

MINI-DISSERTATION

**FOOD SAFETY AND HYGIENE PRACTICES OF STREET FOOD VENDORS AT
GATE TWO VENDING SITE AT THE UNIVERSITY OF LIMPOPO, TURFLOOP
CAMPUS, SOUTH AFRICA**

By

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DECLARATION

I, **Tleane Ditsebe Marcia Rosina**, soberly declare that this mini-dissertation hereby submitted to the University of Limpopo for the degree of Master of Public Health has never been submitted by me or any other person at this University or any other universities for that matter and that I designed and executed the work presented and that all sources of reference and quotations have been acknowledged as thoughts and knowledge by other scholars.

Signature

Date

DEDICATION

This work is dedicated to my Lord and Saviour, Jesus Christ. He gave me life and a blessed assurance that He remains to be the Undefeated Lord at all times. He is Faithful and Trustworthy. I am nothing without you Jesus. (Acts 17:28)

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ABSTRACT

Background: Street food vending has become a common means of providing traditional, known and convenient meals to communal eating. It has also become a growing portent as a means of job creation and as a survival mechanism to many affected by job creation decline. Suggestion: There is an influx of food vendors at Gate 2 of the University of Limpopo and there is a need to investigate both the hygiene and safety measures taken by the vendors and the environment they operate in.

Methods: The purpose of the study was to observe and identify food safety and hygiene practices by the street vendors. An observational descriptive cross sectional study design and a convenience sampling technique were used as research designs and sampling methods. A questionnaire on food safety and hygiene was used to collect data.

Results: The study revealed that all of the street vendors have no form of food safety and hygiene training. The vendors also highlighted the fact that over and above them having no food safety and hygiene knowledge, food safety and hygiene practices such as washing of hands frequently cannot be adhered to because of the time limitations they have to prepare and be ready for customers as quickly as possible. The vendors practise a mixed storage of raw and cooked food in the refrigerators within the refrigerators. Only 30% of the vendors wear protective hand gloves while preparing food. They have running water in the bathroom and on the premises but no soap is provided in the bathroom for hand washing.

Conclusion: Even though street food is increasingly gaining popularity and accessibility based on affordability, traditional meals served and accessibility, food safety and hygiene still are a concern and a matter of alarm.

Key words: food safety and hygiene, street food vendor, food poisoning, health hazards

DEFINITION OF TERMS

Food safety and hygiene is the degree to which food has been tested and accredited to be consumed by humans at any given time and that which has been produced, kept, stored and prepared under safe measures (Yeung & Morris, 2001). In the context of this study, food safety and hygiene refers to environmental and food-handling measures undertaken by vendors at Gate 2 of University of Limpopo to ensure that food that is prepared is safe for human consumption.

Practice is a customary application of doing something or the method and ways of doing something (Martins, 2006). In the context, practices refer to how vendors handle and prepare food and how they operate.

Stall is the cabin or small house-like area provided for any intended operations (Food Safety Authority of Ireland, 2016). In the context of this study, stall will be any physical structure used for food preparations and selling at Gate 2 premises of University of Limpopo.

Street food is a wide variety of both hot and cold, raw and cooked food prepared and sold by vendors on streets around trading centres and other public-inclined areas for immediate consumption (Rane, 2011; Bereda, Emerie, Reta & Asfaw, 2016). In the context of this study, street food refers to food sold around the premises of Gate 2 of University of Limpopo.

Street food vendors are personnel who offer ready-to-eat food on sale to people who are based on the open streets using either a cabin or stall as a vending site (Jayasuriya 1994; Privitera & Nesci 2014). In the context of this study, street food vendors refer to all those who sell or vend food on the vending site outside and next to Gate 2 of the University of Limpopo.

ABBREVIATIONS

AIDS:	Acquired Immunodeficiency Syndrome
CBD:	Central Business District
EHP:	Environmental Health Practitioner
FAO:	Food and Agriculture Organization
FBO:	Food Business Operators
HACCP:	Hazard Analysis Critical Control Point
HIV:	Human Immunodeficiency Virus
KM:	Kilometre
RTE:	Ready-to-eat
SAITA:	South African Informal Traders' Association
SPSS:	Statistical Package for Social Sciences
SREC:	School of Healthcare Sciences Research Ethics Committee
TB:	Tuberculosis
TREC:	Turfloop Research Ethics Committee
WHO:	World Health Organization

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1. CHAPTER 1: OVERVIEW OF THE STUDY

1.1. Introduction and Background

Food is a necessity and a source of life, energy and wellbeing and every human life depends on it (Williams, 1993). Street food is defined by the World Health Organization (WHO) as foods and beverages prepared and sold by vendors in streets and other public places for immediate consumption (Omemu & Aderoju, 2008). These types of foods are prepared as ready-to-eat (RTE) (Muyanja *et al.*.,2011), and/or sold by vendors especially in streets and similar public places for immediate consumption or consumption at a later stage without further processing or preparation. They are largely appreciated for their flavour, convenience, low cost (Samapundo, Climat, Xhaferi & Devlieghere, 2015) and their cultural (Omemu & Aderoju, 2008) and social heritage links (Samapundo *et al.*., 2015).

The safety of street foods is affected by several factors starting from the quality of the raw materials, to food handling and storage practices (Umar, Mande & Umar, 2018). In most cases, the flow of water from taps is not regular for hand and dishwashing, cooking or drinking thus leading the street vendors to store water under vulnerable conditions subject to contamination (WHO, 2015). There is general perception that street vended foods are unsafe, mainly because of the environment under which they are prepared, sold and/or consumed, which exposes the food to contamination (Muyanja *et al.*., 2011). Therefore, the current study focused on environmental aspects contributing to unsafe food and food handling practices with an aim to understand the extent to which street foods are exposed to dangerous and health harming conditions.

Food safety is a significant part of human welfare (Heikkilä *et al.*.,2016). There is increased interest worldwide in the importance of street food as part of a general concern for food security and health (Omemu & Aderoju, 2008). There has been an international call to increase the safety of food sold on the street that encompasses all stages of the food production chain (Cortese *et al.*.,2016). A pivotal role in food safety is played by the food business operators (FBOs) who are the producers of food or serve and sell the food items to the people. They have to guarantee the safety of the items that they sell or distribute in addition to consumers who should handle, prepare

and eventually consume the food (Heikkilä *et al.*, 2016). There are fundamental global guidelines which are in place to ensure food safety (Cortese *et al.*, 2016) but the challenge is that there are still inadequate sanitary conditions in street food venues (Rane, 2011; Cortese *et al.*, 2016).

A study in Haiti showed that in 60% of the cases, flies and animals were evident around the stall and 65% of the stalls did not have access to potable water. The majority of the vendors served food with bare hands and did not wash their hands after handling money (Samapundo *et al.*, 2015).

In South Africa, like in other developing countries, street food vending generates income to households of many (Steyn, Mchiza, Hill, Davids, Venter, Hinrichsen, Opperman, Rumbelow & Jacobs, 2013) and this operation is majorly dominated and operated by women. However, very little is known about street food and fast food consumption in South Africa (Steyn, Labadarios & Nel, 2011; Steyn & Labadarios, 2011) despite this being a large sector of the national economy in terms of employment provided and sales of food. In South Africa, so-called "street foods" are regarded as being foods or beverages that are sold by the informal sector. Street foods are generally sold from stands/stalls (usually not permanent structures) on the pavement of busy streets in both urban and rural areas, usually at a lower cost than fast foods (Steyn *et al.*, 2011).

A study by Mjoka and Selepe (2017) observed that none of the food vendors studied in Kwazulu Natal wore gloves while handling food. Seven out of eight did not store food at the correct temperature, six did not wear hairnets and five out of eight food vendors did not always use clean utensils.

Food vending has increased in South Africa in recent years and may employ up to 25% of the workforce. Because street food is generally inexpensive, readily available, meets the need of immediate hunger, and provides vendors with a source of income it needs to be recognized that street foods contribute to individual and to household food security (Steyn & Labadarios, 2011).

1.2. Problem Statement

Pokhrel and Sharma (2016) strongly emphasise that food safety and hygiene is the area of concern in the field of public health. It aims at protecting individuals and consumers from the effects of consuming ill-managed foods and the environment to which those foods are exposed. Therefore, it has been noted by the researcher that the street foods from Gate 2 of the University of Limpopo are exposed to appalling environmental conditions that contribute to unsafe food and hygiene practices such as, the presence of insects, rodents, domestic animals and air pollution. The above-mentioned unsafe environmental conditions if not corrected may affect the quality of the food sold and consumed, including the food handling and storage practices. Therefore, the current study will focus on personal hygiene practices and environmental hygienic conditions with an aim of improving food safety and hygiene. A study conducted at Mekong River Delta Region in Vietnam used the direct observational cross sectional data collection method in a similar study using the master checklist of both the vending site and the vendors (Minh, 2017).

1.3. Literature Review

The section presents scholarly insight on food safety and hygiene, food poisoning, street vending and the effects of food safety and hygiene both globally and nationally. Global conditions of street vending, street food safety in Africa and South Africa, public health interventions, street food vending in universities, factors contributing to poor and unsafe street food, rationale for street food and food poisoning are Sub-topics which are deliberated on in the literature review, viz., Chapter 2.

1.4. Aim of the Study

The aim of the study is to investigate food safety and hygiene practices of street vendors at Gate 2 vending site of the University of Limpopo.

1.5. Objectives of the Study

The study's objectives are:

- To determine the food safety and personal hygiene and practices by street food vendors at Gate 2 of the University of Limpopo vending site.
- To determine the environmental hygiene conditions of the vending sites at Gate 2 of the University of Limpopo.

1.6. Research Questions

The following research questions were opted for as part of the directive of the study:

- What are the food safety and personal hygiene practices of street food vendors at Gate 2 of the University of Limpopo?
- What are the environmental hygiene conditions at Gate 2 vending site of the University of Limpopo?

1.7. Research Methodology

The study used a quantitative, descriptive observational cross-sectional design. The detailed design and setting, including sampling methods, data collection and data analysis, together with measures taken to ensure validity and reliability while minimising bias, will be elaborated on in Chapter 3.

1.8. Ethical Considerations

The aspects of ethical considerations such as ethical clearance, confidentiality, anonymity and protection of privacy will be dealt with in Chapter 3.

1.9. Significance of the study

Findings gathered from this study will enable the researcher as a qualified health promoter to evaluate the outcomes of the food safety and hygiene practices and propose training pertaining to food safety and hygiene of the vendors where necessary. The training could enhance food safety and hygiene as a means of preventing and eliminating food-borne illnesses and diseases. The findings could also propel the Capricorn District health officers in the development of strategic plans towards regulating licenses for safe food operations, implementing regulations

standards for optimal safety of food as part of public health advancement and health promotion as well as reinforcing adherence and compliance to food safety measures by vendors. Furthermore, the information could be used by the municipalities to reinforce inspections of the sites used for food preparations.

1.10. Conclusion

This chapter discussed the background of the study, aim, objectives, literature review and research design.

2. CHAPTER 2: LITERATURE REVIEW

2.1. Introduction

It is estimated that around 2.5 billion people globally consume street food daily (Singh *et al.*, 2016). The authors further indicate that African countries are mostly burdened and affected by food-borne diseases and there are recorded 351 000 food borne associated deaths globally. Alimi (2016) alludes that consumers of street food are the ones who are highly at risk of being affected by the consequences of unsafe food safety and hygiene practices. Food borne diseases associate with and contributed by street food are a serious concern to the public and the health of individuals (Khairuzzaman *et al.*, 2014). Inappropriate food handling may be associated with 97% of all food-borne illnesses (Pokhrel & Sharma, 2016). In South Africa, like other developing countries, street food vending generates income to many households (Steyn *et al.*, 2013) and this operation is majorly dominated and operated by women.

2.2. What are street foods and street food vending

Street vendors vend a variety of seasonal fruits and cooked meals and at times they sell even non-eatable merchandises such as shoes, clothes, etc. They are among the over 1.1-million people who are informal traders in South Africa and millions more depend on the earnings of these vendors, and millions of people buy food and goods from them every day (GroupUp, 2018). Street foods are ready-to-eat foods which are prepared on the street premises and sold by vendors to the public, community and those who are interested in eating at those facilities, premises and areas (WHO, 2014; Singh *et al.*, 2016). The food is ready to eat and convenient at a time of need and

easily accessed and/or within reach (Pokhrel *et al.* , 2016). Cortese *et al.* , (2016) indicates that street food vending is an ancient practice which is common in most countries as a provision of inexpensive food which are mostly cultural and traditional based. Vending is the same term as hawking as they are mostly referred to in South Africa and is a practice of selling food of different types and processes and is one of the easily reachable opportunities of employment open to anyone, more especially women who need to earn a living. It takes place mostly in market shift infrastructure such as box, plank, plastic and/or corrugated iron sheet-made structures or in the shade at times with the aim of making income, creating small scale jobs, recreation and providing for a specific category of clients (Gamielien & Niekerk, 2017; Cohen, Bhatt & Horn, 2000; Bhowmik, 2010).

2.3. Rationale for street food to be used by many

Street food supports and feeds low-income populations and present itself to be easily accessed and afforded and in most cases specialises in traditional accustomed food for a large majority (Rane, 2011; Proietti *et al.* , 2014; Bereda *et al.* , 2016). Based on the economic need and growth, street vending has been seen to contribute significantly to income inflows for those households and individuals selling those kinds of food due to the fact that they are affordable or inexpensive to the large mass (Food and Agriculture Organization (FAO); WHO, 2005). The street vending has contributed significantly to the small and micro-enterprises in South Africa over the past decades and more-especially with the high rise of unemployment rates, it has been shown to address the socio-economic challenges of those affected by the economic status of the country (Kok & Balkaran, 2014).

Public transport commuters find it more convenient to partake in food sold on the street, in particular fruits, vegetables, as their easy market as it makes it easy to buy and board a bus or taxi and the public consider the food sold on the street cheaper as compared to commercial stores and again, 90% of these operations are black-owned and there is that sentiment of support and empowerment by others (Gamielien & Van Niekerk, 2017).

2.4. The global conditions of street vendors and street food safety

Globally, street vending is a universally known and supported activity which happens around schools, universities, hospitals, railway stations, bus terminals and taxi ranks and provides employment for many and a means of income for women in the majority and in particular and at some stage, those who have started the business end up employing others, creating a circle of unemployment void patching (Balkaran, 2014). Over and above this, food prepared and sold on the streets are completely exposed or predisposed to a number of chemical and environmental contaminations as they are sold in the open and in most cases polluted and clustered spaces and areas and such places do not meet the food safety and hygiene standards (Bereda *et al.* , 2016).

WHO highlights that street food has several benefits to the mass such as, a source of inexpensive, convenient and often nutritious food for urban and rural settings, a source of attractive and varied food for tourists and the economically advantaged, a major source of income for a vast number of persons, particularly women and a chance for self-employment and the opportunity to develop business skills with low capital investment (Tinker *et al.* , 2011). Contradictory to this however, Monney *et al.* , (2014) indicates that street-vended foods are a major contributing factor to food-borne illnesses due to poor food safety and hygiene practices by the vendors and the conditions around the vending sites. Sezgin and Şanlıer (2016) reported that street food poisoning was a cause of 691 individuals who were affected and resulting in 49 deaths from 1983 to 1992 in China and 300 people of whom 14 died were from Hong Kong. In most instances, epidemiological studies have reported significant associations between food vended from the street and diarrhoeal or gastrointestinal diseases (Umar *et al.* , 2018).

2.5. Street food vending and food safety in Africa

Street food vending or food vended or prepared and sold on the streets contributes to economic growth and development and provide low-cost or affordable meals to many but at the same time stances public health concern because of the widespread of food-borne diseases it projects and poses as well as the risk factors concerned, moreespecially due to lack of adequate food safety knowledge and understanding (Rane, 2011; McIntyre, Vallaster, Wilcott, Henderson & Kosatsky, 2013). Over a number of studies conducted in the African region, the street food hygiene and safety

is being undermined by hot climate, sanitary measures, inadequate law enforcement and irregular practices by the vendors (Okojie & Isah, 2014; Kok & Balkaran, 2014; Proietti *et al.* , 2014; Monney *et al.* , 2014).

2.6. Street vending and street food safety in South Africa

The street-food vending in South Africa is rapidly growing based on many contributing factors but the most predominant amongst those factors is the high rate of unemployment experienced in the country, propelling many to seek other money ventures which ensure as income and a means of survival (Willemse, 2011). Demand for food on the go without carrying a lunch pack and at an affordable price and the satisfaction of a variety of traditional meals to choose from has become a norm to many working far and away from home and those finding themselves with busy and demanding schedules. Such vending practices are common at the taxi ranks, street pavements, school premises, CBDs as well as institutions of higher learning. But the hot and humid South African climate, unsanitary conditions, increase in pollution sites, and irregular supervision and compliance measures contribute highly to the unsafeness of the street food in most parts of the country and this is a public health hazard and a serious concern to take note of (Global Forum on Food Security and Nutrition, 2011; Kok & Balkaran, 2014). Approximately 40% of people consume street food daily in South Africa and street foods contribute significantly to the economic growth of both rural and urban areas away people who are unemployed, in particular women (Steyn *et al.* , 2011).

Street vending in South Africa has grown to be a convenient and easy-to-start sort of a business which many south Africans enjoy and find accommodative to both their traditional and accustomed meals as well as affordability and easy to access as many vending sites are erected at high reflux areas such as schools, taxi ranks and industrial sites but the food safety and hygiene practices are deemed to be cautiously considered as many do not practice proper handling, storage , preparing and keeping of food. Personal and environmental hygiene are predominant factors that lead to contamination and food poisoning or food-borne illnesses (Mjoka & Selepe, 2017; Sibanyoni, Tshabalala & Tabit, 2016)

2.7. Conditions of vending streets and sites

Mchiza, Puoane & Steyn (2018) states that street foods are a serious health hazard as they are exposed to perilous hygiene practices and because vending and not aware or are ignorant of certain factors. A study conducted by Singh, Dudeja, Kaushal & Mukherji (2016) in India highlighted that the hygiene conditions of the streets vendors vending at or on and used carts are very poor. The personal hygiene measures are not adhered to or practiced, the food handling procedure that enhances food safety are appalling and there is severe lack of knowledge and understanding regarding food safety and hygiene. The majority of the vending streets and sites project an inadequate vending area for proper working and movement and pose a serious occupational health hazard to those working in them. Sharp and hazardous equipments and resources are used and there is insufficient water supply or untreated water. The sites are clustered and may be good transmitters of diseases and at times the area might not be well monitored by authorities (Abdussalam & Käferstein, 1993).

A study conducted by Okojie & Isah (2014) in Benin City, Nigeria, emphasises the fact that the street vending sites are insufficiently monitored by the food and safety health officers and they operate in very dirty vending sites. Garbage and poor drainage result in providing a conducive ground for rodents and dogs, shortage of clean running water result in the repeated use of water for washing hands, cleaning of the floor surface and washing cutlery, and quite often used without soap and disinfectants.

2.7.1. The regulation of street vendors globally

There is an increase in the number of countries or governments that eye the need to regulate this sector of street vending because they see its operation as being unsystematic, clustered, mushrooming everywhere and hindering traffic and movements in small streets. They attempt to bring order and regularity, more-over because some are found to be in designated areas (Chakravarty & Canet, 1996). The parliament of India indorsed the “Street Vendor Act” in May 2014 as a way of regulating population and operation. The Act came after the government realised that the street vendors are forming small organizations that aims at helping them with legal consideration. The National Hawker Federation formed in India by street vendors became an eye opener to the need for proper legislated regulations (Ministry of Law and Justice, 2014)

A document written by WIEGO LAW & INFORMALITY PROJECT, SA (2014) documented that street vendors in South Africa are “monitored” by local authorities and municipalities (Mokoatle, Sigudub & Morse, 2016) and all the challenges pertaining to street vendors such as permit granting, proximity usage, service delivery, registration procedure, etc, will perhaps be given attention by the South African Informal Traders’ Association (SAITA) as there is nothing that is projected in the Business Act, 1991,48 pertaining to such cases as how street vending should be operated under regulation and law like any other “informal economy/ trading” (Street Vendors’ Laws and Legal Issues in South Africa, 2014).

2.7.2. The structural conditions

In Nigeria, common structures for the street vendors are the kiosks, make-shift accommodation, and push carts as well as other temporary structures which are not well developed and health-monitored (Okojie et al ., 2014).

2.8. Food safety and hygiene practices of street food vendors

Food prepared on streets and vended there raises public health concerns mainly because of the unhygienic practices used in preparing the food as well as unrestricted and unregulated regulations and/ or operation policies to those partaking in providing food on the streets (Elkanem,1998). Street food carries a high potential of food-borne illnesses and diseases and in most cases when tests that are linked to food poisoning and food-borne diseases are conducted, food safety and hygiene are the primary area of investigation and assumption or correlation (Singh et al., 2018).

Street vendors in most countable cases do not practice food safety and hygiene measure due to a vast number of factors such as lack of knowledge, lack of training, lack of resources, lack of time, insufficient monitoring and regulation, lack of time to practise such measures and environmental conditions, and their raw materials as well leave much to question as most procure somehow “unsafe” raw materials (CODEX ALIMENTARIUS COMMISSION, 2018; Nurudeen, Lawal, & Ajayi, 2014)

2.9. Public Health interventions to improve street food safety

The World Health Organization has themed its 2015 World Health Awareness message and campaign to be 'FOOD SAFETY'. Its relevancy is applicable to all nations, stakeholders, health institutions, regulation bodies and all those who are in the food sector to be very serious in raising issues and awareness of food safety and hygiene like many other public health concerns such as TB, HIV/AIDS and others. (Pokhrel & Sharma, 2016; Uyttendaele, De Boeck & Jacxsens, 2015). There is an annual 3 months' international programme since 2009 by Ghent University on intensive training regarding food safety, quality assurance and risk analysis (Uyttendaele *et al.* , 2015).

Cortese *et al.* (2016) announces that there are quite a number of foundational and primary guidelines in place globally dealing and reinforcing compliance to food safety and hygiene but the problem is with implementation, compliance and supervision. The Global forum on Food security and Nutrition (2011) raises the following proposals and intervals in assuring safe street food in Africa as well as in South Africa:

- The government should give attention to the street food vending sector with the aim of improving their safety and nutrition.
- The Public Health Department should create awareness for street food to be of acceptable quality and standard
- Vendors should be given foundation and primary education on health and health promotion mechanisms in order to equip them to practise good health
- There should be application and implementation of HACCP and the World Health Organization`s "five keys to safer food".
- Certificates of operations should be given and reviewed periodically for quality assurance
- Municipalities should provide vendors with appropriate infrastructures and proper access to water, sanitation and sewage system and they should be encouraged to partake in awareness raising programmes
- General education and information pertaining to health and safety should be given to vendors.

2.10. Factors contributing to poor and unsafe street food

Proietti et al., (2016) indicates that inadequate supply of clean water, lack of basic structures, clustering, poverty and unemployment, inadequate waste disposal management, unskilled, untrained and uneducated vendors on basic food safety pre-requisite measures, contribute enormously to the unsafeness of the food prepared and sold on the streets. Rane (2011) designates that place of preparation, utensils and equipment used for storing, preparing and cooking, holding and re-heating mechanisms as well as poor personal hygiene contributes to the microbial contamination of food. Balkaran (2014) emphasises the fact that food risk is aggravated by the hot climate and uncontrolled weather seasons in South Africa as well as the method of preparing the sold food, water availability, handling measures and holding periods, times and mechanism.

The same sentiment is shared by Iwu et al., (2017) in the study they conducted at Imo State, Nigeria, that, climate instability subsequent to temperature changes is predicted to influence the risks associated with food production, handling, storage and distribution, lack of resources, environmental hygiene, increase in demands as well as improper and insufficient monitoring mechanisms. Behavioural practices, plea high population demand for street food, lack of proper training, deficiency in proper sick leave policies to be implemented by employers, challenges of tracing food items to their sources, all pose a challenge.

2.11. The implications of non-compliance to food safety and hygiene

Food safety is the assurance that each consumed food does not pose a threat and hazard to humans in any possible way (CODEX). Failure to practise food safety and hygiene lead to food poisoning, food-borne illnesses and outbreaks, cross contamination and in severe cases, deaths. (Monney et al., 2013, & Patil, 2017).

2.12. Conclusion

This chapter presented knowledge of the degree of food safety and hygiene as well as other supplementary contributions to food safety and hygiene. The following chapter will describe the research methodology undertaken in the study.

3. CHAPTER 3: METHODOLOGY

3.1. Introduction

A Quantitative approach projects an explanation inquiry into social or human problem based on testing a theory composed of variables, measured with numbers, and analysed with statistical procedures, in order to determine whether the predictive generalisations of the theory hold true (Creswell, 2013). The study follows a quantitative approach where the researcher provides numerical data related to food safety and hygiene practices among the street food vendors using applicable statistical packages. Information such as the number of stalls which meet the required food hygiene and safety standards are provided in this study.

3.2. Research Design

An observational descriptive cross sectional design has been used in the study as the study design. An observational study is a study where the researcher observes directly what is happening and based on the observations, the researcher can explain a cause-effect (Prathapan, 2014). A Descriptive study is a study which seek to obtain a complete and accurate information about a phenomenon through observation, description and classification (Brink, 2016) and a cross sectional study design refers to a study which is done at a specific point in time and all the information pertaining to the study is collected at the same time from the same participants and no identical study will be done after a specific period (Brink, Van der Walt & Van Rensburg, 2012). The researcher went to the study site over a short period, asked a few question to the participants and observed their stall as well as the vending site using the modified checklist (**see annexures 1**). The researcher thereafter described the cause-effects and analysed correlations. Over and above the checklist administration, the researcher observed patterns and behaviours which there were no questions pertaining to on the checklist but which served as supplementary important information to consider.

3.3. Study site

The study was conducted on street vended food site at Gate 2 of the University of Limpopo where the majority of the university`s population, both the staff and the

students, procure and consume foods. The university of Limpopo is situated in the Capricorn District of Limpopo Province approximately 30 kilometres from the capital city of Polokwane. The institution has three (3) gates of which two (2) are main gates and one (1) is a pedestrian gate. The pedestrian gate (Gate 2) was the chosen focus area of the study as it is the vending site's centre, having high population and movement of people leading to the shopping complex and the taxi rank.

3.4. Study Population

The target population for this study were the street food vendors at Gate 2 of University of Limpopo who sell cooked food in a closed and/ or open stall. All the vendors who sell cooked food in closed stalls (*pap, malana, chicken stew, diphatlo, chips, etc.*) are 16 in number and those who sell cooked food in open stalls (*chisanyama and and magwinya* are 4 in number). They were conveniently and purposely chosen as the population samples for the study. There are 04 stalls that sell non-cooked food (fruits and vegetables as well as consumables such as bread, drink, potato chips, etc.

3.5. Sampling

The study used the convenience sampling technique which is also called judgment sampling because it is the deliberate choice of a participant due to the qualities the participant possesses. This is a non-random technique that does not need underlying theories or a set number of participants (Etikan et al., 2016). In this type of sampling method, the researcher decided on what needs to be known and set out to find people who are willing to provide the information by virtue of their knowledge or their experience of selling cooked and non-cooked food only using consent letters.

To determine the sample size in the study, a homogeneous sampling was used. This is a form of sampling which focused on candidates who shared similar traits or specific characteristics (Etikan *et al.*, 2016). Therefore, all vendors who sell cooked and non-cooked food in the study setting were regarded as part of the sample size which is 24 food vendors. The vendors are homogenous in the sense that they all sell food, either cooked or not cooked. Some sell cooked food, some sell *chisinyama (braai* meat/chicken) only, while others sell *magwinya (fatkoeks)*, *sephatlo* (a traditional quarter bread with atchaar, chips, Vienna, Russian and eggs sometimes) and chips.

Others still sell quite a range of meals such as *mala mogodu* (tripe), chicken feet, stews, etc. Their practice is the same (they sell food, handle/ prepare food) and it entails that personal hygiene and food safety and hygiene be administered, practised and adhered to. All food vendors who sell cooked and non-cooked food within the premises of Gate 2 of University of Limpopo were included in the study, the reason being that they were conveniently chosen to be a relevant group which will enable the researcher to get relevant data from. Vendors who had not given consent regarding taking part in the study were excluded from the study, the reason being that they did not want to partake in the study.

3.6. Data collection

Data was collected using the researcher-developed observational checklist/questionnaire. The researcher observed the stalls, the preparation, the keeping and serving of food and the vending site. The researcher visited the stall as a preparatory phase for the actual data collection as an ordinarily individual to observe how each vendor was situated and who sells what. The researcher went again to submit letters of consent to the vendors and further explained the study and how the data would be collected. The precise or actual day or date was not announced to the vendors but the period was given for them to be prepared for the visit. The reason for not telling the actual day/date was that the researcher wanted to avoid the Hawthorne effect or observer effect. This is the effect that the observer has on the one being observed. In this case the practices and the phenomenal operations will change to make an impression to the results and all normal day to day standards will be modified to suit the requirements and objectives of the observer (McCambridge et al., 2013).

The researcher went on a particular day within the stipulated period of the week announced and started collecting data. The data which was collected from the street food vendors included: the structures of the vendors (type of vendor, availability of health certificate, length of time spent vending, source of water, changing water for cleaning plates), type of street foods vended, personal hygienic practices and the conditions under which the street vended food are prepared and handled (general environmental factors).

3.6.1. Data collection tool

The data was collected using an adapted compiled checklist which was guided by the World Health Organization Essential Safety Requirements for street-vended Foods. (WHO,1996). The questionnaire was not translated from English into the local language because the researcher administered the questionnaire herself. Section B of the questionnaire was filled in by the vendors themselves but those who did not understand based on the language, the researcher filled the section based on their responses.

3.6.2. Data management

Data was managed in a storage system i.e. hard drive, compact disc and file for hard copies. In addition, the data storage system will be made accessible to only the researcher and supervisors. This will ensure that participants' confidentiality is ensured.

3.7. Data Analysis

Data analysis is an on-going process during research which involves analysing participant information using analysis guidelines or software (Creswell, 2013). Data was captured on a Microsoft word excel spread sheet and then transferred to Statistical Package for Social Sciences (SPSS) software programme version No.25 (2018) by the Statistician at the University of Limpopo for statistical analysis. Categorical variables were presented as counts and percentages while Chi-Squared tests were used for comparison of categorical variables. A level of significance was considered at $p < 0.005$ and all proportions were reported at 95% confidence intervals (95% CI).

3.8. Measures to ensure Reliability and validity

3.8.1. Validity

Validity is when the instrument is able to produce results that reflect what it was initially aimed to measure (Bastos, Duquia, Ganzalez-Chica, Mesa & Bonamigo,

2014). The data collection tool was tested in a pilot study at a street vending site different from those of the study and projected satisfactory result in terms of information required and validity of responses required by the researcher. A general challenge of observational research is validity as this type of the study is evaluated in terms of both internal and external validity (Carlson & Morrison, 2009). Trochim (2000) and A dictionary of epidemiology (2014) indicate that there are four important types of validity that the researcher needs to take into account as a means and measure to ensure valid results by the instrument or tool used or aimed to be used.

3.8.2.1 External validity

External validity is the ability to generalize study results to a more universal population (Carlson & Morrison, 2009; Cozby & Bates, 2015). This minimises sampling bias, and in this study a homogeneous sampling method was used to minimise bias with respect to sampling method and sampling size. External validity is the extent to which the results can be generalised to other populations and settings (Cozby & Bates, 2015). In the current study, the sample size affords the data collection tool good external validity as the size is representative of the food vendors population in the study area.

3.8.2.2 Construct validity

Construct validity defines how well a test or experiment measures up to its claims. It refers to whether the operational definition of a variable actually reflect the true theoretical meaning of a concept. This minimises bias of measurement, and in this study the tool was administered by the researcher and the tool is an adapted checklist.

3.8.2.3 Internal validity

Internal validity refers to the strength of the inferences from the study (Carlson & Morrison, 2009). This is the degree to which a study is free from bias or systematic errors. In the current study, the questionnaire was also checked by the supervisor to ensure validity of the data collection tool.

3.8.2.4 *Conclusion validity*

Construct validity defines how well a test or experiment measures up to its claims. It refers to whether the operational definition of a variable actually reflects the true theoretical meaning of a concept. It ensures proper data analysis tools and methods which correlate with the research methodology and in the current study conclusion validity was ensured by following the appropriate methodology for observational studies. (Calder, Phillips & Tybout, 1982).

3.8.2. *Reliability*

Reliability refers to when the instrument consistently generates the same results after being applied repeatedly (Bastos, Duquia, Ganzalez-Chica, Mesa & Bonamigo, 2014). Responses from the observations were cross-checked by the supervisor for consistency in the results. Consistency between observational responses and questions from the questionnaire was to indicate that the data collection tool is reliable. Furthermore, a pilot study was conducted at the vending sites between shoprite and shell garage (1 km) away from the actual study site with the aim of validating and ensuring measures of reliability as well reinforcing readiness, preparedness and acquisition of skills to administer the questionnaire and undertake observations properly. A pilot study is a trial run of research conducted in preparation for a full scale study to pre-test the research instrument (Dikko, 2016). These process allowed for the questionnaire to be re- and to be rephrased to ensure that the questionnaire measures what it is intended to measure. The results from the pilot study were used to improve the questionnaire where the questions were not clear.

3.9 Measures to minimise bias

Bias is described as any tendency which prevents fair consideration of a research question (Pannucci & Wilkins, 2010). The researcher minimised selection bias by using a homogeneous sampling which focused on food vendors who sell cooked food as the inclusion criteria. The researcher practiced the skills of observational studies in administering the questionnaire during a pilot study prior to administering the questionnaire to actually study food vendors. The unavoidable bias was addressed by

adherence to research methodology and also engaging the statistician to check the data analysis to ensure that the data analysed is a true reflection of the data gathered from the research respondents.

3.10 Ethical considerations

The proposal of the current study was submitted to the Department of Public Health Research Committee, then to the School of Health Care Sciences Research and Ethics Committee (SREC) and lastly to Faculty of Health Sciences Research Committee before the University of Limpopo Turfloop Research Ethics Committee (TREC). Ethical clearance to conduct the study was granted (see certificate attached).

3.10.1 Information leaflet and Informed consent

The owners or any responsible member of the food vendors was handed an information leaflet for the study as well as the consent form to sign before participating in the study. Informed consent is voluntary consent given by a subject or a responsible proxy (e.g., a parent) for participation in a study after being informed of the purpose, methods, procedures, potential benefits and potential harms, and, when relevant, the degree of uncertainty about such outcomes (A dictionary of epidemiology, 2014). The researcher explained to the participants that their participation is voluntary and they can or might withdraw from the study at any time if they wish to do so and there will be no penalties (autonomy).

3.10.2 Measures to protect participants' confidentiality, privacy and anonymity

Medical research must protect the life, health, dignity, integrity, privacy and confidentiality of research participants' personal information (Helsinki Declaration Fortaleza Brazil, 2013).

3.10.3 Confidentiality

Information obtained from the observations was kept confidential, stored and only the researcher and research supervisor/co-supervisor will have access to the

storage system i.e. hard drive, compact disc and file for hard copies for a minimum of five years and after the period has elapsed, it will be destroyed.

3.10.4 *Anonymity*

To maintain the anonymity of the food vendors, the food vendors were not requested to write down their names as well as their identity numbers on the data-collection tool. Code names were used instead to identify participants.

3.10.5 *Privacy*

The Food vendor's identity such as house address and contact details was not sought during the data collection period and will not be used during research report writing or presentation. Only information relevant to the study such as gender, educational background will be requested as part of the study. No pictures were taken during data collection and no information pertaining to the study will not be given to anyone or be shown to anyone except those who are directly involved in the study such as the supervisor and co-supervisor and external moderators and to the stakeholders such as the statistician. No recorder or recording device of any kind was used during data collection to further ensure privacy.

3.10.6 *Benefits, Risk and Harm*

The researcher did not in any form or way entice the participants by promising them incentives or rewards as benefits. The results of the study have the potential to assist with safer food safety and hygiene practices to be implemented and adhered to by the street vendors. None of the questions and observations posed any risk but an assigned psychologist was made available in case participants experienced any harm or any risk during data collection. There were no foreseeable risks to the food vendors as no food samples were collected and no pictures of their stalls and operations were taken. There was no form of psychological harm to the participants during data collection and no participants were referred to the psychologist within the university campus during the period of data collection.

3.10.7 *Compensation for Research-related Costs and Inconvenience.*

Food vendors were not compensated in any form for participating in the study.

4 CHAPTER 4: INTERPRETATION AND PRESENTATION OF FINDINGS

4.1 Introduction

The previous chapter outlined the methodology used in this study. In this chapter, the results of the study are presented and interpreted. The main purpose or aim of the study was to determine food safety and hygiene practices of street vendors.

This chapter is divided into two subsections namely: **Section A**: results of self-reported food and hygiene practice of street food vendors. **Section B**: direct observation of the practice of the street vendors and the vending site.

4.2. Background characteristics of the street food vendors

Twenty-three (23) street food vendors were requested to participate in the study and only twenty (20) street food vendors gave consent to participate, yielding an 87% response rate. The participants comprised either the managers or supervisors of the stalls, where 60% (n=12) were females and 40% (n=8) were males. The results are as presented in Figure 4.1 below.

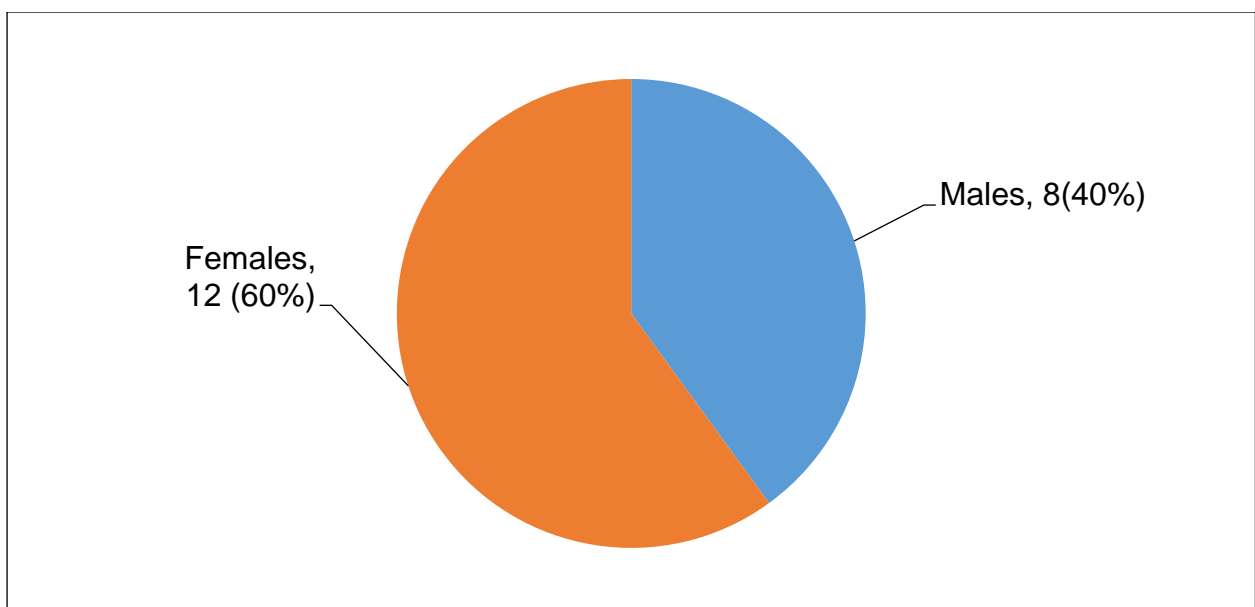


Figure 4.1: Gender distribution of street food vendors

The demographic characteristics of street food vendors are presented in Table 4.1 below. There was no statistical significant difference between males and females with

regard to age, level of education and training in food safety and hygiene ($p>0.05$). Sixty-five percent (65%) of the vendors were in the age group 30 years and older, 25% of the vendors were in age group 30-39 years comprising males and 33% of the vendors were females in the age group 30-39 years.

Considering the educational level, the majority of participants (65%) had secondary education with more females as compared to males, at 75% and 50% respectively. Sixty percent (60%) of the participants had three or more year's working experience as food vendors. A significant greater proportion of females compared to males had 3 or more years of working experience as food vendors (67% versus 50%, $p<0.05$). Ninety-five percent (95%) of the participants were not trained in food safety and hygiene.

Table 4.1: Demographics of the street food vendors by gender

	Overall	Male (n=8)	Female (n=12)	p-values
	n (%)	n (%)	n (%)	
Age (year)				
<30	7 (35)	3 (37.5)	4 (33.3)	0.928
30-39	6 (30)	2 (25.0)	4 (33.3)	
40+	7 (35)	3 (37.5)	4 (33.3)	
Level education				
Primary	3 (15)	2 (25.0)	1 (8.3)	0.471
Secondary	13 (65)	4 (50.0)	9 (75.0)	
Tertiary	4 (20)	2 (25.0)	2 (16.7)	
Period of work as food vendor				
<1 year	4 (20)	-	4 (33.3)	0.003
1-2 years	4 (20)	4 (50.0)	-	
3+ years	12 (60)	4 (50.0)	8 (66.7)	
Vendors trained on food safety/hygiene				
Trained	1 (5)	-	1 (8.0)	0.304
Not Trained	19 (95)	8 (100.0)	11 (92.0)	

4.3 Self-reported food safety and hygiene practices of street food vendors

4.3.1 Personal safety and hygiene practices of street food vendors

Table 4.2 below shows the self-reported personal safety and hygiene practices of street food vendors. Thirty percent (30%) of the participants reported that they wear protective hand gloves when touching food and 55% wear hair covers when preparing food. Slightly less than half of the vendors (45%) said they wear clean washable aprons when serving, selling and preparing foods and only 25% participants do not change their attire daily. With regard to illness, 40% of the participants indicated that they come to work or touch food when sick. In terms of hand washing practices, the majority (85%) said that they do not frequently wash their hands when serving food. In 55% of the stalls, water for hand-washing is not regularly changed for the clients while only 35% of the vendors reported that they provide either soap or gel for hand washing.

Table 4.2: Personal safety and hygiene of the street food vendors

	Yes n (%)	No n (%)
Vendors wear protective hand gloves when touching food	6 (30)	14 (70)
Vendors wear head caps when preparing food	11 (55)	9 (45)
Vendors wear clean washable aprons when serving, selling and preparing foods	9 (45)	11 (55)
When personnel are sick, they come to work	8 (40)	12 (60)
Worn attire is changed daily after work and clean one is used	15 (75)	5 (25)
Food servers wear head caps	9 (45)	11 (55)
Food servers wear hand-gloves	2 (10)	18 (90)
Food servers frequently wash hands	3 (15)	17 (85)
Client hand-washing water is changed frequently	9 (45)	11 (55)
Client given soap/gel for hand-washing	7 (35)	13 (65)

4.3.2 Food safety and hand hygiene practices by street vendors

Almost all (90%) of the street vendors reported that they kept their raw and cooked food in fridges and cabinets within the stalls and 85% of the vendors indicated that their stalls have a hand-washing basin. The results are presented in Table 4.3 below.

Table 4.3: Food safety practices and hand hygiene practices by street vendors

Food storage	Yes n (%)	No n (%)
Food kept in fridges/cabinets at vending site	18 (90)	2 (10)
Hand hygiene resource		
There is a hand washing basin in the stall	17 (85)	3 (15)

4.3.3. Environmental hygiene practices

Table 4.4 below presents the reported environmental hygiene practices on the vending sites and it shows that all vending sites are kept clean as they are maintained by the waste management from the local municipality. Only 15% of the vendors reported that their vending sites are fumigated for rodents or pests by the management of the local municipality and 85% are fumigated by the owners of the vendors. All the vendors indicated that they have access to cleaned toilets with clean water supply.

Table 4.4: Environmental hygiene of the street vending site

Environmental hygiene	Yes n (%)	No n (%)
Vending area kept clean and maintained by waste management	20 (100)	-
Vending site/area industrial waste bins are emptied daily	20 (100)	-
Vending site/area fumigated for rodents/pests by management	3 (15)	17 (85)
Vending site/area fumigated for rodents/pests by vendors	17 (85)	3 (15)
Toilet hygiene		
Toilets cleaned once a day	20 (100)	-
Toilets cleaned by hired cleaners	20 (100)	-
Toilets have water supply	20 (100)	-

4.4 Direct Observation of the practice of the street vendors and the vending site.

4.4.1 General information of the stalls

Table 4.5 shows the characteristics of the observed stalls and the majority of the stalls were made from brick/cement while 15% were made from corrugated iron.) Most (75%) of the stalls could accommodate less than five vendors at a time.

Table 4.5: Description of the stalls

	Total	Stall Type	
		Brick/cement n (%)	Corrugated iron n (%)
Stalls	20	7 (85)	3 (15)
Number of people stall can accommodate during preparation			
<5	15	13 (77)	2 (67)
≥5	5	4 (24)	1 (33)
Description of stalls in terms of preparation of food			
Total in number	20		
Stalls that prepared cooked food	18		
Stalls that don't prepare cooked food	2		

4.4.2 Observed Food safety and hygiene practice

Table 4.6 below presents the food safety and hygiene practices during preparation, storage and serving of food. Ninety percent (90%) of the vendors cooked food and the other vendors (2%) sold only raw food (food which are not cooked such as avocados, bananas, etc. Based on the observations made, none of the stalls that prepared cooked food n=18 (100%) used different colour-coded chopping boards and within this category, none prepared food at home, as they all prepared food on site and kept it well for selling. The observations also revealed that 95% of the vendors did not use different utensils when preparing food. Only 15% of the vendors kept raw food away

from cooked food and again only 15% of the street vendors kept or maintained their preparation tops and stoves clean regularly. Less than half (40%) used clean dish cloths throughout the production and dirty ones were washed properly and dried in the sun. Participants who constantly wore head caps throughout the production and preparation times were only (45%); those who wore protective hand-gloves were only (10%) and those who frequently washed their hands were only (15%). Eighty percent (80%) of the street vendors refilled food in the same containers that they used before without cleaning them first or using clean ones.

Table 4.6: Food safety and hygiene practice during preparation, storage and serving of food

Colour coded chopping boards and utensils	Yes (%)	No (%)
Different colour coded chopping boards are used	-	20 (100)
Different utensils used in each preparation	1(5)	19 (95)
Preparation of food		
Food prepared at home and brought to the stall in containers	-	18 (100)
Food is prepared on site and kept well for selling	16 (90)	2 (10)
Clean spoons are used all the time	16 (90)	2 (10)
Storage of food before and after cooking		
Raw food is kept away from cooked food	3 (17)	13 (82)
Area where food is prepared and dish cloths		
Preparation tops are cleaned regularly	3 (17)	13 (82)
The stoves are cleaned	3 (15)	17 (85)
Clean dish cloths are used all the time and dirty ones are washed properly and dried in the sun	8 (40)	12 (60)
Food safety		
Food covered with lids	16 (80)	4 (20)
Cooked served food refilled in same dish as before	16 (80)	4 (20)
Flies controlled	13 (65)	7 (35)
Personal hygiene		
Vendors wear head cap	9 (45)	11 (55)
Vendors wear protective hand gloves	2 (10)	18 (90)
Vendors frequently wash hands	3 (15)	17 (85)

Table 4.7 presents the environmental conditions around the vending sites. There were no signs of cockroaches/rodents around the vending site/stalls. There were no dish cloth drying area in and around the vending sites.

Table 4.7: Environmental conditions in the vending site

	Yes (%)	No (%)
The waste disposal area is well maintained and waste is managed or collected regularly	20 (100)	-
Each vendor/ stall has a dust bin / waste bin which is emptied regularly and cleaned regularly	20 (100)	-
Clean safe to drink and use water is available with controlled taps	20 (100)	-
Dish drying area available	-	20 (100)
Dish cloth drying area is exposed to sunlight and away from dirt and waste areas	-	20 (100)
Toilets are well cleaned and well maintained and kept closed away from the food	20 (100)	-
Dogs/cats eating the waste and feeding by the waste side and close to the vending stall	20 (100)	-
Cockroaches and rodents are available around the vending site and around the stalls	-	20 (100)
Vending site is kept clean	19 (95)	1 (5)
Vending bins are kept empty	16 (80)	4 (20)

Table 4.8 illustrates the hand hygiene practices in the various vending sites. There were no disposable towels given to clients for drying the hands. Only 25% of the street vendors changed hand-washing water frequently for clients and 60% of the vendors offered hand soap/liquid gel for the clients. In eighty percent (80%) of the stalls, the clients used the same water to wash their hands before and after eating.

Table 4.8: Client hand hygiene practice

	Yes(%)	No (%)
There are disposable towels for drying hand	-	20 (100)
Same hand towel is used by all	16 (80)	4 (20)
There is hand soap/gel for the hands	12 (60)	8 (40)
Hand washing water is changed frequently	5 (25)	15 (75)
Same water is used by all for washing	16 (80)	4 (20)

4.4 Conclusion

In this chapter, the results of the study were presented and interpreted. In the next chapter, the findings will be discussed and compared with relevant literature.

5 CHAPTER 5: DISCUSSION OF RESULTS

5.3. Introduction

Based on the interpretation of the results in chapter 4, the findings were discussed in this chapter.

5.2. Demographic data/characteristics of the street vendors

In this study, the majority (60%) of the vendors were females and the findings are in contrary to those by Low, Jani, Halim et al., 2015; da Silva et al., 2014; Okojie & Isah, 2014 & Sibanyoni et al., 2016) who found that almost all (99%) of the vendors in Mpumalanga were women. Again contrary to the current study findings, Mjoka and Selepe (2017) in KwaDlangezwa, Kwazulu Natal and Singh et al., (2018) at Uttar Pradesh, India reported more male street vendors than females, at 62% and 85% respectively.

In the current study, half of the vendors were 30 years and above, with 60% having secondary education. Similarly, da Silva et al., (2014) and Sibanyoni et al., (2016) reported sixty percent (60%) of the vendors being in the range of 30 years and above, and that most (65%) had attained secondary education level. However, Singh, Singh and Chaturvedani (2018) found that most of the participants (43%) were of a younger age of 30 years and below, 43% had primary level education while fewer (24%) were illiterate. Similarly, Cortese et al., (2016) in a study among street vendors at Florianopolis, Brazil revealed that almost half (49%) only had elementary education (a level between primary and secondary school) and only a few (23.3%) had gone up to secondary school. Women are perceived to be cooks and bread winners in most families, hence a greater proportion of participants are females in the current study (Parry & Segalo, 2017 & Malema, 2019). Given the economical deficiency in South Africa, most residents do not have the chance to go beyond secondary education as they ought to take care of the families and make money to be able to further their studies or create an opportunity for their siblings to go to school. (Ratlebjane, 2015)

5.3. Food preparation areas and resources

In this study, all of the street vendors (n=20, 100%) did not use or have colour coded chopping boards and even though they store both raw and cooked food in the fridges in the stalls, they do not keep and store raw food away from cooked food in both their cold and dry storages. The practice of not separating raw food from the cooked while being stored and cooked as well as not using different or colour-coded boards while preparing food fuels cross-contamination (Ken Hands Agencies, 2019 & HACCP Interantional, 2013). The importance of using different coloured boards is that cross contamination is eliminated and that every food chopped will be safely chopped on a specific board and not on one board which might not even be cleaned after every use. A study by Cortese et al., (2016) reported that 83% of their participants used different colour-coded cutting boards as mechanisms to prevent cross-contamination and to food safety. The above mentioned finding concurs with those by Al-Shabib et al., (2015).

In the current study eighty-five percent (85%) of vendors do not clean their preparation tops regularly and 60% of the vendors do not use clean dish cloths. The findings concur with those by Mjoka and Selepe (2017) who indicate that seventy-five percent (75%) of the vendors' dish cloths are not kept clean. Sanitation and hygiene practices for surfaces and usage of clean dish cloths is very important because improper food safety and hygiene practices lead to many health cases such as food poisoning as working surface areas and dish cloths can harbour pathogenic microorganisms (Okojie & Isah, 2014). Findings in a study by Walker, Pritchard and Forsythe (2003) in the United Kingdom showed that (97%) of food handlers lacked surface or working area cleaning and sanitation knowledge as a mechanism to prevent cross contamination. Imathiu (2017) emphasized the fact that there is an imperative necessity to endorse food safety practices in the production and consumption of street vended foods, predominantly in the developing countries where levels of hygiene standards are dubious and this study`s objectives share the same sentiment.

5.4. Food safety and hygiene training

All the street vendors in the current study (n=20,100%) do not have any form of food safety and hygiene training or education as part of support knowledge to food safety and hygiene practice. The findings concur with those by Sampundo et al., (2016) who reports that 95% of the vendors had not received any food safety training on proper food handling, hand hygiene and general measures on how to practise safe food handling and preparation. Food safety and hygiene is an important part of improving safety and hygiene practices. Rahman et al., (2016) emphasize in their study conducted in Northern Kuching City, Sarawak that the food safety and hygiene training of the food vendors influence food safety practice as it instills caution about food safety and hygiene and again influence health-orientated practices. Sibanyoni and Tabit (2017) recommend that National Schools Nutrition Programme managers be provided with food safety training as a prerequisite and Ehiri and Morris (2010) believes that food safety and hygiene training of food handlers have a potential of reducing food borne illnesses and food disease outbreaks.

5.5. Self-reported personal safety and Hygiene practices by street vendors

General hygiene measures and personal hygiene practices are very crucial in food safety and hygiene control. In the current study, 85% of vendors reported that they did not wash their hands frequently, 70% of the vendors did not wear protective hand-gloves and 40% of vendors reported for duty while sick. The results concur with those of Cortese *et.al.* in Florianopolis, Brazil (2016) who found that 95% of vendors did not wash their hands before and after transaction between foods, after using a restroom. These are serious concerns and confounding factors directly having an effect on food safety and hygiene as the vendors are primary food handlers in the preparation and serving of food and might serve as carriers of microorganisms (WHO, 2015). In a food handler's manual compiled by Singh and Dudeja (2017), there is a robust emphasis on proper hand-washing practices, personal hygiene, clean work attire and comprehensive follow-up of food-hygiene practices during work. Singh and Dudeja (2017) further emphasize that stringent restrictions need to be obligatory for food handlers during illness. Margas & Holal (2014) and Lelieveld & Holal (2016) indicate that people are the reservoirs and vectors of microorganisms and have the highest potential to contaminate food. Fortunately, in this study, 75% of the vendors reported that they change their worn attire daily and a clean one is used on a daily basis.

The fact that 40% of the vendors in the current study come to work when sick, is a cause for concern, more especially if food is touched and prepared without hand-gloves and in this study 70% of the participants reported that they do not wear protective hand gloves when touching food, similar to Cortese and colleagues in Florianopolis, Brazil (2016) who reported that 60% of vendors did not have appropriate hygienic habits such as using hand-gloves frequently. In most ready-to-eat foods, one of the contributing factors to outbreaks or contamination is personnel touching food bare-handed as well as improper washing of hands or failure to frequently wash hands (Greig et al., 2007). A possible reason for reporting for duty even while sick could be shortage of staff and fear of loss of remuneration as the street vendors are paid according to the hours worked. The vendors have an hourly or periodical payment plan and the more one is absent from work, the more money he or she loses. Singh, Dudeja et al., (2016) emphasize in their study that lack of personal hygiene and incorrect and unsafe food handling practices are among the major factors affecting street food safety and hygiene. Over and above the stated facts, 55% of the street vendors in this study wore hair cover when preparing food, 75 % wore clean attires to work daily and 85% of them have a hand-washing basin in their stall to be used for hand-washing which it is assumed it is used for.

5.6. Environmental factors contributing to food safety and hygiene

In this study, 85% of vendors reported that the vending area/ site is fumigated for rodents, cockroaches and pests. However, there was evidence of cockroaches and rodents in some stalls. The majority of the stalls were fumigated by the vendors themselves instead of the waste management department. Both the vendors and the waste management department can fumigate only on strict conditions that the used insecticides and pesticides are not harmful to humans and to food and do not come in contact with food, both raw and cooked. In most cases, the fumigator must have the license to fumigate for safety reasons, so that they could be trusted to know what they are doing.

Samampundo *et.al.* (2015) indicate that in their findings, 60% of the stalls, flies and animals were evident around the vending site but are not explicit as to the causal factor contributing to that but in my assumption it could be that the waste was not managed

or emptied at the time of data collection or perhaps there are many of them using one waste bin which gets full quicker and is not emptied frequently or perhaps the waste disposal management is not involved.

In this study, all vendors (n=20,100%) indicated that they have access to running water but Samampundo *et.al.* (2015) reported lack of access to potable water. Even though the vendors in this study have access to running water, a concern was that the water taps which were on top of the drains which were very filthy. The absence of a dish cloth drying area was also a concern as sunlight contributes to minimization of bacterial growth (Young-Min Bae & Sun-Young Lee, 2011). Exposure of food to flies, environmental factors such as dust, smoke, insects and mismanaged waste disposal dispose it to be a risk factor to contamination (Mensah, Yeboah-Manu, Owusu-Darko and Ablordey, 2002 and Mensah, Mwamakamba, Mohamed and Nsue-Milang, 2012).

6. CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

Even though street food is increasingly gaining popularity and accessibility based on affordability, vast traditional meals served and easy access, food safety and hygiene still is a serious concern to consider and a matter of alarm. The study indicates that all of the street vendors had no form of food safety and hygiene training. This is paramount in curbing the food-related illness cases as well as in promoting and practising appropriate and effective food safety and hygiene measures by all food handlers. The vendors also highlighted the fact that the vendors store raw and cooked food in the refrigerators in their stalls, but within the refrigerators raw food is not separated from cooked food. This practice fuels cross contamination and, similarly to cross contamination caused by failure to use different chopping boards for the preparation of food.

Only 30% of the vendors wear protective hand-gloves while preparing food and this is non-acceptable more, especially when hand-hygiene is not practiced. They have running water in the bathroom and on the premises but no soap is provided in the bathroom for hand-washing and one would also ask how many wash their hands after a visit to the rest room. A similar practice of poor hand hygiene was observed where hand-washing water for customers was not changed frequently.

6.2 Recommendations

6.2.1 National Department of Health: Food control and Food Legislation.

The current study findings raise an emphasis on the implementation of the National (South African) Food Control and Food Legislation. This will ensure that all premises where food is sold and handled ('prepared, packed, processed, produced, stored, exhibited or served') are subject to prior health approval, monitoring and certification (Certificate of Acceptability) by a registered professional Environmental Health Practitioner (). (National Health Act, 2003). Furthermore, the study recommends interventions by the Public Health to find ways of intervening for proper guidelines to be taught to the food handlers, interventions by the dietetics Department to find ways

of interacting with the food handlers as a mechanism of helping them to decrease high risks of food-borne illnesses and lastly the Hospitality sector to see the necessity of prompting for advocacy of food safety and hygiene.

6.2.2 Food safety and hygiene training

The current study findings also recommend that food safety and hygiene training be conducted to the street vendors for safe food safety and hygiene practices by the health promoter within the University of Limpopo Department of Public Health.

6.2.3 Monitoring and supervision of the street vendors by municipal food safety and hygiene specialist

It has been revealed in the current study findings that regular monitoring and check of the street vendors is not done. Therefore, regular monitoring of the vending sites by a health promoter and environmental hygiene specialist is highly recommended. The regular monitoring will emphasise the need for street vendors to be very cautious of food safety and hygiene practices and environmental hygiene as they prepare, store and serve food to the mass and become part of the strategies and means of eliminating and preventing food borne illnesses and food poisoning.

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Annexure 1: Data collection tool

Section A: Demographic Data

1. Age of the Manager/ Person in charge/ Owner

2. Gender of the Manager/ Person in charge/ Owner
 - Female
 - Male
3. The last/ highest grade of school completed
 - Grade 12
 - Grade 8
 - Degree
 - Post-graduate degree
 - None/ not gone to school
4. The length /period of work as a food vendor
 - Less than 1 year
 - 1-2 years
 - 3-4 years
 - 5-6 years
 - 7-10 years
 - More than 10 years
5. Any attended/ completed course or training in Food Safety and Hygiene
 - Yes
 - No

Section B: Manager Administration

Capacity Number	How many people can the stall accommodate in a given period for production or to undertake duties?	5+	-5
		YES	NO
Maintenance of the Area	Is the vending side kept clean and well maintained by:		
	waste management		
	Is the area fumigated for rodents and pests by the maintaining people?		
		YES	NO
Fumigation	Do you fumigate for insects such as cockroaches, etc?		
Toilets	How often are the stall cleaned ?	Once a Day	Once a Week
	Who cleans the toilets?	Hired cleaners	Themselves
		Yes	No
	Do you have water supply in the toilet?		
Industrial waste-bins	How often are they emptied?	Daily	Once a Week
		YES	NO

Hand Hygiene Practices by clients on the dining Area	The hand-washing water is changed frequently.		
	Soap and/or gel is given to clients to use for handwashing.		
		YES	NO
Water accessibility	There is water available on the vending site.		
	The water is safe and clean.		
	Water is bought and brought to the vending area.		
Storage of food	Food is kept in fridges and cabinets on the vending premises		
	Food is kept at home and brought to the vending area.		

Section C: Observation

Type of stall	the stall/vending place is made of	MADE OF	NOT MADE OF
	Corrugated iron sheets		
	Canopies		
	Small containers		
	Brick and cement		
		YES	NO
Ventilation of/in the vending stall	Windows available		
	There is an Entrance door.		
	There is an emergency Exit door.		

	There is a Fire-extinguisher.		
Cleanliness of the vending Area	Is the vending side kept clean?		
	The waste-bin is emptied.		
Toilets on the vending side	There is toilet paper in the toilets.		
	There is soap in the toilet or liquid gel for hands in the toilet.		
	There is running water in the toilets.		
	The toilets are clean/cleaned.		
Food Safety and Hygiene practices during serving	The food is covered with containers with lids.		
	Food is refilled in the same dish as before.		
	Food is refilled in a new cleaned dish.		
	Clean spoons are used to dish/serve.		
	Flies are controlled kept away from the food.		
	Servers wear hair covers.		
	Servers wear hand-gloves when touching food.		
	Servers wash hands frequently with each serving.		
Hand safety and hygiene practices by clients on the dining area	There are disposable towels for drying.		
	There is hand soap / gel for the hands.		

	Hand-washing water is changed frequently.		
	same water is used by all for washing hands.		
	Same hands towel is used by all.		
		YES	NO
Food safety and hygiene practices during preparation	Different colour coded chopping boards are used.		
	Food is prepared at home and brought to the stall in containers.		
	Personnel wash hands regularly and appropriately with clean water before, during and after handling.		
		YES	NO
Food safety and hygienic storage practices	Food is pre-prepared on site and kept well for selling.		
	Raw food is kept away from cooked food.		
	Different utensils are used in each preparation.		
	Preparation tops are cleaned regularly.		
	The stoves are cleaned		
	Clean dish cloths are used all the time and dirty ones are washed properly and dried in the sun.		
		YES	NO
Personal hygiene for food hygiene and safety	There is a hand washing basin in the stall.		
	Vendors wear protective hand-gloves when touching food and when serving.		

	Vendors wear hair covers when preparing food.			
	Vendors wear clean washable aprons when serving, selling and preparing foods.			
	When personnel are sick, they come to work or they touch food.			
	Worn attire is changed daily after work and clean one is worn daily.			
		YES	NO	
Dishwashing area	The dishwashing area has dish basins.			
	The drainage is available.			
	The drainage area is well cleaned and maintained.			
	There is a dish-drying area.			
Food storage for food hygiene and safety		YES	NO	
	Reheating equipments are available and functioning.			
	Reheating equipments are well functioning if available.			
	Bain marries are steam used.			
	There are temperature control storage facilities such as:			
	Fridges			
	Cold containers / rooms			
			YES	NO
Utensils	Wooden spoons for cooking are used.			
	Plenty and clean dish cloths are used.			

	Non-rusted metal serving spoons are used.		
	Heavy-duty metal pots are used.		
	Pots have lids and handles.		
		YES	NO
Pests and Insects	Are there cockroaches in the stall?		
	Are there cats and dogs?		
	Are there mouse and rats in the stall?		
	Are there fleas in the stall?		
Cleaning chemicals and equipment	Do they use a mop to clean?		
	Do they use one or more different mops ?		
	Do they use a specified or dedicated to clean bucket?		
	Do they use cleaning chemicals such as:		
	Pine gel?		
	Jik?		
	Chemico?		
	Domestos? Handy Andy? Or any other unmentioned ?		
	Is a broom (of any make) used for sweeping?		
		YES	NO
Vending location / environment	The waste disposal area is well maintained and waste is managed or collected regularly.		

	Each vending site / stall has a dust bin / waste bin which is emptied regularly and cleaned regularly.		
	Clean safe-to-drink-and-use water is available with controlled taps.		
	Dish cloth drying area is exposed to sunlight and away from dirt and waste areas.		
	Toilets are well cleaned and well maintained and kept closed away from the food.		
	Are there dogs eating the waste and feeding by the waste side and close to the vending stall?		
	Are there cats eating the waste and feeding by the waste side and close to the vending stall?		
	Are there other rodents, other than those mentioned, feeding by the vending stalls?		
	Are cockroaches available around the vending site and around the stalls?		

Annexure 2: Information leaflet and Informed Consent Form.



FOOD SAFETY AND HYGIENE PRACTICES OF STREET FOOD VENDORS AT GATE TWO VENDING SITE AT THE UNIVERSITY OF LIMPOPO, TURFLOOP CAMPUS, SOUTH AFRICA.

University of Limpopo, Department of Public Health support the practice of protecting research participants' rights. Accordingly, this project was reviewed and approved by the University Ethics committee and permission granted from Limpopo Department of Health. The information in this consent form is provided so that you can decide whether you wish to participate in our study. It is important that you understand that your participation is considered voluntary. This means that even if you agree to participate you are free to withdraw from the experiment at any time, without penalty. This study is an investigation into the food safety and hygiene practices among the food vendors at Gate 2 of University of Limpopo. In addition, your food vending area will be observed and inspected. This study poses no known risks to your health and your name will not be associated with the findings. For participation in this research project, you won't receive any remuneration. Upon completion of your participation in this study you will be provided with a brief explanation of the question this study addresses. If you have any questions not addressed by this consent form, please do not hesitate to ask. You will receive a copy of this form, which you should keep for your records.

We thank you for your time.

Researcher's Signature: _____

(Researcher's name, office and phone number): _____

CONSENT STATEMENT:

I have read the above comments and agree to participate in this experiment. I give my permission to be tape recorded, under the terms outlined above. I understand that if I have any questions or concerns regarding this project I can contact the investigator at the above location or the University of Limpopo, Department of Medical Sciences

(Participant's signature) (date)

Annexure 3: Editor Certificate

COMMENTS: I, ROBERT DAVID MAESELA KEKANA HAVE HAD THE SINGULAR HONOUR AND PRIVILEGE OF READING AND EDITING Ms DMR TLEANE (Student Number 200400778)'s M.A. DISSERTATON ENTITLED:

Factors affecting food safety and hygiene amongst the street vendors at Gate 2, University of Limpopo, Mankweng, South Africa.

THE TOPIC CHOSEN COULD NOT HAVE COME AT A MORE APPROPRIATE TIME. THERE IS A PROLIFERATION TODAY OF STALLS SERVING FOOD TO PEOPLE, ESPECIALLY IN OUR URBAN AREAS. PROPER MEASURES OF HYGIENE ARE THEREFORE ESSENTIAL BECAUSE FOOD POISONING HAS BECOME RIFE.

THE RESEARCHER HAS PROBED INTO HER SUBJECT MATTER WITH THE DILIGENCE AND CARE THAT SUCH A TASK REQUIRES. THE TERMINOLOGY, THE APPROACH, AND THE METHODOLOGY ARE ALSO APPOSITE.

CREDENTIALS: ROBERT DAVID MAESELA KEKANA HAS THE FOLLOWING QUALIFICATIONS:

QUALIFICATION

STD
B.A.
B.A. HONOURS
M.A.
Ph.D.

INSTITUTION

UNIN
UNISA
UNIN
DURHAM (UNITED KINGDOM)
POTCHEFSTROOM UNIVERSITY

I HAVE EDITED B.A. HOHOURS, B.ED., MASTERS AND Ph.D. MINI DISSERTATIONS, DISSERTATIONS AND THESES, RESPECTIVELY, IN THE COURSE OF MY CAREER AS AN EDUCATOR AND RESEARCHER.

.....
R.D.M. KEKANA

Annexure 4: TREC Certificate



University of Limpopo
Department of Research Administration and Development
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TURFLOOP RESEARCH ETHICS COMMITTEE
ETHICS CLEARANCE CERTIFICATE

MEETING: 06 February 2019

PROJECT NUMBER: TREC/50/2019: PG

PROJECT:

Title: Food safety and hygiene practices of street food vendors at gate two vending site at the University of Limpopo, Turfloop campus, South Africa.
Researcher: DMR Tleane
Supervisor: Dr E Maimela
Co-Supervisor/s: Mrs M Bopape
School: Health Care Sciences
Degree: Masters in Public Health

PROF P MASOKO
CHAIRPERSON: TURFLOOP RESEARCH ETHICS COMMITTEE

The Turfloop Research Ethics Committee (TREC) is registered with the National Health Research Ethics Council, Registration Number: REC-0310111-031

Note:

- i) This Ethics Clearance Certificate will be valid for one (1) year, as from the abovementioned date. Application for annual renewal (or annual review) need to be received by TREC one month before lapse of this period.
- ii) Should any departure be contemplated from the research procedure as approved, the researcher(s) must re-submit the protocol to the committee, together with the Application for Amendment form.
- iii) PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES.

Finding solutions for Africa

Annexure 5: Letter of permission to street food vendors at Gate 2



University of Limpopo

Department of Human Nutrition and Dietetics

Private Bag X1106, Sovenga, 0727, South Africa

rosina.tleane@ul.ac.za

Contact details; office: 015 268 3376 Cell: 0826732484

Attention: Vending owners' / vending practitioners,
Mankweng/Turfloop Municipality Vendors

Date: 30 October 2018

Dear sir/madam

REQUEST FOR PERMISSION TO CONDUCT RESEARCH WITHIN YOUR STALLS OR VENDING ROOMS

I hereby request your permission to conduct observational research in your vendors/ operation stalls as the student in the University of Limpopo. The topic of my research is: **FOOD SAFETY AND HYGIENE PRACTICES OF STREET FOOD VENDORS AT GATE 2 VENDING SITE AT THE UNIVERSITY OF LIMPOPO, TURFLOOP CAMPUS, SOUTH AFRICA**

I just want to observe how you handle food. A consent form will be given to you as a verification medium to volunteer in the study. Anonymity and confidentiality will be highly considered and implemented as you participate in the study and no information pertaining personal information, pictures and voices will be used. The results obtained from the study will be used under ethical protocols and obligations.

Your permission to conduct this study will be greatly appreciated as well as your participation

Yours sincerely
Tleane DMR

Finding solutions for Africa

Annexure 6: Five keys to safer food by WHO as a standard of reference

<p>Every day people all over the world get sick from the food they eat. This sickness is called foodborne disease and is caused by dangerous microorganisms and/or toxic chemicals. Most foodborne disease is preventable with proper food safety and hygiene practices.</p>		
ASPECTS	PROCEDURE	RATIONAL
keep clean	<ul style="list-style-type: none"> ▪ Wash your hands before handling food and often during food preparation ▪ Wash your hands after going to the toilet ▪ Wash and sanitize all surfaces and equipment used for food preparation ▪ Protect kitchen areas and food from insects, pests and other animals 	<p>While most microorganisms do not cause disease, dangerous microorganisms are widely found in soil, water, animals and people. These microorganisms are carried on hands, wiping cloths and utensils, especially cutting boards, and the slightest contact can transfer them to food and cause foodborne diseases.</p>
separate raw and cooked food	<ul style="list-style-type: none"> ▪ Separate raw meat, poultry and seafood from other foods. ▪ Use separate equipment and utensils such as knives and cutting boards for handling raw food ▪ Store food in containers to avoid contact between raw and prepared food 	<p>Raw food especially meat, poultry and seafood and their juices can contain dangerous microorganisms which may be transferred unto other food during food preparation and storage</p>
cook food thoroughly	<ul style="list-style-type: none"> ▪ Cook food thoroughly, 	<p>Proper cooking kills almost all dangerous</p>

	<p>especially meat and poultry.</p> <ul style="list-style-type: none"> ▪ Bring food to maximum of 70c at least to kill microorganisms. ▪ Reheat cooked food thoroughly. 	<p>microorganisms. studies have shown that cooking food to a temperature of 70 c can help ensure that the food is safe for consumption. Food that require special attention include minced meat, rolled roasts, large joints of meat and poultry.</p>
keep food at safe temperatures	<ul style="list-style-type: none"> ▪ Do not leave cooked food at room temperature for more than 2 hours. ▪ Refrigerate promptly all cooked and perishable food (below 5 0c preferably) ▪ Keep cooked food piping hot and under monitored storages and temperatures ▪ Do not store food for too long, even in the refrigerators ▪ Do not thaw frozen food at room temperature 	<p>Microorganisms can multiply rapidly and by maintaining storage below 5c0 and 60 c 0 , microbial growth can be hindered over a given period of time.</p>
Use safe water and raw materials	<ul style="list-style-type: none"> ▪ Use safe water or treat the water to be suitable ▪ Select wholesome food ▪ Choose safe areas of purchasing food and choose food processed for safety ▪ Wash fruits and vegetables ▪ Do not use food beyond its expiry date 	<p>Water may be contaminated with dangerous microorganisms and chemical. Toxic chemical may be formed in damaged and mouldy food. Care in selection of raw materials and practices such as washing and peeling may reduce the risks.</p>

Annexure 7: Time frame for the study

Activity	Target date Submission
Resubmission to School of Health Care Sciences research and Ethics Committee	10 October 2018
Faculty Higher Degrees Committee	15 November 2018
Turfloop Research Ethics Committee (TREC)	23 November 2018
Data collection	February 2019
Data analysis and interpretation of results	March 2019
Report writing	May – September 2019
Submission for External moderation and assessment	October 2019