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IMPACT OF WASTE MANAGEMENT PRACTICES ON PUBLIC HEALTH IN MUFAKOSE

BY

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DECLARATION

I Hetani Chimumu, B213680B declare that this dissertation is the product of my own work with only exception of the references which have been credited to their sources. The work was not copied from any source without acknowledged of the publisher.

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The undersigned certify that they have supervised the student Hetani Chimumu dissertation entitled **Impact of Waste Management Practices on Public Health in Mufakose.** Submitted in partial fulfillment of Bachelor of Science Honours Degree in Development Studies.

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DEDICATION

I offer my gratitude and dedication to the Almighty for his guidance and protection during this research journey. Special dedication also goes to my parents my parents for inspiring me through my educational career, by providing emotional, spiritual and physical support from the beginning. I also give special dedication to my friends namely Most Kakunguwo, Timothy Mwanandimai, Gibson Munangwa and others for their support.

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ABSTRACT

Waste management in urban high-density areas presents both environmental and public health challenges, especially in low-income communities where service delivery is inconsistent. In Mufakose, Harare, poor waste management practices have been linked to rising cases of respiratory illnesses, gastrointestinal diseases, and water contamination. However, few localized studies have examined this relationship directly. This study was conducted to fill that gap by investigating how waste management practices affect public health outcomes in Mufakose. The study was guided by the Integrated Sustainable Waste Management (ISWM) Model and employed a pragmatist paradigm using a mixed-methods approach. Data were collected through stratified random sampling of households and purposive interviews with key stakeholders. Instruments included questionnaires, interviews, and field observations. The results revealed that waste collection in Mufakose is irregular, forcing residents to burn or dump waste in open spaces. This has led to increased respiratory and waterborne illnesses, particularly among children and the elderly. Statistical analysis showed strong correlations between waste exposure and disease incidence. The study also identified limited public awareness and weak regulatory enforcement as contributing factors. The findings are relevant for policymakers, municipal authorities, public health officials, and NGOs, as they highlight the urgent need for investment in waste infrastructure, community engagement, and health-based interventions. Community-led clean-up efforts, protective measures for waste workers, and educational programs can significantly reduce public health risks. In conclusion, effective and inclusive waste management strategies are crucial for improving health outcomes in Mufakose. Targeted reforms rooted in localized evidence, as presented in this study, can inform broader sustainable urban health and sanitation policies.

KEY WORDS

1. Waste Management Practices
2. Public Health

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ACRONYMS

WHO…….World Health Organization

SEM……..Social-Ecological Model

ISWM……...Integrated Sustainable Waste Management

UWEP……...Urban Waste Expertise Programme

EMA……..Environmental Management Agency

CBD……..Central Business District

CHAPTER 1: ORIENTATION OF THE STUDY

1.0 Background and Research Context

Waste management is a critical aspect of environmental health, and poor waste management practices can have significant impacts on public health. The World Health Organization (WHO) estimates that 24% of global diseases are caused by environmental factors, including poor waste management (WHO, 2018). In Zimbabwe, poor waste management practices are a major concern, particularly in urban areas that are experiencing rapid population growth due to rural-to-urban migration (2022 Population & Housing). This influx of people has led to a sharp upsurge in the volume and variety of solid waste produced, overwhelming in the process the existing waste management systems. This is because as urban populations grow, so do consumption levels, and more waste being generated (Makarati, 2011). Some residential suburbs of Harare are facing major challenge in the issue of waste disposal. These suburbs are targeted by a huge number of people as they are as they do not only have affordable housing prices, but are considered to be near the city center as well as affordable standard of living.

The city of Harare has been accused of failing to meet the demands and provide soluble solutions in maintaining waste disposal due to late collections. There are less reliable dumping infrastructures. Mafusire (2019) stressed that the city has a few designated landfills, such as the Pomona Dumpsite, which is often overwhelmed This results in illegal dumping in vacant lots and along roadsides, something which is contributing to environmental pollution. The city also lacks recycling materials that is crucial in managing waste, as a result causing less collection of garbage.

1.1 Problem Statement

Mufakose, a high-density suburb in Harare, Zimbabwe, faces significant challenges in managing waste. The area lacks adequate waste collection disposal, and recycling facilities, leading to indiscriminate dumping of waste. Despite the efforts of the City of Harare to improve waste management, the problem persists, and the impact on public health can be significant. Despite the significant problems related with waste management in Mufakose, there is insufficient research on the impact of waste management practices on public health in this area. A research by Kanonhuwa (2021) on Mufakose which focused on the effects of waste management on the environment found that it is contributing to water and soil pollution, loss of biodiversity and climate change.

1.2 Aim of the study

This research aims to address this research gap by investigating the relationships between waste management practices and public health in Mufakose.

Etymologically most studies on waste management and public health in Zimbabwe for example Impact of waste disposal on health of a poor urban community in Zimbabwe" (Makoni etal, 2004), "A Situational Analysis of Waste Management in Harare, Zimbabwe (2012) by R Tsiko and S Togarepi and "Solid waste management practices in Zimbabwe" by B Chatira-Muchopa (2019), have used either quantitative or qualitative methods, but not both. However, this research used a mixed-methods approach to deliver a better understanding of the research problem. Studies on waste management and public health in Mufakose have not provided clear policy and practice implications. Moreover, this study provided recommendations for policy and practice based on the research findings.

By addressing these knowledge, methodological, and practical gaps, this research seeks to add a better understanding of the impact of waste management practices on public health in Mufakose and inform policy and practice to improve waste management and public health outcomes.

1.3 Objectives

1. To assess the current waste management practices in Mufakose.
2. To identify the health risks associated with poor waste management practices in Mufakose.
3. To propose ways health risks associated with waste management practices in Mufakose can be mitigated.

1.4 Research Questions

1. What are the current waste management practices in Mufakose?
2. What are the health risks associated with poor waste management practices in Mufakose?
3. How can these health risks associated with waste management practices in Mufakose be mitigated?

1.5 Significance of the Study

This research is important because it may offer insights into the impact of waste management practices on public health in Mufakose. The findings of the study may inform policy decisions on waste management practices in Mufakose and add to the development of operative strategies for improving waste management and reducing the associated health risks.

Academically this research will contribute to the existing literature on waste management and public health, providing new insights into the relationships between waste management practices and health outcomes in high-density urban areas. The study will also advance theoretical knowledge on the Social-Ecological Model (SEM) of health, providing a deeper understanding of the complex relationships between individual, social, environmental and policy factors that influence health outcomes.

Practically the study's findings will inform policy and practice on waste management and public health in Mufakose and other similar urban areas. The study's findings may also contribute to enhancing community health in Mufakose, hence improving the quality of life for residents.

Socially the research will address social inequality in Mufakose, by showcasing the disproportionate impact of poor waste management practices on vulnerable populations. The study may also promote community engagement and participation in waste management decision-making, empowering residents to take control of their environment. This is in line with fostering sustainable development in Mufakose, promoting a clean and healthy environment for future generations.

Overall, this study is significant because it will provide new insights into the relationships between waste management practices and health outcomes in high-density urban areas.

1.6 Scope of the Study

The research centered on Mufakose, a high-density suburb in Harare, Zimbabwe. High-density areas have a large population living in a small geographical area, resulting in increased waste management challenges. More over residents living in these areas have limited financial resources, making it difficult to access adequate waste management. In addition, inadequate waste management in high-density areas can lead to environmental health concerns, such as the spread of diseases and pollution.

More also high-density areas are often characterized by rapid urbanization and growth, making it essential to develop effective waste management strategies to support sustainable development. Finally, high-density areas are a representative of many urban environments in developing countries, making the research findings relevant and applicable to similar contexts, specifically targeting residential areas.

The study targeted residents of Mufakose, business owners and employees in Mufakose, waste management officials and workers, community leaders and stakeholders. The research used a mixed-methods approach, combining quantitative and qualitative methods such as surveys and questionnaires, interviews, and observations, review of existing literature and policy documents.

1.7 Organization of the Study

The research consisted of 5 chapters namely; Chapter 1 which introduced the research problem, objectives, and significance of the study. Chapter 2 which reviewed the literature on waste management practices and their effects on public health. Chapter 3 which described the research methodology used in the research. Chapter 4 presented the findings of the research. Chapter 5 discussed the findings with the reviewed literature and theoretical framework. Chapter 6 presented the research summary, conclusions, and recommendations for improving waste management practices in Mufakose.

1.8 Definition of Key Words

1. **Waste Management Practices**

These refer to the methods, systems, and behaviors used to handle solid waste from its generation to its final disposal (Singh et al., 2014). This includes processes such as waste collection, transportation, sorting, recycling, treatment, and disposal (Singh et al., 2014). Effective waste management practices are essential for reducing environmental pollution, safeguarding public health, and upholding sustainable urban living.

2. **Public Health**

This is the field worried with protecting and improving the health of populations through the prevention of disease, health education, promotion of healthy environments, and policy interventions (Turnock, 2012). It emphasizes collective action to reduce health risks, especially those arising from environmental hazards like poor sanitation and inadequate waste disposal.

1.9 Summary

This chapter has introduced the research topic, “Impact of Waste Management Practices on Public Health in Mufakose”. The chapter has provided an overview of the background to the research, the problem statement, research questions, objectives, and significance of the research. The research investigated the impact of waste management practices on public health in Mufakose, a high-density suburb in Harare, Zimbabwe. The findings of this research will contribute to the existing body of knowledge on waste management practices and their impact on public health, and will inform policy decisions on waste management practices in Mufakose and other similar urban areas. The next chapter reviewed the literature on waste management practices and their impact on public health, providing a foundation for the analysis and interpretation of the data collected in this research.

CHAPTER 2 LITERATURE REVIEW

2.0 Introduction

Chapter 2 lays the theoretical and contextual groundwork for this study. This chapter explores socio-economic, regulatory and environmental aspects of waste management in Mufakose, Zimbabwe, emphasizing the obstacles faced by the community and the importance of implementing effective waste management policies. Ultimately, it sets the stage for this research's contribution to the existing body of knowledge by emphasizing the significance of understanding waste management practices to promote public health and environmental sustainability in urban areas. This chapter is organized into several sections namely theoretical framework, conceptual framework, waste management: an overview, economic impact of waste management, public health dimensions of waste management, challenges faced in waste management, mitigation strategies, legal and institution policies governing waste management, case studies and comparative research, gaps in the literature and the chapter summary.

2.1 Theoretical Framework

This section discussed relevant theories and models associated with waste management practices and public health. This study used the Integrated Sustainable Waste Management (ISWM) Model. It explains how this theory inform research questions and objectives of the study.

2.1.2 Integrated Sustainable Waste Management (ISWM) Model

Paterok (2020) stated that, the ISWM Model was co-created by WASTE, a Dutch non-governmental organization and has been successfully applied in field for over 15 years. According to Lozano Garcia (2017), the foundation for this model was laid during the first workshop of the Working Group on Solid Waste Management in Low-income countries, held in Ittingen, Switzerland, in 1994. Arnold van de Klundert and Inge Lardinios were instrumentals in articulating the concept of ISWM, which was further enriched by the work of many colleagues and partners during the Urban Waste Expertise Programme (UWEP) from 1995 to 2001.

According to Ikhlayel and Nguyen (2017), the ISWM model is a universal line of attack to waste management that address the entire lifecycle of waste from generation to disposal. It emphasizes sustainable practices that minimize the negative effects of waste on the environmental, social and economic dimensions, hence promoting waste prevention, recycling, resource recovery, efficient waste collection and transportation and environmentally sound waste treatment and disposal

methods. It also includes active stakeholder participation and development of supportive policies and regulations (Hornsby et al., 2017). For example, in Zimbabwe waste management include stakeholders such as EMA, Local council, other government and private ministries and the whole at large and the country has the cleanup day campaign policy which is held on the first Friday of every month.

Many studies have been anchored on the ISWM Model to explore various aspects of waste management and public health. For example, a study by Wilson, Velis and Cheeseman (2006) applied the ISWM Model to assess waste management in low and middle-income countries, highlighting the need for integrated and sustainable approaches to address waste challenges. Schubeler, Wehrle and Christen (1996) used the ISWM Model to analyze the role of municipalities in urban waste management, emphasizing the importance of stakeholder participation and policy support. Additionally, a research paper by Zurbrugg, Drescher, Rytz, Sinha and Enayetullah (2005) utilized the ISWM Model to evaluate community-based waste management initiatives in developing countries, demonstrating the effectiveness of local involvement and sustainable practices.

The strengths of the ISWM Model include its holistic approach which ensures comprehensive waste management practices. Its emphasis is on promoting environmentally sound and economically viable practices. The model also encourages active stakeholder involvement, enhancing community engagement and support and supports the development and enforcement of policies and regulations that facilitate effective waste management (Zurbrugg et al., 2014). However, Zurbrugg et al. (2014) argued that, the model has its limitations. They argued that, implementing the model may require significant financial, technical and human resources which can be challenging for resource constrained areas. The comprehensive nature of the model can make it complex to implement and manage, requiring coordination among multiple stakeholders. Effective application of ISWM Model also relies on accurate and comprehensive data which may not always available.

However, the ISWM Model shaped this study by providing a structured framework for assessing and improving waste management practices in Mufakose. By addressing waste prevention, recycling, efficient collection and safe disposal the model aligns well with goals of reducing health risks and promoting environmental sustainability. The emphasis on stakeholder participation

ensures that the perspectives and experiences of residents, health providers and waste management officials are integrated into the research, leading to more contextually appropriate and effective outcomes (Woldesenbet, 2021). Moreover, the model's focus on policy and regulatory frameworks supports the identification of necessary policy interventions to enhance waste management practices.

Despite its limitations, the ISWM Model was used in this study because of its comprehensive and sustainable approach to waste management. While the implementation may be resource intensive and complex, the benefits of adopting a holistic framework outweigh these challenges. The model's emphasis on stakeholder involvement and policy support ensures that the study's findings are not only academically robust but also practically relevant and actionable. By utilizing the ISWM Model, this research provided practical recommendations for enhancing waste management practices in Mufakose, ultimately contributing to improved public health outcomes and environmental sustainability.

2.2 Conceptual Framework

According to Salawu et al. (2023), a conceptual framework serves as a visual representation of the relationships between key concepts and variable in the study, it helps to clarify the focus areas, guide the research process and provide a structured approach to analyze the topic under examination. For this research on impact of waste management practices on public health in Mufakose, the conceptual framework included key concepts such as waste management practices, public health results and community good fortune. It visualized how effective waste management practices can lead to improved health outcomes and enhanced community well-being, while inadequate waste management can result in negative impacts on public health and living conditions.

2.2.1 Waste Management Practices

Berenjkar and Yuan (2021) stated that, waste management practices encompass several key variables including the generation of waste, methods and frequency of waste collection, disposal means and recycling and resource recovery efforts. Berenjkar and Yuan (2021) further explained that, waste generation refers to the amount and types of waste produced by households, businesses and institutions, waste collection involves the methods and schedules for collecting waste from various sources, ensuring that waste is gathered efficiently and regularly, disposal methods include

the various ways in which waste is being disposed of such as landfill, incineration and informal dumping and recycling and resource recovery refer to the processes of reclaiming valuable materials from waste and repurposing them for new uses, thereby reducing the volume of waste that needs to be disposed.

2.2.2 Public Health Outcomes

Public health outcomes are critical variables that highlight the impact of waste management practices on the health of the community, these outcomes include disease incidence, injury rates and mental health effects (Fadhullah et al., 2022). Disease incidence refers to the prevalence of diseases related to poor waste management such as diarrheal diseases, respiratory infections and vector-borne diseases. Injury rates encompass the occurrence of injuries related to waste handling and disposal which can result from exposure to hazardous waste or unsafe practices, therefore, people will be injured with material such as metal and glasses. Mental health effects consider the psychological and emotional impact of waste related issues on the well-being of residents, including stress and anxiety caused by living in unsanitary conditions (Fadhullah et al., 2022).

2.2.3 Community Well-Being

Community well-being encompasses variables that reflect the overall quality of life and social dynamics within the community. One key aspect is living conditions, which refer to the cleanliness and sanitation of the environment where residents live. Improved waste management practices can lead to cleaner and healthier living conditions (NewSouth Waste, 2023). Social cohesion describes the extent to which waste management practices affect community relationships and social interactions. Effective waste management can foster a sense of community pride and cooperation (United Nations Development Programm, 2023). According to Allen (2023) and David (2023), economic opportunities are another important variable, highlighting the potential for income generation and employment related to waste management activities such as recycling and resource recovery initiatives.

2.2.4 Relationships between Concepts

The relationships between these concepts are critical to understand how waste management practices impact public health and community well-being. Awasthi et al. (2019) argued that, effective waste management practices such as efficient waste collection, environmentally sound disposal and active recycling and resource recovery, can lead to improved health outcomes and

enhanced community well-being, conversely. Inadequate waste management can result in increased disease incidence, higher injury rates and negative impacts on mental health. The conceptual framework illustrates how to address waste management practices that can lead to better public health outcomes and improved living conditions, emphasizing the importance of community involvement and economic opportunities in enhancing overall well-being.

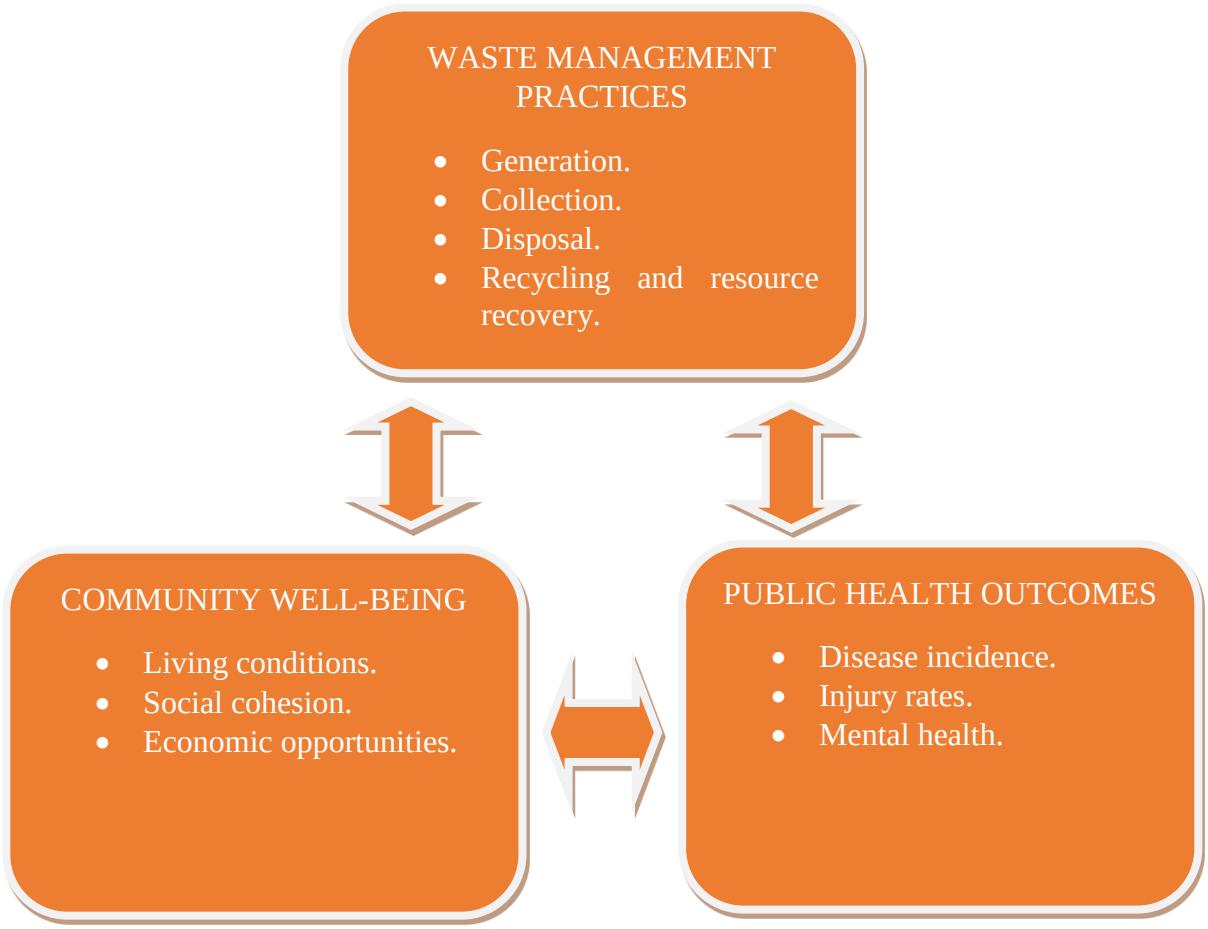

Fig 2.1. Conceptual Framework

2.3 Waste Management: An Overview

Waste management is a process of controlling waste from its inception to its final disposal in a manner that reduces its impact on the environment and public health, this includes a series of actions and practices involving waste generation, collection, transportation, treatment and disposal, as well as recycling and resource recovery efforts (Jouhara et al., 2017). Effective waste management is crucial for sustaining public health, environmental cleanliness and overall urban

sustainability. This section provides an overview of waste management practices including methods of waste collection, disposal, recycling and management strategies.

Waste generation refers to the production of waste by households, businesses, institutions and industries. It includes various types of waster like household waste, commercial waste, industrial waste and hazardous waste (Win et al., 2024). The amount and composition of waste generated can vary fundamentally based on factors like population size, economic activities, consumption patterns and seasonal variations (Abdel-Shafy and Mansour, 2018). Understanding the sources and types of waste generated is essential for developing effective waste management strategies.

Waste collection is the process of gathering waste from various sources and transporting it to a designated location for treatment or disposal and effective waste collection systems are vital for maintaining public health and environmental cleanliness (Gukhool, 2015). Collection methods can include curbside collection, communal collection points and specialized collection for recyclables and hazardous waste (Mihai and Grozavu, 2019). The frequency and efficiency of waste collection services can significantly impact the overall effectiveness of waste management.

Das et al. (2019) stated that, waste disposal involves the final placement of waste in a manner that reduces its effects on the environment and public health. According to Siddiqua, Hahladakis and Ai-Attiya (2022), common disposal methods include landfilling, incineration and open dumping. Landfilling is the most widely used method, involving the burial of waste in specific landfill sites. Incineration includes the combustion of waste at high temperatures, reducing its volume and potentially generating energy (Zakaria et al., 2021). Siddiqua et al. (2022) posits that, open dumping is an informal method where waste is disposed of in open areas, often leading to significant environmental and health hazards.

Victar and Waidyasekara (2024) mentioned that, recycling and resource recovery refer to the processes of reclaiming valuable materials from waste and repurposing them for new uses. Recycling includes the collection, sorting and processing of materials likepaper, plastics, glass and metals to produce new products. Resource recovery includes activities such as composting organic waste, extracting energy from waste through processes like anaerobic digestion and recovering materials for industrial use (Siwal et al., 2021). Recycling and resource recovery are essential

components of sustainable waste management as they reduce the volume of waste that requires disposal and conserve natural resources.

Effective waste management strategies are important to address the obstacles of waste generation, collection, disposal and recycling, these strategies can include policy measures, public awareness campaigns, technological innovations and community-based initiatives (Etim, 2024). Fundamental components of successful waste management strategies include integrated waste management plans which has comprehensive plans that incorporate multiple waste management practices to achieve sustainable goals. According to Rukani (2019), regulatory frameworks includes policies and regulations that set standards for waste management practices and ensure compliance. For example, the government of Zimbabwe has implemented policies such as Statutory Instrument 140 of 2023, which declared a disaster in Harare and assigned waste management responsibilities to the Ministry of Environment, Climate, Tourism and Hospitality Industry. Hornsby et al. (2017) notes that, public participation involves the engagement of communities in waste management practices through education, awareness programs and participation in recycling initiatives. For example, there is the clean-up campaigns which is done on every first Friday of the month. According to Shreya et al. (2023), there are technological solutions which involves the adoption of advanced technologies for waste treatment, recycling and resource recovery to enhance efficiency and environmental performance.

2.4 Economic Impact of Waste Management

Waste management has important economic implications for urban areas. Effective waste management practices can lead to cost savings, income generation and economic opportunities, while inadequate waste management can result in financial burdens and lost economic potential. This section explores the economic impact of waste management, with a focus on the costs and benefits of various practices and their implications for the community.

2.4.1 Cost Savings

Effective waste management can result in substantial cost savings for municipalities and communities, implementing efficient waste collection, recycling and disposal method, local governments can reduce waste management cost (Hannan et al., 2020). For example, recycling programs can lower the costs of waste disposal by diverting a significant portion of waste from landfills. To add on, minimizing the volume of waste through waste prevention and recycling can

extend the lifespan of existing landfill sites delaying the need for costly new landfills, like in Harare, there a lot of people who are collecting waste for recycling which has led to cost saving by reducing the amount of waste that need to be sent to disposal sites.

2.4.2 Income Generation and Employment

Bartolacci et al. (2019) articulates that, waste management activities can create economic opportunities and generate income for individuals and businesses, recycling and resource recovery initiatives can provide jobs in waste collection, sorting, processing and the sale of recycled materials. Informal waste pickers and recyclers can also benefit from increased demand for recyclable materials, improving their livelihoods (Velis, 2017). In urban areas like Harare, Bindura and Bulawayo, community-based recycling projects have created employment opportunities for local residents. These initiatives involve collecting, sorting and selling recyclables, hence providing a source of income for participants and contributing to the local economy.

2.4.3 Economic Opportunities in Waste-to-Energy

Waste to energy technologies convert waste into usable forms of energy like electricity and heat, these technologies can provide a sustainable solution to waste management while generating economic benefits (Demirbas, 2011). By minimizing the volume of waste and producing renewable energy, waste-to-energy projects can attract investment and create jobs in the energy sector. For example, the City of Harare has explored waste-to-energy initiatives as part of its integrated solid waste management. The initiative is called Geo Pomona Waste Management Zimbabwe which will convert solid waste into electricity. The project aim is to harness energy source and creating economic opportunities in the renewable energy sector.

2.4.4 Financial Burdens of Inadequate Waste Management

Inadequate waste management can result in significant financial burdens for municipalities and communities, the costs of managing improperly disposed waste, addressing environmental contamination and mitigating public health risks can strain local government budgets (Mihai et al., 2021). Moreover, poor waste management can negatively impact tourism, property values and business activities, resulting in lost economic potential (Jayasinghe et al., 2021). Poor waste management also includes expenses related to cleaning up illegal dumpsites, addressing health issues caused by waste and dealing with environmental pollution.

2.4.5 Economic Benefits of Public Awareness and Education

According to Desa and Yusooff (2012), public awareness and education campaigns on waste management practices can lead to positive economic outcomes. Educating residents about waste reduction, recycling and proper disposal methods can increase involvement in waste management programs, hence more efficient and cost-effective practices. Additionally, informed communities are more likely to support and engage in sustainable waste management initiatives, contributing to long-term economic sustainability. The Environmental Management Agency (EMA) in Zimbabwe has conducted public awareness campaigns to educate communities about the significance of correct waste management. These efforts have increased community participation in recycling programs and reduced the overall volume of waste resulting in cost savings and environmental benefits.

2.5 Public Health Dimensions of Waste Management

Waste management practices have important implications for public health. Proper waste management can mitigate health risks, while inadequate practices can lead to various health issues. This section explores the public health dimensions of waste management, focusing on the direct and indirect health effects associated with different waste management practices.

2.5.1 Disease Incidence

Inadequate waste management can contribute to the spread of infectious diseases, improper disposal of waste like open dumping can create breeding grounds for disease vectors such as mosquitoes, flies and rodents (Abdullah et al., 2024). These vectors can transmit diseases like malaria, dengue fever, cholera and leptospirosis. To add on, waste that is not properly contained can contaminate water sources leading to waterborne diseases such as typhoid fever, diarrhea and hepatitis A. For example, in Harare, outbreak of cholera and typhoid have been linked to poor waste management and inadequate sanitation. The presence of open dumpsites and uncollected waste has created environments conducive to the spread of diseases.

2.5.2 Injury Rates

Ghaedrahmati et al., (2023) argued that, improper waste management practices can result in injuries to waste handlers, recyclers and the general public, exposure to hazardous waste materials like sharp objects, medical waste and toxic substance, poses significant risks. Informal waste pickers who often lack protective equipment are vulnerable to injuries, poor managed landfill sites

and illegal dumps can lead to accidents like fires and collapse resulting in injuries (Ngwira et al., 2024). For example, in informal settlements around Harare, waste pickers often suffer injuries from handling hazardous waste without proper protective wear. These injuries can range from cuts and infections to more severe health issues caused by exposure to toxic materials.

2.5.3 Mental Health

The presence of unmanaged waste and unsanitary conditions can have detrimental effects on the mental health and well-being of residents. Living in environments with visible waste pollution can cause stress, anxiety and feedings of helplessness, the stigma associated with waste-related issues can also contribute to social isolation and minimized quality of life (Vinti et al., 2021). Addressing waste management effectively is essential for improving the mental well-being of affected communities. For example, the residents of Mbare, one of the Harare's high density suburbs have reported experiencing stress and anxiety due to the presence of uncollected waste and illegal dumpsites. The constant exposure to unsanitary conditions has negatively impacted their mental health and overall well-being.

2.5.4 Respiratory and Other Health Issues

Waste management practices particularly waste burning and incineration can contribute to air pollution, hence respiratory problems and other health issues, the burning of waste releases harmful pollutants, involving particulate matter, dioxins and furans which can cause respiratory infections, asthma and other chronic respiratory diseases (Siddiqua et al., 2022). Furthermore, exposure to toxic chemicals and heavy metals in improperly managed waste can lead to long-term health problems, involving cancer and neurological disorders. For example, areas like Bulawayo, where waste burning is a common practice, residents have reported increased cases of respiratory issues. The air pollution caused by waste burning has been linked to higher rates of asthma and other respiratory conditions among the population.

2.6 Challenges Faced in Waste Management

Effective waste management faces numerous challenges that can hinder its implementation and impact public health and environmental sustainability. One primary challenge is the lack of adequate infrastructure, this includes insufficient waste collection vehicles, limited waste disposal facilities and inadequate recycling infrastructure (Batitsa et al., 2021). In many urban areas, existing infrastructure is outdated or poorly maintained, leading to inefficiencies in waste

collection and disposal. For example, in Harare, the lack of sufficient waste collection vehicles has resulted in irregular waste collection services, leading to the accumulation of waste in residential areas and contributing to environmental pollution and health risks.

Financial constraints also significantly impact the value of waste management programs. Kibria et al. (2023) stated that, municipalities often face budget constraints that bound their capacity to invest in modern waste management technologies, infrastructure and personnel, additionally, financial constraints can hinder the implementation of public awareness campaigns and educational programs on proper waste management practices. According to Chilunjika et al. (2024), due to budgetary constraints, many local authorities in Zimbabwe struggle to provide consistent and efficient waste management services, affecting the maintenance of infrastructure and employment of adequate personnel for waste collection and management.

Regulatory challenges can also pose significant barriers to effective waste management, this includes the absence of comprehensive waste management policies, weak enforcement of existing regulations and lack of coordination among regulatory agencies (Salmenpera et al., 2021). Inconsistent regulations can lead to gaps in waste management practices and reduce the effectiveness of waste management programs. While Zimbabwe has waste management regulations in place, the enforcement of these regulations is often weak, leading to issues such as illegal dumping and non-compliance with waste management standards.

Informal waste management practices are common in many urban areas. This includes the activities of informal waste pickers who collect and sort waste for recycling without formal recognition or support, while these activities contribute to recycling efforts, they often lack the necessary infrastructure and safety measures, posing risks to both the waste pickers and the environment (Nawaz et al., 2021). Informal waste pickers in cities like Harare and Bulawayo play a significant role in waste recycling but face health risks and safety hazards due to inadequate protective equipment and exposure to hazardous waste materials like sharp objects.

2.7 Mitigation Strategies

Implementing strategies to address various challenges and minimize health and environmental risks is crucial for effective waste management. One key approach is developing and enforcing comprehensive policies and regulations that set standards for waste management practices (Jerin

et al., 2022). For example, the Environmental Management Act of Zimbabwe provides a legal framework for environmental protection, detailing regulations for waste disposal, recycling and pollution control to mitigate environmental and health risks. Public awareness and education campaigns are also vital as they inform residents about waste reduction, recycling and proper disposal methods, fostering community involvement in waste management programs (Debrah et al., 2021). For instance, the Environmental Management Agency (EMA) in Zimbabwe has conducted public awareness initiatives through workshops, community meetings and media outreach to promote recycling and waste reduction.

Community-based initiatives and technological innovations are essential for successful waste management. Engaging local communities in waste management activities, such as neighborhood clean-up campaigns and recycling programs, ensures that practices are contextually appropriate and tailored to specific needs (Leknoi et al., 2024). In Harare, community clean-up campaigns have involved residents, local authorities and non-governmental organizations working together to promote sustainable waste management practices. Technological solutions, such as advanced waste treatment technologies, waste-to-energy systems and smart waste collection systems, can enhance the efficiency and effectiveness of waste management (Kurniawan et al., 2022). The City of Harare has explored waste-to-energy projects as part of its integrated waste management plan, aiming to convert waste into renewable energy and reduce waste volumes.

Collaboration among numerous stakeholders, involving government agencies, private sector entities, non-governmental organizations and communities is fundamental for effective waste management. Collaborative efforts can leverage resources, expertise and support to implement comprehensive waste management strategies (Hung et al., 2022). Financial incentives and support such as subsidies for recycling programs and grants for waste management projects, can also encourage the adoption of sustainable waste management practices. The government of Zimbabwe has provided grants and subsidies to support community-based recycling initiatives, enabling local communities to establish and sustain recycling programs, contributing to waste reduction and resource recovery efforts.

2.9 Case Studies and Comparative Research on Waste Management

Case studies and comparative research provide valuable insights into how waste management practices impact public health in different contexts. By examining successful initiatives and

common challenges in various regions, the study can identify strategies applicable to Mufakose's context. One notable example is the waste management improvements in Kigali, Rwanda. According to the study, Community-Based Waste Management for Environmental Sustainability, A Case Study of Kigali by Mukaba et al. (2018), Kigali faced significant challenges due to rapid urbanization and population growth. The city implemented comprehensive waste management policies and engaged the community through the Umuganda program a mandatory monthly community service day where residents participate in cleaning their neighborhoods. This initiative fostered a strong sense of communal responsibility, leading to cleaner environments and improved public health outcomes. Mukaba et al. (2018) highlight that the enforcement of strict regulations, including a ban on single-use plastics, reduced plastic waste and improved waste collection efficiency. Despite ongoing challenges like limited recycling infrastructure, Kigali's experience underscores the effectiveness of community involvement and robust policy enforcement.

Another relevant case is from Surabaya, Indonesia. In the study, Innovative Waste Management Approaches in Surabaya by Sajari and Putri (2019), Surabaya faced waste accumulation and limited landfill space, prompting innovative solutions. The city implemented a waste-to-energy program that converts organic waste into biogas, effectively reducing the volume of waste requiring disposal and providing a renewable energy source. Additionally, Surabaya introduced the Garbage Bank system, where residents can exchange recyclable waste for money, fostering community-based waste management. Sajari and Putri (2019) note that these initiatives not only addressed waste management challenges but also enhanced public health by reducing environmental pollution. Surabaya's success highlights the significance of technological innovations and community engagement.

In Mufakose, waste management challenges have significant implications for public health. Chifamba and Musasa's (2020) study titled Waste Management Practices in Mufakose, A Public Health Perspective, examines the impact of inadequate waste collection services leading to waste accumulation in residential areas. Due to irregular waste collection schedules, residents often resort to improper disposal methods such as open dumping and burning of waste. These practices create breeding grounds for disease vectors like mosquitoes and rodents, contributing to increased incidences of communicable diseases, including diarrhea, malaria and typhoid fever. The

accumulation of waste also leads to environmental pollution, affecting air and water quality and posing further health risks.

Another study by Moyo and Chatiza (2018), titled Community Participation in Solid Waste Management in Mufakose, focuses on the role of community involvement in enhancing waste management practices and reducing public health risks. Through surveys and interviews, they found that community participation was minimal due to a lack of awareness and limited resources. However, in areas where community groups were active, there was a noticeable improvement in waste disposal practices. Moyo and Chatiza (2020), emphasize the need for empowering community organizations and fostering partnerships between residents and local authorities to address waste management challenges effectively.

2.10 Gaps in the Literature

Despite extensive research on waste management and public health, there are specific gaps in the literature regarding Mufakose, Zimbabwe. Firstly, context-specific studies examining the direct impact of waste management practices on public health in Mufakose are scarce. Most existing research tends to generalize findings across broader regions, without delving into the unique socio-economic and environmental factors that influence waste management in Mufakose. This lack of localized research makes it challenging to develop interventions tailored to the community's specific needs, thereby hindering the effective implementation of waste management strategies that resonate with the local population.

Secondly, there is a notable underrepresentation of community perspectives in the existing literature. Qualitative insights into the attitudes, beliefs and behaviors of Mufakose residents, waste workers and other stakeholders regarding waste management are limited. Additionally, there is scarcity of comprehensive data linking specific waste management practices to health outcomes among the residents of Mufakose. Existing studies often acknowledge the general association between poor waste management and health risks but lack empirical evidence demonstrating causality or quantifying the extent of these impacts. Addressing these gaps is important for improving waste management practices and public health outcomes in Mufakose. By generating context-specific knowledge, amplifying community voices and providing empirical evidence on health outcomes, this study offered targeted and effective solutions tailored to Mufakose's unique context.

2.11 Summary of the Chapter

The above chapter examined the complex relationships between waste management practices, public health and community dynamics, exploring socio-economic, regulatory and environmental aspects of waste management in Mufakose, Zimbabwe. The chapter emphasizes the challenges faced by the community and the importance of implementing effective waste management policies. This chapter shed light on theoretical framework, conceptual framework, waste management: an overview, economic impact of waste management, public health dimensions of waste management, challenges faced in waste management, mitigation strategies, legal and institution policies governing waste management, case studies and comparative research and gaps in the literature.

CHAPTER 3. RESEARCH METHODOLOGY

3.1 Introduction

This chapter natures the methodology that will be used in this study to assess the impact of waste management practices on public health in Mufakose. The chapter will describe the study area, research design, research approach, targeted population, sample size sampling methods, data collection methods, data analysis and presentation and ethical consideration. All these subtopics will help to have a comprehensive understanding of the topic under study.

3.2 Description of the Study Area

Mufakose is a high-density suburb located in the southwestern part of Harare, it is situated approximately 15 kilometers from Harare CBD (Chisamba, 2020). Mufakose is relatively flat, with slight undulations and it is characterized by a mix of built-up urban environments and scattered open spaces. It is one of the oldest residential areas established in the 1960s and has grown to become a densely populated neighborhood characterized by residential, commercial and informal sector activities (Dube, Zvoushe and Uwizeyimana, 2023). According to Chipenda (2017), this area has a diverse and dynamic socio-economic profile, the residents of Mufakose engage in various forms of employment to sustain their livelihoods. The formal sector includes jobs in education, healthcare, retail and public services and large number of residents rely on informal sector activities, such as vending, trading, artisanal work and other forms of self-employment.

Figure 3.1 shows the map of Mufakose, which was created by the researcher using QGIS. Shape files used were downloaded from the internet.

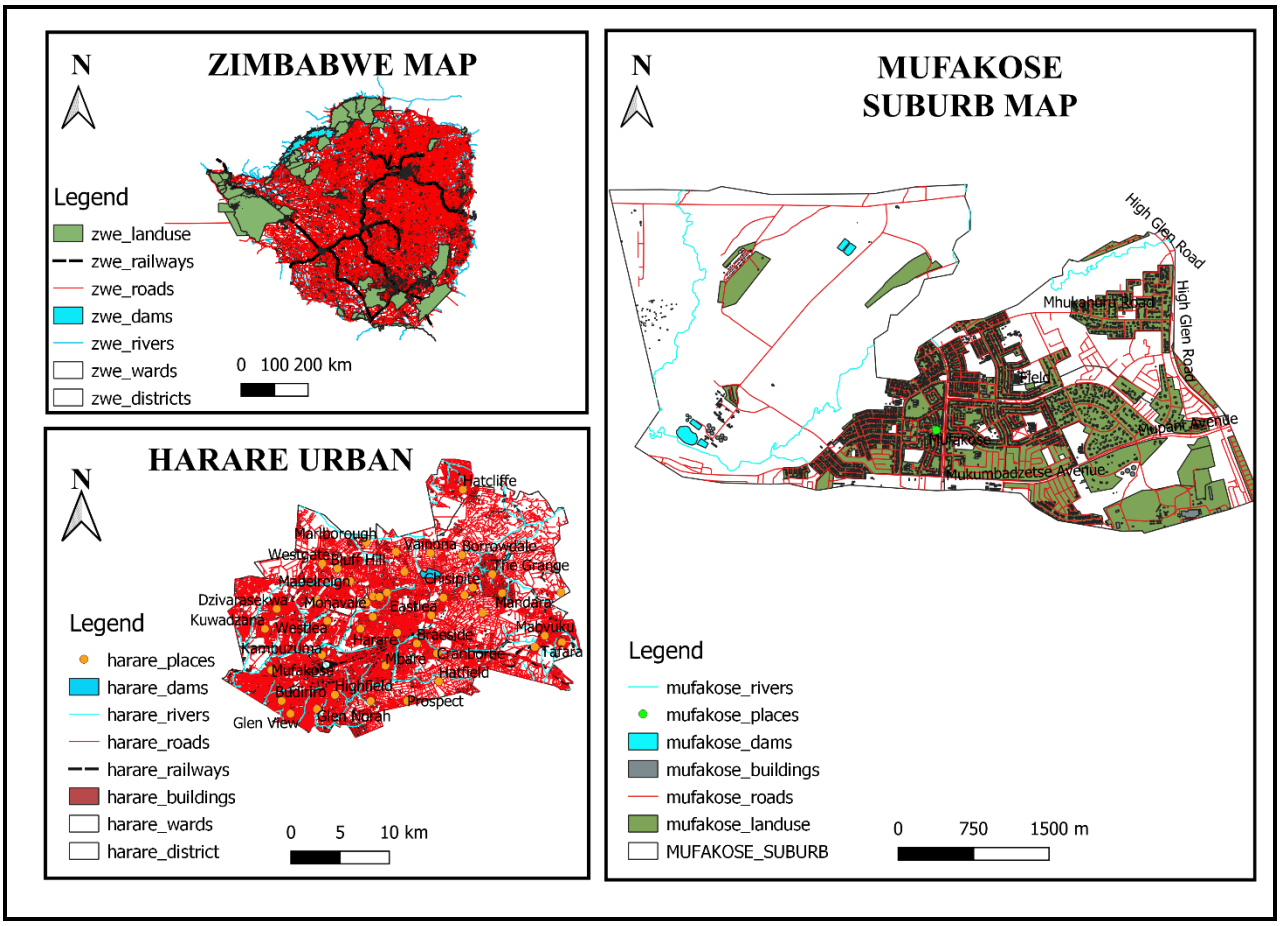

Fig 3.1 Map of Mufakose (Source: Author)

3.3 Research Paradigm

A research paradigm refers to a philosophical framework that guides how researchers approach their studies, shaping their understanding of reality, knowledge and the methods used to acquire it. Antwi and Kasim (2015) mentioned that, a research paradigm incorporates 3 crucial elements namely ontology (beliefs about the nature of reality), epistemology (beliefs about how knowledge is acquired) and methodology (the strategies used to generate knowledge). For this study, the pragmatist paradigm was employed, as it aligns with the study's objective of integrating both quantitative and qualitative approaches to comprehensively explore waste management practices and their impact on public health in Mufakose. The pragmatist paradigm emphasizes practical problem-solving and the integration of diverse methods to address real-world problems. As noted by Kaushik and Walsh (2019), pragmatism values both objective and subjective realities, recognizing that truth is dynamic and context-dependent. In this study, pragmatism enabled the

exploration of measurable health outcomes like disease prevalence alongside the lived experiences and perceptions of Mufakose residents regarding waste management.

There are several studies that have been anchored by pragmatism paradigm. The study by Kaushik and Walsh (2019), titled Pragmatism as a Research Paradigm and Its Implications for Social Work Research, demonstrates the application of the pragmatist paradigm in social work. The researchers explored how pragmatism can empower marginalized communities by integrating quantitative surveys with qualitative interviews to address social justice issues. Their research highlighted the paradigm's ability to bridge the gap between empirical evidence and lived experiences, providing actionable insights for improving social work practices. This study underscores the paradigm's relevance in addressing complex social challenges through a mixed-methods approach. Similarly, Holtrop and Glasgow (2020) applied the pragmatist paradigm in their study on diabetes management, titled Pragmatic Research: An Introduction for Clinical Practitioners. The researchers combined quantitative data on patient outcomes, such as blood sugar levels, with qualitative interviews to understand patients' experiences and barriers to managing their condition. The pragmatist paradigm allowed them to integrate these findings, offering practical recommendations for improving diabetes care in diverse clinical settings. This study showcased how pragmatism facilitates the development of tailored interventions that address both measurable outcomes and contextual factors.

According to Yardley and Bishop (2017), the pragmatist paradigm offers several strengths that make it particularly suitable for this study. Its flexibility allows researchers to adopt methods that best suit the research questions, whether quantitative, qualitative, or a combination of both. Focusing on practical solutions, pragmatism ensures that research findings are applicable to real-world contexts (Yardley and Bishop, 2017). Additionally, its emphasis on integrating diverse perspectives enables a comprehensive understanding of complex issues (Yardley and Bishop, 2017). However, the paradigm also has limitations. Yardley and Bishop (2017) argue that, pragmatism lacks philosophical purity due to its focus on practicality rather than theoretical depth. They further mentioned that, combining multiple approaches can also be resource-intensive and methodologically complex, requiring careful planning to maintain coherence.

Despite these limitations, the pragmatist paradigm provided a meaningful foundation for this study. Its emphasis on practical problem-solving and methodological flexibility aligns with the

research's goal of addressing the multidimensional challenges of waste management and public health in Mufakose. By integrating quantitative and qualitative approaches, the paradigm ensures that the study captured both the measurable and experiential dimensions of the issue. This holistic approach not only enhanced the academic rigor of the research but also ensured that the findings are relevant and actionable for policymakers, community leaders and other stakeholders.

3.4 Research Approach

A research approach provides the overall plan and strategy for conducting a research (DePoy, 2024). It determines how data will be collected, analyzed and interpreted to address the research objectives effectively (Taherdoost, 2022). In this study, a mixed-methods research approach was used, informed by the pragmatist paradigm. To enhance the study's rigor and credibility, methodological triangulation was used within this mixed-methods framework.

Methodological triangulation refers to the utilization of multiple research methods to research the same phenomenon, as mentioned by Hastings and Salkind (2010). Combining different approaches such as quantitative surveys and qualitative interviews it allows researchers to cross-verify findings and obtain a more holistic understanding of the study problem (Hastings and Salkind, 2010). This technique ensures that the limitations of one method are compensated for by the strengths of another, improving the validity and reliability of the results.

In this research, methodological triangulation was used to examine the effects of waste management practices on public health in Mufakose. The quantitative methods, such as surveys, capture measurable data on disease prevalence and waste disposal patterns. The qualitative methods, including interviews and observations, provided deeper insights into the lived experiences and attitudes of residents and stakeholders. Methodological triangulation aligns with the pragmatist paradigm, as it integrates several methods to address both the empirical and contextual dimensions of the research problem.

3.5 Research Design

A mixed method research design was used, incorporating both quantitative and qualitative methods to assess the impact of waste management practices on public health in Mufakose. Structured surveys collected quantitative data on waste management practices and health outcomes from residents, while interviews and observations provided qualitative insights from waste management

officials, healthcare providers and resident. Matovic and Ovesni (2023) states that, this design ensures an effective analysis by combining measurable evidence with in-depth perspectives allowing for a better understanding of the issue under research and the development of effective mitigation strategies.

3.6 Target Population

Pandey and Pandey (2015) states that target population refers to the entire group of individuals that a researcher is interested in studying and from which he or she aims to draw conclusions. For this research, the target population included healthcare providers, waste management officials and residents in Mufakose. Residents provided insights into their waste management practices and perceived health impacts, healthcare provided information about health issues related to waste management and waste management officials shared information on existing practices and challenges. This group ensures an effective understanding of the impact of waste management practices on public health in Mufakose.

3.7 Sampling Methods

Casteel and Bridier (2021) noted that, sampling is the process of selecting a subset of individuals from a larger population to take part in a study. This selection is essential for collecting data that is both representative and manageable. According to Wang (2024), sampling methods can be broadly categorized into probability sampling and non-probability sampling, both of which are vital depending on the research focus and objectives.

Probability sampling is a method where every member of the population has an equal or known chance of being selected (Pace, 2021). This ensures the representativeness of the sample and is commonly applied in quantitative research. Within this method, techniques such as stratified random sampling are particularly valuable. In stratified random sampling, the population is divided into different subgroups, known as strata, based on specific characteristics such as age, gender, or geographic location (Nguyen et al., 2021). From each stratum, participants are randomly selected to form a sample that proportionately represents all groups. This technique is effective for the quantitative component of this study, as it ensures the diversity of Mufakose residents is adequately reflected. For example, residents from different age brackets or neighborhoods were represented in the survey, which allowed for a comprehensive analysis of waste management and health issues. Nguyen et al. (2021) mentioned that, stratified sampling reduces bias and increases the accuracy

of findings, however, it requires detailed knowledge about the population, which can be time-consuming to gather.

There is non-probability sampling which does not provide every member of the population with an equal chance of being selected (Boyd et al., 2023). Instead, respondents are chosen based on specific criteria or the researcher's judgment, making it a more flexible and practical method for qualitative research. A key technique within non-probability sampling is purposive sampling, where participants are selected intentionally due to their knowledge, experiences, or roles relevant to the study (Thomas, 2022). In this research, purposive sampling was utilized to select healthcare providers and waste management officials in Mufakose, as they possess specialized insights into the impacts of waste management practices on public health. This approach ensured that the study captures rich, detailed data from key stakeholders who are directly involved in or affected by these practices. According to Thomas (2022), purposive sampling provides depth and context, however, its main limitation lies in its reliance on the researcher's subjective judgment, which can introduce bias.

The combination of stratified random sampling and purposive sampling aligned well with the study's mixed-methods design. Stratified random sampling allowed for a statistically representative quantitative analysis of the general population, focusing on measurable variables such as disease prevalence. Meanwhile, purposive sampling enabled an in-depth qualitative exploration of the lived experiences and professional perspectives of stakeholders. Together, these techniques enhanced the breadth and depth of the research, ensuring that the findings were both reliable and contextually insightful.

3.8 Sample Size

Casteel and Bridier (2021) said that, sample size is the number of individuals or units selected from a larger population to participate in a research. It signifies the subset of the population that will be studied to draw conclusions. Determining an appropriate sample size is critical for ensuring the reliability, validity and applicability of study findings. In this study, the researcher chose the sample size of 44 participants due to practical challenges such as limited time, budget constraints and the unavailability of helpers. Although the population of interest, comprising Mufakose residents, healthcare providers and waste management officials, is significantly larger, this sample size is deemed sufficient for meeting the study's objectives.

For the quantitative component, 40 participants were drawn from Mufakose residents using stratified random sampling. For the qualitative component, 4 participants, including healthcare providers and waste management officials, were selected using purposive sampling. Although the sample size was smaller than that is supposed to be calculated for large populations, its justification lies in the alignment with the study's objectives, resource constraints and the use of mixed methods to improve the breadth and depth of findings. This strategy ensured that the study generates reliable and meaningful results while remaining feasible within its practical limitations.

3.9 Data Collection Methods

Taherdoost (2021) stated that, data collection is the systematic process of collecting information to address study questions and objectives. In this study, various instruments and techniques were employed to collect both quantitative and qualitative data, ensuring that the findings were comprehensive and reliable. The instruments and methods used were carefully designed to align with the mixed-methods approach, capturing both measurable trends and detailed contextual insights.

3.9.1 Data Collection Protocol

The data collection protocol provides a structured plan to guide the research process (Taherdoost, 2021). It begun with identification of the targeted participants such as Mufakose residents, healthcare providers and waste management officials and obtaining their informed consent for participation. For qualitative methods, additional consent was obtained for recording audio and taking photographs during interviews and observations (Taherdoost, 2021). This ensured ethical compliance and respects participants' privacy and autonomy. All collected data, whether quantitative or qualitative, was securely stored to maintain confidentiality and ensured its integrity throughout the study.

3.9.2 Types of Data

This study focused primarily on primary data, which was collected directly from participants through surveys, interviews, and observations. This data was original and tailored to the research objectives, offering firsthand insights into waste management practices and public health impacts in Mufakose.

3.9.3 Quantitative Data Collection

Structured questionnaires were administered to 40 Mufakose residents and all of them were returned answered. This ensured consistency and standardization across responses, enabled the researcher to conduct statistical analyses to identify patterns and relationships. The quantitative component of the study relied on structured questionnaires as the primary instrument for data collection. According to Karunarathna et al., 2024), questionnaires consist of closed-ended questions designed to gather measurable data on variables such as waste management practices, disease prevalence and frequency of waste collection. The structured format made it easier to process and compare data (Karunarathna et al., 2024). However, a limitation of structured questionnaires is that they do not allow for open-ended responses, which may restrict the depth of the information collected.

3.9.4 Qualitative Data Collection

The qualitative component of this study used a combination of semi-structured interviews, and observations as data collection methods. These methods were supported by specific instruments tailored to each technique, ensuring a comprehensive exploration of participants' perspectives and real-world practices.

The researcher managed conduct 3 interviews instead of 4 with healthcare worker, waste management official, municipal official. Semi-Structured Interview is a qualitative data collection method where the interviewer follows a flexible framework of predetermined questions (Ruslin et al., 2022). They are conducted with healthcare providers and waste management officials using an interview schedule. An interview schedule is a tool used in interviews that consists of a set of predefined questions (Buschle et al., 2022). This schedule includes a set of pre-determined topics and open-ended questions, such as challenges faced in professional roles or perceptions of the waste management system. The flexibility of semi-structured interviews allows participants to provide detailed responses while maintaining focus on the research themes (Ruslin et al., 2022). Interviews may be recorded, with participants' consent, to ensure accuracy in capturing responses and aid in data analysis. According to Ruslin et al. (2022), the advantage of recording is that it allows the researcher to focus on the conversation during the interview, while the drawback is the potential for participants to feel uneasy about being recorded.

Observation is a qualitative data collection method that involves systematically watching, documenting and analyzing behaviors, actions or events in their natural setting (Weston et al., 2022). It is conducted using a structured observation checklist which is known as a structured instrument containing a list of predefined criteria or indicators that guide the researchers in recording observations (Weston et al., 2022). The checklist includes specific criteria, such as the availability of waste disposal bins, instances of illegal dumping, and the condition of the environment. Observations offer unfiltered data that can complement other methods by capturing real-world practices. Pictures of open dumping and waste burn were taken during field visits to add depth (for cross check see Fig 4.2 and Fig 4.3). Taherdoost (2021) posits that, the advantage of photographs is that they provide visual evidence to support the findings, while the limitation is the need for careful ethical considerations to avoid intruding on participants' privacy.

3.10 Data Analysis

Data analysis refers to the systematic process of organizing, interpreting and evaluating data to uncover patterns, insights that address research objectives or questions (Taherdoost, 2022). This process allows researchers to draw meaningful conclusions by applying appropriate statistical, logical and contextual methods. In this study, data analysis was divided into quantitative and qualitative approaches, each with its own unique tools and techniques for handling the respective types of data collected.

3.10.1 Quantitative Data Analysis

Quantitative data analysis is the process of examining numerical data using statistical tools to identify measurable patterns, relationships and trends (Taherdoost, 2022). It focuses on the objective evaluation of data, providing results that can be generalized to the broader population. According to Raherdoost (2022), quantitative data analysis typically includes descriptive statistics, which summarize data trends and inferential statistics, which help to draw conclusions about the larger population based on the sample data.

3.10.1.1 Descriptive Statistics

Descriptive statistics is a crucial tool in quantitative data analysis. It includes the utilization of statistical measures such as mean, median, mode, frequency and percentages to summarize the data collected (Ghanad, 2023). This study used descriptive statistics to calculate the percentage of residents adopting specific waste disposal methods or the frequency of waste-related health issues

reported among respondents. Descriptive statistics was applied to analyze the data from structured questionnaires administered to 40 residents of Mufakose. Summarizing the data in a clear and concise manner, descriptive statistics helped the researcher to identify general trends and provide an overview of the results. Taherdoost (2022) highlights that, the main advantage of this technique is its simplicity and ability to present data in a comprehensible format. However, it does not provide deeper insights into relationships between variables.

3.10.1.2 Inferential Statistics

Inferential statistics is a method used to draw conclusions about the entire population based on the sample data (Ghanad, 2023). It involves statistical tests, such as regression analysis, correlation analysis, or t-tests, to examine relationships or test hypotheses. In this study, inferential statistics were applied to evaluate the correlation between waste management practices and the prevalence of health issues in the community. Inferential statistics were used to analyze the structured questionnaire responses to make generalizations about waste management practices and public health impacts in Mufakose. According to Ghanad (2023), the advantage of inferential statistics is its ability to provide predictions and insights applicable to the broader population. However, its reliability depends on the accuracy and representativeness of the sample data.

3.10.2 Qualitative Data Analysis

According to Chai et al. (2021), qualitative data analysis is the process of interpreting non-numerical data to understand participants' experiences, perspectives and the contextual factors influencing their views. It involves identifying themes, patterns, or concepts within the data and exploring their meaning (Chai et al., 2021). Qualitative data analysis in this study is conducted using thematic and content analysis, supported by data collected through interviews, focus group discussions and observations.

3.10.2.1 Thematic Analysis

Christou (2022) posits that, thematic analysis is a qualitative method for identifying, analyzing and interpreting patterns within textual data. In this study, thematic analysis was used to transcripts data from semi-structured interviews. The process begins with transcription of the audio recordings, followed by reading through the text to identify codes, specific phrases or ideas that captured recurring concepts. These codes were grouped into broader themes, such as community attitudes toward waste management or challenges faced by healthcare providers. Thematic analysis

allowed for the organization of qualitative data into coherent themes, offering in-depth insights into the participants' perspectives and experiences. According to Waeraas (2022), the flexibility of this method enables the researcher to adapt to new findings during the analysis. However, thematic analysis can be time-intensive and requires careful attention to ensure reliability and minimize bias.

3.10.2.2 Content Analysis

Content analysis is a systematic method of categorizing and interpreting observational data to identify meaningful patterns and insights (Kuckartz and Radiker, 2023). In this study, content analysis was applied to data collected through observations guided by checklists. For example, observed behaviors like illegal dumping or the condition of waste bins are grouped into predefined categories, helping the researcher identify patterns in waste management practices. Photographs taken during observations also undergo content analysis to support the findings visually. Content analysis provided a structured approach to analyze observational data and enhances the richness of the findings. Lim (2024) mentioned that, its advantage lies in its ability to handle diverse types of qualitative data, but its accuracy depends on the clear definition of categories and consistent application of the checklist.

3.11 Data Presentation

According to Ningi (2022), data presentation refers to the process of organizing and displaying data in a clear, concise and visually appealing manner to facilitate understanding and interpretation. It transforms raw data into comprehensible formats such as tables, charts, graphs, and thematic summaries, helping to highlight trends, patterns and key findings (Haynes-Brown and Fetters, 2021). Effective data presentation bridges the gap between data analysis and interpretation, ensuring that the results are accessible and meaningful to the intended audience.

3.11.1 Quantitative Data Presentation

Quantitative data presentation focuses on summarizing and displaying numerical findings in ways that allow for easy interpretation of trends, frequencies and relationships (Ghanad, 2023). This study employed tools such as tables, pie charts, and bar graphs, to effectively present the data collected from structured questionnaires.

3.11.1.1 Tables

Tables are a structured way of organizing numerical data into rows and columns, providing a straightforward overview of key findings (Cloutier and Ravasi, 2021). In this study, tables were used to present data such as the response rate, demographic characteristics, and frequency of waste disposal practices or percentages of residents reporting specific health issues. For example, a table displayed waste collection frequency (e.g., daily, weekly) alongside the number of households using each option. According to Cloutier and Ravasi (2021), tables offer the advantage of clarity and simplicity, allowing readers to quickly locate specific values and compare them across categories. However, they may not effectively highlight visual trends, which is where graphical tools become useful.

3.11.1.2 Bar Graphs

Bar graphs are a visual representation of data where numerical values are depicted using rectangular bars (Schwabish, 2021). Each bar represents a category, with its height corresponding to the value it represents. In this study, bar graphs illustrated the comparison between different waste disposal methods, such as burning, recycling, or illegal dumping. Bar graphs are particularly effective for comparing categories or showcasing changes over time. Schwabisk (2021) posits that, their primary advantage is their ability to clearly depict differences between variables. However, they may become difficult to interpret if there are too many categories.

3.11.1.3 Pie Charts

This study utilized pie charts to present findings from qualitative data. Pie chart were used to present findings on community participation in clean up campaigns revealing if the community is participating or not (Fig 4.4). It was also used to see if there is present of waste near water sources (Fig 4.5). It was used in chapter 4 several times, this added more clarity and better visualization.

3.11.2 Qualitative Data Presentation

Qualitative data presentation focuses on conveying non-numerical findings through thematic summaries, quotations and visual tools like photographs (Hamzah and bin Hamzah, 2024). This study used thematic frameworks, narrative descriptions and annotated images to present the insights gained from interviews, focus group discussions and observations.

3.11.2.1 Thematic Summaries

According to Christou (2022), thematic summaries involve organizing qualitative findings into themes derived during the data analysis phase. In this study, themes included challenges in waste management, community attitudes, or health impacts. These summaries condensed the data into clear and concise narratives that highlight the key points while retaining the depth of participants' experiences. According to Hamzah and bin Hamzah (2024), thematic summaries are highly effective for presenting complex and nuanced information in an organized way. Their main limitation is that they rely on the researcher's interpretation, which may introduce bias if not carefully validated.

3.11.2.2 Direct Quotations

Direct quotations are excerpts from interviews or focus group discussions used to illustrate key findings or provide authentic voices to the themes identified (Rockman and Vough, 2024). For example, a participant was quoted to describe their personal experience with waste-related health issues or their thoughts on waste management practices. Quotations added richness and credibility to the findings by providing firsthand perspectives. However, their use must be carefully managed to ensure they are representative and not taken out of context (Rockman and Vough, 2024).

3.11.2.3 Photographs

Photographs are visual tools used to capture and present observed behaviors, practices, or environmental conditions (Chen et al., 2023). In this study, photographs taken during observations depicted waste accumulation sites, illegal dumping practices, or the condition of waste disposal facilities. Photographs complemented qualitative narratives by providing visual evidence that reinforces the textual findings. They are particularly effective for making abstract concepts tangible. However, ethical considerations must be observed, including obtaining consent for any photos involving identifiable individuals (Chen et al., 2023).

3.12 Validity and Trustworthiness

According to Ahmed (2024), ensuring validity and trustworthiness is central to conducting rigorous research. These concepts establish the accuracy, credibility and reliability of findings, ensuring that they reflect the reality being studied. While validity is associated with quantitative research, focusing on the extent to which data collection tools and methods measure what they are

intended to, trustworthiness is a concept tied to qualitative study, emphasizing credibility and confidence in non-numerical data.

3.12.1 Validity in Quantitative Research

Validity refers to the degree to which a data collection instrument measures what it is designed to measure (Ahmed and Ishtiaq, 2021). It ensures that the findings are accurate, meaningful and free from bias or error. Validity encompasses two main aspects that is internal validity and external validity. Internal validity addresses the accuracy of the findings within the context of the research, ensuring that the relationships observed between variables are genuine and not influenced by extraneous factors (Slocum et al., 2022). In this study, internal validity was enhanced by using structured questionnaires with clear and concise questions, pre-tested through a pilot study to identify and eliminate ambiguities. Consistent procedures in administering these questionnaires further safeguard the integrity of the data. External validity assesses the extent to which the study's findings were generalized to the broader population (Findley et al., 2021). While the sample size for this study was limited due to practical constraints, the use of stratified random sampling ensures representativeness. By proportionally including diverse subgroups within the population, external validity is enhanced, increasing the generalizability of the results to the wider Mufakose community.

3.12.2 Trustworthiness in Qualitative Research

Trustworthiness refers to the confidence in the authenticity and credibility of the findings (Haq et al., 2023). It determines whether the results accurately represent the experiences, perspectives and context of the participants. According to Ahmed (2024), trustworthiness is achieved through the principles of credibility, transferability, dependability, and conformability. Credibility ensures that the findings are a true reflection of participants' experiences. This study achieved credibility by engaging with participants for an extended period during interviews and focus group discussions. Triangulation was used by utilizing multiple data sources such as interviews and observations to verify consistency in findings. Additionally, member checking was conducted, where participants reviewed the researcher's interpretations to validate their accuracy. Transferability relates to the extent to which the findings was applied to other similar contexts or populations (Ahmed, 2024). Detailed descriptions of the study setting, respondents and processes were provided to allow

readers to determine the applicability of the findings to their own settings. This ensures that the context-specific insights gained from this study are potentially transferable to similar communities.

Dependability ensures that the research process is consistent and reliable over time and under similar conditions (Ahmed, 2024). To achieve dependability, the study maintained an audit trail that documents all decisions made during data collection and analysis. This included the rationale for methodological choices, ensuring transparency and allowing other researchers to replicate the study if needed. According to Ahmed (2024), conformability emphasizes objectivity, ensuring that the findings are derived from the data rather than the researcher's personal biases or assumptions. Reflexive practices, such as maintaining a reflective journal, was used to critically examine the researcher's influence on the study. Triangulation also enhanced conformability by cross-verifying interpretations using multiple data sources and perspectives.

3.13 Ethical Considerations

Ethics refers to a system of moral principles and values that guide individuals and organizations in determining what is right and wrong (Svara, 2021). In the context of research, ethics entails the principles and practices that ensure the study is conducted responsibly, with respect for the rights, dignity, and welfare of participants (Sanchez et al., 2023). Ethical research involves transparency, integrity, and accountability at all stages of the study process, from design and data collection to analysis and reporting. Conducting a research on the impact of waste management on public health in Mufakose involves numerous ethical considerations to ensure the study respects the rights and dignity of all participants.

3.13.1 Informed consent

All respondents were fully informed about the purpose, methods, risks and benefits of the research before they agreed to participate and informed consent was obtained through written consent forms, ensuring that participants understand their rights to withdraw from the research at any time without any consequences (Manti and Licari, 2018). This process ensured that participation was voluntary and based on a clear understanding of the research.

3.13.2 Confidentiality and anonymity

The privacy of all participants was protected throughout the study, personal identifying information was kept confidential and was not disclosed to unauthorized persons and data was

anonymised, meaning that individual responses were not linked to specific participants (Dougherty, 2021). This ensured that participants' identities are protected and their data is treated with highest level of confidentiality.

3.13.3 Minimization of harm

The study was designed to minimize any potential physical, psychological or social harm to respondents (Favaretto et al., 2020). The researcher was sensitive to any distress or discomfort participants might experience and provided appropriate support or referrals when needed. Participants were assured that there are no wrong answers and their honest feedback was valuable for the study.

3.13.4 Respect for vulnerable groups

Extra care was taken to respect and protect vulnerable groups such as children, elderly and people living with disabilities. Consent from guardians was sought when necessary (Aktar et al., 2020). The study ensured that the participation of these groups does not expose them to any additional risks.

3.13.5 Ethical approval

The study has to seek approval from an appropriate ethics review board to ensure that the research adheres to ethical guidelines and standards (Fletcher, 2015). For this study, the researcher sought approval from Bindura University of Science Education and from City of Harare (see appendix D).

3.15 Summary of the Chapter

This chapter has provided a comprehensive outline of research methodology to enhance a better understanding of the impact of waste management on public health in Mufakose. This chapter shed light on key points such as research design, approach, targeted population, sampling methods, data collection methods, data analysis and presentation methods, and ethical considerations. These sections in chapter 3 helped to understand the study and come up with tailored solution and it laid a foundation for chapter 4.

CHAPTER 4: DATA PRESENTATION AND INTERPRETATION

4.1 Introduction

The previous chapter provided the description and explanation of the research methodology on the topic that examines the impact of waste management practices on public health in Mufakose. This chapter centers on data presentation and interpretation. The study findings are categorized based on the research objectives. The data was drawn from questionnaire responses from Mufakose residents, interviews with municipal officials, and field observations. Statistical analysis such as correlation, descriptive statistics, and regression analysis were used where they were applicable to strengthen interpretation. Pictures from observations are included to visually support key findings.

4.2 Response Rate

Table 4.1 below shows the response rate of the data gathered on the impacts of waste management on public health in Mufakose. The response rate is based on the questionnaire survey key informant interviews.

Table 4.1 Participants Response Rate

Method	**Actual Target**	**Responses**	**Response Rate**
Questionnaires	40	40	100%
Key Informant interviews	4	3	75%

Therefore, Table 4.1 shows that out of the 40 questionnaires that were run, all the 40 were addressed, yielding and returned thus achieving 100% response rate. Out of the 4 the scheduled 4 informants (healthcare worker, waste management official, 2 municipal officials), interview was successfully done with 3, participants to yield a 75% response rate.

4.3 Demographic Characteristics

This section shows the demographic characteristics of participants in the research. Understanding these characteristics is important in contextualizing waste management practices and public health concerns in Mufakose. Major demographic variables involve gender, age, education level, and household size. These variables are summarized in Table 4.2 below, followed by an analysis and interpretation of these findings.

Table 4.2 Demographic Profile of Participants

Demographic Variable	Category	Frequency (n=43)	Percentage (%)
Gender	Male	13	30%
	Female	30	70%
Age Group	18-30	19	44%
	31-40	10	23%
	41-50	6	14%
	51-60	5	12%
	61 and above	3	7%

On gender distribution Table 4.2, illustrates that there was a higher proportion of females (70%), with only 30 % of men participating. In terms of age, 44% of the participants, were aged 18-30), 23% were aged 31-40. 41-50 were 14%, 51- 60 were 12%, and 61 and above were 7%.

On education levels, Table 4.2 shows that 37% of the participants had tertiary education, 28%, had secondary education, 16% had primary education and 19% had no education

Table 4.2 shows that, the participants in this area had different household sizes as follows; 19% had 1-3 members; 48% had 4-6members with 33% of the participants having the household size of 7 members and above.

4.4 Presentation of Findings of Objective 1: Regarding the current waste management practices in Mufakose

4.4.1 Waste Collection Frequency

Participants were asked about the frequency of waste collection in Mufakose. Table 4.3 shows the findings.

Table 4.3 Shows findings on Waste Collection Frequency in Mufakose.

Waste Collection Frequency	Frequency (n=40)	Percentage (%)
Daily	5	13%
Weekly	14	35.0%
Monthly	8	20%
Irregular	13	32%
Never	0	0%

As illustrated in Table 4.3; 35% reported weekly collection. . 13% reported that waste was collected daily, 20% indicated monthly collection, with 32% of the participants indicating that collection is irregular.

4.4.1.1 Statistical Analysis for Waste Collection Practices

Table 4.4 shows correlation analysis on waste collection frequency, proving that irregular waste collection increases illegal dumping.

Table 4.4 Correlation Analysis on Waste Collection Frequency

Variable 1	**Variable 2**	**Correlation Coefficient (r)**	**Significance (p-value)**
Waste Collection Frequency	Presence of Illegal Dumpsites	-0.65	0.002

Table 4.4 shows that there is a strong negative correlation (-0.65, $p < 0.002$) which suggested that irregular waste collection increases illegal dumping rates.

4.4.2 Household Waste Disposal Method

The study also investigated household waste disposal method. Fig 4.1 shows the findings

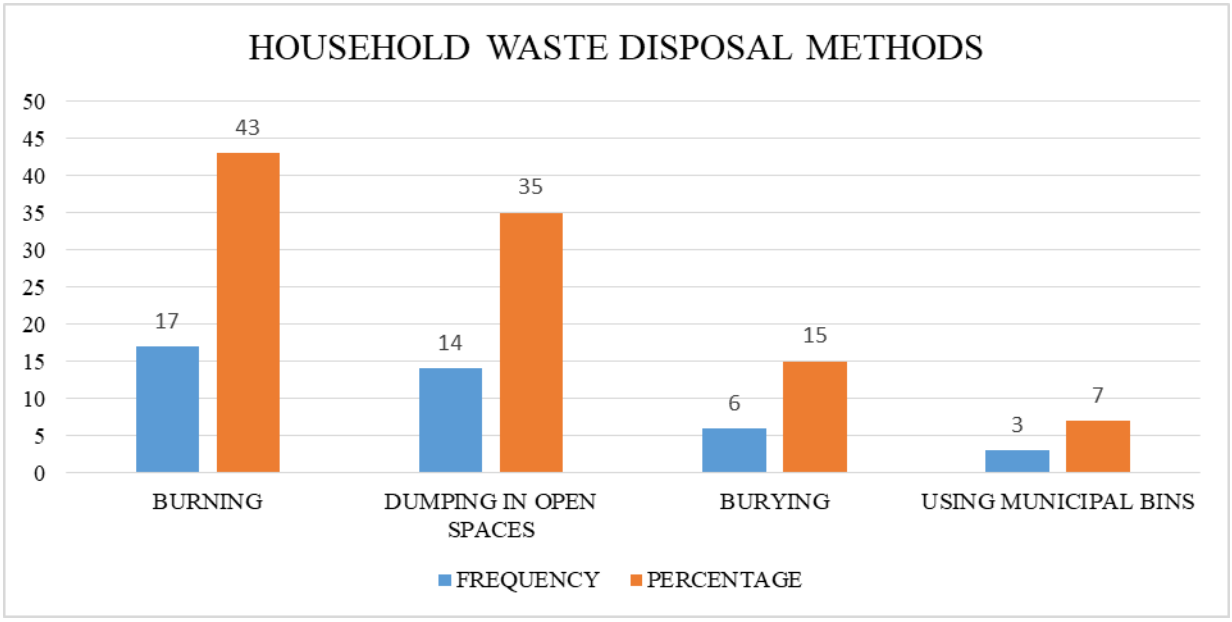

Fig 4.1 Household Waste Disposal Methods

Findings from Fig 4.1 shows dominance of burning as reported by 43% of the participants. This is followed by open dumping (35%) then, burying (15%) and use of municipal bins (7%)

During filed work there were no municipal bins that were seen. The researcher observed cases of waste burning and dumping in open fields. Fig 4.2 below shows the evidence of burning of waste in Mufakose.

Fig 4.2 Waste Burning in Mufakose

Observations corroborated that indeed collection of waste in Mufakose is irregular such that some residents have resorted to dumping waste. Fig 4.3 below shows illegal dump sites.

Fig 4.3 Illegal dumping site

During interviews, municipal officials gave reasons for irregular waste collection, saying:

> *"…unavailability of resources such as compactors, causing delays in scheduled waste collection. Some areas are get skipped during waste due to shortage of fuel and trucks."* (Waste Management Official)

However, a city authority interviewed gave a contrasting answer to that given by a government official, saying:

> *"…as a local council we do not have enough waste bins in residential areas due to high rate of population growth, forcing residents to dump waste openly. Some of the collection systems are not effective such as door to door collection is not being carried out."* (Municipal Official)

4.4.2.1 Statistical Analysis for Household Waste Disposal Methods

Correlation analysis was done to show how absence of Municipal bins influence burning of waste frequently. Table 4.5 shows findings.

Table 4.5 Correlation Analysis between Absence of Municipal Bins and Burning Waste

Variable 1	**Variable 2**	**Correlation Coefficient (r)**	**Significance (p-value)**
Absence of Municipal Bins	Burning Waste Frequency	0.78	0.001

Results from Table 4.5 shows a strong positive correlation ($r = 0.78$, $p < 0.001$). This suggested that the lack of municipal bins directly increases waste burning frequency.

4.4.3 Community Participation in Waste Management

The participants were also asked if the community participate in waste management clean-up campaigns. Figure 4.4 shows the findings.

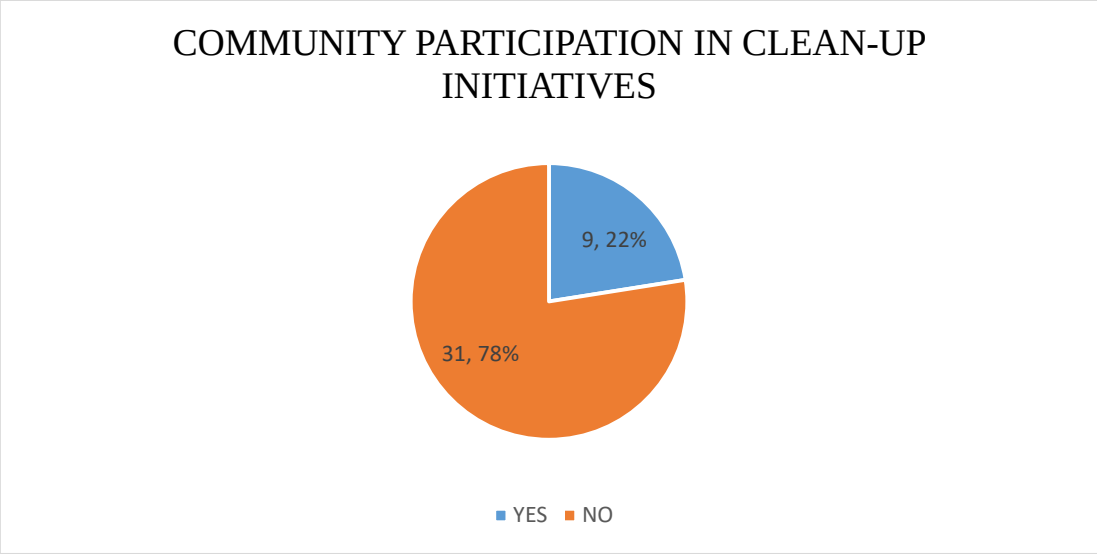

Fig 4.4 Community Participation in Clean-up Initiatives

The findings on Fig 4.4 shows that only 22% of residents participate in clean-up campaigns, 78% of the residents do not take part,

During interviews, municipal officials highlighted low engagement of many residents during clean-up campaigns. One of the officials mentioned that:

> *"…there is lack of awareness, people are unaware of the negative effects of waste. On every first Friday of the Month we conduct a clean-up campaign, large portion of participants are government and NGO officials with few residents and business people."* (Municipal Official)

The researcher observed that, from 8am to 10am on the first Friday of the month many government offices were closed, but the residents were doing their business as usual.

4.5 Presentation of Findings of Objective 2: health risks associated with poor waste management practices in Mufakose

This section presents findings obtained from questionnaire surveys, interviews with healthcare and municipal on health risks linked to poor waste management practices in Mufakose.

4.5.1 Health Risks Associated with Poor Waste Management

Table 4.6 shows findings on health risks associated with poor waste management practices respiratory and airborne issues caused by waste burn and 4.7 below illustrate the frequency of waste burn in Mufakose.

Table 4.6 Health risks associated with poor waste management and the percentage responses

Health Issues Experienced Due to Waste Exposure	Frequency (n=40)	Percentage (%)
Respiratory Problems (Coughing, Breathing Difficulty)	22	55%
Skin Irritations	6	15%
Gastrointestinal Illnesses	8	20%
No Issues reported	4	10%

Table 4.6 shows that poor waste management in Mufakose leads to respiratory problems (55%), followed by gastrointestinal illnesses with 20%, skin irritations (15%), and 10% reported that they are not being affected.

In supporting the above findings, participants were asked about the frequency of waste burning. Table 4.7 shows the findings.

Table 4.7 Frequency of Waste Burning

Frequency of Waste Burning Near Residences	Frequency (n=40)	Percentage (%)
Daily	18	45%
Weekly	10	25%
Occasionally	8	20%
Never	4	10%

Table 4.7 shows that most residents burn waste daily (45%), 25% weekly, 20% occasionally, and 10% said that there is no waste burn. There this supports the findings in Table 4.6 about high prevalence of respiratory diseases. During interviews, healthcare officials expressed concerns over rising respiratory cases due to burning waste, stating:

"…from our records, there are a lot of heart illness due to prolonged exposure to smoke. Especially children who live near dumping areas with frequent waste burning, are being affected by lung infections." (Health Official)

Multiple instances of open waste burning were observed near residential zones, and thick smoke from burning plastic waste and organic waste was observed affecting air quality.

4.5.1.1 Statistical Analysis for Respiratory Health Risks

Correlation analysis was calculated to support the above findings. Is shows that waste burning is a major catalyst for occurrence of waste related illness such as respiratory illness cases. Table 4.8 shows the findings.

Table 4.8 Correlation Analysis for Respiratory Health Risks

Variable 1	**Variable 2**	**Correlation Coefficient (r)**	**Significance (p-value)**
Waste Burning Frequency	**Respiratory Illness Cases**	**0.72**	**0.001**

The Table 4.8 shows that there is a strong positive correlation ($r = 0.72$, $p < 0.001$) confirms that frequent waste burning fundamentally increases respiratory illnesses. Higher levels of smoke pollution contribute to worsening lung conditions, especially among children.

4.5.2 Water Contamination and Gastrointestinal Diseases.

Participants were asked about water contaminated diseases that are associated with poor waste management. Table 4.9 shows the findings.

Table 4.9 Ratings on Water Contamination and Gastrointestinal Diseases

Waterborne Diseases Reported	**Frequency (n=40)**	**Percentage (%)**
Diarrhea	12	30%
Typhoid	10	25%
Cholera	9	23%
No Issues	9	22%

From Table 4.9, reports of diarrhea were 30%, typhoid (25%), and cholera (23%). This revealed that diarrhea is the most common water contaminated disease that is associated with poor waste management.

Participants were also asked if there are dumping sites that are near water points, this supports the above finding (Table 4.9). Figure 4.5 shows the findings.

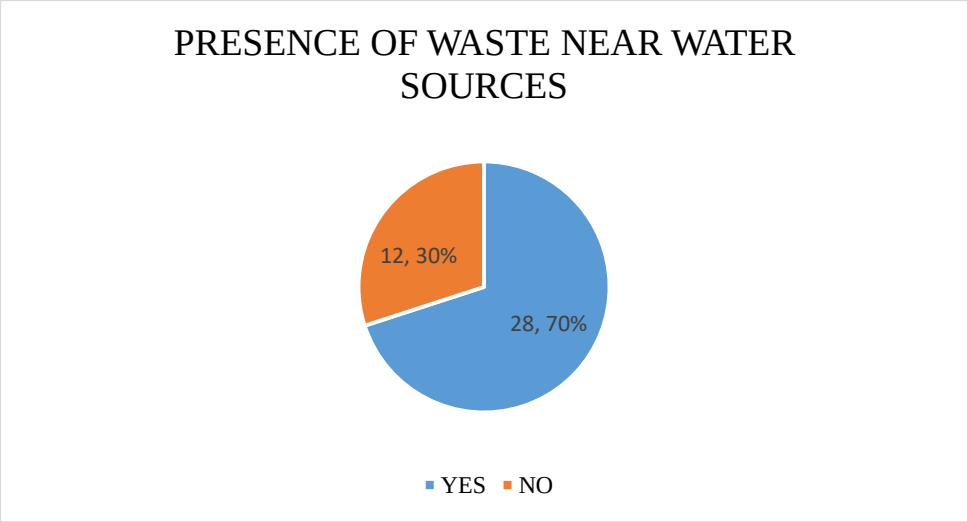

Fig 4.5 Presence of Waste near Water Sources

Fig 4.5 shows that there is a significant contamination risk as illustrated by 70% of residents who reported presence of waste near water sources.

During interviews, municipal officials highlighted that waste-water contamination link, mentioning:

> *"…there is frequency damping of waste near water sources such as boreholes which led to outbreaks of cholera and typhoid. Many people are not aware of the risks that can be posed by contamination."* (Municipal Officer)

Observation findings revealed that, there are several illegal dumping sites were recorded near water sources. The researcher also noted debris and unpleasant odors in community wells and streams.

4.5.2.1 Statistical Analysis for Waterborne Diseases

Regression analysis was also used to see relationship between the presents of waste near water sources and waterborne diseases outbreak. Table 4.10 shows the findings.

Table 4.10 Regression Analysis on Waterborne Diseases

Independent Variable	**Dependent Variable**	**Beta Coefficient (β)**	**R- squared (R^2)**	**Significance (p-value)**	
Presence of Waste Near Water Sources	Waterborne Disease Cases	0.75	0.05	0.62	0.002

The above Table 4.10 shows a strong predictive relationship ($\beta = 0.75$, $p < 0.002$) confirmed that poor waste disposal near water sources increases disease outbreaks.

4.5.3 Vulnerable Populations

This section presents the findings on which group among residents in Mufakose is most vulnerable to the presents of waste. Figure 4.6 shows the findings.

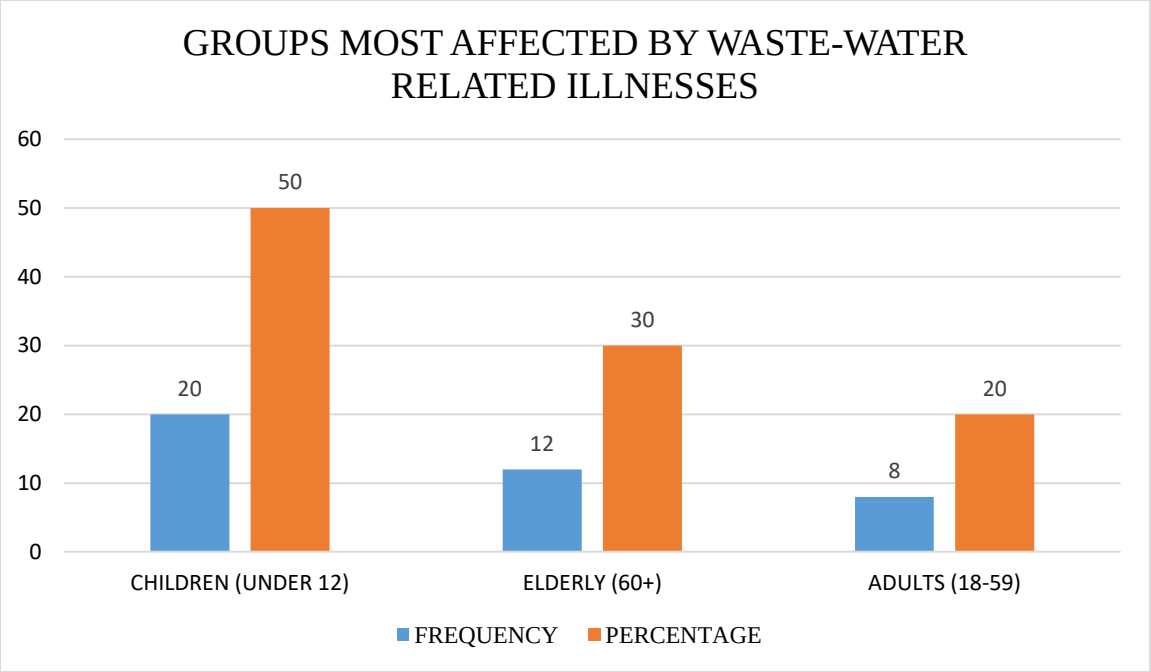

Fig 4.6 Responses on the most affected age group by waste-water illness

From Fig 4.6 above shows that children and elderly people are the most affected ones by waste-related illnesses.

Interview results also confirm this. For example, one of the Municipal Officials mentioned that:

> *"…children are affected most, they are being reported by the healthcare department, a low level during service delivery meetings."*

During observations, children were observed playing around open waste areas, and some of the elderly houses were close near areas where waste burning was prevalent.

Findings revealed that waste burning, contamination near water sources, and exposure risks for vulnerable populations fundamentally contributed to health challenges in Mufakose. Statistical analyses validated strong correlations between poor waste management and disease prevalence, emphasizing the need for policy reforms, municipal interventions, and public awareness campaigns.

4.6 Presentation of Findings of Objective 3: Ways health risks associated with waste management practices in Mufakose can be mitigated

This section presents findings about strategies to mitigate health risks associated with poor waste management in Mufakose. These findings are gathered from observations, interviews and surveys. The analysis includes quantitative statistics, qualitative insights, and applicable statistical tests.

4.6.1 Strategies to Mitigate Health Risks Associated with Waste Management

This section presents strategies that can help to mitigate health risks associated with waste management. Table 4.11 shows the findings.

Table 4.11 Responses on strategies to mitigate health risks associated with waste management

Suggested Waste Management Improvements	**Frequency (n = 40)**	**Percentages (%)**
Increase waste collection frequency	17	43%
Provide more waste bins	8	20%
Designate proper disposal sites	10	25%
Enforce waste management policies	5	12%

Findings from Table 4.11 reveals that, 43% of residents proposed the improvement of waste collection frequency, supporting complaints about irregular services. Only 20% of the residents advocated for more refuse bins, showing shortage of formal infrastructure for waste disposal. 25% of the residents highlighted the need for the establishment of designated disposal sites, confirming a need for structured waste zones. 12% advocated for waste policy enforcement, showing low awareness of already existing regulations.

During interviews, municipal official mentioned the need for waste infrastructure improvements, saying:

"...Mufakose area need more refuse collection bins, however, we are being hindered by financial constraints. There is also need to increase the frequency of waste collection to reduce illegal dumping." (Municipal Officers)

4.6.1.1 Statistical Analysis for Waste Collection Improvements

Regression analysis was used to test the selected strategy, if it can reduce poor waste management and reduce health issues related to poor waste management. Table 4.12 shows the findings.

Table 4.12 Regression Analysis for Waste Collection Improvement

Independent Variable	**Dependent Variable**	**Beta Coefficient (β)**	**Standard Error**	**R- squared (R^2)**	**Significance (p-value)**
Waste Collection Frequency	Presence of Illegal Dumpsites	-0.71	0.06	0.58	0.002

The Table above shows that there is a strong predictive relationship ($\beta = -0.76$, $p < 0.001$) confirming that increased waste collection frequency significantly reduces illegal dumping.

4.6.2 Health-Based Interventions to Reduce Exposure Risks

The study found that there are other ways of mitigating health risks associated with waste, namely, health based intervention which reduces risks. These are regular health screens, public education and protective measures for waste waters as illustrated in Fig 4.7

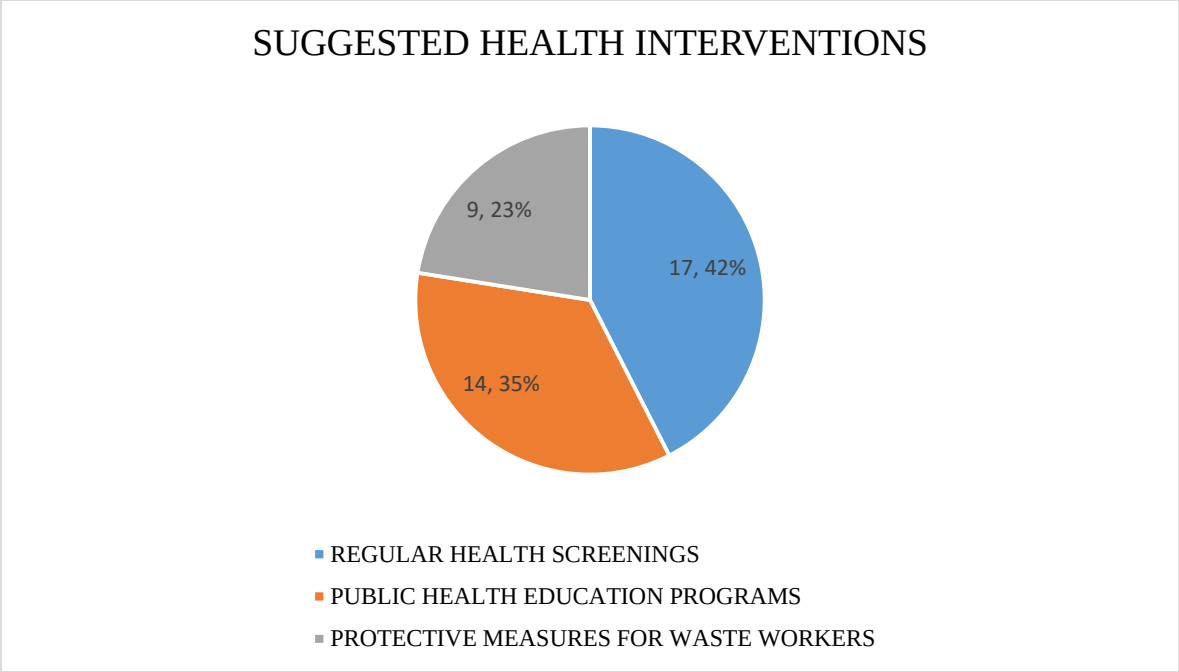

Fig 4.7 Ratings on Suggested Health Interventions

The above Fig 4.7 shows that residents supported regular health screenings with 42%, reinforcing concerns about waste-related illness. 35% of the residents supported public health education, reflecting gaps in awareness regarding waste exposure risks. Only 23% of residents proposed protective measures for waste workers, showing occupational safety concerns.

Insights from interviews by Healthcare officials showcased the need for waste-related health interventions, stating:

> *"…there is the need for more screenings to residents that are exposed to waste to reduce preventable illnesses, and waste collectors should be provided with protective equipment such as gloves, masks, and gumshoes."* (Healthcare Officials)

However, the researcher observed that, among waste collectors some of them did not have full equipment. The tragedy of this anomaly is that it increases direct exposure to contaminated waste.

4.6.3.1 Statistical Analysis for Health-Based Interventions

Regression analysis was done to show that public awareness on waste health risks can be a solution to reduce waste related diseases among residents in Mufakose. Table 4.1.3 shows the findings.

Table 4.13 Regression Analysis for Health-Based Interventions

Independent Variable	**Dependent Variable**	**Beta Coefficient (β)**	**Standard Error**	**R –squared (R^2)**	**Significance (p-value)**
Public awareness of waste health risks	Reported waste-related illnesses	-0.67	0.07	0.59	0.003

Table 4.13 revealed that, there is a significant predictive relationship ($\beta = -0.67$, $p < 0.003$), this confirms that increased awareness of waste health risks leads to fewer reported illness cases.

The finding reflected that waste collection inefficiencies, low community engagement, and inadequate health interventions as crucial areas for improvement. Statistical analyses confirm that enhanced waste management policies, structured public awareness programs, and strengthened health initiatives could reduce waste-related illnesses and environmental hazards.

4.7 Summary

This chapter presented findings on waste management practices, related health risks, and potential mitigation strategies in Mufakose. Data gathered from survey responses, interviews, and observations revealed crucial challenges that involve irregular waste collection, widespread informal disposal, and limited community engagement, all contributing to increased health risks, particularly respiratory and gastrointestinal illnesses. Statistical analyses confirmed strong correlations between poor waste management and health outcomes, reinforcing the need for better policy reforms and structured interventions. These findings provided a fundamental framework for Chapter 5, where discussions will align results with the selected theoretical framework and reviewed literature, providing deeper insights into their broader implications.

CHAPTER 5: DISCUSSION OF THE FINDINGS

5.1 Introduction

Chapter 4 presented research findings. This chapter analyses the findings from Chapter 4, comparing them with reviewed literature from Chapter 2 and assessing their alignment with the Integrated Sustainable Waste Management (ISWM) Model. It examines the current waste collection and disposal methods in Mufakose and, analyses their effectiveness and shortcomings. It discussed the frequency and reliability of waste collection, dominant disposal methods, and community engagement in waste management activities. Findings are compared with existing literature on waste systems, and their alignment or divergence from the ISWM Model was explored. Statistical analyses, interviews, and observations provided deeper insights into how these practices affect environmental sustainability and public health.

5.2.1 Waste Collection Frequency

Waste collection in Mufakose is highly inconsistent. As findings from Table 4.3 have indicated 35% of residents received weekly waste collection, while 32% experience irregular collection, leading to excessive waste accumulation in residential areas. In terms of correlation analysis findings in Table 4.4 show a strong negative relationship ($r = -0, 65$, $p < 0.002$) between waste collection frequency and illegal dumping. This means that many households face irregular collection schedules, which have led to illegal dumping. Whereas, as argued by Jouhara et al. (2017), efficient waste collection is crucial for urban waste management, significant issue in Mufakose is the lack of collection trucks and fuel shortages, which municipal officials cited as major barriers to waste collection efficiency. . ,.

This is different from Kigali where case studies indicate that successfully waste collection efficiency is enhanced through strict enforcement and community-led efforts (Mukaba et al., 2018). These are structured oversight mechanisms that are lacking for Mufakose lack. The ISWM Model assumes that proper waste transportation logistics can be implemented through integrated planning, yet financial limitations hinder practical application in Mufakose. The findings exposed a gap between theoretical waste handling principles and real-world resource constraints affecting municipal waste services.

5.2.2 Household Waste Disposal Methods

As shown in Fig 4.2, informal disposal methods such as burning waste (43%) and open dumping (35%) are widespread in Mufakose. The correlation analysis in Table 4.5 confirms a strong positive correlation ($r = 0.78$, $p < 0.001$) between the absence of municipal bins and increased waste burning. While ISWM emphasizes the importance of structured disposal systems, Mufakose's findings indicate that practical implementation remains challenging due to financial and logistical constraints. As indicated in literature (See Mihai et al. 2021), poor disposal infrastructure encourages informal waste handling practices. This finding suggests the need to expanding waste disposal infrastructure to reduce reliance on unsafe disposal methods. .

5.2.3 Community Participation in Waste Management

As presented in Fig 4.4, lack of clean-up campaigns and other community-led waste initiatives as indicated by low engagement (22%), highlight a major gap in resident participation. This finding suggests the need to increase public awareness and providing community incentives to boost engagement. The correlation analysis in Table 4.13 confirms that public awareness has a strong positive relationship with community participation ($r = 0.69$, $p < 0.002$).

Whereas the ISWM Model assumes that stakeholder involvement is integral to sustainable waste management, findings indicate that voluntary engagement in Mufakose is insufficient without incentive-driven policy mechanisms. Hornsby et al. (2017), recommends that structured waste education directly influences civic involvement. Whereas in Mufakose, clean-ups remain primarily government-led, this is different with Kigali's Umuganda where this program has ensured high participation through mandatory clean-ups (Mukaba et al., 2018).

5.3 Health Risks Associated with Waste Management

This section explored the health implications of waste management practices in Mufakose, focusing on respiratory diseases from waste burning, water contaminated-related illnesses, and vulnerable populations affected by improper waste handling. Findings were contextualized within public health literature, identifying major risk factors and disease prevalence trends. The discussion evaluated whether current waste management approaches effectively mitigate health risks, and whether they align with the ISWM Model's emphasis on environmental and public health protection.

5.3.1 Health Risks Associated with Poor Waste Management

As shown in Table 4.6 waste burning has significantly contributed to respiratory health issues in Mufakose. The correlation analysis in Table 4.8 shows a strong positive relationship ($r = 0.72$, $p < 0.001$) between waste burning frequency and respiratory illness cases. This positive correlation reinforces findings by Velis (2017), who documented pollution-related health effects. These findings suggest enforcing stricter regulations on waste burning and increasing public awareness about health risks. Whereas Mufakose lacks strong enforcement measures the ISWM Model assumes that environmental pollution control policies limit severe health impacts. Thus, this weak regulatory oversight in Mufakose contradicts this expectation.

5.3.2 Water Contamination and Gastrointestinal Diseases

As shown in Fig 4.5 findings indicate that 70% of households report waste accumulation near water sources, leading to disease outbreaks. Also, Table 4.9 confirms high rates of waterborne diseases (diarrhoea 30%, typhoid 25%, and cholera 23%). The regression analysis in Table 4.10 shows a strong predictive relationship ($\beta = 0.75$, $p < 0.002$) between the presence of waste near water sources and increased disease outbreaks. Whereas Kigali successfully minimized contamination risks through structured waste prevention (Mukaba et al., 2018), Mufakose lacks similar enforcement strategies. It ought to be pointed out that the ISWM Model promotes safe waste disposal.

5.3.3 Vulnerable Populations

As shown in Fig 4.6, findings showed that children (50%) and elderly (30%) are disproportionately affected by waste exposure. Suggested strategies include targeted health screenings and protective measures for at-risk groups. These findings align with Chifamba and Musasa (2020), who reported high illness rates among vulnerable populations. Unlike Kigali, which integrated health interventions into waste management policies (Mukaba et al., 2018), Mufakose lacks structured health programs. However, the ISWM Model suggests gaps in demographic-specific health interventions because it does not explicitly address age-related vulnerabilities.

5.4 Mitigation Strategies for Waste Management Challenges

This section examined proposed interventions to improve waste management efficiency and reduce health risks in Mufakose. It discussed enhancing waste collection infrastructure, promoting community awareness, and implementing health-based interventions. The discussion evaluated

how these strategies compare with successful waste management models from other regions, especially those identified in the comparative case studies (2.9, Chapter 2), and assesses their alignment with the ISWM Framework.

5.4.1 Strategies to Mitigate Health Risks Associated with Waste Management

Findings suggest investing in waste collection resources and establishing structured collection zones to reduce illegal dumping. As illustrated in Table 4.11 43% of residents supported increased waste collection frequency. While the ISWM Model prioritizes collection efficiency, financial constraints in Mufakose have prevented full implementation. These findings reinforce those by Moyo and Chatiza (2018), who documented similar infrastructure gaps.

5.4.3 Health-Based Interventions to Reduce Exposure Risks

Findings suggest expanding health screenings and protective equipment for waste workers. The regression analysis in Table 4.13 confirms a predictive relationship ($\beta = -0.67$, $p < 0.003$) between public awareness and reduced illness rates, supporting Chifamba and Musasa (2020). The ISWM Model supports health-based interventions, yet Mufakose lacks implementation frameworks.

5.5 Chapter Summary

This chapter examined findings based on waste management strategies, compared them with scholarly literature and case studies, and evaluated their alignment with ISWM principles. While many suggested strategies align with previous research, gaps remain in regulatory enforcement, community participation, and health interventions. These findings set the foundation for Chapter 6, where practical recommendations will be outlined to bridge these gaps.

CHAPTER 6: SUMMARY, CONCLUSION, AND RECOMMENDATIONS

6.1 Introduction

This chapter provides the summary, conclusion and recommendation of the research titled "Impacts of Waste Management Practices on Public Health in Mufakose. It outlines how the study addressed key objectives, discusses the implication of the findings, and offers target recommendations for improving waste governance and reducing health risks in the study area. The research was driven by the recognition that while waste management has been extensively studied in broader urban contexts, there is a notable lack of localized research focusing specifically on the public health impacts of waste handling in Mufakose.

6.2. Recap of the Central Question and the Research Objectives

This research explored the intersection between waste management practices and public outcomes in Mufakose, a densely populated urban suburb of Harare. The central question that guided this study was: How do waste management practices in Mufakose affect public health, and what strategies can be put in place to reduce the associated health risks? This question also informed the research design, shaped the selection of data collection methods, and directed the thematic focus of the analysis. To answer this question, the research was anchored on three primary objectives. The first objective was to assess the current waste management practices within Mufakose, focusing on the effectiveness, consistency, and limitations of existing collection and disposal systems. The second objective aimed to identify the key health risks associated with these practices, particularly in relation to the prevalence of respiratory illnesses, waterborne diseases, and the vulnerability of certain population groups. The third and final objective sought to propose practical and evidence-based strategies to mitigate these health risks, drawing from both the findings of the research and comparisons with successful case studies from similar urban environments.

6.3 Summary

The research was guided by the Integrated Sustainable Waste Management (ISWM) Model, which provided a theoretical framework for examining the relationships between waste management practices, stakeholder involvement, and public health. Guided by the pragmatism paradigm, the research adopted a mixed-method approach to capture both quantitative and qualitative dimensions of the waste management challenges in Mufakose. Stratified random sampling was used to select

household participands in different sections of Mufakose and purposive sampling was used to identify key informants such as municipal officers and health practitioners. Data were collected through structured questionnaires administered under a survey design, alongside semi-structured interviews and direct field observations, enabling triangulation and a better understanding of the local waste-public health dynamics.

6.4. Results Summary and Conclusion

This section provides a summary of the results that emerged from each objective. Conclusions are also made.

6.4.1 Objective 1

In relation to Objective 1 which focused on waste management practices in Mufakose, the research found that waste collection in Mufakose is extremely uneven, with irregular collection schedules contributing to illegal dumping. Resource shortages, such as limited waste collection trucks and fuel constraints, were highlighted as obstacles to service reliability. The findings also revealed that many households rely on informal disposal methods such as burning and open dumping due to the absence of designated disposal sites and municipal refuse bins. Community participation in waste initiatives was low, with residents showing minimal engagement in clean-up campaigns and waste separation efforts. The research concludes that waste management in Mufakose is ineffective due to inconsistent collection services, limited infrastructure, and weak policy enforcement. Households are largely dependent on informal disposal methods like burning and open dumping, worsening environmental pollution. A lack of community engagement further limits sustainable waste management efforts, demonstrating that structured intervention strategies are needed.

6.4.2 Objective 2

In relation to objective 2 which sought to investigate health risks associated with poor waste management, the research found that exposure to unsuitably managed waste has resulted in serious health consequences for Mufakose residents, mainly to children. Respiratory illnesses are common due to air pollution caused by frequent waste burning. Water contamination is another key problem, where waste accumulation near water sources increases, hence high cases of water-related diseases such as cholera, typhoid, and diarrhea. Vulnerable populations, including children and the elderly, are disproportionately affected by these health risks, facing a higher incidence of waste-related diseases. There are severe health risks that are associated with poor waste

management in Mufakose, which are affecting a large proportion of the population. Respiratory conditions linked to waste burning, waterborne diseases due to contamination, and disproportionate effects on vulnerable groups highlight the urgent need for health-based interventions. The findings indicated that without stronger policy measures, these risks will continue to escalate, emphasizing the necessity of integrating waste management solutions with public health strategies.

6.4.3 Objective 3

In relation to objective 3 which sought to develop strategies to mitigate waste management challenges, the findings suggested many strategies to improve waste management in Mufakose, including increasing waste collection frequency, expanding formal disposal sites, strengthening community awareness programs, and implementing health interventions. The study highlights that enhanced municipal oversight and structured regulatory enforcement could fundamentally improve waste collection efficiency. To add on, community-led initiatives and incentive-based programs may boost resident participation in waste reduction efforts. The study concludes that, mitigation strategies such as improved waste collection infrastructure, public awareness campaigns, and community engagement programs can fundamentally improve waste management effectiveness in Mufakose. Comparative case studies demonstrate that well-regulated waste systems improve service delivery and minimize health risks, suggesting that structured policies and municipal investment are critical in addressing these challenges.

6.5 Relevance of the Theoretical Framework

The research was anchored on the ISWM, which emphasizes the interdependence of technical, environmental, socio-economic, and institutional dimensions of waste management. This framework was relevant as it provided a structured lens for evaluating not only the efficiency of waste collection and disposal systems in Mufakose, but also the roles played by different stakeholders, such as municipal authorities, households, and community leaders. The ISWM Model helped in showcasing how systemic issues like lack of infrastructure, weak enforcement of waste policies, and low community involvement. It also guided the development of study tools, ensuring that data collection addressed aspects such as service coverage, stakeholder engagement, behavioral practices, and risk exposure. The framework’s holistic orientation made it highly suitable for a research grounded in a mixed-method approach, as it allowed both technical issues

(such as collection frequency) and disposal methods and socio-behavioral aspects (such as awareness, participation) to be analyzed in relation to public health.

Moreover, the ISWM Model provided a standard against which Mufakose's current management practices could be evaluated. Comparing the findings with assumptions of the model such as the necessity for integration, inclusivity, and sustainability, made it possible to identify implementation gaps and propose targeted interventions. Thus, the ISWM framework not only shaped the analytical trajectory of the research but also informed the interpretation of results an the formulation of stakeholder-specific recommendations

6.7 Limitations of the Study

The researcher managed to complete the research, however, there were limitation that were encountered. One of the notable limitation was the delay to get approved by the City of Harare. The researcher waited for about twelve days to get permission to collect data in Mufakose which delayed processes such as data cleaning and analysis. On this limitation the researcher had no choice but to wait for the approval form as part of ethics. During interviews with key informants such as health officials and municipal officials, the research found it difficult to interview them because they were always busy, however, the researcher used their lunch time to conduct these interviews and also gave them interview guides to write something during their spare time.

6.8 Policy Recommendations

Based on the research findings, the research developed the following recommendations, targeting policymakers, municipal authorities, health officials, and community stakeholders to strengthen waste management efforts in Mufakose.

- Strengthening Waste Collection Infrastructure: Government and municipal authorities should increase waste collection trucks and ensure regular collection to reduce illegal dumping.
- Implementation of Designated Waste Disposal Sites: Municipal authorities place formal waste disposal areas to prevent open dumping and waste burning.
- Public Awareness and Education Campaigns: Municipal officials should conduct waste education programs through schools, workshops, and media platforms to improve waste handling practices regularly.

- Health-Based Waste Management Interventions: Public health departments should provide health screenings for residents near waste accumulation sites and offer protective gear to waste workers.
- Collaboration between Stakeholders: Government agencies, NGOs, and municipal leaders should work together to ensure sustainable waste governance.

6.6 Further Research Implications

This research highlighted many areas for future research that could expand knowledge on waste management challenges and solutions. Future studies may focus on:

Evaluating the impact of waste-to-energy programs in reducing landfill dependency in urban settlements and assessing their feasibility in low-resource environments. Examining the effectiveness of incentive-based recycling initiatives in increasing community participation and identifying best practices for implementation in Zimbabwean municipalities. Investigating municipal policy frameworks for integrating sustainable waste management models into urban governance structures and assessing their impact on service delivery efficiency.

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APPENDICES

APPENDIX A: INTERVIEW GUIDE

Title: Impact of Waste Management Practices on Public Health in Mufakose

1. Introduction

Good day, my name is Hetani Chimumu, a student from Bindura University of Science Education, and I am conducting research on the impact of waste management practices on public health in Mufakose. This study aims to provide valuable insights that can inform local authorities, healthcare providers, and waste management officials to develop strategies for reducing public health risks. Your participation in this study is voluntary, and you are free to withdraw at any time without any consequences. All information shared will be kept confidential. The interview will take approximately 40 minutes to an hour. Before we start, I need to obtain your informed consent. Please let me know if you are willing to take part in this study, and I will provide you with a consent form to sign.

2. Demographic Information

- Name (optional) or initials:
- Gender:
- Age:
- Role (Healthcare provider/Waste management official):
- Years of professional experience:
- Level of education:

3. Understanding of Waste Management

- Have you heard about waste management practices? If yes, how would you define or describe them?
- In your opinion, what is the importance of proper waste management in a community like Mufakose?
- How would you describe the current state of waste management in this area?

- Do you think waste-related problems have become more severe over time? If yes, why do you think this is the case?

4. Current Waste Management Practices

- Can you describe the waste management practices you have observed or been involved with in Mufakose?
- What challenges do you think are most prevalent in waste disposal, collection, or infrastructure?
- How effective do you think current waste management systems are, and why?
- In your opinion, what contributes to the challenges in proper waste management practices?

5. Health Risks Associated with Waste Management Practices

- What types of health issues do you believe are most common as a result of poor waste management in Mufakose?
- Have you encountered cases of waste-related illnesses (e.g., respiratory conditions, infections)? Can you elaborate on these cases?
- In your professional opinion, how does the state of waste management contribute to these public health concerns?
- Do you see any particular groups or communities that are more affected by waste-related health issues?

6. Possible Solutions and Mitigation Strategies

- What changes or improvements do you think could reduce health risks associated with waste management practices?
- Have you seen any initiatives aimed at mitigating these health risks? Were they effective?
- How can authorities, healthcare providers, and community members work together to address waste-related health issues?

- What role do you think education and awareness campaigns should play in improving waste management practices?

7. Perceptions and Experiences

- From your experience, how do residents generally perceive waste management practices in Mufakose?
- How do residents usually respond to public health concerns caused by waste management issues?
- Do you feel your role allows you to effectively address waste-related health challenges?

8. Conclusion

- Is there anything else you would like to share about waste management practices or public health concerns in Mufakose?
- Are there any additional recommendations you would like to make based on your experiences?

Thank you for taking the time to share your insights with me. Your input is valuable in understanding the link between waste management and public health in Mufakose and identifying ways to reduce related health risks.

APPENDIX B: OBSERVATION GUIDE

Title: Impact of Waste Management Practices on Public Health in Mufakose

1. Objective of the Observation

The objective of this observation is to systematically document environmental, social, and infrastructural aspects of waste management practices in Mufakose. By assessing waste management systems, community engagement, and the physical and social impacts of poor waste management, this study aims to identify associated public health risks and explore opportunities for mitigating these challenges.

2. Key Areas of Observation

A. Environmental Indicators

1. Condition of Waste Disposal Sites:

- Evidence of waste accumulation or overflow. YES [ ] NO [ ]
- Presence of illegal dumping (e.g., waste in open areas or near water sources). YES [ ] NO [ ]

2. Infrastructure:

- Availability and condition of waste disposal bins (e.g., broken, overflowing, missing). YES [ ] NO [ ]
- Observations of waste collection vehicles and their functionality. YES [ ] NO [ ]

3. Water Sources:

- Presence of waste near boreholes, wells, streams, or other water sources. YES [ ] NO [ ]
- Signs of contamination in water sources (e.g., debris, unpleasant odor). YES [ ] NO [ ]

4. Environmental Cleanliness:

- General condition of streets and community spaces (clean/littered). YES [ ] NO [ ]

B. Household and Community Indicators

5. Household Waste Management:

- Observation of waste disposal methods at households (e.g., segregation, dumping, burning). YES [ ] NO [ ]

6. Community-Level Engagement:

- Evidence of clean-up initiatives or campaigns. YES [ ] NO [ ]
- Presence of public awareness programs encouraging proper waste disposal. YES [ ] NO [ ]

C. Socio-Economic Indicators

7. Impact on Daily Life:

- Observation of waste hindering mobility or blocking access (e.g., in alleys, public spaces). YES [ ] NO [ ]

8. Marketplaces:

- Presence of waste accumulation near food vendors or marketplaces. YES [ ] NO [ ]
- Observations of food items stored or sold close to waste disposal sites. YES [ ] NO [ ]

D. Gender and Social Dynamics

9. Roles and Responsibilities:

- Observation of gender-specific tasks related to waste disposal (e.g., women sorting waste, men engaging in community efforts). YES [ ] NO [ ]

10. Vulnerable Groups:

- Observations of children, elderly, or disabled individuals exposed to waste-related challenges. YES [ ] NO [ ]

APPENDIX C: STRUCTURED QUESTIONNAIRE

Title: Impact of Waste Management Practices on Public Health in Mufakose

Section 1: Demographics

1. What is your gender?

- [ ] Male
- [ ] Female
- [ ] Prefer not to say

2. What is your age group?

- [ ] 18–30
- [ ] 31–40
- [ ] 41–50
- [ ] 51–60
- [ ] 61+

4. What is your level of education?

- [ ] Primary school
- [ ] Secondary school
- [ ] Tertiary education
- [ ] No formal education

5. How many people live in your household (including yourself)?

- [ ] 1–3
- [ ] 4–6
- [ ] 7+

Section 2: Waste Management Practices

6. How often is waste collected in your area?

- [ ] Daily
- [ ] Weekly
- [ ] Monthly
- [ ] Irregularly
- [ ] Never

7. How do you dispose of your household waste?

- [ ] Burn it
- [ ] Bury it
- [ ] Use waste bins provided by the local authorities
- [ ] Dump it in open spaces
- [ ] Other (please specify):----------

  ----

8. Are there waste disposal bins available in your area?

- [ ] Yes, and they are adequate
- [ ] Yes, but they are inadequate
- [ ] No

9. Do you segregate waste (e.g., separate recyclable and non-recyclable materials)?

- [ ] Yes
- [ ] No

10. Have you observed illegal dumping sites in your area?

- [ ] Yes
- [ ] No

Section 3: Health Risks

11. Have you or any member of your household experienced health issues you think are related to poor waste management?

- [ ] Yes
- [ ] No

12. If yes, what type of health issues were experienced? (Select all that apply)

- [ ] Respiratory problems
- [ ] Skin infections
- [ ] Gastrointestinal illnesses
- [ ] Other (please specify): ----------

  ----

13. Are children in your household frequently exposed to waste-related risks (e.g., playing near waste dumps)?

- [ ] Yes
- [ ] No

14. How would you rate the cleanliness of your immediate environment?

- [ ] Very clean
- [ ] Fairly clean
- [ ] Dirty
- [ ] Very dirty

Section 4: Mitigation Strategies

15. Have you or your household participated in any community clean-up campaigns?

- [ ] Yes
- [ ] No

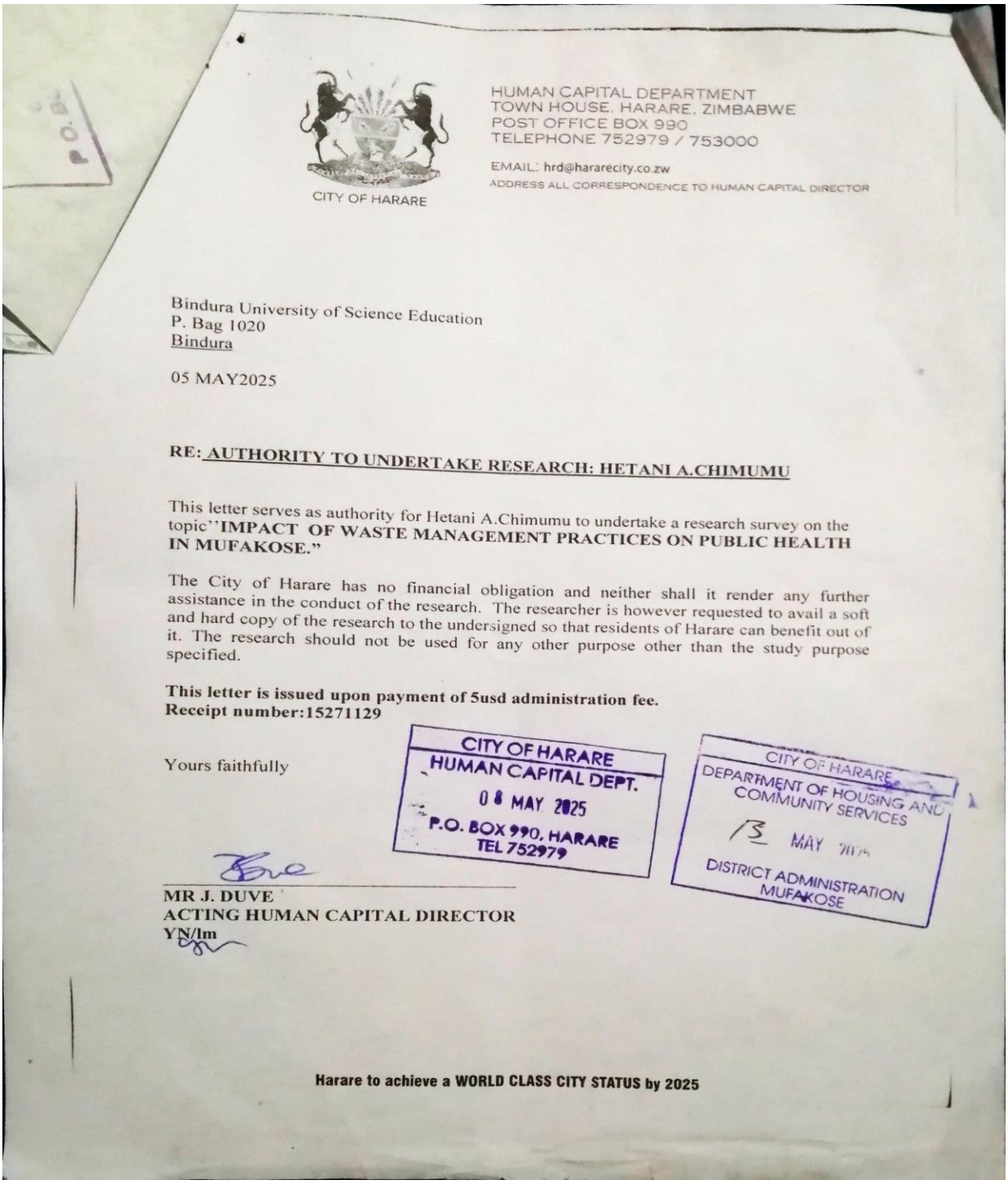
16. Do you think the local authorities are doing enough to manage waste in your area?

- [ ] Yes
- [ ] No

17. What would you suggest to improve waste management practices in your area?

- [ ] Increase waste collection frequency
- [ ] Provide more waste bins
- [ ] Conduct community awareness campaigns
- [ ] Other (please specify): ----------

APPENDIX D: APPROVAL LETTER FROM CITY OF HARARE COUNCIL



CITY OF HARARE

HUMAN CAPITAL DEPARTMENT
TOWN HOUSE, HARARE, ZIMBABWE
POST OFFICE BOX 990
TELEPHONE 752979 / 753000

EMAIL: hrd@hararecity.co.zw
ADDRESS ALL CORRESPONDENCE TO HUMAN CAPITAL DIRECTOR

Bindura University of Science Education
P. Bag 1020
Bindura

05 MAY2025

RE: AUTHORITY TO UNDERTAKE RESEARCH: HETANI A.CHIMUMU

This letter serves as authority for Hetani A.Chimumu to undertake a research survey on the topic''**IMPACT OF WASTE MANAGEMENT PRACTICES ON PUBLIC HEALTH IN MUFAKOSE."**

The City of Harare has no financial obligation and neither shall it render any further assistance in the conduct of the research. The researcher is however requested to avail a soft and hard copy of the research to the undersigned so that residents of Harare can benefit out of it. The research should not be used for any other purpose other than the study purpose specified.

This letter is issued upon payment of 5usd administration fee.
Receipt number:15271129

Yours faithfully

CITY OF HARARE
HUMAN CAPITAL DEPT.
08 MAY 2025
P.O. BOX 990, HARARE
TEL 752979

CITY OF HARARE
DEPARTMENT OF HOUSING AND COMMUNITY SERVICES
13 MAY 2025
DISTRICT ADMINISTRATION
MUFAKOSE

MR J. DUVE
ACTING HUMAN CAPITAL DIRECTOR
YN/lm

Harare to achieve a WORLD CLASS CITY STATUS by 2025

APPENDIX E: PLAGIARISM REPORT

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ORIGINALITY REPORT

14%	7%	9%	4%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	Yllah Kang Okin, Helmut Yabar, Karume Lubula Kevin, Takeshi Mizunoya, Yoshiro Higano. "Geospatial Analysis of Malaria and Typhoid Prevalence Due to Waste Dumpsite Exposure in Kinshasa Districts with and without Waste Services: A Case Study of Bandalungwa and Bumbu, Democratic Republic of Congo", International Journal of Environmental Research and Public Health, 2024 Publication	1%
2	Ojiji, Eta. "Towards Energy Recovery From Waste in Developing Countries: An Analysis of the Challenges, Barriers and Prospects of Waste Management in Abuja, Nigeria.", University of Salford (United Kingdom) Publication	1%