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DETERMINANTS OF HAND WASHING PRACTICES AMONG PUBLIC PRIMARY SCHOOL PUPILS: A CASE OF LURAMBI SUB COUNTY, KAKAMEGA COUNTY, KENYA

HUMPHREY BURADI ZADOCK
MDSDIST443022

ST. PAUL'S UNIVERSITY

A DISSERTATION PRESENTED TO THE SCHOOL OF EDUCATION AND SOCIAL SCIENCESST. PAUL'S UNIVERSITY IN THE PARTIAL FULFILLMENT OF REQUIREMENTS FOR MASTER OF DEVELOPMENT STUDIES DEGREE

NOVEMBER, 2024

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DECLARATION

This dissertation is my original work and has never been presented to any other University for an award of a degree. I agree that this proposal may be available for reference and photocopying, at the discretion of the University.

Signature:…… Date:……

HUMPHREY BURADI ZADOCK

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Declaration by Supervisors

We confirm that the student has worked on this dissertation under our supervision.

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First Supervisor

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Second Supervisor

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ABSTRACT

This research purposed to explore the factors influencing handwashing practices among public primary school pupils in Lurambi Sub County, Kakamega County, Kenya. The study objectives were: to assess primary school pupils' knowledge of handwashing; to analyze association between reliability of improved water service and pupil's handwashing practices; to examine technical factors associated with functionality of handwashing practices; to analyze association between reliability of school water service and pupils carrying water from home to school for handwashing and to analyze association between gender and school pupils' practice of carrying water from home to school for handwashing. A cross-sectional study design was utilized involving a sample of 377 pupils from 12 purposively selected public primary schools in Lurambi Sub County and 12 Key informants. Data collection tools included a questionnaire with both closed-and-open ended questions, observation and interview guide. Quantitative data for respective variables were analyzed through descriptive statistics and cross tabulation while for qualitative data content analysis was undertaken to determine the association between various factors and handwashing practices. The findings revealed several key factors associated with handwashing practices, including the type of water source services, knowledge of handwashing, reliability of improved water service, availability of handwashing facilities, technical factors and gender. The findings highlight the need for reliable improved water service, improved infrastructure, improved management of water stations, enhanced education on hand hygiene, and community involvement to enhance handwashing practices among primary school pupils. Implementing targeted interventions based on these insights can lead to better health outcomes and reduced incidence of infectious diseases in Lurambi Sub County.

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ABBREVIATIONS

HW	Hand Washing
MOH	Ministry of Health
MoWI	Ministry of Water and Irrigation
KESHP	Kenya Environmental Sanitation and Hygiene Policy
NACOSTI	National Commission for Science Technology and Innovation
PSAC	Preschool-Aged Children
SAC	School-Aged Children
SDG	Sustainable Development Goal
STH	Soil-Transmitted Helminth
UNICEF	United Nations Children's Fund
WaSH	Water, Sanitation and Hygiene
WASREB	Water Services Regulator Board
WHO	World Health Organization
WSB	Water Service Boards
WSPs	Water Service Providers

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CHAPTER ONE

INTRODUCTION

1.0 Overview of the chapter

Chapter one provides an overview of the study's history, presenting a synthesis of the issue from a global, regional, Kenyan, and Kakamega standpoint. Additionally, it will include the Problem statement, study goal, objectives, research questions, rationale, scope, constraints, delimitations, assumptions, and definition of terminology.

1.1 Background

Gawai et al. (2016) highlight the fact that hand washing practice is universally acknowledged as a cost-efficient approach to reduce the transmission of infectious illnesses. Nevertheless, hand-washing habits in underdeveloped nations continue to be inadequate, despite their shown efficacy. Berhanu et al. (2022) emphasise that hand washing practice with soap is a crucial component of hand hygiene, which is the use of soap and water to eliminate dirt, organic substances, and bacteria from the hands. Although hand washing practice is generally acknowledged as a cost-effective and efficient method of preventing diseases, the authors highlight that pupils in impoverished nations seldom engage in hand washing practice at critical times, such as after using the restroom, before eating, and before handling food. The absence of adequate hand cleanliness, coupled with the proximity of children in educational institutions and childcare facilities, greatly amplifies the likelihood of transmitting contagious illnesses.

The World Health Organization (WHO) recommends that all nations should give high priority to hand hygiene in both policy and practice. Nevertheless, as per UNICEF (2021b), several locations continue to face a deficiency in adequate hand hygiene facilities and assistance. Bishoge (2021) observes that the majority of endeavours have concentrated on augmenting water supply and sanitation. Kumwenda (2019) proposes that the provision of cost-effective hygiene equipment and instruction may significantly contribute to alleviating suffering and decreasing fatalities since cleanliness habits are vital for preserving health and averting illnesses.

Osher et al. (2009) and UNICEF (2013) assert that children are entitled to fundamental amenities, including sanitary school bathrooms, safe drinking water, hygienic environments,

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and essential knowledge about hygiene. Establishing these circumstances at educational institutions has an invigorating impact on aiding youngsters in comprehending and implementing improved principles and methods regarding cleanliness and personal hygiene, which they might subsequently impart to their families (IRC, 2007). Equipping schools with secure potable water, enhanced sanitation amenities, and teaching hygiene will significantly promote the development of lifelong healthy habits among children (UNICEF, 2012). According to the WHO and UNICEF Joint Monitoring Program (JMP), a school is classified as having a basic water source if it has access to water from an upgraded source, such as a borehole or rainwater collection tank. While improved water sources are an improvement , they do not always ensure the provision of safe drinking water, meaning water that is free from both faecal and prioritized chemical pollution.

Multiple academics have undertaken several studies to identify the difficulties associated with hand-washing in schools. Aiello et al. (2008) examined the impact of hand hygiene on the risk of infectious diseases in the community setting in the United States of America. The research found a correlation between inadequate hand washing and the occurrence of respiratory and gastrointestinal diseases. The survey further confirmed that initiatives aimed at enhancing hand-washing habits had resulted in a rise in hand-washing knowledge and behaviour, as well as a decrease in gastrointestinal ailments.

According to the WHO/UNICEF Joint Monitoring Program for Water Supply, Sanitation, and Hygiene (WaSH) report, (2016) it was found that in Mongolia, 41.4% of Mongolian Schools have basic hygiene services, which are defined as hand washing facilities with water and soap. Furthermore, a significant proportion of high school students, ranging from 8 to 11%, do not often practice hand hygiene by washing their hands before meals and after using the restroom. The survey also found that there is a lack of homework practice data among elementary school pupils in Mongolia. Therefore, it is essential to investigate their engagement in practical activities. Moreover, it is crucial to develop proficient homework habits from childhood, since they are anticipated to persist into adulthood (Enkhbat et al., 2022).

Mengistu, 2021) investigated the hand-washing behaviors of public primary school pupils and the variables related to these behaviors in Harar town, located in Eastern Ethiopia. The survey found that around one-third of kids adhered to adequate hand washing practices. The research further found that students' hand washing behavior was affected by factors such as

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their grade level, place of residence, role models for hand washing, availability of hand washing facilities, access to water and soap, and participation in the WaSH club. Consequently, the discovery indicated a need for interested entities to enhance hand-washing standards in schools. In their research, Besha et al. (2016) examined the hand-washing habits of primary school pupils in Arba Minch Town, Ethiopia, as well as the variables that influenced these habits. According to the report, the annual death toll in Ethiopia due to illnesses connected to sanitation and hygiene exceeds 250,000 children. The research further discovered that around 60% of the illness burden is associated with inadequate sanitation and hygiene. Despite the visibility of the aforementioned issues, global adherence to adequate hand washing practices falls short of the intended level. A study conducted by Besha et al. (2016) found that the percentage of individuals who washed their hands with soap before handling food or after using a toilet ranged from 0% to 34.0%.

A research undertaken by El-Nwsany et al. (2019) in Egypt, focusing on water management as a crucial element for ensuring the sustainability of schools confirmed that water is important in educational facilities due to its multifunctional role, including drinking, sanitation, and construction activities. Hence, prudent water usage management is important owing to its paramount significance. Water is the fundamental basis of our existing resources, and the manner in which we use it is crucial to the continuing discussion on attaining sustainability.

Kisaakye et al. (2021) did research to evaluate the presence of hand-washing facilities in homes across four East African nations. The analysis confirmed that Kenya has implemented regulations to promote proper hygiene and sanitation, in accordance with Goal 6 of the Sustainable Development Goals (SDGs). The Kenya Environmental Sanitation and Hygiene Policy (KESHP) has the objective of achieving universal access to sanitation by 2030 via public education on sanitation practices,(Ministry of Health, 2015; Null et al., 2018). The findings also confirmed that educational programs have been linked to enhanced hand-washing behaviors (Mathai et al., 2010; Nteli et al., 2014; Teker et al., 2015). Prior studies indicate that youngsters are more inclined to regularly exhibiting proper hand-washing practices if they have received appropriate instructions (Chittleborough et al., 2012).

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Kenya has achieved notable progress in enhancing cleanliness and hygiene in schools, as stated by the Ministry of Education (2018). The National Education Sector Strategic Plan (Ministry of Education, 2018) acknowledges that ensuring access to uncontaminated water, advocating for hand hygiene, and implementing proper sanitation practices in schools are crucial for the comprehensive development of children. The Plan has proposed that the lack or inadequacy of reliable water supplies and sanitation facilities would restrict the educational advantages. The disparities will be influenced by factors such as gender, disability, geographical location, and family affluence. According to Greene et al. (2012), the introduction of Free Primary Education (FPE) in Kenya in 2003 has significantly limited the availability of sanitary facilities and school infrastructure. The 2006 Economic Survey reveals that the number of children enrolled in schools in Kenya increased significantly from 5.4 million in 2001 to 7.6 million in 2005. Nevertheless, the increase in the number of students enrolling in educational institutions has outpaced the development of educational infrastructure. In addition, the current school infrastructure has been neglected for many years, resulting in overcrowded classrooms and inadequate water and sanitary facilities in a majority of schools. The lack of availability of water and soap, as well as a lack of motivation for hand washing, has resulted in a low prevalence of hand washing in Kenya.

Kakamega, located in Western Kenya, is among the counties facing water constraints. The county encounters substantial obstacles in safeguarding water resources, constructing water infrastructure, implementing suitable technologies, and guaranteeing the sustainable supply of water and sanitation services (County Water Supply and Urban Sewerage Strategic Plan, 2015-2019). Barasa et al (2015) found that in Lurambi Sub-County, Shieywe Ward, Kakamega County, diarrhoea is a significant cause of death and illness in children under the age of five. This research investigated the factors that influence hand-washing behaviors among students attending public primary schools in Lurambi Sub-County, Kakamega County.

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1.2 Problem statement

Inadequate hand washing practices in public schools in Kenya provide a substantial public health issue, leading to the extensive spread of contagious diseases such as diarrhoea, respiratory infections, and other disorders connected to cleanliness among school-going children. The World Health Organization (WHO) states that insufficient hand hygiene is a primary factor contributing to the transmission of infections and diseases in low- and

middle-income countries, where access to appropriate sanitation facilities is often limited (WHO, 2020). The frequency of hand-washing in schools in Kenya is low primarily because of the limited availability of water and soap, as well as a lack of motivation to practice hand-washing (Wichaidit et al., 2019).

The situation in Kenyan public schools is dire since there is little availability of clean water, soap, and sufficient handwashing amenities. A 2019 survey conducted by the Kenya National Bureau of Statistics (KNBS) and UNICEF found that a mere 40% of schools have the necessary handwashing facilities equipped with soap and water. Consequently, this has resulted in irregular handwashing habits among pupils. The scarcity is exacerbated by a dearth of knowledge and instruction on the significance of frequent and appropriate handwashing, which is prevalent among both students and school personnel (O'Reilly et al., 2021).

Poor handwashing techniques have wide-ranging repercussions. The prevalence of frequent illnesses among kids results in a rise in absenteeism, which has a detrimental impact on both academic achievement and school attendance. This scenario hampers endeavours to accomplish the Sustainable Development Goals (SDGs) pertaining to health (SDG 3), education (SDG 4), and access to clean water and sanitation (SDG 6),(UNICEF, 2020).

Due to the crucial importance of hand hygiene in reducing the spread of diseases and creating a healthy learning environment, it is imperative to investigate the factors that influence hand washing habits among students in public primary schools in Lurambi sub-County, Kakamega County. Gaining a comprehensive understanding of these characteristics is crucial in order to create specific treatments that may boost hand hygiene habits, decrease the impact of diseases, and improve the overall health and academic performance of children.

Multiple studies have been undertaken in this particular scenario. Proper hand hygiene with soap is an essential element for maintaining good health and promoting growth and progress. According to the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF), as of 2021, over 30% of the global population does not have access to adequate hand-washing facilities equipped with soap and water in their own homes. Conversely, according to the World Bank (2020), over 47% of schools lack

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adequate hand-washing facilities, and 16% of healthcare institutions lack suitable hand-washing facilities in crucial places, such as at the point of treatment or near restrooms.

Children attending primary schools in Lurambi Sub-County, Kakamega, Kenya are exposed to avoidable health risks such as diarrhoea, cholera, dysentery, and typhoid owing to inadequate water sanitation and hygiene (WaSH) facilities, as well as unfavorable attitudes and behaviors (Barasa et al. 2015). An investigation is required to analyze the factors that influence hand-washing behaviors among students attending public primary schools in the specified region. This study issue is closely related to Sustainable Development Goal (SDG) 6, which specifically aims to provide universal access to water, sanitation, and hygiene. This work is significant since it will help to tackle the difficulties associated with hand-washing in schools.

1.3 Purpose of the study

To examine determinants of hand washing practices among public primary school pupils in Lurambi Sub-County, Kakamega County.

1.4 Objectives of the study

The specific objectives of this study were to;

i. To assess primary school pupils' knowledge of hand washing practices.
ii. To analyze relationship between reliability of improved water service and pupil's hand washing practices.
iii. To examine technical factors associated with functionality of hand washing practices.
iv. To analyze relationship between reliability of school water service and pupils carrying water from home to school for hand washing practices.
v. To analyze relationship between gender and school pupils' practice of carrying water from home to school for hand washing practices.

1.5 Research questions

The following are the study questions that this study sought to address;

i. What is the primary school pupils' knowledge of hand washing practices?

ii. Is there relationship between reliability of improved water service and pupil's hand washing practices?

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iii. What are the technical factors associated with functionality of hand washing practices?

iv. Is there relationship between reliability of school water service and pupils carrying water from home to school for hand washing practices?

v. Is there relationship between gender and school pupils' practice of carrying water from home to school for hand washing practices?

1.6 Justification of the study

This work is significant since it will help tackle the difficulties associated with hand-washing in schools. This is pertinent to Sustainable Development Goal (SDG) 6, which aims to provide universal access to water, sanitation, and hygiene. This study will provide valuable insights for development practitioners by sharing information on the factors that influence hand washing practices among public primary school students in Lurambi sub County, Kakamega County. It will also propose measures to enhance the Water, Sanitation, and Hygiene (WaSH) infrastructure in order to create an environment in public schools that promotes cognitive development, social skills, and self-governance among students. The decision to conduct this research in Lurambi sub-county aims to provide a comprehensive representation of the various schools and students in Kakamega county. This is because Lurambi Sub-County is home to the Kakamega County headquarters and was also the old Western Kenya Provincial Headquarters. The Sub-County is diverse and reflects the diversity of Kenya, making it a suitable location for our research. This research is particularly relevant to individuals in the education sector as it will urge them to take action to ensure the safety and well-being of students while they are at school. This entails ensuring effective management of the school environment, in addition to providing schools with clean and safe water, sanitation, and hygiene infrastructure.

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1.7 Limitations of the study

There were several limitations to this study;

Lurambi Sub-County is a constituent of the twelve sub-counties that make up Kakamega. It is one of the largest and extensive sub-counties in Kakamega County. This, in itself, presented a constraint on the research in terms of its scope.

Another constraint of this analysis was the topography of the project site. The Lurambi Sub-County is characterized by a rugged topography, which made it difficult to reach some

locations using certain modes of transportation. This might potentially hinder access to the research, hence having a negative impact.

Lastly, this proposed research is limited to the Lurambi Sub-County in Kakamega County, Kenya. Therefore, the generalizability of the results to other contexts is uncertain.

1.8 Delimitation

This research focused only on investigating the factors that influence the practice of hand-washing among students attending public primary schools in Lurambi Sub-County, located in Kakamega County. The research did not explore other factors that contribute to improving hand-washing practices in schools, including as the policy framework on Water, Sanitation, and Hygiene Access and Management in public schools in Kakamega County and beyond. The research specifically concentrated on Lurambi Sub-County, which is known for being one of the biggest and most extensive sub-counties within Kakamega County.

1.9 Scope

The study included investigating the factors that influence hand hygiene behaviours among students attending public primary schools in Lurambi sub-County, Kakamega County. It was limited to Lurambi Sub County and specifically concentrated on public elementary schools within the designated research region. The research concentrated on evaluating the school water supply in public primary schools, analyzing the placement of hand-washing stations, measuring the level of awareness about hand-washing in public primary schools, and reviewing the handling of hand-washing equipment in public primary schools. The research was conducted from October 2023 to September 2024.

1.10 Assumptions

The study was based on the assumption that;

i. The assessment of primary school pupils' knowledge of hand washing, the analysis of association between reliability of improved water service and pupils' hand washing practices, the examination of technical factors associated with functionality of hand washing practices, the analysis of association between reliability of school water service and pupils carrying water from home to school for hand washing and the analysis of association between gender and school pupils' practice of carrying water from home to school for hand washing would all be successful.

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ii. Similar circumstances surround factors influencing hand-washing behavior in Western Kenyan primary schools.
iii. Throughout the procedure, the respondents would be accessible and cooperative in providing reliable, unbiased information that would aid in the study.
iv. When making choices on WASH in schools, stakeholders in the health, education, and development sectors as well as the government will find the study results useful.

1.11 Operational definition of terms

In this study, the following terms used will have meaning as explained below;

Hand-washing – This involves washing hands under running water for ten to fifteen seconds using better tools (soaps and antiseptics), and then drying them with a paper towel to get rid of extraneous materials.

Diarrhoea – This is a disease due to a lack of appropriate WaSH services.

Pupils – Refers to young children between the ages of 6 – 13 years. The majority of pupils who are undertaking Primary Education in public or private schools in Kenya fall within this age bracket. Such a cohort is under the consent age.

Improved sanitation - Refers to establishments and offerings that appropriately dispose off human waste and lessen the risk of contracting dangerous infections. These facilities are intended to keep people away from excrement, which stops illnesses from spreading. Ventilated improved pit latrines, composting toilets, and flush or pour-flush toilets linked to a septic tank or sewage system are a few examples. Systems for properly disposing off garbage and maintaining hygienic surroundings are also part of improved sanitation.

Unimproved sanitation - Unimproved sanitation refers to setups and procedures that don't adequately keep human waste and human touch apart, increasing the danger of environmental pollution and health problems. Open defecation, pit latrines without a slab or platform, bucket latrines, and hanging latrines—which discharge waste into bodies of water directly—are a few instances of inadequate sanitation. These establishments and procedures don't stop illnesses from spreading and worsen the state of hygiene.

Water accessibility - Refers to the existence of sufficient water to meet domestic needs available close to households or institutions.

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Improved water sources - It is a type of water source that, by nature of its construction or through active intervention, is likely to be protected from outside contamination, in particular from contamination with fecal matter.

Unimproved water sources - Unreliable and unsafe access to clean water is not provided by an unimproved water source. These sources may include untreated wells or springs; untreated or unprotected surface water sources, such rivers, lakes, or ponds; and untreated or untreated water collected from rain or other unofficial sources. Users of unimproved water sources face serious health concerns due to the increased likelihood of disease and pollution contamination.

Pupil health - This refers to a student's whole condition of physical, mental, and social well-being and goes beyond just being free from illness or disability. Additionally, students may learn, grow, and engage in creative play in this condition. Students who are in excellent health are better able to form and maintain strong connections with others and have a sense of community within their school.

Pupils hygiene - Students engage in handwashing activities in an effort to stop the spread of illness.

Functionality - When determining whether a water point is functional or not, this applies to yield, mechanical problems, and water availability. School water infrastructure refers to the several parts that work together to pump, divert, transport, store, treat, and provide safe drinking water to schools.

School water sources - These may consist of groundwater wells/boreholes, reservoirs, storage tanks, springs, and piped schemes.

Water treatment - The techniques and procedures used to raise the quality of water so that it is suitable for drinking, cooking, and other applications.. To comply with health and safety regulations, this entails eliminating pollutants including germs, viruses, chemicals, and particle matter.

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CHAPTER TWO
LITERATURE REVIEW

2.0 Introduction

This chapter examines the literature on hand-washing practices in schools, with a particular emphasis on those related to WaSH. Additionally, it addresses the theoretical and conceptual frameworks. Finally, the researcher has provided an empirical literature review and literature that is pertinent to the specific objectives of this study.

2.1. Theoretical framework

This research is founded on two theories that are intended to elucidate, anticipate, and facilitate comprehension of the determinants of hand-washing practices among public primary school students in Lurambi Sub-County, Kakamega County. The two theories are the Socio-Ecological Model (SEM) Theory and the Grounded Theory. A theory is a collection of interrelated constructs that provide a systematic perspective on an issue by defining the relationships between variables in order to elucidate and predict the phenomena, as per Kivunja, C. (2018).

2.1.1 The Socio-Ecological Model (SEM)

This study proposes the use of the Socio-Ecological Model theory to comprehend the many degrees of impact on hand-washing behavior among public primary school students and its effects. Urie Bronfenbrenner first developed this theory as a conceptual model to comprehend human growth in the 1970s. It was subsequently established as a formal theory in the 1980s. Bronfenbrenner (1994) introduced the Socio-Ecological Model, commonly referred to as Ecological Systems Theory or the Social Ecological Model, as a theoretical framework in the fields of behavioral science and public health. This tool is used to investigate the intricate interplay of individual, interpersonal, organizational, community, and societal elements that impact human behavior and health results. Bronfenbrenner highlighted the importance of recognizing that people exist within several interconnected systems, and the interplay between these systems greatly impact their physical and mental health.

Lanfer et al. (2021) performed a research in Sierra Leone that examined hand-washing behaviour from a socioecological and intersectional viewpoint, with a focus on embracing difficult complexity. The research discovered that Socio-Ecological Models (SEMs) use the

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analogy of natural ecosystems, implying that people are integrated into several interconnected subsystems. Furthermore, it was discovered that socio-ecological methods are frequently used to examine the connections between risk factors, which can exist at both the individual level and within the larger contextual environment, and health inequalities among specific populations, such as students in public schools. In addition, the research emphasized that although psychological models of health behavior mostly concentrate on individual behaviours, Structural Equation Models (SEMs) take into account not just immediate external impacts like peer pressure, but also larger elements such as community dynamics, governing bodies, and infrastructure. These models analyze the interaction between many factors and peoples' beliefs, behavioral intentions, and actual actions.

Costanza (2014) argues that the Socio-Ecological Model provides a thorough method for comprehending and dealing with the several levels of impact on health behaviors and outcomes. It provides guidance for the creation of interventions at several levels with the goal of improving health and avoiding illness. This model is extensively used in Public Health research and practice to examine the intricate interaction of individual, interpersonal, organizational, community, and societal aspects. It allows researchers and practitioners to develop treatments that are more efficient. Some examples of these interventions include physical activity programs that are established in the community, education programs on nutrition that are implemented in schools, efforts to promote wellness in the workplace, and governmental laws that limit the use of tobacco and improve access to healthcare services. Essentially, the Socio-Ecological Model is a strong theoretical framework that emphasizes the many levels of impact on health behaviors and outcomes. This model offers significant insights for establishing comprehensive strategies at several levels to promote health, prevent illness, and address health inequalities and inequities. It takes into account individual, interpersonal, organizational, community, and societal aspects.

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2.1.2 Grounded Theory

This study aims to use Grounded Theory to gain insight into the perspectives, attitudes, and actions of both students and staff members during hand-washing activities in public primary schools within Lurambi sub County, Kakamega County. Grounded Theory (GT) was introduced by Glaser and Strauss (1967) as a methodology for constructing hypotheses based on methodically gathered evidence. Grounded Theory is a research approach that prioritizes inductive analysis. The researcher will use the data gathered from key informant

interviews to formulate novel ideas or hypotheses on the management of WaSH infrastructure in schools. Although Grounded Theory (GT) emphasizes the importance of basing findings on empirical evidence, it is crucial to acknowledge that the researcher's bias has the potential to impact the outcomes of the study.

This research is conducted inside a school setting, and as Thornberg (2017) points out, a child-centered early development classroom prioritizes nurturing curiosity, promoting inquiry, embracing discovery, and valuing the process rather than the end result. Experienced educators comprehend that youngsters flourish when their educational setting is organized to provide security and uniformity, enabling their inquisitiveness to guide them. The architecture of an early childhood setting serves as a supporting framework, creating a safe and stable atmosphere that fosters extensive exploration of the world. Similarly, Grounded Theory functions as a systematic methodology for researchers. Similar to how the learning environment facilitates and directs children's exploration, Grounded Theory offers scholars a structured approach to analyze data. This framework enables researchers to thoroughly examine the data, investigate its subtleties, and unveil the analytical narratives it unveils. Grounded Theory is an analytical approach that prioritizes the process of research rather than focusing solely on achieving a specific outcome. It operates within the dynamic space between structure and freedom, routine and playfulness, and consistency and surprise. This approach aligns with the principles of early childhood education.

The positivist orientation of Grounded Theory emphasizes the pursuit of 'objective knowledge' by maintaining a sense of detachment between the researcher and the research process (Lincoln, Lynham & Gaba, 2011). On the other hand, the constructivist Grounded Theory (GT) presents a contrasting viewpoint and asserts that it is impossible to disregard the researcher's significant involvement in gathering and analyzing data (Charmaz, K. (2017) Constructivist GT acknowledges that knowledge is context-dependent and views knowledge as being created via social interactions (Flick, 2014, pp. 78). This study aims to use a qualitative research technique in one aspect. Considering this, the use of Grounded Theory will be optimal for this investigation.

2.2 Empirical Literature Review

2.2.1 Primary School Pupils' Knowledge of Handwashing

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Handwashing is a simple yet highly effective method to prevent the spread of infectious diseases. Despite the simplicity of the practice, proper handwashing behavior, especially among children, can be challenging to implement consistently. Schools, as key environments for promoting health education, play a vital role in imparting knowledge about proper hygiene practices to young children. This review focuses on the empirical studies conducted on the knowledge of primary school pupils regarding handwashing, highlighting key findings, methodologies, and implications.

Several studies have shown that primary school pupils generally understand the importance of handwashing, but their knowledge about the specifics of effective hand hygiene (e.g., duration, critical times to wash hands) is often incomplete. A study by Yallew et al. (2017) in Ethiopia assessed the handwashing knowledge of primary school children and found that while 90% of children reported knowing that handwashing was important, only 40% were aware of the need to use soap regularly. The study emphasized that while pupils were aware of handwashing as a health-promoting activity, their understanding of its correct execution needed improvement. Similarly, a study conducted in Kenya by Saboori et al. (2010) explored children's knowledge and attitudes towards handwashing and found that most pupils could articulate basic reasons for handwashing, such as preventing sickness, but their practical knowledge such as the length of time required to wash hands (20 seconds) and the use of soap was limited.

Studies indicate that the majority of pupils in primary schools are aware of the act of handwashing, but the proper technique is less well understood. Research by Kanki et al. (2020) conducted in rural Nigerian schools demonstrated that 70% of students could recall the importance of using soap when washing their hands, but only 30% practiced the correct technique, including washing the backs of their hands and cleaning between fingers. The World Health Organization recommends that hands be washed for at least 20 seconds with soap, focusing on all parts of the hand, including nails and in between fingers. However, this level of understanding is often not emphasized in school curricula.

Empirical studies have consistently shown that targeted educational interventions can significantly improve pupils' knowledge and handwashing behavior. A randomized controlled trial conducted in Bangladesh by Rabbi and Dey (2013) found that schools that implemented structured handwashing programs saw a 50% increase in pupils' handwashing

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knowledge and a 40% improvement in actual handwashing practices. This study demonstrated the effectiveness of repeated demonstrations, visual aids, and interactive sessions in improving knowledge retention among children. Additionally, a study by Bowen et al. (2007) in China found that introducing handwashing programs in primary schools, with a focus on hand hygiene education and infrastructure improvement (such as providing soap and water), led to a significant decrease in the incidents of respiratory and diarrheal diseases. This demonstrates the critical role of education, combined with improved access to handwashing facilities, in promoting healthy behaviors.

Despite the availability of knowledge about the benefits of handwashing, several barriers prevent primary school pupils from effectively adopting the practice. Lack of access to clean water and soap is one of the most significant barriers, especially in low-resource settings. Research conducted in Ugandan schools by Nandrup-Bus (2009) revealed that while children were aware of the importance of handwashing, many did not have access to handwashing stations equipped with soap and clean water, resulting in poor hygiene practices. Another barrier is the inconsistent reinforcement of handwashing education in both home and school settings. A study conducted in South Africa by Dreibelbis et al. (2013) found that while pupils received handwashing education at school, they often lacked support or role modelling from teachers and parents. As a result, children were less likely to consistently practice good hygiene at home or outside of school.

Cultural factors also influence how handwashing practices are perceived and adopted. In many cultures, handwashing is associated with ritual purity rather than disease prevention. A study conducted in Indonesia by Curtis et al. (2011) found that while handwashing was commonly practised after using the toilet, it was often not seen as necessary after other activities that could spread germs, such as playing or handling food. The researchers suggested that integrating culturally relevant messages into handwashing education could significantly improve its effectiveness.

Empirical evidence shows that primary school pupils generally have basic knowledge about handwashing, but there are gaps in their understanding of proper handwashing techniques and the contexts in which it should be practised. Educational interventions and improved infrastructure can significantly enhance pupils' handwashing knowledge and behaviours. To ensure lasting behavioural change, consistent handwashing education and the active involvement of parents, teachers, and the broader community are essential.

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2.2.2 Association between the Reliability of Improved Water Service and Pupils' Handwashing Practices

Hand washing is a critical component of personal hygiene, particularly in preventing the spread of communicable diseases. The presence of reliable, improved water services in schools play a significant role in enabling and encouraging proper hand-washing practices among pupils. This review examines empirical studies investigating the association between the reliability of improved water services and primary school pupils' hand washing behaviors, focusing on the impact of water accessibility, infrastructure, and consistent supply on hygiene practices.

Improved water services are essential for effective hand hygiene practices. These services are typically defined as those providing clean, accessible water through infrastructure like piped supplies, public taps, or protected wells. Research has shown that access to such water services significantly influence the frequency and quality of hand washing among school children. A study by Dreibelbis et al. (2013) in Kenyan Primary Schools demonstrated that pupils in schools with reliable water sources were twice as likely to engage in regular hand washing compared to pupils in schools with unreliable or no water supply. This suggests that the availability of water, particularly during critical moments such as after using the toilet or before meals, plays a key role in forming and maintaining hand washing habits. In another study conducted by Mwakitalima et al. (2018) in Tanzanian schools, researchers found a strong correlation between the reliability of water service and pupils' hand hygiene behaviours. Schools with constant water availability reported better hand washing compliance among students, and the presence of soap further improved the effectiveness of these practices. This study highlights the importance of not only providing access to water but also ensuring its consistent availability throughout the school day.

Accessibility to improved water services both in terms of distance and consistency strongly correlates with hand washing practices in schools. A study by Jasper et al. (2012) assessed the hand washing behavior of pupils in 60 rural schools in India and found that schools with easily accessible water stations (located close to classrooms and toilets) had significantly higher hand washing rates. Pupils were more likely to wash their hands when they did not have to walk long distances to access water, and when hand washing facilities were placed near sanitation areas. Similarly, in a study by O'Reilly et al. (2008) in Zimbabwean Primary Schools, it was found that water availability close to handwashing stations dramatically

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improved the frequency of handwashing after toilet use. The researchers reported a 67% increase in handwashing compliance in schools where pupils had easy and immediate access to water after using the bathroom, compared to schools where water access was distant or inconsistent.

While improved water services are critical, studies emphasize that water reliability alone is insufficient to foster proper handwashing practices. The availability of soap at handwashing stations is equally important in ensuring effective hand hygiene. A study by Saboori et al. (2011) in rural Kenyan schools found that while improved water access increased the likelihood of handwashing, the presence of soap was a significant factor in determining the quality and frequency of handwashing practices among pupils. In schools with both reliable water services and consistent soap supplies, 80% of students reported washing their hands with soap after using the toilet, compared to only 30% in schools with water but no soap. This suggests that the effectiveness of improved water services in promoting handwashing is greatly enhanced when soap is available, reinforcing the need for a comprehensive approach that addresses both water supply and hygiene materials.

Despite the importance of water access, many schools in low- and middle-income countries face challenges in maintaining a reliable water supply, which directly impacts pupils' ability to practice handwashing. Research by Watson et al. (2020) on school water, sanitation, and hygiene (WASH) services in Malawi found that schools with intermittent water supply struggled to maintain consistent handwashing practices. Pupils in these schools reported not washing their hands regularly due to a lack of water during certain parts of the day, particularly after lunchtime and during high-use periods when water shortages were common. This finding was echoed in a study conducted by Caruso et al. (2014) in Zambia, which showed that unreliable water services led to frustration and poor hygiene practices among students. Schools with frequent water outages or delays in replenishing water storage tanks experienced a marked decrease in handwashing rates. Pupils in these schools reported resorting to wiping their hands on clothes or skipping handwashing altogether when water was unavailable, highlighting the critical role of water reliability in promoting good hygiene.

Several studies have emphasized the importance of long-term infrastructure improvements in supporting sustainable handwashing practices. A longitudinal study by Freeman et al.

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(2012) conducted in 43 primary schools in Bangladesh assessed the impact of installing improved water services and handwashing stations on pupils' hygiene behaviors over a two-year period. The study found that schools with consistent water availability and functional handwashing infrastructure reported significantly higher levels of handwashing among pupils compared to control schools without such interventions. Moreover, the study found that when infrastructure improvements were maintained over time, the effects on handwashing behavior were sustained even after two years, indicating the long-term benefits of reliable water services.

Beyond infrastructure, policy and educational interventions aimed at promoting handwashing have been shown to be more effective when accompanied by reliable water services. A study by Greenland et al. (2016) examined the impact of a handwashing education program in Ugandan schools and found that while the program improved pupils' knowledge of hand hygiene, actual handwashing practices did not improve significantly in schools with unreliable water access. In contrast, schools that had reliable water services saw both improved knowledge and higher rates of handwashing compliance, underscoring the need for reliable infrastructure to support educational initiatives.

The empirical evidence underscores the strong association between the reliability of improved water services and pupils' handwashing practices. Schools with consistent water supply and accessible handwashing facilities report significantly higher rates of handwashing among pupils, especially when soap is also available. However, barriers such as intermittent water supply and lack of infrastructure can undermine handwashing efforts, even in schools where hygiene education programs are in place. Addressing these barriers through sustainable infrastructure improvements, combined with educational interventions, is key to promoting effective and long-lasting handwashing practices among schoolchildren.

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2.2.3. Technical Factors Associated with the Functionality of Handwashing Practices

Handwashing practices are critical for disease prevention, particularly in preventing the transmission of diarrheal diseases, respiratory infections, and other communicable diseases. However, the functionality and sustainability of handwashing practices are often influenced by various technical factors such as the design and location of handwashing stations, availability and accessibility of water, provision of soap, and infrastructure maintenance. This review examines the empirical evidence on the technical factors that are associated

with the functionality of handwashing practices, focusing on key aspects such as water supply, infrastructure design, and materials for hand hygiene.

The availability of water is a fundamental technical factor that directly impacts the functionality of handwashing practices. Without a reliable water supply, handwashing stations cannot function effectively, making it difficult for users to practice proper hand hygiene. Research by Kumpel et al. (2018) in rural India examined the relationship between water supply and handwashing behavior and found that schools with a reliable piped water supply had significantly higher rates of handwashing than those that relied on intermittent or non-piped water sources. The study emphasized that consistent water access ensures that handwashing facilities remain functional throughout the day, allowing students and staff to wash their hands when necessary. Similarly, a study conducted by Pickering et al. (2017) in Kenya found that the absence of continuous water supply was a major barrier to regular handwashing. In schools with intermittent water access, handwashing stations often remained empty or unusable, leading to a reduction in the frequency of handwashing among students. This highlights the importance of reliable and continuous water supply systems to support sustained hand hygiene practices.

The design and location of handwashing stations are critical technical factors that affect the ease and frequency of handwashing. Studies show that handwashing facilities that are easily accessible and conveniently located (e.g., near toilets or food areas) are more likely to be used frequently. A study by Dreibelbis et al. (2016) in Tanzanian schools demonstrated that handwashing stations placed close to toilet facilities significantly increased the likelihood of handwashing after toilet use. The study also found that foot-pedal-operated handwashing stations were more effective in promoting handwashing than traditional tap designs, as they reduced the risk of recontamination of hands after washing. Another study by Hulland et al. (2013) in Ethiopia examined the role of handwashing station design in promoting effective hand hygiene. It found that the use of "tippy taps"—simple, low-cost, and low-water-use handwashing devices—significantly improved handwashing behaviour in schools where water resources were limited. The study emphasized that the design of handwashing stations should be adapted to local conditions, such as water scarcity, to ensure they remain functional and easy to use.

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Soap is an essential component of effective handwashing. The presence of soap, in combination with water, significantly enhances the ability to remove germs from hands. Several studies have shown that the availability of soap is a major determinant of handwashing functionality. A study by Saboori et al. (2013) in Kenya found that regular provision of soap in schools increased handwashing rates by up to 60%. Schools that had handwashing stations equipped with soap dispensers reported more frequent handwashing and a reduction in diarrheal disease rates among students. However, soap dispensers themselves need to be functional and maintained regularly. Research by Grover et al. (2018) in Bangladesh examined the impact of soap dispenser functionality on handwashing practices. The study found that schools with broken or malfunctioning soap dispensers experienced a sharp decline in handwashing rates. Schools that implemented regular maintenance checks for soap dispensers were more successful in maintaining high levels of handwashing compliance.

The durability of handwashing infrastructure is another important technical factor associated with the long-term functionality of handwashing practices. Infrastructure that is prone to damage or difficult to repair can lead to the abandonment of handwashing practises. A study conducted by Caruso et al. (2014) in Zambian schools found that many handwashing stations were made from low-quality materials that degraded quickly, leading to non-functioning facilities. The study emphasised the need for using durable materials that can withstand regular use, especially in high-traffic environments like schools. Maintenance of handwashing facilities is also crucial for their long-term functionality. A longitudinal study by Garn et al. (2017) in Haiti found that schools with regular maintenance programs for handwashing stations, including repairs and soap restocking, maintained higher levels of handwashing compliance than schools without such programs. The study highlighted the importance of establishing routine maintenance schedules to ensure that handwashing facilities remain operational and accessible.

In areas where water access is intermittent, the presence of effective water storage systems can make a significant difference in maintaining the functionality of handwashing practices. A study by White et al. (2019) in Uganda found that schools with water storage systems (such as tanks) were more successful in maintaining functional handwashing stations, even during water shortages. The study highlighted the importance of investing in water storage solutions to ensure the continuous availability of water for handwashing, especially in

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regions with unreliable water supply. Water management practices, such as proper use and replenishment of water storage tanks, also play a critical role. In schools where water was rationed or improperly managed, handwashing facilities were often left without water during critical times of the day, such as after lunch or during peak toilet use. This underscores the need for effective water management practices to maintain the functionality of handwashing stations.

Incorporating innovative technology into handwashing practices can enhance their functionality and sustainability. A study by Ram et al. (2020) in Bangladesh evaluated the use of automatic, sensor-operated handwashing stations in schools. These stations reduced water wastage and eliminated the need for users to touch potentially contaminated surfaces. The study found that automatic handwashing stations significantly increased the likelihood of students washing their hands properly, as they provided a more hygienic and convenient way to access water and soap. In another example, Freeman et al. (2012) explored the use of low-cost sensors to monitor the use of handwashing stations in Kenyan schools. These sensors provided real-time data on handwashing practices, allowing school administrators to address issues such as water shortages or soap depletion more efficiently. The study found that schools using sensor technology had higher levels of handwashing compliance, as they were better able to maintain functional handwashing facilities.

Environmental factors such as climate and weather conditions can also affect the functionality of handwashing practices. In regions with extreme temperatures, handwashing facilities may need to be adapted to ensure functionality. A study by Fisher et al. (2015) in Nepal found that handwashing stations exposed to direct sunlight often suffered from rapid water evaporation, leading to water shortages during the hottest parts of the day. In contrast, handwashing stations that were shaded or protected from extreme weather conditions remained functional for longer periods. Cold climates can also pose challenges for handwashing infrastructure. In a study conducted by McMichael et al. (2019), in Mongolia, researchers found that handwashing stations frequently froze during the winter months, making it impossible for students to wash their hands. The study recommended the installation of insulated or heated handwashing facilities to ensure year-round functionality.

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Finally, the cost of installing and maintaining handwashing infrastructure is a critical technical factor that affects its functionality. Studies have shown that the affordability of materials and resources can influence the quality and durability of handwashing stations. A study by Heijnen et al. (2014) in rural Cambodia found that schools with limited budgets often installed low-cost, temporary handwashing facilities,were prone to breakdowns and frequent repairs. In contrast, schools that invested in higher-quality, durable materials experienced fewer infrastructure failures and higher rates of handwashing. Cost considerations also extend to the ongoing provision of soap and water. Schools with limited financial resources may struggle to restock soap or pay for water supply, leading to non-functional handwashing stations. This highlights the need for sustainable financing mechanisms to ensure the long-term functionality of handwashing infrastructure.

Empirical evidence demonstrates that several technical factors influence the functionality of handwashing practices, including water supply and accessibility, station design and location, soap availability, infrastructure durability, and maintenance. Innovative technology solutions, effective water management, and adaptation to environmental conditions also play a significant role in ensuring functional and sustainable handwashing systems. Schools and institutions must invest in durable infrastructure, consistent maintenance, and appropriate technologies to promote sustained hand hygiene practices. Addressing these technical factors can significantly improve handwashing compliancecontributing to better health outcomes.

2.2.4. Association between Reliability of School Water Service and Pupils Carrying Water from Home to School for Handwashing

The reliability of water service in schools is critical to maintaining adequate hygiene practices, particularly handwashing. In many low- and middle-income countries (LMICs), unreliable water supply in schools forces pupils to carry water from home, which can negatively affect both their educational experience and handwashing practices. This empirical review examines studies investigating the association between the reliability of school water services and the frequency of pupils bringing water from home for handwashing, and the impact of this practice on hygiene behaviours.

The reliability of water services in schools plays a key role in determining the availability of water for handwashing. Studies show that in schools with intermittent or unreliable water

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supplies, pupils are often required to bring water from home to meet their basic hygiene needs. A study by Migele et al. (2007) conducted in rural Kenyan schools found that when water supplies in schools were irregular, pupils frequently brought water from home to meet the school's hygiene and drinking water needs, including handwashing. However, this practice was inconsistent, and many pupils did not carry sufficient quantities of water for both drinking and hygiene purposes, leading to poor handwashing compliance. In a similar study conducted by Caruso et al. (2014) in Zambian schools, researchers found that unreliable water services was a significant factor in pupils' decision to bring water from home. However, due to the added burden of transporting water, students were less likely to wash their hands regularly, especially during peak school hours when water demand was highest. The study highlighted that unreliable water services in schools created a barrier to consistent handwashing practices, contributing to an increased risk of waterborne diseases and hygiene-related illnesses.

The responsibility of carrying water from home to school can also have a broader impact on the educational experience of pupils. A study by Garn et al. (2017) in rural Tanzania examined the link between school water service reliability and pupils' time spent on non-academic activities, including carrying water. It was found that in schools without reliable water access, children—especially girls—often spent considerable time fetching water for handwashing and other school needs, reducing the time available for learning. The study reported that this practice not only affected academic performance, but also, contributed to fatigue, particularly for pupils who had to carry water long distances. Additionally, a study by O'Reilly et al. (2008) in Zimbabwean schools found that the burden of bringing water from home was disproportionately placed on younger pupils, particularly girls, who often had to balance this with other domestic responsibilities. This additional task made it difficult for pupils to maintain regular handwashing practices, as the quantity of water carried was often insufficient to meet the school's hygiene demands.

The quantity of water pupils can bring from home also influences their handwashing behaviour. In a study by Dreibelbis et al. (2013) on school water, sanitation, and hygiene (WASH) conditions in Bangladesh, researchers found that pupils who brought small amounts of water from home often prioritised drinking over handwashing. As a result, handwashing was frequently skipped, particularly during critical times such as after using the toilet or before eating. The study noted that while bringing water from home may be a

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temporary solution to unreliable school water services, it rarely provided enough water to support both drinking and hygiene needs, leading to compromised hand hygiene practices. Similarly, a study conducted by Erismann et al. (2016) in Burkina Faso found that pupils in schools with unreliable water supplies often did not bring enough water from home for regular handwashing. The study revealed that pupils who brought smaller quantities of water from home were less likely to wash their hands after toilet use, increasing the risk of hygiene-related diseases. This finding underscores the challenge of relying on students to supply water for handwashing in the absence of reliable school water services.

Socioeconomic factors also influence whether pupils can consistently bring water from home for handwashing. In many low-income households, access to sufficient water at home is limited, making it difficult for children to carry water to school. A study by Chard et al. (2019) in Ethiopia examined the relationship between household water insecurity and pupils' ability to bring water to school. The study found that children from water-insecure households were significantly less likely to bring water from home for handwashing at school. In households where water collection is labour-intensive, children are often unable to prioritise school water needs over their household's basic water requirements. The study also highlighted the gender dimension of water-carrying practices. In many cases, girls are more likely to be tasked with fetching water, both at home and for school. This can further exacerbate gender disparities in education, as girls may miss class time or face additional physical and emotional burdens due to the responsibility of carrying water. This situation is compounded in schools where reliable water service is lacking, forcing girls to prioritise water collection over hygiene, which may contribute to higher absenteeism rates among girls compared to boys.

Bringing water from home to compensate for unreliable school water services can have negative health implications for pupils, particularly in relation to handwashing practices. A study by Freeman et al. (2012) in Kenyan primary schools found that pupils who relied on bringing water from home for handwashing were less likely to wash their hands with soap consistently, particularly after toilet use. The lack of reliable water supplies in schools was associated with increased absenteeism due to diarrheal diseases, which was directly linked to poor handwashing compliance. The study emphasised the need for reliable school water infrastructure to support effective hand hygiene practices and reduce the burden of waterborne diseases. In a similar vein, a study by Halder et al. (2010) in Bangladeshi

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schools found that the practice of bringing water from home was associated with a higher prevalence of gastrointestinal infections among students. The study revealed that pupils who did not have sufficient water for regular handwashing were more likely to experience hygiene-related illnesses, contributing to higher rates of school absenteeism and decreased academic performance.

Several studies recommend policy and infrastructure solutions to address the issue of unreliable school water services and the practice of pupils bringing water from home. A study by Mwaki et al. (2016) in Uganda emphasised the importance of investing in sustainable water infrastructure in schools, including rainwater harvesting systems, boreholes, and water storage tanks. These solutions can reduce the need for pupils to bring water from home and ensure a consistent water supply for handwashing throughout the school day. Another study by Jasper et al. (2012) suggested that governments and non-governmental organizations should prioritise school-based water and sanitation programs that include regular maintenance of water infrastructure to ensure functionality. Schools that had functional water points and regular water supply were less reliant on pupils bringing water from home, resulting in improved handwashing practices and better health outcomes. The study also recommended that schools implement hygiene education programs to encourage proper handwashing behaviour, even in the face of water shortages.

The empirical evidence demonstrates a clear association between the reliability of school water services and the practice of pupils carrying water from home for handwashing. In schools with unreliable water access, pupils are often forced to bring water from home, which can negatively affect their handwashing practices and overall hygiene. This practice is often inconsistent, and pupils frequently do not carry sufficient water to meet both their drinking and hygiene needs, leading to compromised handwashing behaviour. Socioeconomic factors, particularly water insecurity at home, further exacerbate this issue, with children from low-income households facing greater challenges in supplying water for school hygiene. Addressing these challenges requires investment in sustainable water infrastructure and policies that ensure reliable water supply in schools to promote better hygiene practices and improve health outcomes.

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2.2.5. Association between Gender and School Pupils' Practice of Carrying Water from Home to School for Handwashing

In low and middle-income countries (LMICs), unreliable or absent water services in schools often force pupils to bring water from home to meet basic hygiene needs, including handwashing. This practice is shaped by several factors, including gender, which influences the frequency, responsibility, and burden of water-carrying among students. Gender roles, particularly in rural and resource-poor settings, typically assign household and caregiving tasks, including water collection, disproportionately to girls. This empirical review examines the association between gender and the practice of carrying water from home to school for handwashing, highlighting disparities in responsibility, the impact on handwashing practices, and the broader implications for education and health outcomes.

Gender plays a significant role in determining which pupils are responsible for carrying water from home. In many contexts, girls are often expected to handle tasks related to water collection and hygiene management, which is reflected in the school environment. A study by Sommer et al. (2015) in Tanzanian schools found that girls were disproportionately tasked with bringing water from home compared to boys. This expectation was often based on traditional gender roles, where girls are responsible for household chores, including water collection for domestic and hygiene use. Similarly, research by Erismann et al. (2016) in rural Burkina Faso observed that girls were more likely than boys to bring water to school, a practice that often interfered with their education. The study found that while boys occasionally helped with water-carrying, girls were expected to do so regularly, especially in schools without a reliable water supply. This created a gendered burden, where girls not only had to bring water but were also expected to ensure that there was enough for personal hygiene and handwashing, further impacting their participation in school activities.

Carrying water from home to school places an additional burden on girls, who often bear the responsibility for this task. A study by Garn et al. (2017) in rural Tanzania highlighted the physical and time-related challenges associated with this gendered division of labour. Girls who brought water to school were often late to class or missed school entirely, particularly if they had to travel long distances to fetch water. This reduced their instructional time, with negative consequences for academic performance. Caruso et al. (2014) also explored the impact of water-carrying on girls' education in Zambian schools. The study found that girls who carried water to school for handwashing were more likely to

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report fatigue and absenteeism as compared to boys. In addition, girls frequently prioritised water use for other needs, such as cleaning menstrual hygiene materials, over handwashing, particularly when water was scarce. This increased the risk of poor hand hygiene practices among girls, contributing to higher rates of waterborne diseases and absenteeism.

In many communities, water collection is viewed as a female responsibility, which reinforces gender disparities in schools. A study by Chard et al. (2019) in Ethiopia examined how gender norms around water collection affected pupils' behaviours in school. The study found that girls were often socialized to believe that it was their duty to ensure sufficient water for hygiene practices, including handwashing. Boys, on the other hand, were less likely to view water collection as their responsibility and therefore contributed less frequently to bringing water from home. This gendered perception of water collection responsibilities can have long-term effects on pupils' behaviour and attitudes towards hygiene. Research by Trinies et al. (2016) in India revealed that girls were more likely to adhere to hygiene practices such as handwashing when they were responsible for bringing water, while boys were less consistent in their hygiene behaviours. The study highlighted the need for gender-sensitive WASH (Water, Sanitation, and Hygiene) interventions in schools to ensure that both boys and girls understand the importance of handwashing and take shared responsibility for water collection.

The gendered burden of water collection can also have health implications, particularly for girls. A study by Migele et al. (2007) in Kenyan schools found that girls who carried water to school were less likely to wash their hands consistently due to the strain of transporting water long distances. The study revealed that girls often prioritised drinking water over handwashing, especially when the water supply was insufficient. This practice contributed to higher rates of hygiene-related diseases, such as diarrhoea, among girls, who were more vulnerable to waterborne illnesses due to poor handwashing practices. In contrast, boys were less likely to bring water from home and, therefore, had less access to water for handwashing. A study by Dreibelbis et al. (2013) in Bangladeshi schools found that boys were more likely to skip handwashing altogether when they did not have access to water at school. While both boys and girls faced health risks due to unreliable water supplies, the burden of water collection and its associated health consequences were disproportionately experienced by girls.

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Socioeconomic factors also play a role in shaping gendered patterns of water-carrying. A study by O'Reilly et al. (2008) in Zimbabwe found that girls from lower-income households were more likely to bring water to school for handwashing, as they were often tasked with water collection duties at home. In wealthier households, where access to water was more reliable, both boys and girls were less likely to bring water from home. The study noted that socioeconomic status, combined with gender norms, influenced pupils' ability to engage in proper hygiene practices, with girls from lower-income families bearing the brunt of the water-carrying burden. Freeman et al. (2012) conducted a similar study in Kenyan schools, where they found that girls from poorer households were more likely to be absent from school due to water collection duties, particularly during periodsof water scarcity. The study highlighted the intersection of gender and poverty in shaping pupils' access to water for handwashing, with girls disproportionately affected by both factors. These findings underscore the importance of addressing both gender and socioeconomic disparities in WASH programs to ensure equitable access to hygiene facilities.

Several studies have recommended interventions to address the gender disparities in water collection and handwashing practices among school pupils. A study by Jasper et al. (2012) in Uganda emphasised the importance of improving school water infrastructure to reduce the need for pupils to bring water from home. The study found that schools with reliable water supplies had fewer gender disparities in water-carrying practices, as both boys and girls had access to water for handwashing without the need to transport it from home. Another study by Mwaki et al. (2016) in Kenya recommended implementation of gender-sensitive WASH programs that engage both boys and girls in water collection and hygiene practices. The study highlighted the importance of challenging traditional gender norms that assign water collection responsibilities to girls, promoting shared responsibilities for hygiene in schools. By encouraging boys to take an active role in water collection and handwashing, such programs can help reduce the gendered burden of water-carrying and improve hygiene outcomes for all pupils.

The empirical evidence demonstrates a clear association between gender and the practice of carrying water from home to school for handwashing. In many LMICs, girls bear a disproportionate responsibility for water collection, a task that is often reinforced by traditional gender norms. This gendered burden not only affects girls' handwashing practices but also impacts their educational experience, leading to increased absenteeism

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and fatigue. While boys are less likely to bring water to school, they are also less likely to engage in consistent handwashing practices, particularly when water is scarce. Addressing these gender disparities requires the implementation of gender-sensitive WASH programs that promote shared responsibilities for water collection and hygiene practices in schools. Improving school water infrastructure is also essential to reducing the need for pupils to bring water from home, thereby alleviating the burden on girls and promoting better hygiene outcomes for all students.

2.3 Research Gap

There is insufficient exploration of determinants of hand washing practice among public primary school pupils in Lurambi sub-county in Kakamega county. From the above empirical literature review, several studies have been conducted in the project area focusing on sanitation and hygiene in schools in Kakamega Municipality. This notable gap offered a great opportunity for the researcher to delve into aspects that can enhance pupils hand-washing practice in public schools, such as the Location of hand-washing stations and hand-washing sensitization.

While there may be knowledge of an Assessment on Drinking Water Quality and Management in Kakamega Municipality, there may be limited understanding of the issues specific to the management of hand-washing equipment in public schools in the project area. This also presented an opportunity to examine types of water sources in public schools.

2.4 Conceptual framework

The conceptual framework shown below demonstrates that the kind of water supply in schools, the placement of hand-washing stations, the level of hand-washing education, and the management of water in schools all impact the hand-washing behaviour of students. All of these factors are independent and have a relationship with the dependent variable, which is the habit of children washing. The independent variables are characterised by indicators that represent the variables and provide the basis for their measurement. According to Matthew (1988), a conceptual framework is a visual or textual representation that elucidates the essential elements to be examined, including important components, ideas, variables, and their supposed connections, presented either graphically or in narrative form.

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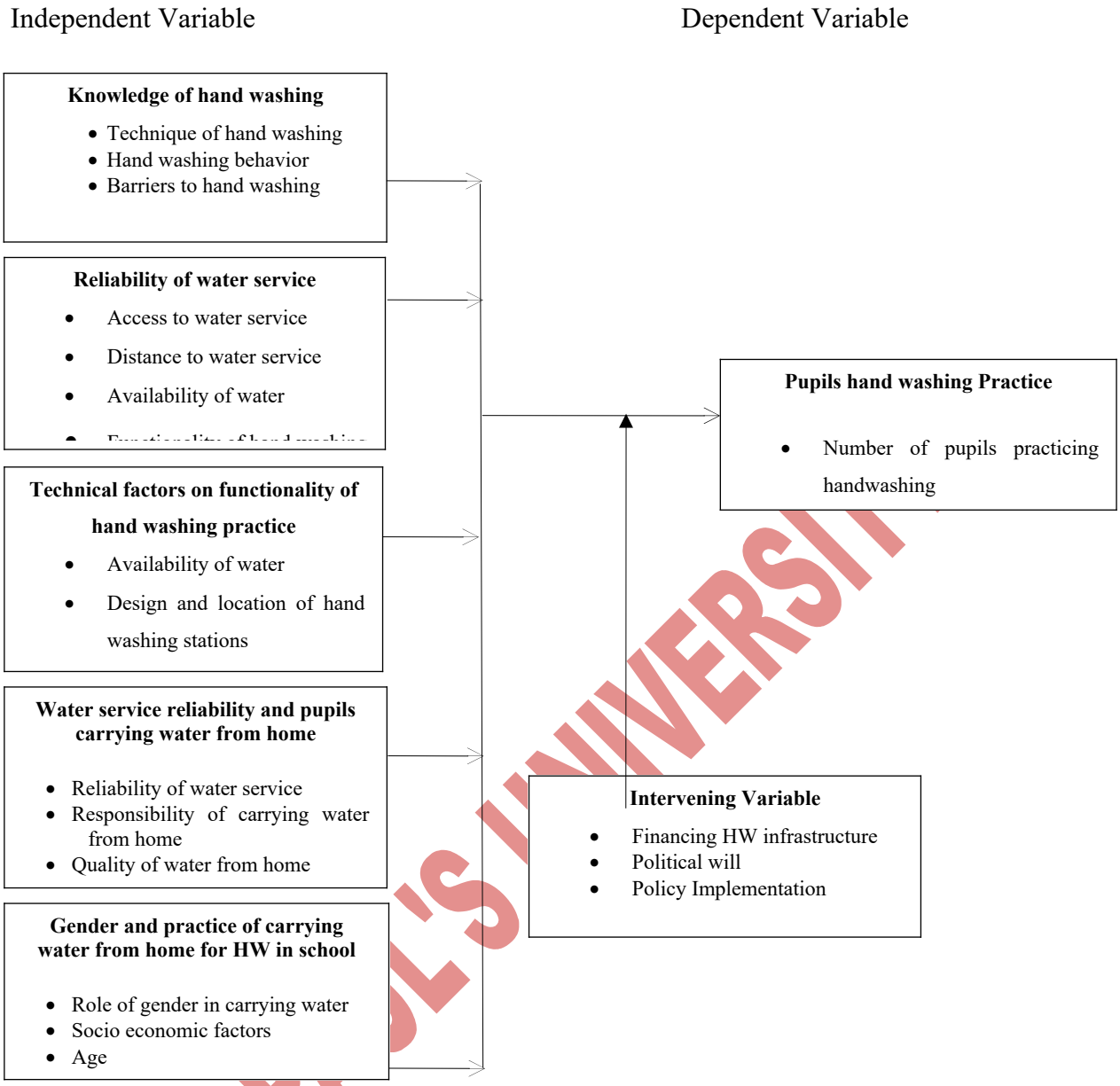


Figure 2. 1: Conceptual Framework

Source: Author.

2.5 Summary

The Socio-Ecological Model (SEM) and Grounded Theory provide a conceptual framework for comprehending how various factors, can impact students' hand-washing behaviours. The literature evaluation identified a significant deficiency in the study concerning pupils' understanding of hand-washing routines. To fill these gaps, it was imperative to carry out research on the factors that influence hand-washing behaviours among students attending public primary schools in Lurambi Sub-County, Kakamega County.

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CHAPTER THREE
METHODOLOGY

3.0. Introduction

This chapter includes an overview of the techniques and protocols used to gather and examine data. This chapter has information about the research concept, study location, target population, determination of sample size, sampling processes, instruments for data collection, and measures taken to ensure reliability and validity. Furthermore, the chapter will include data analysis methodologies and ethical deliberations. Methodology, as described by Kothari (2005) and Skeggs (1997), is the theoretical framework that guides researchers in choosing and using suitable methodologies for their subject.

3.1 Research design

The research used a Cross-sectional survey approach. The process included gathering data from a representative group of students and educators in the sub-county. Data collection was conducted via the use of questionnaires and key informant interviews (KII). The selection of this study design was based on its capacity to enable students to actively participate in the questionnaire as a component of their educational experience, as well as to interview head teachers who provided more insight into the state of hand-washing practices in schools within the project region. Individuals often augment their understanding by engaging with educational resources, such as the instrument that the researcher intends to use in this investigation. Furthermore, the use of this research methodology is also very effective for gathering qualitative and quantitative data from samples that accurately reflect extensive populations.

3.2 Study area

The study was carried out at Lurambi Sub-County, which is situated in Kakamega County. The population of this sub-county is 160,229 and it covers an area of around 161.8 square kilometres. The area is next to Navakholo, Malava, Shinyalu, Khwisero, Mumias East, Ikolomani, and Butere Sub-Counties. The administrative ward units consist of Mahiakalo, Shirere, Butsotso Central, Butsotso East, Butsotso South, and Shieywe (Mwenje 2021). The researcher conducted the study in Lurambi Sub County due to the absence of any previous research on the factors influencing hand-washing behaviour among public primary school students in that specific location. Another reason is that Lurambi Sub-County serves as the location for the County Government of Kakamega's headquarters. Additionally, it has

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a much higher population and a greater number of public schools compared to the other Sub-Counties in Kakamega. The data obtained from this research accurately reflects the characteristics of the other sub-counties and the broader Western area.

3.3 Target population:

The total number of students enrolled in public primary schools in Lurambi Sub-County is 37,514, spread among 64 different schools. The Education Office for Kakamega Central Sub County in 2023. Hence, the study focused on a specific group of individuals, namely students in grades 5 to 8, totalling 14,767 students, as well as 12 head teachers from the schools involved.

Table 3. 1: Gender Segregation of Pupils in Public Primary Schools in Lurambi Sub County

School	ECD - Grade 4	Grade 5 - Grade 8	Total - accessible population
Boys	11,187	7,356	18,543
Girls	11560	7,411	18,971
Total	**22,747**	**14,767**	**37,514**

Table 1: Gender Segregation

Source: (Kakamega Central Sub County Education office, 2023).

3.4 Sample size determination

Sample size determination is the act of determining the appropriate number of observations to include in a sample. This study used the Taro Yamane approach to determine the appropriate sample size. Taro Yamane, a statistician, developed this method in 1967 to calculate the sample size for a certain population (Umar, A. M. et al., 2021). The sample size was determined using the Taro Yamane (1967) formula, $n = N/1+N(e)^2$.

According to this formula, for a population of 14,767+12=**14,779** a sample size is given below;

$n = N/1+N(e)^2$

Where;

n = Sample size

N = Population size (JSS pupils and 12 head teachers) = 14,779

e = 0.05 (Accuracy level) presuming the confidence level is 95% i.e.: ± 5

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The study targeted 389 respondents based on the calculation to determine the sample size. Consequently, two elementary schools were chosen from each water source group. The participants for this study were recruited from the schools specified in Table 3.2.

Table 3. 2: Sample schools by water source

No	Ward	School	Water source	Respondents
1	Mahiakalo	Nyayo Tea Zone Primary	Shallow well	34
		Mwiyala Primary School	Municipal water and Tank Water	32
2	Shirere	Rosterman Primary School	Tank and borehole	32
		Matende Primary School	Children carry water from home	33
3	Butsotso Central	Ikonyero Primary School	Borehole	34
		Emukangu Primary School	Children carry water from home	32
4	Butsotso East	Emusala Primary School	Tank and Borehole	32
		Shikoti Mixed Primary School	Borehole	32
5	Butsotso South	Ematsayi Community Primary School	Borehole	32
		Esokone Primary School	Borehole	32
6	Shieywe	Kakamega Muslim Primary School	Tank and shallow well	32
		Ebwambwa Primary School	Tank and Stream near by	32
Total				**389**

Source: Author

The author estimates that there are a total of 64 public elementary schools in Lurambi Sub-County. The primary water sources for schools consist of borehole water, Municipal water, tank water, steam, students bringing water from home, and shallow wells. There are 4 schools that receive water from the municipality, while 25 schools rely on boreholes as their water source. Additionally, 2 schools receive water from shallow wells, 30 schools collect water from rainwater harvesting tanks, and 1 school gets its water from a stream. On the other hand, 11 schools do not have a water supply, so students have to bring their own water to school.

3.5 Sampling techniques

The research consisted of 389 respondents, a sample size selected using the Taro Yamane algorithm. This research used cluster sampling methods to determine the six administrative units. Lurambi Sub County consists of six administrative Wards. The following are the names of the locations: Mahiakalo, Shirere, Butsotso Central, Butsotso East, Butsotso South, and Shieywe. The researcher used clustering techniques to guarantee that every Ward is adequately represented in this investigation.

The researcher used purposive sampling to collect quantitative data from a total of 377 students, ranging from grade 5 to grade 8. Additionally, one head teacher from each school was included in this study. The students filled out the distributed questionnaires to gather quantitative data. The researcher further chose 12 head teachers from the 12 primary schools that were included in the study. Key informant interviews were conducted with the head teachers to collect qualitative data. Purposive sampling, as described by Rai and Thapa (2015), is a non-probability sampling technique in which the researcher carefully chooses people to be included in the sample based on particular criteria. These criteria may include the researcher's expertise in the research subject or the participants' ability and desire to participate in the study.

Ultimately, the researcher used the Simple Random Sampling technique to choose the students who would participate in the study. Sampling is the process of selecting a smaller group of people from a larger population in order to get an estimate of the characteristics of the total population. According to Singh et al. (2014), simple random sampling ensures that every unit within the population has an equal probability of being chosen. This objective method offers a more precise estimation of parameters, especially in cases when the population is uniform.

3.6 Data collection tools

Data was gathered using questionnaires and interviews. A questionnaire is a research tool consisting of a sequence of inquiries specifically crafted to gather data from participants, often used in surveys or statistical investigations. During this procedure, the researcher developed meticulously organized, uncomplicated, and lucid inquiries that were presented to the students who tookpart in this survey. Kothari (2007) describes the questionnaire as

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the most appropriate tool due to its ability to efficiently collect a large amount of data within a relatively short period of time. The method ensures the preservation of the source's secrecy by maintaining anonymity, while also assuring uniformity (Kerlinger, 1973). The selection of respondents was dependent on their voluntary participation in the research.

The researcher further did key informant interviews (KIIs) with head teachers in order to collect qualitative data. The individualized method provided valuable perspectives on the study subject. Lokot (2021) suggests that Key Informant Interviews (KIIs) tend to focus on people who are considered to possess crucial information, which may result in the prioritization of certain viewpoints and the reinforcement of dominant voices. This approach assumes that these informants properly reflect their communities. Individual Knowledge, Attitude, and Interest (KII) assessments provide participants with the opportunity to express their opinions in a more comprehensive manner than focus group talks or questionnaires with predetermined answer choices. Nevertheless, this approach may also result in the dominance of influential perspectives, which might bias the study (Lokot, 2021).

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3.6.1 Pilot testing

The researcher administered a pilot version of the questionnaire to 39 respondents, which is 10% of the total sample size of 389. This pilot phase aimed at assessing the clarity and effectiveness of the questionnaire's framework and verifying that respondents understood the questions accurately. This was conducted in Mumias East Sub County, an adjacent sub-county that was not be included in the research. To address any potential ambiguity or vagueness during the pilot procedure, the researcher made necessary modifications to the questionnaire in order to enhance its reliability.

3.7.0 Reliability and Validity

3.7.1 Reliability

This study aims to assess the reliability of the instruments by administering a pretest or pilot of the questionnaire to a subset of the sample. Specifically, 10% of the total sample size of 390 participants, which amounts to 39 respondents, was included in this process. The purpose of this pretest was to check that the questionnaire was properly designed and comprehensible to the respondents. The research excluded Mumias East Sub County, a neighbouring sub-county. To ensure the reliability of the questionnaire, the researcher made

necessary modifications to resolve any ambiguity or vagueness that may arise throughout the pilot procedure. After conducting the pilot test, the research instruments were deemed trustworthy if it effectively assessed its intended purpose and yielded consistent outcomes throughout repeated evaluations. This guaranteed that the tool wass both accurate and competent to assess the required criteria, resulting in dependable and uniform results for the same topic. In addition, the research evaluated the dependability of internal consistency. It is typically advised to have a Cronbach's alpha value of 0.7 or above in order to assure the dependability of the research instrument. Dependable measurements should provide highly comparable results when circumstances remain the same. Reliability, as defined by Creswell (2015), consists of two fundamental components: Stability and equivalency.

3.7.2 Validity

In order to guarantee that the study's findings meet scientific criteria, the researcher submitted the instruments to three experts from the Department of Water, Environment, and Natural Resources in Kakamega County. These experts possess significant practical expertise in WaSH. The validity was further evaluated by computing the correlation between each variable and the overall score, and then comparing these findings with the p-value. A p-value below 0.05 substantiated the reliability of the data. Validity, as defined by Thanasegaran (2009), refers to the degree to which a test properly assesses the specific construct it is designed to evaluate. A research measure is deemed legitimate when it accurately evaluates the specified concept without including any unnecessary variables.

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3.8 Data analysis methods

The process of data analysis included the use of both quantitative and qualitative methodologies. The Statistical Package for Social Sciences (SPSS) was used to process the quantitative data. Descriptive statistics was used to succinctly describe and illustrate the data using measures such as frequencies, percentages, and graphical representations. Vetter (2017) defines descriptive statistics as techniques used to accurately and succinctly compute, depict, and summarize research data. The statistics may be represented quantitatively using textual, tabular, or graphical means. According to Larson (2006), the process of data analysis starts with calculating descriptive statistics for the variables being studied. These data provide a comprehensive overview of the sample and give valuable information about the larger population it represents. The selection and reporting of descriptive statistics are contingent upon the characteristics of each variable.

The researcher further examined qualitative data by undertaking content analysis to determine the association between various factors and handwashing practices. The systematic arranging of data was undertaken to reveal recurring themes, patterns, and significant findings. This was accomplished by a systematic procedure that included the categorization, revision, encoding, and examination of data. The researcher used methodologies such as topic analysis or content analysis to glean significant insights from the data. The aforementioned techniques were used to ascertain significant discoveries, build thematic connections, and provide an intricate depiction of the participants' perspectives and encounters.

3.9 Ethical considerations

3.9.1 Confidentiality

In this study, the researcher prioritized secrecy by ensuring that participants' personal information remained undisclosed. The researcher did not disclose personal data to any anyone beyond the boundaries of SPU.

3.9.2 Voluntary Participation

Engagement in the research was optional. The participants replied to the questions out of their own will.

3.9.3 Consent from Respondents

The researcher got informed permission from participants, including both learners and head teachers, by explicitly delineating the study's aims. Participants were granted the option to discontinue their involvement in the research at any point without incurring any repercussions. Headteachers offered consent on behalf of pupils

3.9.4 Research license

Ultimately, the researcher got the necessary license from the Board of Undergraduate Studies at St. Paul's University. Once the university clearance was obtained, the researcher proceeded to seek a research license from the National Commission for Science, Technology, and Innovation (NACOSTI) under the Ministry of Education. Upon receiving the license, the researcher started the study.

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CHAPTER FOUR

DATA ANALYSIS, PRESENTATION AND INTERPRETATION

4.0 Introduction

This chapter presents the results obtained for each objective. First results of descriptive statistics are reported, followed by results of cross-tabulations where this analysis was used, and finally results from interviews with the key informants. The researcher used Tables and bar charts to summarize and present the results obtained.

Table 4. 1: Type of water services for primary schools sampled (n = 10)

Ward	Name of school	Student's population	Water Service	Number of Handwashing stations	Category of water sources – improved/unimproved
Mahiakalo	Nyayo tea zone	635	Shallow well	4 functional – (3 dysfunctional)	improved
	Mwiyala	349	Municipal piped water, RWHS	7	improved
Shirere	Roasterman	380	Shallow well, RWHS	7	improved
Butsotso Central	St Agness Ikonyero	1260	Borehole,	6	improved
Butsotso East	Emusala	744	Borehole, RWHS	3	improved
	Shikoti	616	Borehole	4	Improved
Butsotso South	Ematsiayi	179	Borehole	6	Improved
	Esokone	403	Borehole	5	Improved
Shieywe	Kakamega Muslim	374	Shallow well, RWHS	3 (one functional)	improved
	Ebwambwa	658	RWHS, Stream	2	Mix of improved/unimproved

Schools sample relied on diverse models of water sources, including shallow wells, municipal piped water, roof-top rainwater harvesting and storage, and boreholes). All these are regarded as improved water services. Except for one school, that is, Nyayo Tea Zone,

the rest of the school relied on at least two water sources. The reasons for this are varied. Many institutions face sustainability challenges with rooftop water harvesting and storage associated with high maintenance costs. It is thus probable that over time, these schools adopted an additional water source that is less susceptible to seasonality in rainfall and also maintenance challenges. Only one school had a mix of an improved water source and an unimproved water source, a stream, that is Ebwabwa Primary School. While a stream especially if perennial may cushion a school from experiencing extreme scarcity of water, an improved water source might predispose pupils to health challenges especially where a school lacks an effective water treatment facility. However, water from streams may serve well in terms of washing classrooms, and also toilets.

According to the researcher's expert assessment, water services for two schools, that is, Mwiyala and Ebwabwa primary schools might be characterised as unreliable. The reliability of piped water services and rainwater harvesting and storage depends on several factors that are usually beyond the school's control, for instance,the capacity of the water tank and amount of water harvested, amount of rainfall, whereas piped water is known to be unreliable. The researchers assessment was that the water services for the rest of the schools were relatively reliable. Implications of the reliability of the school's water service on pupil's handwashing are examined and discussed in the findings for Objective 2, 3,4, and 5.

Results in Table 4.1 further reveal a glaring mismatch between a school population of pupils and the number of handwashing stations. This mismatch may be attributed to budgetary constraints. Results from the key informant interviews revealed that schools faced different challenges with different water sources, namely: challenges in fetching water from the source to the washing points; after the rainy seasons water stored water dries up after a short while; lack of containers for collecting water; smelly water due to rust; rainwater harvesting depends on seasonality; pumping machine like Mark II were manual hence insufficient, lack of adequate gutters to harvest rainwater; overcrowding at the water service; dropping of water level in boreholes during the dry seasons; lack of funds to carry out maintenance on concrete tanks; drying up of shallow wells and frequent breakdown of pumps.

4.1 School pupils' knowledge about handwashing

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Objective one sought to assess school pupils' knowledge of handwashing. The following statements were posed to examine students' knowledge of handwashing. The YES – NO response questions sought to ask participants when it is important to wash hands: after play, after work, before meal and after visiting the toilet. In addition, participants were asked the importance of handwashing in regards to health promotion, prevention of disease transmission, being beautiful and smart. YES – NO responses were recorded.

Table 4.2 summarizes the findings of school pupil's knowledge of handwashing.

Table 4. 2: Pupils knowledge about handwashing in the sampled schools (n = 315)

Survey statement – when do you wash hands?	YES F (%)	NO F (%)
After toilet	305 (97.4)	8 (2.6)
Before meal	269 (85.9)	44 (14.1)
After play	208 (66.5)	105 (33.5)
After work	187 (59.7)	125 (39.9)
What is the benefit of hand-washing with clean water and soap?		
Health promotion	297 (94.9)	16 (5.1)
Prevention of diseases transmission	295 (94.2)	18 (5.8)
To be beautiful	43 (13.8)	269 (86.2)
To be smart	44 (14.1)	268 (85.9)

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97% of the respondents agreed that they washed their hands after visiting the toilet while 3% indicated that they never washed their hands after visiting the toilet. That meant that a majority of the respondents strived to practice the good practice of washing hands after visiting the toilet. 86%indicated that they washed their hands before meals, 14% indicated that they did not wash before meals. This too indicated that there was widespread adherence to the universal practice of washing hands among the respondents. Practising appropriate handwashing with optimum frequency is a fundamental skill for leading a healthy life. Handwashing, especially before eating, is believed to be one of the first techniques to protect children against health risk. Handwashing before eating, is believed to be one of the first techniques to protect children from many communicable diseases. hand-

washing before meals is related to a significant reduction of HFDM risk, Zhang, D., et.al (2016).

Being at their playful stage in development, it was prudent to understand the hand-washing practices after playing. 66% indicated that they washed their hands after playing while 34% indicated that they never washed their hands after playing reflecting a high adoption of good hard washing practices among the pupils. It indicated that a significant majority were aware of the importance of hand hygiene, which helps prevent the spread of germs and illnesses. 34% who did not wash their hands after playing highlighted an area for improvement. This group might not fully understand the importance of handwashing, or they might lack access to proper handwashing facilities. At other times the participants may naturally forget or choose not to prioritize washing their hands after playing considering the overcrowding reported at the available washing facilities. They may feel inconvenienced and hence choose not to struggle to look for means to wash their hands.

In this study, after work meant when the pupils were done with their studies. Findings revealed that 59% of the participants usually washed their hands after work while 40% did not wash their hands after work. This could be as a result of the quest to maintain personal hygiene or as a part of the normal routine, especially after the Covid-19 pandemic that encourages the handwashing habit. Also, naturally children love water and they find this as a good opportunity to touch water without reprimanding from adults. The refreshing feeling after washing hands could be a motivation why a majority of the respondents washed their hands after work. On the other hand, the minority who did not wash their hands could be either they never perceived their hands to be dirty or they lacked awareness of the importance of washing hands after work. This could also mean that they lacked access to washing facilities where they could wash their hands. Maybe at the end of the day, the hand washing facilities in schools where water supply is unreliable are dry hence forcing pupils to go home without washing their hands. In other instances, the respondents who are drawn from day schools are in a hurry to go home and undertake other chores. Hence queuing to wash hands would inconvenience their evening routines.

94% of the participants in this study indicated that it was beneficial to wash hands with clean water and soap while just 5% indicated that it was not beneficial to wash hands with clean water and soap. This signified that an overwhelming majority suggests a strong consensus on the positive impact of this practice while the small minority might have had

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different perceptions or experiences, possibly due to lack of awareness, misinformation, or other factors. This would mean that the minority require training and more so, encouragement by putting out clear messages that point out the relationship between handwashing practice and good health.

94% of the respondents were agreeable that washing hands with clean water and soap helps prevent disease transmission while 6% were of the opinion that washing hands with clean water and soap is not beneficial in preventing disease transmission. This indicated a limited gap in knowledge acquisition concerning the relationship between disease and handwashing among the respondents in this study. The data indicated that the majority of the respondents understood the possible implications of disease transmission if they failed to wash their hands. 14% of the respondents washed their hands to be beautiful while 86% did not perceive hand washing as related to their beauty. This suggests that a small segment of the population associates hand hygiene with personal appearance and aesthetics. This could be influenced by cultural norms, personal beliefs, or marketing messages that link cleanliness with beauty. On the other hand, the majority likely viewed handwashing primarily as a health and hygiene practice rather than a beauty routine. This aligns with the common understanding as seen earlier that handwashing is crucial for preventing illness and maintaining overall health. There is also an indication from 14% that health messaging around handwashing is more effective or prevalent than beauty-related messaging.

95% of the pupils believed that if they failed to wash their hands they can transmit diseases while 5% believed that if they failed to wash hands they cannot transmit diseases. This data indicated that there was strong awareness among pupils about the importance of hand hygiene in preventing disease transmission and strong understanding of the role of hand hygiene in preventing the spread of infections. This awareness was likely as the result of effective health education, either at home, in school, or through public health campaigns. It showed that the majority of pupils recognized the connection between hand hygiene and health. On the other hand, 5% of pupils did not believe that failing to wash their hands could transmit diseases. This small minority might have lacked proper education on the topic or may have held misconceptions about how diseases spread.

The 80% majority likely understand that soap is essential for effectively removing germs, dirt, and oils from the hands. This perspective aligns with public health guidelines, which

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emphasize the importance of using soap and water for proper hand hygiene. Soap helps break down and remove contaminants that water alone cannot effectively eliminate. On the other hand, the 20% of respondents whothink washing hands with only water is enough might not be fully aware of the benefits of using soap or might have misconceptions about hand hygiene. Some individuals might rely on water alone due to convenience, lack of access to soap, or cultural practices that do not emphasise the use of soap. The Key Informant Interviews reviewed that there was a major challenge in terms of lacking funds to purchase liquid soaps for handwashing and at other times the soap containers are lost or misplaced by pupils. This 20% suggests that continued education on the importance of using soap when washing hands is paramount. The training offered to the respondents can focus on educating them about the importance of and how it works to remove germs and why it is crucial for effective hand hygiene. Also, the teachers in charge of WASH in schools covered by the study can encourage behavioural change among the 20% through positive reinforcement, such as praise or rewards for proper handwashing. This can help shift perceptions and practices towards using soap and water. They can further carry out demonstrations and practical sessions on effective handwashing techniques to help reinforce the importance of using soap. Schools need to apply clear, relatable messages that highlight the science behind why soap is necessary for effective handwashing. Lack of soap at the washing points may have influenced the 20% perception that using soap was not necessary in the hand washing practice hence the same can be improved by ensuring that handwashing stations are equipped with both water and soap and also encourage parents to provide the same back at home.

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4.2 Association between the reliability of improved water service and the proportion of pupil's participating in handwashing

Objective 2 sought to analyze the association between the reliability of improved water service and pupils' handwashing practices. Survey results revealed that 80 % of the questionnaire participants indicated that water is not sufficient for washing hands while 20% thought that only water is enough for washing hands. This finding is consistent with observational data on the sampled schools on the proportion of the number of children visiting water stations for washing. The researcher and research assistants observed the number of pupils who attended handwashing stations. The observation was gender disaggregated. The total number of pupils observed was computed as a proportion of the total number of school pupils. The categories of proportions observed had washing were

computed into the following categories: namely; a third and below = low handwashing; more than a third but more than fifty = moderate handwashing; over fifty = High. Results of cross-tabulation between reliability category of school water service and category of proportion observed handwashing computed to the total population are summarized below.

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Table 4. 3: Association between reliability of improved water service and proportion of total number of pupil's observed handwashing at handwashing stations

Category of school by status of reliability of water sources	Number of schools	Proportion of pupils observed handwashing		
		LOW (below a third of total school population	**MODERATE** (at least 50% of the school population)	**HIGH** (More than half of the school population)
Less reliable (RWHT, Piped)	2	2 (100%)	0	0
Reliable (BH, Shallow well)	8	3 (42.9)	3 (42.9)	1 (14.1)
TOTAL	**10**	**5**	**3**	

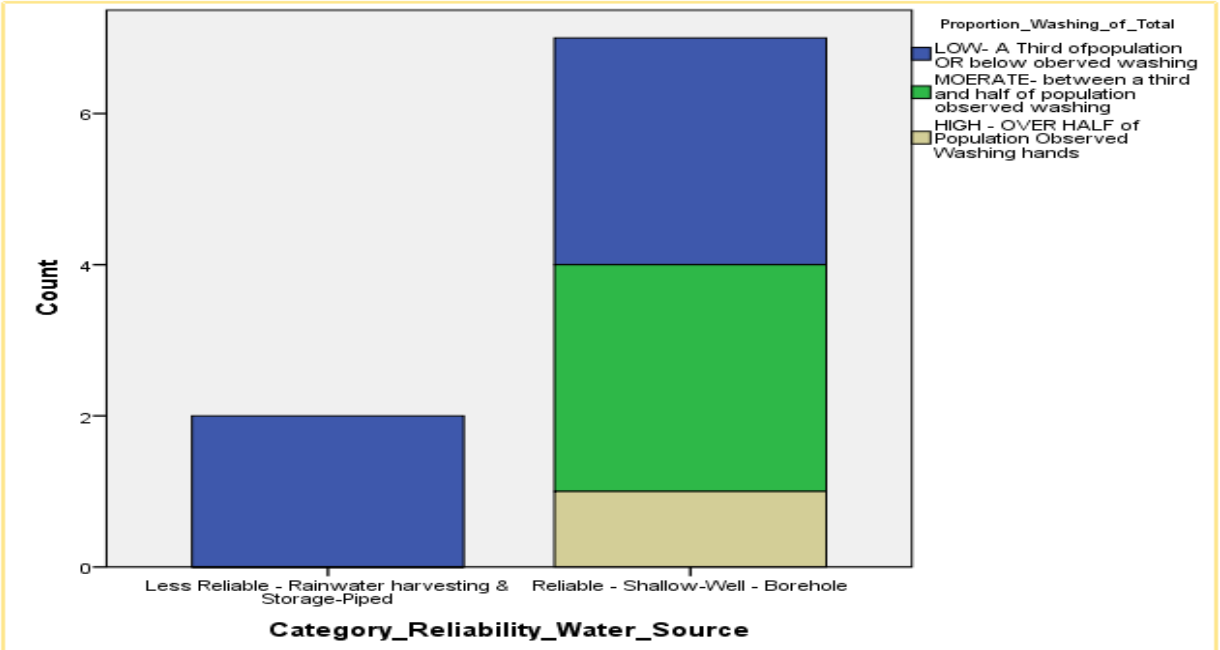


Figure 4. 1: Pupils visiting handwashing stations

Based on the results of observational data on the number of pupils visiting handwashing stations for handwashing, all the two primary schools whose water service was described to be less reliable also exhibited a low level of school population practising handwashing at school. Also, three schools categorized to have reliable water services had school populations categorized to have low hand washing practices, three had their school population categorized to have moderate handwashing practices, whilst one school with reliable water service has its population categorized to have high handwashing practice based on observational data.

The number of handwashing stations in schools varied between two and seven stations. Ideally, schools should have enough handwashing stations to accommodate all students, especially during peak times like before meals and after recess. Ensuring adequate handwashing stations is crucial for maintaining hygiene and preventing the spread of diseases. It would be expected that the school population directly impacts the number of handwashing stations needed. Larger schools like St. Agnes Ikonyero which has a population of 1,260 pupils require more stations to prevent long wait times and ensure that all students can wash their hands regularly compared to a school like Ematsyayi which has a total of 179 pupils. However, the current situation is that the two schools have an equal number of hand-washing facilities at six.

The type of water source available to a school can affect the feasibility and effectiveness of handwashing stations. Data indicated that schools relying on shallow wells and boreholes experienced reliable water supply. On the other hand, Schools that relied on piped water from municipal was less reliable. School head teachers pointed out some challenges that explained this scenario despite the normal expectation that piped water is typically the most convenient and reliable source, that would provide consistent water flow and quality. It is expected that piped water can easily support multiple handwashing stations and improve the handwashing practice by far. Challenges cited include the breakdown of the piping system and high bills which lead to disconnection.

In institutions where the source of water is a stream near the school, reliability was low due to seasonality. The same can be improved by putting up water tanks. Tanks can store large quantities of water but they would need to be refilled regularly and maintained to ensure water quality throughout the academic year.

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4.3 Technical factors associated with the functionality of handwashing practices

Objective three sought to assess the technical factors associated with the functionality of handwashing stations. Data collected and analyzed included, number of functional handwashing stations, number of handwashing stations connected to a water via water pipe, number of leaking handwashing tanks). The researcher observed and noted functionality of handwashing stations. For instance, of the seven handwashing stations in Nyayo tea zone primary school, three were observed to be not functional. Also, Kakamega Muslim school had three handwashing stations, out-of-which only one was functional at the time of the

study. In addition, the researcher further observed that none of the school had handwashing stations connected to the water source via a water pipe. That means water had to be manually collected using a bucket from the water source and delivered to eachwater station. Schools relied on rota in which pupils from different classes took turns on different days to fill and re-fill water at the hand-washing stations. During the key informant interviews, participants were asked what challenges schools faced with this arrangement of delivering water to the handwashing stations. The key informants reported the following challenges: breakdown of the handwashing equipment, size of the handwashing facilities is small, theft of the handwashing facilities, vandalizing of the handwashing equipment by pupils, lack of storage spaces of the hand washing equipment especially during school holidays, moving the handwashing in and out of classes and leaking of handwashing facilities. Such technical factors can further compound challenges of low numbers of handwashing practices and further undermine the level of handwashing practices amongst school pupils. This can be exacerbated by unreliability in a school water service, placing a huge burden on the school pupils, and predisposing school pupils to health risks.

KII's indicated that lack of piping from the source to the handwashing facility, forced learners to fetch water from the source to the washing point. They explained that when the handwashing facility runs dry and lessons are ongoing, learners have to wait up to either health or lunch breaks for them to refill. However, at times they forget to refill them. That meant that some learners missed washing their hands when they found the handwashing facilities empty. On the other hand, during dry seasons there is no water supply to the tanks. In most of the schools, there were teachers who were responsible for overseeing Water, Sanitation and Hygiene.

4.4 Association between reliability of school water service and pupils' practice of carrying water from home to school for handwashing

Objective 4 sought to investigate the Association between the reliability of school water service and pupils' practice of carrying water from home to school for handwashing. The majority of pupils from schools with less-reliable water services carried water from home to school for handwashing (out-of-59 pupils, 48 (81%). Only 11 (18.6% did not carry water from home to school for handwashing. The majority from the schools with reliable water services (71%) did not carry water from home to school for handwashing.

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Table 4. 4: Association between reliability of school water service and pupils' practice of carrying water from home to school for handwashing

	Carry water from home to school for handwashing	
Category of school by status of reliability of water sources	**YES F (%)**	**NO F (%)**
Less reliable (RWHT, Piped)	48 (81.4)	11 (18.6)
Reliable (BH, Shallow well)	74 (29.5)	177 (70.5)
Total	**122**	**188**

Results reveal a significant difference in handwashing practices between pupils from schools with less reliable water services and those with reliable water services. In schools with Less-Reliable Water Services, 81% of pupils (48 out of 59) carried water from home to school for handwashing. This high percentage suggests that these pupils are aware of the importance of hand hygiene and are taking proactive steps to ensure they can wash their hands, despite the lack of reliable water at school. 18.6% of pupils (11 out of 59) did not carry water from home. This minority might face challenges such as the inconvenience of carrying water, lack of awareness, or other barriers. It would mean even in their homes, they faced challenges in getting adequate water for chores and extra for carrying to school. The implication of carrying water from home is that it might not be sustainable in the long term due to the inconvenience and potential inconsistency. This would pose health risks to pupils who do not carry water from home and lack access to reliable water at school. They are at a higher risk of poor hygiene, which can lead to increased illness and absenteeism. The absenteeism potentially impacts educational outcomes.

For the schools with Reliable Water Services, 71% of pupils did not carry water from home for handwashing. This majority likely relies on the school's water facilities, indicating that reliable water services at school reduce the need for pupils to bring water from home. This indicates that pupils can depend on the school's infrastructure for their handwashing needs, which is more convenient and ensures consistent hygiene practices.

4.5 Association between gender and school pupils' practice of carrying water for handwashing from home

Objective 5 sought to investigate the Association between gender and school pupils' practice of carrying water from home to school for handwashing. Results are summarized in Table 4.5 and graph 4.5. Results reveal that of the 122 sample of school pupils who carried

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water from home to school, the majority were girls 58.2%, while boys comprised 41.8%. previous studies have showed that females tend to be more cautious with handwashing.

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Table 4. 5: Association between gender and school pupils' practice of carrying water for handwashing from home

Gender of the participant	Carry water from home to school for handwashing	
	YES F (%)	NO F (%)
Male	51 (41.8)	85 (45.2)
Female	71 (58.2)	103 (54.8)
Total	**122**	**188**

This data indicates a notable gender difference in the practice of carrying water for handwashing from home among school pupils. 58.2% of the pupils who carried water from home for handwashing were girls. This suggests that girls are more likely to take responsibility for ensuring they have water for hygiene purposes while 41.8% of the pupils who carried water were boys. This lower percentage indicated that boys are less likely to engage in this practice compared to girls.

This gender difference in hand-washing practices can be attributed to factors like cultural and Social Norms in the area of study. In this culture, girls are often socialized to be more conscientious about cleanliness and hygiene. This could explain why a higher percentage of girls carry water for handwashing. Boys might not face the same social expectations regarding hygiene, leading to a lower percentage of boys carrying water. In addition, girls are given more responsibility for caregiving tasks, which can include ensuring hygiene for themselves and others. This sense of responsibility might extend to carrying water for handwashing. Boys might not be as involved in caregiving roles, which could influence their lower participation in carrying water. Another factor could be awareness and education on hygiene where there might be differences in how the genders are educated about the importance of hand hygiene. Girls might receive more targeted education or encouragement to practice good hygiene in relation to their day-to-day activities at home. Hence, they tend to adopt the same in the school set-up. On the other hand, the same is less emphasized among boys hence the disparity and low adaptability by boys.

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Table 4. 6: Association between gender and school pupils' practice of carrying water for handwashing from home

Age category of the participant	Carry water from home to school for handwashing	
	YES F (%)	NO F (%)
10-12 years old	42 (34.4)	46 (24.6)
13 years and above	80 (65.6)	141 (75.4)
Total	**122**	**188**

Further, results showed that of the 122 who carry water, the majority (that is 66% were pupils aged 13 years and above, compared to 34%. Carrying water is not easy, especially for young pupils, and older pupils are likely to manage the hassle of carrying water. Also, given the distance rural children walk, it is further likely that older pupils in JSS can manage the burden of carrying water to school for handwashing. The 10-12 years brackets are pupils at primary hence this explains why the KII's indicated that the primary learners are most affected by the limited handwashing stations.

4.6 Discussion

Generally, findings reveal most schools rely on at least two sources of water that is rain rainwater harvesting and shallow wells, rain water harvesting and Municipal water, Rainwater harvesting and borehole, rainwater harvesting and streams near schools.

The findings highlight that schools often rely on multiple water sources to ensure a steady supply. In the schools, the primary sources of water were rainwater harvesting which is a common practice where schools collect and store rainwater during the rainy seasons. This is because it is a method that is cost-effective and environmentally friendly that schools take advantage of. However, due to limitations like lack of adequate storage tanks, and seasonal variability schools are innovative in putting solutions sources in place. Three schools had excavated shallow wells, five schools had drilled boreholes and one had connected to municipal water. Shallow Wells are typically less than 30 meters deep and tap into the upper layers of groundwater. They are relatively easy and inexpensive to construct for these schools that are cash-stuffed. The local municipal water supply was envisioned to provide treated water suitable for drinking and handwashing. Boreholes are deeper than shallow wells and reach aquifers that are not accessible by shallow wells and they equally provide more water than the shallow wells. Nearby streams are free and easily accessible by learners hence they are inexpensive as well. These strategies reflect the schools' adaptability and

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resourcefulness in managing water resources, and relentless effort to meet the need to supply water for hand washing.

4.6.1 School pupils' knowledge about handwashing

Analyzing school pupils' knowledge about handwashing involves considering several key factors: the curriculum, training programs, the role of teachers responsible for Water, Sanitation, and Hygiene (WASH), and the impact of the COVID-19 pandemic. On curriculum Integration of Handwashing Education: is key. Many schools have integrated handwashing education into their curricula, emphasizing its importance in preventing illness. This includes teaching the proper techniques and the critical times for handwashing, such as before meals and after using the toilet.

Schools offer Health and Hygiene Lessons in diverse ways like integrating hygiene lessons into broader health education programs, which can include topics like personal hygiene, disease prevention, and the importance of clean water. They also at other times conduct student workshops or special sessions focused on hand hygiene, sometimes in collaboration with health organizations. However, there is a need to make these sessions more interactive to help reinforce the importance of handwashing through activities and games.

Findings indicated that some schools have designated teachers responsible for overseeing WASH programs. These individuals ensure that handwashing facilities are well stored in the evening when schools are not in session, provide liquid soap for all hand washing equipment, ensure that water is in the containers for hand washing, and monitors the functionality of the equipment. These teachers play a crucial role in reinforcing handwashing practices by regularly reminding students and incorporating hygiene education into daily routines.

The COVID-19 pandemic significantly increased awareness about the importance of handwashing. Schools implemented stricter hygiene protocols, including frequent handwashing and the use of soap. Many schools improved their handwashing infrastructure during the pandemic, installing more handwashing stations and ensuring a steady supply of soap and water. There were widespread educational campaigns during the pandemic, both in schools and through the media, emphasizing the role of handwashing in preventing the spread of COVID-19. The combination of a well-integrated curriculum, targeted training programs, dedicated WASH coordinators, and the heightened awareness brought about by the COVID-19 pandemic has significantly enhanced school pupils' knowledge and practices

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regarding handwashing. These efforts ensure that students understand the importance of hand hygiene and are equipped with the skills to practice it effectively.

4.6.2 Association between the reliability of improved water service and pupil's handwashing practices

Despite the efforts made by the schools to source for water, findings revealed that having improved water services does not necessarily translate to a high level of handwashing practices within the schools. This is because of other factors that influence the practice. Some of these factors include functionality of the water services, human behaviour, population factors, maintenance of the washing stations and management of WASH. Findings revealed that among the challenges faced was the pupil's habit of leaving the taps running which quickly empty's the facilities. Lack of piping from shallow wells and boreholes to water facilities leaves the tedious task of refilling stations every time they run out. At times they run out while lessons are running hence the pupils have no time to refill. It was found out that at that juncture many pupils go without washing hands until the facility is refilled at break time. Still, despite there being improved water sources, handwashing facilities lack proper maintenance whereby they are left outside after school and during holidays. They are also exposed to harsh weather conditions like scorching sun. This makes them degrade in quality making them prone to breakages, vandalization by pupils and some are stolen. This explains the reason for the very small number of washing stations at the schools despite the donor interventions.

4.6.3 Technical factors associated with the functionality of handwashing practices

Handwashing is a crucial practice for maintaining hygiene and preventing the spread of diseases. Several technical factors influence the effectiveness and functionality of handwashing practices. Dirty water and washing stations compromise the essence of handwashing practices. Dirty water carries pathogens that are disease-causing and instead of handwashing playing the role of preventing ailment, be a cause of the same. On other washing stations drain very little water and too slowly as well. This creates impatience among the participants since they have to spend too much time at the station where they wish to wash quickly then rush to class or to the field to play. Again, adequate pressure is required to remove the applied soap and contaminants.

At the station, it is crucial to have liquid soap which is generally more effective and hygienic than bar soap, which can harbor bacteria. Consistent availability of soap is crucial because handwashing without soap is significantly less effective. Though schools grumbled

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about the lack of funds for purchasing the liquid soap, they need to be innovative enough to fundraise the same or at least train teachers responsible for WASH to prepare homemade detergents which are way affordable. In addition, handwashing stations must be regularly cleaned and maintained to prevent the buildup of dirt and bacteria. The longer these facilities are left without cleaning, clogging happens leading to dysfunctional taps.

4.6.4 Association between the reliability of school water service and pupils' practice of carrying for handwashing from home

Generally, the reliability of a school's water service can significantly impact pupils' handwashing practices, including whether they bring water from home. But this highly depends on how reliable the school water service is, instances where the source is reliable, and handwashing facilities are functional, the need for pupils to bring water from home is usually very low if any. Reliable water services at school can increase the frequency of handwashing among pupils, as they have easy access to water throughout the day. Schools with a consistent water supply can maintain higher hygiene standards, reducing the spread of diseases. On the other hand, reliable water service may not always provide clean and safe water which is crucial for effective handwashing. In one school as much as there was a borehole, the water drawn from it was smelly which made it unsafe for use in both drinking and handwashing purposes. In addition, schools with reliable sources of water need to ensure that there are adequate storage tanks and functional handwashing stations for regular handwashing practices. By doing so, pupils will not be forced to carry water from their homes.

In schools where the water service is unreliable, pupils practice carrying of water from home to supplement the inadequate supply to ensure they can wash their hands on their own will as a result of their knowledge of the benefit of handwashing or upon being encouraged by their parents. However, in other instances, findings indicated that despite the reliable source of after-service, the few washing stations where overcrowding is experienced and bullying of younger pupils by the older pupils, may force pupils to insist on carrying water for handwashing from home. Conversely, unreliable water services can lead to inconsistent handwashing and increased reliance on external sources.

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4.6.5 Association between gender and school pupils' practice of carrying water for handwashing from home

The association between gender and the practice of carrying water for handwashing from home among school pupils can be influenced by general expectations for girls to be more diligent about hygiene practices compared to boys. Socialization of girls about personal hygiene and the importance of handwashing, leads them to be more proactive in carrying water from home. At times schools with targeted hygiene programs might emphasise the importance of handwashing more to girls, reinforcing the practice. Culturally, when water sources are far from home, the burden of carrying water usually disproportionately falls on girls, who are often tasked with fetching water hence they are used to the task. The availability and condition of handwashing facilities at school can influence whether pupils feel the need to bring water from home. If facilities are inadequate, girls might be more likely to carry water to ensure they can maintain hygiene.

Findings agree with prior behavioural Patterns studies that have shown that girls generally have better hygiene practices than boys, which might include being more consistent in carrying water for handwashing. In addition, peer influence may play a critical role where girls are influenced by their peers to maintain higher hygiene standards, including bringing water from home. Older girls were seen to be carrying water more compared to the younger ones this could be interpreted to be related to menstrual hygiene. Older girls require adequate water due to the need to manage menstrual hygiene, which is crucial for their comfort and attendance at school. This ensures that they are not absent from school during their periods.

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CHAPTER FIVE
SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.0 Introduction

The aim of the study was to examine factors associated with handwashing practices among public primary school pupils in the case of Lurambi Sub-County, Kakamega County. This chapter presents a summary of the key findings, conclusion and recommendations.

5.1 Summary of Findings

The findings of the study were that schools sampled relied on diverse models of water sources, including improved water services like shallow wells, municipal piped water, roof-top rainwater harvesting and storage, and boreholes. One school- Nyayo Tea Zone had one source of water service while the rest of the schools relied on at least two water sources. Ebwabwa Primary School had a mix of an improved water source and an unimproved water source, a stream. According to the researcher's expert assessment, water services for both Mwiyala and Ebwabwa primary schools might be characterised as unreliable while the water services for the rest of the schools were relatively reliable.

5.1.1 School pupils' knowledge about handwashing

Findings were that 97% of the respondents agreed that they washed their hands after visiting the toilet while 3% indicated that they never washed their hands after visiting the toilet. 86% indicated that they washed their hands before meals, and 14% indicated that they did not wash before meals. 66% indicated that they washed their hands after playing while 34% indicated that they never washed their hands after playing. Findings revealed that 59% of the participants usually washed their hands after work while 40% did not wash their hands after work.

94% of the participants in this study indicated that it was beneficial to wash hands with clean water and soap while just 5% indicated that it was not beneficial to wash hands with clean water and soap.

94% of the respondents were agreeable that washing hands with clean water and soap helps prevent disease transmission while 6% were of the opinion that washing hands with clean water and soap is not beneficial in preventing disease transmission. 14% of the respondents

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washed their hands to be beautiful while 86% did not perceive hand washing as related to their beauty. 95% of the pupils believed that if they failed to wash their hand they can transmit diseases while 5% believed that if they failed to wash their hands they could not transmit diseases.

The 80% majority likely understand that soap is essential for effectively removing germs, dirt, and oils from the hands. This perspective aligns with public health guidelines, which emphasize the importance of using soap and water for proper hand hygiene. Soap helps break down and remove contaminants that water alone cannot effectively eliminate. On the other hand, the 20% of respondents who think washing hands with only water is enough might not be fully aware of the benefits of using soap or might have misconceptions about hand hygiene.

5.1.2 Association between reliability of improved water service and proportion of pupils participating in handwashing

Survey results revealed that 80 % of the questionnaire participants indicated that water is not sufficient for washing hands while 20% thought that only water is enough for washing hands. This finding is consistent with observational data on the sampled schools on the proportion of the number of children visiting water stations for washing.

Based on the results of observational data on the number of pupils visiting handwashing stations for handwashing, all the two primary schools whose water service was described to be less reliable also exhibited a low level of school population practising handwashing at school. Also, three schools categorized to have reliable water services had school populations categorized to have low hand washing practices, three had their school population categorized to have moderate handwashing practices, whilst one school with reliable water service has its population categorized to have high handwashing practice based on observational data. The number of handwashing stations in schools varied between two and seven stations. The type of water source available to a school can affect the feasibility and effectiveness of handwashing stations.

5.1.3 Technical factors associated with the functionality of handwashing practices

Findings revealed that of seven handwashing stations in Nyayo Tea Zone primary school, three were observed to be not functional. Also, Kakamega Muslim School had three

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handwashing stations, out-of-which only one was functional at the time of the study. Only one school had handwashing stations connected to the water source via a water pipe. The rest of the schools had to manually collect water using buckets from the water source and deliver to each of the water stations.

5.1.4 Association between reliability of school water service and pupils' practice of carrying water from home to school for handwashing

Findings indicated that in schools with Less-Reliable Water Services 81% carried water from home to school while only 18.6% did not carry water from home to school for handwashing. The majority of the schools with reliable water services 71% did not carry water from home to school for handwashing.

5.1.5 Association between gender and school pupils' practice of carrying water for handwashing from home

This data indicated a notable gender difference in the practice of carrying water for handwashing from home among school pupils. 58.2% of the pupils who carried water from home for handwashing were girls while 41.8% of the pupils who carried water were boys. Further, the majority at 66% were pupils aged 13 years and above while 34% were pupils in the 10-12 age bracket.

5.2 Conclusions

The study concluded that there is a statistically significant association between type of water service reliability and handwashing practices. Results also led to the conclusion that rainwater harvesting and municipal piped water services were less reliable, indicating a third of the population or below observed handwashing practice. It was also concluded that shallow wells and boreholes were reliable sources of water services. However, it emerged that despite having reliable sources of water services, it was not automatic that handwashing practice was highly practised. Majority of the schools with reliable sources of water services recorded low to moderate hand washing practices with only one school in this category recording high hand washing practice.

The study also arrived at the conclusion that the majority of the participants had knowledge of handwashing practices. Results also indicated that the majority of the participants understood that they were required to wash hands before meal, after visiting the toilet, after work and after playing. The findings also showed that the participants understood that if

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they failed to wash their hands, they can transmit diseases. Further, they were aware that they should use both clean and safe water and soap while washing their hands.

Results of the study also led to the conclusion that improved water services alone do not guarantee high handwashing practice among Primary School pupils. Other factors like management of the improved water service in terms of constant flow to the hand washing station play a major role in promoting hand washing practice. The findings revealed that the model of refilling water at the hand stations was strenuous, time time-consuming for the learners. Also, the lack of adequate washing stations in schools to store water from improved water services led to overcrowding and bullying which discouraged many pupils from handwashing. The frequent movement of the handwashing facilities made them break down hence undermining the effort of promoting hand-washing practices despite the availability of water.

The study concludes that most of the schools faced challenges in the provision of hand washing water to participants. Schools had no funds to install piping systems from reliable water services to hand washing stations. Also, the schools did not have adequate handwashing stations vis a vie their populations. The study established that some hand washing facilities were leaking hence could not hold water for a long time. In other schools, the boreholes were equipped with manual pumps which drew insufficient water and were time-consuming. In addition, despite reliance on rainwater harvesting, schools had inadequate gutters to harvest the rainwater.

Results also led to the conclusion that the presence of reliable school water service did prevent some participants from carrying water from home. The findings revealed that the reliable water services were not adequately distributed to strategic points within schools since they lacked a piping system. It was concluded that when schools faced water shortage especially in the event of breakdowns and dry seasons, pupils were forced to carry water from home.

The study established that the majority of the participants who carry water to school are girls. And being a strenuous activity, it was observed that more of the older girls in Junior Secondary School level carried water to school from home compared to the younger girls.

5.3 Recommendations

It was the feeling of the researcher that in order to improve on existing water services, adequate funding is necessary. The water services require appropriate accessories for them

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to be reliable. For instance, schools can engage other stakeholders within the community to buy durable storage tanks to reserve water for use in dry seasons. Schools should also as well consider buying or improvising gutters for rainwater harvesting. More boreholes need to be sank and the current ones with outdated pumps need to be revamped for efficiency and reliability.

The study recommends that the school management should emphasize promoting activities geared towards knowledge about handwashing, more reminders and campaigns need to be carried out for lasting memory among pupils. Teachers in charge of WASH in schools should continue to emphasize the science behind disease transmission to reinforce the message. The pupils who perceived not washing hands could not lead to transmitting diseases, could benefit from targeted educational interventions to correct misunderstandings and reinforce the importance of hand hygiene. The high level of awareness among pupils is encouraging and suggests that current educational efforts are effective. However, continuing these efforts can help maintain and even increase this awareness. More interactive and engaging methods, such as demonstrations and hands-on activities, can be particularly effective in reinforcing the importance of hand hygiene.

WASH teachers should monitor hand washing closely to ensure easy access to handwashing facilities with soap and water by ensuring that the hand washing facilities are well-maintained and accessible to support good hygiene practices by always providing soap at handwashing stations. Schools with water but no soap are considered to have limited service. All the broken washing facilities as highly indicated by participants need to be replaced.

Further for schools with reliable water services, effective handwashing practices need to be encouraged to ensure proper utilization of the available water. Pupils need to be sensitized on proper handwashing techniques of scrubbing all parts of the hard for at least 20 seconds. This can be done through practical demonstrations at school assemblies. Reminders by posters and periodical educational campaigns.

Washing stations should be placed at convenient places for easy accessibility by all users. In the school context, appropriate height is essential so that pupils in all levels from ECDE, Primary to JSS plus those with disability are able to utilize the facility. The taps installed need to be easy to operate for the pupils otherwise use of complicated taps makes the pupils shy away from using the station and in other instances, they lack anyone to help with its

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operations. They end up forcing their way and this causes taps to malfunction. Sufficient handwashing stations are necessary to prevent overcrowding and ensure that everyone can wash their hands when needed. The study also recommends that schools look for partners who can help in piping from reliable water services to hand washing stations. This would increase the number of stations and reduce time wasted while students are overcrowded at the few stations.

The study recommends that the ratio of the school population to the number of washing stations influences pupils' handwashing practices. When there are adequate stations, overcrowding is reduced and hand washing is made more efficient for pupils who are running to other activities within the institutions. To ensure an improved association of water availability and handwashing practices, these factors need to be addressed.

The study suggests that disparity in gender and pupils' practice of carrying water for handwashing from home can be addressed through the provision of equal education and encouragement to all pupils to practice hand washing, schools can implement policies that promote equal participation in hygiene practices through educational programs that target both boys and girls and providing adequate handwashing facilities at schools that can reduce the need for pupils to carry water from home, thereby addressing the root cause of this gender disparity. Most importantly there is a need for community engagement where schools engage parents and communities in discussions about hygiene to help shift cultural norms and expectations. The community need to be called upon to encourage both boys and girls to take responsibility for their hygiene. That would foster more balance in hand-washing practices and reduce health risks among school populations.

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5.4 Recommendation for Policy

The government should ensure that all schools have adequate handwashing facilities with soap and clean water by providing vote heads to purchase them. Also, the government should come up with financing modalities to install efficient pumps, procure durable and easy-to-maintain storage tanks and piping water to handwashing stations at strategic locations such as near toilets. This can be achieved through secure funding for hand hygiene programs through government budgets or partnerships with private sector and development organizations.

The government needs to relook at revamping educational awareness by integrating hand hygiene education into the school curriculum where the Ministry of Education conducts

regular workshops and training sessions for students, WASH teachers, and staff on the importance of handwashing. The new CBC education curriculum would be appropriate in demonstrating the procedure of handwashing by incorporating role as well. This would make the learning enjoyable for learners and it would remain memorable and easy to practice.

The government should give incentives to best-performing schools in this practice and also establish a system for regular monitoring and evaluation of handwashing practices in schools. Record keeping on the handwashing practice would pinpoint the progress or milestones covered by the country. Hence the ministry should consider collecting data on handwashing compliance and use it to improve policies and practices. Lastly, as observed social and cultural norms play a major role in handwashing practices, especially on matter gender. This calls for an opportunity to engage parents and the community at large in promoting hand hygiene practices at home and in schools.

5.5 Recommendations for Future Studies

The current study was limited to schools in Kakamega County; thus, future studies should consider replicating this study to other counties in order to support the generalization of the findings. Future studies should investigate the lived experiences of special learners in practising handwashing in primary schools.

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APPENDICES

APPENDICES 1: MAP OF LURAMBI SUB COUNTY

Source: Researcher (2019)

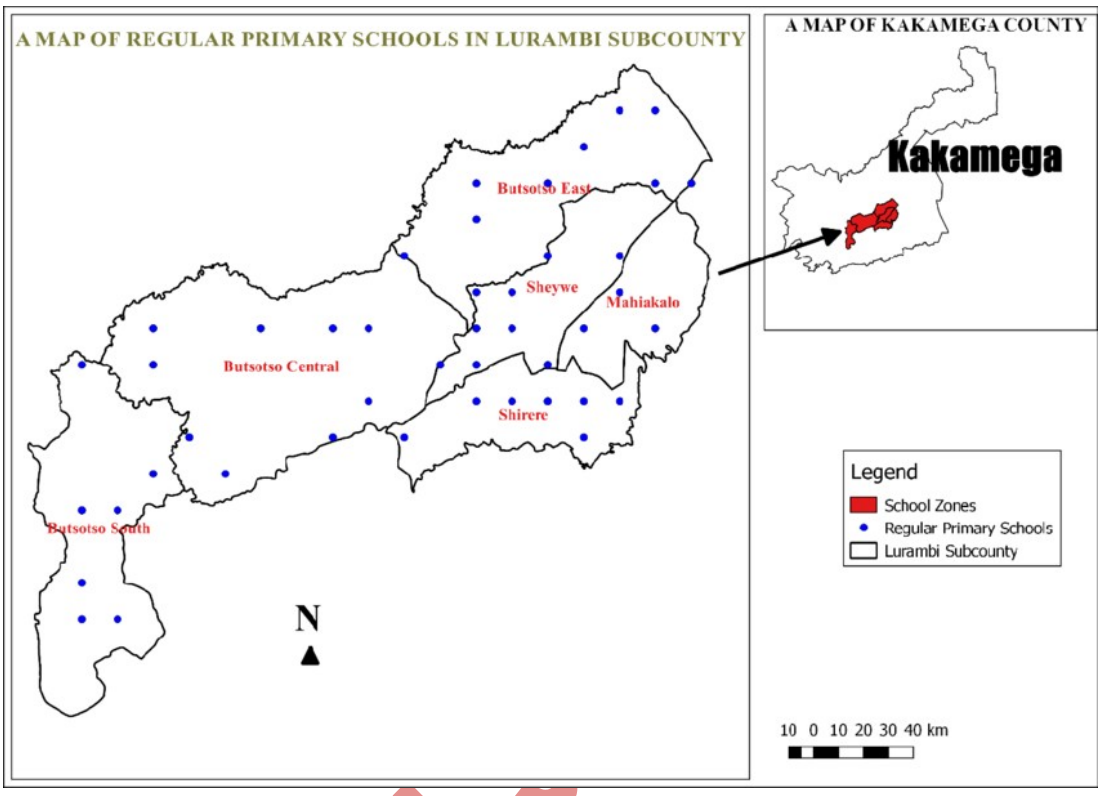


Figure 1: Map of Lurambi Sub-County

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APPENDIX 2: QUESTIONNAIRE CONSENT FORM

Humphrey Buradi Zadock
P. O. Box 2871-50100,
Kakamega.

Dear Pupil,

I am a Master's student in Development Studies at St. Paul's University in Lumuru, and I am currently conducting research on the factors influencing hand-washing practices among public primary school pupils in Lurambi Sub-County, Kakamega County. This research is a key component of my academic program.

Participating in this study will not only broaden your understanding of the factors that affect hand-washing behaviors among students but will also contribute to addressing hand-washing challenges in schools. The research aligns with Sustainable Development Goal (SDG) 6, which focuses on ensuring access to water, sanitation, and hygiene for all. Additionally, the findings will provide valuable insights for development practitioners, helping to improve Water, Sanitation, and Hygiene (WaSH) infrastructure in schools, thereby creating better learning environments where students can thrive cognitively, socially, and independently.

Your participation is entirely voluntary, and while no financial compensation is provided, your thoughtful responses will be invaluable. All responses will be kept confidential and anonymized to ensure your privacy.

Thank you for considering involvement in this important study.

Sincerely,

Humphrey Buradi Zadock.

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APPENDIX 3: QUESTIONNAIRE FOR STUDENTS

General Demographics

1) What is the name of your school? _____
2) In which grade are you? _____
3) What is your gender? (*Tick what is applicable)* Girl _____ Boy_____
4) Is the school a day school or a boarding school? _____
5) Age of the pupil _____

Section 1: Handwashing practices

6) Do you usually wash your hands when you are in school? Yes. ☐ No. ☐
7) On a typical day, how often do you wash your hands in school? _____
8) During this last week, how often did you wash hands in school? _____
9) Where did you obtain water to wash your hands? _____
10) If you rarely wash your hands when in school, what are the reasons? _____
11) Do you usually bring water from home to school? _____
12) What do you use the water you bring from home for? _____
13) What is your main water source that you use at home? _____

Section 2: Type of school water source

14) What is the main source of water provided by the school in the last three months? (*Tick all that apply)* If there is more than one source, the one used most frequently for drinking water should be selected. If children need to bring water from home because water is not provided by the school, "no water source should be selected. **Could be observed or verified by observation.**

☐ Piped water supply
☐ Protected borehole, well or spring
☐ Rain water
☐ Unprotected well/spring

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- [ ] Packaged bottled water
- [ ] Tanker-truck or cart
- [ ] Surface water - lake, river, stream
- [ ] No water source

15) Of the water sources selected, which is used most frequently?

- [ ] Piped water supply
- [ ] Protected borehole, well or spring
- [ ] Rain water
- [ ] Unprotected well/spring
- [ ] Packaged bottled water
- [ ] Tanker-truck or cart
- [ ] Surface water - lake, river, stream
- [ ] No water source

16) During the last two weeks has the main water supply been running?

- [ ] Yes
- [ ] No

17) Is the water from the main source currently available at the school? (*Confirm that the water is available from this source, e.g. check that taps or hand pumps deliver water)*

- [ ] Yes
- [ ] No

18) How would you rate the reliability of the school water supply?

- [ ] Very reliable
- [ ] Reliable
- [ ] Not reliable
- [ ] Extremely unreliable

Section 3: Location of hand-washing station

19) Does the school have hand washing facilities?

- [ ] Yes
- [ ] No

(skip to question 23 if your school doesn't have Hand washing facilities)

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20) Where is the hand washing point located? (This question refers to the location from where the water is accessed for use in the school e.g. tap, borehole)

☐ Within the school grounds - on-premises

☐ Within 500m of the school - off premises, but nearby (within 500m)

☐ Over 500m from the school - far from the school (over 500m)

21) How convenient is the location of the hand-washing station?

☐ Convenient

☐ Somehow convenient

☐ Not convenient

22) What type of hand washing facilities does the school have?

☐ Tank on a metallic stand

☐ Sink with tap connected

Section 4: Hand-washing sensitization

23) Have you been trained on hand-washing?

Yes ☐ No ☐

24) If yes, when was the training conducted?

☐ One month ago

☐ Six month ago

☐ Over one year ago

25) Do you think the amount of water available in the hand washing equipment is sufficient for every student?

Yes ☐ No ☐

26) Do you think only water is enough for washing hands?

Yes ☐ No ☐

27) Do you think washing your hands with soap is important before eating or after visiting the latrine?

Yes ☐ No ☐

28) If you fail to wash hands, can they transmit diseases?

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Yes ☐ No ☐

29) When do you wash your hands (tick all that apply)?

☐ After toilet
☐ Before meal
☐ After Play
☐ After work

30) What is the benefit of hand washing with clean water and soap (tick two that are most important)?

☐ Health Promotion
☐ Prevention of disease transmission
☐ To be beautiful
☐ To be smart

Section 5: Management of hand-washing equipment

31) Who is responsible for managing hand-washing facilities in school?

☐ School Prefects
☐ WaSH club members
☐ Teachers
☐ School support staff
☐ Other (please specify)

32) Is water and soap available at the hand washing station at any given time?

☐ Yes
☐ No
☐ Decline to state
☐ Don't know

33) Has the hand washing station ever broken down?

☐ Yes
☐ No

34) Where do pupils wash their hands when the hand washing station breaks down?

_____

35) When the hand-washing stations break down, who takes the responsibility of repairs?

☐ Support staff
☐ Teachers
☐ I don't know

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36) What else can be done to improve the hand-washing facilities in school?

_____

_____Is there anything else you would like to tell the researcher that would be useful in this study?

_____

_____

Thank you for your participation

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APPENDIX 4: INTERVIEW CONSENT FORM

Humphrey Buradi Zadock
P. O. Box 2871-50100,
Kakamega.

Dear Sir/Madam,

I am now pursuing a Master's degree in Development Studies at St. Paul's University in Lumuru. My study focuses on identifying the variables that impact hand-washing behaviors among students attending public primary schools in Lurambi Sub-County, Kakamega County. This study is a mandatory component of my academic curriculum.

Your involvement in this research will contribute to our enhanced understanding of the factors that influence hand-washing behavior among these students. This study is of utmost importance as it seeks to tackle the difficulties associated with hand-washing in schools and is in line with Sustainable Development Goal (SDG) 6, which specifically targets the provision of water, sanitation, and hygiene for everyone. Moreover, the results will provide significant perspectives for development professionals to improve Water, Sanitation, and Hygiene (WaSH) infrastructure, eventually leading to a healthier and more favorable learning environment for kids.

Participation is completely optional, and while there is no monetary remuneration, your important perspectives are highly valued. All replies will undergo anonymization, and we are dedicated to upholding the confidentiality of your data.

Thank you for considering participation in this important study.

Sincerely,

Humphrey Buradi Zadock.

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APPENDIX 5: INTERVIEW GUIDE FOR HEAD TEACHERS

1) Name of the school

2) How many pupils does the school have in the;

- Pre-primary
- Primary section
- JSS

3) What challenges does the school encounter providing adequate drinking water to pupils?

4) What are the main water sources for the school?

5) What challenges does the school face with each of the type of water service?

6) Is the water piped from source to handwashing facilities? Yes/no

7) If no what challenges do you face as a school in regard to lack of piping from main source to the handwashing facility

8) What challenges does the school face providing adequate hand-washing to all these children?

List ALL the challenges that School pupils encounter.

9) Which category of pupils are most affected by the limited hand washing stations?

10) Are the hand washing stations connected to water sources via a water pipe to the water source?

11) What challenges does a lack of Connecting the hand washing stations to a Water Source through a pipe pose to the school?

12) Does the school have a Teacher who is responsible for overseeing Water, Sanitation and Hygiene in the School?

13) What challenges does a lack of Connecting the hand washing stations to a Water Source through a pipe pose to the School Pupils?

14) If YES, what does the School do to facilitate the Teacher?

15) What challenges does your School encounter facilitating the Teacher responsible for Water, Sanitation, and hygiene Issues in the School?

16) What's the estimated total number of girls in the school?

17) Does the school has adequate toilets for the _____ girls?

18) What challenges does the school face in providing adequate toilets for girls?

19) What is the total number of boys in the school?

20) What challenges does the school face in providing adequate toilets for boys?

Thank you so much for Completing the Survey.

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Appendix 6: Kakamega Central Disaggregated Enrolment Data for Primary Schools

KAKAMEGA CENTRAL DISSAGGREGATED ENROLMENT DATA-PRIMARY 2023

S/ NO	NAME OF SCHOOL	PP1			PP2				GI			GII			GIII			GIV			GV			GVI			GVII			STD 8			GRAND TOTAL		
		B	G	T	B	G	T	TOTAL ECD	B	G	T	B	G	T	B	G	T	B	G	T	B	G	T	B	G	T	B	G	T	B	G	T	B	G	Total
1	AMALEMBA	41	39	80	48	42	90	170	53	51	104	46	44	90	48	50	98	51	54	105	50	53	103	40	43	83	46	45	91	51	62	113	385	402	787
2	BASIL LURAMBI	55	45	100	36	30	66	166	60	52	112	79	88	167	79	88	167	95	86	181	90	78	168	112	89	201	103	80	183	127	106	233	745	667	1412
3	BONDENI	29	28	57	21	18	39	96	39	39	78	32	39	71	64	42	106	51	53	104	56	69	125	51	57	108	48	54	102	39	47	86	380	400	780
4	BUKHULUNYA	27	33	60	40	60	100	160	50	62	112	53	50	103	54	56	110	53	60	113	54	50	104	53	51	104	54	50	104	62	58	120	433	437	870
5	CHIEF MUSEMBI	11	17	28	10	17	27	55	35	31	66	54	42	96	43	52	95	32	38	70	27	35	62	26	39	65	42	33	75	32	32	64	291	302	593
6	DAISY SPECIAL SCHOOL	12	11	23	14	12	26	49	8	11	19	9	19	28	12	11	23	13	10	23	14	16	30	13	15	28	9	12	21	15	13	28	93	107	200
7	EBUCHINGA	23	31	54	18	12	30	84	27	25	52	49	31	80	30	30	60	44	41	85	36	31	67	39	41	80	45	50	95	43	42	85	313	291	604
8	EBUCHIRA	18	12	30	18	11	29	59	17	23	40	27	27	54	35	16	51	32	30	62	38	25	63	37	38	75	38	46	84	55	53	108	279	258	537
9	EBUHAYI	30	23	53	30	27	57	110	41	30	71	42	45	87	50	40	90	40	41	81	40	45	85	40	27	67	45	40	85	59	38	97	357	306	663
10	EBUNGAYA	30	28	58	23	10	33	91	14	21	35	18	23	41	37	36	73	30	31	61	29	39	68	31	37	68	49	19	68	37	24	61	245	230	475
11	EBWAMBWA	36	39	75	27	12	39	114	31	32	63	30	31	61	39	30	69	47	42	89	33	30	63	37	26	63	33	40	73	46	33	79	296	264	560
12	EKAPWONJE	19	38	57	21	22	43	100	27	40	67	30	28	58	20	24	44	28	24	52	30	27	57	14	16	30	31	32	63	20	24	44	200	215	415
13	ELUFAFWA	15	11	26	12	26	38	64	14	19	33	20	17	37	30	16	46	28	20	48	21	18	39	18	18	36	23	19	42	20	19	39	174	146	320
14	ELUKHO	29	26	55	19	29	48	103	31	25	56	30	30	60	31	29	60	48	35	83	25	30	55	38	28	66	39	31	70	40	39	79	282	247	529
15	EMACHEMBE	23	17	40	18	23	41	81	35	19	54	23	34	57	27	22	49	31	18	49	28	14	42	20	25	45	16	17	33	11	21	32	191	170	361

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	PRI																															
16	EMAHUNGU SCHOOL	21	31	52	30	20	50	102	36	34	70	40	35	75	36	40	76	37	41	78	32	34	66	26	36	62	24	27	51	30	27	57	261	274	535
17	EMASERA	23	23	46	22	24	46	92	26	17	43	29	25	54	24	26	50	30	32	62	29	32	61	29	35	64	32	34	66	30	31	61	229	232	461
18	EMASERA COMMUNITY	20	15	35	17	13	30	65	20	22	42	29	28	57	28	24	52	34	25	59	43	36	79	34	36	70	45	38	83	35	47	82	268	256	524
19	EMATIETIE PR	0	0	0	0	0	0	0	22	15	37	22	15	37	18	20	38	14	20	34	22	11	33	21	22	43	17	23	40	24	17	41	160	143	303
20	EMATSAYI	11	14	25	7	10	17	42	14	6	20	10	12	22	22	6	28	7	18	25	17	17	34	9	16	25	21	22	43	11	13	24	111	110	221
21	EMUKABA	19	19	38	19	19	38	76	30	23	53	27	26	53	33	32	65	40	41	81	46	42	88	55	42	97	48	37	85	42	55	97	321	298	619
22	EMUKANGU	0	0	0	0	0	0	0	35	35	70	30	40	70	39	36	75	34	28	62	34	38	72	29	43	72	22	28	50	32	32	64	255	280	535
23	EMULELE	9	17	26	13	25	38	64	17	24	41	28	26	54	27	30	57	28	31	59	25	32	57	15	9	24	3	15	18	8	9	17	151	176	327
24	EMULUNDU	27	33	60	20	28	48	108	40	20	60	34	46	80	59	30	89	52	36	88	40	48	88	45	31	76	32	35	67	25	37	62	327	283	610
25	EMURUMBA PR	21	16	37	14	20	34	71	16	26	42	23	28	51	19	23	42	25	17	42	29	18	47	18	26	44	33	15	48	28	19	47	191	172	363
26	EMUSALA	32	36	68	20	20	40	108	25	19	44	31	41	72	39	62	101	43	42	85	30	38	68	41	43	84	36	44	80	32	44	76	277	333	610
27	ESHIAMBOKO	0	0	0	0	0	0	0	33	48	81	30	36	66	32	28	60	32	29	61	31	36	67	34	31	65	24	29	53	32	31	63	248	268	516
28	ESHIANDUKUSI	34	36	70	28	35	63	133	31	30	61	29	33	62	28	29	57	28	31	59	31	30	61	35	30	65	19	26	45	32	33	65	233	242	475
29	ESHIBEMBE	20	20	40	22	18	40	80	19	21	40	22	23	45	19	15	34	15	19	34	20	24	44	18	17	35	16	10	26	19	17	36	148	146	294
30	ESHIBEYE	30	38	68	34	30	64	132	32	38	70	40	33	73	35	41	76	48	45	93	40	43	83	46	35	81	39	41	80	46	35	81	326	311	637
	ESHILIBO PRI																																		252
31	ESHIKHUYU PR	32	21	53	11	16	27	80	15	14	29	13	19	32	26	27	53	25	21	46	26	16	42	32	17	49	26	27	53	31	31	62	194	172	366
32	ESHIRUMBA	30	30	60	25	31	56	116	32	25	57	31	33	64	24	22	46	34	25	59	24	28	52	19	21	40	16	16	32	17	19	36	197	189	386
33	ESHISIRU	27	15	42	13	15	28	70	30	34	64	28	38	66	25	27	52	26	37	63	34	28	62	30	24	54	28	28	56	28	29	57	229	245	474
34	ESOKONE	20	5	25	11	14	25	50	13	17	30	21	19	40	24	26	50	23	22	45	27	27	54	16	20	36	23	19	42	28	32	60	175	182	357
35	HIRUMBI	35	30	65	22	26	48	113	23	22	45	28	23	51	31	21	52	28	25	53	27	26	53	23	35	58	23	31	54	38	39	77	221	222	443
36	IBINZO PR	26	17	43	15	15	30	73	15	13	28	16	17	33	18	15	33	19	15	34	16	20	36	19	15	34	28	28	56	29	18	47	160	141	301
37	IKONYERO	45	62	107	45	63	108	215	56	65	121	45	68	113	85	66	151	70	77	147	108	68	176	87	84	171	84	90	174	97	110	207	632	628	1260

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38	INDANGALASIA	18	14	32	20	16	36	68	28	18	46	33	35	68	37	34	71	38	39	77	40	24	64	53	36	89	33	29	62	24	37	61	286	252	538
39	KAK MUSLIM	10	8	18	13	9	22	40	16	20	36	24	16	40	28	18	46	25	23	48	17	21	38	13	18	31	20	25	45	19	29	48	162	170	332
40	KAKAMEGA PRIMARY SCHOOL	74	79	153	93	88	181	334	173	152	325	194	210	404	231	243	474	297	247	544	250	279	529	288	283	571	288	275	563	260	286	546	1981	1975	3956
41	KAK SCHOOL FOR DEAF	2	2	4	2	2	4	8	6	4	10	5	4	9	6	5	11	4	6	10	4	5	9	5	4	9	4	3	7	3	4	7	37	35	72
42	KAK TOWNSHIP	82	85	167	26	30	56	223	41	36	77	52	55	107	53	48	101	55	67	122	63	65	128	78	73	151	32	38	70	33	40	73	407	422	829
43	KILIMO PR	90	74	164	75	60	135	299	31	29	60	35	38	73	40	45	85	37	38	75	49	40	89	32	36	68	31	47	78	48	38	86	303	311	614
44	MAHIAKALO	66	42	108	26	36	62	170	58	57	115	87	84	171	77	82	159	132	105	237	107	115	222	99	83	182	120	108	228	129	146	275	809	780	1589
45	MARABA	43	44	87	62	63	125	212	43	37	80	54	67	121	49	63	112	57	67	124	43	48	91	40	48	88	50	73	123	52	52	104	388	455	843
46	MATENDE	18	12	30	16	9	25	55	12	8	20	11	9	20	13	15	28	18	13	31	16	13	29	13	11	24	17	13	30	24	19	43	124	101	225
47	MATIOLI	13	20	33	17	10	27	60	18	22	40	18	30	48	20	25	45	29	28	57	25	41	66	32	22	54	29	22	51	18	25	43	189	215	404
48	MUNGULU	15	25	40	22	24	46	86	37	34	71	50	48	98	35	35	70	37	41	78	35	35	70	29	34	63	34	21	55	28	34	62	285	282	567
49	MUSAA	20	22	42	22	30	52	94	28	39	67	35	33	68	37	38	75	34	36	70	38	33	71	38	44	82	39	36	75	44	31	75	293	290	583
50	MWIYALA	18	16	34	15	13	28	62	26	29	55	28	26	54	27	24	51	38	37	75	30	26	56	37	25	62	32	19	51	44	27	71	262	213	475
51	MWIYENGA	17	20	37	18	21	39	76	32	25	57	31	33	64	24	22	46	34	25	59	45	32	77	45	37	82	36	32	68	26	35	61	273	241	514
52	NABONGO PRI	36	38	74	35	35	70	144	78	76	154	88	90	178	88	94	182	90	94	184	88	97	185	85	90	175	80	84	164	88	102	190	685	727	1412
53	NYAYO TEA ZONE	29	32	61	30	32	62	123	29	26	55	40	28	68	34	28	62	33	29	62	28	36	64	28	29	57	30	28	58	23	35	58	245	239	484
54	ROSTERMAN	6	11	17	13	9	22	39	20	21	41	23	18	41	27	40	67	21	29	50	28	29	57	17	13	30	25	14	39	18	29	47	179	193	372
55	SHIKOTI GIRLS	25	50	75	15	39	54	129	0	45	45	0	56	56	0	53	53	0	54	54	0	51	51	0	63	63	0	59	59	0	45	45	0	426	426
56	SHIKOTI MIXED	17	14	31	32	21	53	84	47	25	72	53	27	80	55	29	84	57	30	87	56	33	89	44	32	76	62	36	98	53	36	89	427	248	675
57	SHISANGO	10	15	25	20	13	33	58	25	27	52	27	28	55	26	25	51	24	42	66	32	36	68	23	12	35	43	35	78	27	34	61	227	239	466
58	SHISASARI	0	0	0	0	0	0	0	10	11	21	18	25	43	15	17	32	23	27	50	21	18	39	19	21	40	15	16	31	26	32	58	147	167	314
59	SHITAHO	14	17	31	18	21	39	70	16	17	33	18	17	35	15	18	33	12	13	25	12	13	25	17	20	37	3	5	8	20	25	45	113	128	241

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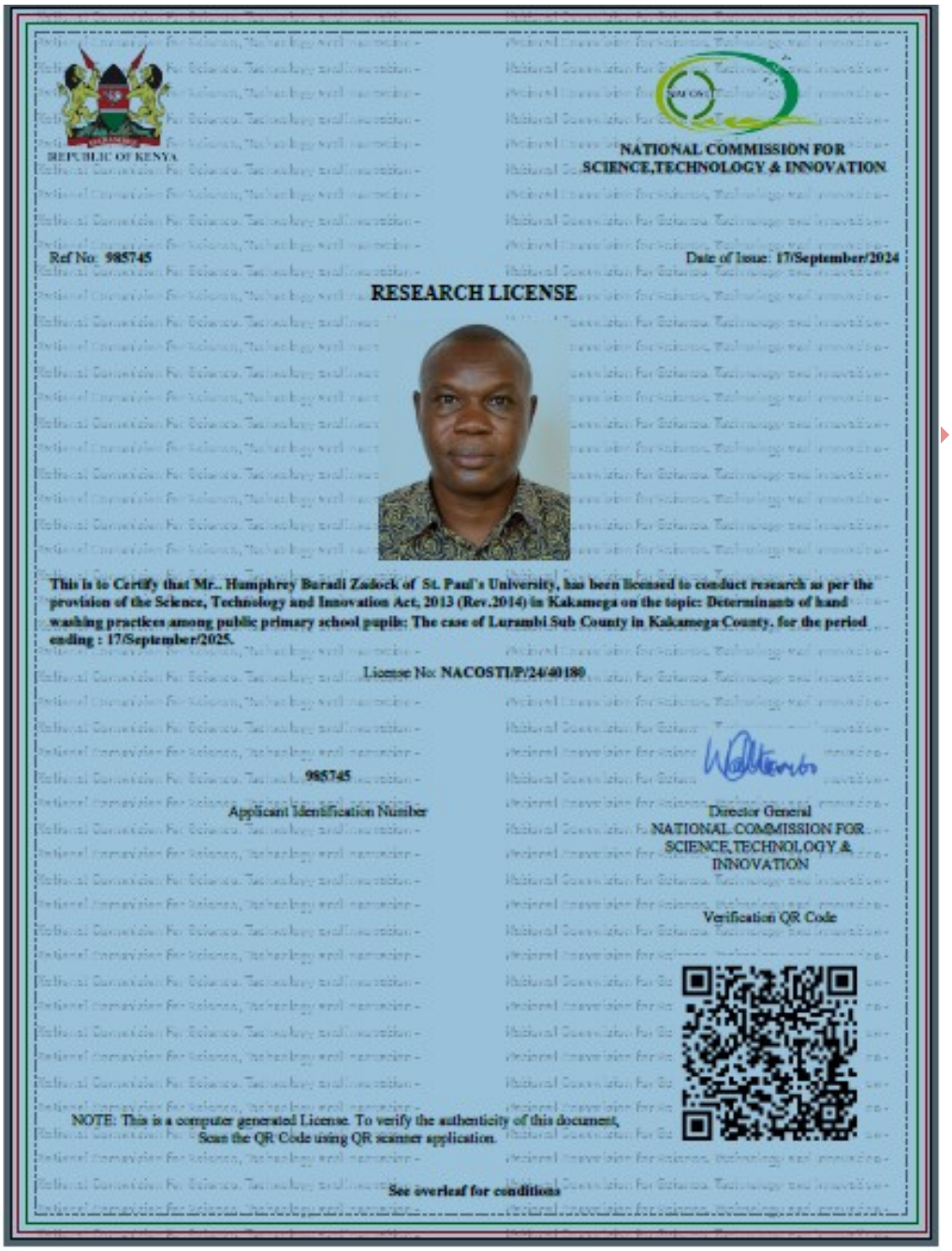
	COMMUNITY																															
60	SHITAHO PRY	30	26	56	25	29	54	110	34	32	66	34	33	67	32	39	71	26	32	58	29	27	56	27	28	55	30	30	60	42	25	67	254	246	500
61	SHIVAKALA	28	22	50	17	15	32	82	31	25	56	28	26	54	23	28	51	24	39	63	32	16	48	36	23	59	25	27	52	21	23	44	220	207	427
62	SHIYUNZU	28	30	58	32	25	57	115	19	23	42	20	21	41	18	17	35	18	22	40	21	14	35	14	17	31	17	15	32	29	25	54	156	154	310
63	ST LAWRENCE ICHINA	12	12	24	11	10	21	45	22	19	41	30	29	59	26	24	50	25	28	53	24	22	46	21	15	36	16	22	38	22	14	36	186	173	359
64	KAKAMEGA REHABILITATION SCHOOL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	8	0	0	0	4	0	4	12	0	12
	TOTALS																																		37,514

Figure 2: Kakamega Central disaggregated Enrolment Data for Primary Schools

Source: Kakamega Central Sub County Education office (2023 Data)

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APPENDIX 7: NACOSTI RESEARCH PERMIT



REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: 985745

Date of Issue: 17/September/2024

RESEARCH LICENSE

This is to Certify that Mr.. Humphrey Buradi Zadock of St. Paul's University, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Kakamega on the topic: Determinants of hand washing practices among public primary school pupils: The case of Lurambi Sub County in Kakamega County, for the period ending : 17/September/2025.

License No: NACOSTI/P/24/40180

985745

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Verification QR Code

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THE SCIENCE, TECHNOLOGY AND INNOVATION ACT, 2013 (Rev. 2014)

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The National Commission for Science, Technology and Innovation, hereafter referred to as the Commission, was the established under the Science, Technology and Innovation Act 2013 (Revised 2014) herein after referred to as the Act. The objective of the Commission shall be to regulate and assure quality in the science, technology and innovation sector and advise the Government in matters related thereto.

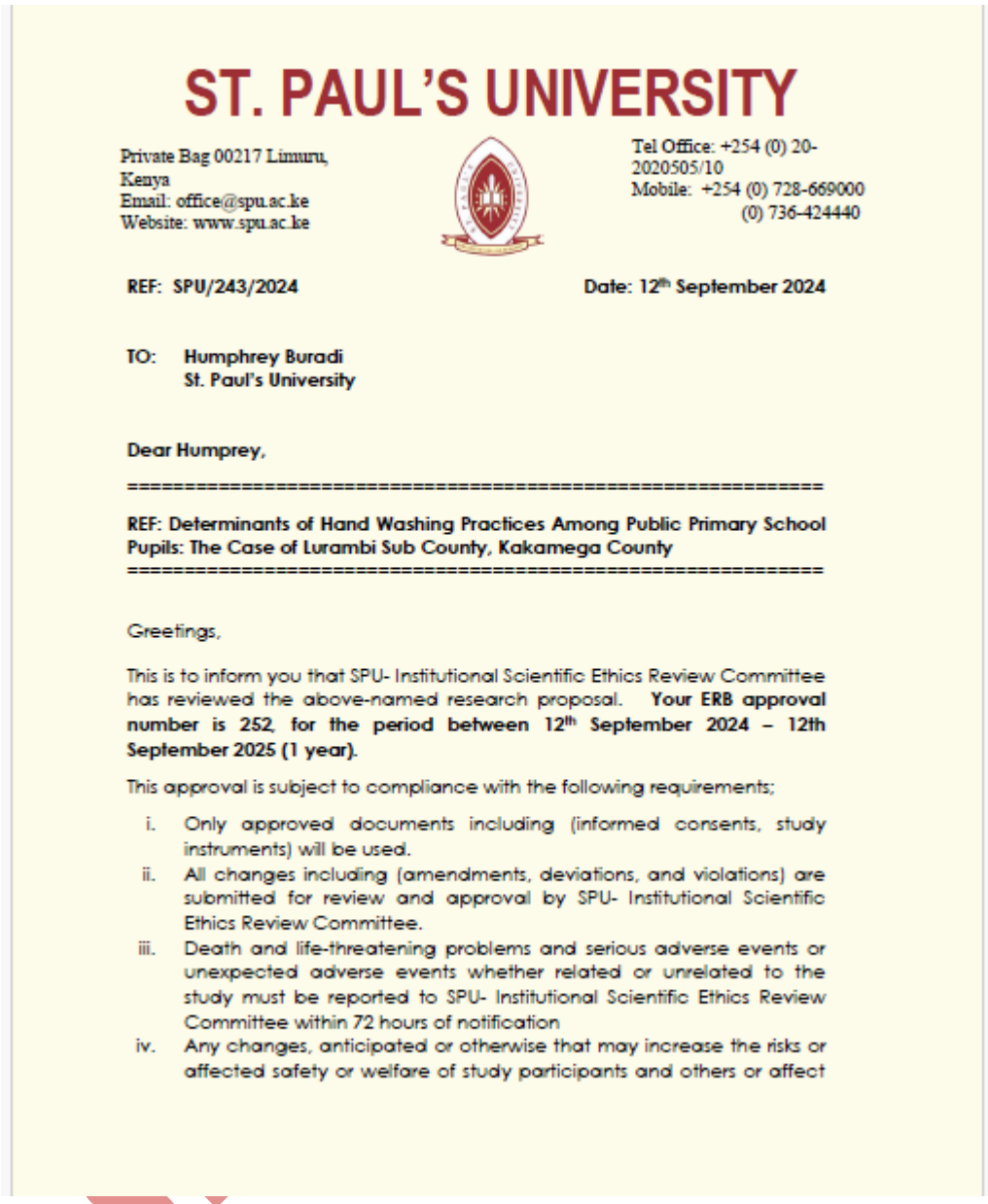
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2. The research and its related activities as well as outcomes shall be beneficial to the country and shall not in any way;
   i. Endanger national security
   ii. Adversely affect the lives of Kenyans
   iii. Be in contravention of Kenya's international obligations including Biological Weapons Convention (BWC), Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO), Chemical, Biological, Radiological and Nuclear (CBRN).
   iv. Result in exploitation of intellectual property rights of communities in Kenya
   v. Adversely affect the environment
   vi. Adversely affect the rights of communities
   vii. Endanger public safety and national cohesion
   viii. Plagiarize someone else's work
3. The License is valid for the proposed research, location and specified period.
4. The license any rights thereunder are non-transferable
5. The Commission reserves the right to cancel the research at any time during the research period if in the opinion of the Commission the research is not implemented in conformity with the provisions of the Act or any other written law.
6. The Licensee shall inform the relevant County Director of Education, County Commissioner and County Governor before commencement of the research.
7. Excavation, filming, movement, and collection of specimens are subject to further necessary clearance from relevant Government Agencies.
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10. The Licensee shall submit one hard copy, and upload a soft copy of their final report (thesis) onto a platform designated by the Commission within one year of completion of the research.
11. The Commission reserves the right to modify the conditions of the License including cancellation without prior notice.
12. Research, findings and information regarding research systems shall be stored or disseminated, utilized or applied in such a manner as may be prescribed by the Commission from time to time.
13. The Licensee shall disclose to the Commission, the relevant Institutional Scientific and Ethical Review Committee, and the relevant national agencies any inventions and discoveries that are of National strategic importance.
14. The Commission shall have powers to acquire from any person the right in, or to, any scientific innovation, invention or patent of strategic importance to the country.
15. Relevant Institutional Scientific and Ethical Review Committee shall monitor and evaluate the research periodically, and make a report of its findings to the Commission for necessary action.

National Commission for Science, Technology and Innovation(NACOSTI),
Off Waiyaki Way, Upper Kabete,
P. O. Box 30623 - 00100 Nairobi, KENYA
Telephone: 020 4007000, 0713788787, 0735404245
E-mail: dg@nacosti.go.ke
Website: www.nacosti.go.ke

ST.P

APPENDIX 8: ST. PAUL'S RESEARCH APPROVAL



ST. PAUL'S UNIVERSITY

Private Bag 00217 Limuru,
Kenya
Email: office@spu.ac.ke
Website: www.spu.ac.ke

Tel Office: +254 (0) 20-2020505/10
Mobile: +254 (0) 728-669000
(0) 736-424440

REF: SPU/243/2024 Date: 12th September 2024

TO: Humphrey Buradi
St. Paul's University

Dear Humprey,

==========

REF: Determinants of Hand Washing Practices Among Public Primary School Pupils: The Case of Lurambi Sub County, Kakamega County

==========

Greetings,

This is to inform you that SPU- Institutional Scientific Ethics Review Committee has reviewed the above-named research proposal. **Your ERB approval number is 252, for the period between 12th September 2024 – 12th September 2025 (1 year).**

This approval is subject to compliance with the following requirements;

i. Only approved documents including (informed consents, study instruments) will be used.
ii. All changes including (amendments, deviations, and violations) are submitted for review and approval by SPU- Institutional Scientific Ethics Review Committee.
iii. Death and life-threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to SPU- Institutional Scientific Ethics Review Committee within 72 hours of notification
iv. Any changes, anticipated or otherwise that may increase the risks or affected safety or welfare of study participants and others or affect

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the integrity of the research must be reported to *SPU- Institutional Scientific Ethics Review Committee* within 72 hours

v. Clearance for export of biological specimens must be obtained from relevant institutions.

vi. Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. Attach a comprehensive progress report to support the renewal.

vii. Submission of an executive summary report within 90 days upon completion of the study to SPU- Institutional Scientific Ethics Review Committee.

viii. **Please note that it is within the ISERC's mandate to monitor your research and to do random visits to the site. All research is subject to post approval monitoring.**

Prior to commencing your study, you will be expected to obtain a research license from National Commission for Science, Technology and Innovation (NACOSTI) ***https://research-portal.nacosti.go.ke*** **and also obtain other clearances needed.**

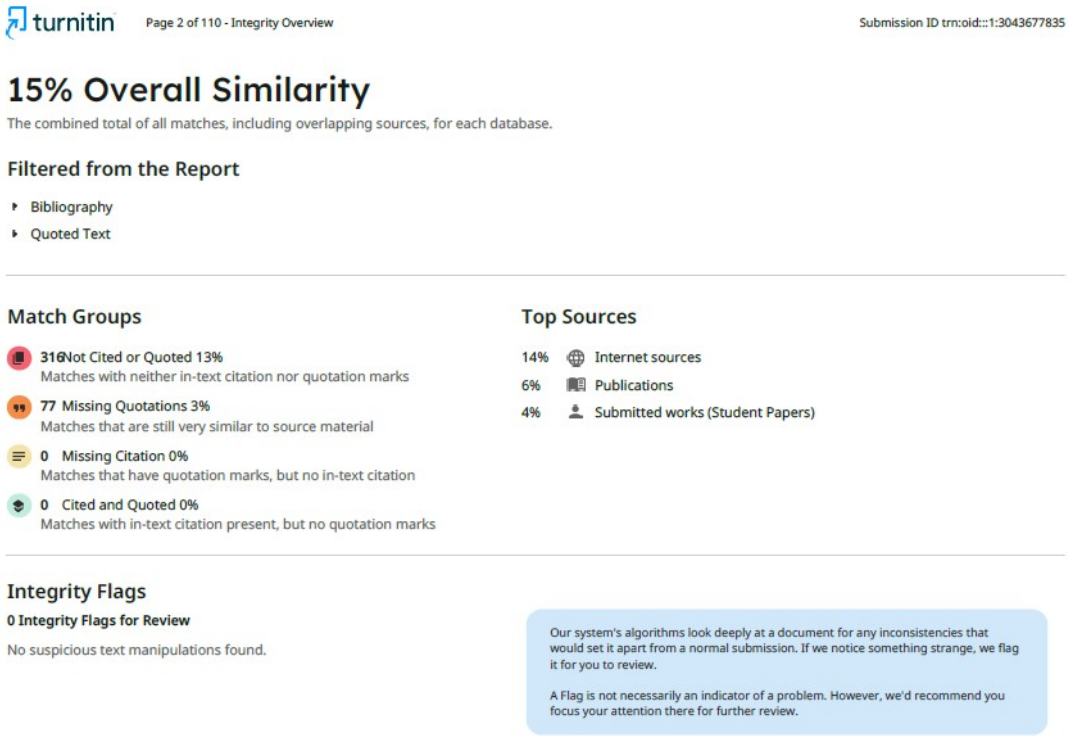
Yours sincerely,



Dr. Daniel Nzengya, PhD
Chairperson
SPU- Institutional Scientific & Ethics Review Committee



APPENDIX 9: PLAGIALISM REPORT



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