# Availability of Sanitary Waste Disposal Mechanism in Toilets of Public Primary Schools Across Tharaka Nithi County, Kenya

**Mureithi, Amos[1*], Peter Wanyoike[2]**

**[1]School of Health Science, Meru University of Science and Technology (MUST), Meru County, Kenya,**

**[2]College of Health Science, Jomo Kenyatta University of Agriculture and Technology (JKUAT), Juja, Kenya.**

***Corresponding author**

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## ABSTRACT

**Background:** Hygiene involves practices that prevent disease spread, focusing on households and public facilities. Poor sanitation, including unsafe waste disposal and dirty water, causes 88% of diarrheal diseases globally. In Kenya, diarrheal diseases rank second among deadly illnesses linked to fecal contamination, highlighting the need for safe sanitation and proper usage.

**Methods:** Analytical cross-sectional study design was used and 219 participants in the selected public primary schools participated in the study. Data was collected using administered structured questionnaire, observation and Key Informant Interview. Quantitative data analysis was conducted using SPSS version 26.0 and involved univariate and bivariate analysis. Bivariate analysis was done through logistic regression was used to test the significance of the association between the dependent and independent variables ($p<0.05$). Qualitative data was analyzed by thematic content analysis.

**Results:** The study involved 219 respondents, with 67.6% male and an almost equal split between school headteachers (50.2%) and deputy headteachers/senior teachers (49.8%). Most respondents (28.3%) had 3-5 years' experience at their current school. Majority of schools (78.1%) were day schools. Environmental sanitation showed 62.1% of schools had drains, but over half were open, with stagnant water in 45.7% of compounds and 51.6% lacking composite pits. Water system maintenance was inconsistent; 56.6% agreed repairs were regular, yet some disagreed on maintenance frequency. Functional water systems, regular repairs, and maintenance significantly predicted water availability for handwashing outside toilets.

**Conclusions:** The study found significant sanitation gaps in Tharaka Nithi schools: 62.1% had drains, over half open, causing stagnant water in 45.7% of compounds. Only 58% of latrines were clean, with inconsistent water system maintenance. Functional, well-maintained water systems significantly improved handwashing water availability, highlighting urgent intervention needs.

**Keywords:** Public primary school, Sanitation facilities, Disease outbreak, Handwashing facilities

## INTRODUCTION

The WHO defines hygiene as practices and conditions that contribute to the upholding of population health or prevention of disease outbreak. Household and public facilities feature among the primary targets of sanitation and hygiene practices (Elmadani et al., 2021). Primarily, sanitation points on the existence of knowledge pertaining the contraction of diseases and the subsequent promotion of ideal mitigation features. Among the measures accepted by the WHO regarding the promotion of sanitation include washing of hands, use of hand sanitisation agents, and correct disposal of waste among others (WHO, 2022). Sanitation facilities stop the most important source of disease-causing pathogens from spreading from faeces to the mouth. They do this by keeping human faeces from getting into the water and dirt. A large number of infectious diseases around the

world are caused by the way trash is thrown away (Kenna, 2018). Wambugu & Kyalo, (2019) found that 88% of diarrheal diseases are caused by poor sanitation, dirty water, and lack of water for personal cleanliness. 4.2% of all deaths and 5.7% of all injury or illness in the world are caused by these diseases.

Githaka et al., (2020) found that in Kenya today, diseases that cause diarrhoea are second on the list of the five most deadly diseases that are mostly spread by eating faeces. This is mostly because of how poorly people get rid of their waste and how exposed their water source is. He also said that providing clean water and sanitation was very important, but that building latrines and digging wells wouldn't do much for people's health if they didn't use them. One gramme of faeces can hold ten million viruses, one million bacteria, one thousand parasite cysts, and one hundred worm eggs. Because of this, Njue & Muthaa, (2020) indicated that getting rid of faeces safely is the most important public health priority. Even now, most illnesses in the world are caused by faeces getting into people's bodies because there aren't enough safe toilets or clean places to wash. Safe water and good sanitation are only half of the answer to stop this huge amount of sickness. The other part is making sure that people use them well and carefully. Alam & Mukarrom, (2023) mentioned that millions of people still don't know enough about the link between poop and illnesses.

# METHODS

## Study design

This study employed an analytical cross-sectional design using both quantitative methods (issuing self-administered questionnaires to the Principals, Deputy Principals or Senior Teachers) and qualitative methods (use of Key Informant Interviews from directors of education, health/hygiene teacher or environment teacher or WASH club teacher/patron, community health workers and public health officers working from selected wards) of data collection that was carried out between January 2025 to February 2025.

## Sampling

The study employed a multistage sampling approach to select participants and sites. Tharaka Nithi County was chosen through convenience sampling due to its high burden of diarrheal diseases, with 51% of cases reported among pupils. A census sampling technique was then used to include all three constituencies within the county—Maara, Chuka/Igambang'ombe, and Tharaka. To determine the appropriate sample size per constituency, proportionate stratification was applied, ensuring that the sample reflected each constituency's population size. Given the heterogeneous nature of the population, stratified random sampling was used to divide the population into homogeneous subgroups (strata) and then randomly select participants from each. Within the primary schools, systematic sampling was employed to select schools from a total of 435, with a calculated sampling interval of k=2. The first school was selected using simple random sampling, followed by every 2nd school on the list. This ensured equal selection probability across the sampling frame. Furthermore, individual respondents within selected schools were chosen using a simple random lottery method, where drawing a "1" indicated inclusion and a "0" meant exclusion. Each participant was selected independently to avoid influence from other participants, completing a rigorous and unbiased sampling process.

## Research instruments

The study used a dual-method approach, combining closed-ended questionnaires, key informant interviews, and observational checklists to assess sanitation in public primary schools in Tharaka Nithi County. Key stakeholders, including teachers and health officials, provided expert insights. The instruments were validated through expert review and pre-testing, and reliability was confirmed using the half-split method and Cronbach Alpha coefficients, all above 0.77. Data collection followed ethical guidelines, including informed consent. Though limited by the cross-sectional design, the use of multiple tools ensured accurate data on sanitation standards, pupil-to-toilet ratios, and hygiene infrastructure, supporting the research's aim to identify influencing sanitation factors.

### Data analysis

Quantitative data was analyzed using statistical package for social science (SPSS) version 29.0. Descriptive data was presented using frequencies, percentages, means and standard deviation while inferential statistics used chi-square test to measure association between independent and dependent variables. P values less than 0.05 were considered statistically significant. Qualitative data generated from KII in form of notes (responses) from the participant's was cleaned and coded manually based on themes developed from responses (thematic analysis) in accordance with the research objectives and reported in narrative form and additionally used to reinforce quantitative data

### Ethical Considerations

The study adhered to strict ethical guidelines. Approval was obtained from Mount Kenya University's Graduate School and the MKU-Ethical Review Committee, followed by a research permit from NACOSTI. Additional permissions were secured from Tharaka Nithi County and the Ministry of Education. Informed consent was obtained from school headteachers and participants, who were assured of confidentiality and informed of the study's purpose and benefits. The research tools were pre-tested prior to data collection, and findings were to be made available at the MKU library, ensuring participants could access the results. Ethical conduct was maintained throughout the research process.

## RESULTS

### Socio-Demographic Characteristics of study respondents

The study involved 219 respondents, as shown in the table 4.1,148 (67.6%) were male respondents, with half 110 (50.2%) being the school headteacher and 109 (49.8%) were the deputy headteacher/ senior teacher. Additionally, 62 (28.3%) had a working experience in current school between 3-5 years and 26 (11.9%) for more than 11 years (Table 1).

Table 1: Socio-Demographic Characteristics of study respondents

| Characteristics | | Frequency | Percent |
|---|---|---|---|
| Gender | Male | 148 | 67.6% |
| | Female | 71 | 32.4% |
| Designation | School headteacher | 110 | 50.2% |
| | Deputy headteacher/ senior teacher | 109 | 49.8% |
| Years in current school | Less than 3 years | 35 | 16.0% |
| | 3-5 years | 62 | 28.3% |
| | 6-8 years | 47 | 21.5% |
| | 9-11 years | 49 | 22.4% |
| | More than 11 years | 26 | 11.9% |

### Status of the School

More than three quarter 171 (78.1%) were day school with 40 (18.3%) and 54 (24.7%) of school had between 150-179 boys and 180-209 girls respectively (Table 2).

Table 2: Status of the School

| Characteristics | | Frequency | Percent |
|---|---|---|---|
| School status | Boarding | 30 | 13.7% |

| | | | |
|---|---|---|---|
| | Day | 171 | 78.1% |
| | Mixed day and boarding | 18 | 8.2% |
| Total number of boys | 90-119 boys | 32 | 14.6% |
| | 120-149 boys | 35 | 16.0% |
| | 150-179 boys | 40 | 18.3% |
| | 180-209 boys | 33 | 15.1% |
| | 210-239 boys | 30 | 13.7% |
| | 240-279 boys | 25 | 11.4% |
| | 280 boys and above | 24 | 11.0% |
| Total number of girls | 110-139 girls | 46 | 21.0% |
| | 140-179 girls | 42 | 19.2% |
| | 180-209 girls | 54 | 24.7% |
| | 210-239 girls | 36 | 16.4% |
| | 240-279 girls | 41 | 18.7% |

**Environmental Sanitation**

Slightly less than two third 136 (62.1%) of schools had drains with 74 (53.6%) had open drains. Additionally, 100 (45.7%) had stagnant water in the school compound, 121 (55.3%) had dustbins in toilets, and 113 (51.6%) had no composite pit in the school compound (Table 3).

Table 3: Availability of Sanitary Waste Disposal Mechanism

| **Characteristics** | | **Frequency** | **Percent** |
|---|---|---|---|
| Availability of drains | Yes | 136 | 62.1% |
| | No | 83 | 37.9% |
| Drains open | Yes | 74 | 53.6% |
| | No | 64 | 46.4% |
| Water stagnates in the school | Yes | 100 | 45.7% |
| | No | 119 | 54.3% |
| Frequency of waste disposal | Daily | 102 | 46.6% |
| | Weekly | 117 | 53.4% |
| Dustbins in toilets | Yes | 121 | 55.3% |
| | No | 98 | 44.7% |
| Composite pit in school compound | Yes | 106 | 48.4% |
| | No | 113 | 51.6% |

This was amplified in the following statement:

*"Yes, the school has drains.... but, some of the school drains are open…. have discussed the issue with the ministry of education to provide monetary assistant to close the drains…but…hasn't materialized, hope it will happen''* (KII 1).

During the KII, one of the teachers pointed out that:

*"....to me the most frustrating and demotivating thing in terms of information use at this facility is that we do a lot of paper work... as in too much documentation and workload .... to make it worse, no feedback and appreciation from the high authority ..."* (KII, 4).

**Maintenance of Water System**

From the findings in Table 4, 60 (27.4%) and 64 (29.2%) of the respondents strongly agreed that water is always available for use by the pupils (mean=3.56) and the school's water system is functional (mean=3.44). In addition, most of respondents 124 (56.6%) were in agreement that the water system is repaired on regular basis (mean=5.9), further, 64 (29.2%) disagreed that water system is maintained on regular basis (mean=3.11).

Table 4: Maintenance of Water System

| **Characteristics** | | **Frequency** | **Percent** | **Mean** |
|---|---|---|---|---|
| The pupils have constant access to water for utilisation. | Strongly agree | 60 | 27.4% | 3.56 |
| | Agree | 57 | 26.0% | |
| | Disagree | 52 | 23.7% | |
| | Strongly disagree | 50 | 22.8% | |
| The school's water system is functional | Strongly agree | 64 | 29.2% | 3.44 |
| | Agree | 46 | 21.0% | |
| | Disagree | 49 | 22.4% | |
| | Strongly disagree | 60 | 27.4% | |
| The water system undergoes regular maintenance and repair. | Strongly agree | 67 | 30.6% | 3.59 |
| | Agree | 57 | 26.0% | |
| | Disagree | 47 | 21.5% | |
| | Strongly disagree | 48 | 21.9% | |
| The maintenance of the water system is conducted periodically. | Strongly agree | 51 | 23.3% | 3.11 |
| | Agree | 52 | 23.7% | |
| | Disagree | 64 | 29.2% | |
| | Strongly disagree | 52 | 23.7% | |

**Model Coefficients on Maintenance of Water System**

Indicatively, the availability of water outside the toilets can be determined (predicted) using key risk factors

which are namely; functional water system (=0.049), repairing water system regularly (P=0.043), and maintenance of water regularly (p=0.017) (Table 5).

Table 5: Model Coefficients on Maintenance of Water System

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 1.214 | 0.206 | | 5.885 | 0.000 |
| | The availability of water for use by the students is constant. | 0.626 | 0.168 | 0.326 | 1.382 | 0.051 |
| | The school's water | 0.749 | 0.192 | 0.549 | 2.725 | **0.049** |

| | | | | | | |
|---|---|---|---|---|---|---|
| | system is functional | | | | | |
| | The water system undergoes regular maintenance. | 0.119 | 0.108 | 0.118 | 1.739 | **0.043** |
| | The water system is maintained on regular basis | 0.745 | 0.201 | 0.445 | 1.655 | **0.017** |
| a. Dependent Variable: Availability of water for washing hands outside the toilets | | | | | | |

## DISCUSSION

The study found that slightly less than two third 136 (62.1%) of schools had drains with 74 (53.6%) had open drains. Additionally, 100 (45.7%) had stagnant water in the school compound, 121 (55.3%) had dustbins in toilets, and 113 (51.6%) had no composite pit in the school compound. Further, slightly more than half 117 (53.4%) of school latrines/toilets are cleaned by pupil with 127 (58.0%) of the school latrines/toilets were clean during the study and 110 (50.2%) had a wet floor. According to the study's findings, the majority of respondents said that schools' restrooms were not kept very clean. The study's conclusions concur with those in research published by Mwangi & Ndani, (2022), which found that sanitation issues are caused by a lack of appropriate home waste water and solid waste disposal options, along with inadequate facilities, unsanitary practices, and a general lack of clean water supply. The massive sanitation coverage backlog in Kenya is evident by the about 57% national coverage rate in both rural and urban primary schools today (Njue & Muthaa, 2020). It also claims that many metropolitan areas in Kenya lack access to functional sewerage systems. Several factors underlie these infrastructure deficits. Funding is chronically inadequate: many schools rely on the Constituency Development Fund (CDF), PTA contributions, or NGOs for facility upgrades, while government resources are largely consumed by reactive repairs, not upgrades (Water-4-Schools data; WASH sector analysis). Cleaning staff lack training in proper waste management protocols, and there is minimal involvement of community stakeholders in planning and upkeep. The absence of dustbins and privacy in toilets disproportionately affects girls (Githaka et al., 2020). Without discreet disposal options, many girls miss school during menstruation—echoing findings from studies in rural Kenya, where only 13% of schools provided water in latrines for menstruating girls and merely 2% had soap; separation and locks were inadequate, further compromising dignity and education (Wambugu & Kyalo, 2019)

The study revealed significant sanitation challenges in public primary schools in Tharaka Nithi County, with only 62.1% having drainage systems, over half of which were open drains, and nearly half experiencing stagnant water. These findings are consistent with Mwangi & Ndani, (2022), who linked sanitation issues in schools to inadequate waste disposal systems and poor hygiene practices. Similarly, c highlighted that only 57% of schools nationally meet basic sanitation standards, emphasizing the widespread backlog in sanitation infrastructure across Kenya. The current study's observation that over half of school toilets were cleaned by pupils and many lacked compost pits also aligns with broader findings about limited sanitation management and inadequate government support. Additionally, the high presence of wet toilet floors and general uncleanliness observed by respondents reflects systemic maintenance issues. This comparison underscores the urgent need for improved sanitation infrastructure, staff training, and increased investment in school hygiene to meet national and global standards.

## CONCLUSION

The study revealed notable disparities in environmental sanitation and water maintenance across public primary schools in Tharaka Nithi County. While 62.1% of schools had drainage systems, over half of these were open, contributing to stagnant water observed in 45.7% of school compounds—posing significant health risks. Despite 55.3% of toilets having dustbins, more than half (51.6%) lacked a compost pit. Furthermore, slightly over half (53.4%) of latrines were cleaned by pupils, yet only 58.0% were found clean, with 50.2% having wet floors. Maintenance of water systems was inconsistent; although 56.6% agreed repairs were regular, nearly a third (29.2%) disagreed on regular maintenance. Regression analysis showed a statistically

significant relationship between the availability of handwashing water and functional, regularly maintained water systems ($p<0.05$). These findings highlight systemic gaps in school sanitation infrastructure and the need for targeted interventions, improved school management support, and resource allocation to enhance sanitation and hygiene standards in learning institutions.

**Suggestions**

The Ministry of Education, in collaboration with the Ministry of Health and county governments, should develop and implement a comprehensive School Sanitation and Hygiene Policy specifically tailored for primary schools. This policy should standardize sanitation infrastructure requirements, including proper drainage systems, safe waste disposal mechanisms, and functional, regularly maintained water supply systems. Tharaka Nithi County Government should prioritize funding to improve school sanitation infrastructure, including closing open drains, constructing compost pits, and ensuring access to clean, running water. Routine inspections and school-based hygiene audits should be institutionalized to monitor compliance. In addition, public primary schools should be supported to establish WASH (Water, Sanitation, and Hygiene) clubs to empower pupils and promote peer-led cleanliness initiatives. Teachers and support staff should also be trained on sustainable sanitation maintenance practices. To improve school sanitation in Tharaka Nithi, county and national governments should invest in infrastructure upgrades, regular maintenance, menstrual hygiene facilities, and staff training. Biannual audits and community involvement are essential. These actions can ensure safe, inclusive, and sustainable learning environments. Finally, a feedback mechanism between schools and education authorities should be strengthened to address sanitation concerns raised at the school level and ensure timely responses and resource allocation.

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**Declarations**

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Conflict of interest: None declared

Ethical approval: The study was approved by the Mount Kenya University- Ethical Review Committee and a permission by National Commission for Science, Technology and Innovation, Kenya. Written consent was obtained from the participants.

**Author Contribution**

**Amos Muriithi:** conceptualization and design of the study, conducting the literature review, collecting and analyzing data, interpreting the results, and writing the manuscript.

**Joseph Juma:** Review of the concept/study design, examination of data analysis and interpretation and writing of the manuscript.

**Judy Mugo:** Review of the concept and study design, examination of data analysis and interpretation and review of manuscript writing.

**Peter Wanyoike:** Review of data analysis and interpretation and manuscript writing.

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