EFFECT OF WATER, SANITATION AND HAND HYGIENE PRACTICES ON DIARRHEAL DISEASES AMONG COMMUNITY MEMBERS IN NYERI COUNTY, KENYA

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A research Project submitted in partial fulfillment of the requirements for the award of the degree of Master of Science, in Public Health Systems Management and Application in the School of Public Health and Applied Human Sciences of Kenyatta University.

January, 2019
DECLARATION

I declare that this research project is my original work and has not been presented for a master’s degree at any other university.

Signed …………………………… Date ……………………………

Cosmas Mwamburi Mwashumbe
Q142/39240/2016

This research project has been submitted for examination with my approval as University Supervisor.

Signed …………………………… Date ……………………………

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DEDICATION

This research project is dedicated to my wife and children for their sincere love, patience, understanding and support. They were of great support throughout my study time and encouraged me, enabling me complete my studies. May our good God, bless them for their patience and understanding.
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ABBREVIATIONS AND ACRONYM

AWP  Annual Work Plan
CHSIP  County Health Strategic Investment Plan
CIDP  County Integrated Development Plan
FBO  Faith Based Organization
GoK  Government of Kenya
KMTC  Kenya Medical Training College
MOH  Ministry of Health
NESH  National Environmental Sanitation and Hygiene
PHC  Primary Health Care
WHO  World Health Organization
WASH  Water, Sanitation and Hygiene.
DEFINITION OF OPERATIONAL TERMS

**Hygiene** - It is the way in which an individual is required to keep himself or herself clean to prevent disease.

**Handwashing** – It is the action of washing one's hands

**Morbidity** - The number affected by a disease in a particular percentage of the population.

**Mortality** - Is the term used for the number of people who died within a population.

**Sanitation** - Refers to the state of the community in terms of clean drinking water and proper disposal of waste from human beings and sewage.

**Public Health** - It involves preventing the community from diseases hence prolonging their life and promoting health through a countries health system.
ABSTRACT

Sanitation is a basic necessity that contributes to better human health, dignity and quality of life. The economic and social benefits of sanitation interventions create more time for productive pursuits, higher productivity, better performance at school and work, lower medical costs. Despite Nyeri County ranked by the Ministry of Health as number one county in terms of sanitation coverage, it has 25.4% unimproved sanitation and 0.3% open defecation. This study was designed to identify the effect of water, sanitation and hand hygiene practices on diarrheal disease among community members in Nyeri County Kenya. The study adopted cross-sectional study design. Data were drawn from 200 households sampled proportionately from two wards in Kieni East Sub-County selected through simple random sampling. A household survey was conducted to the adult household member who was present at home during time of the survey. Data were analyzed using the Statistical Package for Social Sciences (SPSS) version 23. The results showed that prevalence of diarrhea among the community members in the previous two weeks was 13%. Predictors of diarrhea in the community included Low level of education (OR 1.3, 95% CI 0.88-1.81); households with four or more members (OR 1.52, 95%CI 1.03-1.76); unimproved water source (OR 1.52, 95% CI 1.11-1.83); Water inadequacy (OR 1.85, 95CI 0.36-1.97); Unavailability of toilet (OR 1.7, 95%CI 1.14-2.07); and, unavailability of handwashing facilities (OR 3.5 95%CI 1.55-2.99). The community has a very high toilet coverage, Gakawa ward 99% and Thengu ward 95%, however the hand washing facilities were low, 72% in Gakawa ward and 49% in Thengu ward. Again despite this moderate availability of handwashing facilities, fewer had soap, Gakawa ward 24% and Thengu ward 30%. The low availability of handwashing facilities with soap indicate that the community is not consistently practicing adequate handwashing practices. In conclusion, diarrhea remains an important public health concern in the study community. Occurrence of diarrhea could be decreased by interventions aimed to improve water availability, sanitation and hygiene. Nyeri County, Department of Health Services should initiate a sensitization program in Kieni East Sub-County on hand washing and hand hygiene. Such a program should target lowly educated and the poor. Distribution of free soap to the identified low income households would greatly aid efforts to enhance hand washing in the area.
CHAPTER 1: INTRODUCTION

1.1 Background of the Study

Inadequate availability of water, sanitation, and hygiene (WASH) have a major effect on public health around the world. Diarrhea kills nearly two million people annually, where about one and a half million of them are children. Approximately, ninety percent of diarrheais caused by unsafe drinking water, inadequate sanitation, and poor hygiene (UNICEF, 2015).

Water is very important in human life, ecosystem conservation, for farming, and education, but still, a big proportion of the world population does not have access to safe drinking water and two and a half billion lack access to sanitation. In Africa, Asia, and Latin America, women and children often spend most of their day collecting water. Good enough, there are workable measures in place to address the global WASH crisis such as; handwashing with soap, which can reduce the occurrence of diarrhea by forty-five percent; storing rain water; building boreholes with hand or electric pumps; and treating water. Creating public health awareness on hygiene is key to prevention of WASH-related diseases (Walter, 2013). WASH-related diseases are a huge burden in Sub-Sahara Africa health system. Approximately, 88% of diarrhoeal disease is due to unsafe water supply, and inadequate sanitation and hygiene (WHO 2004c).

Kenya revised its National Environmental Sanitation and Hygiene (NESH) policy 2017 to match with its 2010 Kenyan constitution and Kenya vision 2030. This was also to match it with the Kenya Health Policy Framework (2012-2030) and Kenya’s regional and Global Commitment. The NESH 2017 policy, emphasizes the importance of a clean environment and sanitation as a basic human need (Health,
According to Adan et al 2017, the inadequacy of water in Kieni, Nyeri County, has resulted in low hand washing practices, leading to the high burden of WASH-related diseases such as diarrhea. However, the area has a latrine coverage of above 90 percent (Adan, Sugow, & Somo, 2017).

1.2 Problem Statement

Despite Nyeri County ranked by the Ministry of Health as number one county in terms of sanitation coverage, it has 25.4% unimproved sanitation and 0.3 % open defecation (MOH, 2014). Inadequate availability of water, sanitation, and hand hygiene have a major effect on diarrhoeal diseases (UNICEF, 2015). Kieni East Sub-County is a semi-arid area, hence there is water scarcity (Kieni East Sub-County AWP 2016/17). According to Adan et al 2017, the inadequacy of water in Kieni, Nyeri County, has resulted in low hand washing practices, leading to the high burden of WASH-related diseases such as diarrhea. However, the area has a latrine coverage of above 90 percent (Adan, Sugow, & Somo, 2017). Routine surveillance data shows the highest morbidity among the general population due to WASH-related diseases such as upper respiratory tract diseases (59%), pneumonia (11.4%) and diarrheal diseases (11.3%) (Kieni East Sub-County AWP 2016/17). WASH-related diseases are the leading cause of hospital admission and death for children under five years in Kenya (UNICEF,2015). Over half of all hospital visits in Kenya result from illnesses related to water, sanitation, and hygiene (UNICEF, 2015).

This calls for the robust approach of empowering the community members to identify the major triggers of ill health and take preventive measures and empower them on the good and early health seeking behavior.
1.3 Justification of the study

Nyeri County is divided into eight sub-counties, but only Kieni East Sub-County is in a semi-arid region, which is considered as the hardship area. Also, the sub-county is vast and the distance from one health facility to another is large, more than five kilometers away as per the Ministry of health recommendations (Kieni-East Sub-County AWP, 2016/2017). This makes it difficult for some community members to access health services, especially during rainy seasons. No recent research has been conducted on water, sanitation and hand hygiene practices in the sub-county. Also, there are higher rates of diarrheal diseases in the sub-county than the rest of the Nyeri County (Nyeri CHSS&IP, 2013/2018).

1.4 Research Questions

This study addresses these questions:

i) What is the influence of sociodemographic characteristics on diarrheal diseases among the community members?

ii) What is the influence of hand washing practices on diarrheal diseases among the community members in Kieni East sub-County?

iii) What is the influence of the source of water on diarrheal diseases among community members in Kieni-East sub-County?

1.5 Objectives of the Study

1.5.1 General Objective

The broad objective of this study was to determine the effect of water, sanitation and hand hygiene practices on diarrheal diseases among the community members in Nyeri County.
1.5.2 Specific Objectives

Specific objectives in this study are:

i. To determine the influence of sociodemographic characteristics on diarrheal diseases among the community members in Kieni East-Sub County.

ii. To find out the influence of hand washing practices on diarrheal diseases among the community members.

iii. To determine the influence of the source of water on diarrheal diseases among the community members.

1.6 Significance of the study

The purpose of this study was to examine and describe the effects of water, sanitation and hand hygiene practice on diarrheal disease in the study area as well as provide recommendations for improvement. Specifically the study focused on identifying sociodemographic characteristics, handwashing practices and the influence of water source on diarrheal disease in Kieni East sub county community. The findings from this study will help the policy makers in Nyeri County to address the identified weak areas. This will help the community health outcomes to improve. There is a lot of benefits attached to sanitation and hand hygiene from individual and community perspective. Such benefits include time to concentrate on economic activities, good academic performance among school going children and reduced hospitalization. The community is set to enjoy those benefits upon implementation of the study recommendations. No research on WASH has been done in the sub-county before. Also, according to Kieni East Sub-County annual work plan 2016/17, there are higher rates of diarrheal diseases in the sub-county than the rest of the Nyeri County. Hence, the study findings will contribute to the overall improvement of the WASH program in the sub-county.
1.7 Limitation

This study was confined to community themes on water, sanitation and hand hygiene in Kieni East sub-county, Nyeri County. This study was limited to the residents of Kieni East. There are various themes that have effects on the health of a community such as the availability and adequacy of clean water, good sanitation, and proper hygiene. However, apart from these major factors, there are other factors such as poor nutrition, poor health-seeking behavior, and inactivity of the community members, violence and injury which were not included in this study. The study also did not look at the use of ash in hand washing, did not assess the knowledge of the importance of hand washing, the timings of hand washing and the steps of hand washing. Equally the study did not assess level of contamination of water. There was also the likelihood of response bias interfering with the study findings, however, the researcher explained to the respondents the importance of being honest as possible. The study also did not assess the following variables; frequency of hand washing and other incidence or timings when hands should be washed.

1.8 Delimitation

This study concentrated on community themes on water, sanitation, and hand hygiene in Kieni East sub-county, Nyeri County. The study examined the extent to which water availability, good sanitation and proper hand hygiene influences on diarrheal diseases among the community members in the sub-county. The study targeted residents of Kieni East Sub-county, Nyeri County and collected data from the household members.
1.9 Conceptual/Theoretical framework

Independent variable

Hand hygiene practice

- With soap
- Without soap

Sociodemographic characteristics

- Sex
- Age
- Education
- Occupation
- Household size

Water

- Availability
- Adequacy

Diarrheal diseases prevalence

(Source: Created by the author, 2018)

Figure 1.1 Conceptual framework
CHAPTER 2: LITERATURE REVIEW

2.0 Introduction

This chapter presents a review of the literature available on key issues dealing with WASH and how it affects the life of the people in terms of diarrheal diseases. This chapter begins with factors influencing sanitation, access to water and hand washing practices situating the research topic within the public health field of study. This is followed by identified gaps in the literature review.

2.1 Background on global and regional perspective on WASH

Lack of safe water, sanitation and hygiene remains one of the world’s most urgent issues. Worldwide, 748 million people cannot access to an improved source of water and 2.5 billion equally cannot access to improved sanitation. The global goal on water is to address "unfinished business" and encourage governments to adopt ambitious targets for improving WASH service levels in order to reduce the global burden of WASH-related diseases, to improve productivity and economic growth, and to reduce inequalities between population groups. In July 2014, Sustainable Development Goals were developed (SDGs) which adopted a global water goal entitled "Ensure availability and sustainable management of water and sanitation for all" (UNDESA, 2015). For Africa to improve on WASH, it has to deal with its implementation challenges such as low WASH financing, low institutional capacity, political support and management of inconsistencies in the enforcement of legislation. There is a need to scale up appropriate technologies and improve capacity to deal with inequalities and tackle the problems of open defecation, WASH in schools and health centres (UNDESA, 2015). Despite the fact that North Africa has 90% coverage, Sub-Saharan Africa has a startling 30% coverage with only a 4% increase from 1990. This is a serious concern because of the associated massive health burden as many people who
lack basic sanitation engage in unsanitary activities like open defecation, solid waste disposal and wastewater disposal. The practice of open defecation is the primary cause of faecal oral transmission of disease with children being the most vulnerable (UNDP, 2012). The water and sanitation position in West/Central Africa is of particular urgency, as the region has the highest under-five mortality rate of all developing regions: 191 child deaths per 1,000 live births. Recurrent outbreaks of cholera in both urban and rural areas underline the poor state of this region’s basic living conditions (UNDP, 2012).

2.2 Uptake of sanitation

Diarrheal diseases accounts for one in nine childhood mortality worldwide. A lot of efforts have been made by Kenya government over the past twenty years such as introduction of rotavirus vaccination, promotion of breastfeeding, diarrhoea prevention messages focused on safe water and improved sanitation to address the high cases of diarrhea. Also in an effort to address the diarrheal disease burden, the Ministry of Health (MoH) in Kenya introduced community focused programmes. An example is in 2006 Kenya started Community Health Strategy (CHS) which was targeted at engaging communities in managing their own Health (MOH, 2006). From that time, the Government with support from partners in the Health sector including civil society organizations (CSOs) have supported the initiative by establishing and operationalizing Community Health Units (MOH, 2014). However, the most recent Kenya Demographic and Health Survey (KDHS) report showed the prevalence of diarrhea among children under the age of five is 15 percent (KDHS, 2014).

Kenya revised its National Environmental Sanitation and Hygiene (NESH) policy 2017 to match with its 2010 Kenyan constitution and Kenya vision 2030.
Under the NESH policy 2017, the National Government is responsible for national policy, training, capacity building, technical assistance and standards formulation. The county governments are responsible for county sanitation services including licensing and control of undertakings that sell food to the public, cemeteries, funeral parlours and crematoria, refuse removal, refuse dumps and solid waste disposal and storm water management in built-up areas (NESH, 2017). Despite Nyeri County ranked by the Ministry of Health as number one county in terms of sanitation coverage, it has 25.4% unimproved sanitation and 0.3% open defecation (MOH, 2014). However, Nyeri County has a clear policy and advocacy plan to gain support for sanitation. It has a strategic plan and sanitation targets that it is working towards achieving them. There is also clear operational structure with dedicated budget line for putting sanitation in place. The county has a capacity building plan in place and sufficient number of staff to implement sanitation activities (MOH, 2014).

According to Adan et al 2017, the inadequacy of water in Kieni, Nyeri County, has resulted in low hand washing practices, leading to the high burden of WASH-related diseases such as diarrhea. In 2016, the sub county had the highest prevalence of diarrhea of 11.3%. However, the area has a latrine coverage of above 90 percent (Adan, Sugow, & Somo, 2017).

2.3 A conceptual model for WASH and diarrhoea

There are various ways of controlling ‘WASH’ related diseases which research have proved to be very effective. However, there is complexity in the randomization of water supply and sanitation. Thus, most studies recommend for observational studies when it comes to WASH-related diseases (Hoque et al. 1995 and Strina et al. 2003).
According to Victoria et al (1998), studies have proven that health intervention which has a positive result on morbidity due to WASH-related diseases will have similar outcomes on mortality related to WASH diseases. In observational studies, it is recommended that for water source be categorized into “improved connection” and "unimproved connections." Interventions targeting sanitation to focus on handwashing with soap as a measure to hygiene promotion in general.

Figure 2.3 displays the relationship between each intervention and the outcome of reductions in diarrhoeal disease. Another model called “Prüss and others’ model”, developed by Prüss and colleagues (2002), though with a different viewpoint ends with the same results on how best to control WASH-related diseases.
Prüss & Others Model

Present model

VI: No water supply or sanitation

1.60

Va: Basic sanitation

1.00

1.26

Vb: Improved

1.56

N: Improved water & Basic sanitation

1.54

111: Piped water supply or other improvement

2.76

(1.80)

11: House connection & Sanitation

2.50

1: Ideal-No disease transmission

Source: Cairncross & Valdmanis 2006

Figure 2.1A model conceptual framework for diarrhoeal diseases prevention.

Note that the numbers represent the relative risk for developing diarrhea.
2.4 Access to water

According to World Bank (2013), getting water from the piped source is referred to as an improved water source whereas drawing water from the rivers and open boreholes are referred to as an unimproved water source. Water is a basic necessity for all living creatures in this world for their survival, however in third world countries where Kenya is included, getting this water remains a challenge to most of the people (Henschen et al., 2012). According to Vidal (2012), there are over three hundred million individuals in third world countries whom, for them to get adequate water is a nightmare and approximately two hundred and thirty million individuals do not have latrines. In an effort to address water and sanitation issues, Kenya as a country has revised its National Environmental Sanitation and hygiene policy (2017) and realigned it with the current constitution that defined the devolved system of governance. In the same policy, water and sanitation activities have been devolved and now they are the function of the county government, leaving the national government with oversight role and development of standards. It is through these drastic changes that Kenya as a country is working towards attaining the sustainable development goal six to ensure its citizens have clean water and sanitation. This will see the more than 15 million Kenyan citizens that have not been reached by improved water supply, and the 20 million denied improved sanitation by 2030 they get these services (USAID, 2011). According to USAID (2011), WASH-related diseases are a major health concern in Kenya and the rest of Sub-Saharan Africa that needs innovative ways to be developed so that they are addressed.

2.5 Factors influencing sanitation

Inadequate availability of water and sanitation leads to poor utilization of the natural resources (WHO/UNICEF, 2006). Sociodemographic characteristics significantly lead
to what extent the community will need water (Allain, 2014). The size of the household members is a key contributor to the amount of water that will be used in the community, the bigger the household the more water will be needed. The concentration of population in one particular area such as big towns and cities results in higher demand for these two commodities, which is water and sanitation (Allain, 2014). Low socioeconomic status in towns and cities has a direct effect on the availability of adequate water and sanitation in this set up (Dungumaro, 2017).

Another study conducted by Lawrence et al. (2012), reveals similar results that socioeconomic status is a major driver of community access to water and basic sanitation. According to Dungumaro (2017), availability of water and adequate sanitation also depends on who is leading that family, is it a male or a female in the forefront of the family affairs. Addressing issues pertaining to WASH is among the key priorities as a country in Kenya together with other nations in an effort working towards achieving sustainable development goal number six which aims at addressing attainment of clean water and sanitation by 2030 (United Nations General Assembly, 2011). According to the Kenya National Bureau of Statistics (2010), addressing the availability of water and sanitation saves a lot of time for the community. This enables the community to focus on economic activities that will improve their living standards. It also results in lesser cases of illness among the community members, hence more focus again put on the education of their children and conducting their day today business (Bergeron and Esrey, 2013). Too, it results in better academic performance to the school going children in the community (Carter et al., 2015). In summary, addressing and working towards the attainment of sustainable development goal number six, which focuses on clean water and sanitation is a key component to community prosperity in various dimensions (Bhargava, 2016).
2.6 Hand hygiene

Hand washing entails a process where hands are well cleaned to get rid of the infectious materials that the hand has come into contact with. These infectious materials can be soil or microorganism (CDC, 2013). Washing hands using soap is among the best method and cheapest of reducing the burden of WASH-related diseases in a community, it helps bring down the high morbidity and mortality caused by diarrhea.

In health care setting there are five moments of hand washing that are recommended, these are; before touching a patient, before clean or septic procedure, after body fluid exposure risks, after touching patient and last but not least after touching patient surrounding (CDC, 2013). However in the community set up, community members are encouraged to wash their hands after coming into contact with dirty material, after visiting toilet, before preparing food, before and after eating, after changing a baby diaper, after handling a sick person and after handling an animal (CDC, 2013).

Handwashing procedure entails washing hands with clean and warm running water is the most effective way of disinfecting the hands. Turn on the faucet and wet your hands with the wrists and the fingers turned to downward direction. Use of an ample amount of water to do this act is always encouraged (Duru, 2015). Despite efforts by countries such as Kenya to improve the state of clean water and sanitation, there is still a high number of children who die under the age of five years due to diarrhea. Research has shown that there is low hand washing practice among communities yet it is a simple exercise. Use of school children to promote handwashing has proved to be effective (Aigbiremolen, Abejegah, Ike, Momoh, & Abah, 2015). Washing hands with soap and keeping them clean has proved to be a cost-effective measure to stop spreading of microorganism’s from one individual to
Micro-organisms come into contact with individuals hands after use of the toilet or at times after handling raw contaminated meat. Similarly, microorganisms can find their way to individual’s hands when hands get into contact through generated aerosols that are infective (CDC, 2013). With pathogens in an individual’s hands, they are easily passed on to another individual, leading to the setting in of an infection, hence resulting in an illness in that individual. Micro-organisms that are in unclean hands can contaminate meals and liquids that are consumable by a man during the process of cooking. When these meals are taken by man, the microorganisms can grow and cause an illness to the person who has consumed the contaminated meal. Removing microorganisms by proper washing hands with soap help to keep the community healthier (Duru, 2015). The practice of cleaning hands with soap is a good practice for the community to stay healthy and free from constant WASH-related diseases. According to a study conducted by the United Nations Children’s Fund (UNICEF) and the Ethiopian Ministry of Health found that approximately 52% of students as having adequate knowledge of proper hygiene. Most students reported hand washing before meals (99.0%), but only 36.2% reported using soap. Although 76.7% of students reported that washing hands after defecation was important, only 14.8% reported actually following this practice. Students with adequate knowledge of proper hygiene were more likely to have clean clothes (AOR 1.62, CI 1.14-2.29) and to have a lower risk of diarrheal disease (AOR 0.78, CI 0.56-1.09)(Williams, 2014).

2.7 Gaps in the literature review

The purpose of the review of the above literature was to avoid unnecessary and unintentional duplication of the framework from which the research findings were interpreted and also demonstrate the researcher’s familiarity with existing knowledge.
Kenya revised its NESH policy in 2017 to fit with its new 2010 constitution, the devolved system of governance and Kenya vision 2030. The revision of the NESH policy also took into account the declaration of clean environment and sanitation as guaranteed human rights, devolution of sanitation function and the changing context of development (Health, 2016). Since devolution and the revision of the NESH policy 2017, no research on WASH has been conducted in Nyeri County. It is against this background that the current study sought to investigate on the effect of water, sanitation and hand hygiene practices on diarrheal disease among the community members in Nyeri County.
CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

Specifically, the chapter discusses the research design, population under study, instruments for data collection, procedures for data collection and analysis of data. Data presentation method to be used is also discussed in this chapter.

3.2 Research design

Cross-sectional study design was used in this study. This was to ensure proper description of the study subjects and bringing out the real situation of the community on the themes under study.

3.3 Variables

In this study, independent variables included sociodemographic characteristics such as Age, sex, household size, level of education and occupation of community members, Water availability and adequacy and hand hygiene practices with soap and without soap. The dependent variable was prevalence of diarrheal diseases among the community members.

3.4 Location of the study

Nyeri County is in central part of Kenya. The County has an area of 3,356 square Kilometers. Nyeri is constituted of eight sub counties (Tetu, Kieni East, Kieni West, Mathira East, Mathira West, Othaya, Mukurwe-in and Nyeri town). Kieni East sub-county was picked to represent the needs of the population in the semi-arid region which is considered as the hardship area.

3.5 Study Population

This composed of residents in Kieni East Sub-County. The population of Kieni East-Sub-County is a total of 187,871 people, where 95,814 are females and 92,057 are males.
3.6 Sampling technique

Simple random sampling was used to select two wards out of the four wards in Kieni East Sub-County. The two wards were Gakawa and Thengu.

3.6.1 Sample Size Determination

This was calculated by use of Fishers et al formulae (1998) for the target population of 10,000 and above, where:

\[ n = \frac{Z^2 PQ}{d^2} \]

Where \( n \) = sample size

\( Z \) = standard normal deviate (1.96) which corresponds to a 95% confidence interval.

\( P \) = Proportion of target population estimated to have particular characteristic’s.

The estimated \( P \) is 15% (0.15) of the target population.

\( q = 1 - P \)

\( d \) = degree of accuracy of 0.85

\[ n = \frac{1.96^2 \times 0.15 \times 0.85}{0.05^2} = 200 \]

3.6.2 Sampling Procedure

Purposive sampling method was used to select household in the two wards. In Thengu ward 98 households were selected and Gakawa ward 102 households.
Table 3.1 proportinate sampling of households in the two wards

<table>
<thead>
<tr>
<th>Name of the Ward</th>
<th>Number of Households</th>
<th>Percentage contribution to the sample size</th>
<th>Number of households sampled</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gakawa ward</td>
<td>8,054</td>
<td>49%</td>
<td>98</td>
</tr>
<tr>
<td>Thengu ward</td>
<td>8,458</td>
<td>51%</td>
<td>102</td>
</tr>
<tr>
<td>Total</td>
<td>16,512</td>
<td>100%</td>
<td>200</td>
</tr>
</tbody>
</table>

3.6.3 Construction of Instrumentation

The instrument that was used was a questionnaire. They were adapted from WHO, (2014) toolkit for evaluating water, sanitation and hand hygiene practice in a community. The supervisors opinion and guidance was also put into consideration. The questionnaires were then printed out and were administered to the household members in the study area.

3.6.4 Pre-test and Validity

Pre-testing of the questionnaire was done in some selected household members within Kieni East Sub-County. The main objective of pre-testing was to make the questionnaire more clear and collect the intended information. The pre-testing was conducted to 10 percent of the respondents, who were sampled using purposive sampling technique. The survey instrument was used to determine the community themes on water, sanitation and hand hygiene in Kieni East Sub-County. This focused on the clarity of the questionnaire. A pretest was performed and tools were refined for precision, clarity and inclusiveness through close consultation with the supervisor. The research assistants were selected using academic level, the right experience and knowledge of the local the local language and having worked with the community as an added advantage. Two participants that met the criteria were trained in one day
and were taken through the study objectives, data collection instruments and methods and ethical aspects.

3.6.5 Reliability
This is the consistency expected in data collection tools to ensure there is quality of the generated data and consequently the information after analysis. To achieve this, the data was collected by well-trained research assistants and data collection was done in the same time frame. The researchers cross-checked the consistency of findings while getting response from the respondents and the raw data was edited in the field. Each day a de-briefing session was held to collate findings, identify, discuss and resolve the challenges before the next day.

3.6.6 Data collection technique
The questionnaires (Appendix 11) was used in this research to obtain primary data from the respondents. In addition due to the different locations of the field staff, it was more effective to use questionnaires to gather more information. The researcher used two research assistants who were selected based on their level of education, having worked with the community, could speak the local language and had a wealthy of experience in public health. They visited the selected households and mate with the head of the household whom they administered the questionnaire to.

3.7 Data analysis
Data was entered and this was done after data collection was complete and cleaning done. To analyze quantitative data, a statistical software package for social sciences (SPSS V.23) and Microsoft Excel was used. A regression model was being used to show the significance of predictor’s variables. Statistical tests were computed to show an association between the predictor’s variables and the outcome variables. Frequency tables, pie charts and bar graphs were generated in presenting the research results.
3.8 Ethical and Logistical Considerations

To ensure that the research was done in an ethical manner according to the expectations of all authorities, a letter (Appendix 111) from Kenyatta University Graduate School was obtained. The researcher was obliged by law to ensure that the information collected was treated with utmost confidentiality, hence all files containing the research information were put under lock and key. Research permit was sought from the County Director of Health (Appendix V). Respondents were explained to and assured that the information collected was treated with utmost confidentiality, hence it was the duty of the researcher to address the concerns of the participants on the information given. Participation was voluntary and participants were informed that they could withdraw participation at any time of the interview (Appendix I).
CHAPTER 4: RESULTS

4.1 Introduction

This chapter presents the results of quantitative data analysis of the study. It is divided into two major sections. The initial part of the results section explains the socio-demographic characteristics of the empirical survey, giving the details of the age of the respondents, gender of respondents, and occupation. The second section of the chapter provides results, which were based on the three major research questions of the study. For the purposes of this preliminary analysis, descriptive statistics was frequently used to describe the general characteristics of the data collection.

4.1.1 Response Rate

Out of the 200 questionnaires dispatched, all of them were duly filled and returned making response rate of 100%. This was because the research assistants were public health officers who were well trained on use of the data collection tool before the exercise. They were recruited from the local community, hence could speak the local language and interact well with the community members. They were also facilitated with motorbike to enable their movement from house to house.

4.2 Socio-demographic characteristics of the respondents

Table 4.1 presents the socio-demographic characteristics of the respondents. Majority of the respondents were females (80%), aged 31-40 years (35%), had primary education (50%), farmers (76%), with a household size of 4-5 members (54%). Majority of the household had one or more child under five years old.
Table 4.1 Characteristics of the respondents

<table>
<thead>
<tr>
<th>Variables</th>
<th>Category</th>
<th>Frequency (n=200)</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>Female</td>
<td>160</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>40</td>
<td>20</td>
</tr>
<tr>
<td>Age (years)</td>
<td>&lt;20</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>21-30</td>
<td>61</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td>31-40</td>
<td>70</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>41-50</td>
<td>43</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>51-60</td>
<td>12</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>61-70</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>&gt;71</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Education</td>
<td>None</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Primary</td>
<td>100</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>Secondary</td>
<td>68</td>
<td>34</td>
</tr>
<tr>
<td></td>
<td>Certificate</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Diploma</td>
<td>16</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Degree</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Occupation</td>
<td>Farmer</td>
<td>76</td>
<td>38</td>
</tr>
<tr>
<td></td>
<td>Housewife</td>
<td>30</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>Teacher</td>
<td>13</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Self-employed Business</td>
<td>33</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>Casual laborers</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Others</td>
<td>45</td>
<td>23</td>
</tr>
<tr>
<td>Household Size</td>
<td>1-3</td>
<td>35</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>4-5</td>
<td>107</td>
<td>54</td>
</tr>
<tr>
<td></td>
<td>6-8</td>
<td>55</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>&gt;8</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Children below 5 years in Household</td>
<td>0</td>
<td>50</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>100</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>45</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>
4.3 Prevalence of diarrhea among the community members

Figure 4.1 shows the distribution of diarrhoea among the household in the 2-weeks preceeding data collection. Diarrohea was reported in 13% (26 households) of the households.

Figure 4.1 Prevalence of diarrheal disease among the households

4.4 Sociodemographic characteristics influencing prevalence of diarrhea.

Table 4.2 shows a community member’s occupation was not associated with diarrhea; however, the odds of having diarrhea was 1.3 times higher in those with low level of education compared to those with higher level of education (OR=1.3; 95% CI 0.88-1.81). The table also shows that the odds of diarrhea was 1.52 times higher in community members from the households with four or more members compared to community members in the households with only one to three members (OR = 1.52; 95% CI 1.03 - 1.76). This was statistically significant.
Table 4.2 The influence of sociodemographic characteristics on prevalence of diarrheal disease

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Diarrhea (N=200)</th>
<th>Odds Ratio (95% C.I)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age of the household member</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age 15-24</td>
<td>19</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>0.76 (0.56-1.03)</td>
</tr>
<tr>
<td>Age 25-34</td>
<td>55</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>0.83 (0.54-1.25)</td>
<td></td>
</tr>
<tr>
<td>Age 35 and above</td>
<td>100</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><strong>Level of education</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary education</td>
<td>14</td>
<td>86</td>
</tr>
<tr>
<td></td>
<td>1.3 (0.88-1.81)</td>
<td></td>
</tr>
<tr>
<td>Secondary education and above</td>
<td>12</td>
<td>88</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><strong>Occupation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Housewife</td>
<td>4</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>0.99 (0.31-3.1)</td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td>22</td>
<td>147</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><strong>Household size</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-3 family members</td>
<td>4</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4 and above family members</td>
<td>22</td>
<td>143</td>
</tr>
<tr>
<td></td>
<td>1.52 (1.03-1.76)</td>
<td></td>
</tr>
</tbody>
</table>

4.5 Water as a factor influencing diarrheal disease

4.5.1 Source of water for the community

Figure 4.3 shows in both wards, the main source of water is from piped water (85; 85%) in Gakawa and 77 (77%) in Thengu, then from river (15; 15% in Thengu and 6; 6% in Gakawa).
Figure 4.2 Water source in Kieni East Sub- County.

4.5.2 Adequacy of water

Figure 4.3 shows water was adequate for their domestic needs, 116 (58%) said yes and 84 (42%) said no.

Figure 4.3 Adequacy of water for domestic needs.
4.5.3 The influence of water-related factors on prevalence of diarrhoeal diseases

Table 4.3 shows statistical significant result that unimproved water source is more likely to cause diarrhea than improved water source (OR 1.52; 95% CI 1.11-1.83). Households receiving inadequate water had higher odds of diarrhea compared to households receiving adequate water (OR 1.85; 95% CI 0.36-1.97).

Table 4.3 Water-related factors influencing prevalence of diarrheal diseases

<table>
<thead>
<tr>
<th>Water related factors</th>
<th>Diarrhea (N=200)</th>
<th>Odds Ratio (95% C.I)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water source</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>19</td>
<td>19</td>
</tr>
<tr>
<td>No</td>
<td>144</td>
<td>1</td>
</tr>
<tr>
<td>Piped water source (improved)</td>
<td>1.52 (1.11-1.83)</td>
<td></td>
</tr>
<tr>
<td>Not piped water source (unimproved)</td>
<td>1.85 (0.36-1.97)</td>
<td></td>
</tr>
<tr>
<td>Adequacy of water</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes, it is adequate</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>No, it is not adequate</td>
<td>16</td>
<td>74</td>
</tr>
</tbody>
</table>

4.6 Hand washing practice

4.6.1 Toilet coverage

Figure 5.4 shows, Gakawa ward had a toilet coverage of 99%, whereas Thengu ward had a toilet coverage of 95%.
4.6.2 Hand washing facilities

Observation showed that Gakawa ward had 72% (n=100) hand washing facilities, where 24% (n=72) of those hand washing facilities had soap. Thengu ward had 49% (n=100) hand washing facilities, where 30% (n=49) of the hand washing facilities had soap.
4.6.3 Cases of diarrhea in each ward in relation to toilet coverage and handwashing facilities

Thengu with a low toilet coverage and handwashing facilities had reported a high number of diarrheal cases (20 more than Gakawa).

Table 4.4 Cases of diarrhea per ward in relation to toilet and handwashing coverage

<table>
<thead>
<tr>
<th>Ward</th>
<th>Percentage toilet coverage</th>
<th>Percentage availability of handwashing facilities</th>
<th>Number of diarrheal cases reported</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gakawa</td>
<td>99</td>
<td>72</td>
<td>6</td>
</tr>
<tr>
<td>Thengu</td>
<td>95</td>
<td>49</td>
<td>20</td>
</tr>
</tbody>
</table>

4.6.4 Handwashing facilities, toilet and prevalence of diarrheal disease

In table 4.5 it shows diarrhea among community members was significantly associated with lack of handwashing facilities (OR 3.5; 95% CI 1.55-2.99).

The table also shows diarrhea was associated with unavailability of toilets in some community member (OR 1.7, 95% CI 1.14-2.07).
Table 4.5 Handwashing facilities, toilets and prevalence of diarrheal disease

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Diarrhea (N=200)</th>
<th>Odds Ratio (95% C.I)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Availability of toilet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>25</td>
<td>1.7 (1.14-2.07)</td>
</tr>
<tr>
<td>No</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Availability of handwashing facility</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>3</td>
<td>3.5 (1.55-2.99)</td>
</tr>
<tr>
<td>No</td>
<td>23</td>
<td></td>
</tr>
</tbody>
</table>
CHAPTER 5: DISCUSSION, CONCLUSIONS AND RECOMMENDATION

5.1 Discussion

This study investigated the effect of water, sanitation and hand hygiene practice on diarrheal disease among the community members in Kieni East Sub-County in Nyeri County. The two-week prevalence of diarrhea among the community members in Kieni East Sub County was 13 percent. This was slightly higher than the reported 11.3% in the Kieni East Sub-County Annual Work Plan (2016/17).

The two-week period of diarrhea occurrence used as criteria in this study to avoid recall bias, is a similar criteria used in other studies conducted in Eastern Ethiopia (Bezatu, Berhane, & Worku, 2013). Such high rate of diarrhea, despite improvements in water sources and sanitation facilities, indicates the need for more attention.

The study showed that households where the heads had a low education level were more likely to have diarrhea when compared with those of higher education. This finding was similar with other studies; Anteneh and Kumie (2010) report the diarrhea was high among household members whose mother don’t read or write. This is because education provides the knowledge on the rules of hygiene, feeding and weaning practices (Shikur et al, 2013). Hence there is need to create awareness on the community members on various methods of preventing diarrhea.

The study differs with another study in Ethiopia. It showed there is significance in age of the household head and cases of diarrhea reported (Gebru, Taha, & Kassahun, 2014); whereas, in this study, there was no significance in the age of the household head and diarrhea.

In this study, diarrhea was significantly associated with the presence of four or more family members in a household. This is in agreement with a study done in Pakistan that demonstrated more cases of diarrhea reported in a household which has four or
more members (Shah et al, 2003). Other studies also indicated that number of household members was a predictor of diarrhea among the household members (Arif & Naheed, 2012). This might be due to the incapability of the caregiver to care for a large number of family members. It may also be due to economic status; more kids means more drain on economic resources, where if one have to choose between food and soap, one will chose food. Hence there is need to promote family planning in the community.

There was significance in association between household members whose family’s accessed drinking water from unimproved sources and chance of developing diarrhea. This can be explained by the possibility of unimproved water sources getting contaminated with human faeces and animal waste, which carry a number of diseases causing infective microorganisms which cause diarrheal diseases. The result of this study are also consistent with the findings of a similar study conducted in Eastern Ethiopia where more cases of diarrhea were reported in household drawing water from unimproved water source. In his study, he indicated that the unimproved water source was getting contaminated by human and animal waste (Mengistie et al, 2013). Hence there is need to create awareness on communities that draw water source to do chlorination of water at home before use. Provision of free chlorine to these households will aid this intervention.

In this study, diarrheal disease was associated with the adequacy of water collected for daily domestic uses. Those households who have inadequate service level were highly affected by diarrhea. The finding of this study are also in line with the findings of other studies conducted in Sub-Sahara Africa that showed more cases of diarrhea coming from households getting inadequate water (Pickering & Davis, 2012). This might be due to the fact that access to adequate service level has an association with
the frequency of hygiene behaviors of the households. It is very difficult to keep personal hygiene and cleanliness of utensils if there is a shortage of water. There is need to educate the community to invest in water storage facilities so that they can store adequate water for their needs. Harvesting of rain water should also be encouraged.

In this study, toilet coverage had a significant relationship with cases of diarrhea reported. The ward with low toilet coverage reported higher cases of diarrhea than the ward with higher toilet coverage. Similar findings were also reported in a study conducted in Northeast Ethiopia where more cases of diarrhea were in a community with low toilet coverage (Aigbiremolen, Abejegah, Ike, Momoh, & Abah, 2015). Poor toilet coverage leads to open defaecation. This leads to environmental contamination, mainly water and food sources. Hence providing conducive environment for vector breeding sites, which ultimately result to wide spread of diarrhea. Households without toilets should be encouraged to construct toilets.

Studies have shown the importance of hand washing in reducing the occurrence of diarrhea among household members (Bezatu et al., 2013). However, monitoring correct hand washing behavior at critical times is challenging. Some hygiene behavior related observational studies have shown a wide discrepancy between what people said and did, suggesting that reported hand washing behavior is often an overestimate (Strina et al., 2003). Thus, looking at the availability of water and soap in places of hand washing is a better indicator of hand washing behavior (Halder et al., 2010). In this study, there was a significant positive association between the availability of hand washing facility with soap and household member’s diarrhea. Washing hands after visiting toilet is important to reduce the number of microorganisms that have come into contact with hands (Mohammed, 2014).
In conclusion, diarrhea remains an important public health concern in the study community. Occurrence of diarrhea could be decreased by interventions aimed to improve water availability, sanitation and hygiene.

In summary, the major findings of the study are that education level of the household member influences the occurrence of diarrhea. The lower the level of education the more chances of diarrhea is likely to occur in that household. Also the family size, the smaller it is the less likely of diarrhea occurring in the family. In this study there was a significant positive association between the availability of handwashing facility with soap and households members diarrhea. Also in summary there was a significant association between household members whose family accessed drinking water from improved water source has less chances of developing diarrhea.

5.2 Conclusion
This study revealed a high prevalence of diarrhea of 13% among the community members of Kieni East Sub-County. The main sociodemographic characteristics that were predictors of diarrhea in the community were low education level and large household size.

In the community, there was inequality in piped water distribution. More community members in Gakawa received piped water than those in Thengu ward. More cases of diarrhea were reported from households receiving water from unimproved water source, such as rivers and unprotected wells. Despite the high percentage of community members having connected to piped water, 42% reported that the water they receive is not adequate for their domestic use; Meaning that sometimes the taps are dry, and this inadequacy of water was among the predictors of diarrhea in the community.
The community has a very high toilet coverage of 97%, however, the hand washing facilities were of low coverage. Again despite this moderate availability of handwashing facilities, fewer had soap, Gakawa ward 24% and Thengu 30%. The low availability of handwashing facilities with soap indicate that the community is not consistently practicing adequate handwashing practices.

5.3 Recommendations

There are two categories of recommendations to Nyeri County Department of Health services, one from the study and another one for further research.

5.3.1 Recommendations from the study

In order to reduce the burden of diarrheal disease in the community the National Ministry of Health and the Department of Health Services, Nyeri County should:

Initiate a sensitization program in Kieni East Sub-County on hand washing and hand hygiene. Such a program should target lowly educated and the poor. Distribution of free soap would greatly aid efforts to enhance hand washing in the area.

Scale up connectivity of piped water especially in Thengu ward and encourage the community to invest on storage facilities to store adequate water to meet their domestic needs.

Educate the community to scale up hand washing facilities by use of improvised tippy tap and Leaking tin for the poor.

5.3.2 Recommendations for further research

A research on factors influencing diarrhea among children below five years.

A research to identify and detect microbial contaminants in drinking water:

Research on the provision of soap/tippy taps and effect on handwashing practices.
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Appendix I: Consent Form

Hallo, my name is …………………………………………… I am interviewing study participants on behalf of Cosmas Mwamburi who is a Master of public health (Public Health Systems Management and Application) student at Kenyatta University, Nairobi. The objective of this study is to help assess the water, sanitation and hand hygiene practice among the community members. The findings will help in addressing the identified gap with the ultimate aim of improving the community health. The information collected and used for purposes of this study shall be treated with utmost confidentiality by the researchers and will not be availed to any other person outside the purposes of this study. No names except initials where relevant, shall be on this form. Your participation is voluntary and you can choose to decline to answer any questions you are not comfortable with. We appreciate your assistance and co-operation in completing this study.

Thank you.

The Participant:

I agree to participate in the research study. The purpose and nature of the study has been explained to me. I am participating voluntarily. (Please tick one box below)

1. Yes, I agree to participate

2. No, I do not agree to participate

Signed……………………………………. Date………………………….
Appendix II: Questionnaire

This study is aimed at assessing the community health needs in order to guide public health action. The information obtained from the interviews will be confidential and your consent is requested. Hence as the respondent you are requested to give correct and honest information.

**Background information**

1. House hold number ID

2. Name of Ward

3. Sub- County

4. Age of respondent

5. Sex  □ Male  □ Female

6. Please what is the level of your highest formal education?

   □ None  □ Primary education (KCPE)

   □ Form four leaver (KCSE) □ Certificate (specify)

   □ Diploma (specify) □ Degree (specify)

7. What is your occupation?........................................................

8. What is the total number of family members?..............................

9. What is the total number of children less than five years?..............
Water

1. What is the primary source of drinking water for your household?
   - [ ] Piped water
   - [ ] Water boozer – tanker delivery
   - [ ] Free aid from humanitarian
   - [ ] Private Well
   - [ ] Others (specify)

2. Is there water storage?  [ ] Yes  [ ] No.
   If yes, how many liters of drinking water capacity storage do you have? .................

3. How often does your household have running water from the network? For those with piped water
   - [ ] Not connected
   - [ ] Less than 4 hours per day
   - [ ] 5 to 12 hours per day
   - [ ] More than 12 hours per day

4. Is the water you are receiving enough to satisfy your needs  [ ] Yes  [ ] No

5. How much was your water bill last month? ..................................................

Hygiene Practices

12. When do you usually wash your hands? (Multiple responses)
   Before preparing/serving food  Before mealtime
   - [ ]
   After mealtime  After general cleaning
   - [ ]
   After using the toilet  After sneezing/coughing
   - [ ]
   Explain any other time you wash hands.
   - [ ]
13. Observe if there is a toilet in the homestead  ☐ Yes  ☐ No

If yes, observe if there is hand washing facility with soap  ☐  ☐ Yes
☐ No

Health

14. Has anyone in your household less than five years of age had unusual diarrheal symptoms (watery/bloody diarrhea) for a few days in the past two weeks?
☐ Yes  ☐ No

15. Has anyone in your household more than five years of age had unusual diarrheal symptoms (watery/bloody diarrhea) for a few days in the past two weeks?
☐ YES  ☐ NO
Appendix III: Approval Letter

KENYATTA UNIVERSITY
GRADUATE SCHOOL

Website: www.ku.ac.ke

Internal Memo

FROM: Dean, Graduate School

DATE: 16th October, 2018

TO: Cosmas Mwamburi Mwashumbe
     C/o Health Management and Informatics Dept.

REF: Q142/39240/2016

SUBJECT: APPROVAL OF RESEARCH PROJECT PROPOSAL

This is to inform you that Graduate School Board at its meeting of 11th October, 2018 approved your Research Project Proposal for the MPH Degree Entitled, “Effect of Water, Sanitation and Hand Hygiene Practices on Diarrheal Diseases among Community Members in Nyeri County, Kenya”.

You may now proceed with your Data Collection, Subject to Clearance with Director General, National Commission for Science, Technology and Innovation.

As you embark on your data collection, please note that you will be required to submit to Graduate School completed Supervision Tracking Forms per semester. The form has been developed to replace the Progress Report Forms. The Supervision Tracking Forms are available at the University’s Website under Graduate School webpage downloads.

Thank you.

HARRIET ISABOKE
FOR: DEAN, GRADUATE SCHOOL

cc. Chairman, Health Management & Informatics Department.

Supervisors:

1. Dr. George Otieno
   C/o Department of Health Management & Informatics
   Kenyatta University
KENYATTA UNIVERSITY
GRADUATE SCHOOL

E-mail: dean-graduate@kun.ac.ke
Website: www.kun.ac.ke

P.O. Box 43844, 00100
NAIROBI, KENYA
Tel. 8710901 Ext. 37330

Our Ref: Q142/39240/2016

DATE: 16th October, 2018

Director General,
National Commission for Science, Technology
and Innovation
P.O. Box 30623-00100
NAIROBI

Dear Sir/Madam,


I write to introduce Cosmos Mwamburi Mwashumbe who is a Postgraduate Student of this University. The student is registered for M.PH degree programme in the Department of Health Management & Informatics.

Cosmos intends to conduct research for a M.PH Project Proposal entitled, “Effect of Water, Sanitation and Hand Hygiene Practices on Diarrheal Diseases among Community Members in Nyeri County, Kenya”.

Any assistance given will be highly appreciated.

Yours faithfully,

PROF. PAUL OKEMO
DEAN, GRADUATE SCHOOL
Appendix V: County Letter

DEPARTMENT OF HEALTH SERVICES
DIRECTOR OF HEALTH SERVICES

Tel: 0202425160
Email: nyericountyhealth@yahoo.com

COUNTY COMMISSIONER'S HQ
BLOCK 'A'
P.O. BOX 110 - 10100

Ref No: CGN/HEALTH/CIR 18th Sep, 2018

TO WHOM IT MAY CONCERN

Dear Sir/madam,

Ref. AUTHORITY TO COLLECT DATA IN NYERI COUNTY

It gives me great satisfaction to introduce Cosmas Mwashumbe, He is a Master of Science student in Public Health Systems Management and Application which is anchored under Improving Public Health Management for Action program (IMPACT). IMPACT is a joint venture of Ministry of Health, Kenyatta University and Center for Disease Control. The IMPACT Programme is a competency-based training, and a fellow is required to cover eight core activity for Learning. Cosmas has been on placement at the County health department, director's office since March 2017 and he is conducting a household survey for his project. The project title is "Effect of water, sanitation and hand hygiene practices on diarrheal diseases among community members in Nyeri County, Kenya."

In view of this, I request you give Cosmas the necessary support.

Thanks for your continued cooperation,

Dr. Nelson Muriu
County Director of Health
Nyeri County
Appendix VI: My Photo of Nacosti

THIS IS TO CERTIFY THAT:  
MR. COSMAS MWAMBURI MWASHUMBE  
of KENYATTA UNIVERSITY, 0-80111  
MONTONGWE, has been permitted to  
conduct research in Nyeri County  
on the topic: EFFECT OF WATER,  
SANITATION AND HAND HYGIENE  
PRACTICES ON DIARRHEAL DISEASES  
AMONG COMMUNITY MEMBERS IN NYERI  
COUNTY, KENYA  
for the period ending: 13th December, 2019  
Applicant's Signature

Permit No : NACOSTI/P/18/25697/26639  
Date Of Issue : 13th December 2018  
Fee Received : Ksh 1000

Director General  
National Commission for Science, Technology & Innovation
Appendix VII: Nacosti Letter

NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

Ref. No. NACOSTI/P/18/25697/26639

Date: 13th December, 2018

Cosmas Mwamburi Mwashumbe
Kenyatta University
P.O. Box 43844-00100
NAIROBI.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on “Effect of water, sanitation and hand hygiene practices on diarrheal diseases among community members in Nyeri County, Kenya,” I am pleased to inform you that you have been authorized to undertake research in Nyeri County for the period ending 13th December, 2019.

You are advised to report to the County Commissioner and the County Director of Education, Nyeri County before embarking on the research project.

Kindly note that, as an applicant who has been licensed under the Science, Technology and Innovation Act, 2013 to conduct research in Kenya, you shall deposit a copy of the final research report to the Commission within one year of completion. The soft copy of the same should be submitted through the Online Research Information System.

(GODFREY P. KALERWA MSc., MBA, MKIM
FOR: DIRECTOR-GENERAL/CEO

Copy to:
The County Commissioner
Nyeri County.
The County Director of Education
Nyeri County.
Appendix VIII: Map of Nyeri