

ISSN Online: 2616-8383



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ISSN: 2616-8383

The Relationship Between Reliability of School Water Service and Pupils Carrying Water from Home to School for Hand Washing Practices

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How to cite this article: Zadock H., B., Muasya., D. & Gichuhi D. (2024). The Relationship Between Reliability of School Water Service and Pupils Carrying Water from Home to School for Hand Washing Practices. Journal of Education. Vol 7(3) pp. 61-70.

<https://doi.org/10.53819/81018102t3108>

Abstract

The lack of reliable water services in public primary schools in Kenya, particularly in rural areas like Lurambi sub-County, Kakamega County, significantly hinders students' ability to maintain essential hygiene practices, such as handwashing. Inconsistent water access often forces students to bring water from home, creating an unsustainable burden and impacting hygiene consistency. The purpose of this study was to examine the relationship between the reliability of school water services and pupils' practice of carrying water from home for handwashing. The study was informed by the Socio-ecological Model (SEM), which considers individual behaviours within broader systemic influences. Using a cross-sectional survey design, the study targeted a population of 14,767 students and 12 head teachers, with a sample size of 389 participants. Data were collected through structured questionnaires and key informant interviews, and analysed using descriptive statistics. Findings indicated that schools with reliable water sources experienced a lower need for pupils to carry water from home, whereas unreliable sources led to inconsistent handwashing practices. The study concluded that consistent water services reduce the burden on students and improve hygiene practices. Based on these findings, the study recommended that schools improve their water infrastructure to ensure sustainable access to handwashing facilities.

Keywords: *School Water Services, Reliability, Pupils' Practice, Carrying Water from Home, Handwashing*

1.0 Background of the Study

The World Health Organization (WHO) and UNICEF emphasize that access to reliable water sources in schools is essential for fostering proper hygiene practices, especially handwashing, among students (WHO, 2020; UNICEF, 2021b). Despite the established benefits, many schools in low- and middle-income countries, including Kenya, continue to lack reliable water services. Inadequate water access means that students often face insufficient opportunities to wash their hands, particularly during critical times such as before meals and after using the restroom. This lack of availability encourages alternative strategies, such as students bringing water from home, but this approach is inconsistent and depends on household resources (Wichaidit et al., 2019). Therefore, the reliability of school water services directly influences students' handwashing practices, affecting overall health outcomes in educational environments. Numerous studies indicate a significant gap in adequate water and sanitation services in schools, which compromises the establishment of safe, hygienic conditions necessary for effective learning (UNICEF, 2020). The WHO/UNICEF Joint Monitoring Program for Water Supply, Sanitation, and Hygiene (WaSH) has classified schools with consistent access to improved water sources as better equipped to promote health. Improved water sources may include boreholes or rainwater tanks, which, while more dependable than unimproved sources, still present challenges in terms of reliability and safety. In settings where reliable water access is lacking, students may be required to supplement school resources by carrying water from home, though this practice is not sustainable or effective on a large scale, especially in areas with limited household water availability (Besha et al., 2016).

The availability of school water services is closely tied to the daily health practices of students (Kumwenda, 2019). Studies from various developing regions suggest that when schools lack dependable water access, students are often encouraged by parents or school staff to carry water from home to meet their hygiene needs. However, this solution places additional burdens on families and is not a reliable way to ensure consistent handwashing practices. Students from water-scarce households may come to school without adequate water, thereby forgoing essential hygiene activities, which raises the risk of disease transmission (Osher et al., 2009). Thus, the reliability of school water supplies plays a significant role in determining whether students can adhere to daily hand hygiene practices. The Kenyan context underscores the broader issue of inadequate water and sanitation infrastructure in schools. According to the Ministry of Education (2018), the rapid increase in student enrolment since the introduction of Free Primary Education has outpaced infrastructural development, resulting in crowded classrooms and limited sanitation facilities. In Kakamega County, for example, the Lurambi sub-County faces substantial water challenges that prevent schools from ensuring regular access to clean water. Consequently, students are often compelled to bring water from home, a practice that not only varies by household capacity but also reflects socioeconomic inequalities, as some families cannot consistently provide water for this purpose (Wichaidit et al., 2019).

In Kenya, the lack of dependable water infrastructure in schools remains a pressing issue, as highlighted by the Kenya National Bureau of Statistics (KNBS) and UNICEF's 2019 report, which found that only 40% of schools had handwashing facilities with soap and water. This shortage is particularly acute in rural counties like Kakamega, where Lurambi sub-County struggles with water accessibility due to infrastructural and topographical challenges. This scarcity not only limits students' handwashing opportunities but also increases the likelihood that pupils will bring water from home when possible. However, the extent to which this practice supports regular handwashing is limited, as it relies on external household resources rather than sustainable school-based solutions (KNBS & UNICEF, 2019).

1.1 Statement of the Problem

The lack of reliable water services in public primary schools in Kenya, particularly in rural areas like Lurambi sub-County in Kakamega County, presented a significant barrier to maintaining adequate hygiene practices among pupils. In these schools, limited or inconsistent access to water severely restricted students' ability to wash their hands at critical times, such as before meals and after using the restroom, increasing their vulnerability to infectious diseases (WHO, 2020; UNICEF, 2021). When schools could not provide consistent water services, students were often expected to carry water from home, yet this practice was challenging for many families, particularly those already facing water scarcity (Wichaidit et al., 2019). This reliance on household resources to meet essential hygiene needs placed an additional burden on students and parents alike, often leading to irregular handwashing practices. Without a dependable school-based water supply, pupils' hand hygiene was compromised, which negatively impacted their health, school attendance, and overall academic performance (O'Reilly et al., 2021). The absence of reliable water infrastructure in schools not only exposed students to a greater risk of illness but also undermined efforts to create a safe and conducive learning environment.

This problem was further compounded by the broader disparities in water accessibility that characterized many public schools in low-resource settings. Schools in regions like Kakamega County often struggled with infrastructural and topographical challenges that limited water access, meaning students from lower socioeconomic backgrounds were disproportionately affected (Ministry of Education, 2018). The Kenya National Bureau of Statistics (KNBS) & UNICEF report of 2019 highlighted that only 40% of Kenyan schools were equipped with the necessary facilities to support handwashing, underscoring the widespread nature of this issue (KNBS & UNICEF, 2019). When students lacked consistent access to water and were expected to carry water from home, it disrupted their ability to develop and maintain healthy hygiene routines, which were essential for both their immediate well-being and long-term health outcomes.

1.2 Objective of the Study

To determine relationship between reliability of school water service and pupils carrying water from home to school for hand washing practices.

1.3 Research Question

What is the relationship between the reliability of school water services and the practice of pupils carrying water from home to school for handwashing purposes?

2.0 Literature Review

This section reviews both theoretical and empirical literature related to the study. The theoretical review is centered on the Socio-ecological Model (SEM) Theory, which provides a framework for understanding how various levels of influence, including individual and environmental factors, impact health behaviours such as handwashing. This model is relevant for analysing how external factors, like the reliability of school water services, shape students' hygiene practices, specifically the necessity to bring water from home for handwashing. Following the theoretical insights, the empirical review examines existing research on the association between the reliability of school water services and students' handwashing behaviours. The studies analysed highlight how limited water access in educational settings influences students' need to carry water from home, the impact of this practice on hygiene and learning outcomes, and the socioeconomic factors that further complicate this issue. Lastly, a

conceptual framework illustrates the relationship between water service reliability and pupils' handwashing practices, establishing the variables central to this study's objectives.

2.1 Theoretical Review

The study was informed by the Socio-ecological Model (SEM) Theory, which was proposed by Urie Bronfenbrenner in the 1970s as a conceptual model and later formalized as a theory in the 1980s. This theory posits that human behaviour and health outcomes are shaped by multiple levels of influence, including individual, interpersonal, organizational, community, and societal factors (Bronfenbrenner, 1994). Bronfenbrenner's SEM underscores the importance of recognizing that individuals are situated within interconnected systems, and the interactions between these systems significantly impact health behaviours, such as hand-washing practices. The Socio-ecological Model is particularly relevant to this study's objective of examining the relationship between school water service reliability and pupils carrying water from home for handwashing. The theory suggests that individual actions, like bringing water from home, are influenced by broader systemic factors, such as the school's water infrastructure (Costanza, 2014). In this case, students' hygiene behaviours are not solely a product of personal knowledge or attitudes but are also shaped by the availability of adequate sanitation facilities within the school environment. This model, therefore, provides a valuable framework for understanding how institutional and community-level factors, such as the availability and reliability of school water services, shape students' health practices and habits.

Lanfer et al. (2021) applied the SEM in a study on hand-washing behaviours in Sierra Leone, highlighting how the theory enables researchers to examine both individual and broader contextual influences on hygiene practices. The study found that using SEM helped to reveal connections between risk factors at both the individual and community levels. Similarly, in the context of Lurambi sub-County, SEM can help elucidate how systemic issues, such as unreliable school water services, intersect with personal and social factors to influence students' behaviours regarding hand hygiene. Further, the SEM encourages a multi-layered approach to intervention design, advocating for strategies that address the range of influences on health behaviours (Kumwenda, 2019). In public health research, SEM is widely used to design interventions that operate across various levels, from individual education programs to policy initiatives that ensure reliable access to essential services like water and sanitation in schools. By employing the SEM as a theoretical framework, this study can assess how institutional support for water access may alleviate the need for students to carry water from home, thereby promoting consistent and reliable hygiene practices in school settings. Therefore, the Socio-ecological Model is a robust theoretical foundation for understanding the complex factors influencing hand-washing practices in schools. It aligns well with this study's focus on water service reliability in schools, providing insights into how structural and environmental factors affect pupils' behaviours and potentially guiding interventions to improve sanitation and hygiene in educational institutions.

2.2 Empirical Review

The reliability of water services in schools played a key role in determining the availability of water for handwashing. Studies showed that in schools with intermittent or unreliable water supplies, pupils were 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

were a significant factor in pupils' decisions 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 also had 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. The researchers 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 brought from home also influenced 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 prioritized 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 might be a 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 underscored the challenge of relying on students to supply water for handwashing in the absence of reliable school water services.

Socioeconomic factors also influenced whether pupils could consistently bring water from home for handwashing. In many low-income households, access to sufficient water at home was 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 was labour-intensive, children were often unable to prioritize 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 were more likely to be tasked with fetching water, both at home and for school. This further exacerbated gender disparities in education, as girls often missed class time or faced additional physical and emotional burdens due to the responsibility of carrying water. This situation was compounded in schools where reliable water service was lacking, forcing girls to prioritize water collection over hygiene, which contributed to higher absenteeism rates among girls compared to boys.

Bringing water from home to compensate for unreliable school water services had 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 were directly linked to poor handwashing compliance. The study emphasized 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 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 recommended 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 emphasized the importance of investing in sustainable water infrastructure in schools, including rainwater harvesting systems, boreholes, and water storage tanks. These solutions could 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 prioritize school-based water and sanitation programs that included 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.

2.3 Conceptual Framework

This conceptual framework illustrates the relationship between Water Service Reliability (independent variable) and Pupils' Hand Washing Practice (dependent variable). Water service reliability is defined by factors such as the consistency of water access, responsibility for carrying water from home, and the quality of this water. These elements are expected to directly influence pupils' hand-washing behaviours, as regular access to reliable water sources is crucial for maintaining hygiene practices (Kivunja, 2018). This framework aims to clarify how infrastructure challenges in water services impact students' health behaviours, particularly their hand-washing routines.

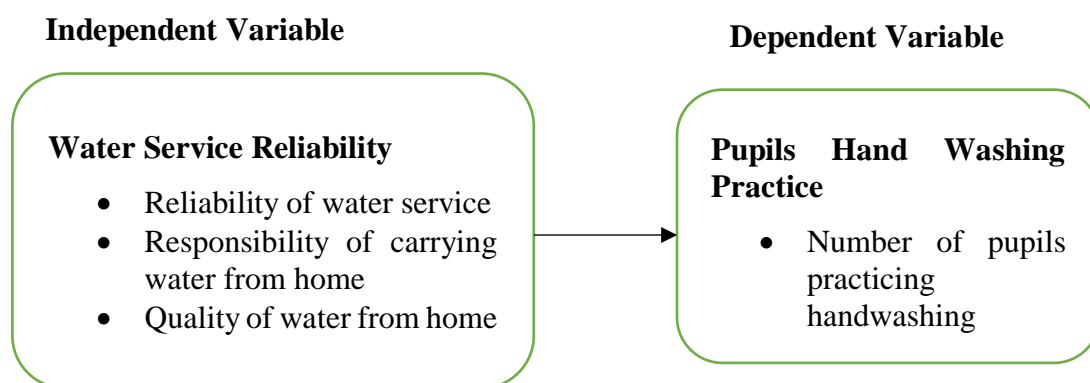


Figure 1: Conceptual Framework

3.0 Research Methodology

This study employed a cross-sectional survey design to gather data from a representative sample of students and head teachers in public primary schools in Lurambi sub-County, Kakamega County. The target population included 14,767 pupils in grades 5 to 8 and 12 head teachers, with a total sample size of 389 determined using Taro Yamane's formula. Cluster sampling was applied to ensure representation from all six administrative wards, while purposive sampling selected participants for qualitative data collection, and simple random sampling identified student respondents for quantitative data. Data collection instruments included structured questionnaires for students and key informant interviews (KIIs) with head teachers, allowing the gathering of both quantitative and qualitative insights. The data collection process was piloted with a sample from a neighbouring sub-county to ensure reliability and validity, making necessary adjustments for clarity. Data analysis involved quantitative processing with SPSS for descriptive statistics, while qualitative responses were analysed thematically to identify patterns and key insights.

4.0 Findings and Discussion

The study aimed to investigate the association between the reliability of school water services and the practice of pupils carrying water from home for handwashing. The findings indicate a significant difference in this practice based on the reliability of water sources. In schools classified as having less reliable water services (such as those relying on rainwater harvesting and municipal piped water), a substantial majority of pupils (81.4%) reported carrying water from home for handwashing. This practice highlights the proactive steps these pupils take to maintain hygiene despite the limitations of their school's water infrastructure. Only 18.6% of pupils in these schools did not carry water from home, which may be due to inconvenience, lack of awareness, or insufficient water resources at home. In contrast, among schools with more reliable water sources, such as boreholes and shallow wells, 70.5% of pupils did not carry water from home, relying instead on the school's water supply for their hygiene needs. This reliance on school facilities demonstrates the impact of consistent water availability on reducing the need for pupils to bring water from home. However, 29.5% of pupils in these schools still chose to carry water, potentially due to overcrowded facilities or preference for personal water security.

Table 1: School Water Source Reliability and Pupils Carrying Water from Home

Category of School by Water Source Reliability	Carry Water from Home	Do Not Carry Water from Home
Less Reliable (Rainwater Harvesting, Piped)	48 (81.4%)	11 (18.6%)
Reliable (Borehole, Shallow Well)	74 (29.5%)	177 (70.5%)
Total	122	188

These results indicated that the impact of reliable water services on handwashing practices, as pupils in schools with reliable water sources are less likely to need to bring water from home. However, where school water services are unreliable, pupils are compelled to carry water, although this solution may not be sustainable in the long term. The practice of carrying water from home is likely to strain families and may lead to inconsistent handwashing, with health risks such as increased absenteeism due to illness. Reliable water services are thus essential in supporting consistent hand hygiene among pupils and promoting overall health within the

school environment. The results align with existing literature on the relationship between reliable water access in schools and pupils' hygiene practices. According to studies by UNICEF (2021) and the WHO (2020), reliable water access in schools significantly improves hygiene behaviours, reducing the need for students to bring water from home. Schools with less reliable water sources, such as rainwater harvesting and municipal piped water, often face challenges with maintenance and supply inconsistencies, leading to a higher proportion of students carrying water from home (Wichaidit et al., 2019). Conversely, schools with reliable sources like boreholes and shallow wells support consistent handwashing practices without additional burdens on students and families.

4.1 Summary of Findings

The study revealed that the reliability of school water services significantly impacts pupils' practice of carrying water from home for handwashing. In schools with less reliable water sources, such as rainwater harvesting and municipal piped water, a high percentage (81%) of pupils reported bringing water from home to ensure they could wash their hands, while only 18.6% did not carry water. Conversely, schools with reliable water sources like boreholes and shallow wells had a majority (71%) of pupils who did not need to carry water from home, relying instead on the school's water facilities. This indicates that reliable school water services reduce the need for pupils to bring water from home, facilitating more consistent hygiene practices. However, challenges such as limited handwashing stations, lack of piping, and manual refilling of water containers impacted the effective use of available water, resulting in overcrowding and discouraging some students from handwashing. Key informant interviews revealed that insufficient handwashing infrastructure and maintenance issues in schools further hindered pupils' hand hygiene efforts, underscoring the need for both reliable water services and adequate facilities to support effective hygiene practices.

5.0 Conclusion

The study concluded that there is a significant association between the reliability of school water services and the practice of pupils carrying water from home for handwashing. In schools with less reliable water sources, pupils were more likely to bring water from home, suggesting that consistent access to school water reduces this burden. Nevertheless, reliable water sources alone do not automatically result in high handwashing practices due to inadequate infrastructure, overcrowding, and the manual water refilling processes in schools. This indicates that while reliable water services are essential, they must be complemented by sufficient handwashing facilities, efficient water delivery systems, and maintenance efforts to foster a sustainable handwashing culture among pupils.

6.0 Recommendations

The study recommends that schools should improve water infrastructure by securing funding for storage tanks, reliable pumps, and piping systems to support consistent access to handwashing facilities. Additionally, schools should conduct regular hand hygiene education campaigns to reinforce the importance of handwashing, place handwashing stations in convenient locations, and engage communities to promote equal responsibility for hygiene practices among all pupils, reducing the need for students, particularly girls, to carry water from home.

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