PREVALENCE OF SKIN AND RESPIRATO RY HEALTH PROBLEMS BETWEEN SOLID WASTE COLLECTORS AND NON-SOLID WASTE COLLECTORS IN MBEYA CITY COUNCIL

By

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CERTIFICATION

We, the undersigned, certify that we have read and hereby recommend for acceptance by the Mzumbe University, a dissertation entitled **Prevalence of Skin and Respiratory Health Problems between Solid Waste Collectors and Non-solid waste collectors in Mbeya City Council,** in partial/ fulfilment of the requirements for award of Master of Research and Public Policy (MRPP) of Mzumbe University.

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DECLARATION AND COPYRIGHT

I, Charles Bahati Mtatifikolo, declare that this dissertation is my own original work and that it has not been presented and will not be presented to any other university in a similar or any other degree award.

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DEDICATION

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LIST OF ABBREVIATIONS AND ACRONYMS

CBOs	Community Based Organisations
CD	City Director
CD-ENVT	City Director for Environment and Transportation
COPD	Chronic Obstructive Pulmonary Diseases
CSOs	Civil Society Organisations
DAS	District Administrative Secretary
DFID	Department for International Development
DRPS	Directorate for Research and Postgraduate Studies
HCFs	Health Care Facilities
ILO	International Labour Organisation
ISWM	Integrated Solid Waste Management
MOHSW	Ministry of Health and Social Welfare
MRPP	Master of Research and Public Policy
MS-Excel	Microsoft Excel
MSW	Municipal Solid Waste
MSWM	Municipal Solid Waste Management
MSWs	Medical Solid Wastes
MSWWs	Municipal Solid Waste Workers
MU	Mzumbe University
MWM	Medical Waste Management

NIOSH	National Institute for Occupational Safety and Health
OHS	Occupational Health and Safety
OSHA	Occupational Safety and Health Authority
PEI	Poverty-Environment Initiative
PHCs	Primary Health-care Centres
PPEs	Personal Pr otective equipment
PPGs	Personal Protective Gears
PPPs	Public-Private Partnerships
RAS	Regional Administrative Secretary
SBL	Serengeti Breweries Company Limited
SPSS	Statistical Package for Social Science
SWCs	Solid Waste Collectors
SWM	Solid Waste Management
TANZAM	Tanzania Zambia highway
TAZARA	Tanzania Zambia Railway
TB	Tuberculosis
TBL	Tanzania Breweries Company Limited
UNEP	United Nations Environment Programme
USA	United States of America
US-EPA	United States Environmental Protection Agency
WEOs	Ward Executive Officers

WHO	World Health Organisation
ZZK	Zana Za Kilimo

ABSTRACT

The study aimed to determine the prevalence of self-reported injuries, skin and respiratory health problems and related factors among waste collectors in Mbeya City Council. A cross-sectional design was used in this study, where 100 respondents highly exposed and 100 not exposed to hazards were recruited. Structured questionnaire was used to collect data for the study. SPSS software was used for analysis from which descriptive analysis and cross tabulation with Chi-square test was used to compare the prevalence of health problems and factors for exposure to health problems between the two working groups. Results show that there was 77.4% of respondents reported injuries for refuse handling and 8.5% from non-refuse handling staff with statistical different (p=0.03). More than three quarters (78.5%) of refuse handlers reported skin health problems while only 2% of skin health problems reported from non-refuse handlers. The two proportions were statistically different (p=0.02). In addition, majority (90.1%) of refuse handlers reported respiratory health problems whereas only 23.6% of non-refuse handling staff reported respiratory health problems. The proportions were significantly different (p=0.01). The difference between the two proportions suggests that refuse handling had significant contribution for Injuries, skin health problems and respiratory health problems occurrence reported. All the associations were established at the statistical significance calculated at p<0.05. The rest of exposure variables due to refuse handling had insignificant influence on the selected health outcomes. In the insignificantly associated variables the p-values were greater than 0.05. There was significantly high prevalence of about 82% injuries, skin health problems and respiratory health problems among refuse handlers as it was compared to 11.4% for non-refuse handling staff. To overcome the problems there should be adequate supply of PPEs to all refuse handlers, training on the proper use of the refuse handling tools; personal hygiene as well as close health monitoring. Further studies, to explore in-depth on the diseases associated with refuse handling activities.

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CHAPTER ONE
INTRODUCTION AND PROBLEM SETTING

1.1 Introduction

This chapter presents the background to the study, statement of the problem, purpose of the study, objectives of the study, research questions, and scope of the study and the significance of the study.

1.2 Background of the study

Worldwide, refuse handlers are exposed to various health problems that originate from refuse or waste substances that they handle. Workers and waste pickers handling solid waste throughout the world are exposed to occupational health and accident risks related to the content of the materials they are handling, emissions from those materials, and the equipment being used (Cointreau, 2006). Efforts to handle refuse differ between countries, where most of the developed countries have the regulations that protect health of waste collectors. Among those efforts for example, are the efforts done by the US Environmental Protection Agency (US-EPA) which is documented to date that showing the hazardous, toxic and biomedical waste, appropriate legislation for managing different kind of waste and assessment of medical waste treatment technologies.

The growth of the world's population, increasing urbanisation, rising standards of living, and rapid developments in technology have contributed to an increase in both amount and variety of solid wastes generated by industrial, domestic and other activities. Production and presence of dangerous waste materials are relatively critical in developing countries whereby waste management technologies are still poor. Domestic solid waste has even become one of the sources of health hazard in many developing countries. It was due to carelessness in handling the waste and failure to organise appropriate solid waste collection schemes and management.

Municipal solid waste is a collection of discarded liquid and slid materials that serve as breeding ground for bacteria and fungi (Perez *et al*. 2006). The generation of waste, collection, processing, transport and disposal of waste are important stages

where human labour together with equipment and machines are involved. Nature and categories of solid waste have effects on public health, aesthetic (beauty) and environment at large (Rushton, 2003). If solid waste is not handled with care it can cause injuries, skin health problems and respiratory health problems to refuse handlers and those scavenging in the dumpsites. Hardoy and Satterwaite (2006) noted that wastes not managed properly may cause health and environmental risks. The overall goal of municipal waste management is to collect and treat waste in such a manner that it improves and safeguards environment, public health and welfare, to reduce waste generation and increase resource recovery, re-use and protect environmental qualities.

There is association between job task of handling municipal solid waste and various respiratory, (dermatology) skin problems and (gastrointestinal) stomach health problems (Rushton, 2005 and Perez, 2006). It had been seen that refuse collectors who underwent clinical evaluation of skin problems and injuries were affected, for example about 75% of refuse collectors had skin health problems and the majority of waste handlers had work related injuries each year that included abrasion, fractures and eye injuries (Gelin, 1985).

Occupational injuries continue to be a serious problem affecting workers at different working stations and industries. The magnitude of the problem worldwide which was documented by the International Labour Organisation (ILO) shows that 250 million workers sustain occupational injuries and 330,000 fatalities annually (Anan, 1997). Additionally, an estimate of 160 million new cases of work related problems occur including respiratory and cardiovascular diseases, cancer, hearing loss, musculoskeletal and reproductive disorders. Among the occupations contributing to the problems is solid waste handling during municipal solid waste management and refuse handling at different industries.

Solid waste is the mixture of different materials; some wastes are hazardous to health of individuals involved in collection, transport, transfer and its disposal. Some solid wastes can cause problems due to nature of the working environment and knowledge of refuse related health effects in other occupations. The handling of municipal solid

waste results in adverse health outcomes such as respiratory problems as the result of inhaling toxicant and irritant gases emitted by waste decomposition such as methane, hydrogen sulphide, sulphur dioxide, carbon dioxide and other gases of the like (Mahal and Thorne, 1999).

In many developing countries, infectious medical wastes and toxic industrial wastes are not segregated from domestic waste exposing solid waste handlers to risk, in most of these countries waste pickers commonly find their livelihood through sorting and recycling of secondary materials, hence they are exposed to the occupational health hazards including the contact with human faecal matter, paper that may have become saturated with toxic materials, bottles with chemical residues, metal containers with pesticides residues and solvent, needles and bandages from hospitals batteries containing heavy metals and exhaust fumes from waste collection trucks travelling and from the disposal sites, dust from disposal operations and open burning of waste all contributes to the occupational health problems.

The worst scenarios of solid waste management and disposal are high in developing countries like Tanzania where there is lack of proper enforcement of laws and regulations (Manyele, 1996). It was observed that the contact between solid waste and workers was greater and the use of personal protective equipment was not addressed properly. Waste disposal practices were found to be quite unsafe and both clinical and non-clinical wastes were found to be thrown together (Akter *et al*., 2007).

There is no documented information from East African countries showing health problems facing refuse handlers. Hazardous and medical wastes are still handled and disposed together with domestic wastes thus creating a greater health risk to municipal workers, the public and environment (Array and Sahel, 2007).

In Tanzania, solid waste collector's both employed and unemployed like scavengers plays a great role on environmental cleanliness through scavenging in various areas of town and cities where environments could be worse as it looks now, the fact that scavengers are the people playing a great role in reducing the volume of recyclable solid waste dumped elsewhere but no institutions are taking care of this group to

support their crucial role in environmental management and enhance protection against haphazard waste disposal.

Mbeya is among the glowing cities in Tanzania with number of industries, health facilities, workshops, markets and social centres that contribute a lot in generation of solid waste that worsen refuse handling activity as refuse handlers' deal with unsorted waste. Most refuse are mixture with different materials from different points that generates waste that require careful handling, among other cities, Mbeya is also included in the national sustainable cities programme to promote environmental sustainable urban development in Tanzania, where skip masters and skip buckets are distributed in different streets to address the problem of haphazard solid waste disposal.

To implement this project, a numbers of solid waste handles are employed to collect waste around the skip buckets and in areas where there is no skip buckets. Apart from those employed waste handlers, there is another group of people who scavenge from those skip buckets and skip masters to meet their daily lively hood, so this study addressed their safety, health and working condition to determine the prevalence of injuries, skin and respiratory health problems and associated factors pertaining solid waste collectors and comment on the possibility for control measures to overcome those problems.

1.3 Statement of the problem

Currently, solid waste management has become common problem in urban area throughout the world, particularly in the fast-growing cities and towns of the developing countries. Most of the wastes generated are from fast population increase, urbanisation, industrialisation and also excessive consumption under the modern daily lifestyle. Solid wastes have many problems related to human health risk because they contain a lot of chemicals agents like, methane gas, hydrogen sulphide, sulphur dioxide, carbon dioxide, toxic materials, exhaust fumes from trucks and containers carrying wastes, which had significant contribution to respiratory health problems (Mahar &Thorne, 1999). Others contains biological agents like bacteria from rotten wastes and viruses from hospital solid wastes that contribute to skin

health problems and gastrointestinal problems Peres *et al,* (2006). These had effects on human health regarding on management of solid waste which could give direct or indirect health risk or impacts to human health. Waste collectors are facing more amounts of exposure and risk in the cause of work compared to other workers (Aminuddin and Rahman, 2015).

In most countries including Tanzania, collection of waste is done by the municipalities or towns where people are employed for that job. In other occasions people scavenge the waste for recycling purpose to earn their living that provides income opportunities for migrants, unemployed, children, woman and handicapped individuals (Medina, 2004). This means the number of solid waste collectors and scavengers who are exposed to potential hazards of injuries, skin health problems and respiratory health problems increases daily

Health related problems resulting from solid waste management; collection and disposal need an extensive care to be addressed. Even if there are some minimal regulatory frameworks existing in the country governing the environmental protection and the health safety, still there is little enforcement. Waste disposal is in ravines and wetlands near residents. In most occasions waste collection is done by labour extensive system with little, if any, worker protection equipment from direct contact with waste and injury. Waste collectors lift heavier loads to the high loading locations and in traffic condition with high dust or diesel exhaust pollution. Waste collectors and scavengers work informally at the open dumps with bare hands and no any other protection used when sorting activities are conducted that expose them to potential hazards which are likely to affect them.

Therefore, the study intended to investigate the magnitude of the reported injuries, skin and respiratory health problems and the other relating factors among the solid waste collectors and scavengers as resources gave information.

1.4 Research questions

1.4.1 General research question

What is the prevalence of injuries, skin health problems and respiratory health problems between solid waste collectors and non- solid waste collectors?

1.4.2 Specific research questions

1. What is the prevalence of self-reported injuries between solid waste collectors and non-solid waste collectors?
2. What is the prevalence of self-reported skin health problems between solid waste collectors and non-solid waste collectors?
3. What is the prevalence of self-reported respiratory health problems between solid waste collectors and non-solid waste collectors?
4. What are the factors associated with injuries, skin and respiratory health problems between solid waste collectors and non-solid waste collectors?

1.5 Objectives of the study

1.5.1 General objective

To determine the prevalence of self-reported injuries, skin health problems and respiratory health problems between solid waste collectors and non-solid waste collectors

1.5.2 Specific objectives

1. To identify the prevalence of self-reported injuries between solid waste collectors and non-solid waste collectors
2. To determine the prevalence of self-reported skin health problems between solid waste collectors and non-solid waste collectors
3. To find out the prevalence of self-reported respiratory health problems between solid waste collectors and non-solid waste collectors
4. To analyse waste collection related factors associated with injuries, skin and respiratory self-reported morbidities

1.6 Hypothesis of the study

1.6.1 General hypothesis

Solid waste collectors are exposed to occupational health hazard in the cause of work as compared to non-solid waste collectors.

1.6.2 Specific hypotheses

1. *Hi* =Solid waste collectors are exposed to hazardous injuries in the cause of work as compared to non-solid waste collectors
2. *Hi*= Solid waste collectors are exposed to hazardous skin health problems in the cause work as compared to non-solid waste collectors
3. *Hi*= Solid waste collectors are exposed to hazardous respiratory health problems in the cause work as compared to non-solid waste collectors.
4. *Hi*= There are some related factors associated with injuries, skin health problems and respiratory health problems between solid waste collectors and non-solid waste collectors.

1.7 The Scope of the study

The scope of study was to identify the reported health problems basing on injuries, skin and respiratory health problems and the associated factors among solid waste collectors in Mbeya city council in Tanzania. The selection criterion for this City is the fact that it is among the fast growing cities in Tanzania with slight population increase with many markets and industrial development that are the contributing factors for solid waste generation

1.8 Significance of the study

The study revealed the prevalence of reported injuries; skin health problems and respiratory health problems facing refuse handlers. The knowledge obtained would raise awareness on the number of refuse handlers exposed to the problem in Mbeya City Council.

The study advises on the adequate supply of the PPEs and monitoring of the proper utilisation of the given PPEs, training of refuse handlers should be done before they are employed to work and even those who are not employed should be educated on

the use of PPEs and observation of personal hygiene after work. Emergence care units should be given to refuse handlers so as to ensure their safety at work. The study also recommended on further research areas which could expand the scope in the same or related matters and will add to existing literature for future references.

The study was built on the assumption that if the results and recommendations are implemented on the field, health problems facing refuse handlers in Mbeya City Council and other areas will be minimised

1.9 Limitations of the study

The study was conducted in Mbeya city council in Mbeya region, that focused on the problem stated *"skin and respiratory health problems and related factors among solid waste collectors"* during data collection questionnaire was the dominant tool for data collection about the matter on board. The limitations of this study included: reluctance of the respondents to give the accurate information when responding to the questions; difficulties to control the external factors such as loss of some questionnaires; and delay or failure to bring back the questionnaires made some difficulties in the study.

1.10 Organisational of the dissertation

The dissertation is contains six chapters, references and list of appendices. The first chapter introduces the study, provides the background and the statement of the problem, the objectives of conducting the study, organisation of the research report, hypotheses that were tested, significance and scope of the study. The second chapter contains definition of concepts, theory of the study, theoretical framework, conceptual framework and literature review. The third chapter is study methodology that explains how the study was executed, it explains on the design of the study, the study population, the sample technique and sampling process. It also explains how data was collected, processed and analysed. Chapter four is data analysis and presentation of the findings where chapter five is the discussion of the findings presented in chapter four. The last chapter provides the summary of the whole study, conclusions, policy implication, limitations and recommendations.

CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

This chapter presents the operational definition of the concepts used in the study, the situation of solid waste management in Mbeya City Council, Theory of the study, Theoretical literature review, Conceptual framework of the study, Empirical literature review and the research gap.

2.2 Operational definition of some key terms

Injury/ injuries are the physical damage to the body or body parts that may bleed and make somebody unable to continue working and it may require treatment, these may be in form of cut/puncture that can cause wounds and may need treatment. These include abrasion, bruise/bruises the damage to the superficial surface that cannot lead to wound and which cannot prevent someone to continue working and do not necessarily need treatment.

Personal protective equipment (PPE)/Personal protective gears (PPGs) are the equipment that provide protection against weather or equipment which are worn to protect workers against risk to health safety, apparel and devices worn to protect the body from contact with solid waste including: coveralls, resistant suits, gloves, footwear, aprons, and headgear, protective eyewear, and respirators (EPA, 2005).

Respiratory health problems are the symptoms that show some difficulties in respiratory system, these are like chest pain, coughing, breathing shortness, difficult breathing and wheezing, respiratory problems are such as chronic cough, wheeze, dyspnoea and chest-tightness, asthma and chronic bronchitis (Mamane *et al*., 2015)

Occupational accident; Is an accident occurring at the workplace and during working time, giving rise directly or indirectly to a physical injury, functional disorder or disease leading to death or a partial or total loss of working or earning capacity.

Associated factors; these are conditions which contribute in the occupational respiratory health symptoms including: smoking behaviour, alcohol drinking, using materials which can lead to body disturbance, being alleged by some drugs and chemicals.

Utilisation of PPEs/PPGs; Means effective use of the available personal protective gears that protects refuse handlers from potential hazards;- PPEs/ PPGs were used interchangeably

2.3 The situation of solid waste management

Municipal solid waste accounts for only a small percentage of the total solid waste in stream in developing countries, the proportions of solid waste are considerably higher because safe and scientific disposal arrangements for various types of solid waste are not in place and waste from multiple sources are abandoned in municipal limits (Dhamija, 2006). The fact is that developed countries use scientific methods in the management of solid waste, for example the use of incinerators and recycling of the wastes (UN-HABITAT, 2010).

Field report done by MOHSW (2013) in Mbeya City shows that in neighbourhoods', garbage is collected by households and brought to a collection point then collected by the council and removed to the dump-site. CSOs are now being involved in collecting to the collection point. All points are open whether concrete or skip. Despite regular collection, many were observed to be over-flowing, surrounded by dogs, children, and flies in most areas

To avoid the problem of overflowing and pilling off of the waste that may cause environmental problems, the municipals and cities employ the groups of people to recollect and make proper dumpling, but there are other groups of scavengers who use to collect the recyclable material around town on street ravines, dumping place and main dumping station to earn their life.

In the year 2000, Mbeya city council started to use a community approach in the management of solid waste to reduce the problem in the city. The household as well as the business places were supposed to have the litter bins in their premises that used to collect solid waste before taking to the collection points. Also, bylaws enacted by ward leaders or solid waste managers' strictly prohibited littering of solid waste in the streets.

In the year 2011, Mbeya city council enacted the solid waste management bylaw where each one who produce waste either at household or through his/her business should pay for solid waste collection fee that help the council in serving the city. Each household was supposed to pay 1000 per month, and for businesses the fee depends on the kind of the business itself. The minimum amount was 2000 and the maximum amount was 200,000. The total collection of the fee was distributed as follows; 10 per cent was for a ward, 20 per cent for sub wards and 70 per cent to the solid waste department in the council that used to pay refuse handlers (Mbeya City Council, 2013).

Mbeya city council has 164 collection points situated in 36 wards where the solid waste collection service is done. There are several refusing bays and skip buckets. These collection points are situated in different areas such as bus stands, market places, and open spaces and around institutions, but these collection points are few compared to the number of people present in an area. The council fails to collect the SW in 100% due to shortage of funds, limited trucks, and inadequate awareness of the community as they think SWM is the responsibility of the council (Mbeya City Council, 2013).

2.4 Theory of the study

The study resulted from Solid Waste Management theory where SWM has been identified as a priority area to be addressed as part of the sustainable development plan. Comprehensive SWM systems are developed with an overall goal of pollution prevention and control of waste resource maximization (Claivair, 2006). Now SWM is considered as a major public health and environmental concern in urban areas of many developing countries. The situation in Africa particularly in the capital cities is

severe; public sectors in many countries are unable to deliver services effectively. Regulation of the private sector is limited and illegal dumping of domestic and industrial waste is a common practice. Generally, SWM is given very low priority in these countries. As a result, very limited funds are provided to the SWM sector by the governments and the levels of services required for protections of public health and the environment are not attained. The problem is most acute at the local government level where the local taxation system is adequately developed and therefore, the financial basis for public services including solid waste management is weak (UNEP, 2005).

This proves that SWM requires an integrated approach. A number of African countries have been implementing integrated solid waste management (ISWM) which refer to the complementary use of a variety of practices to safety and effectively handling. From this integrated solid waste management system is where solid waste collectors are involved and through doing unsecured job of handling wastes is where they face some occupational hazards like injuries, skin and respiratory problems.

2.5 Theoretical literature review

In today's word the major problem of the most developing countries is solid waste management (SWM) that is engineered by the development and growth of cities and towns, where industries, workshops, markets and home consumption generates varieties of solid waste. In the same vein, health facilities is among the cause of the solid waste generation though it contribute to a minimal amount;- yet, medical waste management (MSW) does not receive great attention in the whole process of SWM resulting in the potential environment and health hazards if not properly handled the worst scenario being in the developing countries (WHO, 1999).

The survey done by Da Silva *et al*. (2004) on municipal SWM from different health care facilities in southern Brazil, shows that the major emphasis was kept on the sharp waste and other type of solid waste were given inadequate attention. In developing countries there is large workforce employed in waste collection, sorting and disposal which expose them to some potential health hazard as general

population though effects differ from one country to another. The incidence of occupational accidents for waste collection workers has been found to be higher than the general workforce (Eliott *et al*., 2000).

The International Labour Organisation estimates that workers sustain about 250 million unmentioned occupational injuries and 330,000 fatalities annually worldwide (Anan, 2007). This is because all activities in solid waste management involve risks either to the workers directly involved or to the nearby resident. Risks occur at every step in the process, from the point where residents handle wastes in home for collection or recycling to the point of ultimate disposal (Cointreau, 2006).

In developing countries, a significant portion of the waste pickers found at open dumps are children and pregnant women. Confounding this image is the reality that residents around solid waste disposal sites include infants, young children, women of child-bearing age, and seniors. Children are particularly vulnerable to toxins because they ingest more water, food, and air per unit of body weight; their metabolic pathways are less developed to detoxify and excrete toxins; and any disruption during their growth years can easily disrupt development of their organ, nervous, immune, endocrine and reproductive systems (Landrigan, 1998).

To overcome the exposure to some diseases and injuries from solid waste management it needs to make waste technologies more contained, reducing contaminant emissions, changing working methods, use of protective clothing and keeping the public and residents a safe distance away from operations. For example, risk of respiratory infection or allergic response to organic dusts can be greatly reduced if transfer stations, composting and recycling process systems are enclosed or ventilated and if workers wear respiratory masks.

Human faecal matter is common in solid waste. In high-income countries, human waste generated in cities is primarily handled in separate sewerage systems and only a limited portion gets into solid waste, largely through disposable babies' diapers (nappies). However, in developing countries, a significant portion of human waste generated in a city ultimately reaches the solid waste system because of inadequate sanitation systems.

In the poorest countries, because of a paucity of sanitation systems, people defecate along roadways and on open lots, night soil is deposited in open drains, and the resulting street and drain cleanings contain faeces. Where buckets or bedpans are used, human waste is often placed in a plastic bag or wrapped in newspaper before discarding with the solid waste.

2.6 Empirical literature review

Several studies reveal some factors that differentiate MSWM in developing countries from the industrialised countries. Cointreau (2004) identified these differences as type of materials composing solid waste where in developing countries wastes have high proportion of organic materials making waste denser with greater moisture, small particles and plastic, other differences were seen in the technology used by industrialised and less developed countries, the last issue is poor city plan in developing countries where there is haphazard construction of buildings that makes some difficulties for the collection vehicles to access solid waste dumped in streets (Emily *et al*. 2003).

In low-income countries nearly all of collected wastes are deposited within open dumps. The cost and resources required to implement waste technologies are often regarded as too prohibitively high to be sustained hence the hazardous waste facilities have not yet been implemented and hazardous wastes are mixed for disposal with municipal solid wastes, despite laws to the contrary (Cointreau, 2006).

The situation appears to be problematic as different reports portray poor MSWM practices in different occasions. The study done by Manyele (2003) revealed that MSWM is still poor with inadequate if not lack of awareness on issues related to MWM among generators and handlers. Major factors that hinder good and effective performance of the SWM systems may include technical, financial, economic, social and institutional frameworks, where if not clearly observed may cause potential health, environmental and waste management problems causing hazards to the general population which affect most the solid waste collectors (Ogawa, 1995). Furthermore, Rotich *et al*. (2005), in their study on municipal solid waste management challenges in developing countries mentioned some factors like poor

state of infrastructures, inadequate funding on MSWM and disposal services and inadequate or poor services on municipal solid waste collection vehicles may influence the occurrence of the identified health problems.

Momodu (2011) on his work addressed many factors such as inadequate good and enough infrastructures, non-implementation of the existing environmental sanitation laws, irregular and unplanned dumpsites of the solid wastes, population increase, lack of new technologies for handling wastes, and insufficient capital to run the MSWM as the main cause of the improper solid waste management in different urban centres of the most developing countries.

On the other hand, WHO (1994, 1995); Tudor *et al*. (2005), Mokuolu (2009) identified that Health care facilities (HCFs) also contribute a lot in generation of solid waste as a result of different activities taking place. Medical wastes are from hospitals, primary health- care centres (PHCs), dispensaries, first aid posts, nursing homes and chemical stores but knowledge is not given on its hazardous effects hence still contributing to the potential hazards to solid waste collectors (Tudor*et al*., 2005; Da Silva *et al*., 2005; Oke, 2008; Coker *et al*., 2009 and Path, 2009).

Refuse handlers are exposed to number of injuries resulting from waste and the types of injuries vary from one country to another with the proportion of 5-7% in Brazil and USA respectively and 1% in Denmark. The study on "*The burden of injury in Brazil"* done by Gawryszeski and Rodrigues, (2001) shows the percentage of cutting injuries among the occupational accidents was high in Brazil where (29-31%) refuse handlers were injured. Another study done by Yang *et al*. (2001) also revealed different results;- for example it shows that in Taiwan 37% of refuse handlers were injured by sharp objects, in USA injuries were about (11-31%) among refuse handlers. Results were centrally related to Denmark where only (4%) refuse handlers were injured as was reviewed in the study of "*Occupational safety and health administration"* done by Dorevitch, (2001). Parts which were highly injured were the backs, arms and legs. In other occasions injuries were severe due to the force used to do some works that caused cutting injuries, bruises. Other injuries were caused by

fall or slip injury, being injured by goods, vehicle or objects cutting and overloading of the body.

Because of poverty and the paucity of environmental regulation and enforcement, disposal in many developing countries is still predominately involving open dumping often with associated open burning. When regulatory improvements and economic developments enable disposal to improved sanitary landfill is the most economic and likely choice of disposal techniques. Exposure to household waste was associated with both increased prevalence of respiratory symptoms and worse lung function testing results (Athanasiou1 *et al.,* 2010).

The collection of domestic waste is a hard work and dangerous to the workers, the workforce used in waste collection is larger than other types of work because of the risks associated with waste collection, sorting and disposal of waste to the landfills. SWCs are also exposed to the same potential hazards as the general population though the exposure status and risk may differ. The incidence of occupational accidents for waste collectors has been found to be higher than the general workforce. The main source of the workforces come from considerable heavy lifting as well as other manual handling of containers, hence increasing the risk of musculoskeletal, exposure to bio-aerosols and volatile compounds that can lead to the work-related respiratory gastrointestinal and skin problems.

In developing countries including Tanzania there is a wide range of insecure jobs and a worker does not have any formalised relationship with an employer. Some of the tasks are inherently hazardous, for example the manual collection and recycling of waste. More generally, informal workers tend to have a poor working environment and very unsatisfactory welfare facilities (ILO, 2003). This has resulted in potential hazards like breathing problems to refuse handling staff who had increased the risk of the development of chronic respiratory symptoms such as cough, phlegm, wheezing and chronic bronchitis; musculoskeletal symptoms such as low back pain, elbow/wrist pain and get injured by sharp objects.

On the other hand, the gastrointestinal symptoms such as diarrhoea and nausea are well-known problems among occupational groups exposed to high concentrations of air-borne gram negative bacteria (Mohd and Haliza, 2015). Recent studies have indicated that the high rate of gastrointestinal problems, irritation of the eye and skin problems. Symptoms of organic dust toxic syndrome, influenza-like symptoms, cough, muscle pains, fever, fatigue and headache have been reported among workers collecting the domestic waste. Moreover, other domestic waste collectors were affected to the upper airway inflammation and respiratory symptoms

The study done by Medina (2004, 2005) portrays that in many countries particularly Tanzania, SWCs are employed in informal sectors, in most cases solid waste collection is done by women, the big proportion consists of old women who are disadvantaged in social and education status being employed in private cleaning companies and sent out to different working stations like homes, bars, schools, hotels and other places. This group is highly exposed to potential hazard as they lack some knowledge pertaining to health related problems. In his study of "*Waste pickers cooperatives in developing countries*", Medina (2004) reports that SWCs work informally in open dumps, spending most time in dumpsites with poor housing condition where waste sorting and recycling activities are conducted in micro and small scale enterprises with old equipment, no dust control or if any other worker protection. Gelin and Zavon, (1968) in their study of "*Cincinnati solid waste workers"*, revealed that poor solid waste management was a factor that exposed the population and more particularly solid waste collectors to the conditions that might cause injuries and illness. Apart from that, Sigsgaard and co-workers (1994) reported the largest number of respiratory problems among SWCs resulted from solid waste handling activity.

According to Englehardt *et al*., (2003), in their work pointed out that; in the least developed countries like Tanzania municipal solid waste collection is recently highest risk, occupation and the actual total injuries rates are not compensated with any insurance, and if any are not known. Organic solid wastes are rich in substance for microbial growth (Wouters *et al*., 2005). Hence, poor management of refuse may cause health effects like respiratory health problems and gastrointestinal symptoms.

In most reviewed information the situation is not different from Tanzania. The study done by Manyele (2005) shows that wastes from health facilities are mixed with normal wastes from home, markets, workshops and industries and they are both deposited in the same way and in the same place. This put solid waste collectors endangered because most solid waste is dangerous to both waste generators and handlers.

Prevention is the best form as it protects the workers who are likely to be exposed to infectious materials or organisms found in solid wastes. Regulations require the employer to develop and implement a written exposure control plan. Regina and Saskatoon (2007) pointed out several procedures that should be followed to protect the refuse handlers. These were like; identifying the workers who are exposed at risk, describing those risks, identify the control measures, show the training description, investigations of any associated infection or diseases. Following these regulations may facilitate protection of solid waste collectors from injuries, skin health problems and respiratory health problems in most cases.

Netherlands adopted the most important technology where solid waste collection was done by the use of closed refuse trucks which automatically lift devices containing solid waste to the empty containers that minimises the health resulting problems among refuse handlers (Kuijer and Frings, 2004). Some institutions provide some essential equipment to protect solid waste handlers against occupation problems. A study conducted in Pakistan, revealed that out of 8 health facilities 2(25%) were segregating sharps, pathological waste, chemical, pharmaceutical that helped to reduce potential risk and 2(25%) hospitals provided essential protective gears to its solid waste handlers (Shahida *et al*., 2005).

Literature insists that solid waste generated by the daily activities needs to be properly managed in such a way that minimises the risk to the environment and human health (Chengula, Lucas and Mzula, 2015). Therefore, discarding the waste generated by the daily activities is also important as it minimises the risk to the environmental degradation, human and animal health (Mahar *et al*., 2007).

In order to overcome the greatest problem facing many urban and semi-urban areas in many countries during solid waste management, several methods have been suggested including integration of Public-Private Partnerships (PPPs), creation of the special agencies for solid waste collection, solid wastes incineration, recycling and conversion of MSW to wealth (Awopetu *et al*., 2014 and Oloruntade *et al*., 2014). Launching of an emergency city clean-up campaign, privatisation of solid waste management services and composting to ensure good management of solid wastes in the urban settings (Skat Foundation, 2003). This should be accompanied with educating households, providing good services, creating good relationship with the households and collecting fees for the service at the light time (Kassim and Ali, 2003).

2.7 Research gap

It has been observed from the literature review that, a lot has been written on SWC and SWM in different areas of the world in developed and least developed countries. Studies show the problem in management and disposal of wastes in streets, towns and in dumping sites and its potential hazards to the general population. Literature also shows that there are no records on the trend of waste management in East African countries Tanzania being among them. Lack of these records leads to the limited information about the whole operation and management of solid waste, though legal framework are there but low enforcement is the most salient problem. Environmental and health policies do not say anything on how solid waste collectors go about work, how to protect them from exposure to potential hazards, and how to take care and render treatment to those already affected. Apart from those issues, there is no record on the magnitude of the problem among the refuse handlers exposed to occupation hazard leading to injuries, skin and respiratory problems.

In response to this gap, this study was designed to be carried out as an attempt to know the magnitude of the problem among refuse handlers, that may inform policy and bring legal and institution framework into practice on how to overcome the problem facing refuse handlers from health hazards by ensuring that all stakeholders (government, private sectors, refuse handlers and scavengers) come into discussion

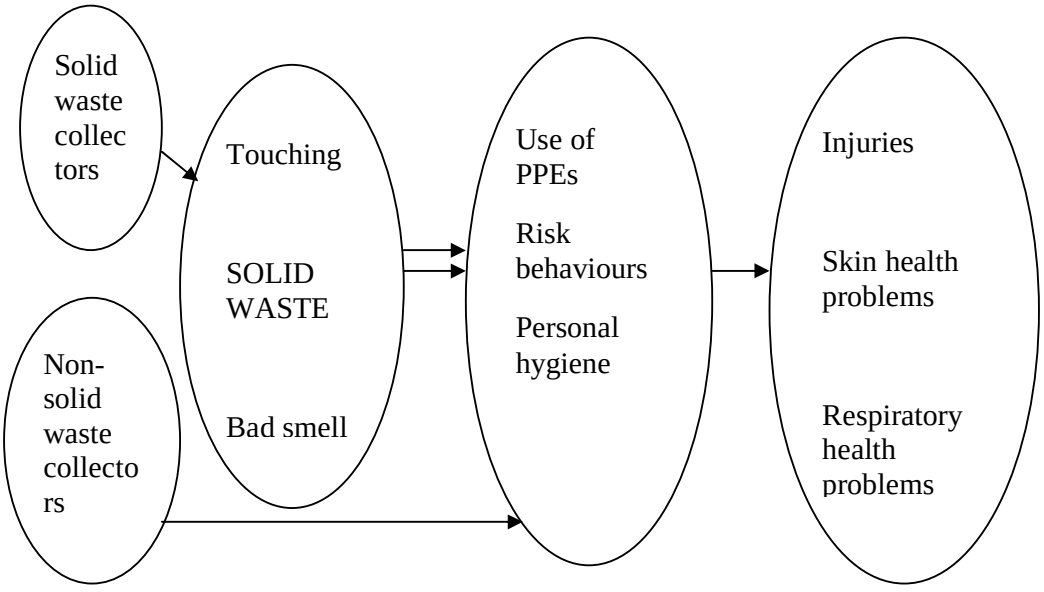
on how to go about safe ways of environmental conservation and poverty alleviation out of occupational health problems.

2.8 The conceptual framework for health problems facing refuse handlers

In this case, the conceptual framework illustrates the relationship between the occurrence of injuries, skin health problems and respiratory health problems among waste collectors and their solid waste collection activities.

Therefore, it assumes that inadequate supply and little utilisation of the PPEs. Such as gumboots, gloves, mask, overalls, apron, sped and blooms, quality of the waste collecting equipment and attitude towards the use personal preventive equipment (PPE) among solid waste collectors, inadequate training and low level of knowledge on the proper use of PPEs, little consideration on personal hygiene and exposure to risk behaviours like alcohol taking, smoking and drugs consumption may expose the solid waste collectors to the potential hazards like injuries, skin health problems and respiratory health problems as described in the table below

Figure 2.1 Conceptual framework



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CHAPTER THREE
METHODOLOGY

3.1 Introduction

This chapter explains the study area, study population, target population, study design, tools and techniques for data collection, method for data collection, unit of study, sample size, sampling procedure, data collection and quality control, data entry and cleaning, data variable and analysis and ethical consideration.

3.2 Research design

The study used cross-sectional design, where data was collected quantitatively to gather information concerning injuries, skin and respiratory health problems and the associated factors among solid waste collectors. The design was used because the researcher intended to get numeric description of trends, attitudes and opinions of a population through the sample of the study population that aimed generalise the findings from the sample to the population.

3.3 Study area

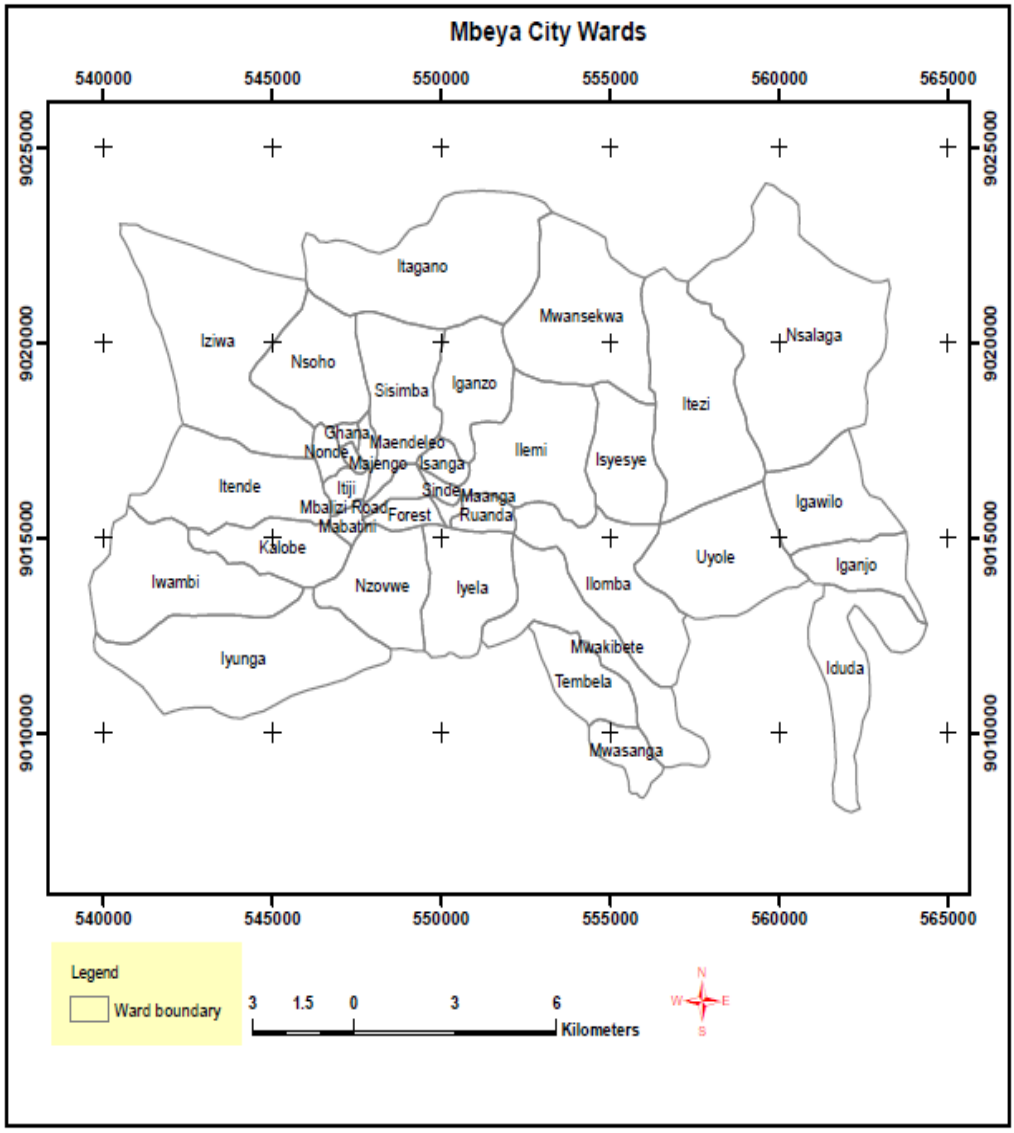
The study was conducted in Mbeya city council which is situated in the south western part of Tanzania along the Tanzania Zambia (TANZAM) highway and the Tanzania Zambia Railway line (TAZARA). It is located within Mbeya District, lying between latitudes 8°50' and 8°57' South of the equator and between longitudes 33°30' and 35°35' East of the Greenwich meridian and borders. Mbeya City is the headquarters of Mbeya region and is conveniently accessible by road and railway from Dar es Salaam (830km North East).

Mbeya City Council is situated at an elevated land along the slopes of Mount Mbeya ranges at an altitude rising from 1600 to 2400 meters above sea level. The city is characterised by moderate climate, with the mean annual rainfall of 1200 mm received between November–May which is accompanied with mean temperature ranging between 110C – 250C.

Major economic activities in the city include commerce and trade, agriculture and livestock keeping and service provision. It is estimated that 33.3% of City residents depend on agriculture for their livelihood. 21% are employed in the public sector mainly dealing with service provision and 43.4% are engaged in the informal sector where they work with small scale production, petty trade and selling of agricultural crops and 2.3% contribute as family workers and other businesses. Mbeya city constitutes of about 36 wards where 29 are urban centred and the rest 7 are in peripheral where small industries and large scale industrial production such as Tanzania Breweries Company Limited (TBL), Serengeti Breweries Company Limited (SBL), Coca-cola company, Pepsi company, Marmo E. Granito mines company limited and Zana Za Kilimo (ZZK) Located at the industrial zone in Iyunga ward.

There are also health facilities located in different wards such as Meta hospital, referral hospital, Regional hospital, Uyole hospital, Itende hospital, kiwanja mpaka hospital and other small dispensaries. Small and big markets are surrounded in Mbeya city council; those are like Mwanjelwa market, Sido market, Sokomatola market, Soweto market, Uyole market and other many small markets. Timber workshops scattered in different areas of the city that generates daily waste to the environment.

Figure 3.1: Mbeya City Map showing Ward Boundaries



Source: Mbeya City Directors' Office

3.4 Target population

In this study population included two groups where the first group (exposed group) consists of the waste collectors from the collection points such as markets, health facilities, industries, street, municipal, mechanical workshops and scavengers in the dumping areas.

The second group was taking respondents doing the relating activities but not completely collecting wastes. This group of these non-waste collectors included workers such as office attendants, office cleaners, gardeners and grass cutters which were standing as unexposed group. The risk associated with solid waste collection was then compared to that of the non-solid waste collectors and generalisation was made from the obtained results.

Given that respondents were meeting the selection criteria of working as solid waste collectors in the respective areas, information was collected regardless of gender, race, working experience, education level and economic status.

3.5 Sample size and sampling procedures

3.5.1 Sample size

For the purpose of this study, a total number of 200 respondents were selected respectively from the population that was eligible to participate for the study of which 100 participants were drawn from waste collectors including waste collectors from collection points such as markets, health facilities, industries, street, municipal, mechanical workshops and scavengers in the dumping areas. Other 100 respondents were taken from the people who were not exposed direct to the solid waste; this group constituted office attendants, office cleaners, gardeners and grass cutters standing for the control group.

Convenient sample size supported by literatures

According to Ndunguru (2007) and Cresswell (2014). Sample size can be adopted from other related studies. In this study, the selection of sample size reflected to similar studies which used related number of respondent. For example, Shahida *et al*. (2005), used a sample of 103 respondents, Rushton (2003) used a sample of 198 respondents, Mohds (2013) used a sample of 200 respondents, Milhem (2004) used a sample of 216 respondents and Das (2009) used a sample of 300 respondents. Therefore, this study adopted a sample of 200 respondents because it was a representative sample for a study population.

3.5.2 Sampling technique

Purposive sampling technique was used to select a list of 200 respondents with whom a questionnaire was administered.

Priority was given first to the respondents who were meeting the criteria of being refuse handles; - then other worker performing relating activities but not direct exposed to refuse handling activities.

In order to achieve the representative sample, a researcher used the about 36 WEOs and VEOs offices to get the respondents who were permanent, temporarily or self-employed, whereby 6 respondents were obtained from 30 wards each and 4 wards provided 5 respondents each to meet a targeted sample of 200 respondents; that is 100 refuse handlers and 100 non-refuse handling staff. The mentioned respondents were asked whether they were willing or not to participate, those who were ready were given questionnaires and they were asked to fill it properly as they represented others. Two wards were left unsurveyed due to lack of respondents.

3.6 Plan for data collection

The work started by getting permission from the Mbeya city authorities, starting from Regional Administrative Secretary (RAS), District Administrative Director (DAS), City Director (CD) and City Director for Environment and Transportation (CD-ENVT). Data were collected from the end of March 2017 to the early May 2017 as time schedule was given by CD-ENVT due to the workload of data required. The selected ward was therefore visited one day before data collection day so as to arrange some strategies together with getting the informed consent. Information included some demographic characteristics, the use of PPEs, reported injuries, skin and respiratory problems with other factors associated to those problems. The checklist also was used to assess the presence and the quality of the PPEs.

3.7 Data collection

Data was collected using two means that is the primary source and secondary sources.

3.7.1 Primary source

In this study primary data were obtained through questionnaires which required respondents to fill their demographic characteristics and then answer the questions that were asked. Interview was used only where question needed more clarification to respondents. Observational checklists were also used to check the real situation in the field.

3.7.2 Secondary sources

Secondary data involves subjecting documents related to the topic under study to deep and critical analysis. In this response data were collected through libraries involving various documents such as reports, books, journals and articles, different literature related to the study was reviewed to know what had already been done by others, what was left, what should be done by others, also to see the relationship of findings between the current study and other studies.

3.7.3 Tools for data collection

The structured questionnaire was used to collect quantitative data from the sampled respondents and observation checklist was used to check whether the equipment have been effectively utilised.

Questionnaires were distributed to the respondents so as to get the required data, interview was also conducted and entailed giving clarification on the questions which were not understood, observation was also a way of getting some data about the real situation that prevailing in the field of study.

3.8 Data analysis

The quantitative data from both refuse handlers and other workers collected through questionnaires were coded, categorised and ordered according to the emerged categories of the responses. The coded data were entered into MS excel by double

entrants with which data were cleaned to remove errors in terms of accuracy, consistence and responses. The cleaned data were then entered into computer software for analysis; the study used the Statistical Package for Social Sciences (SPSS) where a descriptive statistical analysis technique was done giving out frequencies and percentage on the demographic status of respondents, cross tabulation with Chi-square test were also used for analysis of variables. From those outputs is where results were presented and report was written.

3.9 Ethical considerations

Ethics protocols were clearly observed in all stages of research development. A researcher was given research approval letter from Mzumbe University (MU) Directorate of Research and Postgraduate Studies (DRPS). Permission was also given by the City council authorities before engaging in data collection. Apart from enhancing comfortable environment to the respondents, informed consent was also being sought from respondents before and during data collection process. Respondents were assured with anonymity and confidentiality especially in terms of their names not to appear in the text that encouraged frankness during the process of data collection.

CHAPTER FOUR
RESEARCH FINDINGS

4.1 Introduction

This chapter presents the results obtained from the field. Analysis was done and findings are presented in tables.

4.2 Statistical analysis

Demographic characteristics of the sample population were analysed by frequencies and percentages and the findings are presented in Table 1, while the analysis of variables was done to adjust or control predictors that had the potential of being confounders. The exposure prevalence among refuse handlers and non-refuse handler's status for each of the variables are presented in Table 2 and 3.

4.3 Information on demographic characteristics of the sample population

The distribution of age, sex, training, education status, employment status, sleeping disturbances, working hours and working experience are shown in Table 4.1 below:

Table 4.1: A descriptive analysis showing the characteristics of the demographic characteristics of the respondents (using descriptive percentages) N=200

Characteristics	Refuse handlers n=100(%)	Non-refuse Handlers n=100(%)
Age groups (years)		
<15	3(3)	0(0)
15-25	31(31)	26(26)
26-35	37(37)	50(50)
36-45	23(23)	16(16)
>46	13(13)	1(1)
Sex		
Male	73(73)	48(48)
Female	27(27)	52(52)
Employment status		
Employed	9(9)	51(51)
Unemployed	91(91)	49(49)
Education level		
Not gone to school	20(20)	5(5)
Primary	77(77)	68(68)
Secondary	3(3)	27(27)
Working hours (grouped)		
<2 hrs	0(0)	0(0)
2-5 hrs	8(8)	32(32)
6-9 hrs	72(72)	67(67)
10-13 hrs	19(19)	1(1)
>13 hrs	1(1)	0(0)
Working experiences (grouped)		
< 1 yr	0(0)	7(7)
1-5 yrs	71(71)	58(58)
6-9 yrs	16(16)	26(26)
10-13 yrs	8(8)	9(9)
> 13 yrs	5(5)	0(0)
Sleeping disturbances		
Yes	78(78)	0(0)
No	22(22)	100(100)

Source; Field work (April, 2017)

4.4 Exposure factors to injuries, skin health problems and respiratory health problems among refuse handlers

There were direct and indirect factors that may influence the occurrence of health problems among refuse handlers, among those factors were risk behaviours, the use of PPEs and observation of personal hygiene. The finding shows that there was 66.5% prevalence of exposure to health problems for refuse handlers and 47.6% from non-refuse handling staff. The two proportions were significantly different

(p=0.43) proving that the exposure variables due to refuse handling had insignificant influence on the selected health outcomes because in the insignificantly associated variables the p values were greater than 0.05.

Table 4.2: Exposure factors that can influence the occurrence of injuries, skin health problems and respiratory health problems among respondents (using cross tabulation with Chi-square test) N=200

Risk behaviour, use of PPEs and personal hygiene	Refuse handlers n=100(%)	Non-refuse handlers n=100(%)	P-values
Smoking			
No	70(70)	75(75)	
Yes	30(30)	25(25)	0.297
Alcohol drinking			
No	64(64)	68(68)	
Yes	36(36)	32(32)	0.316
Living near dumpsites			
No	91(91)	0(0)	
Yes	9(9)	0(0)	0.599
Living near industrial areas			
No	99(99)	0(0)	
Yes	1(1)	0(0)	0.953
Hat/helmet			
Used			
Never used	1(1)	13(13)	
	99(99)	87(87)	0.014
Face shield			
Used	4(4)	1(1)	
Never used	96(96)	99 (99)	0.928
Apron/coverall			
Used	4(4)	20(20)	
Never used	96(96)	80(80)	0.928
Gloves			
Used	33(33)	70(70)	
Never used	67(67)	30(30)	0.433
Long sleeve shirt			
Used			
Never used	6(6)	24(24)	
	94(94)	76(76)	0.872
Gumboot			
Used	20(20)	59(59)	
Never used	80(80)	41(41)	0.165
Mask			
Do you change clothes after work?			
No	9(9)	98(98)	
Yes	91(91)	2(2)	0.000
Do you separate work and normal clothes?			
No	17(17)	100(100)	
Yes	83(83)	0(0)	0.020
Do you eat/drink during waste collection?			
No	17(17)	95(95)	
Yes	83(83)	5(5)	0.008

Source; Field work (April, 2017)

4.5: A descriptive analysis of the variables showing the prevalence of health problems faced by the refuse handlers (using cross tabulation with Chi-square test)

The central theme of a researcher was to examine the prevalence of injuries, skin health problems and respiratory health problems facing refuse handlers encountered in the cause of work. The findings show that there were 77.4% of respondents that reported injuries for refuse handling and 8.5% from non-refuse handling staff. The two proportion were statistically different ($p=0.03$). The difference suggests that refuse handling had significant contribution for reported injuries. More than three quarters (78.5%) of refuse handlers reported having skin health problems while 2% from non-refuse handlers reported similar skin health problems. The two proportions were statistically different ($p=0.02$).The difference between the two proportions suggest that refuse handling had significant contribution for skin health problems occurrence reported. In addition, majority 90.1% of refuse handlers reported respiratory health problems whereas only 23.6% of non-refuse handling staff reported respiratory health problems. The proportion was significantly different ($p=0.01$) suggesting that refuse handling has an influence on respiratory health problem occurrence reported. All the association were established at the statistical significance calculated at $p<0.05$.

Table 4.3: Comparison of prevalence of health problems between refuse handling and non-refuse handling staff N=200

Injuries, skin health problems and respiratory health pro	Refuse handlers n=100(%)	Non-refuse handlers n=100(%)	P-values
Cut/puncture			
Not affected	5(5)	84(84)	0.000
Affected	95(95)	16(16)	
Fracture			
Not affected	6(6)	0(0)	0.005
Affected	94(94)	0(0)	
Abrasion			
Not affected	3(3)	99(99)	0.031
Affected	97(97)	1(1)	
Ear injury			
Not affected	31(31)	0(0)	0.012
Affected	69(69)	0(0)	
Eye injury			
Not affected	68(68)	0(0)	0.105
Affected	32(32)	0(0)	
Skin contact with wastes			
Not affected	2(2)	81(81)	0.002
Affected	98(98)	19(19)	
Skin irritation			
Not affected	7(7)	97(97)	0.000
Affected	93(93)	3(3)	
Skin rashes			
Not affected	30(30)	99(99)	0.005
Affected	70(70)	1(1)	
Skin burn			
Not affected	43(43)	0(0)	0.072
Affected	57(57)	0(0)	
Skin bruises			
Not affected	6(6)	0(0)	0.028
Affected	94(94)	0(0)	
Nasal irritation			
Not affected	5(5)	51(51)	
Affected	95(95)	49(49)	0.000
Coughing			
Not affected	2(2)	88(88)	
Affected	98(98)	12(12)	0.000
Scratch throat			
Not affected	3(3)	90(90)	
Affected	97(97)	10(10)	0.000
Flue			
Not affected	2(2)	88(88)	
Affected	98(98)	12(12)	0.027
Chest tightness and breathing difficulties			
Not affected	12(12)	0(0)	
Affected	88(88)	0(0)	0.025

Source; Field Work (April, 2017)

CHAPTER FIVE
DISCUSSION OF FINDINGS

5.1 Introduction

Refuse handlers face tremendous challenges while they are on duty in Mbeya city council. Lack of support and interest from their employers regarding health and protective measures, put more load on waste collectors in many areas. There are many factors that affect health and safety of waste collectors. Such factors are related to the age of the waste collector, the educational level, and working hours and working experience. However, some factors proved to be more significant and more influential than others.

The main aim of the study was to assess the proportion of refuse handlers reported with injuries, skin health problem and respiratory health problems and the associated factors that may contribute to the occurrence of the problems. Observation checklists were used to determine whether PPEs were given to solid waste handlers and if had been effectively utilised and also see if there are some emergence health care facilities which provide care and treatment when refuse handlers face the problems.

The theory of the study states that, “refuse handlers doing unsecured jobs are likely to be exposed to potential hazards like injuries, skin health problems and respiratory health problems”. The conceptual framework also assumes that the inadequate use of PPEs, poor quality of the available PPEs, lack of regular training and low level of knowledge on the use of PPEs, little observation of personal hygiene may result in health problems among solid waste collectors. The discussion of findings reflects the theory that guided the study and the conceptual framework from which the study was organised.

5.2 The prevalence of the reported injuries among refuse handlers

Injuries refer to a state of being damaged to the body that may be caused by accidents, falls, hits, weapons or any other form that may cause the prolonged disability or death. In the working stations, many reported injuries resulted from the inadequate and improper use of protective equipment. Refuse handlers are among the exposure groups suffering from injury problems.

The finding shows that the prevalence of reported injuries was significantly high among refuse handlers than of non-refuse handlers. Injuries were caused by glass, bones, metal scraps, nails, woods, metal sheets, iron scraps and syringes from health facilities solid wastes. These materials may cause double impacts that are apart from causing injuries; metal sheets, iron scraps, nails and metal sheet can result in tetanus and syringes from health facilities can cause other diseases from hospitals. Refuse handlers were observed with one or multiple injuries.

The study done by Gizaw and others in (2010) also revealed a similar problem where the overall annual prevalence rate of work related injury was high among refuse handlers than of non-refuse handlers. Another study conducted in Zimbabwe during 2006 and Brazil during 2008 reported high prevalence rate of one or more work related injuries (Kuijer and Frings-Dresen, 2010).

These findings relate to the study done by Milhem (2004) in Bethlehem and Hebron districts which show that high prevalence of refuse handlers were injured by hard or sharp objects either by pulling or pushing the waste trolley or lifting the heavier materials pricked by needles, though the difference may be influenced by time, methodology and sample size taken by a researcher.

A study conducted by Das (2009) relates to this study showing that more than three quarters of refuse handlers were injured; others had single injury and others having multiple injuries that included cuts, punctured wounds, bruises, contusions and cut lacerated wounds. The reasons behind injuries were improper garbage disposal, inadequate or lack of PPEs, lack of training and non-observance of the safety procedures. Mohds and Haliza (2015) also indicated high prevalence of injuries among refuse handlers compared to other workers reasons being the same as what was seen in Mbeya City Council that was due to inadequate supply and underutilisation of protective equipment, carelessness among the refuse handlers, failure to watch for sharp or slippery objects and pinch points, lifting, loos grip and improper tool or no tools for handling waste given by employers, hazardous movement of workers caused high prevalence of injuries among refuse handlers.

5.3 Prevalence of refuse handlers with reported skin health problems

Skin health problems is a condition that irritate, clog or inflame the skin leading to the symptoms like redness, swelling, burning and itching that results in allergies and irritations of the genetic makeup and other diseases. All these were associated to direct contact with solid waste, this is due to lack and improper use of PPEs by refuse handlers.

Apart from inadequate use of PPEs, lack of quality PPEs and carelessness of solid waste handlers, refuse handlers get contact to solid waste when lifting the waste from the deposit sites to the trucks caring refuse, when pulling or pushing trolleys with refuse and sometimes when picking up the plastic bags and other containers containing wastes.

The findings from the study show the prevalence of refuse handlers reported having skin health problems was significantly high. These results are pertinent to the study done by Makaya *et al*. (2014) in Ouagadougou which revealed the same problem that site urine handlers have reported skin symptoms including itching, skin burning, and irritation. Results are also seen to be influenced with working experience and time.

Another work done by Milhem (2004) reveals that refuse handlers have suffered from skin diseases after collection of waste or getting into contact with wastes. Das (2009) also had shown that in the sample population, high prevalence of workers reported skin problems. Majority of respondents had allergic rash and dermatitis.

This study revealed that skin problem is high among refuse handlers compared to non-refuse handling staff in different areas where refuse handling activities has been taking place.

5.4 Prevalence of respiratory health problems reported among refuse handlers

Respiratory health problems are the infections caused by pollution in form of dust, smoke/soot, bad smells that triggers allergies, asthma causing lungs inability to inhale and exhale normally, and finally leading to difficulty in breathing.

Refuse handlers face the above mentioned types of pollution that exposed them in their day to day work. Nasal irritation, coughing, flu, chest tightness, sore throat are part of life throughout their working time. With respect to other findings, there was high prevalence of respiratory problems for refuse handlers than non-refuse handlers.

Studies done by Ranjan *et al.* (2004) in Delhi and Yang *et al.* (2001) in Taiwan shows higher proportion of refuse handlers reported with respiratory symptoms, inflammation of airways, lung function decrement and wide range of general problems in MSW disposal workers, others face chronic respiratory symptoms like coughing, phlegm, wheezing and chronic bronchitis which is highly contributed by inadequate use of PPEs, though in some areas waste handlers use natural PPEs such as rolling pieces of clothes around mouth and nose or wearing discarded plastic bags on their hand instead of hand gloves which do not totally prevent them. A study done by Markalio (2008) in Tanga City had shown high prevalence of effects among refuse handlers than that of non-refuse handling staff that was caused either by being subjected to odour and various gases such as sulphur dioxide, methane, hydrogen sulphide, carbon monoxide, ashes and heavy dust. Other findings from the study done by Milhem (2004) in Bethlehem and Hebron districts revealed that high prevalence of respiratory health problems among the surveyed waste collectors who suffered from sore throat, cough, wheezing and flu.

Another study which reveals similar results was that done by Das (2009) in Surat City which show high prevalence of health related problem. Respondents reported some kind of respiratory disorders faced in past three months before survey. The main respiratory symptoms included cough with phlegm, chest tightness, wheeze with breathlessness, reported running nose, sneezing, dry cough, itching of the nose and sore throat.

The main respiratory illnesses reported by door to door solid waste handlers were; Allergic rhinitis, chronic bronchitis, Asthma, Tuberculosis, and rhinitis. One per cent of asthma cases was on medication and was also confirmed by diagnosis. Symptoms indicative of COPD as defined by OSHA guidelines were not reported by any workers.

Another study done by Mohd and others (2012) in Malaysia also had similar results that show high prevalence of effects to the refuse handlers compared to other workers. Their study indicated the most frequently reported respiratory symptoms among domestic waste collectors were shortness of breath followed by chest tightness, morning phlegm and cough. Even the study by Kretchy *et al.* (2015) shows the persistence of the problem where high prevalence of refuse handlers was facing respiratory problems compared to other workers. Results show high proportion of waste handlers reported direct exposure of uncovered parts of body to waste as the main cause of their health problems whilst others reported that inhaling bad smell of waste was a major cause of their health problems.

5.5 Exposure to other factors related to health problems

Risk behaviours are the lifestyle activities that expose a person at the increased risk of suffering a particular condition, illness or injury. There was direct and indirect behaviours that might expose refuse handlers to health problems. Findings show insignificant prevalence of the respondents who reported smoking and taking alcohol. Other studies also associated alcohol consumption with work related injury. Consistent with other study they revealed that heavy drinkers were more likely to be injured than non-drinkers (Wang *et al.*, 2010), excessive alcohol taking can impaired judgmental and psychomotor skills, alcohol took before work begins cause spill over effects, such as fatigue and hangovers, alcohol may be more likely to be engaged in other behaviours that increase the risk of injury.

Among the confounding factors for skin and respiratory problems was exposure to risk behaviours. The report shows that smoking and alcoholic status was not much different from refuse handlers and other workers, however it was not detected whether these may be the concrete factor causing the skin and respiratory problems because most of respondents reported to take alcohol and smoke cigarette after work hours.

Diseases and illnesses resulting from occupational hazards is not only a problem in Mbeya City but is a concern among workers in many workplaces. Moreover, lack of advanced diagnostic tools and expertise worsen the situation. Currently, the Government has not developed the national system for recording, compiling, and reporting occupational accidents and diseases. This leads to absence of information to enable implementation of necessary interventions for improving occupational health and safety in the country.

Most Tanzanians and especially workers and more specifically refuse handlers are not covered by the occupational health and safety law and do not access occupational health services. Therefore, an occupational health and safety services strategy backed by legislations and occupied with the necessary resources like competent experts, financial and technological resources is a necessity thing to be observed in Tanzania. Major modifications on the existing legal provisions are highly needed to meet international requirements and standards. All OHS regulations and legislations need refocusing, revision and strengthening to cover all working population. Capacities should be improved through training and research to enable enforcement. Finally, the facilities and resources should be made available for OHS services to match with the growing economy (Mrema *et al.,* 2015).

5.6 Personal hygiene

Personal hygiene is the practice performed by an individual to care for ones bodily health and wellbeing, it is the most effective way to protect ourselves and others from illness, and the only way to go with it is through cleanliness. Findings show that respondents were changing clothes very late after work time. Apart from not changing clothes, high prevalence of refuse handlers reported eating with dirty hands and drinking while collecting refuse. Personal hygiene problem was not only observed in Mbeya City Council , the study done by Milhem (2004) in Bethlehem and Hebron districts shows the problem of personal hygiene where low prevalence of refuse handlers reported washing their hands thoroughly with antiseptic before eating and others wash hands sometimes. Kretchy *et al.* (2015) revealed other factors for high prevalence of occupational illness was reported to be associated with personal

hygiene problems including eating with dirty hands and wearing dirty clothes during work hours.

5.7 The use of personal protective equipment (PPEs) among refuse handlers

The use of Personal protective equipment is the only effective way that can protect refuse handlers from occupational health problems, high proportion of refuse handlers testify and prove to know that problems arising from waste collection can be avoided through the use of PPEs but they are unable to avoid them due to inadequate, improper use or lack of those protective gears. Some refuse handlers with PPEs are careless and do not want to use them due to favourable to the environment.

There is high prevalence of refuse handlers and who do not use PPEs. The study done by Milhem (2004) also shows high prevalence of waste collectors do not wear face mask, do not use shoe covers, do not wear overall, do not wear rubber boot and do not wear gloves, so the study proves that there is a big proportion of both refuse handlers who do not use protective gears. Among the reasons of not using PPEs was either they were not given by their employers, very few of them said they had been destructed, others did not like to use due to hot climate, or being unpleasant hence bringing some difficulties for their work but the large group was unable to buy those equipment. Most refuse handlers know the importance of using protective gears due to the nature of the work; the problem is where to get and how to use the protective equipment; hence most refuse handlers were working with bare hands, no feet protection and worked with their normal clothes.

The reasons to why they do not use PPEs was whether equipment were not available or rather not provided by their employers or those who assign them temporary work, but others do not like to use because of climatic condition, being unpleasant and associated factors that may course work imperfection when used.

Tanzania Environmental Occupational Health and Safety Act of 2003, states that, "*There should be safe means of access and safe working place"* so employers have the duty concerning the provision of the protective equipment at work (Health and

Safety Executive, 1992). Also, the Occupational safety and Health Act of 2006 section 13 (subsection 2g) insists on the role of the employers to provide protective gears to the workers.

The main objectives of the National Occupational Health and Safety policy (2009) were also to insist on the effective prevention of the employees in the working centres and improve life quality of the working population as it states.

> *The main objective of OHS Policy is to reduce the number of work related accidents and diseases in Tanzania. This requires the adoption and implementation of a culture to prevent OHS hazards by Government, Employers and Employees. The effective prevention of work related accidents and ill- health will have enormous social and economic benefits. These include improvements in productivity and competitiveness and the quality of life of the working population. The effective management of many safety hazards will contribute to improved levels of public health and safety. The effective control at source in workplaces of hazardous substances will improve levels of public health and minimise environmental pollution.*

Different studies insists on the proper and adequate use of PPEs, Das (2009) in his work identified that personal protective equipment if provided but not used results in the immediate cause of injuries, also hazardous handling that is failure to watch for sharp or slippery objects and pinch points, lifting, loos grip and improper tool or no tools for handling waste given by employers, hazardous movement of workers may result in injuries. Aminudin and Haliza (2015) on their work about health risk for domestic waste mentioned the particular safety and health areas that should be considered are the use of PPE, personal hygiene and hoist or receptacle compatibility, if these are observed and taken into consideration by the employers and employees minimises health hazards.

From these reviews then the Government, informal employers were obliged to train their employees on the effective use and the important of protective equipment to their health before start working, also to ensure the supply of PPEs to both refuse handlers and non-refuse handling staff and the make follow up to see whether the employees utilise them effectively as directed.

5.8 Sleeping disturbances faced by refuse handles

Sleeping disturbances involves some conditions that affect one's ability to sleep well on a regular basis, which is caused by health problems, too much stress and tough work done by a particular person. Among the affected personnel are the refuse handlers because of the heavy work done throughout a day, respondents reported to perform heavy duties like pulling or pushing waste trolleys, lifting heavy waste materials deposited down to the skip buckets and other carrying instruments and picking up heavy loaded waste bags from home to the deposition centres.

Other reasons of facing sleeping disturbances were job stress that was due to overworking with little return either what is obtained in a day's course of work or what had been paid to them as monthly salary. The study done by Eskezia and others (2016) also shows that there was high prevalence of refuse handlers who were suffering from sleeping disturbances and work related stress and the reasons were similar to the mentioned above.

CHAPTER SIX
SUMMARY, CONCLUSION AND POLICY RECOMMENDATIONS

6.1 Introduction

This chapter presents the summary of the findings, conclusion, policy recommendations, policy adoption and area for further studies. Summary provides a brief of major findings obtained from the field work followed by conclusion providing the main arguments developed. Policy recommendations give policy direction on how to go about how overcoming the problem of occupational hazard and strategies to improve the OHS, policy adoption gives the alternative option of the government to adopt the successful policy from other country. Lastly, is the suggestion on areas for further studies to be conducted by other researchers

6.2 Summary

The central theme of this study was to determine the proportional of health problems faced by refuse handlers in the course of their work. It focused specifically on injuries, skin health problems and respiratory health problems and related factors among waste collectors in Mbeya City Council. Identifying whether refuse handlers was exposed to potential hazards with no protection when performing their duties.

Findings revealed that, most of refuse handlers were not using PPEs when performing their duties; this is because protective gears were not supplied to them, not properly utilised, unpleasant condition, weather and priority, but the self-employed claimed to have no ability of buying protective equipment. The prevalence average of the refuse handlers who were found not using the PPEs totally ranged to 89% while the remaining group were partly using or not using hence the prevalence of exposure to potential hazards was high. 68% of other workers also were not using PPEs but there was little or no exposure to risk was found and that is due to nature of their job.

Long-time of working, tough work of lifting heavier materials, pushing or pulling trolleys containing wastes, low return and low salary resulted in job stress that led to sleeping disturbance at the time they go for bed. The prevalence of 78% refuse handlers was suffering from sleeping disturbance due to the mentioned reasons above.

Personal hygiene as one of the factors that may expose refuse handlers to risk was observed, most of them were not taking care of their health, high proportion of about 83% of the population observed by the researcher on the field were eating even what is found around the dumpsite or what is sold around with dirty hands; this was due to the fact that they had no time to rest and even take meals. So, it was good for them to eat what was around, wearing dirty clothes was part of their work, and the time used to change clothes after work revealed to be not proper to most of refuse handlers though others were not changing clothes totally and cleaning clothes and PPEs was done over weekend.

Health problems were highly revealed among refuse handlers, this proved that the general population was exposed to hazardous environment and was affected. In this study, prevalence of injuries reported reached 77.4% of refuse handlers than 8.5% of other workers. Absence, inadequate use of PPGs and carelessness exposed them to sharp pointed materials that caused injuries on different parts of their bodies.

Skin health problems were also observed, the effects were high to the refuse handlers where about 78.5% of refuse handlers reported to have skin problems compared to 2% of other workers; this may be due to exposure to direct contact with waste, wearing dirty clothes, not changing clothes, delay in changing clothes and inadequate cleanliness of clothes and PPGs being used.

Respiratory health problems like wheezing, coughing, phlegm, sore throat and flu were also high among solid waste collectors. The prevalence of the problem was high to about 90.1% compared to 23.6% other workers. This was due to the dust from deposited or transported solid waste, smoke from the burning remains of solid waste and bad smell from rotten solid wastes.

Finally, was to determine the proportion of exposure factors to risk behaviour that may lead, cause or accelerate the problem, smoking may lead to coughing, chest tightness, asthma, allergies and TB. Excessive alcohol taking during work hour may drive the psychomotor skills due to hangover resulting in carelessness that may lead to injuries, but it was observed that frequent taking alcohol without taking proper meal may cause skin burning.

6.3 Conclusion

Despite all the conditions of the study, data collection, coding, cleaning and analysis enabled the researcher to come up with conclusive findings on the occupational health and related factors among solid waste collectors who were the vulnerable group. Findings revealed that refuse handlers were highly exposed to potential hazard causing injuries, skin and respiratory health problems than the other category in the population. Little enforcement of the OHS regulation among the facilities responsible for solid waste collection was a big reason for the problems to occur.

A survey that was done in most areas of all wards noted that refuse collection department is incapable of serving all wards in Mbeya City as a result solid wastes are piling off in the collection points and stay for a while without being taken to the main dump site. This calls for the need of an integrated solid waste management systems that engage other stakeholders like private company, CSOs and CBOs to collect solid waste from home and collection points to the communal deposit sites and finally to the main dumpsite. The council should enact and enforce bylaws to guide the environmental conservation and solid waste management.

Environment is life, refuse handlers and scavengers are important elsewhere nowadays as they play a great role on environmental management and conservation. Basing on their crucial role played in environmental cleanliness today, it is very important to insist on the importance of supply, enforce and monitor the use of PPEs to all solid waste collectors. Health surveillance and periodic medical check-ups and treatment should be done to all refuse handlers and scavengers who are either employed by the government or self-employed. Bylaws enacted should be enforced

to ensure that refuse handlers use properly the available PPEs so that they work safely and healthy.

Apart from that, there is high possibility for the occurrences of child labour risk. This is because numbers of children under 18 years of age were found scavenging in streets, around collection points and at the main dumping areas to sustain their livelihood or getting money for school requirements. Most of children who were questioned proved that they were assigned by their parents to do that job, but others were found accompanied by their parents or grandparents. This calls for the stakeholders to educate the community on the risk that may arise due to child labour.

6.4 Policy recommendations

Basing on the above findings, the government and municipal councils should create the special dumping places that separate the solid waste basing on their status. Metals, glass, iron and bones should be segregated and dumped separately from plastic and other solid waste materials.

The government and municipal councils should train and educate refuse handlers on the importance of using protective gears for their health; following the adequate supply the PPEs and ensure proper utilisation. Emergence care facilities should be created to provide immediate and fast treatment for those who are injured in the cause of work.

Municipal councils should provide enough skip buckets in streets; taking skip buckets and containers with full solid waste to the main dumpsites to avoid the pilling off of wastes around the skip buckets and containers. Refuse handlers should wear long sleeve shirts and coveralls all the time when picking up plastic bags and other containers containing solid wastes, gloves and gumboots should be used when sorting the solid wastes.

Pre-medical examination should be done before refuse handlers are exposed to work by checking their past exposure to hazardous environment that might be contributed to the respiratory health problems. This is because the study reveals that there is a

relationship between the development of skin and respiratory problems and the exposure to hazardous environment.

Refuse handlers observed with skin allergies and respiratory health problems or significant decline in lung function in the cause of work should be transferred to other municipal departments and assign them with other activities to ensure their survival, but more initiatives are needed to encourage the use of safe waste management techniques to reduce the risk of exposure to health hazard.

6.5 Policy adoption

The government can opt to adopt the policy used to catalyse the inclusive Green Economy in Uruguay, titled; ***"Sharing waste, Sharing Wealth* policy".** This was a cooperative policy under the Ministry of Housing, Land Planning and Environment, which aimed at improving environmental and social performance. The municipalities had to work together with the Poverty-Environmental Initiatives (PEI) which brought together Planning and Budget Office, the Ministry of Social Development and the Ministry of Housing, Land Planning and Environment to think and create links between poverty alleviation and environmental protection. The agreements were that all dimensions could be tackled by a joint policy framework and bring about change on the ground.

It was also found to be an important issue of resource efficiency and environmental protection and a healthy programme due to unsanitary conditions that workers were exposed to;- it was one of social policy including child labour and access to social security and one of the policies that shaped the prospects of some of the poorest communities in Uruguay because the PEI was able to model the national level policy framework to ensure that aspects such as health, sanitation, and social security were prioritised in the management models.

For the ***National "Occupational Health and Safety Policy"*** to be successful;- Ministry of Labour, Employment and Youth Development, "***Health policy"*** under Ministry of Health, Community Development, Gender, Elders and Children and

"***Environmental policy"*** under Vice President Office should integrate and ensure that refuse handlers work under safe and conducive environment.

The Ministry of Environment under Vice President Office is the core of the study because all procedures of SWM are within the Environmental management sector; it should take advantage to identify refuse handlers to the ministry of labour so that they can get employed as other workers with reasonable salaries. This would help them to manage their life. Apart from that, they should be identified by the Ministry of Health, Community Development, Gender Elders and Children by giving them health insurance to facilitate their access to immediate health facilities when they are exposed to potential hazards.

6.6 Areas for further studies

The purpose of the study was to determine the magnitude of the occupational health problems and other related factors among refuse handlers.

Another study may be designed to explore the pre medical examination test on skin health problems and respiratory health problems among solid waste collectors within a certain period of time so as to know how long does it take for refuse handlers to be affected.

Other studies should be done to explore in-depth the diseases associated with waste collection activities.

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APPENDICES

Appendix 1. Questionnaire for solid waste collectors

Dear respondents,

I am **Charles Bahati Mtatifikolo,** a student of **Mzumbe University pursuing Master of Research and Public Policy.** Here in is a list of questions intended to collect information on *"Prevalence of skin and respiratory health problems between solid waste collectors and Non-Solid waste collectors in Mbeya city council"* purposely for academic uses only and not otherwise. You are kindly requested to give the relevant particulars/details in the questionnaire. I assure you maximum confidentiality and appreciation upon your contribution on this regard towards the fulfillment of this purpose. (Please return this questionnaire to who provided before the date stated above).

S/N	QUESTION	CODED RESPONSES
A	**Background and personal information**	
1	Age	……
2	Gender	1. Female 2. Male
3	Ward	…….
4	Education level	1. I have not attained any education 2. Primary 3. Secondary 4. Diploma 5. Degree /Master/PHD
5	For how long have you been doing this work?	.....
6	For how long are you working in a day	…….
7	Are you employed for this job?	0. No 1. Yes
8	Are you trained for this job	0. No 1. Yes
9	Do you experience sleeping disturbances during night?	1. No 2. Yes

10	Where do you live	1. Urban areas 2. Rural areas
B	**PERSONAL PROTECTIVE EQUIPMENT USE**	
11	Do you put on hat when collecting waste?	0. No 1. Yes
12	Do you put on face shield when collecting waste?	0. No 1. Yes
13	Do you put on apron or coveralls while collecting waste?	0. No 1. Yes
14	Do you put on gloves while collecting waste?	0. No 1. Yes
15	Do you put on long sleeves shirt while collecting waste?	0. No 1. Yes
16	Do you put on gumboots while collecting solid waste?	0. No 1. Yes
17	Do you put on mask when collecting solid waste?	0. No 1. Yes
18	Who provide for you those protective gears?	1. I buy myself 2. Is given by the employer 3. I do not know 4. Other (specify).....
19	Do you change your clothes after waste collection?	0. No 1. Yes
20	If yes, at what time do you change the clothes after waste collection?	……
21	Do you separate the clothes you wear when collecting waste during washing other clothes?	0. No 1. Yes
22	How do you clean your protective gears?	1. Using clean water only 2. Using soapy water and clean water 3. Using disinfectants and clean water

		4. Others (specify)……
23	Do you eat/drink when collecting waste?	0. No 1. Yes
24	Do you live near dump site?	0. No 1. Yes
C	**SELF-REPORTED INJURIES AMONG WASTE COLLECTORS**	
25	Do you have any puncture in your body?	0. No 1. Yes
26	Did it occur during waste collection?	0. No 1. Yes
27	Do you have any ear Injury in your body?	0. No 1. Yes
28	Do you have eye Injury in your body?	0. No 1. Yes
29	Have you ever got any fracture?	0. No 1. Yes
30	If yes did it occur during waste collection?	0. No 1. Yes
31	Have you ever got abrasion during waste collection?	0. No 1. Yes
32	Do you have any emergence medical service on your working sites?	0. No 1. Yes
33	If yes, have you ever got treatment after being injured?	0. No 1. Yes
D	**SKIN HEALTH PROBLEMS**	
34	Do you have skin contact with solid waste?	0. No 1. Yes
35	Have you ever got any skin problem after contact with solid waste?	0. No 1. Yes
36	Have you experienced skin irritation?	0. No 1. Yes
37	Do you have skin rashes?	0. No 1. Yes

38	Were those rashes associated with solid waste collection?	0. No 1. Yes
39	Currently do you have skin burn?	0. No 1. Yes
40	Do you think this skin burn is associated with solid waste collection?	0. No 1. Yes
41	Do you have skin allergies?	0. No 1. Yes
42	Were the skin allergies associated with solid waste collection?	0. No 1. Yes
43	Currently do you have skin bruises?	0. No 1. Yes
44	Were those bruises associated with solid waste collection?	0. No 1. Yes
45	Do always put on protective gears when exposed to solid waste?	0. No 1. Yes
E	**RESPIRATORY SYMPTOMS**	
46	Have you ever had nasal irritation?	0. No 1. Yes
47	Have you ever had any cough during/after solid waste collection?	0. No 1. Yes
48	Have you ever had scratchy throat?	0. No 1. Yes
49	What do you think were the causes of scratch throat among the following?	1. Smoke from burning wastes? 2. Dust wastes? 3. Bad smell from exhaust materials? 4. Others (specify)……
50	Have you ever had flu after waste collection?	0. No 1. Yes
51	Have you ever had breathing difficulties?	0. No 1. Yes
52	Were the breathing difficulties associated with solid waste	0. No 1. Yes

	collection?	
53	Have you experienced nose and throat irritation after solid waste collection?	0. No 1. Yes
54	Dou you have chest tightness?	0. No 1. Yes
55	Have you ever experienced respiratory problems?	0. No 1. Yes
F	**FACTORS ASSOCIATED WITH SKIN AND RESPIRATORY HEALTH PROBLEMS AMONG WASTE COLLECTION RELATED**	
56	Do you smoke?	0. No 1. Yes
57	Do you take alcohol?	0. No 1. Yes
58	Do you always get into contact with chemicals when collecting waste?	0. No 1. Yes
59	Do you have any drug allergy?	0. No 1. Yes
60	What kind of drugs?	0. Unspecified 1. Specified
61	Do you live near industrial area/ smoking area?	0. No 1. Yes

	OBSERVATION CHECHLIST FOR ISSUES RELATED TO INJURIES	
1	Personal protective equipment: Available and use i. Hat ii. Mask iii. Apron iv. Overall v. Gloves vi. Long sleeved shirt vii. Feet-Long pant viii. Gumboots ix. Mouth-Mask x. Nose-Mask xi. Mouth-Mask	
2	Equipment for waste collection? i. Racks ii. Sped iii. Plastic bags iv. Dust bins	

DODOSO KUHUSU MATATIZO YA NGOZI NA UPUMUAJI YANAYOWAPATA WAKUSANYA TAKA PAMOJA NA SABABU NYINGINE ZINAZOFANANA ZINAZOWEZA KUSABABISHA MATATIZO

S/N	Swali	Majibu
A	**Utangulizi na taarifa binafsi**	
1	Umri (miaka)	……..
2	Jinsia	1. Me 2. Ke
3	Kata unayoishi	……..
4	Kiwango cha Elimu	1. Sikwenda shule 2. Elimu ya msingi 3. Elimu ya Sekondari 4. Astashahada/stashahada 5. shahada, shahada ya uzamili/shahada ya uzamivu
5	Umefanya kazi hii kwa miaka mingapi?	……
6	Unafanya kazi kwa masaa mangapi kila siku?	……
7	Umeajiriwa kwa kazi hii?	0. Hapana 1. Ndiyo
8	Umepata mafunzo ya kazi hii	0. Hapana 1. Ndiyo
9	Je, unapata misukosuko wakati wa kulala usiku baada ya kazi?	0. Hapana 1. Ndiyo
10	Unaishi wapi?	3. Mjini 4. Kijijini
B	**VIFAA VYA KUJIKINGA MWILI**	
11	Je huwa unavaa kofia ngumu wakati wote wa kukusanya taka?	0. Hapana 1. Ndiyo
12	Je huwa unavaa kiziba uso wakati wote wa kukusanya taka?	0. Hapana 1. Ndiyo
13	Je huwa unavaa kizibao au nguo ya kufunika mwili wakati wote wa kukusanya taka?	0. Hapana 1. Ndiyo
14	Je huwa unavaa kinga za mikono wakati wote wa kukusanya taka?	0. Hapana 1. Ndiyo

15	Je huwa unavaa shati ya mikono mirefu wakati wote wa kukusanya taka?	0. Hapana 1. Ndiyo
16	Je, huwa unavaa viatu vigumu wakati wote wa kukusanya taka?	0. Hapana 1. Ndiyo
17	Je, huwa unavaa kiziba pua wakati wote wa kukusanya taka?	0. Hapana 1. Ndiyo
18	Je, nani anakupa vifaa ya kujikinga na vitendea kazi vingine?	1. Ninanunua mimi mwenyewe 2. Ninapewa na mwajiri 3. Sijui 4. Mengineyo (Taja)……
19	Je, unabadilisha nguo za kazi mara baada ya kukusanya taka?	0. Hapana 1. Ndiyo
20	Kama ndiyo, unabadilisha nguo za kazi muda gani baada ya kumaliza kukusanya taka?	…… …
21	Je, Unatenga nguo unazovaa wakati wakukusanya taka na nguo nyingine mara zote wakati wa kufua?	0. Hapana 1. Ndiyo
22	Je, ni jinsi gani unasafisha nguo na vitendea kazi vingine baada ya kukusanya taka?	1. Kwa kutumia maji safi tu 2. Kwa kutumia maji ya sabuni na maji safi 3. Kwa kutumia madawa na maji safi 4. Mengine (taja)……
23	Je, huwa unakula au kunywa wakati wa kukusnya taka?	0. Hapana 1. Ndiyo
24	Je, unaishi karibu na jalala au dampo la taka?	0. Hapana 1. Ndiyo
C	**TAARIFA BINAFSI ZA KUUMIA KAZINI**	
25	Je, Umewahi kuchomwa na kitu chenye ncha kali?	0. Hapana 1. Ndiyo

26	Je ilitokea wakati wa kukusanya taka?	0. Hapana 1. Ndiyo
27	Je umewahi kuumia masikio wakati wa kukusanya au kubeba taka?	0. Hapana 1. Ndiyo
28	Je umewahi kuumia macho wakati wa kukusanya au kubeba taka?	0. Hapana 1. Ndiyo
29	Je, umewahi kupata mshtuko wa viungo vya mwili ?	0. Hapana 1. Ndiyo
30	Kama ndiyo, ilitokea wakati wa kukusanya taka?	0. Hapana 1. Ndiyo
31	Je umewahi kupata mikwaruzo wakati wa kukusanya au kubeba taka?	0. Hapana 1. Ndiyo
32	Je, kuna huduma ya dharura ya matibabu katika maeneo yako ya kazi?	0. Hapana 1. Ndiyo
33	Kama ndiyo, umewahi kupata matibabu baada ya kujeruhiwa?	0. Hapana 1. Ndiyo
D	**MATATIZO YA NGOZI**	
34	Je, ngozi yako hugusana na uchafu wakati wa kukusanya taka?	0. Hapana 1. Ndiyo
35	Je, umewahi kupata tatizo la ngozi baada ya ngozi kugusana na taka?	0. Hapana 1. Ndiyo
36	Je, umewahi kupata tatizo la ngozi kuwasha baada ya kukusanya taka?	0. Hapana 1. Ndiyo
37	Je, una vipele kwenye ngozi?	0. Hapana 1. Ndiyo
38	Je, unafikiri vipele vilitokana na kazi ya kukusanya taka?	0. Hapana 1. Ndiyo

39	Je, hivi karibuni umepata tatizo la ngozi kuungua?	0. Hapana 1. Ndiyo
40	Je, unafikiri tatizo hilo limetokana na kazi ya kukusanya taka?	0. Hapana 1. Ndiyo
41	Je una tatizo la mzio (aleji) ya ngozi?	0. Hapana 1. Ndiyo
42	Je, tatizo la aleji ya ngozi lilianza baada ya kukusanya taka?	0. Hapana 1. Ndiyo
43	Je umewahi kupata michubuko au mikwaruzo kwenye ngozi yako?	0. Hapana 1. Ndiyo
44	Je, tatizo la mchubuko na mikwaruzo kwenye ngozi limetokea baada ya kukusanya taka?	0. Hapana 1. Ndiyo
45	Je, ulikuwa umevaa vifaa vya kujikinga wakati wa kukusanya taka?	0. Hapana 1. Ndiyo
E	**MATATIZO YA UPUMUAJI**	
46	Je unapata tatizo la kuwasha pua baada ya kukusanya taka?	0. Hapana 1. Ndiyo
47	Je unakohoa baada ya kukusanya taka?	0. Hapana 1. Ndiyo
48	Je umewahi kupata tatizo la kuwashwa na koo baada ya kukusanya taka?	0. Hapana 1. Ndiyo
49	Je, unafikiri sababu ya kuwashwa na koo, pua, na kukohoa ilikuwa ni ipi miongoni mwa zifuatayo?	1. Moshi unaotokana na kuchoma taka? 2. Vumbi lililopo kwenye taka? 3. Harufu mbaya inayotokana

		na kuoza kwa taka? 4. Sijui 5. Mengine (taja)…….
50	Je umewahi kupata mafua baada ya kukusanya taka?	0. Hapana 1. Ndiyo
51	Je umewahi kupata tatizo la pumu?	0. Hapana 1. Ndiyo
52	Je una tatizo la kukauka koo baada ya kukusanya taka?	0. Hapana 1. Ndiyo
53	Je umewahi kuwa kupata tatizo la kuwasha wa pua na koo kwa pamoja baada ya kukusanya taka?	0. Hapana 1. Ndiyo
54	Je umewahi kupata tatizo la kubanwa na kifua baada ya kukusanya taka?	0. Hapana 1. Ndiyo
55	Je umewahi kupata tatizo la kupumua baada ya kukusanya taka?	0. Hapana 1. Ndiyo
D	**SABABU NYINGINE ZINAZOWEZA KUSABABISHA MATATIZO YA NGOZI NA MFUMO WA UPUMUAJI**	
56	Je, Unavuta sigara?	0. Hapana 1. Ndiyo
57	Je, unakunywa pombe?	0. Hapana 1. Ndiyo
58	Je unatumia/ kushika kemikali?	0. Hapana 1. Ndiyo
59	Je una aleji na dawa?	0. Hapana 1. Ndiyo
60	Je, ni aina gani ya dawa?	……
61	Je unaishi karibu na viwanda?	0. Hapana 1. Ndiyo

HAYO

Mimi ni Charles Bahati MTATIFIKOLO, Mwanafunzi wa chuo kikuu cha Mzumbe. Ninafanya shahada ya Uzamili katika masuala ya Utafiti na Sera za Nchi (Master of Research and Public Policy).

Ifuatayo ni dodoso inayolenga kupata taarifa kuhusu *"Matatizo ya ngozi na upumuaji yanayowapata wakusanya taka pamoja na sababu nyingine zinazoweza kusababisha matatizo hayo miongoni mwa wakusanya taka"* (Skin and Respiratory health problems and the related factors among solid waste collectors). Ninafurahi kwakuwa umekuwa kati ya wahusika watakaojibu dodoso hii, ninaomba unisaidie kupata taarifa mahiri kuhusu mada ninayoitafiti.

Ifahamike kuwa taarifa hizo ni kwa matumizi ya kitaaluma tu na si vinginevyo, hivyo taarifa utakazozitoa zitakuwa ni siri kati yangu na wewe na pia nitazitunza kwa umakini mkubwa mpaka pale utafiti wangu utakapokamilika.

Baada ya kuijaza tafadhali rudisha karatasi kwa aliyekupa kabla ya tarehe tajwa, ninashukuru kwa utayari wako.

Tafadhali fuata maelekezo ili uweze kutoa majibu sahihi.

1 Jaza nafasi iliyoachwa wazi
2 Weka alama ya vema (V) katika namba ya jibu lililo sahihi

Ahsante kwa ushirikiano wako.

MZUMBE UNIVERSITY

OFFICE OF THE VICE CHANCELLOR

Tel: +255 (0) 23 293120/1/2
Fax: +255 (0) 23 2604382
Cell: +255 (0) 789 722 733
E-mail: drps@mzumbe.ac.tz
Website: www.mzumbe.ac.tz and www.drps.mzumbe.ac.tz

P.O.BOX 63
MZUMBE
MOROGORO, TANZANIA

Ref. No.: MU/DPGS/INT/38/VOL.II/11 Date: 10th March, 2017

TO WHOM IT MAY CONCERN

RE: INTRODUCTION OF MR. CHARLES BAHATI MTATIFIKOLO

The bearer of this letter is a postgraduate student at our university (Mzumbe University) pursuing **Masters of Research and Public Policy (MRPP).** As a part of requirements for completion of his studies, he is collecting information on ***"Skin and respiratory health problems and related factors among solid waste collectors".***

This letter serves to achieve three purposes. Firstly, to introduce him to you, secondly, to request you to grant him permission to undertake the mentioned research at your Institute, and thirdly to request you to facilitate any form of assistance he might need in order to successfully pursue this noble exercise at your organisation/institute. We can assure you that this activity is entirely for academic and will never be used for any other purposes.

We trust that you will accord our student with necessary assistance.

Sincerely yours,

Mr. Benjamin Jonas
For: VICE CHANCELLOR

MZUMBE UNIVERSITY
P. O. Box 1, MZUMBE
TANZANIA

THE UNITED REPUBLIC OF TANZANIA
PRESIDENT OFFICE
REGIONAL SECRETARIAT AND LOCAL GOVERNMENT

MBEYA REGION
TELEGRAM: "REGCOM"
Telephone No: 025-2504045
Fax No.025-2504243

REGIONAL COMMISSIONER'S OFFICE
P.O. Box 754,
MBEYA.

In reply please quote:

06th APRIL, 2017

Ref. No. DA.191/228/01/507

District Administrative Secretary,
P.O. Box 255,
MBEYA.

RE: **RESERCH PERMIT**

Please refer to the above Captioned Subject.

May I introduce to you **Mr. Charles Bahati Mtatifikolo** from Mzumbe University – Morogoro Centre.

At the moment he is conducting research on "**Skin and Respirator Health Problems and Related Factors Among Solid Waste Collectors**" A case study of Mbeya City Council from **30th March** to **21st April, 2017**.

Please assist him accordingly.

Quip Mbeyela
For: **REGIONAL ADMINISTRATIVE SECRETARY**
MBEYA

C.C: Vice Chancellor,
Mzumbe University,
P. O. Box 63,
MOROGORO.

Mr. Charles Bahati Mtatifikolo

THE UNITED REPUBLIC OF TANZANIA
PRISIDENT'S OFFICE
REGIONAL ADMINISTRATION AND LOCAL GOVERNMENT

MBEYA REGION
TELEGRAM: "DAIMA"
Telephone No: 2502067
In reply please quote:

DISTRICT COMMISSIONER'S OFFICE,
P.O. Box 255,
MBEYA.

Ref. No. [illegible]

13th April, 2017

City Director,
Mbeya City Council,
P.O. Box 149,
MBEYA.

REF: RESEARCH PERMIT

Please refer to the above captioned subject.

May I introduce to you, **Mr. Charles Bahati Mtafikolo** from Mzumbe University – Morogoro.

At the moment he is conducting research on **"Skin and Respirator Health Problems and Related Factors among Solid Waste Collectors". A case study of Mbeya City Council** from **30th March 2017** up to **21st April, 2017.**

Please assist him accordingly.

A.J. Mwandelile
for: **DISTRICT ADMINISTRATIVE SECRETARY**
MBEYA

c.c. Mr. Charles Bahati Mtafikolo,
Mzumbe University,
P.O. Box 63,
MOROGORO.

UNITED REPUBLIC OF TANZANIA
PRESIDENT'S OFFICE,
REGIONAL ADMINISTRATION AND LOCAL
GOVERNMENT AUTHORITY,

MBEYA CITY COUNCIL

All correspondences to be addressed to:
Phone:
Fax:
Website:

CITY DIRECTOR,
P.O.BOX 149,
MBEYA

In reply please quote:

Ref. No.MCC/R.50/1/Vol. XXXIV/92 Date: 20/04/2017

CityEnvironmental Officer
MBEYA CITY COUNCIL

RE: RESEARCH PERMIT

Please refer to the above captioned subject.

May I introduce to you Charles Bahati Mtafifikolo from Mzumbe University who at the moment intending to conduct a Research at our organization which is based on "**Skin and Respiratory health problems and related factors among solid waste collectors**"

Case study of his Research is in Mbeya City. The research will commence from 24th March to 30th April 2017.

Kindly assist him.

Emmanuel Daniel
For: CITY DIRECTOR
MBEYA CITY COUNCIL

For: CITY DIRECTOR
MBEYA CITY COUNCIL
MBEYA

C.C. Vice Chancellor,
Mzumbe University,
P.O Box 6,
MOROGORO

Mr. Charles Bahati Mtafifikolo

Appendix 1: A man with no protective equipment dumping waste at one of the collection centre in Forest ward.

Source: field survey (April, 2017)

Appendix 2: Refuse handlers with no protective gears taking waste in one of the collection point in Sisimba ward

Source: field survey (April, 2017)

Appendix 3: Women with no protective gears found scavenging at the part of main dumpsite in Nsalaga ward

Source: Field survey (April, 2017)

Lumen de lumine Lumen de lumine Lumen de lumine Lumen de lumine Lumen de lumine

Dept. Languages and Communication Studies,

Mzumbe University,

P.O.Box 5,

Mzumbe, Morogoro.

18/8/2017

To

Director, DRPS,

Mzumbe University,

P.O.Box 63,

Mzumbe, Morogoro.

EVIDENCE OF LANGUAGE EDITING

This is to provide evidence that I have read, edited and proofread the **MRPP** Dissertation of **Mr. Charles Bahati Mtatifikolo** entitled "***Prevalence of Skin and Respiratory Health Problems between Solid Waste Collectors and Non-Solid waste collectors in Mbeya City Council*"** in order to ensure language accuracy before it is passed for award of the said degree. In editing, I have addressed errors in spelling, tenses, cohesion, coherence, consistency of arguments, and the general organisation of the dissertation. I thus recommend that the candidate can submit the Dissertation for further examination, scrutiny and determination for award of the said Master's Degree as per the jurisdiction (*quod per jurisdictionem*) and discretion of the concerned board of Examiners and the relevant University Authority.

Sincerely Yours

Dominik T. Msabila (Lecturer)

English Language Editor-cum-Translator