AFRICAN JOURNAL OF SCIENCE, TECHNOLOGY AND SOCIAL SCIENCES

Journal website: https://journals.must.ac.ke

A Publication of Meru University of Science and Technology

Situational analysis of occupational safety, health, and dignity of sanitation workers: a case of Mukuru kwa Reuben Slums, Nairobi, Kenya

Alex Mutahi Ngatia[1*], Fiona Anciano[2], Dorothy Kagendo[1] and Joy Riungu[1]

[1]Meru University of Science and Technology, Meru, Kenya [2]University of the Western Cape, Cape Town, South Africa

ARTICLE INFO

KEYWORDS

Occupational Safety and Health

Work Dignity

Sanitation Workers

WASH

Mukuru kwa Reuben

Slums

ABSTRACT

The safety, health, and dignity of sanitation workers, despite being critical to global sanitation efforts, have long been neglected. This study sought to assess the occupational hazards faced by sanitation workers in informal settlements as well as examining factors associated with the state of occupational safety, health, and dignity of the informal settlement sanitation workers. The study adopted a mixed-methods approach, combining qualitative and quantitative data to provide a holistic understanding of the issues. It employed a case study method to explore the specific challenges faced by sanitation workers in Mukuru slums, considering socioeconomic, environmental, cultural, and policy factors. A sample of 40 sanitation workers was selected for the study based on purposive snowballing technique. Data collection was by use of semi-structured questionnaires, observation, and interviews. The findings revealed significant occupational hazards faced by sanitation workers, including chemical exposure, psychosocial challenges, physical injuries, and biological risks. Socioeconomic factors such as low income and limited education contributed to the workers' vulnerability, while social stigma and discrimination negatively impacted their dignity. Based on the research findings, several recommendations are proposed. These include enhancing training and awareness programs, providing access to personal protective equipment, improving working

Introduction

The sanitation sector plays a vital role in the maintenance of public health, environmental sustainability, and the overall well-being of communities. Over 2.3 billion people lacked access to basic sanitation by 2015 (World Bank, 2022). United Nations member states adopted 17 Sustainable Development Goals (SDGs) in 2015 to address this shortcoming and forge a way forward in terms of accelerating global development. According to the WHO and UNICEF (2019), approximately 4.2 billion people worldwide lack access to safely managed sanitation services. Inadequate sanitation facilities and practices contribute to the improper disposal of faecal waste, adding to the spread of health risks. Rapid urbanisation continues to add to the challenges of sanitation in both peri-urban and urban contexts. Regionally, Sub-

*Corresponding author: Alex Mutahi Ngatia Email: alex.ngatia23@gmail.com

https://doi.org/10.58506/ajstss.v2i2.169

Saharan Africa is fast urbanizing concurrently with rapid population expansion. consequently, faecal waste management is facing significant challenge due to immense pressure placed on scantily available sanitation services, and the inadequacy of the infrastructure having a direct impact on the safety and health of sanitation workers (AfDB, 2017).

In Kenya, urban centres have witnessed significant growth and urban migration, leading to the emergence of informal settlements such as Mukuru kwa Reuben. Such settlements are distinctively characterised by overcrowding, limited access to basic services such as safely managed sanitation, and deplorable living conditions. Sanitation workers working in these settings face even more complex challenges, as faecal sludge management in informal settlements tends to be less organised and in hazardous environment. In these areas, sanitation workers often operate in challenging conditions, with some handling faecal waste manually or using rudimentary tools, without adequate protective measures (Gautam et al., 2021). Some of the occupational hazards that the sanitation workers in these informal settlements safe include; low societal recognition, stigma, and marginalisation. Their work is often undervalued and misunderstood, leading to a lack of respect and inadequate support systems.

Numerous studies have explored the occupational hazards faced by sanitation workers along the sanitation value chain (Acharya, 2019; Dalberg Advisors, 2017; DIAGNE et al., 2019; Mahase, 2021; Raghavendra & Kumar, 2022b; Shrivastava & Shrivastava, 2020). The sanitation value chain encompasses a range of labour-intensive tasks, exposing sanitation works to various occupational hazards. Oza et al., (2022) and Diagne et al., (2019)conducted a systematic literature review and highlighted physical risks such as musculoskeletal disorders and accidents, along with chemical hazards arising from exposure to harmful substances. They are prone to sustaining injuries from cuts and bruises due to exposure to unsafe materials such used medical needles, shards of glass and broken metallic materials. The manual handling of heavy waste containers and equipment poses significant physical risks to sanitation workers, often leading to musculoskeletal issues (Nayak. et al., 2013; WaterAid, 2019; World Bank et al., 2019; Yan et al., 2015). Furthermore, inadequate faecal waste management practices can result in exposure to harmful pathogens and toxic chemicals, endangering the health of these workers (Burt et al., n.d.; Sklar et al., 2019).

Socio-economic factors, including abject poverty, limited healthcare access, and inadequate education, contribute to subpar occupational safety and health (OSH) outcomes for sanitation workers. Poverty is prevalent in low- and middle-income economies, where these workers often hail from impoverished communities. Exposure to hazardous conditions, such as noxious gases and disease-causing agents, can lead to occupational diseases (Saldanha et al., 2022). Insufficient healthcare access heightens risks; exposure to contaminated waste raises the likelihood of diseases like hepatitis A, with delayed treatment due to limited medical care (Gomathi & Kamala, 2020; Hassanein et al., 2019; Tolera et al., 2023). Cultural stigmatization further hampers OSH, as sanitation workers endure exclusion and discrimination (Acharya, 2019; Mahase, 2021; Muhammad, 2022; Nelson et al., n.d.; Patwary et al., 2021). Weak regulations, corruption, poor waste management, and inadequate awareness compound these issues (World Bank et al., 2019).

Given the critical role of sanitation workers in management of faecal sludge, it is crucial to address their occupational safety, health, and dignity issues. They play an invaluable role in facilitating the link between sanitation infrastructure and the provision of sanitation services (World Bank, 2019; Yan et al., 2015). They are the workforce responsible for the provision of the essential public service and maintenance of sanitation systems (World Bank, 2019). This research focused on this specific aspect of sanitation management so as to identify the challenges faced and propose target-

ed interventions to improve their working conditions.

Problem statement

Although sanitation is globally acknowledged as key to health and wellbeing among humans, safety, health, and dignity of sanitation workers have for long remained a distant priority to many. In India, studies by World Bank, (2019) and Raghavendra & Kumar (2022) highlights some of the challenges faced by sanitation workers. These include vulnerability to extortion and poor pays for work done. Fundamental to performance of the sanitation value chain and ultimate progress toward realisation of the aspirations of CWIS outcomes and SDG 6.2 are the sanitation workers. World Bank (2019) reveals that sanitation workers in some countries in Africa and Asia face various challenges and risks in their work. It also highlights areas for action among them being knowledge gap, empowerment and building the evidence so as to contribute to the improvement of the situation of the sanitation workforce. The SDGs raised the bar on sanitation through SDG 6 by ensuring availability of sanitation and water for all by 2030; target 2 of the goal further stressed the importance of striving to achieve access to equitable and adequate hygiene and sanitation for all while giving special attention to the needs of the most vulnerable population (UN 2022). Ironically, the very part of society that is at the forefront of ensuring that sanitation services and systems are often neglected in terms of their safety and health at work and also stigmatised as a result of the nature of their work. In this sense, sanitation workers are the ones in vulnerable situations. There has been a huge disregard for the occupational safety, health, and dignity of sanitation workers, especially in the low-income countries (World Bank, 2019). Among others, studies by Russel et al. (2015), have been done focusing on, for example, sanitation systems and not on sanitation workers. As such, available evidence on occupational health hazards and safety concerns associated with hazardous sanitation work is not substantial. In addition, occupational exposure studies in the past have either been related to the risks associated with pit latrines emptying (Buckley *et al.,* 2008) or comparisons of different technologies. Moreover, assessments such as QMRA have in the past focused on hazards from sanitation work through such exposure pathways as agriculture (Dreschsel *et al.,* 2008; Katukiza *et al*., 2014).

In the past, much of the research in the sanitation sector has focused on sanitation infrastructure and systems with little attention accorded to a very critical part of the sanitation service chain – the sanitation workers. For a long time now, sanitation workers have remained an invisible and neglected group of society. They often work in very unhealthy, unsafe, and usually suffer stigma due to the nature of their work (Gautam et al., 2021; WaterAid, 2019; World Bank, 2019; Zaqout, 2018; Zaqout et al., 2021). Little research has been undertaken to study the occupational safety, health, and dignity of sanitation workers, both locally and in the larger context of the countries in the Global South (World Bank, 2019). This study seeks to contribute to the filling of this knowledge gap by analysing the dignity, safety, and health situation of sanitation workers in their day-to-day operations in faecal sludge management in Mukuru kwa Reuben slums, Nairobi.

Objectives

The aim of this research was to conduct situational analysis of occupational safety, health, and dignity of sanitation workers in Mukuru slums in Nairobi, Kenya.

Theoretical Framework

In the bustling slums of Mukuru, sanitation workers play a critical role in maintaining cleanliness and public health. However, their job comes with inherent risks to their safety, health, and dignity. This study aimed at assessing the occupational hazards faced by sanitation workers in Mukuru slums, examine factors associated with their current state of occupation, safety, health, and dignity, and appraise existing measures for

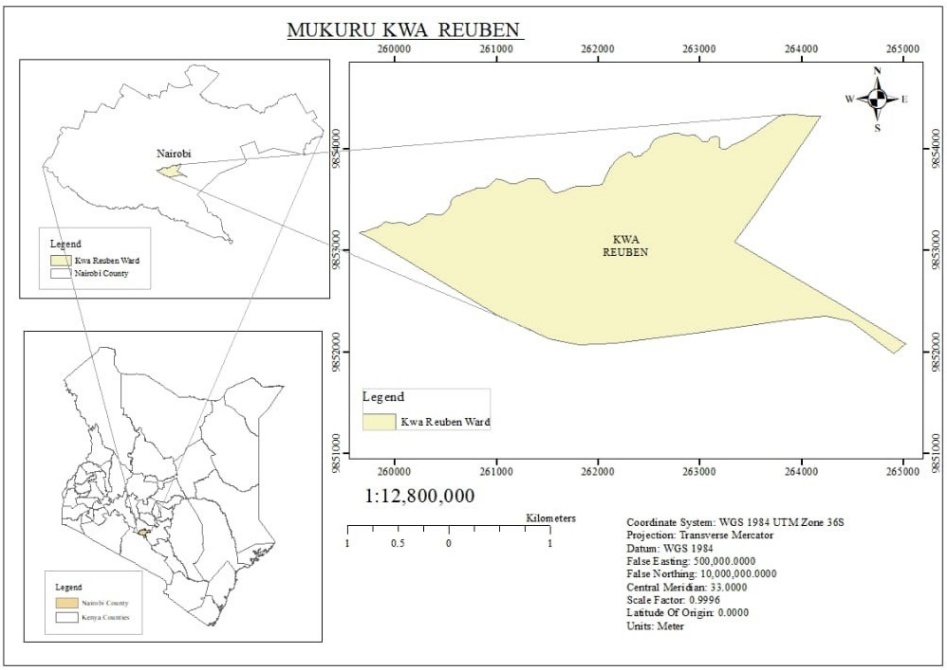

Figure 1 : *Study area - Mukuru Kwa Reuben slums, Nairobi*

their protection. To achieve this, we employed the Health Belief Model (HBM), a theoretical framework that explores individuals' perceptions and beliefs regarding health-related behaviours.

The Health Belief Model (HBM) is a prominent theoretical framework in the field of public health and health behavior research. Developed in the 1950s, the model seeks to understand individuals' decision-making processes related to health behaviors and their subsequent actions. It was initially proposed by social psychologists Irwin M. Rosenstock, Godfrey M. Hochbaum, and Stephen Kegels as they were investigating the factors influencing tuberculosis screening participation (Rosenstock et al., 1956). The HBM is rooted in the concept that people are more likely to take action to prevent or manage a health condition if they perceive themselves to be susceptible to the threat, believe the condition is severe, perceive the benefits of taking action as outweighing the costs, and have confidence in their ability to take action successfully (Glanz et al., 2015). One of the earliest applications of the HBM was in studying tuberculosis screening compliance. Rosenstock et al. (1956) found that individuals were more likely to seek screening if they perceived themselves at risk of tuberculosis, recognized the severity of the disease, and believed that the screening process would be beneficial in detecting and treating it.

Drawing on the Health Belief Model, we analyzed the collected data and interpreted sanitation workers' perceptions and beliefs. Perceived susceptibility to hazards, the severity of risks, perceived benefits of safety measures, perceived barriers, cues to action, and self-efficacy were central to our analysis. By understanding how these factors interact, we can identify key drivers and barriers influencing workers' behaviours related to occupational safety and health.

Research Design

The study adopted a case study research design. The Case Study method, as defined by Yin (1994), involves empirical investigations of contemporary phenomena in their actual settings, particularly when the distinctions between them aren't immediately clear. This approach gathers data from various sources, allowing for a comprehensive understanding of a situation (Yin, 2003).

The Case Study method is characterized by defining the specific case and utilizing diverse evidence sources during data collection and analysis. In this research, the approach is used to delve into the occupational safety, health, and dignity challenges faced by sanitation workers in densely pop-

Sanitation Service Chain				
Toilet/Capture/ Containment	**Emptying**	**Transportation**	**Treatment**	**Reuse/Disposal**
Communal toilet cleaning/maintenance (in plots)	Manual emptying	Manual transport	Faecal sludge	
Public toilet cleaning/maintenance (those in estate centres)	Mechanised emptying	Mechanised transport		
		Sewer and manholes cleaning/maintenance		

Table 1 : *Target types of sanitation workers to include in the research*

ulated settlements (Stake, 2005). The intrinsic case study type is employed to explore the nuances of hazards and impediments (Smith, 1983), aligning with the pursuit of SDGs (SDG 3, 8, 10, 11, 16) in an informal settlement (Wilmot, 2005). The method allows for comprehensive analysis and multiple data sources (Yin, 2003; Njie & Asimira, 2014), suitable for the research's holistic aim (Defra, 2011; Mackinnon, 2019).

Mixed methods approach was chosen for this study. Mixed methods research can allow investigators to address more complex research questions and gather a richer and stronger range of evidence than through use of any single methods on its own. (Yin 2018). It is an ideal approach to enable the combination of fundamentals of qualitative and quantitative approaches for breadth and depth of understanding of the problem being studied (Creswell, 2006). A slum is defined by UN-Habitat as a continuous settlement that has subpar living standard, insufficient access to basic amenities, and uncertain land tenure(UN Habitat, 2007). Mukuru is the second largest informal settlement in Kenya, comprising of, Mukuru Kwa Njenga, Mukuru Kwa Reuben, Mukuru Kayaba, Viwandani, Fuata Nyayo and Mariguini (Corburn et al., 2017). Mukuru Kwa Reuben is among the largest informal settlements in Nairobi, Kenya. It is located in the Embakasi South and Makadara subcounties of Nairobi (Corburn et al., 2020; Joshi et al., 2022a; Pashayan & Ordu, 2023). It is in the south-eastern part of the city. It has a population of over 700,000 people living in crowded conditions (Chumo et al., 2021).It is part of the larger Mukuru slums, covers almost 650 acres, and is home to at least 26,699 households (KNBS, 2019a, 2019b; Muhatiah, 2021). Mukuru kwa Reuben is characterised by dilapidated housing, poor drainage conditions, and flooding (Corburn et al., 2020; Joshi et al., 2022a; Muhatiah, 2021). The area is also prone to several challenges and risks, including rampant insecurity to its residents Many of the slum dwellers in Mukuru work as casual labourers in the manufacturing industries situated close to the slum. Many of the slum dwellers in Mukuru work as casual labourers in the manufacturing industries situated close to the slum (Joshi et al., 2022b). This research focused on Mukuru Kwa Reuben.

Target population

This study focused on sanitation workers involved in various parts across the five building blocks of the sanitation service value chain (toilet/ containment, emptying, conveyance, treatment, and end-use/disposal). Sanitation workers targeted had various roles as shown in the table 1

Sample Size and Sampling

In this study sample size was not predetermined but resulted from received information, with data collection continuing until a point of saturation where no new information was forthcoming. This is the appoint of diminishing

return where more data does not automatically lead to generation of additional information as the study progresses (Mason, 2010). At the very least, for qualitative data collection, saturation point "should be the guiding principle" to ensure that researchers collect adequate data for analysis (Mason, 2010; Bowen 2008). As a guide to sample size, Bertraux (1981) and Mason, (2010),) suggests fifteen as the smallest acceptable sample for qualitative research. Other scholars, Ritchie et al. (2003) argue that qualitative samples "lie under fifty", Creswell (1998) suggest a range of 20 to 30. This research adopted Bertraux's (1981) suggested sample size of at least 15 respondents (Mason, 2010). Sampling was based on purposive snowballing where the first respondent was purposively selected then they provided referrals.

Data Collection and Analysis

The data was collected based on guidelines with questions, in both structured and semi-structured questionnaires and interviews for KIIs. Information was also captured by taking notes and by an audio recorder, with the interview being led by the principal researcher until the point where no new information is forthcoming (Bryman, 2012).

Both qualitative and quantitative data were collected for this study. Consequently, analyses procedures for both types of data were applied to produce results in this study. Recorded information transcribed, including considering translation of information captured in Swahili into English. For data anlysis, quantitative data was analysed using SPSS while qualitative data was subjected to NVivo and analysed systematically with its meaning being interpreted through use of the qualitative content analysis. This was done by organising information as instances of the groupings of a coding frame (Schreier, 2012). Descriptive statistics were used to describe the study sample characteristics. They were generated in form of percentages and frequencies. The study involved both primary and secondary data. Primary data collection included semi-structured and structured interviews and observations. These were guided by the elements of the interview protocols developed prior to going to the field for data collection. Secondary data sources included official reports, census data and other relevant publications.

Ethical Considerations

Research ethics revolve around planning, conduct, and reporting. Essentially, research ethics ensure the protection of human and/or animal subjects by ensuring participants are not harmed; observing informed consent; non-invasion of privacy of participants; and being truthful to participants (Dienner et al., 1985). To ensure all ethical considerations were observed, study approvals and ethical clearance were sought from National Commission for Science, Technology, and Innovation (NACOSTI). Participants were given full information about the study before signing informed consent paperwork. Informed consent was sought before interviews could be conducted. Adequate safeguards of confidentiality were applied.

Results and Discussions

Demographic Information

The results indicate that majority of the respondents (77.5%) were tenants. Information on the nature of residence was deemed important since it correlates with the type of sanitation facility used by the household. This agrees with the findings of Ssemugabo et al., (2021) who noted that a significant association existed between sanitation facilities. In particular, they indicated that households that lived in their own house were 1.9 times more likely to have improved sanitation facilities compared to those that lived in rented houses. The major age group was 18 – 35 years, that is 52.5%, cumulatively, those aged under 50 years were 85.0%. This shows that youth are the ones who are majorly involved as sanitation workers in Mukuru slums. This is in line with findings of a study done by Sukhadeo (2021) for the International Labour Organisation (ILO) in South Asia, which indicated that majority of the sanitation

workers were aged between 15 – 59 years. Degavi et al., (2021) also found the dominant age of sanitation workers to be between 18—- 45 years in their study carried out in Ethiopia. In terms of regilion, majority were Christians (90.0%). This is tandem with findings of a study by Sukhadeo (2021) in South Asia which indicated that majority of the sanitation workers in countries like India and Pakistan were Christians. For example, in Pakistan, adverts proclaim that "only Christians need apply" for government sanitary posts including dangerous sewer work (ur-Rehman and Abi-Habib, 2020), reinforcing discrimination and subjugation of (converted) Christians involved in cleaning (Butt, 2020; Aqeel and Gill, 2021). In Bangladesh, manual pit emptiers from self-defined Harijan communities ("children of God") are unable to access improved jobs on mechanical trucks used to empty human waste, with some reverting back to using buckets and spades (Zaqout et al., 2021).

Occupational Hazards faced by Sanitation Workers

The study sought to assess the occupational hazards faced by sanitation workers in Mukuru slums. The results shown in table 2 show that majority of the hazards were chemical (40.0%) while the least were biological (10.0%), psychosocial hazards were 27.5%, while 22.5% of the occupational hazards faced by sanitation workers were physical. This agrees with findings by WHO, 202 and Comaru and Werna, (2013) who claimed that in many low- and middle-income countries (LMICs), sanitation workers are more vulnerable due to unregulated or unenforced environmental and labor protections, and lack of occupational health and safety measures.

The respondents were asked in interviews the specific type of biological, chemical, psychosocial, and physical hazards they encountered in the line of duty. One of them said;

"The greatest hazard I encounter during manual emptying of the pits are fresh excreta and noxious gases. These two make my work so difficult and I do not have equipment to protect me from such"

	Frequency	Percent
Biological	4	10.0
Chemical	16	40.0
Physical	9	22.5
Psychosocial	11	27.5
Total	**40**	**100.0**

Table 2 : : *Occupational Hazards faced by Sanitation Worker*

On physical hazards, a respondent said;

"When emptying pits either manually or mechanically, we usually come across hospital needles, broken glasses, pieces of metal and porcelain heavy materials to lift or carry. These often injure us as we work, but we have no option since we earn our daily bread from this work"

Another one added;

"As a sanitation worker, I can speak first-hand about the physical hazards we face in our line of work. Our job involves working in environments that can be potentially dangerous and pose risks to our health and safety. Here are some of the physical hazards commonly encountered by sanitation workers. One of the primary physical hazards is the need to lift and carry heavy objects such as garbage bags, bins*, and equipment. This constant strain on our bodies can lead to musculoskeletal injuries, including back pain, strains, and sprains"*

On working space, a respondent said;

"Working in different environments, including uneven terrains, crowded areas, and slippery surfaces, increases the likelihood of slips, trips, and falls. These accidents can result in injuries ranging from minor bruises to more severe fractures or head injuries."

Regarding chemical hazards, one respondent said;

"Chemical hazards are a significant concern for us sanitation workers. On a daily basis, we come across different types of waste that may contain harmful chemicals, such as cleaning agents, pesticides, solvents, and even unknown substances. These chemicals can pose serious risks to our

health and safety if not properly managed. One of the main challenges we face is the lack of information about the specific chemicals present in the waste we handle. Often, we have limited knowledge about the potential hazards associated with certain materials, which makes it difficult to take appropriate precautions. This lack of awareness and training regarding chemical hazards puts us at a higher risk of exposure and related health problems. Furthermore, the absence of proper waste segregation and labeling systems compounds the chemical hazards we face. Sometimes, hazardous materials get mixed with regular waste, and without clear identification, it becomes challenging to differentiate and handle them safely. This lack of awareness and proper waste management practices increases the likelihood of accidental exposure to harmful substances."

Factors Associated with the current state of OSH and dignity of Sanitation Worker

The study also examined factors associated with the current state of OSH and dignity of sanitation workers in Mukuru slums. The factors considered were; policy and regulatory factors, cultural factors, environmental factors, and socioeconomic factors. Respondents were asked to respond to questions regarding all the above factors and the findings are presented follows.

a) Socioeconomic Factors

Socioeconomic factors significantly impact sanitation workers, affecting their working conditions and well-being. Low income and poverty hinder access to crucial resources like personal protective equipment (PPE) and healthcare, while educational disparities limit safety understanding and advocacy. Discrimination compounds challenges. A substantial portion (85.0%) lacked PPE, exposing them to health risks and injuries (Table 3). Similar findings by Degavi et al. (2021) show sanitation workers may not use provided PPE due to misconceptions affecting their job security. Inadequacy, infrequent provision, and economic constraints contribute to non-usage, amplifying their vulnerability.

	Frequency	Percent
Yes	6	15.0
No	34	85.0
Total	**40**	**100.0**

Table 3 : *Availability of personal protective equipment for use by the workers.*

Findings from the interviews showed that personal protective equipment play a significant role in the current state of OSH and dignity of sanitation workers in Mukuru kwa Reuben slums. One respondent said;

"Lack of gloves and masks makes it tough for me to work in utility access holes and emptying of pits. It puts me at a greater risk of contracting diseases due to inhalation of bad gases as well as being cut by glasses that are usually thrown in pit latrines"

The study aimed to assess how income and poverty levels impact sanitation workers' occupational safety and health (OSH) and dignity. The majority of respondents (65.0%) stated that income and poverty greatly influenced OSH and dignity, with 27.5% reporting a very significant im-

		Frequency	Percent
Extent of Influence of Income and Poverty Levels on State of OSH and Dignity	Very great extent	11	27.5
	Great extent	26	65.0
	Little extent	3	7.5
	Very little extent	0	0.0
	Not at all	0	0.0
	Total	**40**	**100.0**

Table 4 : *Extent of Influence of Income and Poverty Levels on State of OSH and Dignity*

		Frequency	Percent
Workers training on sanitation	Yes	11	27.5
	No	29	72.5
	Total	**40**	**100.0**

Table 5 : *Status of workers training on sanitation*

		Frequency	Percent
Perception on exposure to occupational hazards	Yes	37	92.5
	No	3	7.5
	Total	**40**	**100.0**

Table 6 : *Perception on exposure to occupational hazards*

		Frequency	Percent
Are your working conditions good?	Yes	8	20.0
	No	32	80.0
	Total	**40**	**100.0**

Table 7 : *Perception on working conditions of the sanitation workers*

pact (Table 4). Low income and poverty have profound consequences for sanitation workers, affecting various aspects of their lives. Financial constraints hinder access to essential resources like personal protective equipment (PPE), crucial for hazard protection. Additionally, poverty increases vulnerability to hazardous conditions due to limited safety measures and inadequate training, heightening risks of accidents and health issues (Tadesse, 2006; Abdalla et al., 2021).

Respondents were asked to indicated if they had been trained on the job that they do, and the results are shown in table 5. The majority of respondents indicated a lack of adequate training programs for sanitation workers. Insufficient training regarding safety protocols, waste handling techniques, and the use of protective equipment leaves workers ill-prepared to mitigate occupational risks effectively. This is in line with the findings of a study by Zaqout et al., (2022) who found that in Africa, very few countries have majority of their sanitation workers having gone training.

Environmental Factors

Environmental factors can have a significant influence on the state of occupational safety and health (OSH) and the dignity of sanitation workers. Respondents were asked to indicated if they were exposed to occupational hazards, and the results are shown in table 6. It is shown that majority of the sanitation workers (92.5%) in Mukuru slums are exposed to multiple occupational hazards. This corroborates findings of a study by APHRC (2020) which claimed that sanitation workers are exposed to numerous diseases as well as hazardous gases, chemicals, cuts, abrasions, and other injuries due to the nature of their job.

The findings from the interviews showed that the sanitation workers reported exposure to hazardous substances, physical injuries caused by sharp objects and heavy machinery, respiratory problems due to poor air quality, and the risk of contracting diseases from waste materials.

Respondents were asked to indicated if their working conditions were good. The results are shown in table 7

Table 7 results report that majority of the sanitation workers (80.0%) feel their working conditions are not good.

Interview responses reported that the working conditions for sanitation workers in Mukuru slums were extremely challenging. One respondent said;

> *"We go through strenuous physical labour, long working hours, exposure to extreme weather conditions, and the need to handle heavy loads".*

Additionally, workers mentioned working in confined spaces and unsanitary environments, which further impact their well-being.

In conclusion, the physical environment in which sanitation workers operate can pose various hazards to their health and safety. These hazards include exposure to harmful chemicals, biological agents, sharp objects, heavy machinery, and unsafe working conditions. Poor waste management practices, inadequate ventilation, and lack of proper infrastructure can increase the risk

		Frequency	Percent
Do you face social stigma and discrimination?	Yes	27	67.5
	No	13	32.5
	Total	**40**	**100.0**

Table 8 : *Perception on stigma and discrimination by sanitation workers*

		Frequency	Percent
Extent of Influence of Cultural Factors on State of OSH and Dignity	Very great extent	0	0.0
	Great extent	5	1.25
	Little extent	23	57.5
	Very little extent	9	2.25
	Not at all	3	7.5
	Total	**40**	**100.0**

Table 9 : *Perception on the extend of influence of cultural factors on state of OSH and dignity*

		Frequency	Percent
Do you have any legal protection?	No	27	67.5
	Yes	13	32.5
	Total	**40**	**100.0**

Table 10 : *Perception on state of legal protection by sanitation workers*

of accidents, injuries, and occupational illnesses.

b) Cultural Factors

Cultural factors play a significant role in influencing the state of occupational safety and health (OSH) and the dignity of sanitation workers. Respondents were asked to indicated if they faced social stigma and discrimination in their work. The results are shown in table 8. It is seen that that 67.5% of the sanitation workers faced social stigma and discrimination. This is line with a study by Philippe (2021) and concluded that sanitation workers faced pervasive stigma and discrimination related to their profession.

In the interviews, respondents indicated that sanitation workers in Mukuru slums face social stigma and discrimination. They reported being marginalized and excluded from society due to the nature of their work. Such stigma affects their dignity and overall well-being. One respondent said;

"Social stigma and discrimination are prevalent challenges faced by sanitation workers in Mukuru slums. We are often perceived negatively due to the nature of our work, which involves handling waste and maintaining cleanliness in the community. This perception leads to various forms of discrimination and stigmatization, both within the slum community and sometimes even in wider society."

Asked to comment further on how the social stigma and discrimination affects their daily lives, the respondent added;

"The social stigma and discrimination have a significant impact on my daily life. Firstly, it affects my self-esteem and mental well-being. Constantly being looked down upon and facing derogatory attitudes takes a toll on my confidence and can lead to feelings of shame and inferiority. It also hinders my social integration and participation in community activities, as we are often excluded or treated differently by others."

The respondents were also asked to indicate the extent to which they felt cultural factors influenced state of OSH and dignity of sanitation workers

The majority of respondents indicated that cultural factors influenced state of OSH and dignity of sanitation workers to a little extent. This is summarized in Table 9.

c) Policy and Regulatory Factors

Policy and network factors have a significant influence on the state of occupational safety and health (OSH) and the dignity of sanitation workers. Respondents were asked to indicate if they have any legal protection. The results shown in table 10 indicates that 67.5% of the respondents did not have any legal protection. These findings

align with other sources. The Global report confirmed that few countries have guidelines specific to sanitation workers (World bank et al., 2019). The ILO report showed that enforcement of occupational regulations is a challenge in many parts of the world and is caused by various factors, including governments not having enough inspectors to police numerous small and individual service providers Comaru & Werna, (2013). Botchwey's study highlighted the impact of poor regulation enforcement on sanitation workers in Ghana, with sanitation workers not provided with a permanent position after completing the maximum authorised time for employment as a casual worker (NWASKO. 2013). The sanitation workers described feeling taken advantage of and unsafe.

Respondents in the interviews mentioned the absence of comprehensive labor laws and enforcement mechanisms to safeguard the rights and safety of workers. This lack of legal protection contributes to the vulnerability of sanitation workers in the area. In addition, effective legal frameworks establish standards for workplace safety, enforce compliance with safety guidelines, and hold employers accountable for providing a safe working environment. Clear policies addressing issues such as wages, working hours, and social protection can also contribute to the dignity of sanitation workers.

Conclusion

In conclusion, this study shed light on the occupational hazards faced by sanitation workers and the factors associated with the current state of occupational safety and health (OSH) and dignity in Mukuru slums. The findings revealed that sanitation workers encounter various occupational hazards, with chemical hazards being the most common, followed by psychosocial, physical, and biological hazards. Socioeconomic factors emerged as key influencers of the state of OSH and dignity for sanitation workers. Low income and limited education were identified as significant challenges. The inability to afford personal protective equipment and a lack of understanding about the risks they face due to limited education and training put sanitation workers at increased risk. Environmental factors, including poor working conditions and occupational hazards, were also found to negatively impact their well-being. Cultural factors, particularly social stigma, and discrimination, were identified as significant barriers to the dignity of sanitation workers. The nature of their job often leads to stigmatization and exclusion from communal activities, resulting in reduced confidence and social isolation. Policy and regulatory factors highlighted the lack of legal protection and awareness among sanitation workers, with respondents indicating a lack of knowledge about government bodies or policies that protect their rights.

Recommendations

Based on the findings of the study regarding occupational hazards faced by sanitation workers, factors associated with the current state of occupational safety and health (OSH) and dignity, as well as the lack of occupational safety and health measures, the following recommendations are proposed:

i) Enhance Training and Awareness: Develop comprehensive training programs to educate sanitation workers about the occupational hazards they face and the importance of adhering to safety protocols. These programs should cover topics such as handling chemicals, safe waste disposal practices, and the proper use of personal protective equipment (PPE). Additionally, awareness campaigns should be conducted to challenge social stigma and discrimination, promoting a more inclusive and respectful environment for sanitation workers.

ii) Provide Access to PPE: Ensure that sanitation workers have access to appropriate personal protective equipment (PPE) such as gloves, masks, boots, and protective clothing. Government agencies, non-governmental organizations, and employers should work together to provide subsidized

or free PPE to sanitation workers, particularly those with low incomes and self-employed workers who may struggle to afford it.

iii) Improve Working Conditions: Address the environmental factors that contribute to poor working conditions for sanitation workers. This includes improving sanitation infrastructure, waste management systems, and providing appropriate facilities for rest, hygiene, and sanitation at their workplaces. Regular maintenance and inspections should be conducted to identify and rectify hazards and ensure a safe working environment.

By implementing these recommendations, policymakers, government agencies, employers, and relevant stakeholders can contribute to improving the state of OSH, protecting the dignity, and promoting the well-being of sanitation workers. These measures will enhance their working conditions, reduce occupational hazards, and ensure that their vital contributions to society are recognized and valued.

References

Abubakar, I. R., Maniruzzaman, K. M., Dano, U. L., AlShihri, F. S., AlShammari, M. S., Ahmed, S. M. S., ... & Alrawaf, T. I. (2022). Environmental sustainability impacts of solid waste management practices in the global South. International Journal of Environmental Research and Public Health, 19(19), 12717.

Acharya, S. S. (2019). Health, Safety and Well-Being of Sanitation Workers–Realities of Historical Exclusion and Livelihoods. In *Health, Safety and Well-Being of Workers in the Informal Sector in India*. https://doi.org/10.1007/978-981-13-8421-9_16

Adams, E. A., Price, H., & Stoler, J. (2019). Urban slums, drinking water, and health: Trends and lessons from Sub-Saharan Africa. In *Handbook of Global Urban Health*. https://doi.org/10.4324/9781315465456-34

AMCOW. (2021). African Sanitation Policy Guidelines. Abuja, Nigeria.

Bryman, A. (2012). Social research methods (4th ed.). Oxford: Oxford University Press; (Interview guidelines).

Burt, Z., Sklar, R., & Murray, A. (n.d.). *Costs and Willingness to Pay for Pit Latrine Emptying Services in Kigali, Rwanda*. https://doi.org/10.3390/ijerph16234738

Chumo, I., Simiyu, S., Gitau, H., Kisiangani, I., Muindi, C. K. K., & Mberu, B. (2021). Manual Pit Emptiers and Their Heath: Profiles, Determinants and Interventions. *World Academy of Science, Engineering and Technology International Journal of Medical and Health Sciences*, *15*(6), 207–2013. https://publications.waset.org/10012095/manual-pit-emptiers-and-their-heath-profiles-determinants-and-interventions

Clark, T. (2008). *'We're Over-Researched Here!' Exploring Accounts of Research Fatigue within Qualitative Research Engagements*. https://doi.org/10.1177/0038038508094573

Corburn, J., Agoe, V., Ruiz, M., Ortiz, A. J., Patterson, R., Wa, M., Muungano Wa Wanavijiji, W., Kimani, J. W., Kilion, J., Githiri, N. G., Makau, J., Weru, J., Njoroge, P., Kairuki, K., Ngau, P., Mwaura, M., Kinya, D., Bosibori, B., Kang'ethe, I., ... Kano, M. (2017). *Mukuru Settlement Situation Analysis: Report Authors*. http://sdinet.orghttp://akibamashinani.orghttp://urbanplanning.uonbi.ac.kehttp://www.strathmore.edu/en/

Corburn, J., Vlahov, D., Mberu, B., Riley, L., Teixeira Caiaffa, W., Faiz Rashid, S., Ko, A., Patel, S., Jukur, S., Martínez-Herrera, E., Jayasinghe, S., Agarwal, S., Nguendo-Yongsi, B., Weru, J., Ouma, S., Edmundo, K., Oni, T., Ayad, H., Corburn, J., ... Weru Akiba Mashinani Trust, J. (2020). Slum Health: Arresting COVID-19 and Improving Well-Being in Urban Informal Settlements. *J Urban Health*. https://doi.org/10.1007/s11524-020-00438-6

Crane, R. J., Jones, K. D., & Berkley, J. A. (2015). Environmental enteric dysfunction: An overview. Food and Nutrition Bulletin, 36

(1_suppl1), S76-S87.

Dalberg Advisors. (2017). *Understanding Indian sanitation workers, and finding solutions for their challenges*. https://dalberg.com/our-ideas/understanding-indian-sanitation-workers-and-finding-solutions-their-challenges/

Danaei, G., Andrews, K. G., Sudfeld, C. R., Fink, G., McCoy, D. C., Peet, E., ... & Fawzi, W. W. (2016). Risk factors for childhood stunting in 137 developing countries: A comparative risk assessment analysis at global, regional, and country levels. PLoS Medicine, 13(11), e1002164.

DEFRA. (2011, November 7). Guidelines for Environmental Risk Assessment and management: Green Leaves III. GOV.UK. Retrieved October 26, 2022, from https://www.gov.uk/government/publications/guidelines-for-environmental-risk-assessment-and-management-green-leaves-iii

Degavi, G., Debbarma, S., Gelchu Adola, S., Loka Safayi, B., Gemeda, U., & Utura, T. (2021). Occupational hazards and its relation with health-seeking and practicing behaviors among sanitary workers in Southern, Ethiopia. *International Journal of Africa Nursing Sciences*, *15*. https://doi.org/10.1016/j.ijans.2021.100339

Desai, R., McFarlane, C., & Graham, S. (2015). The politics of open defecation: informality, body, and infrastructure in Mumbai. Antipode, 47(1), 98-120.

DIAGNE, N. A., GAMBRILL, M., THOMAS, S., & KENNEDY-WALKER, R. (2019). *The health, safety and dignity of sanitation workers: a blind spot in safely managed sanitation*. https://blogs.worldbank.org/water/sanitation-workers

Doug Parker. (2023, February 17). *The Past and Future of Workplace Safety for Black Americans*.

Eales, K. (n.d.). *Bringing pit emptying out of the darkness: A comparison of approaches in Durban, South Africa and Kibera*. BPD.

Gautam, M., Wankhade, K., Sarangan, G., & Sudhakar, S. (2021). Framework for addressing occupational safety of de-sludging operators: A study in two Indian cities. *Journal of Environmental Management*, *289*, 112243. https://doi.org/10.1016/j.jenvman.2021.112243

Girmay, A. M., Weldegebriel, M. G., Mengesha, S. D., Serte, M. G., Weldetinsae, A., Alemu, Z. A., ... & Tollera, G. (2023). Factors influencing access to basic water, sanitation, and hygiene (WASH) services in schools of Bishoftu Town, Ethiopia: a cross-sectional study. Discover Sustainability, 4(1), 5.

Global advocacy for health, safety and dignity of workers in sanitation WASH and the COVID-19 Pandemic Virtual Symposium. (2021).

Gomathi, P., & Kamala, K. (2020). Threatening Health Impacts and Challenging Life of Sanitary Workers. *Journal of Evolution of Medical and Dental Sciences*, *9*(41), 3055–3061. https://doi.org/10.14260/jemds/2020/669

Harrell, M., Selvaraj, S. A., & Edgar, M. (2020). Danger! Crisis health workers at risk. International journal of environmental research and public health, 17(15), 5270.

Hassanein, F., Masoud, I., & Shehata, A. (2019). Infection hazard of exposure to intestinal parasites, H. pylori and hepatitis viruses among municipal sewage workers: a neglect high risk population. *Parasitologists United Journal*, *12*(2), 130–138. https://doi.org/10.21608/puj.2019.13679.1047

Humphrey, J. H. (2009). Child undernutrition, tropical enteropathy, toilets, and handwashing. The Lancet, 374(9694), 1032-1035.

Jeleff, M., Traugott, M., Jirovsky-Platter, E., Jordakieva, G., & Kutalek, R. (2022). Occupational challenges of healthcare workers during the COVID-19 pandemic: a qualitative study. *BMJ Open*, *12*(3), e054516. https://doi.org/10.1136/bmjopen-2021-054516

Joshi, N., Lopus, S., Hannah, C., Ernst, K. C., Kilungo, A. P., Opiyo, R., Ngayu, M., Davies, J., & Evans, T. (2022a). COVID-19 lockdowns: Employment and business disruptions, water access and hygiene practices in Nairobi's informal settlements. *Social Science & Medicine (1982)*, *308*, 115191. https://doi.org/10.1016/J.SOCSCIMED.2022.115191

KNBS. (2019a). *2019 Kenya Population and Housing Census: Volume II - Distribution of Population by Administrative Units*.

KNBS. (2019b). *VOLUME I: POPULATION BY COUNTY AND SUB-COUNTY*.

Kuddus, M. A., Tynan, E., & McBryde, E. (2020). Urbanization: A problem for the rich and the poor? *Public Health Reviews*, *41*(1). https://doi.org/10.1186/s40985-019-0116-0

Kuffour, R. (2020). OCCUPATIONAL HEALTH AND SAFETY CHALLENGES FACING SANITARY WORKERS IN SEKYERE CENTRAL DISTRICT IN GHANA. *Journal of Environmental and Occupational Health*, *10*(2), 17. https://doi.org/10.5455/jeoh.20190306031559

Lin, S. S., Shen, S. L., Zhou, A., & Xu, Y. S. (2021). Risk assessment and management of excavation system based on fuzzy set theory and machine learning methods. Automation in Construction, 122, 103490.

Lingard, H. (2013). Occupational health, safety and workers' wellbeing. In *Human Resource Management in Construction: Critical Perspectives, Second Edition*. https://doi.org/10.4324/9780203842478

Mahase, E. (2021). Sanitation workers: covid-19's forgotten frontline. *BMJ (Clinical Research Ed.)*, *375*. https://doi.org/10.1136/bmj.n2875

Malik, A., Yasar, A., Tabinda, A. B., & Abubakar, M. (2012). Water-borne diseases, cost of illness and willingness to pay for diseases interventions in rural communities of developing countries. *Iranian Journal of Public Health*, *41*(6), 39–49.

Mallory, A., Omoga, L., Kiogora, D., Riungu, J., Kagendi, D., & Parker, A. (2021). Understanding the role of informal pit emptiers in sanitation in nairobi through case studies in Mukuru and Kibera settlements. *Journal of Water Sanitation and Hygiene for Development*, *11*(1). https://doi.org/10.2166/washdev.2020.193

Mandel, J. L. (2003). Negotiating Expectations in the Field: Gatekeepers, Research Fatigue and Cultural Biases. *Singapore Journal of Tropical Geography*, *24*(2), 198–210. https://doi.org/10.1111/1467-9493.00152

Mandel, J. L. (2003). Negotiating expectations in the field: Gatekeepers, research fatigue and cultural biases. Singapore Journal of Tropical Geography, 24(2), 198–210. https://doi.org/10.1111/1467-9493.00152

Mason, M. (2010). *Sample Size and Saturation in PhD Studies Using Qualitative Interviews*. http://www.qualitative-research.net/

Min, J., Kim, Y., Lee, S., Jang, T. W., Kim, I., & Song, J. (2019). The fourth industrial revolution and its impact on occupational health and safety, worker's compensation and labor conditions. Safety and health at work, 10(4), 400-408.

Molyneux, D. H., Dean, L., Adekeye, O., Stothard, J. R., & Theobald, S. (2018). The changing global landscape of health and disease: Addressing challenges and opportunities for sustaining progress towards control and elimination of neglected tropical diseases (NTDs). Parasitology, 145(13), 1647-1654.

Muhammad, R. (2022, December 30). *Fighting the stigma: Why I chose sanitation work after a postdoctoral degree*. https://www.thenewsminute.com/article/fighting-stigma-why-i-chose-sanitation-work-after-postdoctoral-degree-171435

Muhatiah, W. N. (2021). *UNIVERSITY OF NAIROBI ENHANCING ADAPTIVE CAPACITY OF COMMUNITIES IN INFORMAL SETTLEMENT TO FLOODING: THE CASE OF MUKURU KWA REUBEN IN NAIROBI, KENYA*.

Nankongnab, N., Kongtip, P., Tipayamongkholgul, M., Silpasuwan, P., Kaewboonchoo, O., Luksamijarulkul, P., & Woskie, S. (2021). Occupational hazards, health conditions and personal protective equipment used among healthcare workers in hospitals, Thailand. Human And Ecological Risk Assessment: An International Journal, 27(3), 804-824.

Nayak., S., Shenoi, S., Kaur, G., Bisen, N., Purkayastha, A., & Chalissery, J. (2013). Dermatologic evaluation of street sanitation workers. *Indian Journal of Dermatology*, *58*(3), 246. https://doi.org/10.4103/0019-5154.110888

Nelson, W. /, Wateraid, O., Drik, /, & Haque, H. (n.d.). *The sanitation workers risking their health and lives to provide an essential public service*.

Oza, H. H., Lee, M. G., Boisson, S., Pega, F., Medlicott, K., & Clasen, T. (2022). Occupational health outcomes among sanitation workers: A systematic review and meta-analysis. *International Journal of Hygiene and Environmental Health*, *240*. https://doi.org/10.1016/j.ijheh.2021.113907

Padula, R. S., Comper, M. L. C., Sparer, E. H., & Dennerlein, J. T. (2017). Job rotation designed to prevent musculoskeletal disorders and control risk in manufacturing industries: A systematic review. Applied ergonomics, 58, 386-397.

Pajel, A. (2020). Using PPE correctly and safely. Kai Tiaki Nursing New Zealand, 26(9), 26-28.

Pashayan, A. R., & Ordu, A. U. (2023). *Learning from the people of Nairobi's Mukuru slum*. https://www.brookings.edu/articles/learning-from-the-people-of-nairobis-mukuru-slum/

Patwary, M. M., Hossain, M. R., Shuvo, F. K., Ashraf, S., Sultana, R., & Alam, M. A. (2021). Protecting Sanitation Workers in Low-Middle Income Countries Amid COVID-19. *Annals of Work Exposures and Health*, *65*(4), 492–493. https://doi.org/10.1093/annweh/wxaa128

Philippe, S., Hueso, A., Kafuria, G., Sow, J., Kambou, H. B., Akosu, W., & Beensi, L. (2022b). Challenges Facing Sanitation Workers in Africa: A Four-Country Study. In *Water (Switzerland)* (Vol. 14, Number 22). MDPI. https://doi.org/10.3390/w14223733

Prüss-Üstün, A., Wolf, J., Corvalán, C., Bos, R., & Neira, M. (2016). Preventing disease through healthy environments: A global assessment of the burden of disease from environmental risks. World Health Organization.

Raghavendra, R. H., & Kumar, R. A. (2022a). Sanitation Workers: A Neglected Community of Indian Civilized Society. *Contemporary Voice of Dalit*. https://doi.org/10.1177/2455328X211069683

Raghavendra, R. H., & Kumar, R. A. (2022b). Sanitation Workers: A Neglected Community of Indian Civilized Society. *Contemporary Voice of Dalit*, 2455328X2110696. https://doi.org/10.1177/2455328X211069683

Ramitha, K. L. (2023). Solid waste workers in India and the COVID-19 pandemic: A review of intersecting challenges. Int. J. Occup. Safety Health, 13(1), 126-139.

Rangamani, S., Obalesha, K. B. heemappa, & Gaitonde, R. (2015). Health issues of sanitation workers in a town in Karnataka: Findings from a lay health-monitoring study. *The National Medical Journal of India*, *28*(2), 70–73.

Rangamani, S., Obalesha, K. B., & Gaitonde, R. (2015). Health issues of sanitation workers in a town in Karnataka: Findings from a lay health-monitoring study. The National Medical Journal of India, 28(2), 70–73.

Richard, S. A., Black, R. E., Gilman, R. H., Guerrant, R. L., Kang, G., Lanata, C. F., ... & Childhood Malnutrition and Infection Network. (2013). Diarrhea in early childhood: Short-term association with weight and long-term association with length. American Journal of Epidemiology, 178 (7), 1129-1138.

Saldanha, S., Kirchhelle, C., Webster, E., Vanderslott, S., & Vaz, M. (2022). Between paternalism and illegality: a longitudinal analysis of the role and condition of manual scavengers in India. *BMJ Global Health*, *7*(7), e008733. https://doi.org/10.1136/bmjgh-2022-008733

Schreier, M. (2012). Qualitative content analysis in practice. Sage Publications.

Schreier, M. (2012). *Qualitative Content Analysis in Practice*. www.sagepub.co.uk/schreier

Shao, X., Wen, X., Paek, R., Liu, Y., Jian, Y., & Liu, W. (2022). Use of recirculated air curtains inside ventilated rooms for the isolation of transient contaminant. Energy and Buildings, 273, 112407.

Shrivastava, S., & Shrivastava, P. (2020). Improving the health and safety standards of sanitation workers: Global perspective. *Hamdan Medical Journal*, *13*(3). https://doi.org/10.4103/hmj.hmj_89_19

Simiyu, S., Chumo, I., & Mberu, B. (2021). Fecal Sludge Management in Low Income Settlements: Case Study of Nakuru, Kenya. *Frontiers in Public Health*, *9*. https://doi.org/10.3389/fpubh.2021.750309

Simiyu, S., Chumo, I., & Mberu, B. (2021). Fecal Sludge Management in Low Income Settlements: Case Study of Nakuru, Kenya. Frontiers in Public Health, 9, 750309. https://doi.org/10.3389/fpubh.2021.750309

Simiyu, Sheillah, Chumo, I., & Mberu, B. (2021). Fecal Sludge Management in Low Income Settlements: Case Study of Nakuru, Kenya. *Frontiers in Public Health*, *9*. https://doi.org/10.3389/fpubh.2021.750309

Sing, K. (2021). *Global advocacy for health, safety and dignity of workers in sanitation WASH and the COVID-19 Pandemic Virtual Symposium*.

Sing, K. (2021). Global advocacy for health, safety and dignity of workers in sanitation WASH and the COVID-19 Pandemic Virtual Symposium.

Sklar, R., Zhou, Z., Ndayisaba, W., Muspratt, A., Fuhrmeister, E. R., Nelson, K., & Katharine Hammond, S. (2021). Risk of adenovirus and cryptosporidium ingestion to sanitation workers in a municipal scale non-sewered sanitation process: A case study from kigali, rwanda. *Journal of Water Sanitation and Hygiene for Development*, *11*(4). https://doi.org/10.2166/washdev.2021.241

Sklar, R., Zhou, Z., Zalay, M., Muspratt, A., & Hammond, S. K. (2019). Occupational exposure to endotoxin along a municipal scale fecal sludge collection and resource recovery process in Kigali, Rwanda. *International Journal of Environmental Research and Public Health*, *16*(23). https://doi.org/10.3390/IJERPH16234740

Smith, M. F. (1983). Sampling considerations in evaluating cooperative extension programs. Journal of Extension, 21(4), 45-50.

Strande, L., & Brdjanovic, D. (Eds.). (2014). Faecal sludge management: Systems approach for implementation and operation. IWA Publishing.

Tekade, R. P. (2021). The impact of hazardous waste and it's impact on human health. Int J Res Biosci Agric Technol.

Tolera, S., Mengistu, D. A., Alemu, F. K., Geremew, A., Mulugeta, Y., Dirirsa, G., Temesgen, L. M., Diriba, W., Mulatu, G., Sintie, T., Bayu, K., & Berhanu, A. (2023). Sero-prevalence of hepatitis viral infections among sanitary workers across worldwide: a systematic review and meta-analysis. *BMC Infectious Diseases*, *23*(1). https://doi.org/10.1186/S12879-023-08354-1

UN Habitat. (2007). *UN-Habitat - Twenty First Session of the Governing Council*. https://www.preventionweb.net/files/1700_462551419GC202120What20are20slums.pdf

UN. (2022, April). Transforming our world: The 2030 agenda for sustainable development | Department of Economic and Social Affairs. United Nations. Retrieved October 26, 2022, from https://sdgs.un.org/2030agenda

UNICEF, WHO, & World Bank. (2018). Joint child malnutrition estimates - Levels and trends (2018 edition). Global Database on Child Growth and Malnutrition.

Veloso Neto, H., Arezes, P., & Barkokébas Junior, B. (2021). Safety values, attitudes and behaviours in workers of a waste collection and sanitation company. *Safety Science*, *144*. https://doi.org/10.1016/j.ssci.2021.105471

WaterAid. (2019). *The hidden world of sanitation workers - Media briefing*. https://washmatters.wateraid.org/sites/g/files/jkxoof256/files/the-hidden-world-of-sanitation-workers_1.pdf

WaterAid. (2021). *Assessment of the Health, Safety and Dignity of Sanitation Workers in Kano City, Nigeria*.

WaterAid. (2021). Sanitation workers: The forgotten frontline workers during the COVID-19 pandemic. https://washmatters.wateraid.org/publications/sanitation-workers-forgotten-frontline-workers-covid-19-world-toilet-day

WHO & UNICEF. (2017). *Progress on drinking water, sanitation and hygiene : 2017 update and SDG baselines.* who.int/publications/i/item/9789241512893

Wilmot, A. (2005). Design sampling strategies for social qualitative research: With particular reference to the Office for National Statistics' qualitative respondent register. Office for National Statistics, 220–34. Available from: https://wwwn.cdc.gov/qbank/Quest/2005/Paper23.pdf.

World Bank, ILO, WaterAid, & WHO. (2019). *Health, Safety and Dignity of Sanitation Workers An Initial Assessment*. https://documents1.worldbank.org/curated/en/316451573511660715/pdf/Health-Safety-and-Dignity-of-Sanitation-Workers-An-Initial-Assessment.pdf

World Bank, ILO, WaterAid, & WHO. (2019). Health, Safety and Dignity of Sanitation Workers: An Initial Assessment.

World Bank. (2022). Sanitation. Retrieved October 26, 2022, from https://www.worldbank.org/en/topic/sanitation#1

World Health Organization. (2000). The world health report 2000: health systems: improving performance. World Health Organization.

World Health Organization. (2022). Caring for those who care: guide for the development and implementation of occupational health and safety programmes for health workers.

Yan, Y., Wang, X., Wu, J., & Xu, L. (2015). Occupational skin diseases and prevention among sanitation workers in China. *African Health Sciences*, *15*(3), 768–775. https://doi.org/10.4314/ahs.v15i3.10

Zaqout, M., Cawood, S., Evans, B. E., & Barrington, D. J. (2020). Sustainable sanitation jobs: prospects for enhancing the livelihoods of pit-emptiers in Bangladesh. *Third World Quarterly*, *42*(2), 329–347. https://doi.org/10.1080/01436597.2020.1810560

Zaqout, Mariam, & Hueso, A. (2020). Providing municipal faecal sludge management services: Lessons from Bangladesh. *Waterlines*, *39*(2), 166–179. https://doi.org/10.3362/1756-3488.20-00002

Zaqout, Mariam, Cawood, S., Evans, B. E., & Barrington, D. J. (2021). Sustainable sanitation jobs: prospects for enhancing the livelihoods of pit-emptiers in Bangladesh Sustainable sanitation jobs: prospects for enhancing the livelihoods of pit-emptiers in Bangladesh School of Civil engineering, Faculty of engineering, university of leeds, uK. *Third World QuarTerly*, *42*(2), 329–347. https://doi.org/10.1080/01436597.2020.1810560

Zaqout, Mariam. (2018). *Informal sanitation jobs: the prospects of enhancing the status of pit-emptiers in Bangladesh*.

Ziegelbauer, K., Speich, B., Mäusezahl, D., Bos, R., Keiser, J., & Utzinger, J. (2012). Effect of sanitation on soil-transmitted helminth infection: Systematic review and meta-analysis. PLoS Medicine, 9(1), e1001162