

**THE AVAILABILITY AND ADEQUACY OF WATER, SANITATION AND HYGIENE
(WASH) INFRASTRUCTURE IN 13 MISSION HOSPITALS IN RURAL ZAMBIA.**

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Keywords

Water

Sanitation

Hygiene

Infrastructure

Availability

Adequacy

Mission hospitals

Handwashing

Waste Disposal

Rural Zambia



Acronyms

CLTS-Community Led Total Sanitation

CSO-Centrals Statistical Office of Zambia

GLAAS-Global Analysis and Assessment of Sanitation and Drinking-water

HCAI-Health Care Associated Infection

HCFs- HCFs

IPC-infection prevention control

JMP-Joint Monitoring Programme

LMICs-Low- and Middle-Income Countries

MoH-Ministry of Health

MLGH-Ministry of Local Government and Housing

NUSSP-National Urban Sanitation and Supply Programme

NRWSSP-National Rural Water Supply and Sanitation Programme

OPD-Out Patient Department

SDG-Sustainable Development Goal

UNICEF-United Nations Children's Fund

UN-United Nations

UNZABREC-University of Zambia Biomedical Research Ethics Committee

WASH-Water Sanitation and Hygiene

WHO-World Health Organization



Definition of Terms

Availability of WASH: the presence of a specific infrastructure such as a toilet within the facility or health facility grounds

Adequacy of WASH: the presence of required supplies for the optimal functioning of a specific infrastructure

Basic Water Services: where the main source of water is an improved source, located on premises, from which water is available

Improved Water Source: Improved water sources are those which, by nature of their design and construction, have the potential to deliver safe water. Improved sources include: piped water, boreholes or tube wells, protected dug wells, protected springs, rainwater, and packaged or delivered water

Basic Sanitation Services: availability of improved and usable sanitation facilities, with at least one toilet dedicated for staff, at least one sex-separated toilet with menstrual hygiene facilities, and at least one toilet accessible for users with limited mobility

Improved Sanitation Facilities: facilities designed to hygienically separate excreta from human contact

Basic Hygiene Services: availability of functional hand hygiene facilities available at one or more points of care and within 5 metres of toilets

A hand hygiene facility: any device that enables staff and patients to clean their hands effectively, such as a sink with tap, water tank with tap, bucket with tap or other similar device

Reticulated Water: piped water network

Abstract

Background and Rationale

The World Health Organization (WHO) has shown that the provision of Water Sanitation and Hygiene (WASH) in Health Care Facilities (HCFs) of many low and middle-income countries is poor. This is compounded by the lack of national plans and consolidated data on WASH in HCFs. This study assessed the availability and adequacy of Water Sanitation and Hygiene (WASH) infrastructure in 13 mission hospitals spanning 13 districts in Zambia. The objectives of this study were to identify the different kinds of WASH infrastructure available, and their adequacy, and factors influencing the status of WASH infrastructure and services in the selected hospitals.

Methodology

This study had a mixed methods design with semi-quantitative, descriptive and qualitative components. Assessments were conducted of the WASH infrastructure on the hospital property, and specifically in the male medical wards and outpatient facilities as two tracer areas, using a WHO checklist adapted and administered by the researcher. Checklist items were assigned scores (0=absent/bad to 2=on target/good) and total WASH scores for each facility compiled. For the qualitative component, individual semi-structured interviews using an interview guide were conducted, also by the researcher, with the facility managers and the head staff of the male medical wards.

Results

Overall coverage with an improved water source was reasonably good with 11 of the 13 hospitals reporting availability of improved water sources within the facilities. Hand washing basin coverage was similarly good. In contrast, coverage by well-functioning toilets was not as high, with 5 hospitals reporting toilets that were either broken, blocked, or having no running water and no toilet paper. Facility

WASH scores varied from 22 (38%) to 57 (97%) out of a possible total of 58 points. Most of the Facility Managers indicated that the hospital WASH infrastructure was old, and with frequent breakdowns. This was worsened by lack of readily available spares and materials for repairing once there was a fault.

Conclusion

This study reveals an uneven coverage of WASH across facilities and elements, with poor sanitation a challenge across facilities. This is compounded by ongoing challenges in WASH infrastructure maintenance. Moving forward, there is need for government to develop a clear policy on WASH in HCFs. A national plan with resources and a monitoring framework need to be in place for streamlined support and tracking of progress by all stakeholders.



Declaration

I declare that *The Availability and adequacy of Water, Sanitation and Hygiene (WASH) infrastructure in 13 Mission hospitals in rural Zambia* is my own work, that it has not been submitted for any degree or examination in any other university, and that all the sources I have used or quoted have been indicated and acknowledged by complete references.

Kelvin Hanyinda

June 2019

Signed 



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I would like to show my gratitude by acknowledging the following individuals/institutions:

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Chapter One: Introduction

Background

Access to good water, sanitation and hygiene (WASH) is critical to the health of populations the world over. Various global and national initiatives, through bodies such as the United Nations, have committed to ensuring equitable access to water, sanitation and hygiene for all by the year 2030 under the Sustainable Development Goal (SDG) number six (6). SDG 6 seeks to “ensure availability and sustainable management of water and sanitation for all”. Evidence suggests that investment in WASH has the potential to save lives. In 2008, the World Health Organization (WHO) estimated that improving water, sanitation and hygiene has the potential to prevent at least 9.1% of the disease burden or 6.3% of all deaths globally (Prüss- Üstün, Bros, Gore, Bartram, 2008). Children shoulder a great deal of this burden, accounting for more than 20% of deaths up to the age of 14 years.

One of the fertile grounds for contamination is inadequate WASH facilities and infrastructure at HCFs (HCFs). Evidence shows that basic WASH standards are not always met in HCFs. A 2015 World Health Organization survey entitled *Water Sanitation and Hygiene in HCFs, Status in Low and Middle-Income Countries and way forward*, showed that 38% of HCFs in low and middle-income countries did not have an improved water source, 19% did not have improved sanitation, and 35% did not have water and soap for hand washing (WHO/UNICEF, 2015). Further, the 2014 World Health Organization (UN, 2014) report *Water Global Analysis and Assessment of Sanitation and Drinking-water* found that only 94 out of 194-member countries had data available on WASH in HCFs. Of the countries with data, only 25% had a plan for sanitation in HCFs that is implemented with funding and regular review. Unfortunately, Zambia was not among the reviewed countries as the required data was not available. The 2017 GLAAS Report focused on WASH financing in the 75 assessed countries and only 25 reported government budget allocations at least partially between drinking-water and sanitation. Of the 25 countries, 17 countries that provided data in 2013 showed an increase in WASH budget allocation an expenditure. However, on 5

countries had their WASH budgets disaggregated for WASH in HCFs (UN, 2017).

A lack of, or inadequate national policies on WASH in HCFs translates into non-existent or poorly funded and regularly reviewed national plans (WHO, 2014). From the 2014 WHO report (WHO, 2014), more than half of the surveyed countries had no targets for basic WASH in HCFs. Lack of policies, plans and monitoring systems, and inadequate funding, insufficient staff and ineffective institutional arrangements have together undermined the provision of quality WASH in HCFs. Poor WASH in HCFs has dire consequences for the health of a population. An estimated 15% of patients from developing countries develop one or more infections during a hospital stay (Allegranzi et al, 2011). Poor WASH in HCFs may also discourage utilization of services and lead to staff absenteeism (Velleman et al, 2014).

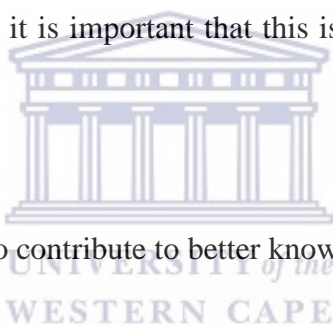
In Zambia, the Ministry of Local Government and Housing (MLGH) is responsible for the provision of Water Supply and Sanitation (WSS) in the country. The legal framework for WSS is fragmented with rural WSS operating under the Local Government Act (Cap 281 of 1991) and urban WSS operating under Water Supply and Sanitation Act (No 28 of 1997), creating possible overlaps or, worse, gaps in service delivery (MLGH, 2015). The Ministry has further acknowledged the lack of clear policy direction, goals, targets, national standards and adequate budgetary resources as factors making delivery of WSS erratic (MLGH, 2015). In addition, the two flagship programmes in the sector, the National Urban Sanitation and Supply Programme (NUSSP), and National Rural Water Supply and Sanitation Programme (NRWSSP), focus only on provision of WASH infrastructure and services in the home, schools and community and not HCFs.

WASH in HCFs has not received much attention in Zambia. This may be because all HCFs are required to follow basic standards, hence any operational health facility may be assumed to have proper water, sanitation and hygiene infrastructure in place. The lack of national data on the situation also means that

it is a challenge for countries like Zambia to set WASH targets for HCFs.

Research Rationale

Proper WASH services in HCFs is important for the prevention of infections and spread of disease, to protect staff and patients, and to uphold the dignity of vulnerable populations, including pregnant women and the disabled (WHO, 2015). Zambia, has a National Water Policy (from the Ministry of Energy and Water Development, 2010), and national programmes for rural and urban water supply and sanitation, but these do not extend to HCFs. Consequently, there is no consolidated national dataset on the status of WASH in HCFs. It is therefore important to understand the status of WASH in HCFs in Zambia for improvements of health outcomes in the facilities. The benefits of improved WASH in infection prevention in HCFs are immense and it is important that this issue starts receiving due attention from policy makers and implementers.



This study was therefore undertaken to contribute to better knowledge of WASH in Zambian HCFs

Study Setting

Zambia, as a developing country faces high levels of poverty and poor access to water, sanitation and hygiene. According to the Ministry of Local Government and Housing (MLGH, 2011) report on Community Led Total Sanitation (CLTS), 80% of diseases in Zambia are environmental and related to water and sanitation. Access to improved sanitation in rural Zambia was estimated at 43% in 2011 (MLGH, 2011) while use of improved sanitation facilities in rural Zambia in 2015 was at a low of 36% (UN, 2017).

The study was conducted in 13 mission rural hospitals across the country, selected specifically because

they are in remote rural areas which do not have government hospitals of a similar size. By default, therefore, these hospitals serve as district hospitals. These are also the hospitals the researcher had access to through his work environment. The hospitals have an average of 100 beds and 90 staff. As indicated, the hospitals operate as district hospitals and are subsidized by the Ministry of Health and supervised by the government District Health Offices under the District Health Directors. The hospital administrative and finance positions are reserved for the church mother bodies running the hospitals while the clinical and support staff are supplied by the Ministry of Health. Drugs and all medical supplies are provided by the Government through the national supply chain system, the Medical Stores Limited. In addition, the hospitals receive a monthly grant from the government to support operations. This, however, does not mean the government supplies and human resource support are adequate, and the hospitals always source support from the church mother bodies to supplement government support. The hospital buildings are owned by the church mother bodies and government does not take responsibility for putting up infrastructure, including WASH. However, the government does provide maintenance services while the supplies have to be sourced by the hospitals themselves. Table 1 below gives more background information about the hospitals under the study.

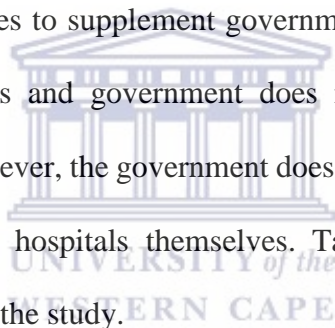


Table 1: Hospitals' Background Information

Hospital	District	No. of Beds	No. of Staff	Catchment Population	Brief Description
St Francis' Mission	Katete District	410	400	200,000	St Francis' is in the rural part of the Eastern Province of Zambia in Katete District. The hospital provides medical and surgical care to the population of the district, as well as accepts referrals from the whole of Eastern Province.
Mwami Mission	Chipata District	210	122	102,000	Mwami Mission is in the rural part of Chipata District of the Eastern Province of Zambia. The hospital provides medical and surgical services to the local population.
Minga Mission	Petauke District	175	133	105,200	Minga Mission Hospital is in rural part Petauke District in the Eastern Province of Zambia.
Chilonga Mission	Mpika District	175	241	162,000	Chilonga Mission hospital is in Muchinga Province of Zambia in the northern part of the country. The hospital is set in the rural district of Mpika.
Katondwe Mission	Luangwa District	60	87	27,000	Katondwe Mission Hospital was established in 1963 in Luangwa District of Lusaka Province and it's a referral centre of 9 outreach Rural Health Centers. The Hospital provides medical and surgical services.
Mpanshya Mission	Rufunsa District	113	94	33, 099	Mpanshya Mission hospital is in Rufunsa District of Lusaka province. The hospital serves as the district hospital for Rufunsa.
Chikuni Mission	Monze District	108	95	39,451	Chikuni is in the rural part of Southern Province in Monze District. The hospital is set within a mission compound, comprising, a radio station, convents, two schools and the hospital.
Macha Mission	Choma District	45	151	84,090	Macha Mission Hospital, owned by the Brethren in Christ Church, is in the rural part of Choma

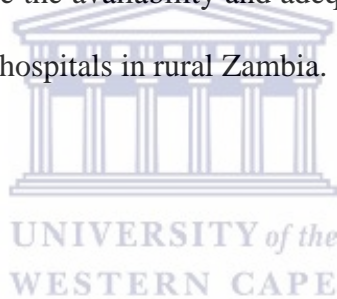
					District in the Southern Province of Zambia.
Mwandi Mission	Mwandi District	89	130	28,330	The Mwandi Mission is in the rural district of Mwandi in the Western Province of Zambia. The hospital serves as the district hospital for Mwandi District. It has wards for men, women, children, TB patients and patients with infectious diseases (primarily children).
Mtendere Mission	Chirundu District	134	191	103,075	Mtendere Mission Hospital is in border district of Chirundu district in Lusaka Province. The hospital is in a rural setting and serves as the district hospital for Chirundu.
St Theresa Mission	Mpongwe District	156	115	13,151	St. Theresa's Mission Hospital is in rural district of Masaiti in the Copperbelt Province of Zambia. It serves as the district hospital because the district has no own hospital.
Mangango Mission	Kaoma District	74	53	36,034	Mangango Mission is in the rural district of Kaoma in the Western Province of Zambia. The hospital provides medical and surgical services to the surrounding communities.
Kamoto Mission	Mambwe District	64	105	70, 425	Kamoto Mission hospital is in Mambwe District of Eastern Province of Zambia.

Purpose

The purpose of the study was to identify the WASH infrastructure available in the 13 HCFs of focus and assess the adequacy of this infrastructure. The study further sought to explore the challenges of providing adequate WASH infrastructure in the selected mission hospitals in Zambia. The results of this study can be used by the facilities to implement interventions to either maintain or improve the availability and adequacy of WASH infrastructure in their hospitals. In addition, the results can be used to advocate for more resources and expertise for WASH in HCFs.

Study Aim

The aim of the study was to determine the availability and adequacy of Water, Sanitation and Hygiene (WASH) infrastructure in 13 mission hospitals in rural Zambia.



Study Objectives

- i. To identify the different kinds of Water, Sanitation and Hygiene (WASH) infrastructure available in the selected mission hospitals in Zambia, on the hospital grounds as a whole, and then specifically in the outpatient department and male medical wards.
- ii. To assess the adequacy of this WASH infrastructure.
- iii. To explore the challenges of providing adequate WASH infrastructure in the selected mission hospitals in Zambia.

Chapter Two: Literature Review

This chapter starts by providing a summary of key literature used in this review and then outlines the status of WASH in HCFs globally. The section will further discuss the common challenges among countries in the provision of WASH in HCFs. The effects of poor WASH in HCFs on the health of populations are discussed, as well as the global initiatives being implemented to address the challenges. The chapter ends by outlining some of the global and local (Zambian) initiatives to address WASH in HCFs.

The literature cited in this review was collected from open access online journals, google scholar and institutional websites. The literature search was limited to materials published after the year 2000 and low and middle-income countries using the search engines PubMed, ScienceDirect, google scholar and PLOS. Institutional websites consulted included the World Health Organization, the Ministry of Local Government and Housing of Zambia, UNICEF, WaterAid and WASH in HCFs. Key search terms used to find the literature included “WASH in HCFs”, “diarrhoeal disease burden”, “hand washing”, “WASH Infrastructure”, “Sanitation in HCFs”, and “WASH policies”.

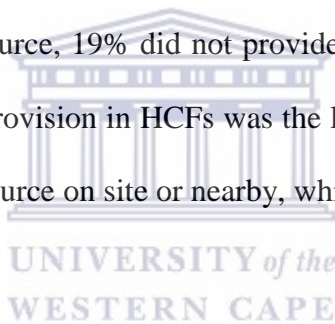
Literature on WASH in HCFs

A total of 79 publications were identified of which 55 were deemed relevant to this study. Of the published articles, 19 were reviews, 21 empirical studies, 11 policy documents, and 1 of each of the editorial commentary, conference report and pilot study. A large proportion (26) of the articles reviewed was multi-country focused, while 21 were single country focused. Twelve (12) articles reported exclusively on African countries while 6 reported exclusively on Asian countries. From the reviewed materials, two main methodological approaches to assessing WASH in HCFs were identified: 1) cross sectional studies of WASH infrastructure and 2) studies of the consequences of poor WASH such as

diarrhoeal disease and hospital acquired infections. The WHO and UNICEF have led the global monitoring strategy on WASH in HCFs through the Joint Monitoring Programme (JMP) which they co-lead (UNICEF, 2015). An annotated bibliography of the articles reviewed is provided in Appendix VIII.

Availability of WASH

Water, Sanitation and Hygiene (WASH) services should provide for water availability and quality, sanitation infrastructure and the availability of soap and water for hand washing (WHO, 2015). A review of the status of WASH in HCFs (HCF) in 2015 in low and middle-income countries by the WHO and UNICEF (WHO/UNICEF, 2015) showed that many HCFs in resource limited settings have inadequate to no WASH services. Of the 66,101 facilities in 54 countries surveyed in 2015, 38% did not provide users access to an improved water source, 19% did not provide improved sanitation, and 35% did not have soap for hand washing. Water provision in HCFs was the lowest in the African Region, with 42% of HCF not having improved water source on site or nearby, while 43% of the facilities in the Americas had no sanitation infrastructure.



A systematic review by Gon et al (2016) corroborates these findings. They reviewed data from 58 Low and Middle Income countries (LMICs) and found that less than half of the facility deliveries had been conducted with improved water and sanitation in the childbirth environment.

Cronk and Bartram (2018) further validate these findings in their 2018 systematic review of data from 78 low and middle-income countries where they found that 50% of HCFs lacked piped water, 33% lacked improved sanitation, 39% lacked hand washing soap, 39% lacked adequate infectious waste disposal, and 73% lacked sterilization equipment.

Guo et al (2017) painted a bleak picture in their cross-sectional study of six African countries - Ethiopia, Kenya, Mozambique, Rwanda and Zambia, where they found that full access to WASH in rural HCFs “stood at 7% in Ethiopia, 30% in Kenya, 29% in Mozambique, 50% in Rwanda, 30% in Uganda and 21% in Zambia. Fewer than 25% of HCF in each country reported that a combination of water, soap, and hand-drying materials were always available”.

Country level studies reviewed by the researcher also show a consistent pattern of inadequate WASH in HCFs in low and middle-income countries. A cross sectional survey of 701 HCFs in 2015 in Liberia showed that only 45% had an improved water source and only 27% had proper disposal for infectious waste (Abrampah et al, 2017). In 2010, only 30.5% of births in Tanzania were taking place in a water and sanitation safe environment, in a combined assessment of both domestic and facility-based deliveries (Benova et al, 2014). This situation was further corroborated by Malebo and Njee (2016: p. 4) who assessed water, sanitation and hygiene situation in HCFs in Tanzania mainland when they reported that “conditions of water supply, sanitation services and hygienic practices in the studied HCFs are alarmingly inadequate”.

Further evidence supporting this trend in African countries has been provided by the World Health Organization (2015) in its report on the situation assessment of WASH and trachoma in Mali which showed that many HCFs in Mali suffer from a lack of adequately functioning WASH infrastructure and poor infection prevention control (IPC) practices. The report summarized the situation as follows: “Common problems include inadequacies in water supply and storage, poorly maintained infrastructure (for example broken water tanks, incinerators and blocked latrines), lack of protective equipment for staff, poor handwashing practices, improper management of medical waste and visibly dirty facilities.” (WHO, 2015: p.3)

A 2017 cross sectional assessment of WASH infrastructure in 17 rural HCF in Rwanda, showed that only 32% of hand washing locations (46 of 142) had water and soap and only 44% of sanitary facilities (48 of 109) were in hygienic condition and accessible to patients (Huttinger et al, 2017). None of the assessed facilities had on-site capacity for performing repairs. Finally, Mulogo et al (2018) found that all the 50 HCF assessed in 4 rural districts in Uganda had improved water facilities, although availability of hygiene facilities (hand washing amenities and messages) remained very limited.

Poor access to improved WASH infrastructure, especially hygiene facilities, in HCF has also been documented in a number of Asian countries. A study by WaterAid Nepal (2015) revealed that only 55% of the 20 assessed HCFs had hand washing stations with both water and soap. Further, a review of the 2010/2011 National Data Sets for Indonesia (Odagiri, 2018) for 8,831 HCFs showed a huge gap in hand washing facilities with 72% of these facilities lacking these in general consulting rooms, immunization and delivery rooms.



Several studies have assessed WASH availability in Cambodia. Robertson (2015), in a study of 12 HCF in two provinces of Cambodia reported that almost none provided any form of drinking water and sanitation facilities accessible to disabled patients. Another 2015 survey of HCF WASH by WaterAid (WaterAid, 2015) in three districts in Cambodia showed that out of the 98 surveyed toilets, hand washing stations were available in 75% of the total toilets observed yet out of this number only 55% of hand washing stations had soap and water, Por (2016: P. 4) provides further supporting evidence in his assessment of 101 HCF in 2016, which showed that “only 3% of them had basic sanitation as defined based on the Cambodian standard (with at least three improved and usable toilets, including one separate for women and one meeting the needs of people with reduced mobility) and 39% had limited sanitation as defined based on the Cambodian standard (with at least three improved and usable toilets, but not

meeting or meeting only some of the needs for people with reduced mobility)”. The assessment further revealed that in 68% of the assessed HCFs, there was no functional hand hygiene station available at any toilet, whereas 32% others had a functional hand hygiene station available at least one toilet area. Less than 1% of them had a functional hand hygiene station available at four toilet areas.

In sum, the evidence from the literature suggests that WASH is a major problem in the HCFs of many African countries, with the combined availability of WASH ranging from 7%-50% in surveys. Provision of improved water and sanitation shows a better picture than hygiene facilities. Asian studies highlighted weaknesses in availability of hygiene supplies and access for disabled populations.

Challenges in Provision of WASH in HCFs

The lower WASH access in HCFs can be attributed to many factors, among them the lack of national policies and global targets and behaviour of frontline providers. For instance, the 2014 UN-Water Global Analysis and Assessment of Sanitation and Drinking-water (GLAAS) report (WHO, 2014), showed that only 15% of the 86 responding countries had a plan for sanitation in HCFs that is implemented with funding and regular review, while only 15% of countries had plans for drinking water and hygiene in HCFs. Furthermore, over 52% of countries did not have targets for hygiene in facilities and 35% and 44% did not have targets for sanitation and water, respectively. In their policy note, WHO, UNICEF and WaterAid (2015) highlighted several challenges to provision of WASH in HCFs (Box 1).

Box 1: Challenges to provision of WASH in HCFs. Source: Copied from WHO, UNICEF and WaterAid

2015 Policy Note

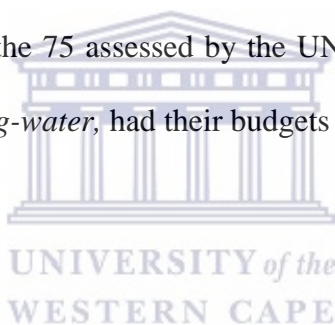
- (a) lack of comprehensive and comparable national data measuring the full set of WASH needs in HCFs, which makes it difficult to understand the scale of the problem and target resources effectively;
- (b) partial or non-existent operation and maintenance protocols for WASH provision in HCFs, which leads to a lack of accountability for ensuring that WASH infrastructure and patient safety protocols are adhered to as part of the overall performance of HCFs
- (c) lack of timely allocation of adequate resources for installation and upkeep of WASH infrastructure. Poor supervision and lack of funds to maintain WASH facilities, causing them to deteriorate and break down, at times permanently;
- (d) lack of political will and commitment to ensuring basic WASH standards in HCFs in many countries.

WASH standards and targets have been some of the key challenges affecting provision of WASH in HCFs. This has been further corroborated by Khader et al (2017) in their assessment of water, sanitation and hygiene in Jordan's HCFs. They reported that WASH coverage in the surveyed 19 hospitals was above 80%, however, there was lack of national standards and targets for WASH in HCFs. In addition to non-availability of WASH standards and targets in LMICs, there is also limited national data, as comprehensive assessments specifically of WASH infrastructure and services are rarely conducted (Emory University, 2017).

Zambia was not among the surveyed countries by WHO in 2014 due to non-availability of data (WHO, 2014). WASH in HCFs is integrated in a few national policies and programmes such as the National Health Strategic Plan 2011-2015 (MoH, 2011) and the National Urban and Rural Water Supply and Sanitation Programmes under the Ministry of Local Government and Housing (MLGH). Zambia has no routinely collected data showing the WASH coverage in HCFs at a given time. The country, however, conducted the Service Availability and Readiness Assessment in 2010 at sub national level which

captured data on WASH coverage in HCFs. The results however showed positive picture with ninety-five percent of the facilities from the 17 sampled districts, out of a total of 73, had basic sanitation infrastructure, while 88% had improved water sources (MoH, 2010). Indicators used in this assessment included ones set by the WHO/ UNICEF Joint Monitoring Programme; defining ‘access to water’ as the presence of a water source within 500 meters of the facility, and ‘access to sanitation and hygiene’ as the presence of facilities within the health care facility.

Understanding the scale of gap in provision of WASH in HCFs in LMICs is still a huge challenge due limited/lack of comprehensive and comparable national data measuring the full set of WASH needs in HCFs. This makes it difficult to advocate for increased resource allocation for WASH in HCFs. By 2016 (UN, 2017), only 5 countries out of the 75 assessed by the UN under the *Water Global Analysis and Assessment of Sanitation and Drinking-water*, had their budgets disaggregated by WASH in HCFs.



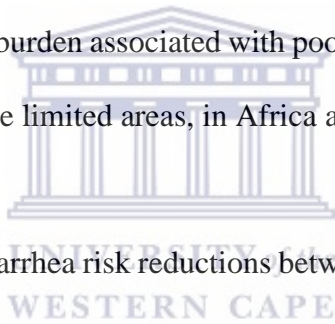
Effects of poor WASH in HCFs

In her foreword message to the first ever report on global assessment of the status of WASH in HCFs in low and middle-income countries in 2015 by the WHO (2015: p. III), Dr. Margaret Chan, the former World Health Organization Director General said “the health consequences of poor water, sanitation and hygiene services are enormous. I can think of no other environmental determinant that causes such profound, debilitating, and dehumanizing misery.... Speaking as a health professional, I am deeply concerned that many HCFs still lack access to even basic water, sanitation, and hand-washing infrastructure, and I have committed WHO to support partners to overcome this problem”.

Indeed inadequate WASH in non-household settings such as HCFs, schools and workplaces impact the health, education, welfare, and productivity of populations, particularly in low and middle-income

countries (Cronk et al, 2015). Poor WASH provision is also associated with significant patient dissatisfaction and stop women from seeking care at maternity services (Bouzid, Cumming and Hunter, 2017). Allegranzi and colleagues (2011) in their systematic review and meta-analysis of the burden of endemic health-care-associated infection in developing countries, estimate that globally, 15% of patients develop one or more infections during a hospital stay.

Beyond HCFs, the impact of WASH on health has long been established for decades. For instance, 10% of the global disease burden could be prevented by improvements related to drinking-water, sanitation, hygiene and water resource management (Pruss et al, 2008). The disease burden associated with lack of proper WASH falls more on the young children mainly through under 5 diarrhoea. Diarrhoeal diseases account for 39% of the global disease burden associated with poor WASH, with 80% of diarrhoea related under 5 mortality occurring in resource limited areas, in Africa and South Asia (DFID, 2005).

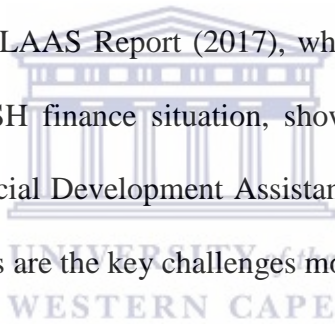


Various WASH interventions show diarrhea risk reductions between 27% and 53% in children 0–5 years old, depending on intervention type (Darvesh et al, 2017). Despite evidence that interventions in the water, sanitation and hygiene sector are the most effective ways to address morbidity and mortality, its importance in developing countries is overseen (Roma and Pugh, 2013).

Global Initiatives to Address WASH in HCFs

Health care facility WASH has been overlooked for years and data on coverage are scarce (Emory University, 2017), not only in Zambia, but globally. However, this subject has gained momentum in the last few years.

Global WASH in HCFs monitoring is being led through 3 mechanisms (Johnston, 2014); WHO/UNICEF Joint Monitoring Programme, Service Availability and Readiness Assessment Rationale and the UN-Water GLAAS: Global Analysis and Assessment of Sanitation and Drinking-Water. The WHO and UNICEF have led global efforts in ensuring universal access to improved WASH beyond households by 2030. In 2009, the WHO developed the Guidelines on Hand Hygiene in Health Care. The 2015 (WHO and UNICEF, 2015) report on the global meeting on Water, Sanitation and Hygiene (WASH) in HCFs highlights urgent needs and actions by all stakeholders. The Global Action Plan on WASH (WHO and UNICEF, 2015) in HCFs was subsequently developed following the global meeting. Further, the UNICEF WASH Strategy 2016-2030 (2016) focuses on ensuring universal access to WASH and identifies WASH in HCFs as one of the key areas of focus. All these efforts appear to be having some positive impact as the 2017 WHO GLAAS Report (2017), which was a cross sectional survey of 75 countries to assess the current WASH finance situation, showed more and better data availability, increase in national budgets and Official Development Assistance disbursements for WASH in HCFs. Sustaining and improving on the gains are the key challenges moving forward.



Chapter Three: Methodology

Study Design

A mixed methods study with cross sectional, descriptive semi-quantitative and qualitative components was conducted. This design was chosen because the study sought to determine the prevalence of WASH infrastructure and explore its adequacy as well as provide insights into facility managers' challenges in providing adequate WASH infrastructure. The semi-quantitative component captured data, using a facility assessment tool, on the availability and adequacy of various types of WASH infrastructure in the selected hospitals. The qualitative component explored the challenges facilities are experiencing in providing WASH services, from the perspective of the facility and ward (male medical) managers.

Study Population

The study population was all 13 mission hospitals in 13 districts in Zambia that were supported by the AIDS Relief Transition Project (2013-2017) under the Catholic Relief Services in Zambia. These mission hospitals were selected because the researcher was already working with them in implementing HIV/AIDS activities.

Sampling

All the facility managers (13) and all the male medical head staff (13) were recruited to participate in the study.

Data Collection

Data was collected in two ways, firstly by administering a health facility rating checklist of available WASH infrastructure. Secondly, semi-structured interviews with health facility managers and heads of male medical wards were conducted.

Health Facility Rating Checklists

Two checklists, adapted from the World Health Organization's Essential Environmental Health Standards in Health Care (WHO, 2008), were developed for collecting data on the type and adequacy of overall WASH infrastructure on the hospital grounds, the male medical ward and the outpatient departments in each facility. These are attached in Appendix I. The data collected included among others; number of staff, services offered, average number of patients visiting the facility monthly, types of water sources, sanitation and hygiene infrastructure available, WASH infrastructure maintenance schedules, and procedures for repairing broken infrastructure. These checklists were administered by the researcher.

Semi-structured interviews

Semi-structured interviews using discussion guides were conducted with each health facility manager and each head staff of male medical wards to get an understanding of the challenges, opportunities and factors influencing the status of WASH services in their HCFs. This provided an opportunity to get an in-depth insight into the nature and interplay of factors influencing the availability of WASH services. This data was audio recorded and notes were taken during the interviews. Each of the verbatim recordings was transcribed to inform qualitative analysis.

Data Analysis

Quantitative Data: After collection, the survey data was checked for errors and completeness. Further clarification was sought from some respondents through phone calls before the data was captured. Thereafter, the data was coded by assigning it into categories and allocating numbers to each category. In addition, the ratings in the checklist were assigned numerical values (0=bad/absent 1=medium 2=on good/target) to enable the researcher compile total WASH scores for each of the sites and rank the 13 facilities from the least to the highest WASH infrastructure coverage. From the 29 questions in the rating

scale, the maximum cumulative score a site could get was 58. The rating scale for each of the questions is defined in the assessment tool which has been attached with the data set (appendix II).

Qualitative Data: Thematic analysis was used to analyze the qualitative data from semi-structured interviews, based on the challenges, opportunities and other factors influencing the obtaining status of WASH infrastructure and services. Key emerging themes from the semi-structured questionnaire data set were grouped. Two data sets were generated from the discussion guides, one for the Facility Managers and one for the male medical ward in charges. A table was developed for each data set and responses to each question were grouped together. Thereafter, emerging themes were identified from each group of responses. The emerging themes were later grouped under basic themes for the narrative. These were also used as findings to further explain the findings from the assessment tool.

Validity

A code sheet was developed to ensure a standard and consistent coding of the qualitative data for stability, reproducibility and accuracy of data analysis. Potential measurement bias from leading questions was addressed by piloting the data collection tools to ensure neutral questions can elicit honest responses. Selection bias in this study was addressed using the total population sampling of all the mission hospitals that were supported by the AIDS Relief Transition Project (2013-2017) under the Catholic Relief Services in Zambia, the hospital managers and all the male medical ward in charges. In addition, the data collection tools were developed by adopting standard checklists from the World Health Organization's (WHO, 2008) Essential environmental health standards in HCFs.

Reliability

Reliability in this study was addressed by ensuring that the key concepts of availability and adequacy of WASH infrastructure were clearly defined. Availability was defined as the presence of a specific infrastructure such as a toilet within the facility or health facility grounds. Adequacy was defined as the presence of required supplies for the optimal functioning of a specific infrastructure. For instance, a toilet should have a door, toilet tissue and water, if it is a flushing toilet, to qualify to be called adequate. The facility assessment tool and the in-depth interview guides were pre-tested, and questions were refined to ensure they elicited the same understanding from the respondents without additional explanation. The data entry was also double-checked to ensure the correct data had been entered before analyzing it.

Rigour

To ensure rigour in the qualitative part of this study, the researcher used the following strategies: recording of the semi-structured interviews with audiotapes to allow notes taken to be checked and improved. Key findings were triangulated against the quantitative findings and were checked with the respondents. To minimize influencing the respondents' responses, the researcher clearly explained that he was conducting this study in his personal capacity independent of his official duty. In addition, the researcher explained that there was no benefit attached to the results of the study. Furthermore, the data was collected 1 year after the end of the AIDS Relief Transition Project which the researcher's employers supported, thus delinking it from expectations of material support.

Generalizability

The findings of this study are only generalizable to the study facilities. However, the challenges, opportunities and factors influencing the status of WASH infrastructure may have broader relevance to other mission HCFs in the country and HCFs in rural settings.

Limitations of the Study

While this study goes some way in determining the availability and adequacy of Water, Sanitation and Hygiene infrastructure in selected mission HCFs in Zambia, it is not necessarily representative of all mission hospitals in this country, nor is it likely to be representative of government hospitals. This is because the study is only focused on rural mission hospitals. The study is also limited in the coverage of whole facilities as it focusses on the outpatient department and male medical ward for quantification and assessment of the WASH infrastructure. However, it is highly likely that the problems identified are common to other mission and government HCFs in rural areas.

Ethical Considerations

The research protocol was given ethics approval by the University of the Western Cape (UWC) Ethics Committee, and later by the local body, the University of Zambia Biomedical Research Ethics Committee (UNZABREC). In addition, before data was collected, the researcher obtained written approval from the Facility Managers of the 13 hospitals under the study. Consent, both verbal and written was sought from the hospital managers and the male medical ward head staff respondents at facilities. Findings are reported anonymously, with each hospital assigned a number in the scores and in reporting interview data (1-13).

Chapter Four: Results

This section analysis the availability and adequacy of WASH infrastructure in the 13 assessed rural mission by firstly summarizing the response rate. Thereafter, it looks at the available WASH infrastructure within the hospital set up, the Out-Patient Department and the Male Medical Wards. This data is further triangulated with the qualitative feedback from semi-structured discussions with the hospital managers and male medical ward in charges. The section then discusses the challenges, material and skilled personnel, the HCFs face in maintenance of WASH infrastructure.

Response Rate and Study Facilities Description

All the 13 hospitals approached agreed to be studied and all the respondents (13 Facility Managers and 13 male medical ward heads) agreed to be interviewed. The denominations represented were the Catholic Church, Seventh Day Adventist, Brethren in Christ, Anglican, Reformed Church in Zambia and United Church of Zambia (Table 1). As indicated in the introduction, hospital sizes ranged from patient bed capacities of 45 to 410.

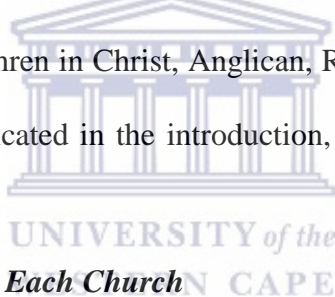


Table 1: Number of Facilities run by Each Church

Church Running the facility	No of Facilities
Brethren in Christ Church	1
Catholic	8
Catholic and Anglican	1
Reformed Church in Zambia	1
Seventh Adventist Church	1
United Church of Zambia	1
<i>Total</i>	<i>13</i>

WASH Infrastructure Availability: Overall, Outpatient Departments and the Male Medical Wards

This section discusses three things; the overall availability of water at the hospitals, availability of sanitation infrastructure in the outpatient departments (OPD), and availability of sanitation, hand hygiene and disinfection materials in the male medical wards.

The availability of water in the mission hospitals assessed was generally good with most of the sites reporting an improved water source inside or within the grounds of the facility (Table 2). Out of the 13 HCFs, only 2 were accessing non-improved water sources outside the facility grounds. However, 4 facilities reported inconsistency in supply of drinking water. Of these 4 facilities, 3 also reported not having enough water storage capacity to meet the needs of a facility for 2 days. The water treatment technology of 7 facilities was found to be relatively ineffective and non-sustainable.

Table 2: Overall Water Infrastructure Availability at Hospitals (n=13)

Water	Good-2 (Target)	Medium-1	Bad-0
Improved water source inside or within the ward or ground of the facility	11	2	0
Water source(s) always functioning and accessible	12	1	0
Water storage is sufficient to meet the needs of the ward/facility for 2days	10	1	2
A reliable drinking water station is present and accessible for staff, patients and care givers, and those with disabilities at all times	9	4	0
Drinking water is treated with an effective, sustainable technology	6	7	0
At least one shower or bathing area is available per 40 inpatients	12	1	0

Table 3 shows findings on sanitation in the Outpatient Departments of the HCFs. Five facilities had poorly-functioning toilets that were either broken, blocked, with no running water or no toilet paper. In addition, 6 facilities did not have at least 1 toilet accessible for disabled patients. Hand washing basins coverage was high among the facilities, with 11 facilities having them within 5 metres of toilets.

Table 3: Sanitation Infrastructure Availability at Outpatient Departments (n=13)

Sanitation	Good-2 (Target)	Medium-1	Bad-0
Number of functioning toilets/ latrines	8	5	0
Latrines clearly separated for staff and patients and visitors	10	2	1
Latrines clearly separated for male and female	12	0	1
At least one toilet accessible to people with reduced mobility	7	0	6
Functioning hand hygiene stations within 5 metres of latrines	11	1	1
All latrines kept clean	10	3	0
Record of cleaning visible and signed by the cleaners each day	3	10	0

Table 4 below reports the findings from the assessment of the male medical wards, focusing on assessments of sanitation, hand hygiene, cleaning and disinfection. Like the OPD, most of the facilities (11) had hand washing stations or alcohol-based hand rubs in every room where care was provided. However, 7 of these didn't have the hand washing stations at the entrance to the wards. It is also notable that 12 facilities had a month's supply of disposable health care gloves, even though 7 of these did not have them for all of the sizes required by staff members. Seven (7) HCFs did not have legible hand hygiene promotion materials at key places.

Table 4: WASH Infrastructure Availability in Male Medical Wards (n=13)

Sanitation	Good-2 (Target)	Medium-1	Bad-0
Number of functioning toilets/ latrines	8	5	0
Latrines clearly separated for staff and patients and visitors	9	2	2
Latrines clearly separated for male and female	10	1	2
At least one toilet accessible to people with reduced mobility	8	0	5
Functioning hand hygiene stations within 5 metres of latrines	10	2	1
All latrines kept clean	11	2	0
Record of cleaning visible and signed by the cleaners each day	6	7	0
Hand Hygiene	Good-2 (Target)	Medium-1	Bad-0
Functioning handwashing stations or alcohol-based hand rubs in every room where care is provided	11	1	1
Functioning handwashing stations or alcohol-based hand rubs at every entrance to the ward	4	2	7
Hand hygiene available in waste disposal area	7	2	4
Hand hygiene promotion materials clearly visible and legible at key places	6	4	3
Cleaning and Disinfection	Good-2 (Target)	Medium-1	Bad-0
A month's supply of disposable healthcare gloves for health care staff (sterile where needed)	12	1	0
At least two pairs of household cleaning gloves, in a good state, for each cleaning and waste disposal staff member	6	5	2
At least one pair of overalls or apron and boots, in a good state, for each cleaning and waste disposal staff member	8	4	1
Floors and horizontal work surfaces are cleaned at least once a day with water and a detergent	13	0	0

Figure 1 below shows WASH infrastructure coverage in percentages and overall scores. Mission Hospital MH1 has the least coverage at 38%, while Mission Hospital MH13 has the highest coverage at 98%. Overall WASH coverage among the rural mission hospitals was reasonably good, with 10 facilities scoring 78% and above.

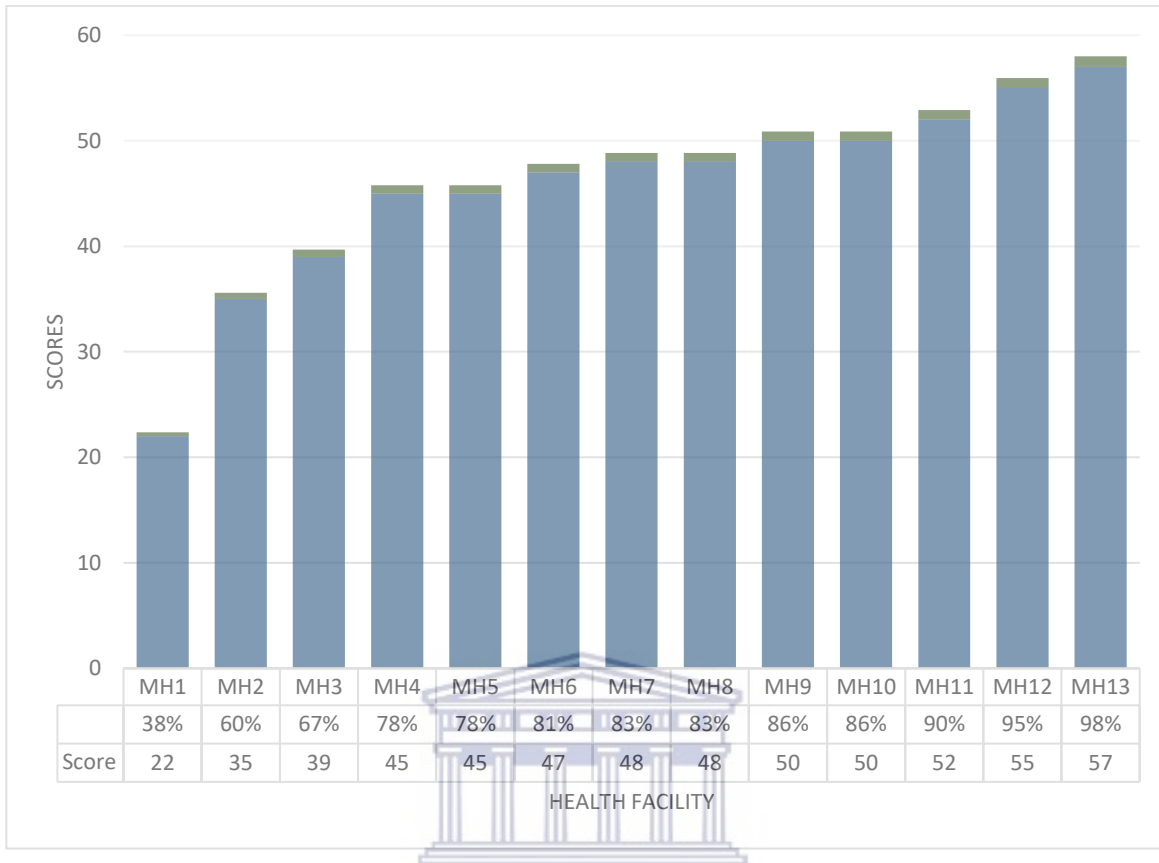


Figure 1: Total scores for WASH infrastructure coverage by facility (n=13)

Qualitative Findings

The qualitative findings were analysed thematically and are presented in the following major themes:

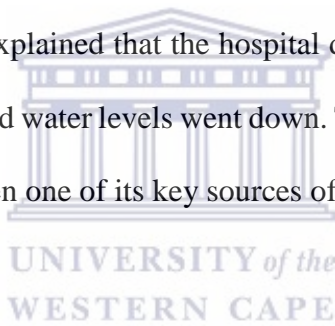
- Hospital WASH availability and deficiencies
- Investment /Support for WASH infrastructure
- WASH Maintenance Staff and Skills
- WASH Management/Oversight

Overall findings among the 13 mission hospitals under each of the theme are discussed with selected

quotations from the respondents. Where applicable, outlier (or “deviant”) findings under each of the themes are highlighted and discussed.

Hospital WASH Availability and Deficiencies

All the hospitals reported having running water on their premises. Two common sources of water in the hospitals were standalone underground boreholes and reticulated tap water provided by relevant water utility companies. Despite having running water at their premises, some mission hospitals still had the challenge of inconsistent water supply. This was attributed to many factors such as inconsistent supply from the water utility companies, old water pumps that could not pump for 24 hours or the underground water levels dropping in the dry season. The medical superintendent at the mission hospital with the lowest overall WASH score (MH1) explained that the hospital did not have 24-hour supply of water in the dry season because the underground water levels went down. The hospital had been actively soliciting support from the government to deepen one of its key sources of water, a lake nearby the hospital.



“The other thing we need will be to deepen the lake. So rainy water is held in a lake by a dam, but the dam was built in 1970, so it’s about 50 years old. The lake is shallow, it’s quite large but not deep enough. The government will not do it for us, we have explored that, the government says it will cost \$150,000-\$180,000 to do that. And we may need some help for finding enough money to deepen that dam. That way, the dam water is essential for ablution, for flushing the toilets in the hospital, then the homes.”(HA-MH1)

Furthermore, although coverage of hand washing facilities in service rooms in the hospitals was high, there was general agreement among the hospitals that availability of supplies such as soap and alcohol-based hand rub was a challenge due to a limited availability of resources. Hospitals bemoaned the

inadequate monthly grant from the government which was not enough to cater for the supplies for all the departments. In the words of one Facility Manager; *“The grant that comes from government (imprest) is not adequate to equip all departments with sufficient supplies. Therefore, the facility strains to keep the services going by using monies from some income generating activities”*. (HA-MH13)

In addition, despite the availability of running water and hand washing basins, the general condition of the WASH infrastructure in the mission hospitals was viewed as poor. Both the heads of male medical wards and Facility Managers across all the sites lamented the fact of old corrugated water pipes, broken toilet pans and cisterns, blocked drains and broken hand washing basins. Most of the infrastructure was old and lacked routine maintenance.



“The water system was built about 20 years ago and needs to be replaced” (MA-MH5)

“[There are] frequent break downs due to dilapidated infrastructure/equipment and lack of equipment/tools to effectively carry out necessary works and quality maintenance activities” (HA-MH4)

“If you were to go in the male toilets right now, the way the toilets...the seat pans themselves the way they are, you can't like them. The type of water that we use in the ablution block, we don't know how you can call the colour of water anyway, dam water, it's brown with all the stuff, whatever you can call it, that comes with the water. So even if the toilets are cleaned, they don't look clean, they are all dirt” (MW-MH5)

Some facilities reported not having enough toilets to cater for both the patients and staff.

“the facility has an Out-Patient Department which has no toilets or hands washing facilities for the

patients. They use the In-Patient Department for these services”.(MA-MH4)

A similar view was echoed by another respondent who bemoaned the lack of a staff toilet in their male ward:

“Apart from that, the same ward, male medical ward, it doesn’t have a toilet for staff. If a staff is pressed, you need to go to other wards to solve your problem, which is unfair for staff not to have a toilet in male medical ward”. (MW-MH5)

Investment /Support for WASH Infrastructure

The mission hospitals are owned by faith-based institutions. Therefore, infrastructure development is the sole responsibility of the church institutions and the government has a limited role to play. The government through the Ministry of Health commits to support the mission hospitals with relevant equipment, supplies and health care workers. Hence, the mission hospitals must source own funding for WASH infrastructure, which is neither steady nor adequate. Across all the hospitals, there was evidence of old infrastructure which was not routinely maintained. All interviewees were in agreement on the priority needs and type of support required for the WASH infrastructure. They emphasized replacing and maintenance of broken WASH infrastructure, namely the water pipes, broken toilet pans and cisterns, and the installation of improved sanitation systems.

“The taps, sluice room, taps in toilets and toilets themselves need to be improved. Only one tap is working out of the four taps in the toilet, the toilets have no cisterns hence the need to carry water in a bucket, the sluice room has inadequate water supply”. (MW-MH10)

“Septic tank/soak-way system should be discarded and replaced with compact sewer treatment system.

The current system is dilapidated and too small for the current population giving rise to many maintenance challenges, frequent overflow of sewer from septic tanks and blocked soak-way systems”.

(HA-MH9)

“It would be helpful to have flushable toilets as an institution because they are easy to clean and even by the patients themselves”. (MW-MH8)

WASH Maintenance Staff and Skills

Government is obliged to provide staff for the mission hospitals. Environmental technologists and plumbers are responsible for maintenance and are qualified cadres hired by the government and deployed in hospitals. However, not all the hospitals had them. Five facilities, including the three with the highest scores (MH11-13) had an Environmental Health Technologist in the staff, of which two had qualified plumbers (Table 5). There was a varied use of qualified and non-qualified staff to repair broken WASH infrastructure among the hospitals. Use of casual, but experienced workers (non-qualified plumbers) to carry out maintenance and repair on WASH infrastructure in mission hospitals was quite common as shown in Table 5.

Table 5: Infrastructure Maintenance Staff at the Hospitals

Hospital Code	Maintenance Staff
MH1	Environmental Health Technologist
MH2	Non-qualified plumber
MH3	Non-qualified plumber
MH4	Non-qualified plumbers
MH5	Environmental Health Technologist
MH6	General workers
MH7	General worker
MH8	None, outsource when need arises
MH9	Non-qualified plumber
MH10	Non-qualified maintenance officer
MH11	Environmental Health Technologist and a plumber
MH12	Environmental Health Technologist
MH13	Environmental Health Technologists and plumbers

WASH Management/Oversight

Mission hospitals use a defined management system for managing WASH infrastructure issues. Either the Facility Manager, a direct employee of the mother church, or the medical superintendent, who can either be a church employee or Ministry of Health staff, was found to be the final authority on maintenance and repair of WASH infrastructure in the mission hospitals. Besides this, the reporting of any need for repair or maintenance was the task of any affected staff to their supervisor or maintenance committee. This structure can be summarized in the words of one of the Facility Managers:

“people responsible for reporting breakages are the people working in the wards, the in charges. If they see something is broken, they usually report to the maintenance committee, then in turn bring the information to the office to see if we have money to try and repair and engage anyone who could do the work”. (HA-MH3)

The turnaround of the repairs varied based on the urgency and availability of resources. Minor repairs and maintenance works were generally addressed within a month, while major works depended on the availability of resources.

Triangulating quantitative and qualitative results

The findings of availability of WASH infrastructure at the HCFs as assessed with the assessment checklist was to a large extent confirmed by the feedback from the interviews with the facility managers and male medical ward in charges. The interviews also provided insight into the quality of the available infrastructure, beyond stating whether the infrastructure was available or not. For instance, MH13 which had the highest score of WASH infrastructure availability (98%), nevertheless reported inadequacies in WASH supplies due to insufficient funding. Both the facility manager and the male medical ward in charge highlighted this inadequacy in their separate interviews. Both respondents further bemoaned the location of toilets which were away from the OPD and MMW. Inadequate supplies further compromised the functionality of hand washing basins due to inconsistent supply of hand washing soap or alcohol hand rub.

The qualitative interviews also provided the opportunity to establish varied perspectives on the nature of the problems and appropriate solutions. For example, at MH1, which had the lowest score on availability of WASH infrastructure, the facility manager felt they needed adequate spare parts and tools for the maintenance of the available infrastructure and that this would solve the current leakages and broken

infrastructure. To the contrary, the male medical ward in charge felt the entire water reticulation system need replacement together with the toilets. The view was that the system had never received a complete overhaul since the facility was built. This view was very common among the male medical ward in charges as shown in the quote below:

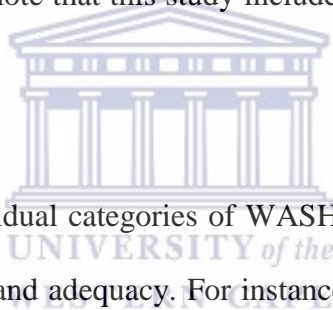
“since the hospital was built in 1956, our ablution and water systems have never been rehabilitated. Since then, we have been using old model things. Even the way the ablution block is made, it’s not up to standard and we have got less toilets compared to the number of patients we have in the ward. The male medical ward needs a complete rehabilitation, changing of toilet pans, seat covers, the cistern itself. In short what I can say is, the whole sewer system needs to be rehabilitated, if anything” [MMW in charge for MH1]

The availability of qualified maintenance staff in certain HCFs did not have a major impact on the state of infrastructure in both the OPD and Male Medical Wards. This was mainly due to inadequate supply of maintenance and repair materials and supplies. For instance, MH1 and MH5, despite having qualified environmental health technicians, the male medical ward in charges reported blocked drainage systems, showers and taps.

“sanitation and hygiene is not functioning; we also have a blocked drainage system. We need replacement of shower system, toilet system, taps and medical waste disposal bins” [MMW-MH5]

Chapter Five: Discussion

The importance of running water in a health facility cannot be overemphasized. It is a requirement for provision of quality health services, both curative and preventive. The availability of WASH infrastructure in the mission HCFs was found to be generally good. Results from the study show that only one facility had an average coverage score of below 50% at 38%, while 10 facilities scored 78% or above. These results are at variance with most studies cited in the literature showing low coverage rates in low and middle-income countries. In their 2017 assessment of Water, Sanitation, and Hygiene in Rural Health-Care Facilities in selected African countries, including Zambia, Guo A et al (2017), found that fewer than 50% of rural HCFs had access to improved water sources on premises, with Zambia standing at 21%. However, it is important to note that this study included both government and mission owned HCFs.

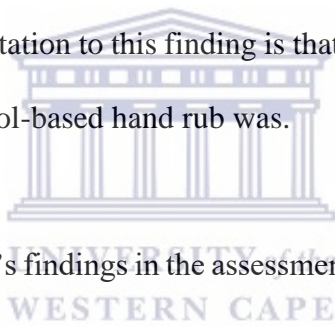


It is also important to note that individual categories of WASH infrastructure in the mission hospitals show varying degrees of availability and adequacy. For instance, even though all the 13 studied HCFs had improved water sources, water treatment is a problem in the hospitals as more than half (7) of the surveyed facilities reported that the water treatment technology they use is neither effective nor sustainable. This is corroborated by the findings by Tembo and Sakala (2010) who found only 1 out of the 8 surveyed rural mission hospitals was treating drinking water.

Like findings in other LMICs, the WASH infrastructure in the 13 mission hospitals studied was poorly maintained, with many of the same inadequacies described elsewhere, including water supply, poorly maintained infrastructure, such as broken water tanks and blocked latrines, lack of protective equipment for staff, poor handwashing practices and visibly dirty facilities (WHO, 2015). The state of toilets in the hospitals was not good with 5 of the 13 facilities reporting that their toilets were not well functioning as

they were either broken, blocked, with no running water or no toilet paper. Disabled patient-friendly toilets were either inadequate or not available at all.

Hand washing basin coverage in most low and middle-income countries has been reported to be low. Malebo and Njee (2016) found that in Tanzania, a low-income country, 44% of consultation rooms and 42% of delivery rooms in the 96 surveyed HCFs did not have functional hand washing facilities and some had been replaced by plastic water containers without drainage. Similar findings were reported by Huttinger et al (2017) in Rwanda, another low-income country, where only 32% of the 146 hand washing stations were functional (had water and soap in 17 HCFs surveyed). The findings from this study show a slightly different picture. Eleven (11) out of the 13-facilities reported having these in every room where service is provided. However, the limitation to this finding is that the study did not assess how steady the supply of hand washing soap or alcohol-based hand rub was.



In confirmation with the WHO (2015)'s findings in the assessment of WASH in HCFs in low and middle-income countries, the study found that most of the WASH infrastructure in the hospitals is old and has not received a complete overhaul for years. Facilities reported, amid growing catchment populations, having broken down flushing toilets, showers and water pipes, and frequent breakdowns. This situation was further aggravated by inadequate supply of materials for maintenance of infrastructure. The lack of adequate supply of materials for WASH infrastructure maintenance is worsened by inadequate and non-qualified maintenance staff. Of the 13 facilities, only 5 reported having qualified plumbers and/or environmental health technologists, while the rest relied on experienced but non-qualified plumbers. As these staff are primarily employed and deployed by government, it is likely that this situation is no different at mission hospitals across the country.

The management structure of mission hospitals was found to be headed a direct church employee who could either be the Facility Manager or Medical Superintendent. This could be because the infrastructure development and maintenance are primarily roles of the mother church.

There are several possible factors explaining the poor state of WASH infrastructure in the mission hospitals. As observed by Olivier et al (2015, p2), “mission hospitals historically have had varied funding sources—in early missionary days, funding consisted of a combination of international denominational support, donations from international religious communities, and, in some cases, colonial ministry support. However, over time there have been changes in the way that some mission hospitals operate and raise funds. Some now receive much of their support from a combination of user fees, government grants, and aid agencies. As a share of total contributions, traditional, international denominational bodies are less prominent than in the past”. Of interest to note is the reduction in contributions from international denominational bodies, coinciding with falling in standards of WASH infrastructure, if not general hospitals infrastructure. Apart from inadequate and changing funding streams, there may be other systematic or underlying factors responsible for the poor state of WASH. These could include inadequate staff, lack of routine assessments, low priority placed on WASH, and lack of WASH-specific governance relationships between the government and mother church bodies.

Chapter Six: Conclusion and Recommendations

Access to improved water sources was reasonably high in the 13 mission hospitals, compared to the situation in other low and middle-income countries. Nevertheless, numerous problems in WASH infrastructure were documented. Inadequate twenty-four-hour access and treatment of water were common problems and most of the hospitals did not have effective and sustainable technology in place. Availability of hand washing basins was also reasonably high among the hospitals, although there was considerable damage and limited functionality due to unstable supply of hand washing soap. The study has further revealed that most of the WASH infrastructure in the hospitals is old and in bad state, with for instance, frequently leaking pipes.

The recommendations arising from this study are as follows:

- Government to develop a national WASH information system with key indicators based on the WHO/UNICEF Joint Monitoring Programme core indicators and questions (WHO/UNICEF 2016). These could form the basis of a national assessment of WASH in HCFs to provide a baseline for development of standards and interventions to either sustain or improve the status of WASH. Regular collection of these data will raise the profile of WASH in HCFs. Enhancing the monitoring of the implementation of national infrastructure standards for hospitals would further ensure prioritization of WASH infrastructure maintenance.
- Government needs to consider funding infrastructure maintenance at mission hospitals. Even though these are not government owned hospitals, they are not profit-making HCFs and are serving mostly rural populations of the country. Moreover, a better WASH infrastructure would help the hospitals provide quality services and a clean hospital environment for proper patient rehabilitation.

- There is a need to lobby the Ministry of Health to place qualified environmental health technologists in such hospitals. Skills enhancement of the current cadres would also be a quicker and an option to address the current skills gap.
- Finally, further studies could be conducted to understand the day-to-day dynamics of utilization of the WASH infrastructure by both the patients and health care workers at critical times. Water quality and the supply of WASH materials for infrastructure repair (basins, pipes etc.) are other areas that would merit to be studied.



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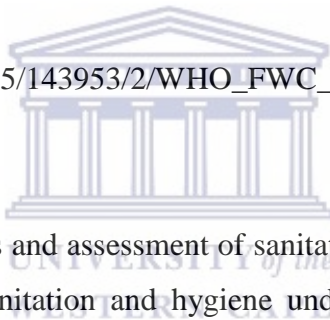
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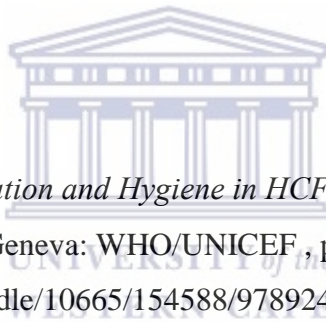
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Appendix I: Health Facility Assessment Rating Scales

Name of Health Facility: _____

District: _____

Date of Assessment: _____

Church Running the Facility: _____

Number of Personnel: _____

Number of Beds: _____

Patients per month: _____



Health Facility Rating Scale

SN #1	WATER	Good-2 (Target)	Medium -1	Bad -0	Score
1.1*	Improved water source inside or within the ward or ground of the facility	Yes, within facility/ward	Yes, within grounds	No improved water source within ward/facility grounds	
1.2	Water source(s) always functioning and accessible	Yes, everyday	More than 2/3 days per month	Fewer than 2/3 days per month	
1.3*	Water storage is sufficient to meet the needs of the ward/facility for 2days	Yes	More than 75% of needs met	Less than 75% of needs met	
1.4	A reliable drinking water station is present and accessible for staff, patients and care givers, and those with disabilities at all times	Yes, at all times	Yes, sometimes, or not available for all users	Not available	
1.5	Drinking water in is treated with an effective, sustainable technology	Yes	Treated but not regularly	Not treated	
1.6	At least one shower or bathing area is available per 40 patients in the ward	Yes	Showers, but no water or in disrepair.	No showers.	

Notes	
1.1	Water system in buildings / water system on facility grounds / public tap/fountain / Borehole / Protected well / Protected rainwater collection
1.3	Water needs will vary depending on the type of facility and number of patients. To calculate the facility's water requirements, add up the following requirements (source: WHO 2008 Essential Environmental Standards) Outpatients (5 litres/consultation) + Inpatients (40–60 litres/patient/day) + Operating theatre or maternity unit (100 litres/intervention) + Dry or supplementary feeding Centre (0.5–5 litres/consultation depending on waiting time) + Cholera treatment Centre (60 litres/patient/day).

SN #2	SANITATION	Good-2 (Target)	Medium-1	Bad-0	Score
2.1*	Number of functioning toilets/ latrines	One per 20 users	One per 30 users	Less than one per 30 users	
2.2	Latrines clearly separated for staff and patients and visitors	Yes	Some separate latrines but not sufficient to meet need	No separate latrines	
2.3	Latrines clearly separated for male and female	Yes	N/A	No indication of gender separation.	
2.4*	At least one toilet accessible to people with reduced mobility	Yes	N/A	No toilets for disabled users	
2.5*	Functioning hand hygiene stations within 5m of latrines	Yes	Present, not functioning or no water, soap or handrubs	Not present	
2.6*	All latrines kept clean	Yes	Some but not all clean	All latrines unclean	
2.7	Record of cleaning visible and signed by the cleaners each day	Yes	Toilets cleaned but not recorded	No record / toilets cleaned less than once a day	

Notes	
2.1	Functioning means: unlocked and accessible + lockable from inside + within the grounds of the facility
2.4	A toilet can be considered accessible if it meets the following conditions: can be accessed without stairs or steps, handrails for support are attached either to the floor or side walls, the door is at least 80 cm wide, and the toilet has a raised seat
2.5	Tap and water with soap. Water should not be chlorinated.

2.6	Absence of visible excreta, smell and insects
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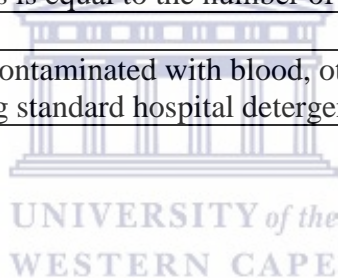
Male Medical Ward and Outpatient Rating Scale

SN #3	SANITATION	Good-2 (Target)	Medium-1	Bad-0	Score
3.1*	Number of functioning toilets/ latrines	One per 20 users	One per 30 users	Less than one per 30 users	
3.2	Latrines clearly separated for staff and patients and visitors	Yes	Some separate latrines but not sufficient to meet need	No separate latrines	
3.3	Latrines clearly separated for male and female	Yes	N/A	No indication of gender separation.	
3.4*	At least one toilet accessible to people with reduced mobility	Yes	N/A	No toilets for disabled users	
3.5*	Functioning hand hygiene stations within 5m of latrines	Yes	Present, not functioning or no water, soap or handrubs	Not present	
3.6*	All latrines kept clean	Yes	Some but not all clean	All latrines unclean	
3.7	Record of cleaning visible and signed by the cleaners each day	Yes	Toilets cleaned but not recorded	No record / toilets cleaned less than once a day	
Notes					
3.1	Functioning means: unlocked and accessible + lockable from inside + within the grounds of the facility				
3.4	A toilet can be considered accessible if it meets the following conditions: can be accessed without stairs or steps, handrails for support are attached either to the floor or side walls, the door is at least 80 cm wide, and the toilet has a raised seat				
3.5	Tap and water with soap. Water should not be chlorinated.				
3.6	Absence of visible excreta, smell and insects				
SN #4	HAND HYGIENE	Good-2 (Target)	Medium-1	Bad-0	Score
4.1*	Functioning handwashing stations or alcohol-based handrubs in every room where care is	Yes	Stations present, but no water and/or soap or handrub solution	Not present	

	provided				
4.2*	Functioning handwashing stations or alcohol-based hand rubs at every entrance to the ward	Yes	Stations present, but no water and/or soap or handrub solution	Not present	
4.3*	Functioning handwashing stations within 5m of all latrines	Yes	Stations present, but no water and/or soap or handrub solution	Not present	
4.4*	Hand hygiene available in waste disposal area	Yes	Stations present, but no water and/or soap or handrub solution	Not present	
4.5*	Hand hygiene promotion materials clearly visible and legible at key places	Yes	Some places but not all.	None	
Notes					
4.1	Tap and water with soap OR alcohol-based hand-rub. Rooms where care is provided includes consultation rooms, operating rooms AND laboratory				
4.2,4.3,4.4	Tap and water with soap or handrub solution				
4.5	Key places include the waiting room, handwashing station at entry and at latrines				

SN #5	CLEANING AND DISINFECTION	Good-2 (Target)	Medium-1	Bad-0	Score
5.1*	A month's supply of disposable healthcare gloves for health care staff (sterile where needed)	Yes	Less than one month's supply	None available	
5.2	At least two pairs of household cleaning gloves, in a good state, for each cleaning and waste disposal staff member	Yes	Only one pair, or two pairs but have tears, are dirty or otherwise are not in good condition.	Not available	
5.3*	At least one pair of overalls or apron and boots, in a good state, for each cleaning and waste disposal staff member	Yes	Available but in poor condition.	Not available	

5.4*	Floors and horizontal work surfaces are cleaned at least once a day with water and a detergent	Yes	Surfaces cleaned less than once a day or not cleaned with detergent (e.g. water only)	Surfaces and floors are not cleaned daily	
Notes					
5.1	Number of consultations per months is equal to the number of pairs of disposable gloves				
5.3	Poor means ripped, dirty or soiled.				
5.4	Environmental surfaces or objects contaminated with blood, other body fluids, secretions or excretions are cleaned and disinfected as soon as possible using standard hospital detergents /disinfectants				



Appendix II: WASH Infrastructure Availability Total Facility Scores

Hospital	q11	q12	q13	q14	q15	q16	q21	q22	q23	q24	q25	q26	q27	q31	q32	q33	q34	q35	q36	q37	q41	q42	q43	q44	q45	q51	q52	q53	q54	Total Score	Perfect Score	Actual % Score
MMH1	1	1	0	1	1	1	1	1	2	0	0	1	1	1	0	0	0	0	1	1	0	0	0	0	0	2	2	2	2	22	58	38%
MMH2	1	2	2	2	2	2	1	1	2	0	1	1	1	1	0	0	2	1	1	1	2	0	0	2	1	2	1	1	2	35	58	60%
MMH3	2	2	1	2	1	2	1	0	2	0	2	2	1	1	1	2	0	2	2	1	2	2	2	0	2	2	0	0	2	39	58	67%
MMH4	2	2	2	2	1	2	1	2	2	0	2	2	1	1	2	2	0	2	2	1	2	2	2	2	1	2	0	1	2	45	58	78%
MMH5	2	2	2	2	2	2	2	2	0	0	2	2	1	2	1	1	2	1	2	2	2	0	1	2	1	2	1	2	2	45	58	78%
MMH6	2	2	2	1	1	2	2	2	2	0	2	2	1	2	2	2	0	2	2	1	2	0	2	2	2	2	2	1	2	47	58	81%
MMH7	2	2	2	2	1	2	2	2	2	2	2	2	1	2	2	2	2	2	2	2	2	0	0	0	0	2	2	2	2	48	58	83%
MMH8	2	2	2	2	2	2	1	2	2	2	2	2	1	1	2	2	2	2	2	1	2	0	2	1	0	2	1	2	2	48	58	83%
MMH9	2	2	0	2	2	2	2	2	2	2	2	2	1	2	2	2	2	2	2	1	2	1	2	1	2	1	1	2	2	50	58	86%
MMH10	2	2	2	1	1	2	2	2	2	2	2	2	2	2	2	0	2	2	2	1	1	2	2	1	2	1	2	2	2	50	58	86%
MMH11	2	2	2	2	2	2	2	2	2	2	2	1	1	2	2	2	2	2	2	2	2	0	2	0	2	2	2	2	2	52	58	90%
MMH12	2	2	2	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2	55	58	95%
MMH13	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2	2	2	2	57	58	98%



Appendix III: Health Facility Manager's Interview Guide

	Date:
	Facility Name:
	District:
	Mother Church:
	Questions
1	What is your name and job title? (Optional)
2	Can you tell me a good news story related to WASH infrastructure or WASH services in your facility?
3	What aspects of WASH would you like to improve in your facility and why?
4	What support do you need in maintaining and improve your WASH infrastructure and services?
	1.
5	What challenges do you face with WASH infrastructure and services, and what do you think you can do to overcome them?
	1.
6	Who is responsible for the repair and maintenance of WASH infrastructure in this hospital? Are they full time and qualified?
7	What is the procedure for reporting broken WASH infrastructure? How long does the approval take on average?
8	What else would you like to tell me that I haven't asked you?

Appendix IV: Male Medical Ward Head Discussion Guide

	Date:
	Facility Name:
	District:
	Mother Church:
	<i>Questions</i>
1	What is your name and job title? (Optional)
2	Can you tell me a good news story related to WASH infrastructure or WASH services in this ward?
3	What aspects of WASH would you like to improve in your ward and why?
4	What support do you need in maintaining and improve your WASH infrastructure and services in this ward?
5	What challenges do you face with WASH infrastructure and services (patients and staff), and what do you think you can do to overcome them?
6	Once you have reported a broken WASH infrastructure in this ward, how long on average does it take to have it resolved?
7	What else would you like to tell me that I haven't asked you?

Appendix V: Consent Form to Administer the Checklists



THE UNIVERSITY OF ZAMBIA

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CONSENT FORM TO ADMINISTER THE CHECKLISTS

Title of Research Project: A situational Analysis of the Availability and Adequacy of Water, Sanitation and Hygiene (WASH) in rural Mission hospitals in Zambia; A case of 13 selected Mission hospitals

The study has been described to me in a language that I understand. My questions about the study have been answered. I understand what the participation of this health facility in this study will involve and on behalf of the facility management, I confirm that we have agreed to participate of our own choice and free will. I understand that the identity of the health facility will not be disclosed to anyone, and the findings anonymized. I understand that as a health facility, we may withdraw from the study at any time without giving a reason and without fear of negative consequences or loss of benefits. I hereby authorize the researcher to collect information from this health facility using the tool that has been availed to us.

Participant's Name..... Signature.....

Health Facility Name.....

Position

Date.....

The University of Zambia
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Lusaka, Zambia
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Appendix VI: Consent Form for Interviews



THE UNIVERSITY OF ZAMBIA

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CONSENT FORM FOR INTERVIEWS

Title of Research Project: A situational Analysis of the Availability and Adequacy of Water, Sanitation and Hygiene (WASH) in rural Mission hospitals in Zambia; A case of 13 selected Mission hospitals

The study has been described to me in a language that I understand. My questions about the study have been answered. I understand what my participation will involve, and I agree to participate of my own choice and free will. I understand that my identity will not be disclosed to anyone, and the findings anonymized. I understand that I may withdraw from the study at any time without giving a reason and without fear of negative consequences or loss of benefits.

Participant's Name..... Signature.....

Health Facility Name.....

Position (Facility Manager or Male Medical Ward Head)

.....

Date.....

The University of Zambia
Biomedical Research Ethics Committee

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Appendix VII: Information Sheet



THE UNIVERSITY OF ZAMBIA

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INFORMATION SHEET

Project Title: A situational Analysis of the Availability and Adequacy of Water, Sanitation and Hygiene (WASH) in rural Mission hospitals in Zambia; A case of 13 selected Mission hospitals

What is this study about?

This is a research project being conducted by Kelvin Hanyinda of the University of the Western Cape. We are inviting you to participate in this research project because you are a key stakeholder in the advocacy for quality WASH in HCFs in Zambia. The purpose of this research project is to understand the availability and adequacy of WASH infrastructure in selected mission hospitals in Zambia. This information will be very important for the selected facilities' planning purposes and for advocacy of quality WASH in HCFs in Zambia.

What will I be asked to do if I agree to participate?

You will be asked to respond to a few questions regarding the availability and adequacy of Water Sanitation and Hygiene (WASH) infrastructure in this hospital. The interview will take about 20-30 minutes.

Would my participation in this study be kept confidential?

The researchers undertake to protect your identity and the nature of your contribution. To ensure your confidentiality, all the collected data will be stored in a lockable cabinet while the soft copy data set will be stored using password-protected computer files. Your name will not be mentioned in the report or other forms of dissemination. We will also combine the findings from the 13 hospitals and not single out any individual institution by name.

What are the risks of this research?

There may be some risks from participating in this research study. All human interactions and talking about self or others carry some amount of risks. We will nevertheless minimize such risks and act promptly to assist you if you experience any discomfort, psychological or otherwise during the process

of your participation in this study. Where necessary, an appropriate referral will be made to a suitable professional for further assistance or intervention. The risk of individual exposure will be limited by reporting on the group of hospitals as a whole, and being careful not to name particular managers, male medical wards heads or individual institutions.

What are the benefits of this research?

This research is not designed to help you personally, but the results may help the investigator learn more about the status of WASH infrastructure and services in this hospital. We hope that, in the future, other people might benefit from this study through improved understanding of the health benefits of improved WASH in HCFs. The results from this study will be used to highlight the plight of hospitals in the provision of WASH infrastructure and services. This should put WASH in HCFs on the agenda of policy and decision makers to provide more resources and expertise. In the long run, with improved WASH in HCFs, this is likely to lead to better quality health services and reduce infection related deaths.

Do I have to be in this research and may I stop participating at any time?

Your participation in this research is completely voluntary. You may choose not to take part at all. If you decide to participate in this research, you may stop participating at any time. If you decide not to participate in this study or if you stop participating at any time, you will not be penalized or lose any benefits to which you otherwise qualify.

What if I have questions?

This research is being conducted by Kelvin Hanyinda of the School of Public Health at the University of the Western Cape. The researcher is currently based at his employing organization the Catholic Relief Services in Lusaka, Zambia. If you have any questions about the research study itself, please contact Kelvin Hanyinda at Catholic Relief Services Zambia Office, P.O. Box 38086, Lusaka, Telephone +260 973 742770, Email: Kelvinh1983@gmail.com

Should you have any questions regarding this study and your rights as a research participant or if you wish to report any problems you have experienced related to the study, please contact:

**The Chairperson
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This research has been approved by the University of the Western Cape's Research Ethics Committee.
(REFERENCE NUMBER: *BM/17/3/4*)

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Appendix VIII: Annotated Bibliography of the Articles Reviewed

Country/ries of Study	Authors	Year of Study	Study type	Title	Key Findings
Low and Middle-income countries	WHO, 2011	2011	systematic reviews of the literature on endemic HCAI from 1995 to 2010 in high- and low/ middle-income countries	Report on the Burden of Endemic Health Care-Associated Infection (HCAI) Worldwide	HCAI affects hundreds of millions of patients every year worldwide, with the burden of disease much higher in low- and middle-income countries
Low and Middle-income countries	Pruss-Ustun A et al., 2014	2014	A systematic review of data from low and middle-income countries	Burden of disease from inadequate water, sanitation and hygiene in low- and middle-income settings: a retrospective analysis of data from 145 countries	Deaths attributable to inadequate water, sanitation and t hand hygiene is estimated to be 842 000 deaths, which represents 1.5% of the global disease burden in 2012
Low and middle-income countries	Bouزيد M, Cumming O, Hunter PR, 2017	2017	Systematic review assessing the effect of WASH in HCF on two quality of care outcomes: patient satisfaction and care seeking behavior.	What is the impact of water sanitation and hygiene in healthcare facilities on care seeking behavior and patient satisfaction? A systematic review of the evidence from low-income and middle-income countries	Poor WASH provision is also associated with significant patient dissatisfaction and stop women from seeking care at maternity services
78 Low and Middle-Income Countries	Cronk R, Bartram J, 2018	2018	Systematic review of data from monitoring reports and peer-reviewed literature representing 129, 557 HCFs	Environmental conditions in HCFs (HCFs) in low- and middle-income countries: Coverage and inequalities	50% of HCFs lack piped water, 33% lack improved sanitation, 39% lack handwashing soap, 39% lack adequate infectious waste disposal, 73% lack sterilization equipment
Developing Countries	Allegranzi et al, 2011	2011	Systematic review and meta-analysis	Burden of endemic health-care-associated infection in developing countries	An estimated 15% of patients annually globally developing one or more

					infections during a hospital stay
Global	Roma E and Pugh I, 2013	2013	Systematic literature review of the scale of the global sanitation crisis, potential benefits of addressing the crisis and actionable recommendations	Toilets for Health; A report by the London School of Hygiene and Tropical Medicine in collaboration with Domestos	Interventions in the water, sanitation and hygiene sector are the most effective ways to address morbidity and mortality, however its importance in developing countries is overseen.
75 countries	WHO, 2017	2017	A cross sectional survey of 75 countries to assess the current WASH finance situation in countries, with an assessment of policies, actions and funding gaps to reach targets, financial planning and government budgets, as well as different sources of WASH financing (taxes, transfers and tariffs) and expenditure allocations	UN-Water Global Analysis and Assessment of Sanitation and Drinking-Water. GLAAS 2017 Report	<p>National WASH budgets are increasing as countries prepare to take on board the SDGs, yet there remains a discrepancy between global aspirations and national realities. There remains a lack of financial sustainability for reaching the unserved and maintaining services</p> <p>More and better data are available for informed decision-making</p> <p>Official development assistance (ODA) disbursements for water and sanitation are increasing, but future investments are uncertain</p> <p>Extending WASH services to vulnerable groups is a</p>

					policy priority, but implementation is lagging
25 countries from Sub Saharan Africa (SSA)	Roche R, Bain R, Cumming O, 2017	2017	A review of most recent data from Demographic Household Survey (DHS) or Multiple Indicator Cluster Survey (MICS) data for 25 countries in SSA	A long way to go-Estimates of combined water, sanitation and hygiene coverage for 25 sub-Saharan African countries	The most common WASH access scenario in SSA is improved water without improved sanitation or hygiene facilities with almost half (41.5%) of the population in this situation. This is true for almost all individual countries, too. After this, approximately a sixth (15.4%) have improved water and sanitation without improved hygiene
Ethiopia, Kenya, Mozambique, Rwanda, Uganda, and Zambia	Guo A, Bowling JM, Bartram J, Kayser G, 2017	2017	A Cross-Sectional Study	Water, Sanitation, and Hygiene in Rural Health-Care Facilities: A Cross-Sectional Study in Ethiopia, Kenya, Mozambique, Rwanda, Uganda, and Zambia	Access to improved water sources on premises, improved sanitation, and consistent access to water and soap for handwashing in rural HCFs stood at 7% Ethiopia, 30% Kenya, 29% Mozambique, 50% Rwanda, 30% Uganda and 21% Zambia. Fewer than 25% of HCF in each country reported that a combination of water, soap, and hand-drying materials were always available
Liberia	Abrampah N M et al, 2017	2015	Cross sectional survey of 701 HCFs in 2015	Improving water, sanitation and hygiene in health-care facilities, Liberia	In Liberia, only 45% of 701 surveyed health-care facilities had an improved

					water source in 2015, and only 27% of these health-care facilities had proper disposal for infectious waste. Relevant changes Local ownership, through engagement of local
Mali	Hayter A, 2015	2015	Desk review available data of WASH and Infection Prevention Control practices in healthcare facilities	Situational analysis of water, sanitation and hygiene and trachoma in Mali: implications and next steps	Many healthcare facilities in Mali suffer from a lack of adequately functioning WASH infrastructure and poor infection prevention control (IPC) practices. Common problems include inadequacies in water supply and storage, poorly maintained infrastructure (for example broken water tanks, incinerators and blocked latrines), lack of protective equipment for staff, poor handwashing practices, improper management of medical waste and visibly dirty facilities.
Rwanda	Huttinger A et al, 2017	2017	A cross sectional assessment of the state of WASH services used by staff, patients and caregivers was assessed in 17 rural HCFs in Rwanda	Water, sanitation and hygiene infrastructure and quality in rural healthcare facilities in Rwanda	At all sites, 60% of water access points (160 of 267) were observed to be functional, 32% of hand washing locations (46 of 142) had water and soap and 44% of sanitary facilities (48 of 109) were in hygienic

					condition and accessible to patients. No HCF had on-site capacity for performing repairs
Kenya	Bennett S D et al, 2015	2015	A pilot study on the Acceptability and Use of Portable Drinking Water and Handwashing Stations in HCFs and Their Impact on Patient Hygiene Practices in 40 facilities in Western Kenya	Acceptability and Use of Portable Drinking Water and Handwashing Stations in HCFs and Their Impact on Patient Hygiene Practices in 40 facilities in Western Kenya	Low-cost, low-maintenance, locally-available, portable handwashing and drinking water stations were acceptable short- to medium-term interventions to assure that health workers had a place to wash their hands and provide safe drinking water for medication administration
Tanzania	Benova L. et al, 2014	2014	A review of the 2010 Tanzania Demographic and Health Survey and the 2006 Service Provision Assessment data	Where There Is No Toilet: Water and Sanitation Environments of Domestic and Facility Births in Tanzania	30.5% of all births in Tanzania took place in a water and sanitation-safe environment as of 2010
Uganda	Mulogo E M et al, 2018	2018	A cross sectional survey across 50 HCFs in 4 districts of southwestern Uganda.	Water, Sanitation, and Hygiene Service Availability at Rural HCFs in Southwestern Uganda	Most of HCFs are improved water sources while most have improved sanitation facilities. Availability of hygiene facilities (hand washing amenities and messages) remains very limited in the HCFs.
Cambodia	Robertson Y, 2015	2015	Cross sectional survey of 12 facilities	Cross sectional pilot in 12 HCFs in two provinces of Cambodia: Kampong Speu and Prey Veng.	Almost none of the facilities provided any form of drinking water and sanitation facilities were not

					accessible to disabled patients. Hygiene and handwashing facilities were better in delivery units than maternity wards
Nepal	WaterAid Nepal, 2015	2015	A cross sectional study to analyze the adequacy and functionality of WASH services in 20 healthcare facilities considering the needs of patients and healthcare providers and to assess hygiene practice.	Assessment of WASH services in healthcare facilities in Nepal	Hand washing stations were available in 75% of the total toilets observed yet out of this number only 55% of hand washing stations had soap and water. 48% of the toilets had toilet pans stained with fecal material.
Cambodia	WaterAid Cambia, 2015	2015	Desk review of existing national and international policy documents, as well as reports and tools on WASH in HCFs, including assessment frameworks and datasets, and key informant interviews.	Towards safer and better-quality health care services in Cambodia. A situation analysis of water, sanitation and hygiene in HCFs	There is no single policy document that comprehensively describes national policies and planning, including standards and coverage targets, on WASH in HCFs in Cambodia. A few national policy documents stipulate one or more WASH-related elements within HCFs, including standards and indicators as reflected in the WHO guidelines
Bhutan	Ministry of Health, Bhutan, 2016	2016	A cross-sectional study of all hospitals of Bhutan including BHU I of Gasa and Haa Districts that serve as District hospital	Understanding Water, Sanitation & Hygiene in HCFs. Status in hospitals of Bhutan	Water, sanitation and hygiene are studied taking into consideration the various variables such as water quantity, water quality, water points, sanitation access, drainage,

					waste disposal and infection control.
Jordan	Khader Y S, 2017	2017	A cross sectional survey of 19 hospitals (15 public and 4 private)	Water, sanitation and hygiene in Jordan's healthcare facilities	WASH coverage in the surveyed hospitals was above 80%. However, the highlighted the lack WASH in HCFs standards and targets. The need to provide toilets for patients with special needs and establishing hand washing basins with water and soap near toilets
Indonesia	Odagiri M, Cronin A, Gressando Y et al, 2018	2018	An analysis of WASH in public HCFs using the 2010/2011 National Data Sets against the World Health Organization/United Nations Children's Fund Service Ladders	Water, Sanitation, and Hygiene Services in Public Health-Care Facilities in Indonesia: Adoption of World Health Organization/United Nations Children's Fund Service Ladders to National Data Sets for a Sustainable Development Goal Baseline Assessment	One quarter of 8,831 primary health centers (PHCs) did not have access to a combination of basic water and sanitation (Water and sanitation) services (23.6%), whereas more than two third of PHCs (72.0%) lacked handwashing facility with soap in all three locations (general consulting room, immunization room, and delivery room)
NA	Cairncross, S. et al., 2013	2013	systematic searches of major health outcomes associated with WASH	Water, Sanitation and Hygiene Evidence paper May 2013	Globally, around 1.4 million child deaths are estimated to be due to inadequate access to hygiene, sanitation and water (Prüss-Üstün et al. 2008)
NA	Bartram et al, 2015	2015	Editorial comment	Lack of toilets and safe water in health-care facilities	HCFs serve as foci for infection and patients

					seeking treatment fall ill and may die, for the lack of the most basic requirements for good hygiene – safe, reliable water supplies and adequate sanitation
NA	Adams, J. et al., 2008, WHO	2008	NA	World Health Organization. (2008). Essential environmental health standards in health care. Geneva, Switzerland	WHO's Essential environmental health standards in health care
NA	Chartier, Y., et al, 2014	2014	NA	Safe management of wastes from health-care activities, WHO 2 nd edition	WHO's Safe management of wastes from health-care activities
NA	Cronk R et al, 2015	2015	A systematic review of international standards, international and national actors, and monitoring initiatives of WASH in non-household settings	Monitoring drinking water, sanitation, and hygiene in non-household settings: Priorities for policy and practice	Inadequate drinking water, sanitation, and hygiene (WASH) in non-household settings, such as schools, HCFs and workplaces impact the health, education, welfare, and productivity of populations, particularly in low and middle-income countries. There is limited knowledge on the status of WASH in such settings.
NA	WHO, 2009	2009	NA	WHO (2009). WHO guidelines on hand hygiene in health care: first global patient safety challenge. Clean care is safer care. World Health Organization: Geneva.	WHO guidelines on hand hygiene in health care: first global patient safety challenge. Clean care is safer care. World Health Organization: Geneva.
NA	Benova L et al, 2014	2014	Systematic review of published literature in Medline, Embase, Popline	Systematic Review Systematic review and meta-analysis: association between water and	There is evidence of association between sanitation and maternal mortality and

			and Africa Wide EBSCO since 1980.	sanitation environment and maternal mortality	between water and maternal mortality.
NA	Erasmus, V. et al, 2010	2010	A systematic review of studies published before January 1, 2009, on observed or self-reported compliance rates	Systematic Review of Studies on Compliance with Hand Hygiene Guidelines in Hospital Care	Overall median hand washing compliance rate of 40% across all settings, situations and health care workers globally
NA	Emory University, 2017	2017	Side Event Meeting Report 2017 Water and Health Conference: Where Science Meets Policy	Moving WASH in HCF from Assessment to Action: What are the Solutions	Water shortages, poor water quality, deteriorating water infrastructure, poorly-maintained sanitation and inadequate hygiene are very common, and comprehensive assessments specifically of WASH infrastructure and services are rarely conducted.
NA	Gould DJ Moralejo D, Drey N, Chudleigh JH, Taljaard M. 2017	2017	A systematic review of literature from November 2009 to October 2016	Interventions to improve hand hygiene compliance in patient care	From the 26 studies reviewed, there is varying certainty in evidence, interventions and methods. Hence the need for further research on this subject
NA	Darvesh N, Das J K, Vaivada T, Gaffey M F, 2017	2017	A systematic review of studies (up to September 2016) evaluating the effects of WASH interventions on childhood diarrhea in children 0–5 years old	Water, sanitation and hygiene interventions for acute childhood diarrhea: a systematic review to provide estimates for the Lives Saved Tool	Various WASH interventions show diarrhea risk reductions between 27% and 53% in children 0–5 years old, depending on intervention type.
NA	Gon G, Restrepo-Méndez MC, Campbell OMR, Barros AJD, Woodd S,	2016	A review of data sets from 58 countries	Who Delivers without Water? A Multi Country Analysis of Water and Sanitation in the Childbirth Environment	Among women delivering at home (58 countries), coverage of improved water and sanitation by region varied from 9% to 53%.

	Benova L, et al, 2016				Fewer than 15% of women who delivered at home in Sub-Saharan Africa, had access to water and sanitation infrastructure (range 0.1% to 37%).
NA	WHO/UNICEF, 2016	2016	NA	Monitoring WASH in HCFs: Final Core Indicators and Questions	A summary of core indicators and questions for monitoring WASH in HCFs
NA	Bartram J, Lewis K, Lenton R, Wright A, 2005	2005	NA	Focusing on improved water and sanitation for health	Far more people endure the largely preventable effects of poor sanitation and water supply than are affected by war, terrorism, and weapons of mass destruction combined.
NA	A. Prüss-Ustün, R. Bos, F. Gore, and J. Bartram, 2008	2008	NA	Safer water, better health: costs, benefits and sustainability of interventions to protect and promote health	An important share of the total burden of disease worldwide—around 10%—could be prevented by improvements related to drinking-water, sanitation, hygiene and water resource management
NA	WHO, 2014	2014	NA	Preventing diarrhea through better water, sanitation and hygiene: Exposures and impacts in low- and middle-income countries	The number of deaths attributable to inadequate water, sanitation and hygiene has dramatically reduced; falling by over 50% from 1.8 million in 1990 (adjusted for comparability of methods) to 842 000 in 2012.

					Globally, total diarrhea deaths have declined from 2.9 million in 1990 to 1.5 million in 2012.	
NA	Johnston (WHO) 2014	R	2014	Water and Health Conference, UNC 2014	Water, sanitation and hygiene in HCFs	In low income settings, an estimated 10-15% of maternal deaths are due to infections that can be linked to unhygienic conditions
NA	Johnston (WHO) 2014	R	2014	Water and Health Conference Presentation, UNC 2014	Water, sanitation and hygiene in HCFs	<ul style="list-style-type: none"> • WHO/UNICEF Joint Monitoring Programme • Service Availability and Readiness Assessment Rationale • UN-Water GLAAS: Global Analysis and Assessment of Sanitation and Drinking-Water
Zambia	Ministry of Energy and Water Development, 2010		2010	NA	National Water Policy 2010	NA
Zambia	Ministry of Health, 2011		2011	NA	National Health Strategic Plan 2011-2015	NA
Zambia	Ministry of Health, 2010		2010	A cross sectional study of 565 HCFs (HFs) from 17 districts across the country	Zambia Service Availability and Readiness Assessment 2010 Summary Report	49% of the HFs in rural areas reported having an improved toilet-ventilated Pit Latrine
Zambia	Ministry of Local Government and Housing 2011		2011	A cross sectional study evaluating of the Community Led Total Sanitation Programme in 6	Community Led Total Sanitation in Zambia: An Evaluation of Experiences and Approaches to Date	80% of diseases in Zambia are environmental and related to water and sanitation. Access to

			districts		improved sanitation in rural Zambia was estimated at 43% in 2011
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