Understanding the Effects of Poor Sanitation on Public Health, the Environment and Well-being
Report of a study conducted in Homa Bay, Elgeyo Marakwet and Kericho counties in Kenya

June 2018
Executive Summary

Poor sanitation is linked to diarrhoeal diseases, which are among the leading causes of morbidity and mortality in children under five. It is also associated with a number of infectious and nutritional outcomes which have great bearing on the health and well-being of the child.

The Sustainable Sanitation and Hygiene for All (SSH4A) project from SNV Netherlands Development Organisation (SNV) supports the improvement of sanitation services in four counties in Kenya, to help them address some of the pressing challenges they face in providing sanitation for all. This study was commissioned by the Voice for Change Partnership (V4CP) programme to gain more insights into the effects of poor sanitation on public health, the environment and well-being in Kericho, Homa Bay and Elgeyo Marakwet counties. It is expected that these counties will learn from these findings and take steps to improve their water, sanitation and hygiene activities.

The findings from the case-control study show that, in general, case households had a bigger burden of sanitation-related disease than control families: slightly more households in the case category had a family member who was treated for sanitation-related illness in the six months before the survey than in the control group. Analysis of disease burden across the three counties shows the households in Homa Bay had experienced a higher burden of sanitation-related illnesses in the previous six months than the other two counties.

Children in the case group were also more significantly affected by recurrent diarrhoea compared to those in the control group: 79% had suffered diarrhoea in the past two weeks, compared to only 10% in the control group. Across the counties, recurrent diarrhoea was more commonly reported in Homa Bay and Elgeyo Marakwet than in Kericho. The results also show that nearly half of the children in the sample (45.9%) were receiving mixed feeding (42% in the control and 49% in the cases group), but the results suggest that children in the case category were more exposed to risky feeding practices, which can contribute to an increased risk of diarrhoea.

The study found that slightly more households in the case category used unimproved water sources (37.7%) compared to controls (35.7%). Over 40% of the total combined sample said they do nothing to the water before drinking, while about a third said they use chlorine. In Homa Bay, Elgeyo Marakwet and Kericho respectively, the Colilert tests were positive in 63.6%, 65.6 % and 80% of the cases respectively, indicating possible presence of faecal or animal waste contamination. There also appears to be link between the source, storage and treatment of the water and the child having diarrhoea.

The results also suggest a possible link between exposure to messages and information on sanitation and hygiene and the child having diarrhoea, with more caregivers of a child in the control group having heard such messages, compared to controls. Caregivers’ sanitation and hygiene habits were also found to be more at risk of spreading contamination among the case households than in control households. For instance, more respondents in the case households (11%) did not wash hands after using the toilet than in the control households (9%). In addition, more respondents in the case households used only water (45.6%) than in the control households (38.3%), meaning they were exposed to a much higher chance of contamination by faeces.
Poor sanitation and related illnesses were found to have an impact on farming and income generating activities, with adult caregivers reporting that diarrhoea in children disrupted their normal economic activities and incurred extra expenses for the household. The additional burden on an adult when a child is unwell or when an adult is suffering from severe sanitation illness had a negative impact on their ability to perform their other responsibilities. During illness incidents, care of other children often shifted to the next of kin or close kin, including the husband or grandmothers, and often the children received less care.

“The three counties can use these findings to expand their initiatives and deliver effective sanitation services to all. For instance, they can set up initiatives to mobilise the community to build improved toilets to reduce the risk of water and environmental contamination through poorly disposed of faeces and open defecation. They can also strengthen public awareness and education about sanitation and hygiene and the risk posed by poor sanitation to the health and well-being of young children. In addition, governments in the three counties need to ensure that the communities have access to and use clean, treated drinking water and that faecal sludge is disposed of safely. 

“Nearly every family has a pit latrine. We don’t allow sharing of the pit latrine with other families... Some families who don’t have one use the bush.”

Artisan training in Kericho
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<thead>
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<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CBOs</td>
<td>community-based organisations</td>
</tr>
<tr>
<td>CHV</td>
<td>community health volunteers</td>
</tr>
<tr>
<td>CLTS</td>
<td>Community Led Total Sanitation</td>
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<tr>
<td>E. coli</td>
<td>Escherichia coli</td>
</tr>
<tr>
<td>FGD</td>
<td>focus group discussions</td>
</tr>
<tr>
<td>GIS</td>
<td>geographic information system</td>
</tr>
<tr>
<td>HDSS</td>
<td>household dietary diversity score</td>
</tr>
<tr>
<td>KSh</td>
<td>Kenyan shilling</td>
</tr>
<tr>
<td>MCA</td>
<td>member of county assembly</td>
</tr>
<tr>
<td>MoH</td>
<td>Ministry of Health</td>
</tr>
<tr>
<td>MUAC</td>
<td>measurement of upper arm circumference</td>
</tr>
<tr>
<td>ORS</td>
<td>oral rehydration solution</td>
</tr>
<tr>
<td>PHO</td>
<td>public health officer</td>
</tr>
<tr>
<td>SSH4A</td>
<td>Sustainable Sanitation and Hygiene for All</td>
</tr>
<tr>
<td>SNV</td>
<td>SNV Netherlands Development Organisation</td>
</tr>
<tr>
<td>URTI</td>
<td>upper respiratory tract infection</td>
</tr>
<tr>
<td>V4CP</td>
<td>Voice for Change Partnership</td>
</tr>
<tr>
<td>WASH</td>
<td>water, sanitation and hygiene</td>
</tr>
<tr>
<td>WHO</td>
<td>World Health Organisation</td>
</tr>
<tr>
<td>WSP</td>
<td>Water and Sanitation Program</td>
</tr>
</tbody>
</table>
Chapter 1: Introduction
Worldwide, lack of access to safe drinking water, together with inadequate sanitation and hygiene, is an overwhelming contributor to approximately 4 billion cases of illness annually (Kariuki, Magambo et al. 2012).

According to WaterAid (2006), **approximately 1.1 billion people in the world lack access to safe water and another 2.6 billion do not have access to adequate sanitation.** Water Aid also indicated that in developing countries an estimated 2.2 million people, most of whom are children, die annually due to diarrhoea linked to a lack of access to safe drinking water, inadequate sanitation and poor hygiene (WaterAid 2006). The World Health Organization estimates (WHO 2004) show that **88% of the burden attributable to unsafe water supply, sanitation and hygiene severely affects children in developing countries** (Lubaale and Musyok 2011). In many developing countries, sanitation is inadequate and has devastating effects on the diseases burden. WHO also estimates that 97,900 people die every year due to poor sanitation.

The rapid growth of urbanization, without an improvement of the sanitation infrastructure have reduced the capacity of most of the African nations to provide adequate sanitation services to the growing population (Adane, Mengistie et al. 2017). Most cities have poor solid waste management strategies as evidenced by overflowing garbage containers. These cities and households experience a **wide range of sanitation issues including lack of adequate sanitation facilities, poor quality water supply, poor drainage, uncollected garbage, contaminated food and overcrowded housing** (Owusu 2010). The burden of poor sanitation lies mainly with poor neighbourhoods.

The combination of poor water supply, hygiene and sanitation has clear consequences. These include diseases such as diarrhoea, dysentery, intestinal nematode infections and schistosomiasis, as suffered by a huge number of the global population (Worley 2016) and particularly in developing countries. In spite of the evidence and the magnitude of the effects, a sizeable population around the world still lives without water and sanitation facilities; **approximately 40% of the African population does not have access to improved water supply and sanitation** (Clasen, Bostoen et al. 2010).

Kenya alone loses approximately KSh 27 billion annually because of poor sanitation. According to a study that was carried out by Water and Sanitation Program (WSP), 2.1 million Kenyans use unsanitary or shared latrines while 5.6 million have no latrines at all and practice open defecation (WSP 2012). Poor sanitation causes productivity loses including absenteeism in work and school because of the associated diarrheal diseases as well as the time taken to seek care in the health facilities. Through its impact on malnutrition, poor sanitation is among the leading causes of child mortality in Kenya. These costs are inequitably distributed among the poor in the society.

Diarrhoeal disease is the second leading cause of death in children under five years old, and is responsible for killing around 525,000 children every year (WHO 2017). It is attributed to poor personal hygiene, sanitation and water supply (Worley 2016), including lack of clean water for proper hand-washing (Norman, Pedley et al. 2010) and exposure to human excreta (Clasen, Bostoen et al. 2010). This is exacerbated by a lack of toilets, as faeces on the ground contribute to contaminated drinking water and water resources in general. Children who are malnourished or have impaired immunity as well as people living with HIV are most at risk of life-threatening diarrhoea. Approximately 19,500 Kenyans, including 17,100 children, die every year because of diarrhoea (WSP 2012). 90% of these cases are attributed to poor sanitation.
To gain more insights into the effects of poor sanitation on public health, the environment and well-being, SNV Netherlands Development Organisation (SNV) commissioned a study in three counties (Homa Bay, Kericho and Elgeyo Marakwet) through the Voice for Change Partnership (V4CP) programme. The V4CP programme is implemented by SNV in collaboration with the Institute of Economic Affairs (IEA). The research was conducted by the Centre for Population Health Research & Management (CPHRM).

**Study Areas**

Only 22% of the population in **Homa Bay County** have improved sanitation coverage, 38.8% practice open defecation and 20.5% of the population have unimproved sanitation. The county loses approximately KSh 920 million because of poor sanitation (WSP 2014). The cost is in many instances underestimated because of a lack of analysis of the true cost that includes pollution and social impacts. Unimproved sanitation has been linked to stunting in children because of infections such as pneumonia, measles, dysentery and diarrhoea. 46.3% children in Homa Bay are stunted (WSP 2014).

In **Kericho County**, only 35.6% of the households in the study population have improved sanitation coverage while 26.2% have unimproved and 8.0% practice open defecation. The consequence are immense; the county suffers from premature deaths, reduced productivity and increases sanitation related burden of disease.

The situation is no different in **Elgeyo Marakwet** as only 26.2% have access to improved sanitation and open defecation is still practiced by 18.7% of the population. It is estimated that approximately KSh 308 million is lost annually because of poor sanitation in the county (WSP 2014).

This study was conducted to contribute to the existing body of knowledge and generate information on the social, health, nutritional, economic, political and environmental effects of poor sanitation on different groups in the county. The research studied the following aspects:

- The effects of poor sanitation on public health, the environment and well-being
- The social effects of poor sanitation on different groups (by age, gender and ability)
- The political role and economic cost of poor sanitation in the selected counties
- The effects of poor sanitation on the environment, such as on the quality of underground and surface water. The study obtained data on excreta management in the rural and urban areas of the county.
A collapsed latrine block
Chapter 2: Study Design and Justification
2.1 Methodology Overview

The research study used a mixed methods design that comprised a case-control quantitative study, qualitative interviews in the community (key informant interviews and focus group discussions), observation, review of health facility data on under-five morbidity and mortality and water sampling and testing. Cases and controls were recruited at public health facilities in each county between February and March 2018. The health facilities were selected in order to achieve the required rate of recruitment and representation. Table 1 summarises the sample by place of recruitment.

Recruitment took place from Monday to Saturday. All children under five years of age brought to the health facilities on these days and who were eligible for inclusion were recruited into the study.

All children reporting to the health facility with diarrhoea (as defined by the health worker, with a minimum requirement of three or more loose or watery stools in the previous 24 hours) and no other symptoms were chosen as cases.

Controls were children in the same age range, who reported with any other infection or trauma but without diarrhoea.

After the child had been examined by a health worker, the parent or guardian was interviewed at the clinic using a structured questionnaire. Information on the child, the episode of illness, the family’s access to water supply and sanitation facilities, household hygiene practices and a wide variety of socio economic factors were collected. In addition, all the cases and controls were visited at their homes and the parent or guardian who had been interviewed at the clinic was re-interviewed. The water and sanitation facilities available to the family and the general household conditions were also observed.

What is a case-control design?

A case–control study is an investigation that compares a group of people with a disease (such as diarrhoea) to a group of people without the disease. It is used by epidemiologists to identify and assess factors that are associated with diseases or health conditions, with the ultimate goal of preventing such diseases.

A case–control study begins with a group of cases of a specific disease or condition. A group of people without that disease or condition is selected as control, or comparison, subjects. The investigator then seeks to compare cases and controls with respect to previous exposures to factors of interest. Information about prior exposure may be obtained by a variety of methods, including self-administered questionnaires, interviews and medical examinations.

In case–control studies, information about exposure is generally collected after the disease has already occurred. It looks back (retrospectively) to see if an exposure to something in particular (e.g. in the environment) was more likely in the group with the condition than in the group without.

Researchers trace backwards to identify possible exposures or factors that may have contributed to the condition. This study design helps determine if a previous exposure, such as sanitation status or environment, is linked to a current condition, such as having a disease.
2.2 Sampling

Sample size calculation: The minimum required to detect an increased 10% diarrhoeal morbidity of cases compared to control was estimated as,

\[ n = \frac{(r + 1)(\bar{p})(1-\bar{p})(Z_{1-\alpha/2} + Z_{1-\beta})^2}{(p_1 - p_2)^2} \]

where:
\( n \) is the sample size in the case group
\( r \) is the ratio of control to cases
\( \bar{p} \) is the measure of variability (similar to standard deviation)

such that \( \bar{p} = (p_1 + p_2)/2 \), \( Z_{1-\alpha/2} \) and \( Z_{1-\beta} \) is the standard normal deviate corresponding to the desired level of significance and power respectively

\( p_1 - p_2 \) is the effect size (i.e. difference in proportions with diarrhoea between the two groups).

Assuming 95% confidence interval, 90% power, an effect size of 0.1, equal number of cases and control and 15% prevalence among the controls, and after increasing by 25% to take care of contingencies like non-responses, gives 555 children per arm. That is, a total of 1110 children. This was then distributed across the selected facilities. Overall the sample size of 1174 children aged under five was selected.

**Sampling:** The study adopted a proportional sampling of the health facilities. A ratio for the county facilities and the overall sample size by level were used to sample the facilities in each county.

**Table 1: Number of children by facility type and sector**

<table>
<thead>
<tr>
<th>Facility Type</th>
<th>Total</th>
<th>Controls</th>
<th>Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elgeyo Marakwet</td>
<td>344</td>
<td>29.3</td>
<td>162</td>
</tr>
<tr>
<td>Homa Bay</td>
<td>473</td>
<td>40.3</td>
<td>233</td>
</tr>
<tr>
<td>Kericho</td>
<td>357</td>
<td>30.4</td>
<td>166</td>
</tr>
<tr>
<td>Hospital</td>
<td>149</td>
<td>12.7</td>
<td>83</td>
</tr>
<tr>
<td>Health Centre</td>
<td>535</td>
<td>45.6</td>
<td>252</td>
</tr>
<tr>
<td>Dispensary</td>
<td>485</td>
<td>41.3</td>
<td>225</td>
</tr>
<tr>
<td>FBOS</td>
<td>2</td>
<td>0.2</td>
<td>0</td>
</tr>
<tr>
<td>Other (Specify)</td>
<td>3</td>
<td>0.3</td>
<td>1</td>
</tr>
</tbody>
</table>
Selection of cases

All diarrhoeal patients aged under five years of age being treated at the selected health facilities from February 1-10, 2018 were recruited into the study with their parents’ consent. The researchers read the consent form to the parent or caregiver to confirm that they understood the study and were willing to participate. If the parent did not consent to the study, the child was not recruited.

To ensure that cases selected for the study represented a homogeneous entity, a strict definition of diarrhoea was established. A case was defined as a child under five years of age having three or more episodes of loose, liquid, or watery stools or at least one bloody loose stool within 24 hours. In addition, the age of a child was verified by cross-examining the information provided in their health and vaccination cards.

Selection of controls

The controls were children aged under five years of age being treated at the selected health facilities from February 1-10, 2018. The recruitment of controls was carried out after their parents consented to participate in the study. The selection of controls who were attending the health facilities had some important practical and scientific advantages because they were easy to identify and readily available in sufficient numbers.

Inclusion criteria

All children under five years of age attending the selected health facilities were eligible for the study. With respect to the parents of children recruited into the study, the mothers were best able to provide adequate information about the children and other variables surrounding the child's environment because the mothers spent more time with their children than did the fathers.

2.3 Data collection techniques

The study used the following data collection methods:

- **Household surveys** (with informed consent) were held with the parents or guardians of the 1174 children selected for follow-up, to establish the knowledge, attitudes and practices of the communities in relation to water, sanitation and hygiene. The researchers enquired about the number of children under the age of five who had ever died from water and sanitation-related diseases in the family; the cost of water and sanitation related diseases in the family; how the family manages faecal matter; and about cultural norms surrounding sanitation that the family observes, among other issues. The interviews were conducted using a questionnaire.

- **Review of health facility data on children under the age of five:** The researchers reviewed data from selected healthcare facilities in the three counties to identify the number of children under five seeking treatment for any illness; those treated for water and sanitation-related diseases; the number that had died; and, specifically, those that had died from water and sanitation related diseases.

- **Field interviews with selected informants and focus group discussions (FGDs):** The researchers held key informant interviews with local and national government officials specifically the county public health officers (PHOs), the Ministry of Environment, the Ministry of Water, the National Council of Persons with Disabilities, heads of water and sewerage companies and non-state actors focusing on water, sanitation and hygiene (WASH), to engage them in the research process and to understand the WASH situation in each county from their perspective. The researchers also held FGDs with groups of residents in the research communities, to gather more information on sanitation in the community and the management of human waste, among other issues. FGDs were also held with individuals who empty toilets (pit emptiers) in the communities, to explore management of waste and their perceptions about risk of water contamination.
- **Water sample testing:** The researchers collected water samples from all sources that the households in the study were using, including water taps, water vendors, wells, boreholes, springs and tanks for collecting rainwater. The team used high quality testing kits to detect whether the water was contaminated by faecal matter, which poses a risk to human health.

The study methods are summarised in Table 2 by study objective.

**Table 2: Summary of data collection methods used in the study**

<table>
<thead>
<tr>
<th>Study Objective</th>
<th>Focus &amp; Scope</th>
<th>Data Collection Approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>To examine the effects of poor sanitation on public health and nutrition</td>
<td>Analysis of all causes and water related causes of mortality in each county over the last six months</td>
<td>• Review of health facility records in sampled facilities: review of under-five all-cause mortality data in the sampled health facility and comparison of all-cause mortality to child mortality due to water and sanitation related diseases</td>
</tr>
<tr>
<td></td>
<td>Analysis of risk factors for diarrhoea for cases and controls</td>
<td>• Health facility interviews with caregivers of children under five who attend the health facility (using a health facility screening tool).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Anthropometric measures</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Household survey</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Focus group discussion on sanitation experience and emptying service within communities (focused on men and women – the elderly, young to middle-aged and opinion leaders)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Key informant interview guide for local and national government ministries and departments</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Water quality assessment tool</td>
</tr>
</tbody>
</table>
| To examine the social effects of poor sanitation on different groups | Analysis of social effect of poor sanitation on the following groups:  
• Children  
• Women  
• Persons with disability  
• Elderly | • Household survey |
<p>| | Analysis of epidemic data three months prior to the study in each county | • Focus group discussion on sanitation experience and emptying service within communities (focused on men and women – the elderly, young to middle-aged and opinion leaders) |
| | Water testing for main sources of water in the epidemic zones | • Key informant interview guide for local and national government ministries and departments |
| | | • Sub-county level review of weekly data related to (i) sanitation related epidemic monitoring data collected weekly in the county through the sub counties and (ii) a review of community health extension workers weekly summary tool |
| | | • Water testing and analysis for main sources of water in the epidemic zones |</p>
<table>
<thead>
<tr>
<th>Study Objective</th>
<th>Focus &amp; Scope</th>
<th>Data Collection Approach</th>
</tr>
</thead>
</table>
| To examine the political role and economic cost of poor sanitation             | Analysis of the political and economic cost of poor sanitation                | • Household survey  
• Focus group discussion on sanitation experience and emptying service within communities (focused on men and women – the elderly, young to middle-aged and opinion leaders)  
• Key informant interview guide for local and national government ministries and departments |
| To examine the effects of poor sanitation on the environment in the four counties | Water analysis of underground and surface water  
Analysis of the excreta management in urban and rural areas of the county | • Household chlorine and Ph test, presence and absence of coliform using a water sampling and analysis monitoring form  
• Faecal sludge management situational assessment tools  
• Key informant interview guide for the heads of water and sewerage companies; instructions to the participants  
• Key informant interview guide for local and national government ministries and departments |
| To establish trends during the devolution years and compare pre-devolution data with data obtained for the years since devolution (for example, quality of underground and surface water) and obtain data on excreta management in the rural and urban areas of the country | Qualitative analysis of the trends of sanitation related epidemics before and during devolution  
Qualitative analysis of the trends of sanitation surveillance and epidemic reporting before and during devolution | • Key informant interview guide for local and national government ministries and departments  
• Desk review of documents |
| To evaluate the extent to which the sanitation activities as planned in the County Integrated Development Plan (CIDP) have materialised in the county | A policy analysis of the planning, funding and sanitation related activities in the county | • Key informant interview guide for local and national government ministries and departments  
• Review of CIDP for each county |
Chapter 3: Key Findings
3.1 Socio-economic status of selected families and household characteristics

Nearly all of the 1174 respondents, i.e. caregivers of the children, in the household survey (88.6%) were female. The majority were aged between 20 and 39 years of age. A small proportion (4.9%) were aged under 19 years: nearly 3% of respondents in the control group and 5% of those in the case category. There were no other notable differences in the other age ranges.

Over 80% of the total sample was married. There were more single respondents in the case group (11%) than the control group (9.8%). About a third of all the respondents were farmers (30.5%), spread in near equal proportions across the two groups. Only 23 respondents reported that they were living with a disability. In terms of education status, the majority had at least a primary school education, as illustrated in Table 3.

Table 3: Sample characteristics by education status

<table>
<thead>
<tr>
<th>Education</th>
<th>Total</th>
<th></th>
<th>Controls</th>
<th></th>
<th>Cases</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>No formal</td>
<td>16</td>
<td>1.4</td>
<td>10</td>
<td>1.8</td>
<td>6</td>
<td>1.0</td>
</tr>
<tr>
<td>Incomplete Primary</td>
<td>177</td>
<td>15.1</td>
<td>80</td>
<td>14.3</td>
<td>97</td>
<td>15.8</td>
</tr>
<tr>
<td>Complete Primary</td>
<td>328</td>
<td>27.9</td>
<td>155</td>
<td>27.6</td>
<td>173</td>
<td>28.2</td>
</tr>
<tr>
<td>Incomplete Secondary</td>
<td>230</td>
<td>19.6</td>
<td>115</td>
<td>20.5</td>
<td>115</td>
<td>18.8</td>
</tr>
<tr>
<td>Complete Secondary</td>
<td>290</td>
<td>24.7</td>
<td>141</td>
<td>25.1</td>
<td>149</td>
<td>24.3</td>
</tr>
<tr>
<td>College</td>
<td>108</td>
<td>9.2</td>
<td>50</td>
<td>8.9</td>
<td>58</td>
<td>9.5</td>
</tr>
<tr>
<td>Higher level</td>
<td>25</td>
<td>2.1</td>
<td>10</td>
<td>1.8</td>
<td>15</td>
<td>2.5</td>
</tr>
</tbody>
</table>

The respondents in the two categories were almost evenly distributed across the three wealth quintiles. A third were classified poor (34% control and 32.8% cases) and another third were in the middle quintile. About the same proportion (28%) in both samples were classified wealthy.

Household disease burden

Analysis of disease burden across the three counties shows that the burden of disease was about the same: 84% of the respondents had had a sick family member during the previous six months. In 50% of the instances, across both the control and case categories, the family member paid money for treatment. On general chronic diseases, nearly a quarter of the households had someone who had been diagnosed with a chronic illness (24% in control and 21% in case group). There was no variation in the seasonal pattern of disease in the two groups, with more illnesses occurring in the wet seasons across the three counties.

The analysis shows that households in Homa Bay had experienced a higher burden of sanitation-related illnesses in the previous six months than the other two counties. More family members from households in the case category in this county had sought treatment for typhoid (28% compared to 16.7% in the control group), cholera (2.9% compared to 0.9% in control) and amoebiasis (2.9% compared to 0.4% control). In Kericho, 16.9% of the control households and 20.4% of cases had a family member who had sought treatment for typhoid and family members in 12.7% of the control group and 14% of the cases group had sought treatment for amoebiasis. Elgeyo Marakwet had the lowest incidence of typhoid reported at 16.5% of the cases households and 13% in the control group. Across all the counties, typhoid was the most commonly reported disease for which a family member had to seek treatment, with significantly more families in the case category reporting a family member had typhoid, as shown in Figure 1.
Health-seeking behaviour

The findings show that the majority of the respondents in the three counties sought treatment from public facilities, with no difference between the control and case groups. Slightly more households in the control group sought care in private facilities (17%) compared to case households (14%). More households in the control group (13.7%) used pharmacy or over-the-counter treatment, compared to case families (11%), as illustrated in Table 4.

Comparison across the counties shows Homa Bay and Elgeyo Marakwet had the most households seeking care in public facilities, while Kericho County had the most using private facilities. In Elgeyo Marakwet, 89% of the case households and 81% of the control households sought treatment in public facilities, and 15% in the control group and 11% in the case group sought treatment in private facilities. In Homa Bay, in over two-thirds of the households, the sick family members sought treatment in a public health facility: 71.7% from the case families and 78.5% of the controls. In Kericho, 60% of the households in both groups sought care from a public facility and 25.3% in the control group and 15.2% in the case group sought care in private facilities.
Table 4: Type of facility where sick family member sought assistance the past six months (%)

<table>
<thead>
<tr>
<th>Facility</th>
<th>Controls</th>
<th>Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community health worker</td>
<td>5.4</td>
<td>5.6</td>
</tr>
<tr>
<td>Public facility</td>
<td>75.2</td>
<td>75.5</td>
</tr>
<tr>
<td>Traditional healer</td>
<td>2.3</td>
<td>2.8</td>
</tr>
<tr>
<td>Private facility</td>
<td>17.1</td>
<td>14.0</td>
</tr>
<tr>
<td>Pharmacy</td>
<td>13.7</td>
<td>11.1</td>
</tr>
<tr>
<td>Local herbs</td>
<td>5.5</td>
<td>5.9</td>
</tr>
<tr>
<td>Relative/Friend</td>
<td>3.7</td>
<td>5.7</td>
</tr>
<tr>
<td>Shop/Kiosk</td>
<td>7.1</td>
<td>5.6</td>
</tr>
</tbody>
</table>
3.2 Effects of poor sanitation on public health, the environment and well-being for the different groups in the county population

The research study examined a range of factors related to the health of the children in the sample, to draw conclusions regarding their well-being. The study screened and recruited 1174 children aged under five, almost evenly distributed between the sexes. Nearly a third (28%) of the children were aged under one year, these were also evenly distributed between the cases and controls. While the children across the two groups were comparable in terms of height and measurement of upper arm circumference, those in the control group were significantly heavier than those in the case group, as illustrated in Table 5.

Table 5: Vital measurements of the children in sample, by group

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Control</th>
<th>Cases</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Weight (kg; Median, IQR)</strong></td>
<td>11 (8.4-15)</td>
<td>12 (8.5-15)</td>
<td>10.7 (8.2-14)</td>
<td>0.100</td>
</tr>
<tr>
<td><strong>Height (cm; Median, IQR)</strong></td>
<td>73 (60-90)</td>
<td>73 (60-90)</td>
<td>73 (60-87)</td>
<td>0.382</td>
</tr>
<tr>
<td><strong>MUAC (mm; Median (IQR)</strong></td>
<td>15 (13-131)</td>
<td>15 (13-125)</td>
<td>15 (13-135)</td>
<td>0.310</td>
</tr>
</tbody>
</table>

Other findings show that, on the whole, children in the case group were significantly more likely to have suffered recurrent diarrhoea, as shown in Table 6. They were also significantly more likely to have been treated with oral rehydration solution (ORS) and Zinc in their previous episode of diarrhoea, indicating a high likelihood of it having been severe.

Table 6: Whether the child had diarrhoea in the past two weeks and its management

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Control</th>
<th>Cases</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Child had diarrhoea</strong></td>
<td>492</td>
<td>77</td>
<td>415</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Across the counties, recurrent diarrhoea was more commonly reported in Homa Bay and Elgeyo Marakwet than Kericho. In Elgeyo Marakwet and Homa Bay, 79% and 72.5% of the children in the case group had suffered diarrhoea in the two weeks before the study, compared to 51% in Kericho (case group). More children with diarrhoea did not get ORS or Zinc in Elgeyo Marakwet, compared to the other two counties. Those that did not get ORS and Zinc in Elgeyo Marakwet were 24% and 45% respectively, compared with 8.3% and 14% in Kericho who did not get ORS and Zinc respectively and 13% in Homa Bay who did not get ORS and 13% who did not get Zinc.

In all counties, data drawn for this study from the Ministry of Health (MoH) DHIS database and facilities for 2017 show that in Elgeyo Marakwet and Kericho, diarrhoea is the second most common illness for children aged five year and under after upper respiratory tract infections (URTI). In Homa Bay, malaria, upper respiratory tract infections and diarrhoea are the leading causes of illness in children.

Infant feeding practices

Infant feeding practices have great bearing on the child’s risk of getting diarrhoea; in the case of supplementary or mixed feeding, the risk is heightened through potential contamination of the food, the water and the utensils used to prepare the food. Household survey respondents were questioned regarding the feeding practices for all children who were aged below six months in both control and case households. The results show that nearly half of the children in the sample (45.9%) were receiving mixed feeding (42% in the control and 49% in the cases group). This data suggests that children in the case category were more exposed to risky feeding practices that can contribute to increased risk of having diarrhoea.
Table 7: Infant feeding practices for children younger than six months

<table>
<thead>
<tr>
<th>Feeding practice</th>
<th>Total</th>
<th>Control</th>
<th>Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>Exclusive</td>
<td>250</td>
<td>41.4</td>
<td>123</td>
</tr>
<tr>
<td>Supplementary feeding</td>
<td>77</td>
<td>12.8</td>
<td>40</td>
</tr>
<tr>
<td>Mixed feeding</td>
<td>277</td>
<td>45.9</td>
<td>118</td>
</tr>
</tbody>
</table>

Analysed by county, the data shows that more children in Elgeyo Marakwet and Kericho were on mixed feeding, whereas in Homa Bay, 65% of the children were on exclusive breastfeeding.

Table 8: Infant feeding practices for children younger than six months by county (%)

<table>
<thead>
<tr>
<th>Feeding practice</th>
<th>Elgeyo Marakwet</th>
<th>Kericho</th>
<th>Homa Bay</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exclusive</td>
<td>28</td>
<td>26.6</td>
<td>65</td>
</tr>
<tr>
<td>Supplementary feeding</td>
<td>6.4</td>
<td>3</td>
<td>27</td>
</tr>
<tr>
<td>Mixed feeding</td>
<td>65</td>
<td>70</td>
<td>7.7</td>
</tr>
</tbody>
</table>

Household nutrition practices

The majority of the families eat at least three meals a day. The most commonly eaten foods in the sample households were cereal-based food, dark green leafy vegetables and other locally available vegetables, milk and oils and fats. In terms of coping with inadequate food supply in the previous month, the results show that some households had to borrow food from a relative (35.5%), purchase on credit (59%) or reduce the size of food servings (31%). There were no marked differences between the two groups in this respect.

Table 9: Coping strategies in case of inadequate food

<table>
<thead>
<tr>
<th>Coping strategy</th>
<th>Total</th>
<th>Control</th>
<th>Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>Borrow food from a friend or relative</td>
<td>417</td>
<td>35.52</td>
<td>202</td>
</tr>
<tr>
<td>Purchase food on credit</td>
<td>699</td>
<td>59.54</td>
<td>331</td>
</tr>
<tr>
<td>Reduction in size of meals</td>
<td>373</td>
<td>31.77</td>
<td>179</td>
</tr>
</tbody>
</table>
Exposure to sanitation messages and information

Household respondents were asked questions to gauge their exposure to common sanitation and hygiene messages. The results show that overall 64% of the sample had heard sanitation messages, while 36% had not. The most commonly heard messages were about washing hands with soap (54% control, 48% case); treating drinking water (43% control, 35.9% control); and using latrine or stopping open defecation (39.6% control and 34.3% cases).

For all types of message, more respondents in the control group had heard the message than those in the case group. Table 10 presents these findings and Table 11 shows the results by county.

<table>
<thead>
<tr>
<th>Message</th>
<th>Total</th>
<th>Controls</th>
<th>Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Build a latrine</td>
<td>243</td>
<td>122</td>
<td>121</td>
</tr>
<tr>
<td>Latrine use or stop open defecation</td>
<td>432</td>
<td>222</td>
<td>210</td>
</tr>
<tr>
<td>Safe disposal of infants’ faeces</td>
<td>307</td>
<td>159</td>
<td>148</td>
</tr>
<tr>
<td>Wash hands with soap</td>
<td>598</td>
<td>304</td>
<td>294</td>
</tr>
<tr>
<td>Treat drinking water</td>
<td>462</td>
<td>242</td>
<td>220</td>
</tr>
<tr>
<td>Wastewater management</td>
<td>93</td>
<td>50</td>
<td>43</td>
</tr>
<tr>
<td>Proper solid waste disposal</td>
<td>165</td>
<td>83</td>
<td>82</td>
</tr>
<tr>
<td>Other</td>
<td>30</td>
<td>16</td>
<td>14</td>
</tr>
</tbody>
</table>

Table 11: Sanitation messages heard by county (%)

<table>
<thead>
<tr>
<th>Message</th>
<th>Elgeyo Marakwet</th>
<th>Kericho</th>
<th>Homa Bay</th>
</tr>
</thead>
<tbody>
<tr>
<td>Build a latrine</td>
<td>14.0</td>
<td>8.1</td>
<td>35.1</td>
</tr>
<tr>
<td>Latrine use or stop open defecation</td>
<td>29.9</td>
<td>29.7</td>
<td>47.2</td>
</tr>
<tr>
<td>Safe disposal of infants’ faeces</td>
<td>16.0</td>
<td>30.5</td>
<td>30.2</td>
</tr>
<tr>
<td>Wash hands with soap</td>
<td>44.5</td>
<td>45.9</td>
<td>59.4</td>
</tr>
<tr>
<td>Treat drinking water</td>
<td>35.8</td>
<td>22.1</td>
<td>55.0</td>
</tr>
<tr>
<td>Wastewater management</td>
<td>2.6</td>
<td>5.6</td>
<td>13.5</td>
</tr>
<tr>
<td>Proper solid waste disposal</td>
<td>6.1</td>
<td>9.0</td>
<td>23.7</td>
</tr>
<tr>
<td>Other</td>
<td>1.2</td>
<td>2.5</td>
<td>3.6</td>
</tr>
</tbody>
</table>

Quality of household water

Household water sources: The study classified common water sources into improved and unimproved. Under improved sources are piped water, public tap and tube well, borehole with pump, protected wells and springs. Among unimproved water sources are unprotected wells and springs, water provided by small vendors and all surface water (rivers and ponds). The results show that slightly more households in the cases category in the total sample used unimproved water sources (37.7%) compared to controls (35.7%) (Table 12).
Table 12: Improved drinking water sources vs unimproved drinking water sources (%)

<table>
<thead>
<tr>
<th>Drinking water source</th>
<th>Total</th>
<th>Controls</th>
<th>Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>Unimproved</td>
<td>431</td>
<td>36.7</td>
<td>200</td>
</tr>
<tr>
<td></td>
<td>231</td>
<td>37.7</td>
<td></td>
</tr>
<tr>
<td>Improved</td>
<td>743</td>
<td>63.3</td>
<td>361</td>
</tr>
<tr>
<td></td>
<td>382</td>
<td>62.3</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1174</td>
<td></td>
<td>561</td>
</tr>
<tr>
<td></td>
<td>613</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

OR=0.92, 95%CI: 0.72 - 1.16   Pvalue= 0.0470

For the majority of households, the water source was less than two kilometres away. Over 70% of the households in both groups stored the water in closed containers or a jerry can. Slightly more case households (24%) stored their drinking water in an open container or jerry can, compared to 22% of the control group.
Treatment of the water at home before drinking is equally as important as the source in preventing water-borne diseases. The respondents were asked what their families did with the water at home before drinking. Over 40% said they do nothing to the water before drinking, while about a third said they use chlorine, as illustrated in Table 13. Slightly more families in the case category (44.7%) do nothing to the water before drinking, compared to the controls (41.7%).

**Table 13: Drinking water treatment at home by group (%)**

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th></th>
<th>Controls</th>
<th></th>
<th>Cases</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Chlorination</td>
<td>378</td>
<td>32.2</td>
<td>176</td>
<td>31.4</td>
<td>202</td>
<td>33.0</td>
</tr>
<tr>
<td>Boiling</td>
<td>265</td>
<td>22.6</td>
<td>133</td>
<td>23.7</td>
<td>132</td>
<td>21.5</td>
</tr>
<tr>
<td>Pot filter</td>
<td>66</td>
<td>5.6</td>
<td>26</td>
<td>4.6</td>
<td>40</td>
<td>6.5</td>
</tr>
<tr>
<td>Strain through a cloth</td>
<td>18</td>
<td>1.5</td>
<td>8</td>
<td>1.4</td>
<td>10</td>
<td>1.6</td>
</tr>
<tr>
<td>Solar disinfection</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Traditional herb</td>
<td>1</td>
<td>0.1</td>
<td>0</td>
<td>0.0</td>
<td>1</td>
<td>0.2</td>
</tr>
<tr>
<td>Let it stand and settle</td>
<td>92</td>
<td>7.8</td>
<td>50</td>
<td>8.9</td>
<td>42</td>
<td>6.9</td>
</tr>
<tr>
<td>Nothing</td>
<td>508</td>
<td>43.3</td>
<td>234</td>
<td>41.7</td>
<td>274</td>
<td>44.7</td>
</tr>
</tbody>
</table>

Analysis by county shows that over half of the households in Elgeyo Marakwet and Kericho do not treat their water in any way before drinking (Table 14), while using chlorine is quite high in Homa Bay (63.9%).

**Table 14: Drinking water treatment at home by county (%)**

<table>
<thead>
<tr>
<th></th>
<th>Elgeyo Marakwet (%)</th>
<th>Kericho (%)</th>
<th>Homa Bay (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chlorination</td>
<td>4.9</td>
<td>16.5</td>
<td>63.9</td>
</tr>
<tr>
<td>Boiling</td>
<td>30.5</td>
<td>19.3</td>
<td>19.2</td>
</tr>
<tr>
<td>Let it stand and settle</td>
<td>2.6</td>
<td>13.2</td>
<td>7.6</td>
</tr>
<tr>
<td>Nothing</td>
<td>64</td>
<td>54.3</td>
<td>19.9</td>
</tr>
</tbody>
</table>

“The small children usually defecate in the home compound even in homes with latrines since they are not trained on how to use them.”
The study also analysed water quality at point of consumption to determine the proportion of household water samples passing the designated water safety quality threshold.\textsuperscript{1} The research team analysed all water samples for free chlorine levels and presence and absence of coliform. This involved using a quick and simple kit for testing chlorine residual and compared the strength of colour standard colours on a chart to determine the chlorine and pH concentration. The Colilert test involved introducing an enzyme powder to 100 ml of water. After an incubation period of 24 hours, a positive result is indicated by a change in colour to yellow to magenta.

Figure 2: Percentage showing positive result in Colilert water tests

![Percentage showing positive result in Colilert water tests](image)

In Homa Bay, Elgeyo Marakwet and Kericho respectively, the Colilert test indicated that in 63.6\%, 65.6\% and 80\% of the households with cases, the water tested positive, indicating possible presence of faecal waste contamination. Further observation of the water indicated that 58.2\% of the cases used water which is either turbid, has a smell or is coloured.

\textsuperscript{1} All tests conducted on water in this study followed set protocols and standard procedures. See Water Testing Guidelines for procedure applied
Caregivers’ hygiene habits: hand washing and toilet use

The hygiene habits of a child’s caretaker are an important factor in preventing hygiene-related infections. The study examined household respondent’s hand-washing habits, because unwashed hands after toilets use contribute significantly to faecal contamination of food and water. Respondents were asked about instances in the previous 24 hours when they had washed hands and what they used to wash their hands with. The research team also made physical observations around the home for handwashing facilities.

The results show significant associations between washing hands after toilet, washing hands with soap and the incidence of diarrhoea, as illustrated in the Tables 15 – 16.

**Table 15: Hand washing after toilet use**

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Controls</th>
<th>Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>No</td>
<td>129</td>
<td>11.0</td>
<td>51</td>
</tr>
<tr>
<td>Yes</td>
<td>1,045</td>
<td>89.0</td>
<td>510</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1,174</strong></td>
<td><strong>561</strong></td>
<td><strong>613</strong></td>
</tr>
</tbody>
</table>

**Table 16: Hand washing with soap or detergent**

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Controls</th>
<th>Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>Water only</td>
<td>378</td>
<td>32.2</td>
<td>163</td>
</tr>
<tr>
<td>Soap and</td>
<td>796</td>
<td>67.8</td>
<td>398</td>
</tr>
<tr>
<td>detergent</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1,174</strong></td>
<td><strong>561</strong></td>
<td><strong>613</strong></td>
</tr>
</tbody>
</table>

The results of the study teams’ observations around the home for presence of handwashing facilities with soap did not demonstrate a significant difference between the controls and cases as shown Table 17.

**Table 17: Assessment of hand washing facilities: soap, detergent, ash, mud or sand present at place for hand washing**

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Controls</th>
<th>Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>No</td>
<td>950</td>
<td>80.92</td>
<td>447</td>
</tr>
<tr>
<td>Yes</td>
<td>224</td>
<td>19.08</td>
<td>114</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1,174</strong></td>
<td><strong>561</strong></td>
<td><strong>613</strong></td>
</tr>
</tbody>
</table>
Type of sanitation facilities used by the households and faecal waste containment

The results show that the majority of the households in the sample used improved sanitation facilities (90.5% control and 88.5% cases). There was no significant difference between the two groups.

Table 18: Type of sanitation facilities used (improved vs unimproved)

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th></th>
<th>Control</th>
<th></th>
<th>Cases</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Unimproved</td>
<td>123</td>
<td>10.48</td>
<td>53</td>
<td>9.45</td>
<td>70</td>
<td>11.42</td>
</tr>
<tr>
<td>Improved</td>
<td>1051</td>
<td>89.52</td>
<td>508</td>
<td>90.55</td>
<td>543</td>
<td>88.58</td>
</tr>
<tr>
<td>Total</td>
<td>1174</td>
<td></td>
<td>561</td>
<td></td>
<td>613</td>
<td></td>
</tr>
</tbody>
</table>

OR=0.81, 95%CI: 0.55 - 1.17   p-value= 0.271

About 50% of the households in both categories do not share toilets with another household; the households who use a communal toilet (three or more households) constitute 17% of the sample, with no significant difference between the two groups.
Disposal of faecal waste
The household survey respondents were asked whether they were aware that children’s faeces were harmful. Over 80% said they were aware (82.3%) with 14% saying they were not aware that they were harmful, with no significant difference between the two groups. The respondents were also asked how the household disposed of a child’s stool. The majority said the stool was thrown into the toilet. There were slightly more case households reporting unsafe disposal of children’s stool than control. For instance, 3% of the case families left the stools in the open, compared to 1.6% control, and more case households (6.5%) said they rinsed it off into a ditch, compared to 4.3% control, as illustrated in Table 19.

Table 19: Disposal of children’s stools, by group

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>%</th>
<th>Controls</th>
<th>n</th>
<th>%</th>
<th>Cases</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child used toilet/latrine</td>
<td>106</td>
<td>9.0</td>
<td>64</td>
<td>11.4</td>
<td>42</td>
<td>6.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Put or rinsed into toilet or latrine</td>
<td>858</td>
<td>73.1</td>
<td>413</td>
<td>73.6</td>
<td>445</td>
<td>72.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Buried</td>
<td>42</td>
<td>3.6</td>
<td>17</td>
<td>3.0</td>
<td>25</td>
<td>4.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thrown into garbage</td>
<td>59</td>
<td>5.0</td>
<td>28</td>
<td>5.0</td>
<td>31</td>
<td>5.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Put or rinsed into drain or ditch</td>
<td>64</td>
<td>5.5</td>
<td>24</td>
<td>4.3</td>
<td>40</td>
<td>6.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Left in the open</td>
<td>28</td>
<td>2.4</td>
<td>9</td>
<td>1.6</td>
<td>19</td>
<td>3.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>7</td>
<td>0.6</td>
<td>4</td>
<td>0.7</td>
<td>3</td>
<td>0.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Don’t know</td>
<td>10</td>
<td>0.9</td>
<td>2</td>
<td>0.4</td>
<td>8</td>
<td>1.3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Approaches adopted by the community to deal with environmental issues
1. Social Accountability mechanism
2. Community county partnerships through formation of sanitation committees
3. Fundraising to construct latrines
4. Integrating sanitation and hygiene education in schools
5. Partnering with local NGOs and community-based organisations (CBOs)

“Pregnant women at times also miscarry due to infections brought by dirt, faecal matter. This contamination is not good to the environment.”
3.3 Social effects of poor sanitation on different groups (age, gender, ability) in the county population

This study sought to establish if any factors contribute to poor sanitation among some groups in the community and the effects of such discrimination or exclusion. Overall, the results show that social exclusion or discrimination in terms of toilet use in these communities is mainly among the elderly, children, young married women and those living with disability. In Homa Bay County, the majority of male and female respondents reported that unmarried women and in-laws were not allowed to share toilet facilities based on cultural norms. Overall, in all counties, poverty was reported as a key barrier to owning a latrine in the three counties.

"The small children usually defecate in the home compound even in homes with latrines since they are not trained on how to use them."

The majority of the respondents who reported not sharing sanitation facilities with women reported that cultural norms do not allow them to see women’s menstrual periods and therefore during this time girls cannot share with father and in-laws.

Household respondents were asked whether there were any reasons or occasions that barred some household members from using the household toilet. The results show that there were no occasions or reasons in the study sample when a family member is not allowed to use the household toilet, and that the toilets are used equally by all members of the household, including the elderly and children, as illustrated in Table 20.

Table 20: Use of the household toilet by group

<table>
<thead>
<tr>
<th>Group</th>
<th>Total n</th>
<th>Total %</th>
<th>Control n</th>
<th>Control %</th>
<th>Cases n</th>
<th>Cases %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Children</td>
<td>1051</td>
<td>89.5</td>
<td>506</td>
<td>90.2</td>
<td>545</td>
<td>88.9</td>
</tr>
<tr>
<td>Elderly</td>
<td>847</td>
<td>72.2</td>
<td>406</td>
<td>72.4</td>
<td>441</td>
<td>71.9</td>
</tr>
<tr>
<td>Disabled</td>
<td>383</td>
<td>32.6</td>
<td>186</td>
<td>33.2</td>
<td>197</td>
<td>32.1</td>
</tr>
<tr>
<td>Women</td>
<td>1057</td>
<td>90.0</td>
<td>507</td>
<td>90.4</td>
<td>550</td>
<td>89.7</td>
</tr>
<tr>
<td>Men</td>
<td>1046</td>
<td>89.1</td>
<td>505</td>
<td>90.0</td>
<td>541</td>
<td>88.3</td>
</tr>
</tbody>
</table>

However, qualitative studies demonstrate that in Homa Bay County both men and women are influenced by cultural beliefs on whether to use a latrine or not. The social distance of engagement between in-laws and genders affect ownership of latrines.

One elderly man explained: "You know, our people have a lot of cultural issues in nature. There are things that can’t just happen. There’s no way I can share a toilet with my sons’ wives or my daughter. Let alone that, imagine sharing a toilet with in-laws". He shared amid laughter from other men.

Another lady explained: "It is wrong for mothers to share washrooms and bathrooms with men and strangers. Visitors, especially men, should have their own toilets away from young girls and women".
Security and safety
Household respondents were also asked questions to gauge whether there were any security-related issues or other considerations that may affect the ability of some household members to use the toilet, thus contributing to poor sanitation. The results show that in the majority of cases in both groups, security may not be an issue and that the toilet is accessible all the time. In the majority of both groups, the toilet was located either in the dwelling or within the yard, and only in about 13.6% of the households (12.8% control and 14.4% cases) was it located elsewhere. For the majority, the toilet was accessible all the time (night and day).

Results from the qualitative study show that poor sanitation has been associated with child safety. In Elgeyo Marakwet, respondents reported that children have drowned in waste put aside by pit emptiers. One man noted: "We have had incidence where a child has drowned in faecal matter removed by a pit emptier while emptying a filled latrine".

Disease outbreaks
Disease outbreaks were reported in all three counties. In Homa Bay County, disease outbreaks such as cholera were reported next the lake along the beaches. Such outbreaks were reported to affect schooling in the county; the county was reported to shut down schools due to epidemics in some sub-counties. Child mortality was associated with diarrhoea and other sanitation related illness. A mother described the situation: "A lot of children suffer from diarrheal cases and some die in the process".

The use of contaminated water by households was associated with disease outbreaks. One man noted: "Unprotected water sources, especially nearby dam and river, may also be causing suffering due to poor disposal of faecal sludge by the emptier".

Health outcomes
Using qualitative methods, the study sought to understand the effect of diarrhoea illness and health outcomes in the family. Poor sanitation was associated with recurrent infections of diarrhoea and respiratory infections in children. Some respondents associated adverse maternal health outcomes such as spontaneous abortions and low birth weight with poor sanitation. Overall, those who observed the association of adverse health outcomes and poor sanitation reported that poor sanitation promoted infections and induced stress during pregnancy. The qualitative study findings call for additional studies to elucidate the socio-behavioural and biological basis of this association of poor sanitation and adverse maternal health outcomes.

“During the cholera outbreaks some schools here were closed until the Ministry of Health approved their re-opening”

“Security and safety
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“Our children are taught in school about the importance of a latrine, they try to insist they should have it at home, even though at many times this does not happen.”
School attendance

The majority of the respondents reported that diarrhoea and sanitation infections affect children’s school attendance. Children were reported to miss school for an average of one week. Additionally, schools were reported to close down as a results of disease outbreaks in Homa Bay County.

Community engagement on environmental issues

Measures to deal with environmental issues have been put in place in most counties by the community. In Homa Bay County, it was reported that the community members have put in place community dialogues on environmental issues. Additionally, in Homa Bay, the community reported engaging the county government i.e. governors, members of county assembly (MCAs) and PHOs to contract latrines in the community as well as engaging the local chiefs to punish open defecation and inadequate waste disposal. The approach used in Homa Bay County is a social accountability mechanism.

In Kericho County, a sanitation committee was formed that includes representatives from the community. Also, the community has been empowered with knowledge to reject rental houses with poor sanitation facilities in urban areas. In Elgeyo Marakwet, the community is partnering with the county to seek alternative sources of funding through stakeholders to construct latrines. Educating children on sanitation and hygiene was reported in all three counties. The below extracts demonstrate some of the approaches used.

**Approaches adopted by the community to deal with environmental issues**

1. Social Accountability mechanism
2. Community county partnerships through formation of sanitation committees
3. Fundraising to construct latrines
4. Integrating sanitation and hygiene education in schools
5. Partnering with local NGOs and CBOs

"We (the community) have also asked the area MCA to build us public toilets next to the water sources. All of these travellers and passers-by should also be able to access the facilities adequately."

"We also have a sanitation committee that is responsible for expanding latrine coverage in every home."

"We have tried with the village elders to tell people to stop this open defecation and build latrines but because of lack of money the habit is on-going. The community health visitors (CHVs) should educate people more."
3.4 Effects of poor sanitation on the environment

Poor disposal of human waste and excreta can contaminate the environment, contributing to poor health outcomes observed in the community. The researchers analysed the effects of poor sanitation on the environment, to establish if poor faecal matter management had affected the quality of the water. Samples were collected of the water in some of the rivers and other public water sources in the three counties. In all three counties, the results revealed that the public water points tested were contaminated with a high presence of *E. coli*, and thus were unfit for human consumption if untreated.

The qualitative study sought to explore how faecal waste is contained in the counties. The findings show that a sewer network was used in Homa Bay and Kericho counties. In these counties, limited availability and access to sewer networks was reported in rural areas. However, the use of septic tanks and soak pits were reported as being used in rural areas without access to sewer network. Elgeyo Marakwet lacks a sewerage network. The reasons provided by key implementers in the county for a lack of sewerage network were mainly low demand and lack of resources. However, the community reported a lack a prioritisation of sewer networks by the county. One man from the county reported the situation as "We have our own private sewer i.e. a septic tank and a soak pit where a pour flush type toilet is directly connected". Overall the factors associated with limited access and availability were similar in the three counties.

**Factors associated with limited access and availability of sewer system in Homa Bay, Kericho and Elgeyo Marakwet**

1. Cost associated with sewer connections
2. Limited land to construct a sewer system
3. Low demand for sewer systems
4. Availability of alternatives such as septic tanks
5. Barriers to access and availability of sewer lines

"We just close or cover it with soil then construct another pit latrine. We don’t remove or empty the pit latrine when it’s full."

"We use semi-permanent latrines and not a temporary one. What I mean about not a temporary one is that the pit latrine is made of timber and offcuts around the pit but is a pit latrine."

"We first do the pit digging inside deeper like 5 feet. We use timber to cover the surrounds. Use of offcuts to construct the latrines and some use cement if one can afford it."

"Nearly every family has a pit latrine. We don’t allow sharing of the pit latrine with other families. Some families (extended family) do share. Some families who don’t have one use the bush.”

"It is emptied in Eldoret but sometimes it is emptied in the rivers".
In Elgeyo Marakwet County, a key factor that emerged was the building of temporary sanitation facilities because of insecurity.

"The majority of community members here use a pit latrine with a super structure constructed of cheap and locally available material such as wood and maize stalks. But there are some who are rich who use a pit latrine with cement slab and wooden superstructure and door. But they are very few in this community."

The study also sought to understand the emptying of faecal matter and its effects on the environment. Emptying of filled up latrines was done by a manual pit emptier, with use of chemicals. Some latrines were permanently covered after filling up.

"He usually come to do this work for us. You know when it rains, the septic tank gets full very fast. So, he first digs up a pit adjacent to the septic tank then manually empties the septic tank into the pit. Sometimes there are blockages in the pipes in the septic tank. So, after being fully emptied, he re-connects the pipes for us. He actually helps us a lot. We pay him something small."

**Pit Emptiers: Where do they dispose?**

- In a pit
- Thrown into the bush
- Dumped in sacks and thrown into wastes
- Poured into a deserted pit latrine
- Some pour them openly next to the pit to dry
- Some are licensed vehicles with tankers and transport them to the treatment plant

“A lot of children suffer from diarrheal cases and some die in the process”
Manual pit emptying was considered by some as “dirty and ungodly” while others said it was just a job like any other. In Kericho County, the community members do not have a negative attitude towards the manual pit emptiers. One man explained: “We can get engaged in this business of emptying if taught well and provided with items to assist in the work”.

In Elgeyo Marakwet, manual pit emptiers were reported as common in the community. The emptiers in this county reported disposing of waste in bare land and forests. One emptier said: “It is emptied on the bare land especially during rainy season”.

The main means of transport and disposal for the faecal matter was through honey suckers. However, challenges were reported in the transportation and disposal of faecal waste mainly (i) maintenance of the tankers (ii) leakage of the tankers (high cost of emptying) (iii) unavailability of tankers and (iv) unscrupulous people empty tanker in forests. The average cost of hiring a tanker was reported at KSh 8000/= to 12,000/=.

“The tanker sometimes bursts on its way due to too much pressure because of long distances from Iteni to Eldoret sewer plant.”

“The “honesucker” tanker is the common method. But some unscrupulous attendants to empty the tanker in the forest.”

Most of the respondents felt that the county government supported institutions in the management of faecal sludge but neglected the community.

“There is a group of manual pit emptiers who help to empty the pit latrines and it’s good to involve them. The county government only visits institutions to empty the pit latrines but neglect the community.”

The researchers sought to understand the perception to re-use of faecal sludge. There was a mixed view about using products from faecal sludge: some agreed they would use it while others would not. However, some members are open to learning about the business.

“We would be happy to be trained on ways of doing the recycling so as to make money out of it.”

Qualitative results show that majority of the respondents felt that they could not use products from faecal sludge. The main reasons behind the non-use is because of the stigma associated with handling faecal sludge, a lack of knowledge of end products from faecal sludge and the perceived health risk associated with products from faecal sludge such as charcoal.

“We as the people from Koyumbre village, we don’t want to deal with issues of touching faecal matter after it has been disposed into the pit.”

“We heard that another NGO wanted to come and tell us how to use faeces in generating gas. Some are wondering how this will work.”
3.5 Examining the political economy and comparison of implementation during devolution years and comparing pre-devolution data with data obtained for the years since devolution

This study included an assessment of the policy, legal and implementation issues facing counties as they seek to expand sanitation services. The results are summarised in the following sections. The study examined the sanitation related budget for each county as demonstrated in Figure 3 below.

Figure 3: WASH Budget Allocation

Overall Homa Bay County has the biggest public health allocation from the total annual budget. However, in terms of WASH allocation (as a proportion of the total public health budget) Homa Bay has the lowest allocation for WASH activities. Although Elgeyo Marakwet has the lowest allocation for public health the county has allocated substantial amount to WASH activities.

In addition, the study sought to explore the effect of poor sanitation on expenditure of the households through focus group discussion with men and women. The effect of poor sanitation varied based on the severity of the disease. Qualitative findings demonstrated disruption in the household and its economic activities following a sanitation related illness. The mother was especially affected. Women specifically reported not doing most of the household chores as they sought health care or nursed a sick baby. As one mother described it: "I am not able to work when my child has diarrhoea. I do not attend to my farm as I seek care for my child. Sometimes we get admitted to hospital and my mother-in-law take care of my other children".

Thus, when a child or adult is severely ill, it creates significant disruption in the functioning of the household. Other household members are forced to help out in household tasks for which the woman was primarily responsible. The husband in particular take up extra responsibilities that they are not used to. One man noted: "The other day when our child had diarrhoea, I had to make sure our other children has something to eat and that the cows and the farm were taken care of until the child was discharged from hospital".

Qualitative findings resonate well with the quantitative data. More cases paid money for healthcare, spent more money on treatment and services and specifically spent more money on the treatment of diarrhoea.
Table 21: Disease burden and cost of seeking care

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Total</th>
<th>Controls</th>
<th>Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>Sick family member sought assistance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>990</td>
<td>84.3</td>
<td>472</td>
</tr>
<tr>
<td>No</td>
<td>184</td>
<td>15.7</td>
<td>89</td>
</tr>
<tr>
<td>Paid money for healthcare received</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>496</td>
<td>50.1</td>
<td>225</td>
</tr>
<tr>
<td>No</td>
<td>494</td>
<td>49.9</td>
<td>247</td>
</tr>
<tr>
<td>Money spent on treatment and services received during the most recent visit</td>
<td>100 (0-500)</td>
<td>100 (0-500)</td>
<td>100 (0-400)</td>
</tr>
<tr>
<td>Amount of money spent on treatment of diarrhoeal disease in past six months</td>
<td>0 (0-300)</td>
<td>0 (0-200)</td>
<td>50 (0-500)</td>
</tr>
</tbody>
</table>

Quantitative findings demonstrate that controls had higher income compared to cases. Additionally, more cases (54.8%) compared to controls (53.1%) reported to have borrowed food or other items in the month prior to the study.

Table 22: Household income in the last 12 months ('000)

<table>
<thead>
<tr>
<th>Median (IQR)</th>
<th>Total</th>
<th>Controls</th>
<th>Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>32 (15-80)</td>
<td>36 (16-90)</td>
<td>30 (15-70)</td>
</tr>
<tr>
<td>0-150</td>
<td>1,059</td>
<td>90.2</td>
<td>497</td>
</tr>
<tr>
<td>151-300</td>
<td>81</td>
<td>6.9</td>
<td>42</td>
</tr>
<tr>
<td>301-400</td>
<td>13</td>
<td>1.1</td>
<td>11</td>
</tr>
<tr>
<td>401-500</td>
<td>8</td>
<td>0.7</td>
<td>4</td>
</tr>
<tr>
<td>&gt;500</td>
<td>13</td>
<td>1.1</td>
<td>7</td>
</tr>
</tbody>
</table>
The ripple effect of sanitation related illness on farming and income generating activities was discussed in all the counties. The fact that an adult was reported to take on additional reponsibilities when a child is unwell or an adult has severe sanitation illness limits their ability to perform their other responsibilities. Thus, such illness creates a disruption chain. On occasions when a mother is admitted to hospital with a sick child or when an adult is home bedridden with severe illness, another adult is reported to give up their wage labour, and the income it provided, in order to take care of the children left behind or the sick adult.

Most women reported it would be impossible for husbands to take up casual jobs when caring for a baby. One woman noted: "My husband is a casual worker. When my children are sick and I'm in hospital he cannot take up a job as he will need to take care of the other children and animals". Consequently both men and women agreed that such disruption affected agricultural activities not only because of loss of labour but also because the adults now have to juggle farming work and their additional household responsibilities.

Children's care and feeding were reported by women to face massive disruption. During incidences when a mother has to be in and out of hospital or admitted to hospital, the responsibility for feeding the children was shifted to close kin, including the husband or grandmother. It was reported that often the children got less care.

The study also sought to estimate food diversity for cases and controls. A household dietary diversity score (HDDS) was estimated to provide an indication of food consumption patterns in the household. Twelve food groups were created (cereals, roots, vegetables, fruits, meat, eggs, fish and other seafood, legumes, nuts and seeds, milk and milk products, oils and fats, sweets, spices, condiments and beverages) from which HDDS was calculated by summing the number of food groups consumed in the household over the past seven days. The HDDS ranged from 2 to 12 food groups, with a mean of 9.8 (Elgeyo Marakwet: mean=9.9, SD=1.4; Homa Bay: mean=10.0, SD=2.1; Kericho: mean=9.4, SD=2.2). The cases had, on average, a significantly lower HDDS (mean=9.7, 95%CI: 9.5-9.8) than controls (mean=9.9, 95%CI: 9.8-10.1; t=2.37, df=1172; P=0.009). This, however, varied across counties: in Elgeyo Marakwet, HDDS was the same in cases (mean=9.9, 95%CI: 9.7-10.1) as in control (mean=9.9, 95%CI: 9.7-10.1; t=0.11, df=342; P=0.457); in Homa Bay, cases had significantly lower HDDS (mean=9.8, 95%CI: 9.5-10.1) than controls (mean=10.1, 95%CI: 9.9-10.4; t=0.11, df=471; P=0.049); and in Kericho, cases had significantly lower HDDS (mean=9.2, 95%CI: 8.9-9.5) than controls (mean=9.7, 95%CI: 9.3-10.0; t=1.8, df=355; P=0.033).

The findings show that majority of the cases were more likely to be malnourished as compared to the controls because of the lower food diversity and hence were more likely to experience episodes of diarrhoea. The households were further grouped into highly food insecure (if consumed three or less food groups), moderately food insecure (if consumed 4 or 5 food groups) and highly food secure (if consumed 6+ food groups). The table below shows the food groups consumed by households in each category. In summary, the majority (approximately 97%) of the households were highly food secure.
### Table 23: Food groups consumed by households by dietary diversity

<table>
<thead>
<tr>
<th>Highly food insecure (3 or less food groups)</th>
<th>Moderately food insecure (4 or 5 food groups)</th>
<th>Highly food secure (6+ food groups)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cereals</td>
<td>Cereals</td>
<td>Cereals</td>
</tr>
<tr>
<td>Roots</td>
<td>Roots</td>
<td>Roots</td>
</tr>
<tr>
<td>Vegetables</td>
<td>Vegetables</td>
<td>Vegetables</td>
</tr>
<tr>
<td>Eggs</td>
<td>Eggs</td>
<td>Eggs</td>
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Improved handwashing facility
Chapter 4: Conclusions and Recommendations
Conclusions

This study was conducted to gain more insights into the effects of poor sanitation on public health, the environment and well-being in Kericho, Homa Bay and Elgeyo Marakwet counties. Poor sanitation is linked to diarrhoeal diseases, which are among the leading causes of morbidity and mortality in children under five. Poor sanitation is also associated with a number of infectious and nutritional outcomes which have great bearing on the health and well-being of the child.

The findings show that more of the case households, with a child with diarrhoea, were likely to be poorer than those in the control group. There were slightly more case group respondents in the poor quintile (34%) than in the control group (33%) and more households in the control group (15%) sought treatment in private facilities than those in the case group (11%). In addition, case families appear to be larger than control families, meaning there is a high likelihood of having congested living arrangements: in the study, 29.7% of the case families had seven family members or more who had slept in the homestead the night before the interview than the control group (22%), indicating they were likely to be larger families.

The results also suggest that case households are, in general, exposed to a higher risk of sanitation-related diseases than the control group. According to the findings, slightly more households in the cases category had a family member who was treated for sanitation-related illness in the six months before the survey than in the control group. For instance, 16.5% of the cases households had a member treated for typhoid, compared to 13% in control, skin and eye infections (5%, compared to 4% in control group) and diarrhoea or stomach ache (four households compared to one household in control group). This suggests that in general, case households are more at risk of illnesses related to sanitation, and that children in these households are at aggravated risk of diarrhoea and related negative health outcomes.

In terms of the observed health status of the child, the results show that the children in the case group were also more significantly affected by recurrent diarrhoea compared to the ones in the control group: 79% had suffered diarrhoea in the previous two weeks, compared to only 10% in the control group. In addition, although the cases group had older children (73% aged 1-4 years), they had a lower median weight at 10 kg, compared to the control group at 11 kg, indicating the likelihood of poor nutrition.

Overall, more respondents in the control group (58%) had been exposed to messages on sanitation and hygiene than those in the case group (54%). Notably, more respondents in the control group (42%) heard such messages when visiting a health facility compared to those in the case group (30%), suggesting a possible link between exposure to messages and information on sanitation and hygiene and the child having diarrhoea.

In terms of water used by the households in the sample, the results also suggest there may be a link between the source, storage and treatment of the water and the child having diarrhoea. More control households use water from improved, protected sources than case households. There are also more case households (39% vs 32%) that store water in an open container. Significantly, about 71% of the case households reported doing nothing with the water, compared to 56% of those in the control group, and about 24% of the households in the case group reported boiling their water before drinking, compared to 38% of the control group. The situation is aggravated by the finding that the public water points tested in this study were contaminated with a high presence of \textit{E. coli} and thus unfit for human consumption if untreated.
Geographic information system (GIS) mapping of the location of the cases and controls in relation to water sources, open defecation sites and pit latrines suggests that there may be a link between the proximity to open defecation sites and the likelihood of a child having diarrhoea.

Caregivers’ sanitation and hygiene habits were also found to be more at risk of spreading contamination among the case households than in control households. For instance, there were more respondents in the case households (11%) who did not wash hands after using the toilet than in control households (9%). In addition, more respondents in the case households used only water (45.6%) than in the control households (38.3%), meaning they were exposed much higher chances of contamination by faeces.

In Kenya and other countries with poor sanitation, these findings must catalyse renewed and strengthened efforts to:

- ensure universal access to improved sanitation
- strengthen community led total sanitation initiatives
- monitor and improve the quality of water at source and household level
- promote hand washing with soap
- provide financial and social support for socially excluded persons to be able to access sanitation and water services.
The following recommendations can be made in view of these findings:

- **Set-up an initiative to mobilise the community to build improved toilets** to reduce the risk of water and environmental contamination through poorly disposed of faeces and open defecation.

- **Strengthen public awareness and education** about sanitation and hygiene and the risk posed by poor sanitation on the health and well-being of young children. The results have demonstrated that exposure to messages on sanitation and hygiene may be related to a child having diarrhoea, as more respondents in the control group (58%) had been exposed to such messages than those in the case group. Such public education and awareness initiatives should address personal hygiene habits, and especially the need to wash hands with soap after the toilet in order to reduce contamination.

- There is a need to **address the high incidence of mixed feeding for children younger than six months**, who should still be on exclusive breastfeeding. The results show that more children in the control group were on exclusive breastfeeding than in the cases group. This suggests that mothers of young children are not getting the right information regarding child nutrition, and the county government with its partners need to address this.

- **Health care providers should closely observe children presenting with diarrhoea** and link their families with community health workers for monitoring and support at home to address sanitation and prevent recurrent episodes. The results show that the children in the case group were significantly affected by recurrent diarrhoea compared to those in the control group.

- **Improve the quality of water through water testing and monitoring** of public water sources and household water to ensure the water is fit for human consumption. The results of this study suggest there may be a link with the source, household storage and treatment of the water with the child having diarrhoea. In addition, the public water points tested in this study were contaminated with a high presence of *E. coli* and thus are unfit for human consumption if untreated.

- **Invest in faecal sludge management.** The results also showed that nearly half of the faecal sludge is unsafely contained. To address this situation, there is a need to ensure all public drinking water is treated and appropriate measures are taken to reduce the potential of contamination through poorly disposed of or contained faecal sludge. In addition, the government should consider expanding the sewerage system in densely populated areas.

- **Budget advocacy.** The WASH budget as reported by the counties is a small proportion of the public health budget. Increasing the budget will strengthen implementation of water, sanitation and hygiene interventions.

- **Include water testing and monitoring as a key component for Community Led Total Sanitation (CLTS).** The current CLTS approach adopted by the country does not provide a relation of key interventions such as the walk of shame and the effect of the “shit”. Including water testing will provide an association of the quality of water for human consumption and the faecal matter.

- **Invest in surveillance of hotspot for sanitation illness and associate factors.** Such surveillance can be done through Geospatial mapping of open defecation sites, sites with outbreaks such as diarrhoea and water testing results to understand the distribution of sanitation illness and risk factors.


Lubaale, G.N. and S.M. Musyok (2011). *Pro-poor sanitation and hygiene in East Africa: Turning Challenges to Opportunities*


For detailed county level findings, see:


*Distribution of Diarrhoea and Associated Factors in Kericho County - A Geospatial Analysis*

*Distribution of Diarrhoea and Associated Factors in Elgeyo Marakwet County - A Geospatial Analysis*

*Distribution of Diarrhoea and Associated Factors in Homa Bay County - A Geospatial Analysis*

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**Further information**

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