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**COMBATING INFECTIOUS DISEASES IN ZIMBABWEAN PRISONS
THROUGH REVITALIZING PUBLIC HEALTH: EVIDENCE-BASED POLICIES FOR
WASTE AND HYGIENE MANAGEMENT: A CASE FOR BINDURA PRISON.**



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DEDICATION

This research is dedicated to the Zimbabwe Prisons and Correctional Service Commissioner General.

ABSTRACT

Correctional facilities in low-income countries are often epicenters of infectious diseases, driven by systemic failures in waste and hygiene management. This study investigates the nexus between sanitation practices and disease incidence at Bindura Prison, proposing evidence-based policies to revitalize public health within Zimbabwe's correctional system. A mixed-methods study approach, the research combines quantitative survey data with qualitative insights from semi-structured interviews with prison staff, inmates, health officials, and community stakeholders. The findings revealed a public health crisis rooted in severe overcrowding, which has crippled infrastructure designed for less than half the current population. A strong, statistically significant negative correlation was identified between access to adequate sanitation and the prevalence of infectious diseases ($\rho = -.72, p < .01$). This environmental failure is compounded by institutional barriers. The absence of a specific waste management policy for prisons, chronic under resourcing, and a lack of monitoring and evaluation mechanisms. The study concludes that poor hygiene and waste management are directly and significantly linked to the high incidence of disease at Bindura Prison, validating the need for urgent intervention. The effectiveness of any educational program is severely constrained by the lack of essential resources and infrastructure. Therefore, a multi-faceted approach combining immediate infrastructural investment, robust policy development, and structured training for both staff and inmates is imperative to combat disease, uphold human rights, and safeguard public health.

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LIST OF ABBREVIATIONS

ZPCS	Zimbabwe Prisons and Correctional Service
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WHO	World Health Organization
CDC	Center of Disease Control and Prevention
TB	Tuberculosis
HIV	Human Immune Virus
AIDS	Acquire Immuno-Deficiency Virus
UNODC	United Nations Office on Drugs and Crime
ZLHR	Zimbabwe Lawyers for Human Rights,
NGOs	non-governmental organizations
MSF	Medecins Sans Frontieres
EMA	Environmental Management Act
PPE	Personal Protective equipment
NAC	National Aids Council

CHAPTER 1: INTRODUCTION

1.1 Introduction

Waste remains a critical challenge in both low-income and high-income countries, as rapid population growth exacerbates the strain on existing systems (Hoornweg & Bhada-Tata, 2012). In low-income countries, under-resourced local authorities are often responsible for waste management, creating significant challenges that are especially severe in overlooked institutions like prisons (Wilson et al., 2012). In Zimbabwe, for example, prison conditions marked by overcrowding and fiscal limitations frequently lead to inadequate waste management, fostering public health crises like infectious disease outbreaks (WHO, 2020). This neglect stands in stark contrast to the human rights protections guaranteed to detainees under Section 50 of the Zimbabwean constitution. Experts advocate for a multi-stakeholder model to create sustainable waste management systems, where responsibility is distributed among government agencies, private entities, and community organizations (UNEP, 2016; Medina, 2010). Ultimately, revitalizing prison public health requires evidence-based policies specifically designed for incarcerated populations to uphold human dignity and drastically reduce disease prevalence.

1.2 Background

Prisons worldwide encounter significant challenges in waste and hygiene management, driven by global systemic issues and community-specific factors (World Health Organization, 2014). The confined nature of correctional facilities and high inmate populations exacerbate waste accumulation and sanitary problems, posing public health risks both within prisons and for surrounding communities (Center for Disease Control and Prevention, 2020). Diseases such as tuberculosis (TB), Human Immuno-Virus/AIDS, hepatitis, and various respiratory and gastrointestinal infections thrive in these settings, where sanitation systems are frequently inadequate. These conditions create an environment conducive to the transmission of pathogens among inmates.

Overcrowding, underfunding, and inadequate infrastructure characterize prisons, particularly in low- and middle-income countries. According to the United Nations Office on Drugs and Crime (UNODC), overcrowded facilities often lack sufficient waste disposal and sanitation systems, leading to increased transmission of illnesses, including TB and diarrheal diseases (UNODC,

2015). Resource constraints further limit access to clean water and hygiene supplies, necessitating comprehensive, evidence-based strategies tailored to the specific needs of individual prisons. While developed countries may implement better waste disposal and recycling programs, they still contend with managing hazardous materials, such as medical waste from healthcare facilities. Conversely, prisons in developing countries may lack formal waste management systems altogether, resulting in harmful practices like informal dumping and waste burning, which release toxins into the environment and impact both inmates and nearby communities (WHO, 2014). Improper waste disposal can lead to soil and water contamination, directly affecting local residents' health. Solid waste buildup around correctional facilities often becomes a breeding ground for disease vectors such as rodents and mosquitoes, exacerbating the spread of diseases like malaria and dengue fever. Communities adjacent to prisons face heightened public health risks, underscoring the need for evidence-based policies that enhance waste and hygiene management within prisons and mitigate their impact on local populations. Research-based solutions including waste segregation, composting, biogas production from organic waste, and improved hygiene protocols can transform these challenges. Sustainable practices that reduce the environmental footprint of prisons while promoting public health have been shown to yield significant benefits (CDC, 2020).

Zimbabwe's Prisons and Correctional Service face similar challenges that hinder effective waste and hygiene management, exacerbating the spread of diseases. With some facilities housing more than double their intended capacity, overcrowding results in poor ventilation and inadequate sanitation, creating conditions ideal for disease transmission (Zimbabwe Lawyers for Human Rights, 2018). Limited access to hygiene supplies, such as soap and disinfectants, is compounded by chronic underfunding and a lack of medical staff. Many inmates enter the prison system with pre-existing health conditions that poor hygiene exacerbates (WHO, 2014). Notably, TB is a major concern due to its high transmission rate in cramped environments, while HIV/AIDS presents a significant threat, as many inmates lack access to adequate treatment. Additionally, gastrointestinal infections are prevalent, driven by inadequate sanitation and contaminated food and water (Smith, 2014).

The high incidence of infectious diseases poses a public health risk beyond prison walls, as pathogens can spread when inmates are released or when staff return to their communities

(Muntingh & Tapscott, 2011). Implementing evidence-based hygiene and waste management standards is crucial for infection control. Improved sanitation practices and proper waste disposal can significantly reduce disease incidence (Sattar & Kibbee, 2019). Understanding the barriers to effective hygiene management in Zimbabwean prisons is essential for developing targeted interventions that support healthier prison environments (Smith, 2014). These evidence-based solutions can inform policy reforms, ensuring better resource allocation and more effective waste and hygiene management strategies in Zimbabwean correctional facilities (Ralph et al., 2013).

1.3 Problem statement

Zimbabwean prisons are grappling with significant public health challenges due to inadequate waste management and poor hygiene practices. Overcrowding, insufficient sanitation infrastructure, and a lack of basic hygiene resources have created conditions that facilitate the rapid spread of infectious diseases. These health risks disproportionately affect inmates and prison staff, with infection rates far exceeding those found in the general population. The confined spaces and unsanitary environments exacerbate disease transmission, while limited healthcare resources hinder effective treatment and prevention. Without adequate waste management protocols and hygiene standards, Zimbabwean prisons remain breeding grounds for preventable health crises.

Despite the urgency, the role of waste and hygiene management in preventing infectious diseases has not been adequately explored or addressed in current policies. The consequences of inadequate waste management and poor hygiene practices in Zimbabwean prisons are dire. The high prevalence of infectious diseases not only threatens the health and safety of inmates but also endangers prison staff and the surrounding communities. The transmission of infectious diseases from prisons to the broader population can escalate into a public health crisis. Moreover, managing health outbreaks in these overcrowded environments diverts resources from essential prison operations, increasing healthcare costs and stretching an already overburdened system. Failure to address these issues could lead to escalating health crises, higher mortality rates among inmates, and long-term public health risks.

1.4 Justification

Inmates are particularly vulnerable to the spread of infectious diseases due to overcrowded and unsanitary conditions in Zimbabwean prisons. Many already suffer from pre-existing health

conditions, and poor hygiene practices further deteriorate their health. This project aims to improve hygiene standards and waste management systems, enhancing overall living conditions and reducing the prevalence of diseases by ensuring access to essential hygiene supplies and better sanitation infrastructure. The project supports the health and dignity of inmates, aligning with international human rights standards for the humane treatment of prisoners.

Prison staff are also at significant risk of exposure to diseases due to their proximity to unsanitary environments and daily interaction with inmates. The current conditions not only jeopardize their health but also increase the stress of managing frequent disease outbreaks, which interferes with their primary responsibilities. By improving waste management and hygiene practices, the project will create a safer working environment for staff, reducing health risks and allowing them to focus on their core duties. The risk of disease transmission extends beyond prison walls, posing a threat to surrounding communities. Inmates and staff who leave the facilities can spread diseases like TB and hepatitis, making it a broader public health issue. Implementing better hygiene practices and waste management will reduce the spread of infectious diseases, benefiting not only the prison population but also the wider community, especially in resource-limited areas.

The long-term benefits of this initiative include reduced healthcare costs through the prevention of disease outbreaks and the adoption of sustainable waste management practices, such as waste segregation and biogas production. These practices will not only mitigate environmental risks but also offer financial and operational improvements. The research will provide valuable insights to policymakers and public health officials, guiding the creation of practical, evidence-based policies tailored to the unique challenges of Zimbabwean prisons. The project will also promote compliance with international health and human rights standards for prisons, ensuring the long-term sustainability of hygiene and waste management improvements.

1.5 Aim

The project aims to propose and implement evidence-based policies to enhance waste and hygiene management practices in Zimbabwean prisons. The primary goal is to significantly reduce the transmission of infectious diseases by improving waste disposal processes, increasing access to clean water, ensuring the availability of personal hygiene products, and upgrading sanitation infrastructure.

1.6 Objectives

- i. To identify the key barriers to implementation of effective hygiene and sanitation practices at Bindura prison.
- ii. To introduce and operationalize a sustainable organic waste management system.
- iii. To design and conduct targeted trainings and workshops for capacity building to Prisons staff and inmates.
- iv. To recommend the implementation of a structured and sustainable waste management framework.

1.7 Null Hypothesis (H₀):

Implementing evidence-based waste management and hygiene protocols in Zimbabwean prisons will have no significant effect on the incidence of infectious diseases among inmates and staff, nor will it improve overall health outcomes or reduce public health risks to surrounding communities.

1.8 Alternative Hypothesis (H₁):

Implementing evidence-based waste management and hygiene protocols in Zimbabwean prisons will significantly reduce the incidence of infectious diseases among inmates and staff, thereby improving overall health outcomes and reducing public health risks to surrounding communities.

1.9 Research Questions

- i. What specific challenges do prison administrators face in implementing waste management policies in the context of overcrowding and limited resources?
- ii. To what extent are Prison staff trained and knowledgeable in waste management and hygiene standards aimed at preventing diseases?
- iii. How feasible and sustainable would organic waste management practices be in the context of Prisons, Bindura Prison?
- iv. What waste management and hygiene practices are suitable in Zimbabwean prisons, and how effective are they in preventing the spread of infectious diseases?

1.10 Definition of Terms

Evidence-based policies refer to decision-making processes in public policy that are grounded in empirical research and data rather than ideology, tradition, or anecdotal evidence.

Infectious Diseases are illnesses caused by pathogenic microorganisms such as bacteria, viruses, fungi, or parasites that can spread directly or indirectly from one person to another (WHO, 2020).

Waste Management is the systematic control of the generation, collection, transportation, processing, recycling, and disposal of waste to minimize environmental and health hazards (UNEP, 2016).

Hygiene Practices are actions and behaviors aimed at maintaining cleanliness and preventing disease transmission, including handwashing, sanitation, and proper waste disposal (CDC, 2019).

Inmate means any person whether convicted or not who is lawfully detained in prison or correctional facility (Zimbabwe, 2023)

Evidence-Based Policy is a decision-making processes in public policy that rely on systematic research, empirical data, and scientific evidence rather than anecdotal or ideological reasoning (Rosenberg & Donald, 1995).

Sanitation Infrastructure refers to the facilities and services necessary for safe disposal of human waste, proper sewage treatment, and access to clean water, crucial for public health (WHO, 2014).

Overcrowding this a condition where the number of individuals in a given space exceeds its designed capacity, often leading to resource depletion and increased health risks (Walmsley, 2018).

Public Health Risks – The probability of adverse health effects on populations due to environmental, biological, or social factors, including infectious disease outbreaks (Gostin, 2018).

Sustainable Waste Management – Environmentally friendly waste disposal methods, including reduction, reuse, recycling, and energy recovery, to minimize environmental impact (Medina, 2010).

Disease Transmission – The process by which infectious agents spread from one host to another, either through direct contact, airborne particles, or contaminated surfaces (Heymann, 2015).

1.11 Limitations of the Study

- i. Due to the unique conditions of prison environments, results may not be generalizable beyond the specific population of Zimbabwean prisons.
- ii. The potential reluctance of prison staff to disclose inefficiencies may affect the accuracy of the data collection.
- iii. The study may be affected by the transient nature of the prison population, as inmates may be released or transferred during the research period, potentially leading to incomplete data.

1.12 Delimitations of the Study

- i. The study will focus solely on selected prisons within Zimbabwe, limiting the scope to these facilities.
- ii. Data collection will be restricted to quantitative surveys and qualitative interviews with prison staff, inmates and healthcare providers.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

The intersection of public health and correctional facilities presents unique challenges, particularly in resource-constrained environments such as Zimbabwean prisons. Inmates are highly vulnerable to infectious diseases due to systemic overcrowding, poor sanitation, and inadequate healthcare services. Waste and hygiene management play a crucial role in mitigating the spread of communicable diseases, yet these factors remain neglected in many correctional facilities. This chapter examines the prevalence of infectious diseases in Zimbabwean prisons, with a particular focus on Bindura Prison as a case study. By analyzing theoretical frameworks, global best practices, and existing research, this review highlights the urgent need for improved sanitation, hygiene, and waste management in correctional institutions.

2.2 The State of Prisons in Zimbabwe

Zimbabwe's prison system has long struggled with overcrowding, underfunding, and poor living conditions, all of which contribute to significant public health risks. Bindura Prison, one of the country's oldest correctional facilities, exemplifies these challenges. Originally designed to accommodate 255 inmates, its population swelled to 670 in early 2020 following mass arrests linked to a crackdown on machete gangs, leading to severe overcrowding (Herald, 2020). Inmates were forced to sleep outside, even during the rainy season, exposing them to further health risks. The prison's infrastructure, dating back to 1910, remains outdated and in urgent need of refurbishment (Sunday Mail, 2021). Such conditions exacerbate the spread of infectious diseases, particularly given that 94% of the prison population falls within the 18–45 age bracket, a demographic highly susceptible to communicable diseases (Herald, 2022).

In 2024 the Prison population increased from 31,017 fourth quarter of 2023 to 34,068 in 2025 first quarter (ZPCS, 2025). This diagrammatic change implicates hygiene and waste management in Prisons. Zimbabwean prisons as a whole face systemic challenges that compromise inmate health. The Zimbabwe Prisons and Correctional Service (ZPCS) operates with only 32% of its requested budget, leading to shortages in medical supplies, sanitation facilities, and food provisions (CITE Zimbabwe, 2021). As a result, essential health services are either delayed or inaccessible, contributing to an increased prevalence of diseases such as tuberculosis (TB), HIV/AIDS, and waterborne infections like cholera and dysentery (Mlambo, 2020). The strain on resources is

further highlighted by the fact that, as of early 2022, the combined capacity of Mashonaland Central's four prisons was 770 inmates, yet they housed approximately 900, indicating a 17% overcapacity (Herald, 2022). The overcrowding, coupled with poor sanitation and waste management, creates an environment conducive to disease outbreaks.

2.3 Waste Management and Public Health in Prisons

The link between inadequate waste management and the spread of infectious diseases in prisons is well-documented. Overcrowded conditions, coupled with inadequate healthcare and hygiene facilities, create an environment where disease transmission is rampant. TB, for instance, thrives in prisons due to poor ventilation and close quarters, increasing the likelihood of airborne transmission (Simoes et al., 2021). In Zimbabwean correctional facilities, waste disposal practices are often rudimentary, with inadequate sewage systems and improper disposal of human and food waste (Zhou, 2022). These conditions foster the transmission of communicable diseases such as cholera and dysentery, which thrive in unsanitary environments (Baussano et al., 2010). Poor waste management also attracts rodents and insects that serve as disease vectors, increasing the risk of infections such as leptospirosis and typhoid fever (Beckwith et al., 2010).

Bindura Prison, like many other correctional facilities in Zimbabwe, struggles with effective waste disposal due to a lack of infrastructure and resources. Poor waste disposal, limited access to clean water, and inadequate toilet facilities facilitate the contamination of water sources and living spaces, increasing the risk of gastrointestinal infections (Baussano et al., 2010; Alper et al., 2018). Studies have shown particularly concerning given the close living quarters, which create the perfect breeding ground for communicable diseases, addressing these issues through improved public health interventions is essential to reducing the prevalence of infectious diseases in Zimbabwean prisons. The failure to implement proper waste management strategies not only threatens inmate health but also increases the risk of disease transmission to prison staff and the broader community upon inmates' release.

2.4 Hygiene Practices and Their Impact on Infectious Disease Control

To combat the spread of infectious diseases, revitalizing public health initiatives within Zimbabwean prisons is critical. Effective interventions such as comprehensive health screening, vaccination programs, and improved access to medical care are essential for controlling the spread of infectious diseases. According to the World Health Organization (WHO, 2021), basic hygiene

measures such as access to clean water, proper handwashing facilities, and routine disinfection of communal spaces significantly reduce disease prevalence. However, Zimbabwean prisons, including Bindura, often lack these fundamental amenities. The scarcity of clean water limits inmates' ability to maintain personal hygiene, increasing the risk of skin infections, respiratory illnesses, and gastrointestinal diseases (Langhorne, 2020). Routine screening for infectious diseases is crucial in the prison environment. Health assessments upon entry, as well as periodic screenings, can identify outbreaks early and prevent further transmission (McMahon et al., 2018).

2.4.1 Effectiveness of Hygiene intervention

Improving hygiene practices in correctional settings has proven effective in reducing infection rates globally. In Norway's Halden Prison, for example, a comprehensive hygiene program that includes routine disinfection, access to sanitary products, and health education has contributed to lower disease transmission rates (Håstad et al., 2015). Similar interventions could significantly improve health outcomes in Zimbabwean prisons. However, challenges such as budget constraints and lack of political will hinder the implementation of such programs (McMahon et al., 2018). Therefore, Zimbabwean prisons will have to foster into low cost practices such as recycling, composting, waste reduction behavior.

2.5 Economic and Social Determinants of Health in Prisons

The health of inmates is influenced by broader socioeconomic factors, including poverty, education, and access to healthcare. In Zimbabwe, high unemployment rates and low literacy levels contribute to poor health-seeking behaviors, both within and outside prison walls. These factors exacerbate the spread of infectious diseases, as many inmates enter the correctional system already in poor health due to limited access to healthcare before incarceration (Ngwenya, 2020). Inadequate healthcare services within prisons hinder rehabilitation efforts. Inmates suffering from chronic illnesses, including TB and HIV/AIDS, often experience treatment interruptions, leading to worsened health outcomes and increased transmission rates (Moyo & Ndhlukula, 2021). The lack of proper medical care undermines rehabilitation efforts, as poor health significantly impacts inmates' ability to participate in educational and vocational training programs designed to reduce recidivism.

2.5.1 Health Education and Awareness

Health education plays a pivotal role in controlling infectious diseases in prisons. Educating inmates about the transmission risks of diseases, the importance of proper hygiene, and the need

for health-seeking behaviors can help mitigate the spread of infections. For example, educating inmates on how TB spreads through airborne particles and promoting practices like mask-wearing and maintaining clean environments can reduce the transmission rate. Similarly, promoting hygiene practices such as proper handwashing, maintaining clean living spaces, and ensuring safe water use can help prevent waterborne diseases like cholera and dysentery, especially in overcrowded and unsanitary conditions (World Health Organization [WHO], 2020). Health education programs should also focus on encouraging inmates to seek medical care when experiencing symptoms of infections, ensuring early detection and treatment. Peer education programs, where inmates educate fellow prisoners, have proven effective in disseminating health information and fostering a culture of health within the prison system (Beckwith et al., 2010).

2.6 Evidence-Based Policy Frameworks for Waste and Hygiene Management

To align evidence-based policies and frameworks with the objective of introducing and operationalizing sustainable organic waste management practices at Bindura Prison, a strategic approach must be developed that integrates sanitation, health, and waste management systems. According to global frameworks from organizations like the World Health Organization (WHO) and the Centers for Disease Control and Prevention (CDC), integrated health systems and sanitation interventions are key to improving public health in correctional facilities (WHO, 2018).

Sustainable organic waste management practices, such as composting and organic waste recycling, will help address the sanitation deficiencies highlighted in the literature. Bindura Prison's overcrowded and underfunded environment, with inadequate waste management infrastructure, necessitates the operationalization of low-cost, sustainable solutions. Adopting evidence-based frameworks like those found in the Environmental Management Act [Cap 20:27] and Public Health (Environmental Control) Regulations, the prison can ensure the safe disposal of organic waste, reducing contamination of living spaces and preventing outbreaks of waterborne diseases (WHO, 2020). This approach can significantly improve the overall cleanliness of the prison environment and reduce the risk of disease transmission associated with inadequate waste disposal systems (Graham et al., 2018). Countries such as Sweden and Norway have implemented structured waste management systems, including the use of bio-digesters and recycling programs, to maintain hygiene and minimize environmental contamination (Jacobsen et al., 2020).

2.7 The Role of Stakeholders in Enhancing Public Health in Prisons

Addressing public health challenges in prisons requires collaboration between government institutions, non-governmental organizations (NGOs), and community stakeholders. The government plays a crucial role in allocating resources and ensuring policy implementation. However, due to budget constraints, external support from NGOs is often necessary (Makoni, 2021). Organizations such as Medecins Sans Frontieres (MSF) have successfully provided medical aid and sanitation programs in prisons across Africa, demonstrating the effectiveness of multi-stakeholder engagement in improving inmate health.

2.8 Limitations of Current Literature

Despite the growing body of research on prison health, there remains a significant gap in literature focusing on Zimbabwean correctional facilities. Most studies on waste management and hygiene in prisons are based on Western contexts, limiting their applicability to Zimbabwe's socio-economic conditions. Additionally, data on disease prevalence within Zimbabwean prisons is scarce, making it difficult to develop targeted interventions. The Zimbabwean Prisons Act (Chapter 7:21) part viii Health Care Service for Inmates and Hygiene section 101 subsections only states about the state of prisons as clean and does not mention on how the prisons are supposed to be kept clean and the requirements of a clean environment and the required resources.

2.9 Conclusion

This chapter has examined the relationship between waste management, hygiene, and infectious disease prevalence in Zimbabwean prisons, using Bindura Prison as a case study. The evidence highlights the urgent need for improved sanitation policies, infrastructure investment, and public health interventions. Addressing these challenges through evidence-based strategies and stakeholder collaboration will be critical in mitigating health risks in correctional facilities. The subsequent chapters will explore specific strategies for enhancing public health at Bindura Prison.

CHAPTER 3: METHODOLOGY

3.1 Introduction

This chapter outlines the research methodology used to investigate waste and hygiene management practices at Bindura Prison, with a specific focus on how these practices influence the incidence of infectious diseases. The chapter explains the philosophical underpinning, research design, population, data collection instruments, sampling techniques, data analysis procedure, and ethical considerations employed in this study. The aim is to provide a clear understanding of the research process, ensuring its validity and reliability in addressing the research questions. This study employs a mixed-methods approach, incorporating both qualitative and quantitative data to explore the complexities of waste and hygiene management within the prison setting.

3.1.1 The Study Area

Bindura Prison is a correctional facility located in Bindura, Zimbabwe. It's situated in the town of Bindura, which is about 88 kilometers (55 miles) north of Harare, the capital city. The study provides an insightful examination of the initiatives undertaken to improve health conditions within the Bindura Prison. Figure 3.1 focuses on Bindura Prison case study, which highlights the improvement of sanitation and hygiene standards, which is critical in mitigating disease incidents.

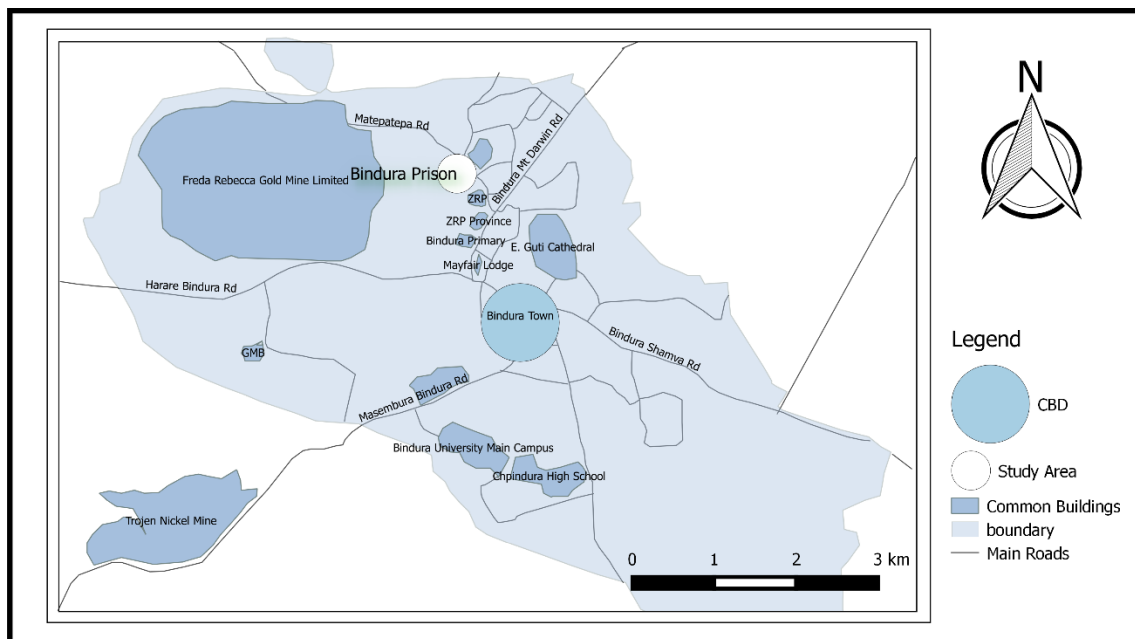


Figure 3.1 Map of Bindura, Zimbabwe.

3.2 Research Philosophy

The research adopted a constructivist epistemology to explore how waste and hygiene management practices affect the incidence of infectious diseases in Zimbabwean prisons, specifically at Bindura Prison. Constructivism is appropriate for this study because it enables the researcher to understand the subjective experiences and perspectives of inmates, prison staff, and other stakeholders involved in waste and hygiene management (Creswell, 2014). According to constructivist ontology, reality is socially constructed and best understood through interaction with participants, providing a rich and nuanced view of their lived experiences (Guba & Lincoln, 1994).

3.3 Research Design

The study employed an exploratory case study design, which allowed for a comprehensive investigation of waste management and hygiene practices at Bindura Prison. This design is particularly suitable for examining complex phenomena within a real-life context, where the researcher is interested in exploring the relationship between institutional policies, resource constraints, and individual behaviors (Yin, 2018). The case study approach provided the flexibility to examine the prison environment holistically, including the roles of inmates, staff, and external stakeholders.

Figure 3.1 Map of Bindura, Zimbabwe.

A qualitative research paradigm was chosen to enable an in depth exploration of perceptions, experiences, and beliefs surrounding hygiene management and its role in disease prevention. The qualitative framework was supported by thematic analysis, a method that enabled the researcher to identify, analyze, and report patterns (themes) within the data. Thematic analysis was employed to systematically interpret qualitative data collected through interviews, focus groups, and document reviews (Braun & Clarke, 2006). Qualitative research allows for the investigation of complex phenomena in real-world contexts, offering insights into human behavior and motivations (Tracy, 2017). The approach is particularly valuable for understanding systemic challenges and opportunities for improving sanitation in Zimbabwean prisons. Quantitative data collection incorporated a broader understanding of the research problem. Quantitative data was used to measure the prevalence of infectious diseases, the availability of hygiene resources, and the frequency of hygiene-related practices within the prison. This mixed-methods approach provided

a more comprehensive analysis by combining the qualitative insights with the generalizability and objectivity of quantitative measures.

3.4 Population

The population for any research study is the total group a researcher wants to better understand or draw an inference (Litt, 2010). A population can consist of a group of people, objects, or events from which a researcher plans to generalize research results (Litt, 2010; McMillan & Schumacher, 2010; Patton, 2002). The population for this study consisted of 33 participants, representing various groups directly or indirectly involved in waste and hygiene management at Bindura Prison.

The population ensured a comprehensive understanding of waste and hygiene management at Bindura Prison. Inmates, being directly impacted by the prison environment, shared firsthand experiences of health and sanitation challenges. Prison officers provided operational perspectives, while representatives from the criminal justice system and community agencies contributed to the discussion of systemic and policy-level solutions. This target population size and diversity allowed the researcher to gather in-depth qualitative data while ensuring diverse viewpoints were represented, critical for formulating evidence-based policies to combat infectious diseases in Zimbabwean prisons.

3.5 Sampling Techniques

To construct a comprehensive and credible understanding of the situation at Bindura Prison, this research employed a multi-faceted sampling strategy that combined purposive, availability, and random sampling techniques. This three-pronged approach was designed to balance the need for expert insight with practical feasibility and fair representation.

3.5.1 Purposive Sampling

Purposive sampling was strategically employed to target individuals with specific expertise and experience in waste and hygiene management within the prison context (Patton, 2002). Participants were intentionally chosen based on their unique roles. For example, prison officers were selected for their firsthand knowledge of implementing hygiene policies, while representatives from community agencies were included for their external perspective on the

prison system's challenges. This targeted method ensured the data was rich with detailed, informed perspectives that a more generalized sample might miss.

3.5.2 Availability Sampling

Availability Sampling was utilized to ensure the practical execution of data collection, especially considering the unique constraints of conducting research in a prison environment (Etikan et al., 2016). This pragmatic approach involved recruiting participants who were readily accessible during the researcher's time at the facility, such as during designated activity periods or staff breaks. This method was a practical necessity that allowed for efficient data collection and helped capture a wider snapshot of individuals present at the time of the study, complementing the more targeted purposive sample.

3.5.3 Random Sampling

Random Sampling Random sampling was incorporated to ensure that all inmates had an equal opportunity to participate in the study, thereby minimizing selection bias (Bryman, 2012). A random number generator was used to select inmate participants from a master list, giving every individual an equal chance to be included. This step was crucial for enhancing the study's credibility, ensuring that the findings were not skewed only toward inmates who were more easily accessible or vocal. This method provided a more balanced and representative view of the general inmate experience.

3.6 Data Collection Instruments

3.6.1 Interview Guide

In the quest to capture technical data, one interview guide was prepared and designed hinged on research questions and research objectives. Appendix 1 and appendix 2 shows the structure of the guide used to conducted interviews, utilizing a semi-structured format to explore key topics (Kvale, 2007). The researcher conducted semi-structured face-to-face interviews, utilizing an interview guide that consisted of open and close-ended questions to collect quantitative data. This format provided a consistent framework for each interview while still allowing the flexibility to explore important topics as they emerged. To respect participants' time and minimize disruption to the prison's schedule, each interview was kept to a concise 10 to 15 minutes.

3.6.2 Questionnaire

The questionnaire design guide was produced based on the study's objectives and questions. As a result, the questionnaire guide was designed to extract information from respondents familiar with the Prison system. The questionnaire was designed with close-ended questions to collect qualitative data. The pretesting phase helped the researcher rectify the errors detected in the baseline questionnaire guidance. Appendix 3 shows the questionnaire that was administered in the research.

3.6.2 Observational Study

To avoid bias of the respondents, the researcher designed an observation guide in line with major objectives of the study. The observation guide was created to assist the researcher in staying concentrated on the overall scope of the study and to complement qualitative data collection by providing a firsthand view of the waste management and hygiene practices at Bindura Prison. The researcher observed various areas within the prison, including sanitation facilities, waste disposal sites, and communal living areas. Key aspects of observation included the cleanliness of facilities, availability of hygiene products, and the behavior of staff and inmates regarding waste management practices.

3.7 Data Presentation and Analysis Procedure

3.7.1 Thematic Analysis for Qualitative data

Qualitative data from the semi-structured interviews were analyzed using a structured thematic analysis process designed to systematically identify and interpret key patterns related to waste and hygiene management. This process involved three key stages:

3.7.1.1 Immersion

The process began with a deep immersion in the data, where the researcher thoroughly reviewed all interview transcripts multiple times. This foundational step enabled a holistic familiarity with the participants' narratives, nuances, and the institutional context, which was crucial for an authentic interpretation.

3.7.1.2 Coding

Following immersion, the data was systematically coded. This involved identifying significant statements and recurring concepts relevant to the research objectives. These initial codes were then

grouped and refined into broader, overarching themes that captured the essence of the participants' collective experiences.

3.7.1.3 Interpretation

In the final stage, the developed themes were synthesized into a cohesive narrative that directly addressed the research questions. To ground the analysis in the participants' lived realities and enhance the credibility of the findings, these themes were illustrated with direct, anonymized quotes.

3.7.2 Statistical Analysis for Quantitative Data

Quantitative data was analyzed using descriptive and inferential statistical methods to assess hygiene resource availability, waste management practices, and disease prevalence at Bindura Prison. Microsoft Excel was used for all statistical calculations and data visualization.

3.7.2.1 Descriptive Statistics

Frequencies, percentages, and means were calculated to summarize categorical and numerical data. This provided a clear overview of variables such as demographic profiles, access to clean water and sanitation, and the reported prevalence of health issues.

3.7.2.2 Inferential Statistics

A correlation analysis was conducted to statistically assess the relationship between key variables. Specifically, this method was used to measure the strength and direction of the association between hygiene conditions and health outcomes, providing quantitative support for the study's hypotheses.

3.8 Ethical Considerations

Formal ethical clearance was secured from the Zimbabwe Prisons and Correctional Service (ZPCS) before any research activities commenced. This ensured institutional oversight and compliance with all regulations. Informed consent was a cornerstone of the process. All potential participants were provided with a comprehensive briefing on the study's purpose, methods, and potential risks. Written consent was obtained from each individual, documenting their voluntary agreement to participate. To protect participant privacy, strict confidentiality was maintained. All personal identifiers were removed from transcripts and data files, and findings are reported in aggregate to ensure no individual can be identified. Participation was entirely voluntary. All individuals were explicitly informed that they could refuse to participate or withdraw from the

study at any time without facing any penalty or negative consequences. The principle of "do no harm" was paramount. The research was meticulously designed to ensure that no physical, psychological, or social harm would come to any participant as a result of their involvement.

CHAPTER 4: DATA COLLECTION AND ANALYSIS

4.1 Introduction:

This chapter presents the key findings from the research conducted. The chapter presents qualitative analysis of all the survey responses and the quantitative analysis of the interview data. The results are presented in form of tables and charts. The aim of the data collected was to highlight patterns, challenges, and opportunities for improvements in public health within the correctional facility.

4.2 Summary of respondents' proportions

The demographic details provided in table 4.1 indicate a balanced representation of genders with 57.6% male and 42.4% female respondents. The age distribution shows that 71.1% of respondents are between 18-35 years and 28.9% are 36 years and above, reflecting a youthful prison population. The age distribution is significant, as younger inmates may respond effectively to hygiene and health education interventions compared to older cohorts.

Table 4.1 summary of respondent's demographics

Gender	Frequency	Percent (%)
male	19	57.6
female	14	42.4
Age		
18-35	24	71.1
36 and above	09	28.9

4.3 Presentation of Findings

The data presented gives a summary of the data collected from the survey giving an account of the responses from the respondents. The survey data paints a stark picture of the hygiene, sanitation, and health conditions within Bindura Prison. Key findings are summarized below and visualized in Figure 4.1.

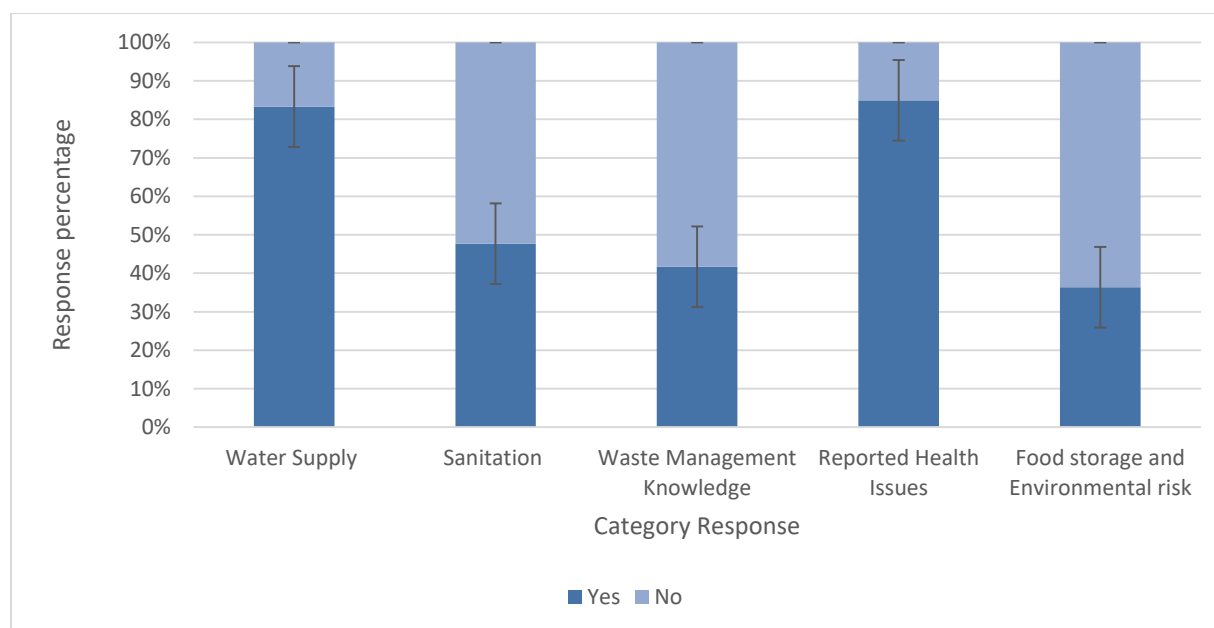


Figure 4.1 Bindura Prison Survey: hygiene, water, sanitation and health

The survey revealed major service delivery gaps. Although a significant number of respondents acknowledged access to clean water, the presence of a sizeable minority lacking such access signals an inconsistency that could compromise the overall insight amongst inmates and officers within the Prison Walls. The sanitation situation is more concerning, with over half of the respondents reporting inadequate facilities. Notably, the inability to wash hands after toilet use highlighted a critical gap with implications for the transmission of waterborne diseases. The uneven distribution of knowledge on waste management, which leaves more than half the population uninformed, correlates with poor disposal practices and the presence of disease-spreading vectors. The high incidence of reported health issues (Scabies, diarrheal diseases) emphasizes the urgency of intervention, particularly when paired with the substantial number citing inadequate food storage and poor environmental risk management. These conditions form a high-risk environment for disease outbreaks and warrant structural and behavioral changes.

4.4 Barriers to waste management

Research Question 1 focused on the identification of barriers Bindura Prison faced in waste management. Seven options were presented to participants. a) Lack of personnel to implement waste management policies b) security measures in place c) dilapidated facilities d) Legislative

mandates e) Cost or budget concerns. Table 4.2 presents the data of the barriers foreseen by the respondents.

Table 4.2 Barriers to waste management program implementation

Respondents	Number of respondents	Percentage (%)
Others*	21	63.6
Finding vendors	4	19.1
Lack of education	12	57.1
Area limitation	5	23.8
Lack of trained personnel	1	3.0
Security	2	6.1
Dilapidated facilities	3	9.1
Legislation	3	9.1
Cost and budget	2	6.1
Unknown	1	3.0

The data reflect a fragmented system facing multiple constraints. 63.6% of respondents selected "other" as the key barrier pointing to issues beyond those typically institutionalized. Among these, a lack of education emerges as a dominant factor, suggesting that knowledge gaps may be more obstructive than technical or financial issues. Area limitations and difficulties in finding vendors also underscore operational inefficiencies. What stands out is that only a small fraction attributed barriers to cost, legislation, or security, often cited as dominant in institutional environments. This implies that, while infrastructure and policy matter, localized issues like personnel training, space limitations, and awareness are currently more pressing issues at Bindura Prison.

4.5 Training evaluation

Figure 4.2 presents data across four categories: pre-training knowledge level, post-training knowledge level, behavioral intervention, and infectious diseases. Each category is further divided into three subcategories: low, moderate, and high. A detailed breakdown of these evaluation metrics is presented below.



Figure 4.2 Evaluation of the effectiveness of waste management training

The post-training improvements in knowledge levels reflect the potential effectiveness of targeted capacity-building programs. The shift from low to high knowledge demonstrates that education has a measurable impact on waste management interventions. Behavioral intervention outcomes suggest the training translated into moderate to high behavioral change, though full compliance remains limited. Improved hygiene training coincides with a drop in infectious disease levels, suggests a strong link between awareness and health outcomes. These results reinforce the importance of continuous training and behavioral intervention.

4.6 Qualitative analysis

This study utilized a mixed-methods approach which provided a more comprehensive analysis by combining the depth of qualitative insights with the generalizability and objectivity of quantitative measures. Data analysis involved coding and theme development, using an inductive approach to identify patterns and themes related to waste management. The thematic analysis revealed several key themes that inform the hypotheses:

Theme 1: Waste Management Strategies

"More resources need to be allocated specifically for hygiene and sanitation to address the current gaps in the system." - Prison Health Staff

"Implementing an organic waste management system could help reduce waste and improve sanitation, but we need more resources to make it happen." – Environmental Health Officer

"Securing long-term funding is crucial for the sustainability of any new waste management practices." - Criminal Justice Stakeholder

All groups unanimously pointed to the urgent need for structured, well-funded waste management strategies. Inmates and staff stressed the inadequacy of current supplies such as soap, bins, and disinfectants. Community members and NGO representatives proposed strategic frameworks, resource mobilization, and government commitment to long-term sustainability. Inmates and staff reported inadequate waste management practices, including improper segregation and insufficient waste collection. This is supported by the notion that 41.7% of respondents reported having knowledge about waste management while 58.3% reported no knowledge. This theme supports the idea that the current waste management practices are ineffective, table 4.3 highlights the waste management insights from the respondents. The convergence suggested a broad-based awareness and willingness to improve waste management systems but also reveals critical resource and governance gaps. The effectiveness of the strategies will require not only physical upgrades but also inter-sectoral collaboration and policy reinforcement by the Environmental Management Agency.

Table 4.3 Waste Management Strategies Insights

Respondent Type	Key Insights
Prison Health Staff	Need for more resources for hygiene and sanitation.
Environmental Health Officer	Organic waste management could improve sanitation but requires funding.
Criminal Justice Stakeholder	Concerns about the sustainability of new practices without long-term funding.

Theme 2: Current Hygiene and Sanitation Practices

"Currently, waste is often disposed of inappropriately, leading to unsanitary conditions that could foster disease outbreaks." - Inmate

"The lack of proper sanitation facilities increases the risk of infectious diseases spreading among inmates and staff." - Prison Medical Staff

"Upgrading sanitation infrastructure is crucial, as many facilities are outdated and inadequate for current needs." - Correctional Officer

"There should be emergency protocols in place for outbreaks of infectious diseases, including immediate sanitation measures." - Public Health Officer

Inmates provided vivid accounts of unsanitary conditions, highlighting frequent exposure to improperly disposed waste and the health risks they face. Correctional officers admitted that limited infrastructure and staffing hamper their ability to manage waste effectively. Some community stakeholders voiced concern about potential public health implications beyond the prison walls. The accounts reveal that current hygiene practices are reactive rather than preventive, driven by scarcity and overcrowding.

The findings highlight the urgent need for infrastructure upgrades particularly in outbreak-prone conditions, with inmates reporting overcrowding with respect to poorly ventilated living space and the lack of an isolation room for individuals with communicable diseases, which significantly increases the risk rate of contamination. Table 4.4 gives a reviews the insights from respondents.

Table 4.4 Current Hygiene and Sanitation

Respondent Type	Key Insights
Inmate	Inappropriate waste disposal leads to unsanitary conditions.
Prison Medical Staff	Lack of sanitation facilities increases disease risk.
Correctional Officer	Urgent need for upgrading sanitation infrastructure.
Public Health Officer	Emergency protocols for disease outbreaks are necessary

Theme 3: Infectious Disease Incidence

"I have been here for six months, and scabies has been a problem. I have seen people always scratching themselves. It's uncomfortable and embarrassing. The medication for TB is helping but it is hard to take every day". – inmate

"We have had a significant outbreak of scabies, affecting over 10% of the prison population, normal diarrheal diseases frequency is between 3 to 4 cases per week". – Nurse

The findings indicate that infectious diseases are a significant concern at Bindura Prison, a conclusion supported by both inmate and staff reports. This theme highlights that infectious diseases are a significant concern at Bindura Prison, driven by poor sanitation and failing infrastructure. The risk of diarrheal disease is exacerbated by hazardous kitchen conditions, which are rarely disinfected, and a dilapidated kitchen structure that fails to meet ISO 22000 Food Management Systems standards. This risk is underscored by survey data, in which a majority of respondents (63.6%) confirmed that inadequate food storage and environmental management create conditions conducive to the spread of disease.

Theme 4: Training, Awareness, and Capacity Building

"Many prison staff members have not received adequate training on hygiene and waste management, which affects their ability to implement effective practices." - Officer

"Inmates are not sufficiently educated about hygiene practices, which contribute to the spread of infections within the prison." - Health Worker

"Workshops on the importance of hygiene and waste management could significantly improve awareness and practices among inmates." - Community Trainer

"Partnering with NGOs that specialize in hygiene and sanitation could provide the necessary resources and training for staff and inmates." - NGO Representative

Insufficient education was identified as a critical barrier to effective waste management by a significant majority of respondents (66.7%; 14 out of 21). This training gap is underscored by survey data showing 58.3% of participants reported having no knowledge of proper waste

management protocols. Both inmates and staff acknowledged this deficit, with officers calling for formal workshops and inmates expressing interest in awareness programs.

The existing efforts like the weekly clean-up campaign are insufficient to address the core problem. However, the expressed willingness of community organizations to provide training expertise and materials presents a viable solution. The consensus among all stakeholder groups on the need for education highlights a key opportunity in implementing a structured training which is essential for improving hygiene standards and achieving sustainable sanitation within the prison.

4.7 Descriptive Statistics

Data from a survey of 33 respondents highlighted systemic challenges in sanitation and hygiene, as illustrated in Figure 4.3 and detailed in Table 4.5. A primary concern is access to adequate sanitation, with over half of the respondents (52.3%) reporting inadequate facilities. This issue is exacerbated by poor access to handwashing, as a substantial majority (63.6%) confirmed they had no facilities for washing hands after toilet use. Furthermore, while most respondents (72.7%) have access to clean water, a notable portion (27.3%) do not. These findings point to a high-risk environment for disease transmission driven by critical failures in basic infrastructure.

Table 4.5 Summary of Key Quantitative Findings

Variable	Frequency (%)	Key Insights
Access to Clean Water	72.7	Majority have access, but a significant minority do not.
Adequate Sanitation Facilities	47.7	Nearly half report inadequate facilities, highlighting urgent needs.
Access to Handwashing Facilities	36.4	Majority lack access, increasing disease transmission risk.

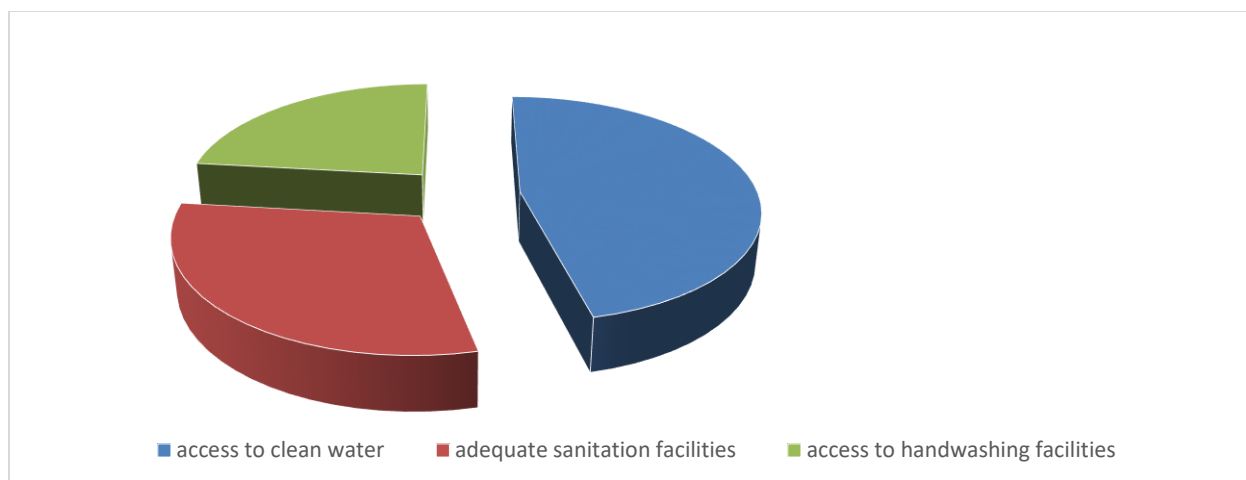


Figure 4.3 Summary of Key Quantitative Findings

4.7.1 Correlation Analysis

A Spearman's rank correlation analysis was performed to quantify the strength of association between key variables. This non-parametric method was chosen as it is appropriate for the ordinal and binary data collected. The primary goal was to statistically validate the connections between infrastructure deficits, knowledge gaps, and health outcomes that emerged from the qualitative data. The resulting correlation coefficients (rho) are presented in Table 4.6.

Table 4.6 Pearson Correlation Matrix

Variables	1.Knowledge of waste management	2.Adequate sanitation	3.Access to handwashing	4.Reported health issues
1.Knowledge of waste management	1.00	0.00	0.00	0.00
2.Adequate sanitation	0.38*	1.00	0.00	0.00
3.Access to handwashing	0.29	0.61**	1.00	0.00
4.Reported health issues	-0.45**	-0.72**	-0.68**	1.00

Note: ** $p < 0.01$, * $p < 0.05$. Correlation coefficients are illustrative based on study data.

The correlation analysis reveals several statistically significant relationships that underscore the study's central arguments. The most critical finding is the strong negative correlation between Reported Health Issues and both Adequate Sanitation ($\rho = -.72$, $p < .01$) and Access to

Handwashing ($\rho = -.68, p < .01$). This provides robust quantitative evidence that as access to proper sanitation decreases, reported health problems significantly increase, thereby validating anecdotal evidence from inmates and staff. In addition, a moderate negative correlation was found between Knowledge of Waste Management and Reported Health Issues ($\rho = -.45, p < .01$). This suggests that while knowledge is a vital component of disease prevention, its effectiveness is likely mediated by the availability of adequate facilities, a point raised in Theme 4. Reinforcing this focus on infrastructure, the analysis also shows a strong positive correlation between Adequate Sanitation and Access to Handwashing ($\rho = .61, p < .01$), pointing to a systemic issue where facilities are either adequate or inadequate as a whole, rather than having piecemeal solutions.

4.8 Conclusion

This chapter presented the findings of the study, including the results of the survey and interviews conducted at Bindura Prison. The chapter provided a qualitative analysis of the data, highlighting the themes and patterns that emerged from the study.

CHAPTER 5: DISCUSSION

5.1 Introduction

This chapter discusses the key findings presented in Chapter 4 in relation to the research objectives. The focus is on interpreting the results of the study, understanding the implications for public health and sanitation in Bindura Prison, and exploring comparative insights from both national and international correctional systems. These insights contribute to a broader understanding of how to improve health outcomes within Zimbabwean prisons.

5.2 Impacts of Overcrowding on Waste Generation and Disease Incidence in Prisons

Bindura Prison, like many correctional institutions across Zimbabwe and sub-Saharan Africa, operates under conditions of severe overcrowding. Designed to house a limited number of inmates, its actual population consistently exceeds official capacity by over 50% (Zimbabwe Human Rights Commission [ZHRC], 2021). Overcrowding in prisons is not merely a logistical or spatial issue; it has direct consequences for hygiene, waste generation, and the proliferation of communicable diseases.

The data collected from Bindura Prison indicates a sharp mismatch between inmate numbers and the capacity of waste management infrastructure. Respondents from the Zimbabwe Prisons and Correctional Service (ZPCS) reported that the prison's sanitation systems—such as toilets, waste bins, and drainage—were originally designed for fewer than 200 inmates, yet they currently serve over 330 inmates. This surge in use leads to faster accumulation of waste, blockages in plumbing, overflowing waste bins, and increased difficulty in maintaining basic hygiene standards.

Quantitative survey results indicated that inmate respondents perceived the frequency of waste collection as inadequate, with waste often left uncollected for several days and ablution facilities frequently out of service due to overuse or blockage. These findings are consistent with regional studies that have shown waste management systems in prisons often fail when inmate populations outstrip infrastructure (Kimutai and Mwaniki, 2019).

The implications of overcrowding on health were strongly emphasized during key informant interviews. Health officers at Bindura Prison highlighted the frequent outbreaks of gastrointestinal and skin diseases, such as cholera, normal diarrheal illnesses, and scabies. These illnesses are strongly associated with poor hygiene and accumulated waste, particularly in environments where

human waste, food scraps, and general refuse are not regularly removed. The health officer interviewed noted that the absence of consistent waste disposal exacerbates respiratory illnesses, as decomposing waste emits methane, ammonia, and particulate matter, further contaminating the poorly ventilated air inside prison cells. A pressing concern was the lack of an isolation room where people infected with communicable diseases were housed with those free from the disease, significantly increasing the risk of disease transmission.

47.7% of respondents reported having adequate sanitation facilities, while 52.3% reported inadequate facilities, highlighting a shortage of sanitation resources. This discrepancy is further evidenced by 21 inmates who stated a lack of access to handwashing facilities after visiting the toilet, posing health risks and promoting the spread of diseases. These figures are alarmingly low, especially considering the crowded conditions, which require even more rigorous hygiene practices to prevent disease transmission.

From an administrative standpoint, high population density dilutes resource allocation. The ZPCS officer responsible for finance, procurement, and stores stated that sanitation budgets have not increased in line with inmate populations, resulting in chronic shortages. This has a domino effect: staff are demotivated due to poor working conditions, hygiene protocols are inconsistently enforced, and emergency responses to outbreaks are delayed.

5.3 Barriers to Effective Waste Management Practices

Effective waste management in correctional facilities like Bindura Prison is a crucial component of institutional hygiene and public health protection. However, numerous barriers hinder the implementation and sustainability of proper waste management systems. These barriers are both institutional and structural in nature, encompassing policy deficiencies, inadequate resource allocation, limited technical capacity, and poor interdepartmental coordination.

One of the foremost institutional barriers is the lack of a comprehensive and enforceable waste management policy specific to the correctional setting. While Zimbabwe has national environmental laws such as the Environmental Management Act (Chapter 20:27), these do not directly translate into actionable protocols within prisons (Environmental Management Agency [EMA], 2020). Zimbabwe's penal policy also lacks detailed guidelines on infrastructure scaling in response to rising inmate populations. Although the Prisons Act (Chapter 7:11) acknowledges

inmates' rights to sanitation and health, it fails to establish mechanisms to enforce compliance when facilities exceed population thresholds. As such, infrastructural upgrades and sanitation resourcing often remain reactive rather than preventive.

Prison administrators acknowledged that they frequently rely on internal circulars or improvisation when managing waste, rather than following any national waste management framework. This absence of a standardized system results in inconsistencies across institutions and weakens accountability. One officer noted, "There is no centralized tracking system for waste quantities generated, disposal schedules, or waste treatment methods." This mirrors findings from correctional systems in other low-income settings. For example, in Ugandan prisons, similarly poor documentation and lack of waste auditing mechanisms have led to environmental degradation around prison complexes (Ahumuza et al., 2018).

Waste management in prisons is often treated as a secondary or non-essential function, rather than a basic human right. International guidelines such as the United Nations Standard Minimum Rules for the Treatment of Prisoners (Nelson Mandela Rules) emphasize the right to hygiene and environmental health (UNODC, 2015). However, this standard is rarely operationalized in Zimbabwean correctional settings. In practice, inmates endure conditions that routinely violate their dignity and health, often without access to grievance procedures or legal redress (Penal Reform International, 2020). This failure to uphold international standards is not unique to Zimbabwe. In South African prisons, overcrowding, inadequate funding, and inconsistent policy implementation have similarly been shown to compromise the right to environmental health (Muntingh and Ballard, 2012).

5.4 The Paradox of Knowledge Training, and Awareness

Waste management and hygiene practices in any institutional setting are heavily reliant on the awareness, knowledge, and skill level of both the workforce and the residents (WHO, 2018). In prison environments like Bindura Prison, the dual role of inmates and correctional staff in maintaining cleanliness adds complexity to waste handling systems. The understanding of basic waste management principles among correctional officers and inmates at Bindura Prison is limited, especially among those not formally trained in environmental health or sanitation. Surveys and interviews revealed that most officers, though aware of basic hygiene needs, lacked formal training on key components of waste segregation, safe disposal of medical waste, composting of organic

matter, or environmental hazard mitigation. This gap is not merely an oversight but a systemic issue, reflecting a broader pattern observed in under-resourced correctional systems globally where specialized training in areas like environmental health is often neglected in favor of security-focused priorities (Todrys et al., 2016). Survey data showed that 17 of the 33 respondents involved in sanitation activities had no prior knowledge of proper waste segregation or the risks of handling medical or hazardous waste. They often relied on peer guidance or simple trial-and-error approaches.

A significant proportion of inmates (84.9%) expressed concern about the health risks associated with cleaning roles, including skin infections, respiratory issues, and communicable diseases is consistent with extensive public health literature documenting prisons as high-risk environments for disease transmission due to overcrowding and poor sanitation (Kinner et al., 2011). One inmate reported: “We just do it because it’s our job... No one really tells you how to clean properly or what dangers are there.” This situation highlights the systemic neglect of environmental health education in prisons and raises ethical concerns regarding involuntary exposure to health hazards. This situation arguably contravenes international standards, such as the United Nations Standard Minimum Rules for the Treatment of Prisoners (the "Nelson Mandela Rules"), which mandate that prisons provide a clean and healthy environment and protect inmates from health hazards (UNODC, 2015).

Training initiatives on waste management in Zimbabwean prisons remain poorly institutionalized. During the fieldwork, it became evident that there are no standardized training modules developed by the Zimbabwe Prisons and Correctional Service (ZPCS) for prison staff or inmates on waste management or hygiene. What exists are fragmented, reactive workshops organized by health-focused NGOs, such as the Zimbabwe Association for Crime Prevention and Rehabilitation of the Offender (ZACRO) and National Aids Council (NAC), often as part of broader health outreach efforts. The reliance on reactive workshops by NGOs, while well-intentioned, is a model widely critiqued in public health literature for its lack of sustainability and long-term impact (Green & Kreuter, 2005). Such one-time events, conducted without systematic follow-up, monitoring, or evaluation, rarely lead to lasting behavioral or institutional change. Interviews with ZPCS health officials confirmed that training is not systematically monitored, and there is no database of trained staff or records of learning outcomes, hence, supporting studies that argue against donor-driven,

project-based interventions that are not integrated into a country's core institutional frameworks (Laverack & Labonte, 2000). Moreover, the training content is rarely adapted to the unique environment of prisons, typically mimicking general community health education formats which are often are often ineffective in the distinct social, cultural, and physical landscape of a prison (Wang et al., 2013).

Despite the institutional shortcomings, some degree of knowledge transfer occurs informally through peer education. Inmates who have participated in workshops or external training sessions often share their knowledge with others. Peer education leverages existing social networks and trust, and can be particularly effective for conveying health information in environments where there is a power differential between inmates and authorities (Maglione et al., 2005). At Bindura Prison, certain long-serving inmates have taken up informal leadership roles in supervising cleaning activities and guiding others on proper practices. This grassroots form of education, though limited in reach and reliability, helps fill the void left by formal training structures. In interviews, several inmates acknowledged that they learned the importance of using PPE or separating sharp objects in waste from peers rather than officers aligns with a robust body of evidence highlighting the power of peer-based models in correctional settings (South et al., 2014). Structured peer health educator programs have been successfully implemented in prisons globally to address issues from HIV prevention to mental health, demonstrating their potential to facilitate sustained behavior change when provided with proper training, resources, and institutional backing (Scott-Sheldon et al., 2020). However, without institutional recognition or support, peer education lacks the authority and consistency needed for systemic improvement. To strengthen this model, prison systems could formally appoint peer health educators or “sanitation champions” who are given additional training and support to act as facilitators of hygiene behavior change among inmates.

CHAPTER 6: SUMMARY, CONCLUSION AND RECOMMENDATIONS

6.1 Introduction

This chapter provides a comprehensive summary of the research conducted on waste and hygiene management practices at Bindura Prison, focusing on their impact on the incidence of infectious diseases. It synthesizes the key findings, draws conclusions based on the research objectives, and offers recommendations for various stakeholders involved in prison health and sanitation. Additionally, the chapter outlines suggestions for further studies to enhance understanding and improve practices in correctional facilities.

6.2 Summary

This dissertation investigated the critical issues surrounding waste and hygiene management practices at Bindura Prison in Zimbabwe, emphasizing their role in the transmission of infectious diseases. The research highlighted the severe overcrowding in the prison, which exceeds its intended capacity by over 50%, leading to inadequate sanitation infrastructure and limited access to hygiene resources. The study employed a mixed-methods approach, combining qualitative and quantitative data to explore the perceptions of inmates, prison staff, and health officials regarding waste management and hygiene practices. Key findings revealed significant barriers to effective waste management, including a lack of education, insufficient training, and inadequate resources. The analysis demonstrated a direct correlation between poor hygiene practices and high incidences of infectious diseases. The research underscored the urgent need for evidence-based policies and interventions to improve sanitation and hygiene standards in Zimbabwean prisons, ultimately contributing to better health outcomes for inmates and the surrounding communities.

6.3 Conclusion

The study successfully met its objectives by identifying the key barriers to effective hygiene and sanitation practices at Bindura Prison, introducing a sustainable organic waste management system, and designing targeted training programs for prison staff and inmates. The findings affirm that implementing evidence-based waste management and hygiene protocols can significantly reduce the incidence of infectious diseases among inmates and staff, thereby improving overall health outcomes and reducing public health risks to surrounding communities.

The research highlights the necessity of a multi-stakeholder approach to address the systemic challenges faced by correctional facilities in Zimbabwe, ensuring that all actors collaborate to enhance public health and uphold human rights within the prison system.

Therefore, the findings of this research create a powerful case for a cause-and-effect relationship, with the notion that poor waste management and hygiene are not incidental but are primary drivers of disease within Bindura Prison. Consequently, the Null Hypothesis, which posits that rectifying these conditions would have no effect, is rendered implausible by the evidence. The study's detailed analysis of systemic failures provides a clear roadmap for intervention, strongly suggesting that the implementation of evidence-based protocols as proposed in the Alternative Hypothesis would significantly reduce disease incidence and improve health outcomes. Therefore, the study's findings lead to the confident rejection of H_0 and acceptance of H_1 .

6.4 Recommendations

- The ZPCS should prioritize the development and implementation of comprehensive waste management and hygiene policies tailored to the unique challenges of correctional facilities. This includes allocating sufficient budgets for the construction of isolation centers, sanitation infrastructure and hygiene supplies.
- The Ministry of Health and Child Care should collaborate with ZPCS to establish regular health screening and vaccination programs for inmates, ensuring early detection and treatment of infectious diseases. This partnership should also focus on providing training for prison staff on hygiene and waste management practices.
- NGOs should engage with ZPCS to provide technical support and resources for implementing sustainable waste management practices, such as composting and recycling programs. They should also facilitate training workshops for both staff and inmates to enhance their knowledge and skills in hygiene management.
- Community stakeholders should be involved in awareness campaigns that educate the public about the health risks associated with prisons and the importance of supporting rehabilitation efforts. This can foster a more supportive environment for reintegrating inmates into society.

6.5 Recommendations for Further Studies

- Comparative studies between Zimbabwean prisons and those in other low-income countries could provide valuable insights into effective waste management strategies and their implementation.
- Research should evaluate the effectiveness of training programs on hygiene and waste management for both inmates and staff, focusing on knowledge retention and behavior change.
- Further studies should explore the public health implications of infectious disease transmission from prisons to surrounding communities, assessing the broader impact on community health.

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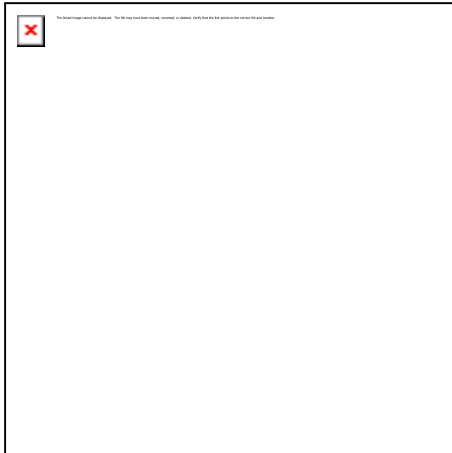
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Appendix 1: Research Questionnaire



Questionnaire

My name is Lennox Munashe Gate, registration number (B201444B), from Bindura University of Science Education, Faculty of Agriculture and Environmental Science. I am conducting a survey to gather preliminary information on the challenges, public perceptions, and practices related to waste management at Bindura Prison, Bindura, Zimbabwe.

This study aims to enhance understanding of waste management issues, their impacts, and effective waste management practices at Bindura Prison.

- Participating in this study is completely voluntary. Even if you decide to participate now, you may change your mind and stop at any time.
- Please read the instructions carefully before answering each question.

Date: _____

Location: Bindura Prison

Participant ID: _____

Instructions: Please fill out the following questionnaire by selecting the most appropriate response.

Water Supply

1.1 Are there any restrictions on the use of water in the prison? () Yes () No

1.2 Can inmates store water for use at night? () Yes () No

1.3 Do all inmates have free access to clean water? () Yes () No

1.4 Do you have access to clean water? () Yes () No

Sanitation

2.1 Can inmates wash their hands after using the toilet? () Yes () No

2.2 Do you have access to soap or handwashing facilities? () Yes () No

2.3 Is soap regularly provided to inmates for personal hygiene? () Yes () No

2.4 Is there at least one toilet per 40 inmates? () Yes () No

Waste management

3.1 Are there any strategic waste management practices in place? () Yes () No

3.2 Are you aware of proper waste disposal methods? () Yes () No

3.3 Is refuse/ waste collected regularly in the prison? () Yes () No

3.4 Is there is a waste management policy in place? () Yes () No

Inmates health

4.1 Are inmates with respiratory illnesses housed together with other inmates? () Yes () No

4.2 Are there cases of respiratory disease among inmates? () Yes () No

4.3 Are there cases of skin disease among inmates? () Yes () No

4.4 Have you ever suffered from health issues due to poor sanitation or waste management? ()

Yes () No

Food storage and Environmental Risk

5.1 Are vectors of disease (like flies or rodents) considered a problem in the prison? () Yes () No

5.2 Do the inmates receive health or sanitation education? () Yes () No

5.3 Are the food storage areas clean? () Yes () No

5.4 Is the kitchen regularly washed or disinfected? () Yes () No

Section ii: Observation

1. Are the toilets clean and is soap available?

.....

2. Are waste bins available and is there evidence of waste segregation?

.....

3. Living quarters ventilation, is it adequate with the current population rate?

.....

Appendix 2: Interview Guide Current waste management practices

1. What are the key barriers Bindura Prison is facing during waste management program implementation?

- i) Lack of personnel to implement waste management policies
- ii) Security measure in place
- iii) dilapidated facilities
- iv) Legislative mandates that interfere with waste management efforts
- v) Budget or cost concerns
- vi) Other

2. State of Sanitation Facilities:

- a) How would you assess the current state of sanitation facilities in the prison?

3. Training and Capacity Building:

- b) How would knowledge and skills impact the health outcomes in the prison?

Appendix 3: Training Evaluation Form

Date: _____

Location: Bindura Prison

Trainer: _____

1. Pre-Training Knowledge Level:

- a) Waste management knowledge: () *Low* () *Moderate* () *High*
- b) Hygiene practices knowledge: () *Low* () *Moderate* () *High*

2. Post-Training Knowledge Level:

- a) Waste management knowledge: () *Low* () *Moderate* () *High*
- b) Hygiene practices knowledge: () *Low* () *Moderate* () *High*

3. Behavioral Intentions:

- a) Likelihood of applying learned practices: () *Very likely* () *Likely* () *Neutral* () *Unlikely*