SAFETY AND HEALTH PROBLEMS ASSOCIATED WITH FOOD FROM FOOD OUTLETS. THE CASE OF NYIKA GROWTH POINT. BIKITA DISTRICT, MASVINGO, ZIMBABWE.

BY

CHIRESHE AMATO

R146094Z

A DESSERTATION PRESENTED TO THE DEPARTMENT OF GEOGRAPHY AND ENVIRONMENTAL STUDIES IN PARTIAL FULFILMENT OF THE MASTER OF SCIENCE IN SAFETY, HEALTH AND ENVIRONMENTAL MANAGEMENT

MIDLANDS STATE UNIVERSITY

OCTOBER 2015

APPROVAL FORM

The undersigned certify that they have read and recommended to the Midlands State University for acceptance a dissertation entitled: Safety and health problems of food from food outlets: The case of Nyika growth point, Masvingo, Zimbabwe.

By

CHIRESHE AMATO

Submitted in partial fulfilment of the requirements of Msc Degree in Safety, Health and Environmental Management.

STUDENT…… .....DATE……

SUPERVISOR…… DATE……

CHAIRPERSON……DATE……

EXTERNAL EXAMINER……DATE……

DEDICATION

This dissertation is dedicated to my wife Lillian Chireshe and my daughter Anotida Blessing Chireshe. They assisted me with information and time to ensure success of this research.

ACKNOWLEDGEMENTS

The researcher is grateful to the Bikita District Rural Council, Ministry of Health and Child Care, Midlands State University authorities and Midlands State University lecturers. Special gratitude to Mr Manhokwe S, my supervisor for his patience and scholarly guidance he gave me during the research period. Without his guidance and encouragement, this dissertation would not have been a success.

ABSTRACT

This study focused on safety and health implications of food from food outlets at Nyika growth point. The purpose of the study was to evaluate safety and health hazards associated with food from food outlets. Records of the Bikita Rural District Council indicated that from 2006 to 2014, the number of food outlets increased by more than 100%. Cases of food borne illnesses increased by at least 100% according to the records of the Bikita District Hospital. A cross-sectional survey was used. Triangulation was also used. A sample of 69 people was used of which 26 were food outlet owners, 40 were food outlet consumers and 3 were key informants. Graph Pad Prism 4 was used to analyse quantitative data. One way ANOVA was used to test hypothesis and 5% significance level was used. Diarrhoeal diseases, vomiting and back pains were the main health implications. Cuts and burns were the main safety issues. Handling of food by ill employees, lack of financial resources and lack of food safety training were the main causes of food contamination at Nyika. Land and water pollution were the main environmental impacts. Each food outlet should have a cleaning schedule and running water at appropriate temperature. There should be more surveillance to collect information on diseases.

ACRONYMS

CDC-Centers for Disease Control and Prevention of United States

DEFRA-Department for Environment, Food and Rural Affairs (UK)

FAO- Food Agricultural Organization

ISO- International Organization for Standardization

WHO-World Health Organization

Contents

LIST OF TABLES

LIST OF FIGURES

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND TO THE STUDY

Food is essential to life but if contaminated can cause illness (Liscott, 2011). WHO regards contaminated food as one of the most widespread health problems worldwide (McEntire, 2004). Both developed and developing countries experience food borne illnesses but developing is more affected (WHO, 2005). The percentage of people suffering from food borne diseases each year in industrialised countries has been estimated to be 30% (WHO, 2003; WHO, 2006).

In developing countries, contaminated food cause about 80% of all diseases and more than 1/3 of all deaths (WHO, 2004).Large proportions of food borne diseases in developing countries result from poor sanitation and unhygienic handling of foods in restaurants and other eating outlets (WHO, 2007).

In US, about 48 million cases are reported, 128 000 hospitalisation and 3000 deaths every year due to food borne contamination (CDC, 2011). It was estimated that each year food borne illness causes about 2 366 000 cases, 21 138 hospitalisation and 718 deaths in England and Wales (Liscott, 2011). 5.4 million (32%) cases of gastroenteries a result of contaminated food were reported each year in Australia (WHO, 2007).

The Avian Influenza crisis in Asia has heightened public concerns over safety of foods of animal origin (Niode, 2010). First documented cases of Avian Influenza were reported in Hong Kong in 1997 and it resulted in six fatalities. In 2004, cases were reported in Viet Nam and Thailand (WHO, 2006). In China and Indonesia, cases of Avian Influenza were reported later (WHO, 2007).

In 2009, cases of food borne illnesses were reported in Costa Rica where more than 200 people were affected and hospitalised (Niode, 2010). Food borne diseases are also common in Africa for example in countries like Ethiopia because of the prevailing poor handling and

sanitation practices, lack of financial resources to invest in safer equipment and lack of education for food handlers(WHO, 2004). Cases of food borne illnesses reported from 1997 to 2003 were about 1 492 690 which resulted in 604 deaths (WHO, 2002). Because of rapid increase in food borne illnesses worldwide, the researcher has found it necessary to carry out this study in order to assess the safety and health problems of food from food outlets at Nyika.

1.2 STATEMENT OF THE PROBLEM

The number of food outlets at Nyika growth point has increased greatly as indicated by the records of the Bikita Rural District Council. According to the records, there were 35 registered food outlets at Nyika in 2006. By December 2014, the number increased to 70. This indicated a 100 percent increase. A survey contacted by the researcher at Nyika indicated that there were 80 food outlets. This means that 10 were not registered and might have negative safety and health implications.

Cases of food borne illnesses have been on the increase according to the records of the Bikita District Hospital. In 2006, there were 15 cases of food borne illnesses per year. In 2014, there were 34 cases of food borne illnesses per year. This represented more than 100 percent increase. This rapid increase is a cause for concern. So the situation at Nyika is having negative safety and health implications to all residence including those residing outside Nyika growth point. It could also have negative environmental impacts thereby affecting other living organisms in the area and beyond.

1.3 OBJECTIVES OF THE STUDY

1.3.1 MAIN OBJECTIVE

To evaluate safety and health problems of food from food outlets at Nyika growth point, Bikita District.

SPECIFIC OBJECTIVES

1 To identify the causes of food contamination at Nyika.
2 To assess environmental impacts of food from food outlets at Nyika.
3 To evaluate microbiological safety of food sold at Nyika.

1.4 HYPOTHESES

H_o: There is no significant difference in microbiological load in food samples at Nyika

H_1: There is significant difference in microbiological load in food samples at Nyika

1.5 JUSTIFICATION OF THE STUDY

This study takes a closer evaluation of the actual causes of safety and health issues associated with food from food outlets at Nyika. It looks at the effects of food outlets on human beings, the environment and other living things. The findings and recommendations would benefit different groups.

Local authorities would be in a position to identify shortcomings of food outlets within their jurisdiction thereby being able to help through proper inspection. Donors may cheap in by providing financial resources and equipment for local authorities since constraints of local authorities would be brought to light.

The Ministry of Health and Child Care would also benefit since it will be aware of the main causes of food borne illnesses. This would enable the Ministry to design strategies to reduce or eliminate food borne illnesses.

In addition, The Ministry of Environment, water and climate change would benefit from the findings on environmental impacts of food outlets. This would assist the Ministry in policy formulation and implementation.

Owners of food outlets will also benefit. They would be aware of practices leading to food borne illnesses. This would assist them in improving their food service practices thereby reducing food borne illnesses.

Finally, residence of Nyika would be aware of the causes of food borne diseases. This knowledge would assist them in improving their safety and health. For example they could improve their personal hygiene and shun food outlets having bad practices thereby promoting good practices.

1.6 STUDY AREA

Nyika is the growth point of Bikita district in Masvingo province. It is about 85km to the east of Masvingo city along Masvingo-Mutare highway as shown on figure 1 below. Soils are generally sandy which means they are generally poor. There is very little vegetation cover bearing testimony to widespread deforestation in the area. The climate is dry savannah. Temperatures are moderate to high and erratic rainfall averaging 600- 800mm per annum. Rozva is the only river passing through Nyika. There is properly structured settlement pattern at Nyika. Houses and business buildings form linear settlement pattern. Roads separate each line of buildings. The population of Nyika is two thousand five hundred (Zimbabwe census, 2012).

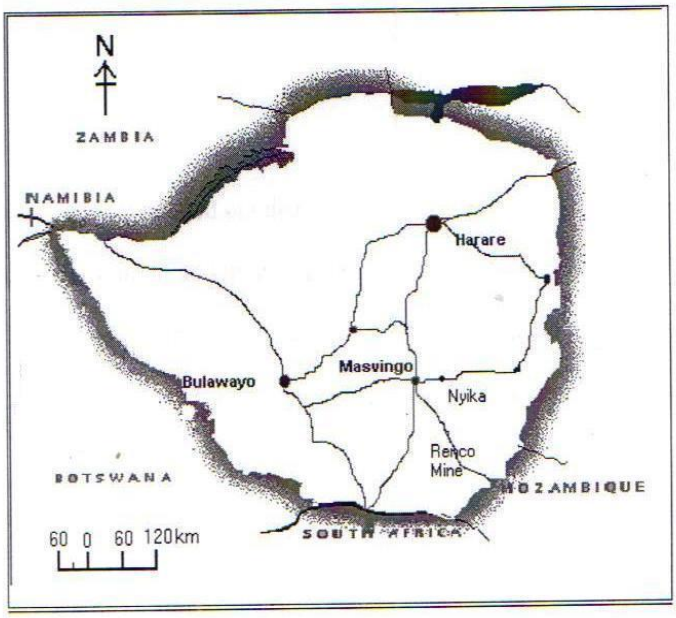


*Figure 1****: Map of Zimbabwe (Nyika) Munowenyu(2003)***

Africa > Zimbabwe > Masvingo > Nyika Growth Point

Nyika Growth Point

The picture with the title **Nyika Growth Point** was taken by the photographer **Muchinda** on 03 June 2011 and published over Panoramio. Nyika Growth Point is next to Gumunye School and is located in Masvingo, Zimbabwe. You can see the original site of the image here.

Creator: **Muchinda**

Latitude:**19°59'43.98"**

Longitude: **31°35'55.58"**

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

This chapter reviews global, regional and national (Zimbabwe) food safety. It also covers prerequisite programs, causes of food contamination and environmental impacts of food from food outlets.

2.2 GLOBAL FOOD SAFETY

Food safety can be defined as the assurance that food will not cause any harm to the consumer when it is prepared and or consumed according to its intended use (FAO/ WHO, 1997). There are several safety implications of food from food outlets (Story, 2008). The incidences of diarrhoeal diseases worldwide have been estimated to be 400 million per year of which 70% are food borne (WHO, 2010; WHO, 2000). This implies that food from food outlets is a cause of diarrhoeal diseases.

The percentage of people suffering from food borne diseases each year has been estimated to be up to 30% in industrialised countries (Scallan , 2011; WHO, 2003). In US, about 48 million cases are reported, 128 000 hospitalization and 3 000 deaths every year due to food borne contamination (Mead, 2000; Sivapalasingam, 2004). It is estimated that each year, there are 2 366 000 cases, 21 138 hospitalization and 718 deaths in England and Wales (WHO, 2006). An estimated 2 million deaths occurred worldwide due to gastrointestinal illness during the year 2005 (Fleury *et al*., 2008). In 2005, it was reported that 32% of 17, 2 million cases of gastroentries in Australia each year were estimated to originate from contaminated food (WHO, 2007). In 2010, contaminated food in Australia was estimated to be responsible for 30, 840 gastroenteritis-associated hospitalizations, 76 associated deaths and 5, 140 non gastrointestinal illnesses (Scallan, 2011). In 2000, food poisoning linked to milk products produced in the Osaka factory of the Snow Brand Company sicked 14 780 persons, making this Japan's one of the largest food poisoning outbreaks (WHO,2007; Niode *et al*., 2010). This implies that food borne illnesses occur in developed countries despite progress in food science.

Human beings can acquire zoonosis through food (WHO, 2005). Foods of animal origin have been known to be significant vehicles for the transmission of emerging and re-emerging food borne diseases (FAO/WHO 2002; 2005).For example the recent Bovine Spongiform Encephalopathy (BSE) and the Foot and Mouth Disease crises in Europe (WHO, 2002; DEFRA, 2005). In Belgium, traces of dioxin were found in certain products of animal origin since the ingredient was used in animal feed (FAO/WHO, 2002). In Asia, the Avian Influenza crisis has heightened public concerns over safety of foods of animal origin (Niode, 2010). The first documented cases of Avian Influenza were reported in Hong Kong in 1997 and it resulted in six fatalities (WHO, 2005). In 2004, cases were reported in Viet Nam and Thailand (WHO, 2006). In China and Indonesia, cases of Avian Influenza were reported later (WHO, 2007). Avian influenza can be found in many species of birds like chickens, turkeys and guinea fowl (WHO, 2005).This implies that food of animal origin can cause food borne diseases.

Biological food hazards include bacteria, viruses and parasites (Inteaz, 2004). *E.coli* is currently the leading cause of food borne illnesses in the United States (McEntire, 2004). In France, in the last decade of the 20th century, *Salmonella* was the most frequent cause of bacterial food borne illness (5, 700- 10, 200 cases), followed by *Campylobacter* (2, 600- 3, 500 cases) and *Listeria* (304 cases) (WHO, 2005). More than 200 diseases are transmitted through food including the major food borne illnesses of *Campylobacter, Salmonella, Llisteria and E.coli 0157 H7* (WHO, 2002). This is in harmony with World Health Organisation (2007) which noted that the most common pathogens responsible for food borne gastroenteries were pathogenic *Escherichia coli, Norovirus, Campylobacter and non-typhoidal Salmonella*.

About 80% of all diseases in developing countries are food borne and they cause more than 1/3 of all deaths (WHO, 2004; Wagacha, 2008). Food borne cases have been reported in countries like UAE, Costa Rica and Bangladesh (WHO, 2007). In 2009, cases of food borne illness were reported in Costa Rica where more than 200 people were affected and hospitalised (WHO, 2007).

The incidences of food borne diseases are not uniform within a given country. In 2000, data available indicated that the incidence of *Salmonella enteric serovar enteritidis* infection was highest among African Americans (Simonne, 2004; Sivapalasingam, 2004). Segments of population at high risk of experiencing food borne illness are the elderly, infants, young

children, pregnant women and those who are immune compromised like those who are diabetic and HIV positive (Simonne, 2004). This means that certain groups are more susceptible to food borne illnesses because of weakened immune system. This implies that certain groups might be at high risk of experiencing food borne illnesses.

The adverse health effects of food borne diseases range from gastroenteritis to life threatening conditions including cancer, birth defects and neurological, hepatic and renal syndromes (Scallan, 2011). The symptoms include fever, headache, nausea, vomiting, abdominal cramps, diarrhoea and paralysis (Scallan, 2011). This implies that these are some of the signs of food borne illnesses in different parts of the world.

Food borne illnesses include typhoid, cholera, dysentery, brucellosis and diarrhoea (WHO, 2002). Worldwide, the incidences of diarrhoea diseases alone have been estimated to be 400 million cases per year (WHO, 2000). More than 200 million episodes of diarrhoea occur in children under the age of 5 and of these three million die globally (Linscott, 2011; WHO, 2007). This implies that food can cause a variety of stomach problems.

Food chemical hazards include agricultural pesticides, fertilizers, food additives, preservatives, disinfectants and toxic metals like lead, mercury, cadmium and arsenic in different parts of the world (Story, 2008). Lead contributes to cardio-vascular diseases, mild mental retardation from childhood exposure leading to reduced intellectual function and the 2004 global burden of disease for these outcomes was estimated to be 143, 000 deaths (Navas-Aclen *et al*., 2007). This implies that there are various food chemical hazards worldwide.

Food physical hazards mean foreign objects that accidentally get into the food such as human hair, broken glass, stones, wood fragments, animal faeces and plastic from packaging cases (Inteaz, 2004). They also include naturally occurring objects such as bones in fillet (WHO, 2003). Physical hazards can cause injury to the mouth or teeth, can cause serious injuries if swallowed and depending on their size, shape and texture, have the potential to cause choking if swallowed (Inteaz, 2004).This implies that physical hazards are a threat to the safety and health of consumers.

Cuts are important health and safety issues in food services (WHO, 2006). Cuts are a result of sharp objects like knives especially when cutting food like meat in butcheries and could also be a result of cutting machines (Worsfold, 2001). In restaurants and grocery shops, cuts can

be a result of broken glass (WHO, 2000). This implies that injuries in form of cuts are associated with food from food outlets.

Burns are also a health and safety issue. Heat burns can be a result of hot oil, steam, hot water, ovens, hot pots, stove tops and other hot surfaces (WHO, 2007). This implies that burns are associated with food from food outlet.

Ergonomic hazards may occur due to repetitive motion, bending and lifting of heavy food (WHO, 2000). Lifting heavy foods may hurt workers' wrists and backs over time (WHO, 2000). This implies that ergonomic problems are associated with food from food outlets.

2.3 REGIONAL FOOD SAFETY

Several devastating food borne outbreaks have been reported on the African continent (WHO, 2005). In Kenya, cases of food borne illnesses reported from 1997 to 2003 were about 1 492 690 which resulted in 604 deaths (WHO, 2007; Wagacha, 2008). In 2004, Kenya experienced an acute Aflatoxicosis outbreak which was attributed to maize (WHO, 2005). In Thika District of Kenya, intestinal worms and typhoid are among the top ten leading causes of hospitalization (WHO, 2000). Angola registered 400 cases of bromide poisoning in 2005 associated with the use of sodium bromine as cooking salt (WHO, 2005). 260 asariases, 131 dysentery, 191 typhoid were reported in 1995 in Gambela region in Ethiopia and in 1991, 75 ascariases, 270 typhoid, 65 tapeworm and 29 infections hepatitis were reported in Afar region of Ethiopia (Wendafrash, 2010).This implies that unsafe food is the largest cause of diseases in developing countries and that many people die because of food related diseases.

Species of *Listeria* and *Enterobacter* were most prevalent bacteria in ready-to-eat foods in South Africa (WHO, 2005). *Campylobacter* infections in humans have been widely reported in Botswana, Malawi and Mozambique (FAO/WHO, 2004). This implies that biological food hazards are common in Africa.

Food poisoning from pathogens include headache, muscle pain, nausea, fatigue, fever, abdominal pain, vomiting and diarrhoea (Inteaz, 2004). Foods commonly involved in food poisoning incidents include meat and poultry and their products, eggs, milk and dairy

products, fruits and vegetables (Inteaz, 2004).This implies that microbiological hazards are one of the major causes of food borne diseases.

A study in Ghana some few years ago indicated that street food vendors source their pots and other utensils from both formal and informal retailers and samples had high levels of lead, cadmium, arsenic, mercury and copper since the chemicals could leach into food (WHO, 2002). This implies that food chemical hazards occur in Africa.

2.4 PREREQUISITE PROGRAMS AND CAUSES OF FOOD CONTAMINATION

Prerequisite programs can be defined as specified and documented activities or facilities implemented in accordance with the Codex General Principles of Food Hygiene, Good Manufacturing Practice and appropriate legislation in order to establish basic conditions that are suitable for the production and handling of safe food at all stages of the food chain (WHO, 2002). The prerequisite programs include premises and facilities, personnel training, hygiene and practices, sanitation and cleaning, pest control, equipment and transport and storage (Inteaz, 2004).

Premises (food outlets) should be located far away from sites that are sources of environmental contaminants, pest infestations, smoke or dust (FAO, 2001). The building exterior walls and roofs should be free of cracks that could be breeding sites for pests (Inteaz, 2004). This implies that poor food outlets locations, exterior walls and roofs could be sources of food contaminations.

Building interiors should have enough light for people to do their jobs and that the lights themselves do not present a hazard (McSwane, 2000). There should be adequate ventilation and air exchange throughout the building to prevent airborne contamination, condensation on any structure or equipment, and accumulation of dust (Inteaz, 2004). This implies that enough light, proper lights and adequate ventilation are essential since they prevent food hazards.

Employee facilities should include accessible hand washing stations at appropriate locations, with potable running water at a suitable temperature, soap or other hand-cleaning and sanitizing materials, sanitary hand-drying equipment for employees to wash and dry hands as

required (Codex Alimentarius Commission, 2003). Wash rooms and toilet rooms should be separated from and should not open directly into food storage, handling and processing areas (WHO, 2002). This implies that there should be suitable hand washing facilities for employees and that wash and toilet rooms should be properly located to avoid food contamination.

In addition, there should be designated containers with covers for collection of waste and garbage for temporary storage until disposal. The containers should be made of impervious material to prevent leakage and should be properly identified (Inteaz, 2004). The waste collection containers should be located on the grounds outside the building and should be maintained properly (McSwane, 2000). This implies that improper maintenance of waste collection containers could be a source of contamination or pest infestation.

Furthermore, all employees should be trained in the basic food safety principles and practices that are required to prevent contamination and cross-contamination of foods. Personnel food safety training covers hygienic food handling practices, personal hygiene requirements and the dangers associated with poor personal hygiene (Worsfold, 2005). This implies that personnel food safety training is essential since it involves basic food safety principles and practices that prevent contamination of foods.

In addition, employees with certain illnesses or injuries should be excluded from food handling activities (Inteaz, 2004). The illnesses include diarrhoea, fever, vomiting, infected skin, sore throat, burns and cuts. Excluded food handlers are permitted to resume food handling activities only on medical consent (Inteaz, 2004). This implies that excluding ill food handlers is essential since it prevents the spread of food borne illnesses since ill food handlers (disease transmitters) are removed near food.

Furthermore, there should be high standards of personal hygiene among food handlers which involves personal cleanliness and good hygienic habits (Inteaz, 2004). It includes having clean clothes, body and finger nails, refraining from placing fingers in nose or mouth, eating, spitting, smoking , sneezing and chewing while handling food (WHO,2004; Inteaz, 2004). Washing of hands with soap and water before start of work, after visiting toilet or after handling raw materials, equipment or waste shows high standards of personal hygiene (Inteaz, 2004; Codex Alimentarius Commission, 2003). It implies that high standards of personal hygiene prevent food borne diseases since it can protect against contamination of food products.

Poor personal hygiene among food handlers causes food contamination (Bermudez-Millan, 2004). Having dirty clothes and body, uncovered hair, placing fingers in the mouth, nose or ears, eating , chewing, spitting, coughing, sneezing over unprotected products and food-contact surfaces cause food contamination (Inteaz, 2004). Lack of hand washing make hands of food handlers dirty thereby making them sources of contaminants (Inteaz, 2004). This is in harmony with WHO (2007) which noted that large proportions of food borne diseases result from poor sanitation and unhygienic handling of foods in restaurants and other eating outlets in developing countries. This implies that bad personal hygienic practises among food handlers can result in contamination of food.

Cleaning and sanitizing is one of the hygienic practices in food outlets (WHO, 2010). There should be a written program for cleaning and sanitizing of the structures, facilities and equipment. The written program should identify each structure, facility and equipment to be cleaned and sanitized (Inteaz, 2004; Codex Alimentarius Commission, 2003). There should be a program for cleaning of all equipment including food handling equipment and food storage equipment like refrigerators and there should be a schedule for cleaning and sanitizing, along with any specific cleaning instructions for each type of equipment (Inteaz, 2004). All utensils used for handling like containers, pans and trays and food contact surfaces should be cleaned and sanitized as it becomes necessary (Inteaz, 2004). This implies that it is a way of preventing food contamination since it involves removing and killing of microorganisms present on equipment.

There is also prerequisite program pest control which covers the specific activities that are directed at, controlling, preventing and excluding the occurrence of pests particularly rodents, insects and birds from the plant (Inteaz, 2004). The program should have measures that are taken to exclude and eliminate pests and pest-control devices should be located at appropriate positions where they are most effective for removing pests from the building (FAO, 2001). Pest-control personnel should have the required qualification and training and only chemicals approved as pesticides by the appropriate regulatory agency should be used for pest control (Wendafrash, 2010). This implies that inappropriate pest control can cause food contamination.

Prerequisite program equipment includes activities directed at design, construction, installation, performance, maintenance , use of equipment and calibration of equipment used for monitoring and measuring parameters at any point in the process of detection,

elimination, control or prevention of food safety hazards (Inteaz, 2004). Food contact surfaces of equipment should be made of nontoxic material and should not be corroded or damaged when in contact with raw materials, products and cleaning materials and maintenance personnel should be aware of the practices to be followed to ensure that contamination of product does not occur as a result of equipment maintenance (Inteaz, 2004). Contaminated equipment is a source of food contamination. Unclean utensils that touch raw food and ready to eat food cause contamination (Story, 2008). This implies that unclean equipment can cause food contamination. Proper equipment and proper maintenance of the equipment prevent food contamination.

In addition, there is prerequisite program transport and storage. Raw materials, ingredients, packaging materials should be stored separately to prevent any likelihood of cross-contamination of products (Story, 2008). Transport vehicles should be inspected to ensure that the sanitary conditions of the vehicle are satisfactory and there was no potential for tampering or contamination of materials during delivery (Inteaz, 2004). Inteaz (2004) also noted that poor maintenance of storage equipment like freezers and refrigerators results in materials and products stored under inappropriate conditions which cause deterioration of foods. This implies that proper storage and transportation are practices of preventing food borne diseases since they can prevent contamination, cross-contamination or pest infestation of raw food, ingredients and package materials. Failing to separate raw and cooked foods results in contamination of cooked foods.

Inappropriate cooking is a cause of food contamination. If food is cooked for inappropriate length and inappropriate temperature to kill pathogens, it can be a health hazard (Dorny, 2009). This implies that food should be thoroughly cooked to control biological hazards. If not thoroughly cooked, the food can contain biological hazards.

In addition, absence of food inspection can be a cause of food contamination (Yapp and Fairman, 2004). Food inspection is a way of enforcing the law which promotes good handling practices (WHO, 2005). This implies that lack of food inspections can cause food contamination in the sense that there might be improper storage of food, inappropriate cooking and poor personal hygiene among food handlers.

Furthermore, purchasing food from unapproved sources can result in food borne illnesses. Unapproved food sources are usually associated with poor storage, inappropriate cooking and

poor personal hygiene among food handlers (WHO, 2010). This implies that unapproved food sources can be sources of food contamination.

Lack of financial resources to invest in safer equipment and lack of education among food handlers can cause food contamination (WHO, 2004). This implies that financial constraints can result in the use of unsafe equipment which may cause food contamination. Awareness on good hygienic practices is very essential because if the knowledge is lacking among food handlers, improper practices could be common thereby causing food contamination.

Failing to keep food at appropriate temperature can cause food contamination (Inteaz, 2004; Codex Alimentarius Commission, 2003). Bacteria grow quickly when temperatures of high risk food are between 5 and 60 degrees Celsius (WHO, 2004). This implies that keeping cold food cold at 5 degrees Celsius or colder and hot food hot at at least 60 degrees Celsius prevents food contamination.

2.5 ENVIRONMENTAL IMPACTS OF FOOD FROM FOOD OUTLETS

Food preparation results in emission of greenhouse gases like carbon dioxide. This is due to burning of fossil fuels like wood and coal (WHO, 2007). Carbon dioxide reduces the loss of long wave radiation from the earth atmosphere system (Waugh, 2009). This implies that food from food outlets can cause global warming since it involves burning of fossil fuels during cooking which produce carbon dioxide one of the major greenhouse gases.

In addition to that, food causes solid waste generation. This includes food waste and packaging materials (Worsfold, 2005). Glass, plastics and cardboard are part of packaging material. Food waste and packaging materials constitute significant portions of overall US municipal waste stream (Scallan, 2011; Mead, 2000). This implies that food from food outlets can be associated with generation of solid waste.

Food from food outlets causes water pollution. Wastewater from food outlets can increase Biochemical Oxygen Demand (BOD) (Andrew *et al*., 2013). They noted that domestic waste water obtained from fast food outlets at the City Centre in Benin City, Edo State in Nigeria had high BOD. The waste water had low Dissolved Oxygen (DO) due to high BOD(Andrew et al., 2013).Food outlets are point sources of water pollution (Scallan , 2011; WHO, 2007). This implies that wastewater from food outlets can affect the quality of water negatively by

increasing BOD and reduce DO since the wastewater can contain fertilisers applied during growth of food crops.

Nutrients like nitrates and phosphates in wastewater from food outlets can stimulate excessive plant growth which may release toxins to the water leading to oxygen depletion and this process is known as eutrophication (Williams *et al*., 2006). Meat, poultry and related products have estimated contribution of 24% of eutrophication of all food products; milk and dairy products have 10% while cereal, bread and flour have 9% (Dorney, 2009). This implies that different foods have different eutrophication potential.

2.6 FOOD SAFETY IN ZIMBABWE

A major cholera epidemic occurred in Zimbabwe in 2008 with 98,585 reported cases and 4,287 deaths (WHO, 2010). By December 2008, the disease was reported from all 10 provinces in Zimbabwe and the Zimbabwe Minister of Health and Child Care declared a state of emergency (WHO, 2008). This implies that food related problems are common in Zimbabwe including Masvingo which is one of the 10 provinces in the country.

Campylobacter infections in humans have been widely reported in Zimbabwe and poultry were the likely source of food contamination (FAO/WHO, 2004). This implies that biological hazards are making food in different parts of Zimbabwe unsafe for human consumption.

In Zimbabwe, Environmental Health Technicians from local authorities and Ministry of Health and Child Care are empowered by the Public Health Act [15:09] and the Food and Food Standards Act [15:04] to inspect where food is sold or prepared and to collect food samples (Public Health Act [15:09; Food and Food Standards Act [15:04]). Food inspection in Africa is generally weak partly due to the fact that inspection services are split between various departments and ministries and lack of proper training of personnel (FAO/WHO, 2003). This implies that there might be poor food inspection in Zimbabwe.

Improper slaughtering practices in Zimbabwe can cause food contamination of meat (Public Health Act [15: 19]). This implies that food especially meat can be contaminated during slaughtering if good slaughtering practices or procedures are not adhered to.

Statistics available show that prevalence of suspected anthrax cases in Zimbabwe was as much as 1 per hundred thousand population in 1999 and 2 per hundred thousand in 2002 (WHO, 2004). This implies that anthrax which is a food borne disease from meat is common in the country.

Food vending plays an important role in Zimbabwe as it provides a wide variety of foods that are relatively cheap (Kwiri *et al*., 2014). Most people in Zimbabwe are now eating food in outlets. However, the foods have implications as noted by Kwiri *et al* (2014). They noted that 80% of the samples of cooked vended foods at Mbare Msika were highly contaminated with *S. aureus* and 53 % of the total sampled food items were *E. coli*. contaminated. Little has been documented for Nyika; this research seeks to evaluate safety and health implications of food from food outlets at Nyika growth point.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 INTRODUCTION

This chapter looks at research design, research instruments, population and sample, data collection procedures and data analysis and presentation.

3.2 RESEARCH DESIGN

A research design can be defined as the structure of research. It provides the glue that holds the research together (Gwimbi and Dirwai, 2003). It implies a plan of action to be used to answer research questions. A cross-sectional survey was used. A cross-sectional survey records events occurring at a particular point in time. It is done only at one point in time for each member of the population. In this case it involved recording the outcome of exposing people to unsafe food. Triangulation was used which means combining qualitative and quantitative research. The rational for using qualitative approach in this research was to explore and describe attitudes, opinions and perceptions of food outlet owners, food consumers and health officials on safety and health implications of food from food outlets at Nyika. Qualitative approach complements quantitative approach thereby having an effective approach.

Triangulation was the most suitable approach for this study since it corresponds with the data collection tools used. In this case questionnaires and interviews were used. Questionnaires were used to collect quantitative data while interview guides were used to collect qualitative data. Observation checklist also collected qualitative data.

3.3 POPULATION

Population consists of all the possible observations of the random variable under study (Waugh, 2009). This means it is all the possible cases of interest. The researcher used all

restaurants, butcheries and grocery shops at Nyika growth point. Consumers of food from these outlets were also used.

3.4 SAMPLING TECHNIQUES

Stratified sampling was used to select restaurants, butcheries and grocery shops involved in the study. Food outlets were divided into sub groups in this case restaurants, butcheries and grocery shops. Then random samples of a predetermined size were obtained from each sub group. In this case, 14 restaurants, 6 butcheries and 6 grocery shops. Purposive sampling was used to select three key informants namely the Environmental Health Technician (EHT), nurse in charge at Bikita district hospital and the council social services officer. Convenient sampling was used to select food consumers.

3.5 SAMPLE SIZE

The total number of food outlets at Nyika was 80. A sample of 26 food outlets was used of which 14 were restaurants, 6 butcheries and 6 grocery shops. Food outlet owners became respondents. 40 food consumers were used of which 28 were from restaurants, 6 from butcheries and 6 from grocery owners. Three key informants were also used. So, a total of 69 people made the sample of which 26 were food outlet owners, 40 food consumers and 3 key informants.

3.6 RESEARCH TOOLS

The researcher used questionnaires, interview schedules and observation checklist to collect data. These instruments enabled the researcher to collect a wide range of information. That is quantitative and qualitative.

3.6.1 QUESTIONNAIRES

A questionnaire is a document containing a list of questions the researcher intends to ask each respondent. Space is provided after each question for the response (Brown, 2001). So it is a means of eliciting the feelings, experiences, perceptions or attitude of some sample of individuals. In this case the documents had questions on safety and health implications, practices and environmental impacts of food from food outlets at Nyika growth point.

There are two types of questions on a questionnaire namely open ended and closed ended. The respondent has room to say anything within the scope of the question for open ended questions while closed ended questions limit the respondent to the choice provided. Both closed and open ended questions were used to collect both quantitative and qualitative information. Questionnaire for restaurant owners had 23 closed ended questions and 3 open ended questions. Questionnaire for grocery and butchery owners had 19 closed ended questions and 3 open ended questions.

Questionnaires were used because same questions were repeated to different respondents thereby being able to assess the accuracy of information given concerning safety and health implications, environmental impacts, practices and constraints of food outlets at Nyika growth point. In addition, the instruments were used since survey method was used. This is in harmony with Gwimbi and Dirwai (2003) who noted that a questionnaire is used where primary data collection is to be carried out by way of survey. It implies that a questionnaire is one of the most appropriate tools to be used when carrying out a survey. Information that was collected through the use of questionnaires was easy to analyse.

However, one problem faced was that, it was very difficult for illiterate respondents to answer questions. To solve this problem, respondents with high level of illiteracy were asked questions in the language they understand (Shona) and the researcher wrote down their answers.

3.6.2 INTERVIEWS

An interview can be defined as one to one verbal interaction between the researcher and the respondent for a purpose (Gwimbi and Dirwai, 2003).Thus it is a face to face discussion between the interviewer (researcher) and interviewee (respondent). It is not just a chat in

which one talks about anything but is directed so that it provides the most useful information. In this case the most useful information was safety and health implications, environmental impacts, practices and constraints of food outlets at Nyika growth point. Interview schedules do not have space where the interviewee can fill.

There are two types of interviews. These are fully structured and semi-structured. A fully structured interview has a predetermined set of questions and responses are recorded on the schedule (Gwimbi and Dirwai, 2003). It implies that the researcher has no freedom to modify questions during conversation. It is not flexible. Semi- structured interview enables the researcher to modify questions during conversation. The researcher used semi-structured interview since it is more flexible. It enabled the researcher to change wording and skip aspects which was inappropriate during the conversation. The researcher was able to probe interesting items on safety and health implications of food from food outlets. Because of the interview, the researcher came into contact with the subjects hence used various questioning techniques to obtain information.

Face to face interviews were conducted with 40 food consumers at Nyika growth point. The researcher also conducted interviews with three key informants namely the EHT, council social services official and the nurse in charge. The nurse in charge was interviewed since she is the person with all the information related to food borne illnesses in the district. The Environmental Health Technician was interviewed since he is the person responsible for health inspection of all food outlets at Nyika thereby having information on health issues related to these food outlets. The council social services officer had information on safety and health within shops at Nyika.

3.6.3 OBSERVATION CHECKLIST

Observation checklist was used to collect information on pre-requisite programs (hygienic practices) thereby complementing data from questionnaires and interviews. Surfaces, personnel, equipment, food storage, hand washing facilities, toilet rooms, sources of fuel and food waste management were observed.

3.7 DATA COLLECTION PROCEDURES

Firstly, the researcher asked for permission to carry out the research from the Bikita Rural District Council and from the Ministry of Health and Child Care through application letters. After being granted permission, the researcher obtained informed consent from the research participants before collecting data. In this case the participants included food outlets owners, food consumers and three key informants. Then the researcher made appointments with the respondents. 26 questionnaires with both closed and open ended questions were personally distributed of which 14 to restaurant owners and 12 to butchery and grocery owners. Questionnaires for restaurant owners were different from those for butchery and grocery owners. After completion, they were personally collected. 43 flexible interviews were used for 40 food consumers and 3 key informants.

Field observations were also conducted within food outlets and surrounding environments. Field observations enabled the researcher to get correct information on the ground especially on environmental impacts and practices of food outlets. Observations, interviews and microbial examinations were used for the purpose of reinforcing questionnaire data.

Secondary data collection methods were also used. An extensive search was conducted on internet sources for safety and health implications of food from food outlets to get informed on the prevailing situation elsewhere. The researcher also read public documents such as Public Health Act and Food and Food Standards Act. This enabled the researcher to get information on safety and health implications, food practices and environmental impacts. So secondary data collection methods supported data which was collected using questionnaires, interviews and field observations.

3.7.1 Microbial Safety Assessments

3.7.2 Sample collection

Six food samples were randomly collected from the selected restaurants and butcheries. Two of the samples were uncooked beef, two salads and two were rice. Two butcheries from the selected were randomly picked and the researcher collected two beef samples one from each. The researcher randomly picked four restaurants from the selected 14. Then the researcher

collected two salad samples from two of the restaurants and two rice samples from the other two restaurants.

The above picture shows the researcher collecting beef sample from one of the selected butchery

The above picture shows the researcher collecting the other beef sample from the other butchery

The above picture shows the researcher collecting cooked rice sample from one of the restaurants

Collected food samples were put in food collection bottles and were properly closed. Then the bottles were put in a cooler box and were taken to Midlands State University' s Food and Nutrition Laboratory for microbiological examinations. The researcher had protective

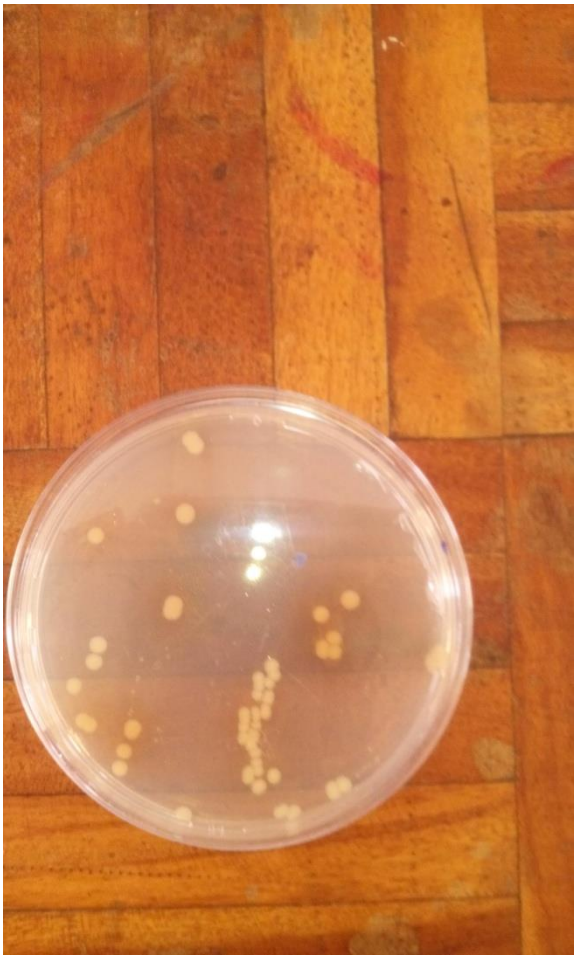
clothing as shown on the above pictures while collecting samples to avoid food contamination.

The picture above shows the six food samples collected in food collection bottles and the cooler box which was used.

3.7.3 SAMPLE ANALYSIS

Violet Red Bile Agar (VRB) (7, 8 g) was mixed with 200ml of water. 5,6g of Nutrient Agar (NA) were mixed with 200ml of water. 3,22g of Buffered Peptone were also mixed 200ml of water to make Peptone water. VRB was boiled. NA and Peptone water were sterilised in the automatic Autoclave at 121 degrees Celsius for 15 minutes. VRB, NA and Peptone water were then allowed to cool.

Ethanol was used to make sure that surfaces were free from bacteria. Potato Dextrose Agar (PDA) was put in 6 plates; VRB into 6 plates and NA into 6 plates. Peptone water was put in each of the six bottles containing food samples. Then, liquid was collected from each of the bottles and spread in plates with PDA, VRB and NA. Plates were put in an incubator at 37 degrees Celsius for 24 hours for bacteria to grow. Some plates with PDA, VRB and NA but without inoculum were also put in the incubator to act as controls. Then, the bacteria were counted using colony counter and analysed after 24 hours.



The above pictures show plates with bacteria after 24 hours.

3.8 STATISTICAL ANALYSIS

The data was both qualitative and quantitative and was presented and analysed differently. Graph Pad Prism 4 software was used to analyse quantitative data. One way ANOVA was used to test hypotheses and 5% significance level was used (α=0, 05). Qualitative data described and explained the safety and health problems of food from food outlets. Findings of the research were presented through the use of tables, graphs and pie charts and the significance of each illustration was briefly explained.

CHAPTER FOUR

PRESENTATION OF RESULTS

4.0 INTRODUCTION

The thrust of this chapter was to present results obtained through questionnaires, interviews, observation and microbiological examinations. The information was presented in tables and figures.

4.1 QUESTIONNAIRE RESULTS

Table 1: ***Food usually consumed from restaurants***

Food consumed	**% of respondents**
Cooked stew	16
Roasted beef	12
Roasted chicken	19
Salads	16
Rice	19
Sadza	18

As shown on Table 1, rice and roasted chicken were most preferred by the majority of respondents. The preference to all food groups could be attributed to the nature of activities at a growth point like Nyika where most people are in transit.

Table 2: ***Knowledge on food safety practices***

Question	**Type of food outlet**			
	Restaurant		**Grocery and Butchery**	
	% of respondents		**% of respondents**	
	Yes	**No**	**Yes**	**No**
Do you cook food to appropriate temperature?	100	0		
When preparing food, do you take steps to prevent food contamination?	100	0		
Are food handlers not allowed to handle food if they are known to be suffering from food borne illness?	93	7	67	33
Are they permitted to resume food handling on medical consent?	36	64	17	83
Do food handlers undergo food certification?	100	0	92	8
Is food protected from contamination?	100	0	100	0
Do you ensure all food contact surfaces are clean all times?	100	0	100	0
Is displayed food protected from contamination?			100	0

The majority of respondents had knowledge on food safety practices. Table 2 shows that 100% of restaurant owners cooked food to appropriate temperature and took steps to prevent food contamination. 100% of food outlet owners ensured that all food contact surfaces were

clean. However, the majority of respondents (64% of restaurant owners and 83% of grocery and butchery owners) allowed excluded ill food handlers to resume food handling without medical consent as illustrated on Table 2.

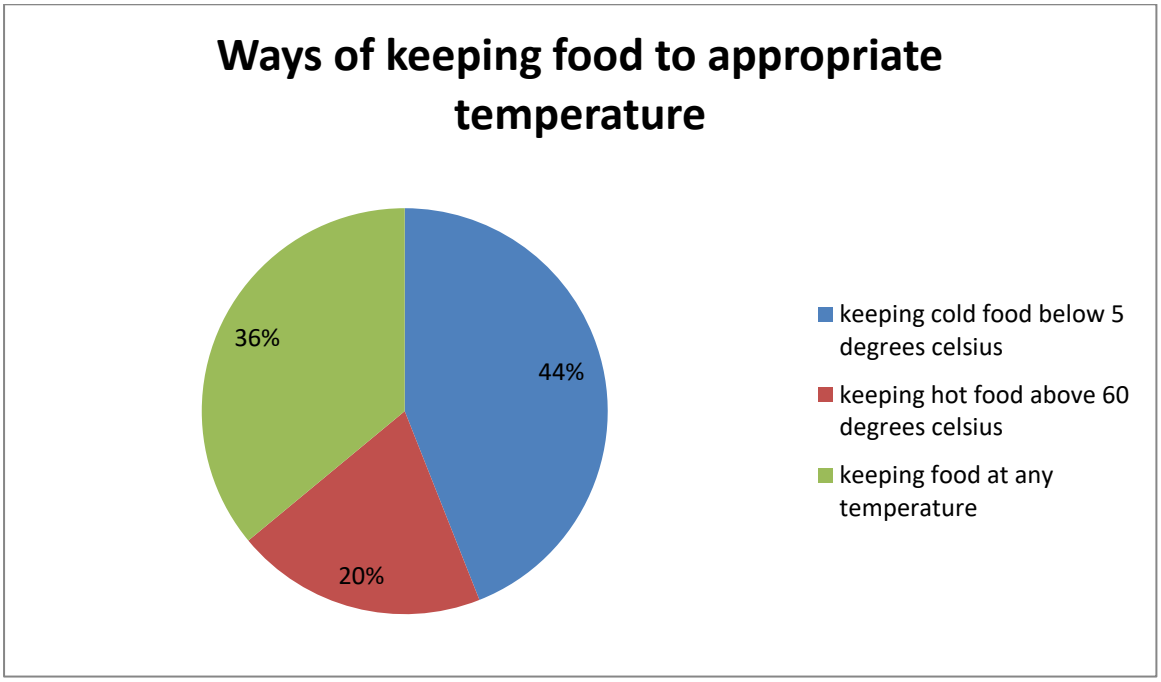


*Figure 2****: Responses on how to keep food to appropriate temperature by restaurant owners.***

Most of the respondents kept food to appropriate temperature. 44% of restaurant owners kept cold food below 5 degrees and 20% of them kept hot food above 60 degrees Celsius but 36% of the respondents did not adhere to prescribed temperatures as they kept food at any temperature as highlighted on Figure 2.

*Figure 3**: Responses on methods used to prevent food contamination by restaurant owners***

Figure 3 show that most of the respondents prevented food contamination by refrigerating and roasting. 29% of restaurant owners put food in the refrigerator and 25% of them did so by roasting. Salting was used by the least number of restaurant owners. Only 5% of the respondents used salting as illustrated on Figure 3. This could be due to the type of food stored.

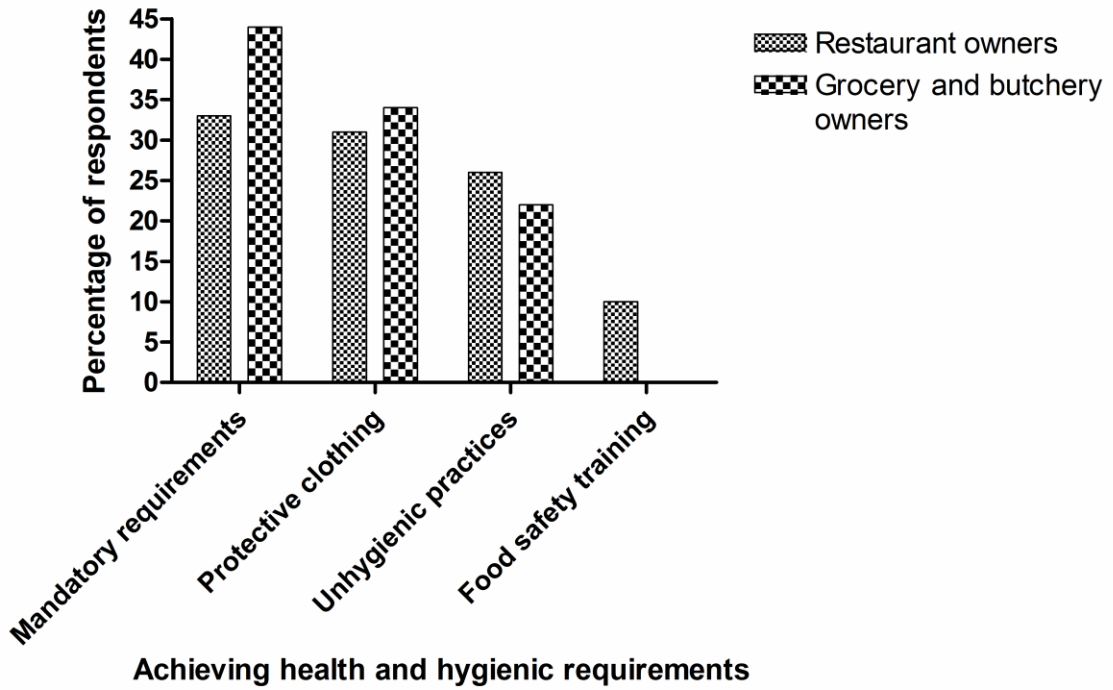


Figure 4: Responses on how to achieve health and hygienic requirements by food outlet owners.

More grocery and butchery owners were aware of mandatory obligations than restaurant owners. Figure 4 illustrated that 44% of grocery and butchery owners were aware of mandatory obligations while 33% of restaurant owners were aware of mandatory obligations. Some employees in restaurants were involved in food safety training while none from grocery and butchery outlets were trained. 10% of the employees in restaurants had been involved in food safety training while 0% from grocery and butchery outlets was trained as highlighted on Figure 4.

Table 3: Food certification frequency

Certification frequency	**Restaurant**	**Grocery and Butchery**
	% of respondents	**% of respondents**
Quarterly	0	18
Once in six months	29	0
Annually	71	82

It has been noted that very few food employees were food certified quarterly. 18% of grocery and butchery food employees were certified quarterly while 0% of employees in restaurants were certified quarterly as illustrated on Table 3. The majority of food outlet employees were

certified annually. As indicated on Table 3, 71% of restaurant employees and 82% of grocery and butchery employees were certified annually. According to the Public Health Act, food outlet employees should undergo medical examination once a year.

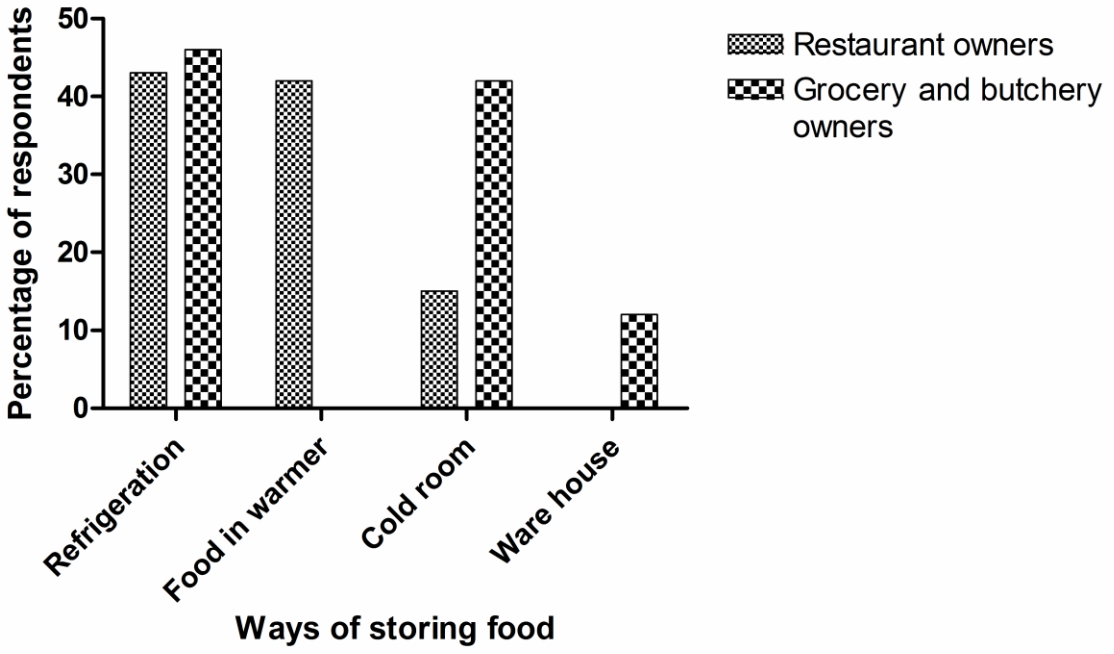


Figure 5: Ways of storing food

Most of the food in restaurants was stored in refrigerator and warmer. Figure 5 highlighted that 43% of restaurants stored food in refrigerators while 42% of them stored in a warmer. Most of the food in grocery and butchery shops was stored in refrigerator and cold room. 46% of grocery and butchery shops stored their food in refrigerators while 42% of them stored it in the cold room as indicated on Figure 5. This could be due to the nature of food which requires low temperatures.

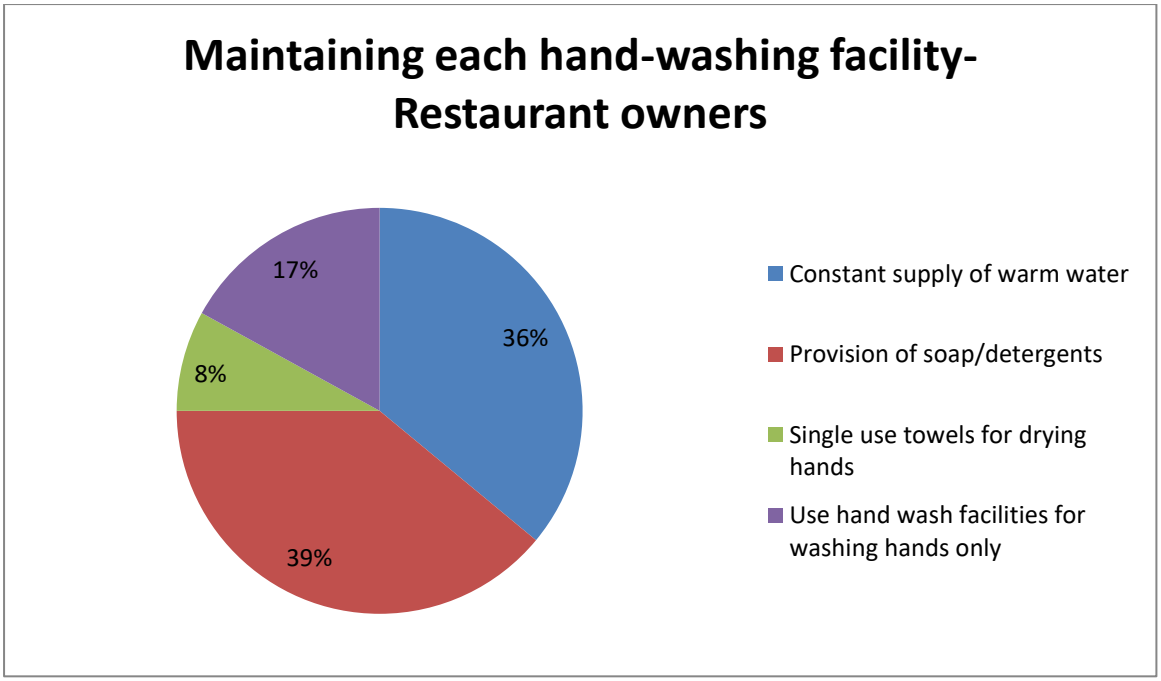


Figure 6: Responses on ways of maintaining each hand-washing facility by restaurant owners

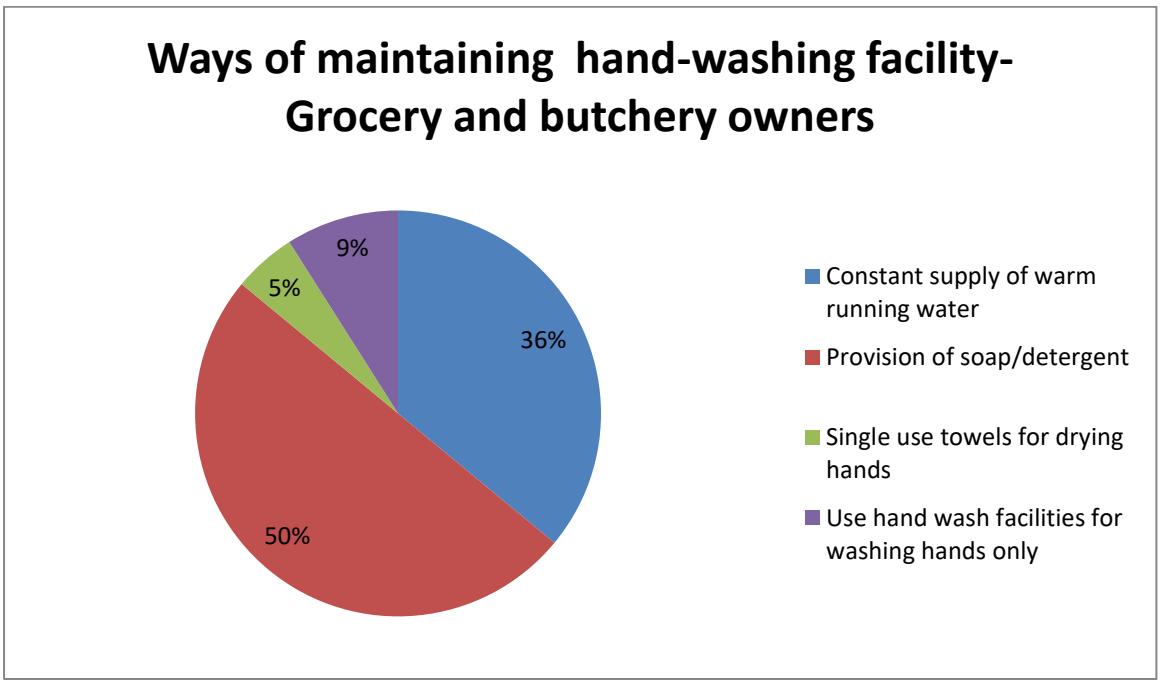


Figure 7: Responses on ways of maintaining hand washing facility by grocery and butchery owners

The majority of respondents provided soap/detergents and supplied warm water for cleaning hands at each hand-washing facility. Figure 6 illustrated that 39% of restaurant owners provided soap/detergents while 36% of them provided warm water. Figure 7 highlighted that 50% of grocery and butchery owners provided soap/detergents while 36% of them supplied

warm water. Very few respondents provided towels for drying hands. Figure 6 show that 8% of restaurant owners provided towels while Figure 7 indicates that 5% of grocery and butchery owners provided towels for drying hands. More grocery and butchery shops (50%) as shown on Figure 7 provided soap/detergents than restaurants (39%) as indicated on Figure 6.

Table 4: Cleaning schedule for utensils

How often utensils are cleaned	**Restaurants**	**Grocery and butchery**
	% of respondents	**% of respondents**
Immediately after use	71	42
After some hours	29	58
After a day	0	0
After a week	0	0

The majority of restaurants cleaned utensils immediately after use while most of grocery and butchery cleaned after some hours. Table 4 shows that 71% of restaurants cleaned utensils immediately after use and 58% of grocery and butchery employees cleaned utensils after some hours. This could be due to the nature of food handled. Restaurants handle more high risk food than grocery and butchery shops such that there is need for cleaning utensils immediately after use.

4.1.1 MAINTAINING FOOD PREPARATION SURFACES CLEAN

Figure 8: Responses on ways of maintaining food surfaces clean by food outlet owners

Most of the respondents used wet cloth for cleaning. Figure 8 illustrated that 33% of restaurants and 31% of grocery and butchery shops used wet cloth for cleaning. The same percentage of restaurants and grocery/butchery shops used detergents. From Figure 8, 31% of both restaurant and grocery/butchery shops used detergents for cleaning. Very few respondents used radiation for cleaning. Figure 8 highlighted that 3% of grocery and butchery shops used radiation while 0% of restaurants used radiation. The limited use of radiation could be due to limited technology and financial resources. Preference of wet cloth and detergents could be due to the fact that they are cheap.

4.1.2 HEALTH ISSUES ASSOCIATED WITH FOOD FROM FOOD OUTLETS

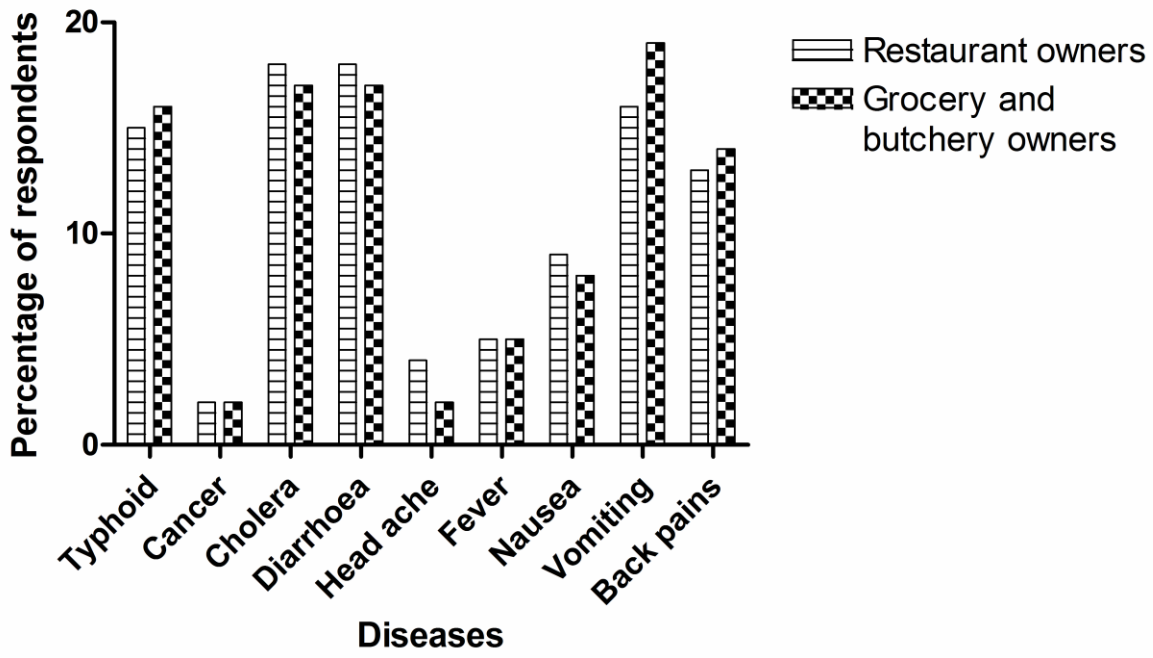


Figure 9: Responses on health issues associated with food from food outlets

Most of the respondents noted diarrhoeal diseases as health implications of food from food outlets. Figure 9 highlighted that 15% of restaurant owners indicated typhoid, 18% cholera and 18% of them diarrhoea while 16% of grocery and butchery owners noted typhoid, 17% cholera and 17% of them diarrhoea. The pattern of diarrhoeal diseases could be due to the fact that the respondents failed to distinguish them. Results were without medical diagnosis, so cholera was noted as one of the major health implications. Vomiting and back pains were also among prevailing health issues at Nyika. Figure 9 illustrated that 16% of restaurant owners noted vomiting while 13% of them indicated back pains. On the same figure, 19% of grocery and butchery owners noted vomiting while 14% of them indicated back pains.

Table 5: Responses on occupational implications by food outlet owners

Occupational implications	**Restaurants**	**Grocery and butchery**
	% of respondents	**% of respondents**
Burns	52	0
Cuts	48	100

Burns were common within restaurants while none occurred within grocery and butchery shops. Table 5 highlighted that 52% of restaurant owners noted burns as an occupational implication associated with food from food outlets and 0% of grocery and butchery owners indicated burns. This could be due to the fact that there is a lot of cooking within restaurants while there is no cooking in butcheries and grocery shops. More cuts were experienced within grocery and butchery than within restaurants. Table 5 illustrated that 100% of grocery and butchery owners indicated cuts while 48% of restaurants owners noted cuts. This trend could be due to abundance of sharp objects in grocery and butchery shops.

4.1.3 FREQUENCY OF HEALTH INSPECTIONS

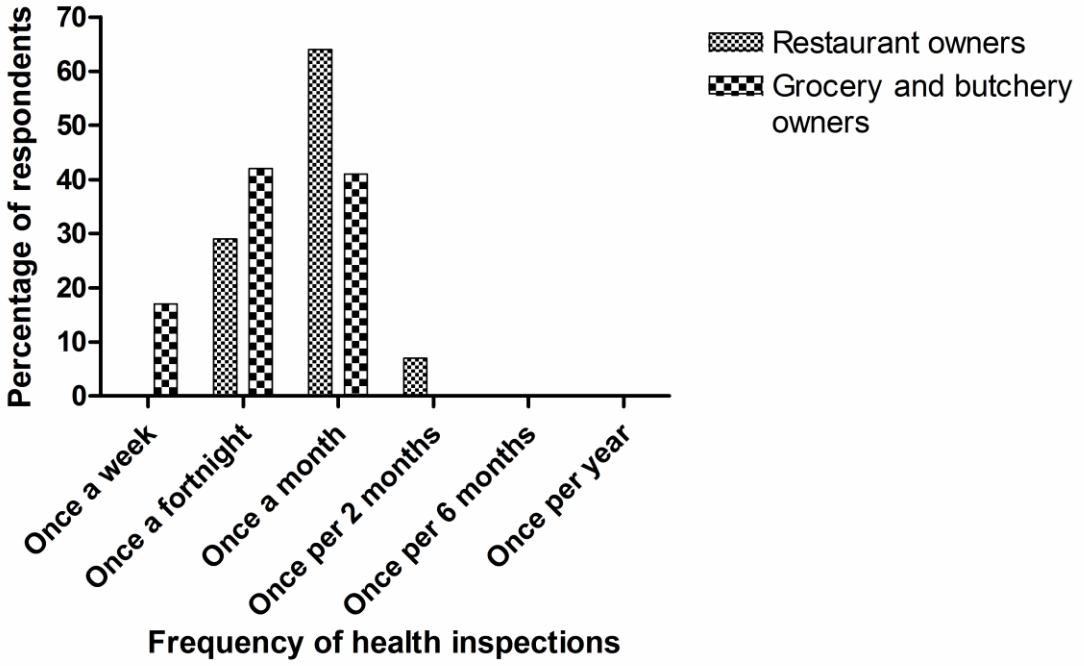


Figure 10: Responses on health inspection frequency by food outlet owners

Most of the food outlets were inspected once a month and once a fortnight. Figure 10 highlighted that 64% of restaurants and 41% of grocery and butchery shops were inspected once a month. The same figure indicated that 29% of restaurants and 42% of grocery and butcheries were inspected once a fortnight. None of the food outlets was inspected once per six months or once per year as highlighted on Figure 10. So, health inspections were frequent.

4.1.4 FOOD WASTE DISPOSAL METHODS

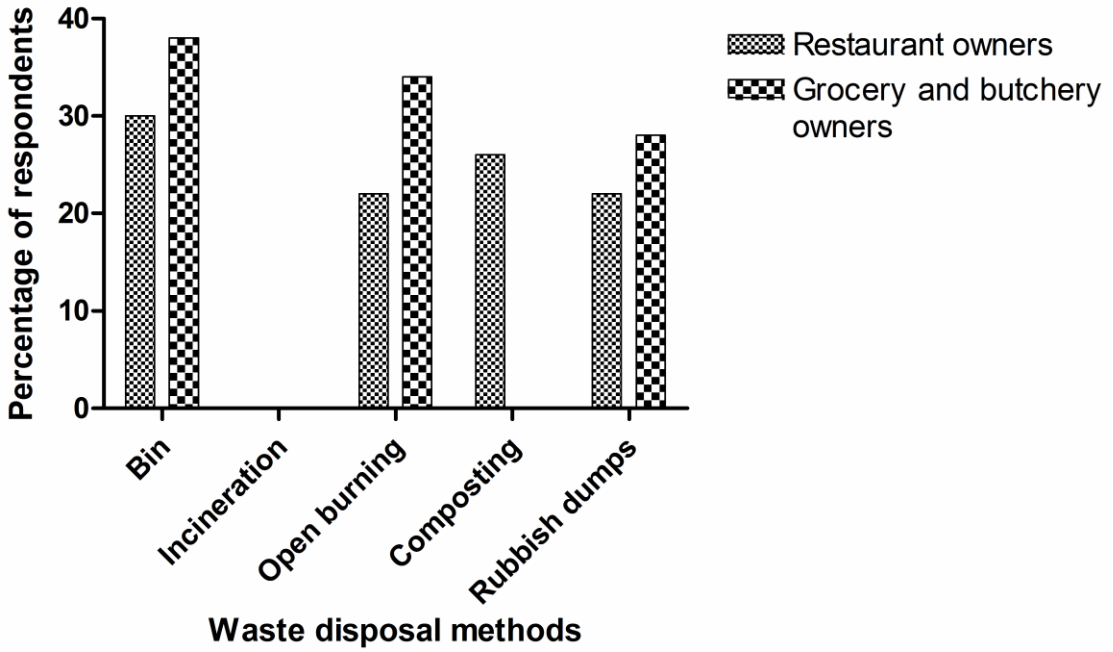


Figure 11: Responses on food waste disposal methods by food outlet owners

The majority of food outlets at Nyika used bin, open burning and rubbish dumps as waste disposal methods. Figure 11 illustrated that 30% of restaurants and 38% of grocery and butchery shops used the bin, 22% of restaurants and 34% of grocery and butchery shops used open burning and 23% of restaurants and 28% of grocery and butchery shops used rubbish dumps. There was no use of incineration at Nyika as shown on Figure 11 may be due limited resources.

4.1.5 HEALTH IMPLICATIONS OF FOOD WASTE DISPOSAL METHODS

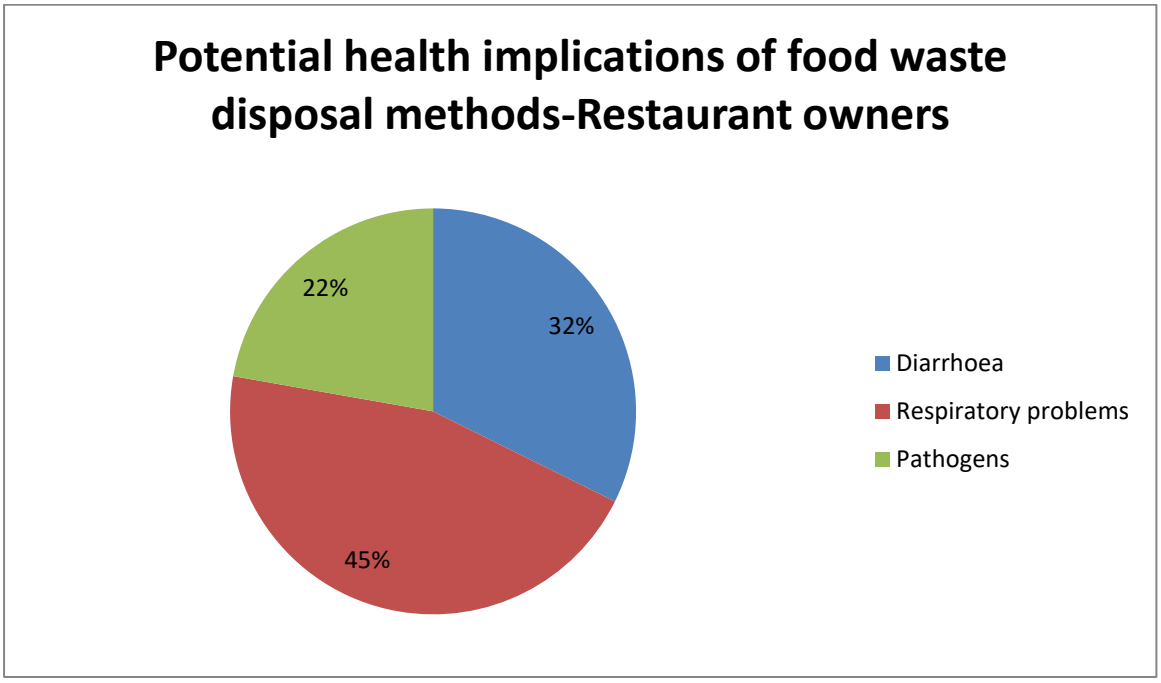


Figure 12: Responses on potential health implications of waste disposal methods by restaurant owners

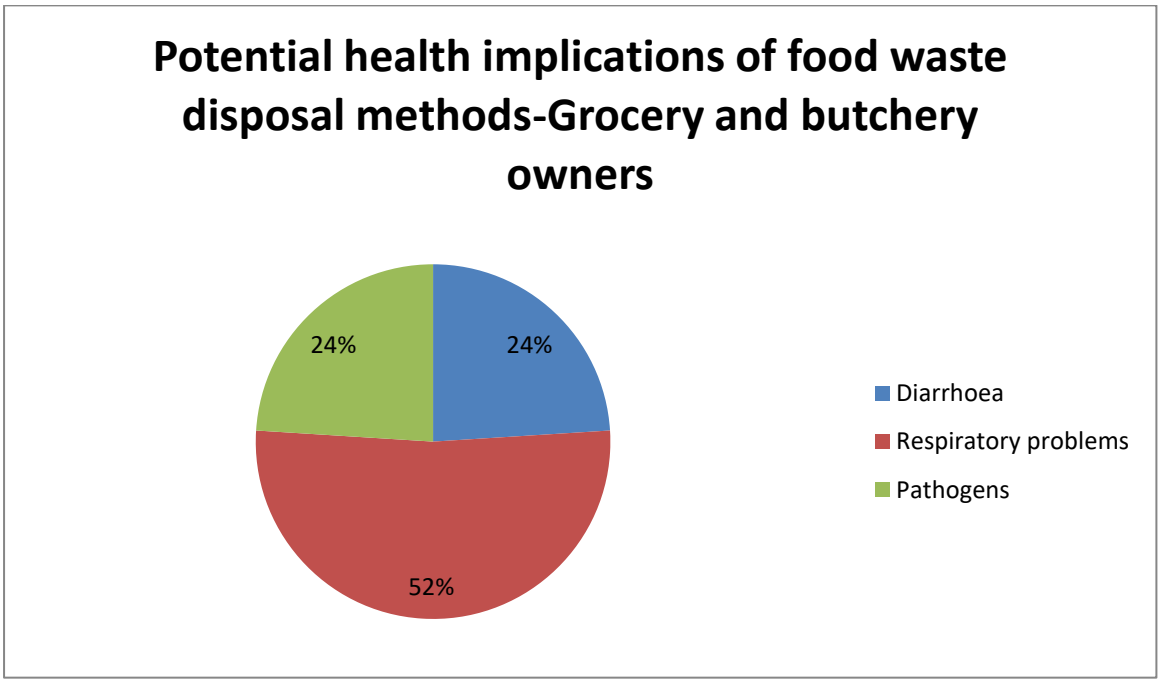


Figure 13: Responses on potential health implications of food waste disposal methods by grocery and butchery owners

Most of the respondents indicated that respiratory problems were health implications of food waste disposal methods. Figure 12 highlighted that 45% of restaurant owners noted respiratory problems as an implication and Figure 13 illustrated that 52% of grocery and butchery owners indicated respiratory problems as a health implication. More grocery and butchery owners (52%) noted respiratory problems than restaurant owners (45%). More restaurant owners than grocery and butchery owners highlighted diarrhoea as a health problem associated with food waste disposal. As shown on Figure 12, 32% of restaurant owners indicated diarrhoea while Figure 13 shows that 24% of grocery and butchery owners highlighted diarrhoea.

4.1.6 ENVIRONMENTAL IMPACTS ASSOCIATED WITH FOOD FROM FOOD OUTLETS

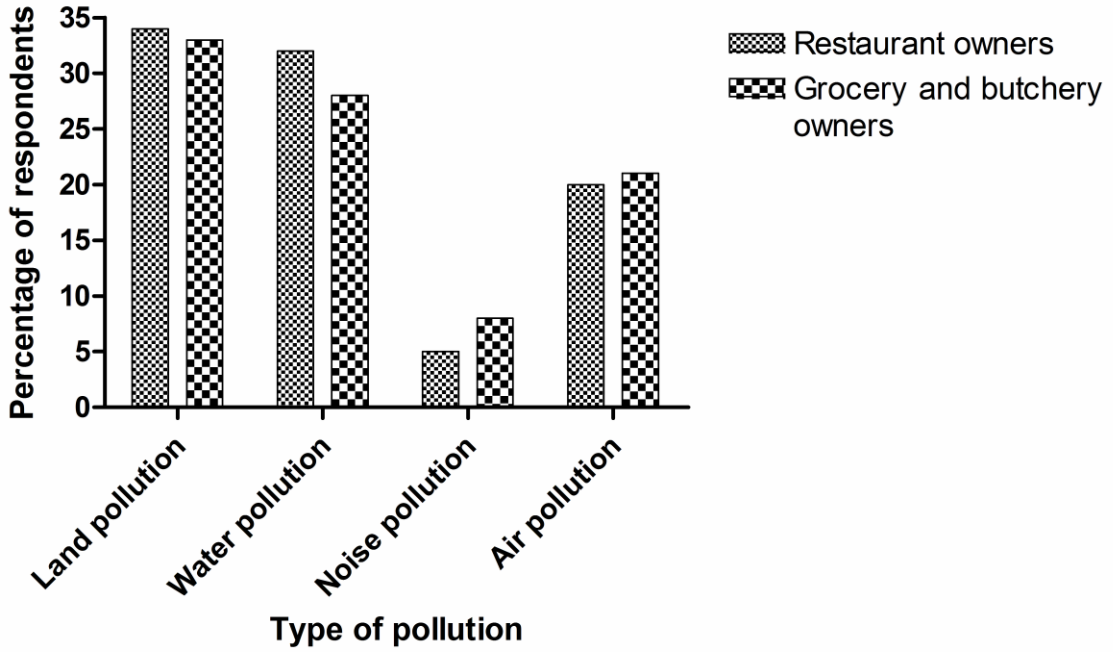


Figure 14: Responses on environmental impacts associated with food from food outlets by food outlet owners

Land, water and air pollution were dominant environmental impacts. Figure 14 illustrated that 34% of restaurant owners and 33% of grocery and butchery owners indicated land pollution. The same figure highlighted that 32% of restaurant owners and 28% of grocery and butchery owners noted water pollution. Figure 14 also illustrated that 29% of restaurant owners and 31% of butchery and grocery owners indicated air pollution. Very few respondents indicated

noise pollution as highlighted on Figure 14. Limited noise pollution could be due to the type of machines used.

4.1.7 Constraints encountered by food outlet owners

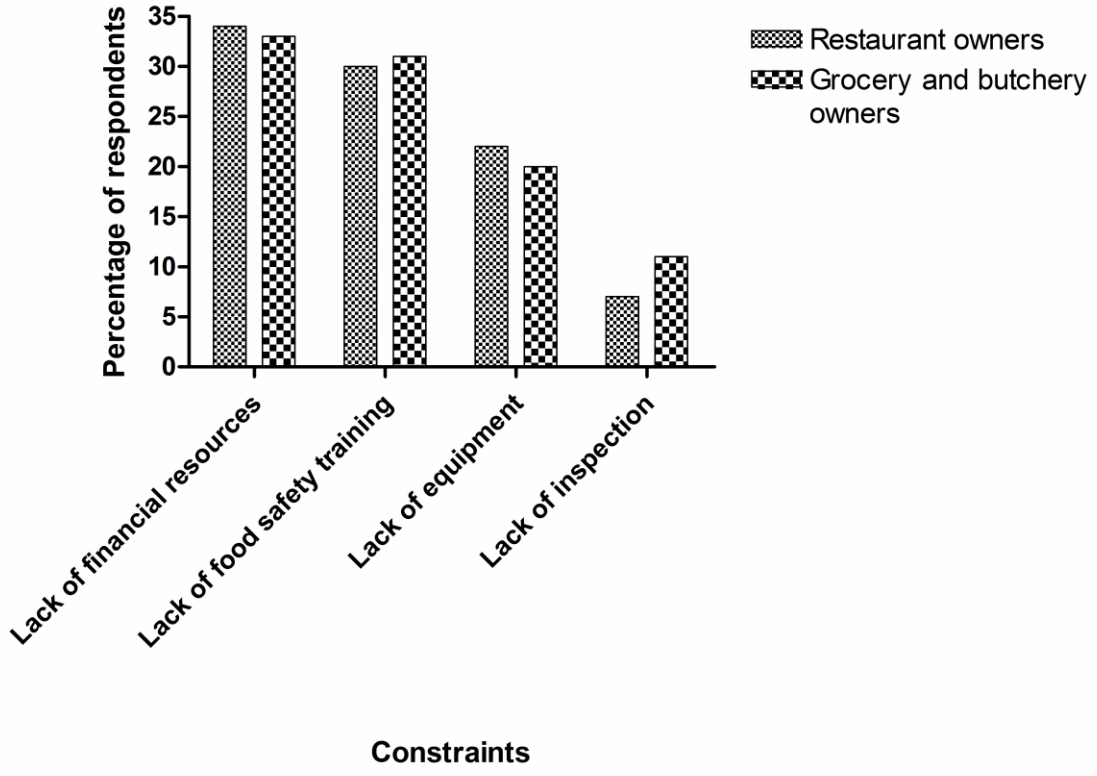


Figure 15: Responses on constraints by food outlet owners

The main constraints were lack of financial resources, safety training and equipment. Figure 15 highlighted that 34% of restaurants and 33% of grocery and butchery owners noted lack of financial resources as a constraint affecting food safety. 30% of restaurant owners and 31% of grocery and butchery owners indicated lack of food safety training as a constraint as shown on Figure 15. Few respondents noted lack of inspection as a constraint. Only 7% of restaurant and 11% of grocery and butchery owners indicated lack of inspection as a constraint. So, inspection of food outlets was frequent.

Exclusion of ill food handlers, ways of preventing food contamination and ways of improving food safety. Questionnaire results open ended questions.

The majority of food outlets owners indicated that excluded ill food handlers were permitted to resume food handling when they felt fit to do the job and that food contamination was prevented by having hand washing facilities and not having unnecessary contact with ready

to eat food. On ways of improving safety and health implications, majority of them indicated that there should be food safety training for food handlers, financial support for food operators and that there should be cleaning schedule in each food outlet.

4.2 INTERVIEW RESULTS

4.2.1 CONSUMERS

Most consumers indicated that they usually consume cooked stew, roasted chicken, salads, rice and sadza from restaurants. The majority of consumers in butcheries indicated that they buy beef and pork while from grocery they purchase goods like bread, ice cream and biscuits. Most of them indicated that they consume food at least two times a week from these food outlets.

The majority of restaurant consumers indicated that there have been cases of diarrhoea and vomiting early 2014 when certain restaurants bought and cooked stolen vegetables which had been sprayed. They also indicated that hygienic practices were not adequate since some of the food handlers did not cover hair and most hand washing facilities lacked warm water and soap. Most of the grocery consumers pointed out that sometimes some of the shops sold expired goods.

In addition to that, the majority of consumers indicated that causes of food contamination at Nyika included improper slaughtering of animals, poor personal hygiene, improper cooking, lack of financial resources, and lack of awareness, limited inspection and corruption.

On environmental impacts, most of them indicated that the majority of restaurants used wood fire for cooking thereby causing air pollution and waste water from food outlets pollutes Rozva River.

The majority of consumers pointed out that there should be food safety training; financial support from government and financial institutions such that food operators can afford safer equipment and that government should improve remuneration and working conditions so that food inspectors carry out their duties effectively.

4.2.2 NURSE IN CHARGE

The nurse in charge indicated that diarrhoea, nausea and vomiting were health issues of food from food outlets and that causes of food contamination included poor personal hygiene, lack of food safety training and lack of financial resources.

Cuts from cutting machines in butcheries, broken bottles in groceries and restaurants and burns in restaurants from cooking were the main safety issues at Nyika as noted by the nurse in charge.

On environmental impacts, the nurse noted air pollution, land pollution and water pollution. Food safety training and financial support from financial institutions were noted as ways of preventing food contamination.

4.2.3 ENVIRONMENTAL HEALTH TECHNICIAN (EHT)

The EHT indicated that food handlers undergo food certification once a year as required by the Public Health Act but the medical certificate ceases to be valid when the food handler falls sick and should undergo a full medical examination after being treated.

Licensing inspection is done once a year but if there is a food related disease from outlet, licence is withdrawn and then relicensing inspection after rectification of noted problems. There is no prescribed inspection time schedule and routine inspection is done as often as possible depending on prevailing hygiene situation at outlets as highlighted by the Public Health Act noted the EHT.

Cuts and burns were the safety issues at Nyika while typhoid, diarrhoea, vomiting and nausea were the main health issues as noted by the EHT. Poor personal hygiene, improper cooking, lack of financial resources and lack of food safety training were the causes of food contamination at Nyika according to the EHT.

The EHT pointed out that poor remuneration, lack of equipment, lack of food safety training and lack of financial resources were the constraints faced by food operators and EHTs at

Nyika. Water pollution, land pollution, air pollution and loss of biodiversity were identified as environmental impacts of food from food outlets at Nyika.

Food safety training, financial support for food operators and provision of enough equipment and other resources for EHTs were noted as ways of improving food safety at Nyika.

4.2.4 COUNCIL SOCIAL SERVICES OFFICER

The officer highlighted that bin and open burning were the main food waste disposal methods used at Nyika.

Cuts and burns were noted as the main safety issues while diarrhoeal diseases, vomiting and back pains were highlighted as the main health issues associated with food from food outlets at Nika.

On causes of food contamination, the officer indicated poor personal hygiene, improper cooking, poor food storage and lack of cleaning schedule.

The officer highlighted land, water and air pollution as environmental impacts. According to the officer, air pollution was due to open burning of solid waste and use of fire for cooking within the majority of restaurants and water pollution was a result of waste water from food outlets.

Lack of financial resources, lack of food safety training and equipment were the main constraints affecting food safety at Nyika as noted by the officer.

4.3 FOOD SAFETY OBSERVATIONS

The researcher observed that most of the food contact surfaces were clean while a few were dirty. Most of the food handlers had clean clothes, finger nails and covered hair but a few had uncovered hair.

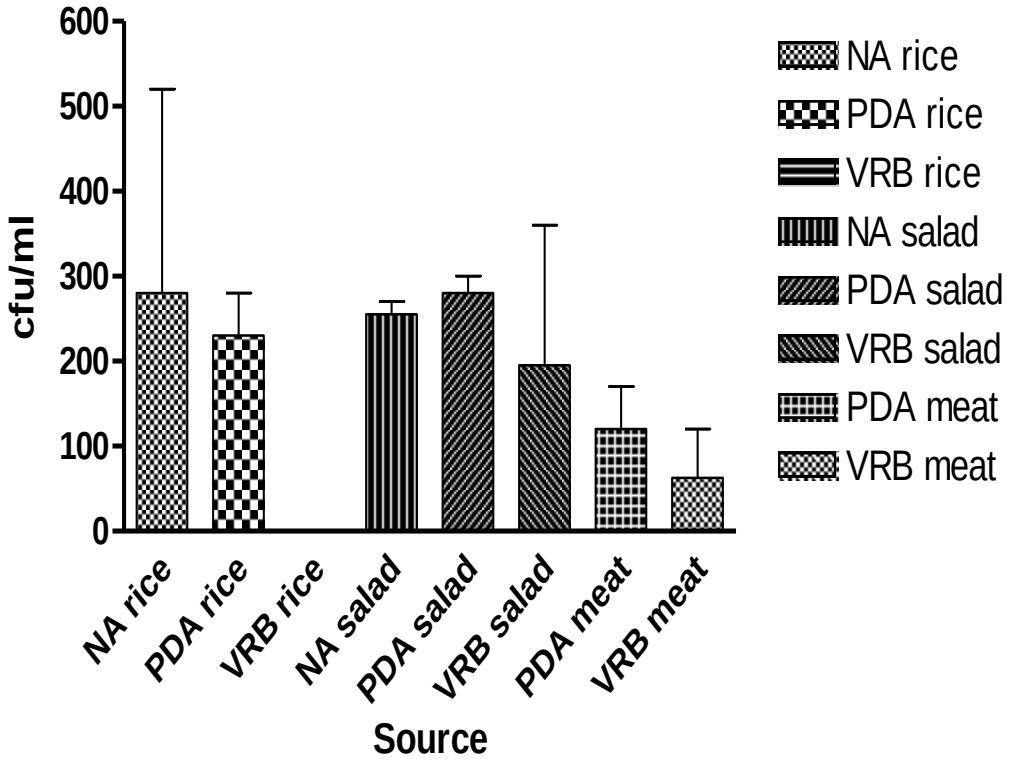
Most of the equipment was clean and there was proper food storage by majority of food handlers since there was separation of raw food, ingredients and ready-to eat food as required by the Codex Alimentarius Commission (2003) but there was improper food storage in few of the food outlets.

Nearly all of the food outlets had hand washing facilities but the problem was that the majority of these facilities lacked warm water and soap. Toilets were properly located but some of them were dirty.

The researcher observed rubbish dumps near some of the food outlets and that the majority of restaurants used wood as source of power for cooking.

4.4 MICROBIOLOGICAL ANALYSIS

4.4.1 MICROBIOLOGICAL LOAD IN FOOD SAMPLES



NB: cfu means colony forming units

Figure 16: Microbiological load in rice, salads and meat samples

All food samples had bacteria. NA rice and VRB salad had high variation and this could be due to the number of samples used. Two samples were used for each type of food.

4.4.2 HYPOTHESIS TESTING

H_0: There is no significant difference in microbial load in food samples at Nyika.

Table 6: One way ANOVA output for microbial load (TBC) at α =0, 05 using Graph Pad Prism 4

Table Analyzed			
Data 1			
One-way analysis of variance			
P value	0.5192		
P value summary	Ns		
Are means signif. different? (P < 0.05)	No		
Number of groups	8		
F	0.9522		
R squared	0.4545		
ANOVA Table	SS	Df	MS
Treatment (between columns)	156200	7	22320
Residual (within columns)A	187500	8	23440
Total	343700	15	

SS= sum of squares **Df**= degrees of freedom

$F_{calculated=}$ 0.9522

$F_{critical=}$ 3.50

CHAPTER FIVE

DISCUSSION OF RESULTS

5.1 INTRODUCTION

The thrust of this chapter was to discuss results which were presented on tables and figures in chapter four. Environmental, safety and health implications were highlighted.

5.2 FOOD SAFETY

Figure 9 indicated that typhoid, diarrhoea and vomiting were the dominant health implications of food from food outlets. On Figure 9; 15% of restaurant owners and 16% of grocery and butchery owners indicated typhoid and 18% of restaurant owners and 17% of grocery and butchery noted diarrhoea. In addition to that, the same figure highlighted that 16% of restaurant owners and 19% of grocery and butchery owners noted vomiting as a health problem. From interview results, the majority of restaurant consumers indicated that diarrhoea and vomiting occurred at Nyika early 2014 when certain restaurants cooked stolen vegetables which had been sprayed. All the key respondents that is the nurse in charge, council social services officer and the EHT noted that diarrhoea and typhoid were associated with food from food outlets. It is interesting that the results were similar to those of World Health Organization (2002) which noted that typhoid, cholera; dysentery and diarrhoea were food borne illnesses affecting different parts of the world. Inteaz (2004) purported that vomiting was one of health issues associated with food from outlets. Diarrhoeal outbreaks transmission occurs through contaminated foods served by street vendors and restaurants in countries like Bangladesh, India and Nepal (FAO/WHO, 2004). This implies that typhoid, diarrhoea and vomiting were health implications of food from food outlets at Nyika. These health problems could be a result of unhygienic practices.

Back pains were also a major health issue at Nyika as shown on Figure 9. From questionnaire results, 13% of restaurant and 14% of grocery and butchery owners indicated back pains as a health issue at Nyika. From interview results pertaining to health issues, both the EHT and the nurse in charge highlighted that back pains were a health problem at Nyika. This is in harmony with World Health Organization (2000) which noted that lifting of heavy foods may

hurt workers' wrists and backs over time. This means that back pains were one of the safety and health implications of food from food outlets at Nyika. Back pains could be a result of bending and lifting of heavy food.

From table 5, burns and cuts were the main safety issues at Nyika. 52% of restaurant owners indicated burns while 48% of them noted cuts. 100% of grocery and butchery owners indicated cuts. The nurse in charge, EHT and the council social services officer highlighted that cuts and burns were the main safety issues. It is interesting to note that according to World Health Organization (2006), cuts are safety issues in food services. Worsfold (2001) purported that cuts are a result of sharp objects like cutting machines in butcheries and broken glass in restaurants and grocery shops. Burns can be a result of hot oil, water and hot surfaces (WHO, 2007). This means that cuts at Nyika could be a result of sharp objects like knives and broken glass and burns could be a result of fire, water and hot surfaces like pots used for cooking. So, burns and cuts were safety implications of food from food outlets at Nyika.

Respiratory problems were one of the dominant potential health implications of food waste disposal methods used at Nyika. 45% of restaurant owners as illustrated on Figure 12 highlighted that respiratory problems were a health problem as a result of waste disposal methods. 52% of grocery and butchery owners as indicated on Figure 13 noted that respiratory problems were one of the health issues. This is in harmony with Wendafrash (2010) who noted that respiratory problems like asthma and chronic bronchitis were a result of burning solid waste. This implies that respiratory problems were one of the health implications at Nyika and it could be a result of open burning

The majority of food outlet owners allowed sick food handlers to handle food. Table 2 indicated that 64% of restaurant and 83% of grocery and butchery owners allowed excluded ill food handlers to resume food handling without medical consent. This means that most of these food handlers resumed food handling when they were still ill thereby being sources of food contamination. People known, or suspected to be suffering from a disease or illness likely to be transmitted through food should not be allowed to enter any food handling area and possible exclusion from food handling include diarrhoea, vomiting and visible infected skin lesions (Codex Alimentarius Commission, 2003). According to Inteaz (2004), excluded ill food handlers should be allowed to resume food handling only on medical consent. This means that allowing excluded ill food handlers to resume food handling causes food

contamination at Nyika since ill employees are sources of contamination. Handling food without medical consent at Nyika could be due to lack of food safety training.

Interview results from food outlet consumers indicated that poor personal hygiene and lack of cleaning schedule were causes of food contamination at Nyika. The nurse in charge, EHT and the council social services officer noted these as causes of food contamination. The researcher observed that some of the food handlers had dirty clothes, used dirty utensils, had uncovered hair and that about one quarter of hand washing facilities had no soap/detergent for cleaning hands. In addition to that, questionnaire results revealed that less than 10% of restaurant owners and 10% of grocery and butchery owners had cleaning schedule as illustrated on Figure 8. Bermudez-Millan *et al* (2004) purported that poor hygiene among food handlers causes food contamination. Codex Alimentarius Commission (2003) highlighted that food handlers should maintain a high degree of personal cleanliness and where appropriate should wear protective clothing to prevent food contamination. WHO (2007) noted that large proportions of food borne diseases result from poor sanitation and unhygienic handling of foods in restaurants and other eating outlets in developing countries. Cleaning schedule results in safe food handling and storage equipment thereby preventing food contamination (Inteaz, 2004). This means that poor personal hygiene and lack of cleaning schedule could be causing food contamination. Poor personal hygiene and lack of cleaning schedule at Nyika could be due to limited financial resources and lack of food safety training.

Furthermore, questionnaire results pertaining to constraints show that 34% of restaurant and 33% of grocery and butchery owners noted lack of financial resources as a constraint leading to food contamination as illustrated on Figure 15. From interview results, nurse in charge, EHT, council social services officer and the majority of food outlet consumers noted lack of financial resources as a constraint. This is in harmony with World Health Organization (2004) which noted that lack of financial resources to invest in safer equipment is a cause of food contamination. It means food outlet owners at Nyika due to financial constraints were using unsafe equipment which could contaminate food thereby having negative implications on safety and health of food consumers.

Lack of food safety training was another food safety constraint at Nyika as indicated by questionnaire results. Figure 15 indicated that 30% of restaurant owners and 31% of grocery and butchery owners noted lack of food safety training as one of the major constraints. From

interview results, the majority of food outlet consumers highlighted lack of food safety training as a constraint. The nurse in charge, the EHT and the council social services officer also noted lack of food safety training. It is interesting to note that Worsfold (2005) purported that food handlers should be trained in the basic food safety principles and practices that are required to prevent contamination and cross- contamination of foods. Low education levels among consumers and food handlers leads to reduced information of food safety (FAO/WHO, 2004). Food safety training is fundamental since inadequate training pose a threat to the safety of food and its suitability for consumption (Codex Alimentarius Commission, 2003). According to Wendafrash (2010), behaviour of food handlers and consumers reflects their attitudes which in turn often results from their education and training. This means that the behaviour of food handlers and consumers who have undergone food safety training is different from those who have not. Food safety training changes the behaviour of food handlers towards safer food handling. Food handlers should have the necessary knowledge and skills to handle food hygienically. There could be unsafe food handling at Nyika due to lack of food safety training. Lack of food safety training could be a result of poor policies and lack of financial resources.

Improper cooking was a cause of food contamination. More than 80% of food consumers interviewed from restaurants highlighted improper cooking as a cause of food contamination at Nyika. They noted that some of the food was not cooked to appropriate temperature. This is in harmony with Dorny (2009) who noted that if food is cooked for inappropriate length and temperature to kill pathogens, it could be a health hazard. Failure to cook food properly at Nyika could be having negative safety and health implications to food consumers. Improper cooking at Nyika could be a result of lack of food safety training.

In addition, there was keeping of food at inappropriate temperature which causes food contamination. Questionnaire results as shown on Figure 2 indicated that 36% of restaurant owners kept food at any temperature. Inteaz (2004) and WHO (2004) noted that failing to keep food at appropriate temperature could cause food contamination since bacteria grow quickly when temperature of high risk food is between 5 and 60 degrees Celsius. It means that more than 1/3 (36%) of restaurant owners who kept food at any temperature could be causing food contamination at Nyika thereby having negative safety and health implications. Keeping food at any temperature could be a result of lack of equipment and food safety training.

From interview results, the majority of food outlets consumers and the EHT indicated improper slaughtering of animals as a cause of food contamination. This is in harmony with the Public Health Act [15:19] which noted that improper slaughtering practices in Zimbabwe are sources of meat contamination. This implies that meat contamination at Nyika could be a result of unhygienic slaughtering practices which could be due to lack of food safety training.

5.3 ENVIRONMENTAL IMPACTS

Land pollution was one of the main environmental impacts of food from food outlets. From questionnaire results, 34% of restaurant owners and 33% of grocery and butchery indicated land pollution as an environmental impact as illustrated on Figure 14. The majority of food outlet consumers interviewed noted land pollution. Both the nurse in charge and EHT noted land pollution. The researcher also observed illegal dumps of solid waste from food outlets. ISO 22 000 deals with environmental impacts related to food activities. The results were similar to those of Worsfold (2005) who highlighted that food waste and packaging materials like glass, plastic and cardboard were solid waste causing land pollution. Mead (2000) purported that food waste and packaging materials constitute significant portions of overall US municipal waste stream causing land pollution. Thus the findings by Mead and Worsfold revealed that food waste and packaging materials from food outlets cause land pollution. Land pollution at Nyika could be a result of food waste and packaging material. Illegal dumps could be a result of irregular collection of waste by the Bikita Rural District Council.

Air pollution was also noted as an environmental impact. From questionnaire results shown on Figure 14, 29% of restaurant owners and 31% of grocery and butchery owners highlighted air pollution as an environmental impact. The majority of food consumers interviewed noted air pollution. The nurse in charge, the EHT and the social services officer indicated air pollution. The researcher observed that the majority of restaurants used wood fire for cooking and there was a lot of smoke from these fires. Activities in Zimbabwe should not cause environmental pollution as highlighted by the Environmental Management Act [20:27]. This means that land and air pollution at Nyika associated with food from food outlets is against Zimbabwean law.

The results were similar to those of WHO (2007) which noted that use of fossil fuels like wood and coal cause air pollution since a lot of carbon dioxide is produced. So, food outlets

at Nyika could be causing air pollution due to use of fossil fuels for cooking. Most of the restaurants could be using fossil fuels due to limited financial resources to use electricity when preparing food for the public.

Figure 14 indicated that 32% of restaurant owners and 28% of grocery and butchery owners noted water pollution as an environmental impact of food from food outlets. Both the nurse in charge and the EHT highlighted water pollution as an environmental impact. The majority of food outlet consumers also indicated water pollution. The researcher observed food remains and packaging material in Rozva River. It is interesting that Andrew *et al* (2013) noted that water obtained from fast food outlets at the City centre in Benin City, Edo State in Nigeria had high Biochemical Oxygen Demand (BOD). Food outlets are point sources of water pollution (Scallan, 2011; WHO, 2007). This implies that food outlets can affect negatively water quality thereby having negative environmental impacts. Nitrates and phosphates in waste water from food outlets can stimulate excessive plant growth leading to oxygen depletion (Waugh, 2009). This means that water pollution as a result of food from food outlets at Nyika could be causing eutrophication in Rozva River.

5.4 MICROBIAL SAFETY

Results of microbiological analysis indicated that food samples at Nyika had bacterial contamination as illustrated on Figure 16. It was interesting that FAO/WHO (2003) noted that microbiological contamination in food is a major cause of illness. This implies that the bacteria could be a cause of food contamination at Nyika thereby causing illness which is a negative health implication. This could be an indication of unhygienic practices as noted by the presence of coliforms in VRB salad. Coliforms are normally used as hygienic indicators in food safety issues. The recommended WHO value of *Coli Eschericia* in food and water is zero. The microbial safety results contradict with the responses given by participants in the survey an indication that there were many unhygienic practices at Nyika.

5.5 GOOD HYGIENIC PRACTICES

Questionnaire results shown on Figure 4 indicated that 33% of restaurant and 44% of grocery and butchery owners informed food handlers of their obligations. 31% of restaurant and 34% of grocery and butchery owners as shown on Figure 4 ensured that food handlers and other persons did not have unnecessary contact with ready to eat food. That is having protective clothing. The results were in harmony with the Codex Alimentarius Commission (2003) which noted that food handlers should be aware of their obligations and that they and other persons should not have unnecessary contact with ready to eat food. So, making food handlers aware of their obligations and not having unnecessary contact with ready to eat food are some of the good hygienic practices at Nyika. However, the researcher observed that a few of food handlers had unnecessary contact with ready to eat food.

Figure 4 also showed that 26% of restaurant and 22% of grocery and butchery owners ensured that food handlers did not spit, smoke or use tobacco where food or surfaces likely to come into contact with food were exposed. That is guarding against unhygienic practices. Not spitting or smoking while handling or near food is a prerequisite program (Inteaz, 2004; WHO, 2004). This means that it was one of the good hygienic practices at Nyika.

Questionnaire results on maintenance of hand washing facility as highlighted on Figure 6 showed that 36% of restaurant and 36% of grocery and butchery owners indicated that they ensured constant supply of warm running water. This is in harmony with Codex Alimentarius Commission (2003) which noted that food outlets should have potable water at a suitable temperature. This implies that provision of warm running water at Nyika was a good hygienic practice. However, the researcher observed that about one third of hand wash facilities had running water at inappropriate temperature.

In addition to that, Figure 6 showed that 39% of restaurant and 50% of grocery and butchery owners indicated that they provided soap/ liquid detergents for cleaning hands. Codex Alimentarius Commission (2003) and Inteaz (2004) noted that food outlets should have hand wash facilities with soap or other hand cleaning materials. This implies that provision of soap/detergent for cleaning hands is a good hygienic practice at Nyika. But, the researcher observed that some of the hand washing facilities lacked soap/detergents.

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1 CONCLUSION

Diarrhoeal diseases, vomiting, respiratory problems and back pains were the main health problems of food from food outlets at Nyika. Cuts and burns were the main safety issues associated with food from food outlets at Nyika .Handling of food by ill employees, poor personal hygiene, lack of cleaning schedule, improper cooking, keeping food at inappropriate temperature and improper slaughtering were the causes of food contamination at Nyika.

Lack of financial resources, lack of food safety training and lack of equipment were the main constraints affecting food safety at Nyika. Land and water pollution were the main environmental impacts of food from food outlets at Nyika. Informing food handlers of their obligations, frequent provision of warm running water and provision of soap/liquid detergents were the main good food hygienic practices at Nyika.

6.2 RECOMMENDATIONS

In light of the research findings, the researcher has the following recommendations to make:

- Each food outlet should have a cleaning schedule.
- Each food outlet should always have running water at appropriate temperature.
- Soap/cleaning detergents should always be available at each hand wash facility.
- All food handlers should undergo food safety training.
- There should be more surveillance to collect information on diseases.

REFERENCES

Andrew N. Amenaghawon, Peter A. Assegame, and Kessington O. Obahiagbon,"Potential application of Urea and NPK 15:15:15 Fertilizers as Biostimulants in Bioremediation of Domestic Wastewater" American Journal of Environmental Protection\, no.4 (2013): 91-95 .doi: 10.12691/env-1-43.

Bermudez-Millan (2004). Food safety knowledge, attitudes among people living in Hartford. Prentice Hall, London, UK.

Brown, J.D. Using surveys in language Programs. Cambridge University Press, 2001.

CDC (2005). Campylobacter Infections. Blackwell Publishing, UK.

Codex Alimentarius Commission. General Principles of Food Hygiene. CAC/RCP 1-1969. Rev.4 (2003).

DEFRA (2005). Zoonoses Report UK 2004. McGraw Hill, London, UK

Dorney, A. (2009). Emerging food borne parasites. CRC Press, New York, USA.

FAO. 2001 Codex Alimentarius- Food Hygiene-Basic Text, 2nd ed. Rome. Italy.

FAO/WHO Food Standards Program, 1997.

FAO/WHO (2002).Integrated Approaches to the Management of Food Safety throughout the Food Chain; FAO/WHO GLOBAL FORUM of Food Safety Regulators, Marrakesh, Morocco, 20-30 Jan 2002. http://www.fao.org/docrep/meeting/004/y3680e/Y3680E07. htm

FAO/WHO (2005). Assuring Food Safety and Quality in Small and Medium Size Food Enterprises; FAO/WHO Regional Conference on Food Safety for Africa, Harare, Zimbabwe 3-6 October 2005. ftp://ftp.fao.org/doc rep/fao/meeting/010/j6022e.pdf

FAO/WHO. 2003. Hazard Characterization for pathogens in food and water. Guidelines. Microbiological Risk Assessment Series, No.3 (available at; ftp://ftp.fao.org./docrep/fao/006/y4666E/y4666E00.pdf).

FAO/WHO, "International Cooperation on food contamination and food borne disease surveillance," Second FAO/WHO Global Forum of Food Safety Regulators, Bangkok, Thailand, October 12-14, 2004

Fleury, M.D., Stratton, J., Tinga, C., Charron, d.f., and Aramini, J. (2008). A descriptive analysis of hospitalization due to acute gastrointestinal illness in Canadian Journal of Public Health, 99 (6), 485-93.

Government of Zimbabwe (2002). Environmental Management Act Chapter 20:27, Government Printers, Harare, Zimbabwe.

Government of Zimbabwe (2001).Food and Food Standards Act Chapter 15:04, Government Printers, Harare, Zimbabwe.

Government of Zimbabwe (1996). Public Health Act Chapter 15:09, Government Printers, Harare, Zimbabwe.

Gwimbi, P. and Dirwai, C. (2003). Research Methods in Geography and Environmental Studies: GED 302. Harare: Zimbabwe Open University.

Inteaz, A. (2004) Food Quality Assurance, Principles and Practices. CRC Press, New York, United States of America.

ISO 22000 (2007) Food Safety Management Systems- An easy-to use checklist for small business. International Trade Centre.

Raphel Kwiri, Clive Winini, Jeritah Tongonya, Wishmore Gwala, Enock Mpofu, Felix Mujuru, Shannon T. Gwala, Lydia Makarichi, Perkins Muredzi. Microbiological Safety of Cooked Vended Foods in an Urban Informal Market: A Case Study of Mbare Msika, Harare, Zimbabwe. International Journal of Nutrition and Food Sciences. Vol.3, No. 3, 2014, pp.216-221. doi: 10.116481; ijnfs.20140303.24

Liscott AJ (2011). Food borne illness. Blackwell Publishing, London, UK.

McEntire J (2004). Bacteria associated with food borne diseases. McGraw Hill, London, UK.

McSwane, D.2000. Essentials of Food Safety and Sanitation, 2nd ed. New Jersey: Prentice Hall.

Mead, C. (2000). Food related illness and death in the United States.CRC Press, New York, USA.

Munowenyu, E.M. (2003) 'A' Level Geography. A Comprehensive Guide. Longman, Harare, Zimbabwe.

Navas-Aclen A, Guallar E, Silbergeld EK, Rothenberg SJ: Lead exposure and cardiovascular disease- a systematic review. Environ Health Perspect 2007, 115:472-482

Niode, A. (2010). Insight into Asian and Hispanic restaurant manager needs for safe food handling. Nelson Thomes Ltd, Cheltenham, UK.

Scallan E (2011). Food borne illness acquired in the United States.CRC PRESS New York, USA.

Simonne A.H (2004). Ethnic food safety trends in the United States. HarperCollins, New York, USA.

Sivapalasingam, S (2004). A growing cause of outbreaks for food borne illnesses in the United States. Hachette, New York, USA.

Story, M (2008). Health food and eating environments. HarperCollins, New York, USA.

Wagacha, J.M. (2008). Mycotoxin problem in Africa: Current status, Implications to food safety and health. CRC PRESS New York, USA.

Waugh, D. (2009). An Integrated Approach. Nelson Thomes Ltd, Cheltenham, UK.

Wendafrash, A. (2010) Food Safety and Codex activities in Ethiopia. Food borne diseases. December 14-15, 2010 Addis Ababa 21-26

WHO (2000). Food borne diseases.

WHO (2002) WHO global strategy for food safety. Safer food for better health. Food Safety Programme-2002. World Health Organization. Geneva, Switzerland.

WHO (2003). The present state of food borne disease in OCED Countries.

WHO (2004). Five keys to safer food.

WHO (updated 2005) Avian Influenza. Food safety issues.

WHO (2006). Food safety and food borne illness.

WHO (2007) Food safety and food borne illnesses Fact.

World Health Organization (2008) Cholera Country Profile, World Health Organization Global Taskforce on Cholera. Available at http://www.who.int/choler/countries/zimbabwe country Profile2008.pdf. Accessed April 5, 2010

Williams, A.G, Audsley, E. And Sandars, D.L (2006) Determining the Environmental burdens and resource use in the production of agricultural and horticultural commodities. Main Report. Defra Research Project iso205. Bedford: Cranfied University and Defra. Available on www. Silsoe.cranified.ac.uk and www.defra.gov.uk

Worsfold, D. (2001) "Food safety behaviour in butchers' shops".Macmillan, New York, USA.

Worsfold, D. (2005). Survey of food safety training in small food manufacturers. Macmillan, New York, USA.

Yapp, C and Fairaman, R. (2004). Factors affecting food safety compliance. Hachette, New York, USA.

ZimStat. (Zimbabwe National Statistical Agency: Census 2012 Provincial Report, Masvingo.

APPENDICES

APPENDIX 1

Release Form

APPENDIX 2

MIDLANDS STATE UNIVERSITY

QUESTIONNAIRE FOR RESTAURANT OWNERS

PREAMBLE

My name is Chireshe Amato from Midlands State University doing Master of Science in Safety Health and Environmental Management. This questionnaire seeks to establish safety and health implications, practices and environmental impacts of food from food outlets. You are kindly requested to complete this questionnaire as it will assist in improving safety and health implications of food from food outlets. The information you are going to provide will be treated with confidence and will be used for academic purposes only.

Please indicate your answer by putting a tick and writing on spaces provided. Can tick more than once where it is applicable.

1 Food usually consumed (Tick more than once)

(a) Cooked stew ☐
(b) Roasted beef ☐
(c) Roasted chicken ☐
(d) Salads ☐
(e) Rice ☐
(f) Sadza ☐

Food processing

2 Do you cook food to appropriate temperature? Yes ☐

No ☐

3 If yes for 2, when preparing food which of the following do you use? (Can tick more than once)

(a) Keeping cold food below 5 degrees Celsius ☐
(b) Keeping hot food above 60 degrees Celsius ☐
(c) Keeping food at any temperature ☐

4 When preparing food, do you take steps to prevent the food from being contaminated?

Yes ☐ No ☐

5 Which methods do you use to prevent contamination of food? (Can tick more than once)

(a) Salting ☐
(b) Boiling ☐
(c) Refrigerating ☐
(d) Frying ☐
(e) Adding preservatives ☐
(f) Roasting ☐

Health of people who handle food

6 Are food handlers not allowed to handle food if they are known to be suffering from food borne illness? Yes ☐

No ☐

7 If a food handler is excluded from handling food, when is he/she permitted to resume food handling?----------
---

---

8 Are they permitted to resume food handling activities only on medical consent? Yes ☐

No ☐

Health and hygienic requirements

9 How do you achieve health and hygienic requirements? (Can tick more than once**)**

(a) Informing all food handlers of their obligations. ☐

(b) Ensure that food handlers and other persons (e.g. visitors) do not have unnecessary contact with ready to eat-food. ☐

(c) Ensure that Food handlers do not spit, smoke or use tobacco or similar products, where food or surfaces likely to come into contact with food are exposed or unprotected. ☐

(d) Food safety training ☐

10 Do food handlers undergo food certification?

Yes ☐ No ☐

11 If yes to 10, how often do they go for certification?

(a) Quarterly ☐
(b) Once in six months ☐
(c) Annually ☐

Food storage

12 How is food stored? (Can tick more than once)

(a) Refrigerating ☐
(b) Putting food in a warmer ☐
(c) Putting food in a cold room ☐
(d) Putting in a ware house ☐

13 Is food protected from contamination? Yes ☐

No ☐

14 If yes, explain how----------

Hygiene of food handlers

15 How do you maintain each hand-washing facility? (Can tick more than once)

(a) Constant supply of warm (between 25 and 45^0C) running water? ☐

(b) Provision of soap/ liquid dispensing detergent ☐

(c) Single use towels or other method for effectively drying hands ☐

(d) Use hand wash facilities for washing hands only ☐

Cleaning and sanitising of food equipment

16 Do you ensure all food contact surfaces are clean and sanitary all times? Yes ☐

No ☐

17 How often do you clean utensils?

(a) Immediately after use ☐

(b) After some hours ☐

(c) After a day ☐

(d) After a week ☐

18 How do you maintain the food preparation surfaces in a clean condition? (Can tick more than once)

(a) Use of wet cloth ☐

(b) Use of detergents ☐

(c) Use of running water ☐

(d) Cleaning schedule ☐

(e) Use of radiation ☐

Safety and Health implications

19 Health issues associated with food from your outlet (Can tick more than once)

(a) Typhoid ☐

(b) Cancer ☐

(c) Cholera ☐

(d)Diarrhoea ☐

(e) Head ache ☐

(f)Fever ☐

(h)Nausea ☐

(i)Vomiting ☐

(j)Back pains ☐

20 Occupational implications of food from food outlets (Can tick more than once)

(a) Burns ☐
(b) Cuts ☐

21 Frequency of health inspections

(a) Once a week ☐
(b) Once a fortnight ☐
(c) Once a month ☐
(d) Once per 2 months ☐
(e) Once per 6 months ☐
(f) Once per year ☐

Food waste disposal

22 Food waste disposal methods (Can tick more than once)

(a) Bin ☐
(b) Incineration ☐
(c) Open burning ☐
(d) Composting ☐
(e) Rubbish dumps ☐

23 What are the health implications of these disposal methods? (Can tick more than once)

(a) Diarrhoea ☐
(b) Respiratory problems ☐

(c) Pathogens ☐

Environmental impacts

24 Environmental issues associated with food from food outlets (Can tick more than once)

(a) Land pollution ☐
(b) Water pollution ☐
(c) Noise pollution ☐
(d) Air pollution ☐

Constraints

25 Which constraints do you encounter in your food industry? (Can tick more than once)

(a) Lack of financial resources ☐
(b) Lack of food safety training ☐
(c) Lack of equipment ☐
(d) Lack of inspection ☐

26 What do you think should be done to improve safety and health issues of your food outlets?----------
---

APPENDIX 3

MIDLANDS STATE UNIVERSITY

QUESTIONNAIRE FOR GROCERY AND BUTCHERY OWNERS

PREAMBLE

My name is Chireshe Amato from Midlands State University doing Master of Science in Safety Health and Environmental Management. This questionnaire seeks to establish safety and health implications, practices and environmental impacts of food from food outlets. You are kindly requested to complete this questionnaire as it will assist in improving safety and health implications of food from food outlets. The information you are going to provide will be treated with confidence and will be used for academic purposes only.

Please indicate your answer by putting a tick and writing on spaces provided. Tick more than once where it is applicable.

Food display

1 Is all displayed food adequately protected from contamination? Yes ☐

No ☐

Health of people who handle food

2 Are food handlers not allowed to handle food if they are known to be suffering from food borne illness? Yes ☐

No ☐

3 If a food handler is excluded from handling food, when is he/she permitted to resume food handling?----------

---

---

4 Are they permitted to resume food handling activities only on medical consent? Yes ☐

No ☐

Health and hygienic requirements

5 How do you achieve health and hygienic requirements? (Can tick more than once**)**

(a) Informing all food handlers of their obligations. ☐

(b) Ensure that food handlers and other persons (e.g. visitors) do not have unnecessary contact with ready to eat-food. ☐

(c) Ensure that Food handlers do not spit, smoke or use tobacco or similar products, where food or surfaces likely to come into contact with food are exposed or unprotected. ☐

(d) Food safety training ☐

6 Do food handlers undergo food certification?

Yes ☐ No ☐

7 If yes to 6, how often do they go for certification?

(d) Quarterly ☐

(e) Once in six months ☐

(f) Annually ☐

Food storage

8 How is food stored? (Can tick more than once)

(e) Refrigerating ☐

(f) Putting food in a warmer ☐

(g) Putting food in a cold room ☐

(h) Putting in a ware house ☐

9 Is stored food protected from contamination? Yes ☐

No ☐

10 If yes, explain how----------

Hygiene of food handlers

11 How do you maintain each hand-washing facility? (Can tick more than once)

(e) Constant supply of warm (between 25 and 45^0C) running water? ☐

(f) Provision of soap/ liquid dispensing detergent ☐

(g) Single use towels or other method for effectively drying hands ☐

(h) Use hand wash facilities for washing hands only ☐

Cleaning and sanitising of food equipment

12 Do you ensure all food contact surfaces are clean and sanitary all times? Yes ☐

No ☐

13 How often do you clean utensils?

(e) Immediately after use ☐

(f) After some hours ☐

(g) After a day ☐

(h) After a week ☐

14 How do you maintain the food preparation surfaces in a clean condition? (Can tick more than once)

(f) Use of wet cloths ☐

(g) Use of detergents ☐

(h) Use of running water ☐

(i) Cleaning schedule ☐

(j) Use of radiation ☐

Safety and Health implications

15 Health issues associated with food from your outlet (Can tick more than once)

(c) Typhoid ☐
(d) Cancer ☐

(c) Cholera ☐

(d)Diarrhoea ☐

(e) Head ache ☐

(f)Fever ☐

(h)Nausea ☐

(i)Vomiting ☐

(j)Back pains ☐

16 Occupational implications of food from food outlets (Can tick more than once)

(c) Burns ☐
(d) Cuts ☐

17 Frequency of health inspections

(g) Once a week ☐
(h) Once a fortnight ☐
(i) Once a month ☐
(j) Once per 2 months ☐
(k) Once per 6 months ☐
(l) Once per year ☐

Food waste disposal

18 Food waste disposal methods (Can tick more than once)

(f) Bin ☐
(g) Incineration ☐
(h) Open burning ☐
(i) Composting ☐
(j) Rubbish dumps ☐

19 What are the health implications of these disposal methods? (Can tick more than once)

(d) Diarrhoea ☐
(e) Respiratory problems ☐
(f) Pathogens ☐

Environmental impacts

20 Environmental issues associated with food from food outlets (Can tick more than once)

(e) Land pollution ☐
(f) Water pollution ☐
(g) Noise pollution ☐
(h) Air pollution ☐

Constraints

21 Which constraints do you encounter in your food industry? (Can tick more than once)

(e) Lack of financial resources ☐
(f) Lack of food safety training ☐
(g) Lack of equipment ☐
(h) Lack of inspection ☐

22 What do you think should be done to improve safety and health issues of your food outlets? ----------
---

APPENDIX 4

INTERVIEW GUIDE FOR CONSUMERS

1 Which foods do you usually consume?

2 How often do you consume food from this outlet?

3 Is the food safe?

4 Are there any health implications of this food?

5 Are the hygienic practices adequate?

6 What do you think are some of the causes of food contamination?

7 Are there any environmental impacts of food outlets?

8What do you think should be done to improve safety and health of food?

APPENDIX 5

INTERVIEW GUIDE FOR ENVIRONMENTAL HEALTH TECHNICIAN

1 Do food handlers undergo food certifications?

2 Which are the food waste disposal methods used?

3 How often do you inspect food outlets at Nyika?

4 What are the safety issues of food from these outlets?

5 Are there any health implications of this food?

6 Which are the possible causes of food contamination at Nyika?

7 Are hygienic practices at Nyika adequate?

8 Which are the constraints faced by food operators and Environmental Health Technicians at Nyika?

9 What are the environmental impacts of food from these outlets?

10 What do you think should be done to improve safety and health implications of food at Nyika?

APPENDIX 6

INTERVIEW GUIDE FOR NURSE IN CHARGE

1 Which are the health issues of food from outlets at Nyika?

2 What is the food borne incidence rates at the moment?

3 How often are food borne cases reported?

4 What do you think are the reasons for the trend?

5 Which are safety issues of food from food outlets?

6 Are there any environmental impacts of food from these outlets?

7 What should be done to improve safety and health implications of food from food outlets?

APPENDIX 7

INTERVIEW GUIDE FOR COUNCIL SOCIAL SERVICES OFFICER

1. How often are food borne cases reported?
2. Which are the food waste disposal methods used?
3. What are the safety issues of food from these outlets?
4. Are there any health implications of this food?
5. Which are the possible causes of food contamination at Nyika?
6. Are there any environmental impacts of food from these outlets?
7. Which are the constraints faced by food operators at Nyika?
8. What do you think should be done to improve safety and health implications of food at Nyika?

APPENDIX 8

Rupare High School

Private Bag 557

Nyika

24 February 2015

The Chief Executive Officer

Bikita Rural District Council

Private Bag 594

Nyika

Dear Sir/Madam

RE: REQUEST FOR PERMISSION TO CARRY OUT A RESEARCH ON FOOD OUTLETS AT NYIKA GROWTH POINT

I write to apply for permission to carry out a research on health and safety issues of food outlets at Nyika.I am a student at Midlands State University studying Master of science in Safety, Health and Environmental Management.

Yours faithfully

Chireshe Amato. (ID Number 04079206T04. Cell Number 0773529053)

APPENDIX 9

Rupare High School

Private Bag 557

Nyika

24 February 2015

The Provincial Medical Officer

Ministry of Health and Child Care

Box 80

Masvingo

Dear Sir/Madam

RE: REQUEST FOR PERMISSION TO CARRY OUT A RESEARCH ON FOOD OUTLETS AT NYIKA GROWTH POINT

I write to apply for permission to carry out a research on health and safety issues of food outlets at Nyika.I am a student at Midlands State University studying Master of science in Safety, Health and Environmental Management.

Yours faithfully

Chireshe Amato. (ID Number 04079206T04. Cell Number 0773529053)