on the enforcement of South African food hygiene regulations by relevant government authorities will also be collected. You will be spending approximately 20 minutes in answering these questions.

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

You will be allowed to withdraw from the 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 boosting consumers' confidence in the purchasing of street vended foods.

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

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

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

Your response to all questions 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 Nelly Virginia Nkosi at 0832484887, [nvmawandla@gmail.com](mailto:nvmawandla@gmail.com) or you may contact Prof FT Tabit, 0114712080, [Tabitft@unisa.ac.za](mailto:Tabitft@unisa.ac.za).

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

NV Nkosi



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](http://www.unisa.ac.za)

## 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.....



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## APPENDIX 4: PERMISSION LETTERS

**UMASIPALA  
WASOLUNDI**

Private Bag X 17  
Ulundi  
3838

**" The City of Heritage "**



**ULUNDI  
MUNICIPALITY**

Tel: 035 8745100  
Fax: 035 870 1164

Enq : NM Phakathi  
Ref : 13/5/2

Date: 15 March 2018

UNISA-Florida-Science Campus  
Florida  
1709

**Attention : Ms N.V Nkosi**

Dear Madam

**REQUEST FOR PERMISSION TO CONDUCT RESEARCH ABOUT FOOD SAFETY  
KNOWLEDGE AT ULUNDI MUNICIPALITY**

Your letter dated 28 February 2018 is hereby acknowledged.

Ulundi Municipality hereby affords you the opportunity to conduct your research entitled "Assessing food safety knowledge, safety food handling practices of street food vendors and sanitary conditions of their vending environment in the urban municipality towns under Zululand District, South Africa", on condition that you share your findings with the municipality.

You may contact the Local Economic Development Manager Mr NM Phakathi for more information at 0781210134/0605376027.

Ulundi Municipality wishes you all the best in your studies.

Yours sincerely

  
**N.G Zulu  
MUNICIPAL MANAGER**

Our Ref: 10/1/R  
Your Ref:  
Enquiries:  
Department: Municipal Manager



✉ 57, VRYHEID 3100  
c/o, Mark & High Street  
☎ (034) 982 2133  
Fax: (034) 980 9637

Email: mm@abaqulusi.gov.za

13 July 2018

Ms. NV Nkosi (60869666)

UNISA  
Florida Science Campus  
1709

[nvmawandla@gmail.com](mailto:nvmawandla@gmail.com)

Dear Ms. NV Nkosi

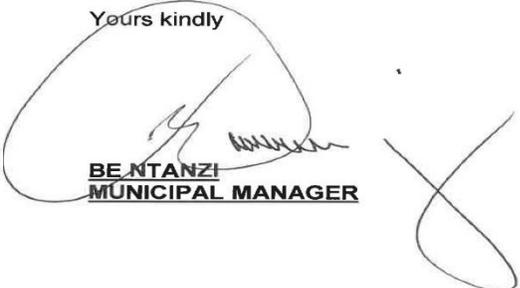
**Request for permission to conduct research.**

This serves to grant permission to Ms. NV Nkosi to conduct a study in the research field of:

*"Assessing food and safety knowledge, safe food handling practices of street vendors and the sanitary conditions of their vending environment in the urban municipality towns under Zululand District, South Africa."*

I would also like to take this opportunity to wish you great success with your studies towards obtaining your Master's degree.

Yours kindly



**BE NTANZI**  
**MUNICIPAL MANAGER**

-----  
"LEADERSHIP AND SERVICE EXCELLENCE"

EXECUTIVE COMMITTEE

Cllr: MJ Sibiya (Mayor) Cllr MC Maphisa (Deputy Mayor), Cllr MB Khumalo (Speaker), Mr BE Ntanz (Municipal Manager), Cllr: IA De Kock, Cllr: PN Mazibuko, Cllr: TZ Nkosi, Cllr NN Mdlalose, Cllr PP Selepe, Cllr. BL Zwane.

## APPENDIX 5: ETHICS CLEARANCE LETTER



### UNISA GENERAL RESEARCH ETHICS REVIEW COMMITTEE

Date: 19/03/2018

Dear Ms Nkosi

NHREC Registration # : REC-170616-051  
ERC Reference # : 2018/CAES/034  
Name : Ms NV Nkosi  
Student # : 60869666

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

**Researcher(s):** Ms NV Nkosi  
nvmawandia@gmail.com

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

**Working title of research:**

Food safety knowledge and practices of street food vendors as well as the sanitary conditions of their vending environments, Zululand District, South Africa

**Qualification:** MSc Agriculture

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 district authority must be submitted 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.*



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## APPENDIX 6: PROPOSAL APPROVAL LETTER



31/01/2018

**TO WHOM IT MAY CONCERN  
CONFIRMATION OF PROPOSAL PRESENTATION AT THE DEPARTMENT BY  
MS. NKOSI NELLY VIRGINIA (60869666)**

This is to certify that the above student Ms. Nkosi Nelly Virginia (60869666) presented the MSc Agric. research proposal "**Assessing food safety knowledge, safe food handling practices of street food vendors and the sanitary conditions of their vending environment in the Zululand District, South Africa.**" at the Agriculture and Animal Health Department on the **10 November 2017**. She has effected changes mentioned below as suggested by academic staff members present at the seminar and therefore recommend that she proceeds with ethics clearance and other administrative matters.

**COMMENTS:**

- Inconsistencies in the referencing style should be corrected
- The independent variables indicated should be revised. Some of them cannot be classified as independent variables
- The selection of the respondents should be more exploratory
- Indicate the anticipated risks in the study and state how such risks will be minimized
- Explain the non-parametric aspects of the data analyses in detail.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'MA Antwi', is written over a white rectangular area.

Prof MA Antwi

M&D Proposal presentations coordinator; Email: [antwima@unisa.ac.za](mailto:antwima@unisa.ac.za); Tel: 011 670 9391



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