

**QUANTIFICATION OF HOUSEHOLD-BORNE COST  
ASSOCIATED WITH ACUTE GASTROENTERITIS  
AMONG HOSPITALIZED CHILDREN UNDER FIVE IN  
SELECTED HOSPITALS IN KENYA**

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**MASTER OF SCIENCE**

**(Field Epidemiology)**

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ACUTE GASTROENTERITIS AMONG HOSPITALIZED CHILDREN  
UNDER FIVE IN SELECTED HOSPITALS IN KENYA**

**BY**

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**A Thesis Submitted to the School of Public Health in Partial Fulfilment of the  
Requirements for the Award of degree of Master of Science in  
Field Epidemiology**

**Moi University**

**2018**

## DECLARATION

### Declaration by Candidate

“This thesis is my original work and has not been presented for a degree in any other University. No part of this thesis may be reproduced without the prior written permission of the author and/or Moi University”.

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Date \_\_\_\_\_

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### Declaration by Supervisors

This thesis has been submitted for examination with our approval as University Supervisors.

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## **DEDICATION**

To my loving husband Banzi Akeng'o Omwanga, my sons Dennis Akeng'o and Ethan Emmanuel for their encouragement, understanding and support during the long periods of time I was away from home, I am also grateful to my extended family whose understanding, support and prayers made a considerable difference in completing this work.

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I also thank Kenyatta National Hospital, Siaya and Nakuru County Health Department for granting permission to collect data in the three health facilities. In addition, I also appreciate the cooperation accorded to me by the health information officers and the data collectors at all the health facilities during data collection. My gratitude also goes to the caregivers and their children who participated in this study.

A lot of thanks go to Kenya Field Epidemiology and Laboratory Training Program for providing the platform and teaching that led to the conception and eventual completion of this study. And not forgetting Moi University who will confer the master's degree to me. Lots of appreciation goes to the members of Cohort 12 for the positive competition and challenges and National Vaccines and Immunization program for their support during my training. Finally, I sincerely thank the Ministry of Health and the County Government of West Pokot for granting me the approval to undertake this postgraduate course.

## ABSTRACT

**Background:** Diarrhoea is a leading cause of morbidity and mortality among children less than five years old. Hospitalization for diarrhoea can pose a significant financial burden to families of affected children.

**Broad Objective:** The objective of this study was to quantify household-borne cost associated with acute gastroenteritis disease among hospitalized Kenyan children <5 years old in selected health facilities.

**Specific Objective:** I aimed to estimate direct medical costs associated with acute gastroenteritis disease incurred by households pre-hospitalization. Secondly, I aimed to estimate direct costs (medical and non-medical) incurred by households of the hospitalized children during and after hospitalization. Lastly, I aimed to estimate indirect costs incurred by households of hospitalized children.

**Methods:** We conducted a cross-sectional study in three health facilities: Kenyatta National Hospital, Nakuru County Referral Hospital, and Siaya County Referral Hospital. We enrolled children aged <5 years hospitalized for acute diarrhoea ( $\geq 3$  looser-than-normal stools in 24 hours, with onset <7 days before admission) from May to September 2018. We interviewed caretakers during admission, on discharge, and 7 – 14 days following discharge/referral. Data were entered via scannable forms and analysed using Epi Info and SPSS statistical software. We calculated median and interquartile range cost of direct medical costs (e.g. medications, diagnostics), non-medical direct costs (e.g. transport, food) and indirect costs (e.g. lost income).

**Results :** Direct medical, non-medical direct and indirect costs incurred by the family, associated with seeking treatment for paediatric diarrhoea were analysed for 227 children. The median total household cost due to diarrhoea treatment was 8,000 Kenya shillings (IQR: 3,150-21,600) and differed by site ( $p < 0.0001$ ): 34,278 Kenya shillings (IQR: 17,680-50,528) in Kenyatta National Hospital, 7,850 Kenya shillings (IQR: 4,560-11,180) in Nakuru County Referral Hospital, and 1,275 Kenya shillings (IQR: 650-3,300) in SCRH. The median direct medical cost to families was 5,000 Kenya shillings (IQR: 800-16,380) and differed by site ( $p < 0.0001$ ): 28,148 Kenya shillings (IQR: 13,775-46,178) in Kenyatta National Hospital, 4,910 Kenya shillings (IQR: 3,060-6,750) in Nakuru County Referral Hospital, and 502 Kenya shillings (IQR: 400-800) in Siaya County Referral Hospital. Median direct non-medical cost was 1200 Kenya shillings (IQR: 450, 2400) overall and differed by site, 2,050 Kenya shillings (IQR: 1,100-5,000) in Kenyatta National Hospital, 1,300 Kenya shillings (IQR: 730-2,200) in Nakuru County Referral Hospital, and 210 Kenya shillings (IQR: 100-400) in Siaya County Referral Hospital. Median indirect cost was 0 Kenya shillings (IQR: 0-3,200) with ( $p = 0.60$ ) in Kenya National Hospital, 0 Kenya shillings (IQR: 0-2,100) in Nakuru County Referral Hospital and 0 Kenya shillings (IQR: 0-1,013) in Siaya County Referral Hospital. About 51% of the families reported using savings to pay for care during the diarrheal hospitalization.

**Conclusion:** Households in Kenya bear a substantial direct financial burden for diarrhoea hospitalization. All the costs differed across the three hospitals.

**Recommendation:** A cost analysis benefit for the whole country should be done to guide in policy making for diarrhoea management.

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## DEFINITION OF TERMS

**Case Definition:** Acute diarrhoea was defined as passage of three or more loose, abnormally liquid stools or bloody diarrhoea within any 24-hour period and less than 7 days before hospitalization, among children less than five years old. Persistent diarrhoea (a child who had diarrhoea for 7 or more days before admission) was excluded.

**Direct medical costs** = diagnostic tests costs + medication costs + other hospital costs incurred by the family. (In this current analysis, we focus on the family-borne costs).

**Direct non-medical costs** = round-trip transport costs for the patient and caregiver(s) + round-trip transport costs for visitors from the child's household + accommodation costs for visitors from the child's household, and any other childcare costs during the diarrheal illness .

**Indirect costs** = sum (number of days of work lost\*reported daily wage) for each household member losing income as a result of the child's illness.

**ACRONYMS AND ABBREVIATIONS**

AGE	Acute Gastroenteritis
CDC	Centres for Disease Control and Prevention
EIA	Enzyme Immunoassay
EMR	Eastern Mediterranean Region
FELTP	Field Epidemiology and Laboratory Training Program
GAVI	Global Alliance for Vaccines and Immunization
HF	Health Facility
HIV	Human Immunodeficiency Virus
IREC	Institutional Research and Ethics Committee
KDHS	Kenya Demographic Health System
KNH	Kenyatta National Hospital
M.O.H	Ministry of Health
NCRH	Nakuru County Referral Hospital
OOP	Out of Pocket
ORS	Oral Rehydration Salts
PCR	Polymerase Chain reaction
RNA	Ribonucleic acid
RV	Rotavirus
SPSS	Statistical Package for Social Studies
SCRH	Siaya County Referral Hospital
SAGE	Strategic Advisory Group of Experts

SERU	Scientific Ethical Review Unit
SSC	Scientific Steering Committee
WHO	World Health Organization
RVGE	Rotavirus Gastroenteritis
MPHS	Ministry of Public Health and Sanitation

## **CHAPTER ONE**

### **INTRODUCTION**

#### **1.1 Background**

Globally, diarrheal diseases are a leading cause of death among children less than 5 years old and account for 1 in 9 child deaths worldwide (Claudio *et al.*, 2013) . In sub Saharan Africa and south Asia , most childhood diarrhoea deaths occur among children less than 2 years of age (Mwenda *et al.*, 2010) . In Kenya, diarrhoea remains the second leading cause of under-five mortality (Mulatya & Ochieng, 2020) .

#### **Household cost of diarrhoea**

Costs of diarrhoea treatment include direct medical costs, which are the costs of the consultation, drugs, tests, and any previous treatment for the same episode of diarrhoea before hospitalization. Costs also include direct non-medical costs, which are the cost of food during hospitalization or as you wait for the consultation, transportation from home to hospital and back, and the cost of caring for children when parents are away in the hospital. Indirect costs are defined as lost productivity of parents and guardians, determined using a salary and time lost by a caregiver during the period the child is sick.

This can substantially impact the household economy due to the higher costs of care offered to the sick child during hospitalization hence raising the cost of livelihoods (Ombaba *et al.*, 2009). This illness can also result in a substantial burden to the health system. Health system/government resources are planned and allocated towards the management of common childhood illness like diarrhoea. Costs may be small to moderate in absolute terms , but can be costly to these households and health system ;

this could result in reduced care seeking and worsening impoverishment (Rheingans *et al.*, 2012) .

Few studies have estimated the economic burden of each inpatient admission for diarrhoea borne by the health system and by households in African countries (Rheingans *et al.*, 2012) . In Ghana , the direct medical costs (e.g., hospital stay , diagnostics , medications , and medical staff time) were estimated to range from \$65 to \$97 (Armah *et al.*,2010) .Another study conducted in South Africa estimated the average direct medical costs to range from \$937 to \$1140, and the average household costs were \$16 ( Russell *et al.*,2009) .

Previous studies in Kenya provided cost estimates based only in Nyanza region to be \$19.63 for the management of an episode of acute gastroenteritis, and there is need to update the cost estimates using new data across Kenya.

## **1.2 Problem Statement**

Globally , diarrhoea remains the leading cause of death among children less than five years old (Lanata *et al.*,2013) . Kenya is among the fifteen countries that account for over 75% of all deaths from diarrhoea among children under five years of age annually (Obi *et al.*,2010) . In Kenya, despite much efforts and successes in the management of diarrhoea , the disease has remained among the top five causes of mortality and morbidity , particularly among infants and children less than five years of age despite the introduction of rotavirus (RV) in June 2014 (Karambu *et al.*,2013) .

Therefore, country-specific gastroenteritis household cost estimates are essential for analysing the cost-effectiveness of RV vaccine diarrhoea interventions and households cost impact during caring for any single case of diarrhoea among children less than five years old (Ngabo *et al.*, 2016b) .

### **1.3 Justification**

Data associated with household cost of acute gastroenteritis in Kenya are limited and there is no system routinely capturing it. Doing this study would ensure readily available data for reference. The families face large costs to care for the sick children with acute gastroenteritis. This cost needs to be quantified so that policy makers can understand the importance to the country and then can act accordingly example by continuing to support rotavirus vaccination and implement other anti-diarrhea measures in the National and sub national's health facilities.

Therefore, this study aimed to determine the cost incurred by households in treating all-cause diarrheal disease among hospitalized children <5 years old through assessing: (1) direct medical costs, such as costs associated with receiving direct medical services for diarrhoea (2) direct non-medical costs, such as transport costs incurred by the care takers, and (3) indirect costs, such as productivity losses resulting from lost income by caregivers who care for a sick child.

### **1.4 Research Questions**

The study was guided by the research questions below:

- 1) What were the direct medical costs associated with acute gastroenteritis among children <5 years old incurred by households pre-hospitalization?
- 2) What were the direct costs (medical and non-medical) associated with acute gastroenteritis among children <5 years old incurred by the household during and after hospitalization, for this episode of diarrhoea?
- 3) What were the indirect costs incurred by households due to acute gastroenteritis requiring hospitalization among children <5 years old?



## **1.5 Objectives**

### **1.5.1 Broad objective**

To quantify household costs associated with treating a case of acute gastroenteritis among hospitalized Kenyan children <5 years old in the selected hospitals.

### **1.5.2 Specific objectives**

- 1) To estimate direct medical costs associated with acute gastroenteritis among children <5 years old incurred by households pre-hospitalization.
- 2) To estimate direct costs (medical and non-medical) incurred by the households of sick children <5 years old hospitalized for acute gastroenteritis during and after hospitalization.
- 3) To estimate the indirect costs incurred by households of hospitalized children <5 years old with acute gastroenteritis.

## CHAPTER TWO

### LITERATURE REVIEW

#### 2.1 Global Burden of Diarrheal diseases

Worldwide, diarrhoea is the second leading killer of children, accounting for approximately 8% of all deaths among children less than 5 years old (Margaret *et al.*, 2017) . This translates to over 1300 young children dying each day, or about 480,000 children per year, despite the availability of simple effective treatment such as oral rehydration solutions (Tagbo *et al.*,2018) .

In Africa , an estimated 696 million cases and 9.6 million severe episodes of diarrhoea occur among children in this age group (Margaret *et al.*, 2017) . This represents an economic burden for developing countries. Although diarrhoea disease is usually less harmful to adults than children, it can also affect a country's economy by reducing the health of its workforce (Margaret *et al.*, 2017) .

In Kenya, diarrhoea has been a major public health problem. According to the WHO data published in 2017 , diarrheal deaths in Kenya among children under five reached 33,224 or 11.80% of deaths according to (WHO,2017) . This has been rated among the top five leading cause of under 5 child mortality .

Diarrhoea occurs in all age groups and can lead to life-threatening dehydration (Yen *et al.*, 2014) . However, it is more common and severe in children , particularly amongst bottle fed babies and malnourished children (Kimani *et al.*, 2013) . The prevalent viral causes of diarrhoea include norovirus, rotavirus, adenovirus, astrovirus, and sapovirus.

The most common parasitic agents include *Giardia lamblia* and *Cryptosporidium* (Chissaque *et al.*,2018) . These agents are transmitted when particles from diarrhoea

from the stool of one individual come in contact with the mouth of another, termed “faecal-oral transmission” (Chissaque *et al.*, 2018) .

Improving sanitation or hygiene interventions alone will not fully control the spread of rotavirus (RV ) or other causes of diarrhoeas (Darvesh *et al.*, 2017) . RV vaccination holds much promise for substantially decreasing the burden of diarrhoea (Tate *et al.*, 2016) . Therefore, RV vaccines were recommended in 2009 by the World Health Organization for all countries to include national immunization programs. In 2013 countries were recommended to remove age restrictions, and offer an effective strategy to reduce diarrhoea burden and deaths (WHO Geneva, 2013) . In Kenya RV vaccine was introduced into the routine immunization schedule in June 2014.

## **2.2 Burden of Rotavirus as a Major Cause of Diarrhoea**

Nearly a quarter of a million African children die from the dehydrating diarrhoea caused by RV every year, accounting for more than 50 per cent of the global total of RV deaths (Sarker *et al.*,2018) . In Kenya, RV diarrhoea causes an estimated 4500 deaths, 8800 hospitalizations, and 1,444,000 clinic visits among children <5 years of age and costs Kenya almost \$11 million (Tate *et al.*,2009) . Over 50% of the 215,000 diarrhoea-related deaths occur in Africa. The peak age of contracting gastroenteritis in children is from 6 weeks to 24 months (Agutu *et al.*, 2017). In Kenya it is estimated that 25% of all under-five hospitalized cases of diarrheal disease are caused by RV; this was after the introduction of RV vaccine in June 2014 (Agutu *et al.*, 2017).

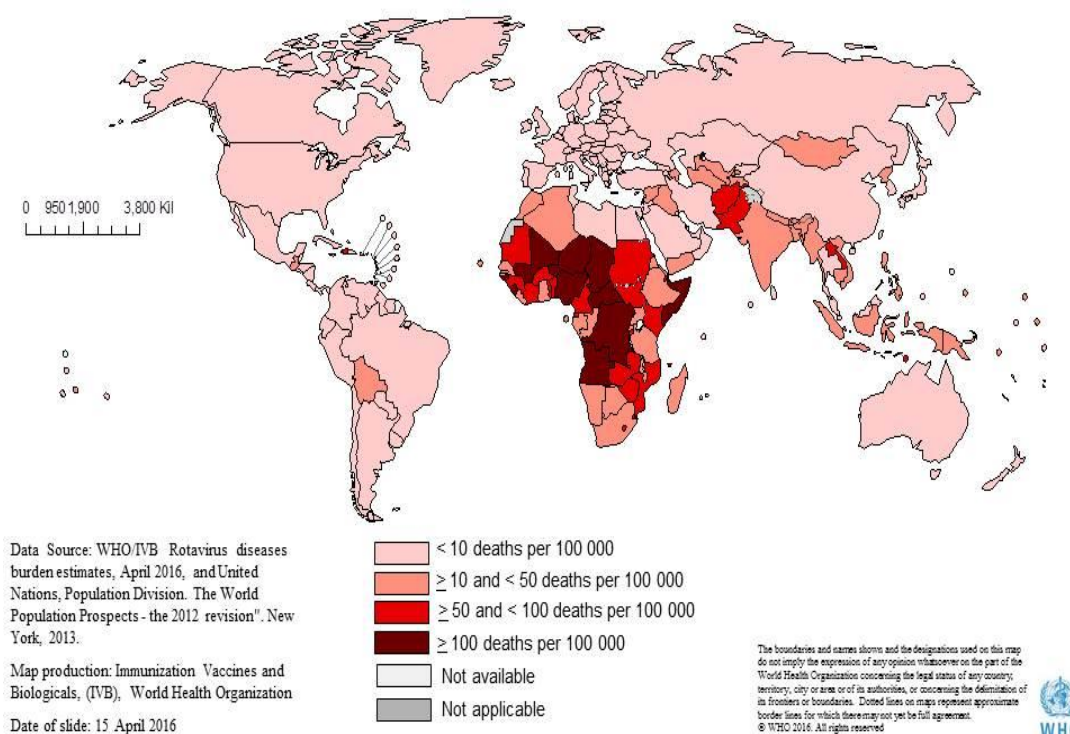
In the absence of vaccine, the incidence of RV disease is similar in children in both developed and developing nations (Zhen *et al.*, 2015) . Children in developing nations die more frequently than those in developed settings, possibly because of several factors, including inadequate access to healthcare for services like rehydration

therapy. Thus, prevention of RV through vaccination is critical to saving children; further, it is one of the most cost effective methods to preventing RV diarrhoea (Path website, 2008).

### **2.3 Geographic Distribution of RV Disease**

RV is found worldwide. Twenty-five million outpatient visits and more than 2 million hospitalizations among children <5 years of age are attributable to RV infection each year (Hegazi *et al.*, 2017) . RV vaccination provides the best means of prevention of this disease burden, RV vaccine effectiveness has been reported to be high in high-income countries with protection of severe RV disease to be 80-90% (Lee, 2020) . In sub-Saharan Africa and Southeast Asia it was 30-50% lower , and these are mainly low and middle-income countries where vaccine is needed most ( Lanata *et al.*, 2013) . Figure 1

## Rotavirus mortality rate in children younger than 5 years, 2013



**Figure 1: Global Distribution of Rotavirus Mortality Rate**

### 2.4 Situation of RV in Sub-Saharan Africa (Figure 1)

Forty three studies from 15 African countries found RV to be the single most common cause of childhood diarrhoea (Akoua-Koffi *et al.*, 2014) . Over 120,000 children die from the dehydrating diarrhoea caused by RV every year, accounting for 56% of the global total of RV deaths (Akoua-Koffi *et al.*, 2014) .

### 2.5 Summary of Literature on Economic Costing of Diarrhoea.

In Africa, several studies have been carried out on the cost of diarrhoea and RV disease. In a study done in Nyanza Kenya , diarrheal diseases caused approximately 842 deaths per 100,000 per year in children <5 years of age , where 164 deaths per

100,000 children <5 years of age were secondary to RV infection (Tate *et al.*, 2009b) . In another study done in Ghana, the direct medical costs (e.g., hospital stay, diagnostics, medications, and medical staff time) were estimated to range from \$65 to \$97 (Arma *et al.*,2010).

## **2.6 Health Financing in Kenya**

Currently health care financing in Kenya is financed from three main sources: out of pocket expenditure (households) , government expenditure and donors (Munge *et al.*, 2013) . All hospitalized patients pay using the current cost sharing fees , where the cost is subsidized and a portion of the cost of care is paid by the government public facilities (Munge *et al.* , 2013) . The National Health Insurance Funds (NHIF) has mainly focused on formal sector employees and left out those employed in the informal sector , those in agriculture , and pastoralists (Munge *et al.*, 2013) . The government plans to address this through universal health coverage which is currently being piloted in 4 counties (Kisumu, Machakos, Nyeri and Isiolo) and soon it will be cascaded to the 43 counties. It is also expected that the new scheme will increase healthcare service utilization, which has suffered under cost sharing, way of payment during hospitalization as a result of acute gastroenteritis.

## **2.7 Importance of Cost study**

It is important to gain information on the costs of treating paediatric diarrhoea. This study will provide recent data which was collected using household perspectives and from different parts of Kenya. This study didn't cost the burden due to Disability-adjusted life-years (DALYs), since the study was not designed to measure the prevalence, incidence, and mortality associated with diarrheal diseases.

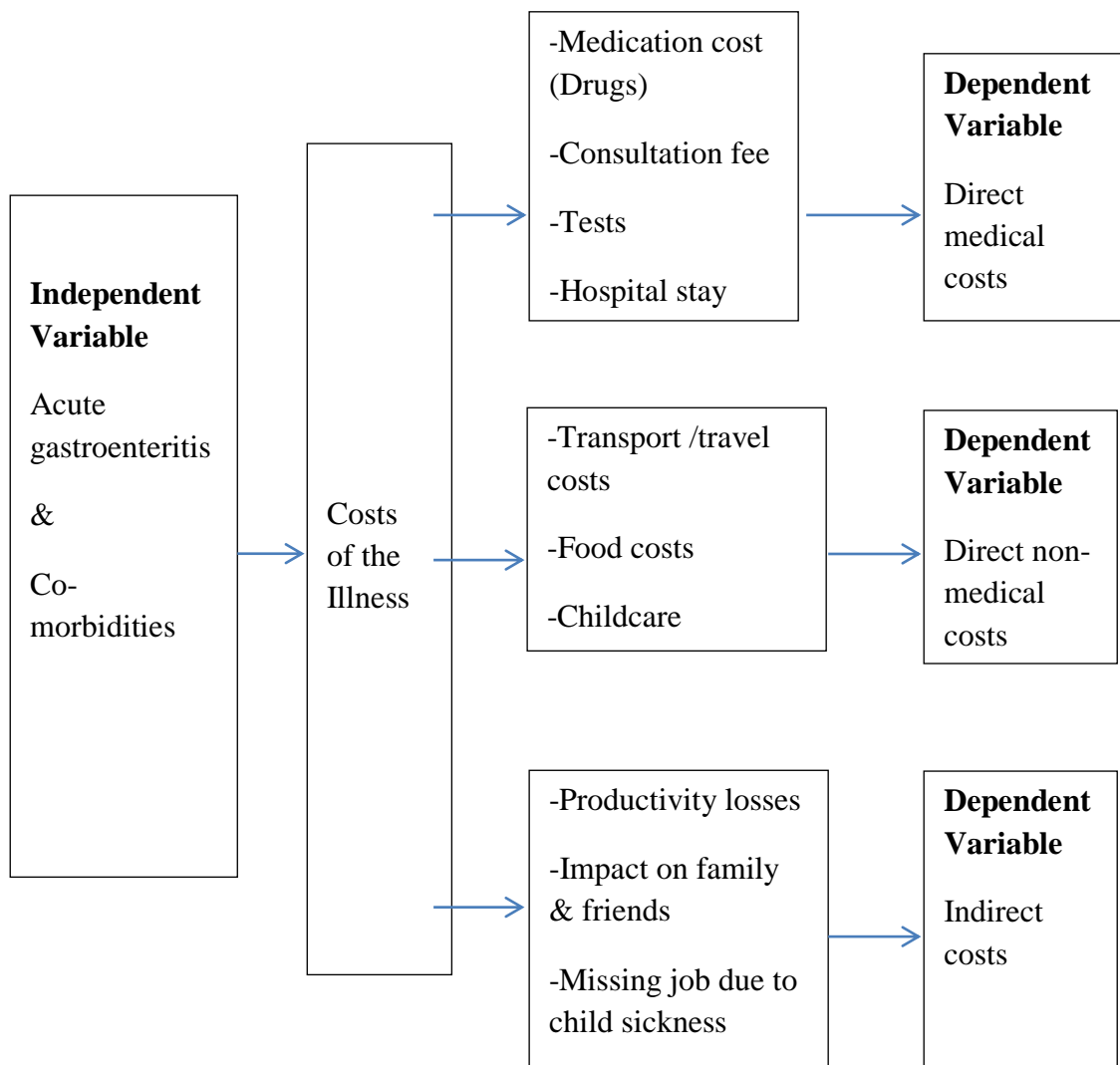


Figure 2 : Conceptual Framework (Walker & Beutels, 2008)

## CHAPTER THREE

### METHODOLOGY

#### 3.1 Study Sites

This study was undertaken in three selected health facilities in Kenya. These included Kenyatta National Hospital (KNH), Nakuru County Referral Hospital (NCRH) and Siaya County Referral Hospital (SCRH).

The three hospitals were not representative of all Kenyan hospitals and health care facilities but collectively represented a cross section in terms of size, geographic location and population. Two of them were part of the WHO RV surveillance network .Nakuru is not part of the network so it was selected to represent a non-surveillance site of rotavirus diarrhoea.

##### 1) **Kenyatta National Hospital (KNH)**

KNH is the largest referral and teaching hospital in Kenya. The hospital is a sentinel site of WHO RV surveillance, and the facility conducts surveys on diarrheal diseases and other different types of research. Health system financing to all patients in this facility is through the current cost sharing fees, where the cost is subsidized and a portion of the cost of care is paid by the government and sometimes through the national health insurance funds (NHIF). (Munge *et al.*,2013). Patients who are not civil servants may take their own personal insurance to cover for their health in case of any admission. KNH has over 6,000 staff members; it has a capacity of 1,800 beds, with 209 beds in a private wing and 232 for the paediatric wards. However, due to congestion, the patient numbers can rise as high as 3,000. It operates 24 hours per day seven days per week. The facility offers among others the following services for paediatric populations: outpatient services, observation unit, inpatient services. The



facility is located in Nairobi city county, which has a population of over 3.1 million persons(*KNBS,2009*).

## **2) Nakuru County Referral Hospital (NCRH)**

NCRH is not part of the WHO RV surveillance network. The hospital costs patient care through the current cost sharing fee , where the cost is subsidized and a portion of the cost of care is paid by the government (*Munge et al., 2013*). The facility has 15 general wards which has bed capacity of 620 beds with 60 beds in the paediatric ward and operates for 24 hours per day seven days per week, and has the following capabilities and services: outpatient services, in-patient services, laboratory, dental, pharmacy, radiology , well-baby services, and an observation unit .

NCRH is located in the Great Rift Valley region and borders Baringo County to the north, Laikipia County to the north east, Nyandarua County to the east, and Kajiado County to the south. It is the largest teaching and referral hospital in the region. The county has 11 sub counties and 16 wards. The 2009 population of Nakuru County was recorded as 1,603,325 (*KNBS,2009*) .

## **3) Siaya County Referral Hospital (SCRH)**

SCRH is a sentinel site of WHO RV surveillance and conducts surveys on the incidence of disease syndromes, including diarrhoea, and provides data on health care use. The hospital uses the cost sharing fee system (*Munge et al ., 2013*). This facility has 240 beds with 58 beds in paediatric ward and operates 24 hours per day, seven days per week. Capacities include in-patient services, outpatient services, family planning, AGE section, and home-based care. SCRH is a Ministry of Health county referral hospital located in Mulaha (within Siaya town) Township, in the Karemo

ward, within Alego sub county in Siaya County. The total population of Siaya County is about 840,000 as per 2009 census(*KNBS,2009* ), and the county is made up of six constituencies and 29 wards. It is one of the poorest counties in Kenya.

### **3.2 Study Population**

Were caregivers of children <5 years' old presenting to the selected hospitals for the in-patient treatment of acute gastroenteritis. These three hospitals represented different regions of Kenya with different size, geographies locations and populations.

### **3.3 Study Design**

A cross sectional survey was conducted among caregivers of children <5 years old admitted at the selected health facilities mid-May 2018 to mid-September 2018 through caregiver interviews .

### **3.4 Inclusion and Exclusion Criteria**

#### **3.4.1 Inclusion Criteria**

I included patients who were:

- Children less than 5 years old
- Those who presented with any cause of acute diarrhoea
- Admitted to the hospital for treatment primarily for diarrhoea
- Those who had diarrhoea for less than 7 days on presentation to the hospital

(All eligible children were enrolled and included in the analysis even if they died or if they absconded or household didn't pay medical bills).

#### **3.4.2 Exclusion Criteria**

Patients were excluded from participation if any of the following criteria were present

- Diarrhoea which had lasted more than 7 days before presentation to hospital.

- Children aged more than 5 years.
- Diarrhoea which was acquired during hospitalization for another disease (such diarrhoea could be a nosocomial infection).
- Chronic diarrhoea

### 3.5 Sample Size Determination

The target sample size for each facility was determined based on WHO guidelines (Walker & Beutels, 2008). The sample size was determined from the annual number of cases that was abstracted from the registers, in order to achieve a 10% precision while assuming a 0.5 coefficient of variation.

As per the WHO guidelines, hospitals that are to be used as a surveillance site should at least attend 250-500 children annually with gastroenteritis. This was based on the conservative prevalence of 30% for rotavirus infection set for developing countries (Walker & Beutels, 2008). The sample size calculation formula was as follows:  $N = [(precision^2 / (CV^2 \times Z^2)) + (1/N_0)]^{-1}$ , where Precision is 10%, CV is coefficient of variation = 0.5, Z is 1.96 for level of significance at  $p = 0.05$  and  $N_0$  is expected # of cases.

Facility	Annual diarrhoea cases	Target Sample size*	Sampling interval (assuming 6 months Data collection)
KNH	1286	90	8
NCRH	1236	90	8
SCRH	320	73	2
Total	3143	253	

\* For 10% Precision and 0.5 coefficient of variation , as per WHO recommendations (Walker & Beutels, 2008).Therefore, before the beginning of this study I calculated a sample size of 253 patients as minimum for the achievement of the target precision for the household-borne costs , and so our goal was to enrol a minimum of 253 patients over the course of 4 months of data collection . Of these 253 patients we distributed them across the sites according to the above table (for instance, 90 patients each at KNH and NCRH).

### **3.6 Sampling Procedure**

This was cross sectional costing study that used a purposeful sampling approach to select the hospitals included in the study. I enrolled all admissions of eligible children in all the sites. Patients were identified from hospital admission registers/ logs with the assistance of hospital staff by the data collectors. Interviews were carried out with the caregivers of the patients enrolled in the study.

### **3.7 Recruitment and Enrolment**

Caregivers were identified with the help of hospital staff using inpatient admission logs. The inpatient caregivers in the entire paediatric general wards and the paediatric private ward were approached by study staff, who explained the study, again screened for eligibility, and consent the eligible and interested participants for the interviews.

### **3.8 Data Collection**

#### **3.8.1 Description of Data collected**

Caregiver interviews were conducted to determine household-borne direct costs (medical costs prior to (if there were any medication bought before admission to the hospital), during, and after admission, and non-medical costs during the admission) as well as indirect costs. This ran from mid-May 2018 to mid-September 2018.

### **3.8.2 Data Collection Procedures**

All data collectors (6) were trained on research ethics and on the study instruments. Two were assigned to each study site. Data collectors were nurses and health information officers who performed study duties as a part-time job, and one Kenya Medical Training College (KMTC) nursing student. We piloted study questionnaires prior to the beginning of the investigation and we revised thereafter before investigation began.

### **3.8.3 Caregiver Interview**

Caregivers were identified with the help of hospital staff using inpatient admission logs. The study staff approached the caregiver and explained the study. Interested caregivers provided written informed consent. Caregivers were interviewed according to a structured questionnaire. The questionnaire covered direct household-borne costs as well as indirect costs, as described above.

The interview lasted for approximately 20 minutes in total , with the first portion given shortly after the child was first admitted to the hospital , and a second portion given shortly before discharge (if the child recovered) or by phone after 1 week if the child passed away . Study staff closely worked with the hospital staff and left their contacts with the specific paediatric ward where the survey was done, to ensure he/she was informed in case of any discharge of an enrolled child so that the survey could be completed. In case the child was discharged before completion of the survey, a follow-up call was done by phone.

The data collector additionally followed up the caregiver between 7 and 14 days after the child had been discharged home or transferred to a different hospital (for surviving children ; date was determined from medical records) , to determine

additional costs incurred over the period following discharge or in the transferred hospital . This was done through a phone interview guided by a separate structured questionnaire.

#### **3.8.4 Data Management**

Data was entered weekly from scannable paper forms into an Access database and stored on a laptop computer of a data officer who was managing all forms received from the field) before it was shared with the principal investigator (PI) (who was myself) and other study staff . Scannable forms were stored and locked in file cabinets which had restricted access by the study coordinator (who did quality checks of the forms) and other study staff.

All data records in the scannable forms collected were reviewed by the study coordinator and sometimes the PI in the field before collection and sending to the data officer, for another quality check for accuracy before scanning them to the Access database. Errors detected led to data rechecking then later re-entry.

#### **3.8.5 Data Analysis**

Data were analysed using Statistical Package for Social Science version (SPSS) 23 software and EPI INFO CDC version 7.2.2.2, with patient as the unit of observation. A patient-level database was developed to record inputs from the study. This database included individual patient information of demographics, facility type and duration of stay. Descriptive statistics were calculated overall and by hospital; these included demographics, length of stay, direct medical, direct non-medical and indirect costs, total family-borne costs. Medians and interquartile range are presented.

For non-normal data, distributions were compared by the health facilities using non-parametric tests such as the Mann-Whitney test; we also compared total family cost

and each group of co-infections /comorbidities. The cost according to the household perspective was calculated from the results of the caregiver interview. This included direct medical costs (like drugs and consultation fees prior to the hospitalization). We also calculated indirect costs (missed earnings). Costs were estimated and presented as means or medians, with the standard deviation or interquartile range depending on the distribution of the costs.

### **3.8.6 Cost Calculations**

Household-borne costs and indirect costs were calculated based on caregiver report.

Direct medical costs = diagnostic tests costs + medication costs + other hospital costs.

Direct non-medical costs = round-trip transport costs for the patient and caregiver(s) + round-trip transport costs for visitors from the child's household + accommodation costs for visitors from the child's household and any other childcare costs during the diarrheal illness .

Indirect costs = sum (number of days of work lost\*reported daily wage) for each household member losing income as a result of the child's illness.

### **3.8.7 Ethical Considerations**

The research study was approved by Moi University Department of Institutional Review Ethics Board committee (IREC) IREC/2017/FELTP/C, approval number 1858 and Kenyatta National Hospital Ethics and Research Board approval number P612/10/2017. Further permission to access patient data at the three health facilities was also given by the, KNH, NCRH and SCRH County Health authority. In addition, the data was de-identified for confidentiality and stored in a secure password protected database and computer.

## CHAPTER FOUR

### 4.0 Results

A total of 227 children were enrolled in this study; none of them chose to withdraw from the study. The final sample used in the analysis remained to be 227. Enrolment targets were met for NCRH but not for KNH and SCRH because of the low diarrheal cases admissions. More than half of the children enrolled were male (126; 56%), while 101 (45%) were females. Mothers (N = 209 (92%)) were the main interview respondents and caregivers for the children during hospitalization. The median length of stay (LOS) in the hospital was 4 days. Only KNH had significantly different median LOS of 7 days compared with the other sites which had 4 days. Out of those who had complete data on comorbidities (149 of 227) , 35% of children presented with pneumonia , 24% malnutrition , 21% malaria , 11% septicaemia , 3% convulsions , and 3% meningitis . Overall 80% of the children enrolled presented with some type of comorbidity or complication. Some children died during the study period (n = 14), and some absconded from the hospital (n = 2); most were treated and discharged (n = 211). I evaluated all the cost incurred by the families despite their outcome.



**Table 1: Characteristics of study population (N = 227)**

<b>Characteristics of general demographics</b>	<b>N (%) or median with IQR (25% and 75%)</b>
<b>Facility/Site</b>	
NCRH	97 (23%)
KNH	72 (17%)
SCRH	58 (14%)
<b>Sex</b>	
Male	126 (56%)
Female	101 (45%)
<b>Age (months)</b>	
Median Age	12 months (7,18)
<b>Age Group Months</b>	
0 – 6	78 (18)
6 – 11	129 (30)
12 – 17	88 (25)
18 - 23	26 (11)
24 – 59	27 (16)
<b>Caregivers Responding to Interview</b>	
Mother	209 (92)
Father	8 (4)
Others	8 (3)
<b>Characteristics of the illness</b>	
<b>Length of stay(LOS) in days</b>	4 (3,7)
<b>Comorbidities</b>	
Pneumonia	52 (35)
Malnutrition	36 (24)
Malaria	32 (21)
Septicaemia	16 (11)
Convulsions	4 (3)
Meningitis	4 (3)
<b>No Comorbidities/infections</b>	30 (20)
<b>Outcome</b>	
Recovered & Discharged	211 (93)
Died	14 (6)
Absconded	2 (1)
Referred / Transferred	0

The households who sought direct medical care pre-hospitalization spent a median cost of kshs 100 (Interquartile range [IQR]: 0, 1600) for the care of their sick children. This varied across the sites ( $p < 0.0001$ ). Households who visited KNH paid a median 1450 (IQR: 0, 3650), while those who went to Nakuru spent median 200 (IQR: 0, 1000) pre-hospitalization. In contrast, those admitted in Siaya spent a median of 0 (IQR: 0, 0) prior to hospitalization. Which were lower, this could be due to low living status at the rural area.

Households spent a median cost of kshs 4520 (IQR: 1250, 13605) on direct medical costs during hospitalization of the child suffering from AGE. This varied across the sites ( $p < 0.0001$ ). In KNH the household paid 24485 (IQR: 13015, 40000), NCRH 4210 (IQR: 2700, 5680) and in SCRH they paid a median cost of 500 (IQR: 400, 700) (As shown in Table 4, below).

**Table 2: Median Costs incurred by families of Hospitalized children (N=227)**

Costs	All n=227,IQR	KNH	NCRH	SCRH	P value
Direct medical cost <b>pre-</b> Hospitalization	100 (0,1600)	1450 (0,3650)	200 (0,1000)	0 (0,0)	0.0001
Direct medical cost During Hospitalization	4520 (1250,13605)	24485 (13015,40000)	4210 (2700,5680)	500 (400,700)	0.0001

This study estimated total direct medical costs for the diarrhoea illness at a median cost of approximately Kshs 5000 (IQR: 800, 16380) but varied across sites ( $p < 0.0001$ ); Caregivers of children who were admitted at KNH spent median cost of Kshs 28143 (IQR: 13775) to care for a child who had AGE disease during hospitalization which was costly compared to a child admitted at Nakuru and Siaya.

Nakuru median cost was kshs 4910 (IQR: 3060, 6750), whereas Siaya median cost was kshs 502 (IQR: 400,800)

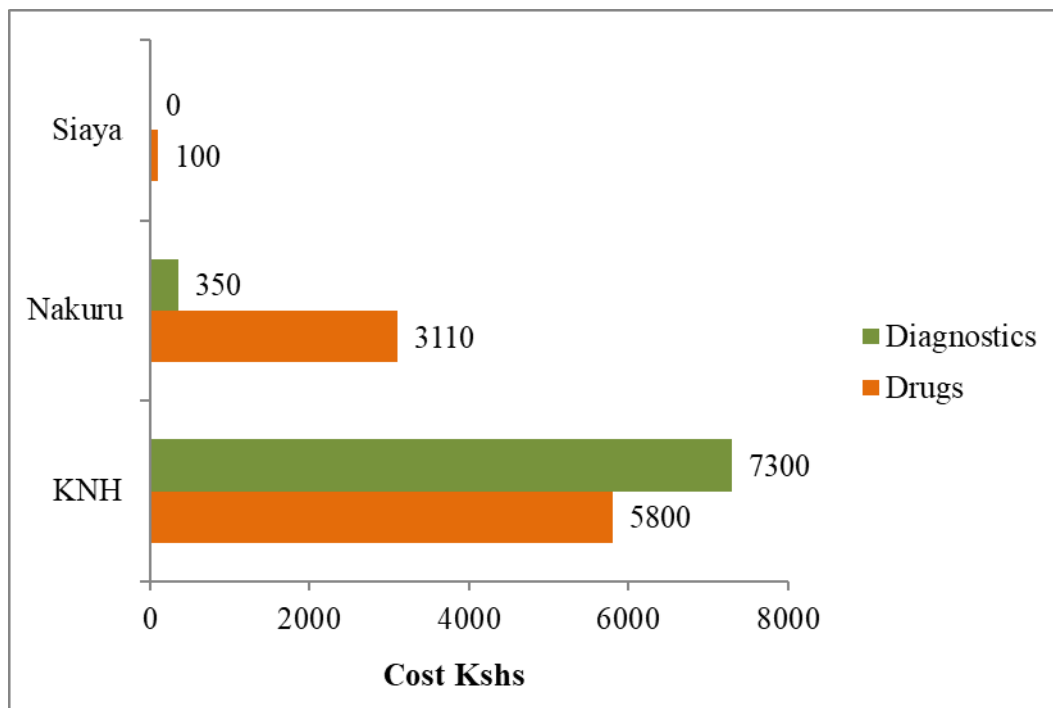
The median direct non-medical costs incurred by households for the treatment of single case of AGE were 1200 (IQR: 450, 2400). This varied by site ( $P < 0.0001$ ); in KNH median incurred was Kshs 2050 (IQR: 1100, 5000), Nakuru median was kshs 1300 (IQR: 730, 2100), and the median in Siaya was kshs 200 (IQR: 100, 360).

**Table 3: Median Households Total Direct Medical costs (DMC) and Median direct non-medical costs incurred by families of Hospitalized children (N=227)**

	ALL	KNH	NCRH	SCRH	Pvalue
<b>Total</b>	5000	28143	4910	502 (400,800)	0.0001
<b>DMCs</b>	(800,16380)	(13775,28143)	(3060,6750)		
<b>DNM Costs</b>	1200 (1450,2400)	2050 (1100,5000)	1300 (730,2100)	200 (100,360)	0.0001

The study also found the most common diagnostic tests performed on the patients was full blood count, whereas the common medication used across the health facilities were: Oral rehydration salts, ceftriaxone, crystapen penicillin, gentamycin and paracetamol oral syrup for the management of diarrheal illness . Its costs were as follows; Total median medical diagnostic costs were estimated at Kshs 350 (IQR: 0, 5000) but these varied across the sites ( $p < 0.0001$ ): KNH had median diagnostic cost of kshs 7300 (IQR: 3000, 12000), NCRH median cost was kshs 350 (IQR: 0,800) whereas SCRH had median cost of 0 (IQR: 0, 0). The study estimated the median cost for the drugs used during hospitalization to be kshs 2140 (IQR: 500, 4470) but this varied across the hospitals, KNH had a median cost of kshs 5800 (IQR: 3000, 12600),

NCRH median cost was kshs 2160 (IQR: 1550, 3110), whereas SCRH median cost was 0 (IQR: 0,100) (Figure 7).



**Figure 3: Median costs for drugs and diagnostics incurred by households by site**

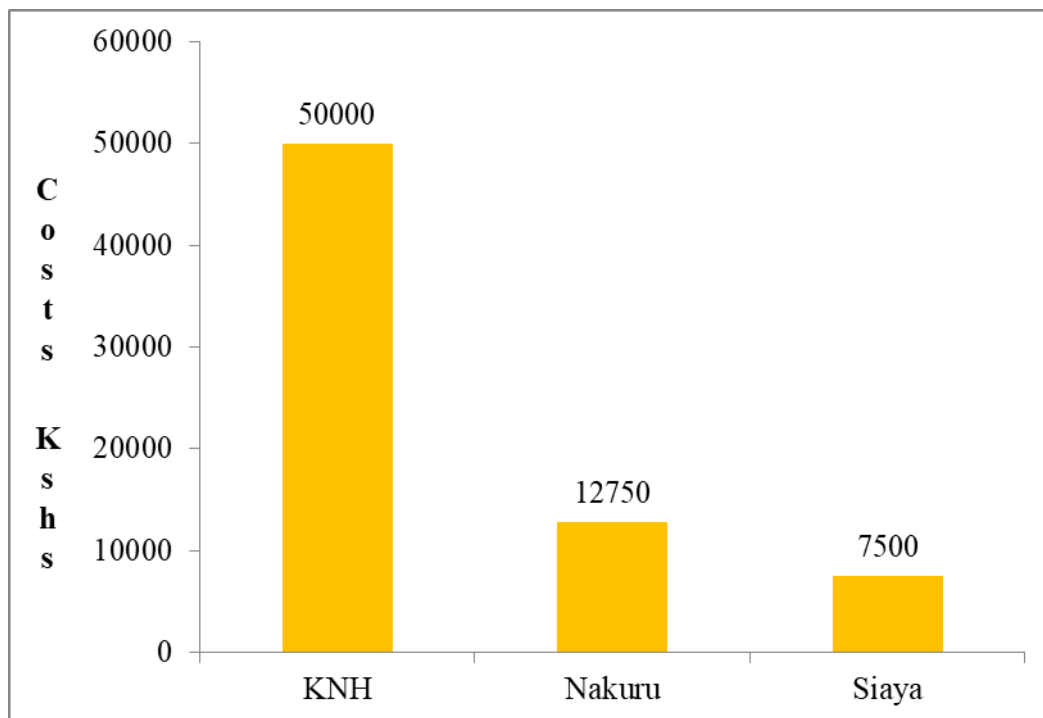
This study estimated the indirect costs of treatment of AGE illness during hospitalization was 0 across the sites, but IQR varied by sites ( $p=0.60$ ). KNH had median of kshs 0 (IQR: 0, 3200), Nakuru had median of kshs 0 (IQR: 0, 2100) and lastly Siaya median of kshs 0 (IQR: 0, 1033) (Table 7).

The average median total household costs used to manage a case of acute gastroenteritis was estimated at Kshs 8000 (IQR: 3150, 21600) per case. I also calculated costs as percentages of monthly income using the following formula. This varied across the sites ( $p<0.0001$ ); KNH spent approximately median Kshs of 34278 (IQR: 17680, 50528) for an episode of AGE disease, whereas in Nakuru they spent median cost of Kshs 7850 (IQR: 4560, 11180) and Siaya spent median cost of approximately Kshs 1275 (IQR: 650, 3300) (Table 7).

**Table 4: Median cost of Indirect costs and Median cost of Total family cost incurred by families of Hospitalized children (N=227)**

<b>Costs</b>	<b>All n=</b> 227,IQR	<b>KNH</b>	<b>NCRH</b>	<b>SCRH</b>	<b>P</b> <b>value</b>
<b>Indirect Costs</b>	0 (0,0)	0 (0,3200)	0 (0,2100)	0 (0,1033)	0.0001
<b>Total Family</b> costs for entire illness	8000 (3150,21600)	34278 (17680,50528)	7850 (4560,11180)	1275 (650,3300)	0.0001

The study also showed the total median parental monthly income of the caregivers interviewed reported to be approximately kshs 18000 (IQR:7500,30500) this varied by site ( $p < 0.0001$ ) but their values differed ; KNH caregivers reported earning median of kshs 50000 (IQR:21500,64500), those in Nakuru reported earning median of kshs 12750 ( IQR :6005,25000), whereas Siaya caregivers reported to earn median kshs 7500 (IQR:5000,20000) (Figure 9). Monthly family income was calculated from a function of daily, weekly, or monthly salary, and days worked per month as reported by the parents. The income of both parents was summed to create the total family income.



**Figure 4: Household median parental income per month by Site**

Of the households interviewed 74 (36%) reported using insurance to pay for the costs of treating AGE illness; the majority of those who used insurance were from KNH. Those who paid using their saving were 44 (21%). About 20 (10%) paid using donations, those who reported borrowing the money and cutting down on other costs were 12 (6%) and 8 (3%) respectively. There were 79 (24%) who reported using other sources to pay for the costs of AGE hospitalization.

**Table 5: Breakdown of households' source of money used to pay for the costs of treatment**

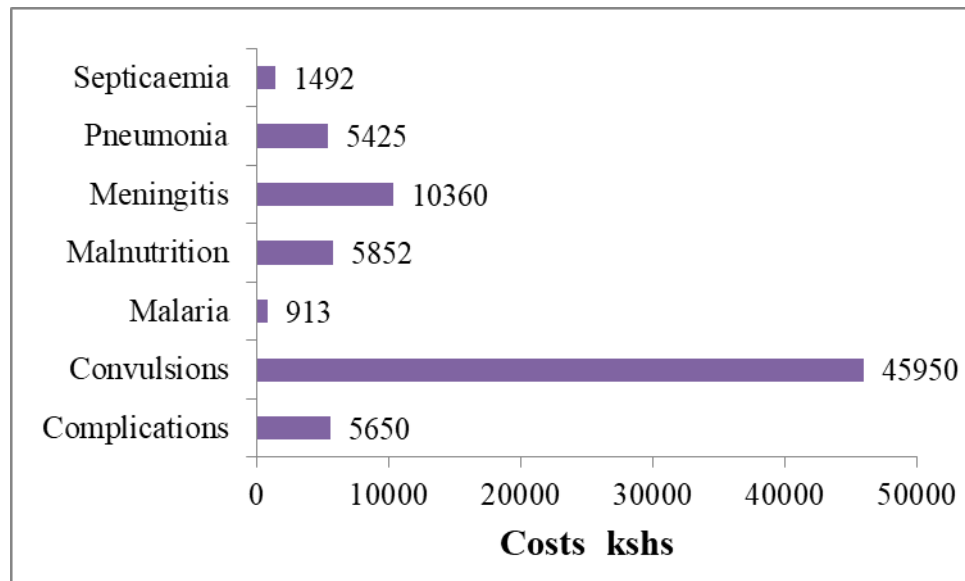
Where did the money come from to pay for these costs?	N	%
Used Insurance	74	36
Using savings	44	21
Donations from friends or relatives	20	10
Borrowing	12	6
Cutting down on other costs	8	3
Other (e.g. NGO, waiver)	79	24

Length of stay of those without comorbidities varied by a day with those with comorbidities. Their age too varied, most of the costs significantly differed between those with and those without co-morbidities.

**Table 6: LOS, age of participant's and median costs paid by Households with children with no-comorbidities and those with comorbidities**

Variable	No- Comorbidities N=30;Median(IQR)	Co-morbidities N=119;Median(IQR)	P value
Length of stay (LOS)	3 (2,7)	4 (3,8)	<0.1910
Age of participants	10.5 (7,14)	9 (5,14)	<0.4168
Cost of care	14730 (5900,31700)	5650 (1583,17111)	<0.0016
Cost of Diagnostics (tests)	3400 (350,7000)	50 (0,1920)	<0.0004
Costs of Drugs	3000 (1860,5700)	1890 (0,3600)	<0.0022

The data on children who presented with comorbidities/other infections during hospitalization, was also collected and presented as shown below (Figure 3)



**Figure 5: Median costs of comorbidities incurred by households**



## CHAPTER FIVE

### 5.0 Discussion

The main objective of this study was to describe direct, non-direct and indirect costs to the households associated with AGE disease among children <5 years old hospitalized in the selected health facilities (KNH, NCRH and SCRH). Households of these children hospitalized incurred substantial costs for the care administered during hospitalization. In addition direct and non-direct costs due to AGE disease episodes were shown to be a larger burden than indirect costs upon the caregivers and households of the sick children. Overall admissions due to these AGE diseases affected the financial situations of most households negatively.

The study demonstrated the total cost due to diarrheal episodes for inpatients were substantially higher in KNH than those in other sites. KNH provides a higher level of care, including handling more complicated cases than the rest of the other sites; it's also a national referral hospital where its costs could be higher. The other government facilities' have inadequate human resource and handles less complicated cases comparable to KNH. Hence this study cost calculation would be higher in KNH than other facilities.

General findings of costs of hospitalized children were greater, which showed consistent with other studies of diarrheal costs of the inpatient care in China and India, which also demonstrated high inpatient costs incurred by the families. Of hospitalized children with AGE.

This study also found that the household income was higher for caregivers who attended KNH than the rest of the sites. The cost of treatment during hospitalization varied across the sites, and it was higher in KNH, demonstrating that families from a

variety of income levels can experience a tremendous burden from even a single diarrheal episode, with the world of so many other economic competing demands in a household this is indeed costly and it impacted on them. This is contrast to a study on diarrheal disease in Canada, in which few families reported impact on indirect costs (missing work)

Total median costs for a single diarrheal illness was Kshs 8520 (IQR: 3150, 21600). These estimates were almost similar to those reported in other African countries, specifically for studies done in Rwanda (Ngabo *et al.*, 2016). Ngabo reported the estimation cost of treating diarrheal illness of \$ 101 which is the same as kshs 10100. Whereas in Ghana (Aikins *et al.*, 2010) reported cost estimation of treating a case of diarrhoea illness to be \$ 133.86 which is the same as kshs 13386 and this was incurred by the families of the sick children. In a study done in Kenya (Tate *et al.*, 2009) estimated the total costs spent by the household cost during the treatment of diarrhoea case to be kshs 1963 combined.

Travel costs were significantly higher among the urban families in this study: KNH median transport cost was kshs 2000 (IQR; 1000, 4650), whereas the caregivers who were in NCRH paid a median cost of kshs 1300 (IQR: 730, 2200), and those who were in SCRH paid transport median cost of kshs 210 (IQR: 100,350). This could be explained by the distance between the hospital and the estates where caregivers live. Also it could be due to the number of visits made to the hospitals from their homes leading to higher transportation costs.

Direct medical costs associated with a diarrheal illness that results in a hospitalization were significantly different across the three hospitals, median cost was kshs 4520 (IQR: 1250, 13605) per illness. Direct medical costs varied across the sites

( $P < 0.0001$ ); KNH having the higher costs compared to the rest of the sites. This could be due to the costing of items at the National referral hospitals being higher compared to itemization at the county referral hospitals which could be slightly cheaper.

This finding has shown some decline in the cost of treating an episode of AGE. There were several notable differences in a study done in Kisumu in 2009. This Previous study found a median lost income of kshs 660 whereas my study lost income in the same site Siaya was kshs 0. median transport costs was kshs 157, cost of medication and tests was \$ 0.90 this is same as kshs 90, whereas in our study the median transport cost was kshs 200 more than the previous study, cost of medication and diagnostic was kshs 100 and kshs 0 respectively lesser than the previous study. In a study conducted in South Africa it estimated the average direct medical costs ranged from kshs 93700 to kshs 114000, and the average household costs were kshs1600 (Russell *et al.*, 2009) which were slightly higher than this one demonstrated by this study.

Our study reported low indirect costs among families in all the sites; this could be explained by lack of formal employment among caregivers accompanying hospitalized children to the health facility and most of them were dependent on their spouses/ male partners for their up keep . Although costs were highest in Nairobi and lowest in Siaya, the burden may be comparable because cost of living varies across Kenya. Which could be slightly cheaper at the rural areas than urban. Overall, data in this study indicated that both direct and direct-non-medical costs cause a big burden to the households of children with AGE illness.

Another finding of this study was about the cost incurred by the households of children with no comorbidities paying more than those children who had comorbidities. This not been the case most of the times .We have always known

comorbidities to increase the cost of care unlike in this my study. This could be because; the care of under five children in most public health facilities is free or subsidized.

The estimation of diarrhoea treatment costs is crucial for several reasons: cost information could help inform prevention programs and awareness of financial burden on households in care of AGE disease. This will promote the need for adequate funding for management of diarrhoea. Information on the cost of illness can help in planning and budgeting of the program on issues preventive measures of diarrheal infections.

### **5.1 Strengths**

One strength of this study is obtaining results from several health facilities, which covered multiple geographic regions including National referral hospital which receives many transferred children and treats more complicated cases. Another strength was the details of multiple types of costs data which was collected for this study gave a good picture of the costs incurred by the households during hospitalization of their children with AGE disease. Finally the large proportion of the caregivers were mothers who have the most important information of the children; by nature mothers have key and important information for health status of their children.

### **5.2 Limitations**

This study had several potential limitations. There was slight low enrolment numbers at KNH and SCRH, due to low numbers of children presenting with AGE in these facilities. Secondly the household-borne costs as well as indirect costs were collected through interviewing the caregivers using structured questionnaires; therefore recall

of the costs information was a challenge to the caregivers, hence cost estimates in this study could have been underestimated or over-estimated compared to the true costs.

Another limitation was the study reported household costs and not cost to the government which likely account for the bulk of the costs associated with diarrhoea hospitalizations. Household-borne costs associated with AGE disease only included the admissions of public health facilities and did not include admissions of private hospitals. Costs are likely to be higher at the private facilities, so these estimates are not representative of costs across Kenya. Although private facilities don't make larger portion of the healthcare in Kenya they could be costly. Further, this study was not designed to follow children over a long period of time. Therefore we cannot capture long-term economic implications of an episode of AGE.

Also, the study focus was only on the household-borne costs associated with AGE disease attributable to inpatient admissions however it is important to note that total household-borne costs due to AGE is also critical for the outpatients case. Future studies should plan to estimate the household-borne costs attributable to AGE disease among outpatient visits.

## CHAPTER SIX

### 6.0 Conclusion

Children with diarrhoea were hospitalized for a median of five days and maximum of seven days in the National Referral Hospital and a median of four days for NCRH and SCRH. Not many caregivers sought care prior to admission to hospital; instead many went to the hospital immediately their children felt sick.

To manage an episode of diarrhoea was costly to many caregivers across the three health facilities. They also reported the same impact when it came to direct non-medical costs they spent. From the study indirect median cost analysed showed zero payment, while many caregivers did not have any lost income, some had quite a bit of payment. Again most caregivers were mothers who were totally dependent on their husband for all the support or rather some mothers did not lose income.

All the costs we estimated varied significantly across the three hospitals included in this study. Costs were highest in KNH and lowest in SCRH, but the burden may be comparable because cost of living varies across Kenya. Households in Kenya bear a substantial direct financial burden for diarrhoea hospitalization. Most households in this study reported having financial problems resulting from the entire AGE illness.

### 6.1 Recommendations

The Ministry of Health in cooperation with the County government to organize a national cost analysis benefit study to guide in policy for management of diarrhea, referral. The county facilities should induce behavior change on sanitation for families towards diarrhea prevention by health workers working at the outpatient departments, pediatrics wards, and, maternal and child welfare clinic.

Both National and County hospitals should involve community health volunteers/workers in educating the community on preventive strategies of diarrheal diseases and timely treatment of the same. I would recommend to the program to utilize information on the costs of treating paediatric diarrhoea reported here, for their planning and budgeting of diarrheal diseases in the country. This report provides very recent data collected from multiple sites in different parts of Kenya and it is readily available for any reference.

There is need to allocate resources to preventive program by policy makers to enhance recognize various referral systems at different levels across Kenya for the effective management of AGE. It is important for the National government through the ministry of health to allocate funds to research bodies, to aid further studies on cost associations studies and inclusion of more public hospitals, private hospitals including outpatient department. This is very crucial for the real time results of the economic implications of the diarrheal disease both to the health system and the households.

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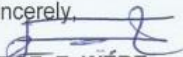
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## APPENDICES

## Appendix 1: Moi University Ethics and Research Committee Approval

	<b>INSTITUTIONAL RESEARCH AND ETHICS COMMITTEE (IREC)</b>		
MOI TEACHING AND REFERRAL HOSPITAL P.O. BOX 3 ELDORET Tel: 334711/2/3 Reference: IREC/2017/198 <b>Approval Number: 0002084</b>		MOI UNIVERSITY COLLEGE OF HEALTH SCIENCES P.O. BOX 4606 ELDORET 8 <sup>th</sup> March, 2018	
Ms. Nancy Changwony, Moi University, School of Public Health, P.O Box 4606-30100, <b>ELDORET-KENYA.</b>	<div style="border: 2px solid blue; padding: 5px; width: fit-content; margin: 0 auto;"> <b>INSTITUTIONAL RESEARCH &amp; ETHICS COMMITTEE</b>   <b>08 MAR 2018</b>   <b>APPROVED</b>  <b>P. O. Box 4606 - 30100 ELDORET</b> </div>		
Dear Ms. Changwony,			
<b><u>RE: FORMAL APPROVAL</u></b>			
The Institutional Research and Ethics Committee has reviewed your research proposal titled:-			
<b><i>“Economic Burden of Rotavirus Disease among Children under Five Years of Age in Selected Health Facilities in Kenya, 2017-2018”.</i></b>			
Your proposal has been granted a Formal Approval Number: <b>FAN: IREC 2084</b> on 8 <sup>th</sup> March, 2018. You are therefore permitted to begin your investigations.			
Note that this approval is for 1 year; it will thus expire on 7 <sup>th</sup> March 2019. If it is necessary to continue with this research beyond the expiry date, a request for continuation should be made in writing to IREC Secretariat two months prior to the expiry date.			
You are required to submit progress report(s) regularly as dictated by your proposal. Furthermore, you must notify the Committee of any proposal change (s) or amendment (s), serious or unexpected outcomes related to the conduct of the study, or study termination for any reason. The Committee expects to receive a final report at the end of the study.			
Sincerely,			
 <b>PROF. E. WÉRE</b> <b>CHAIRMAN</b> <b>INSTITUTIONAL RESEARCH AND ETHICS COMMITTEE</b>			
cc	CEO - MTRH Principal - CHS	Dean - SOP Dean - SON	Dean - SOM Dean - SOD

## Appendix 2: Letter of Authority to Access Cost data by Kenyatta National Hospital

 <p>UNIVERSITY OF NAIROBI COLLEGE OF HEALTH SCIENCES P O BOX 19676 Code 00202 Telegrams: varsity Tel: (254-020) 2726300 Ext 44355</p>	 <p>08 FEB 2016 KNH-UoN ERC P.O. Box 20723-00202 NRB.</p>	 <p>KENYATTA NATIONAL HOSPITAL P O BOX 20723 Code 00202 Tel: 726300-9 Fax: 725272 Telegrams: MEDSUP, Nairobi</p>
<p>Ref: KNH-ERC/A/56</p> <p>Nancy Chematat Chongwony Reg. No. SPH/PGH/FE/06/2015 School of Public Health College of Health Sciences Moi University</p>	<p>KNH-UoN ERC Email: <a href="mailto:uonknh_erc@uonbi.ac.ke">uonknh_erc@uonbi.ac.ke</a> Website: <a href="http://www.erc.uonbi.ac.ke">http://www.erc.uonbi.ac.ke</a> Facebook: <a href="https://www.facebook.com/uonknh.erc">https://www.facebook.com/uonknh.erc</a> Twitter: @UONKNH_ERC <a href="https://twitter.com/UONKNH_ERC">https://twitter.com/UONKNH_ERC</a></p>	<p>8<sup>th</sup> February, 2018</p>
<p>Dear Nancy</p> <p><b>RESEARCH PROPOSAL : "ECONOMIC BURDEN OF ROTAVIRUS DISEASE AMONG CHILDREN UNDER FIVE YEARS OF AGE IN SELECTED HEALTH FACILITIES IN KENYA, 2017 – 2018" (P612/10/2017)</b></p> <p>This is to inform you that the KNH- UoN Ethics &amp; Research Committee (KNH- UoN ERC) has reviewed and <b>approved</b> your above revised proposal. The approval period is from 8<sup>th</sup> February 2018 – 7<sup>th</sup> February 2019.</p> <p>This approval is subject to compliance with the following requirements:</p> <ol style="list-style-type: none"> <li>a) Only approved documents (informed consents, study instruments, advertising materials etc) will be used.</li> <li>b) All changes (amendments, deviations, violations etc) are submitted for review and approval by KNH-UoN ERC before implementation.</li> <li>c) Death and life threatening problems and serious adverse events (SAEs) or unexpected adverse events whether related or unrelated to the study must be reported to the KNH-UoN ERC within 72 hours of notification.</li> <li>d) Any changes, anticipated or otherwise that may increase the risks or affect safety or welfare of study participants and others or affect the integrity of the research must be reported to KNH- UoN ERC within 72 hours.</li> <li>e) Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. (<i>Attach a comprehensive progress report to support the renewal</i>).</li> <li>f) Clearance for export of biological specimens must be obtained from KNH- UoN ERC for each batch of shipment.</li> <li>g) Submission of an <i>executive summary</i> report within 90 days upon completion of the study. This information will form part of the data base that will be consulted in future when processing related research studies so as to minimize chances of study duplication and/ or plagiarism.</li> </ol>		
<p>Protect to discover</p>		

For more details consult the KNH- UoN ERC website <http://www.erc.uonbi.ac.ke>

Yours sincerely,



**PROF. M. L. CHINDIA**  
**SECRETARY, KNH-UoN ERC**

c.c. The Principal, College of Health Sciences, UoN  
The Deputy Director, CS, KNH  
The Chairperson, KNH-UON ERC  
The Assistant Director, Health Information, KNH  
Supervisors: Prof. Mabel Nangami, College of Health Sciences, Moi University  
Dr. Jennifer Verani, Centers for Disease and Control and Prevention

### Appendix 3: Approval to collect data in Paediatrics department



KENYATTA NATIONAL HOSPITAL  
P.O. BOX 20723, 00202 Nairobi

Tel.: 2726300/2726450/2726550  
Fax: 2725272  
Email: [knhadmin@knh.or.ke](mailto:knhadmin@knh.or.ke)

Ref: KNH/PAEDS-HOD/48 Vol.II

Date: 16<sup>th</sup> February, 2018

Nancy Chongwony  
School of Public Health  
College of Health Sciences  
Moi University

Dear Nancy

**RE: APPROVAL TO COLLECT DATA IN PAEDIATRICS DEPARTMENT**

Following approval by the KNH/UON-Ethics & Research Committee for your Research Proposal, this is to inform you that authority has been granted to collect data in *Paediatrics Department* on your study titled "*Economic burden of rotavirus disease among children under five years of age in selected health facilities in Kenya*".

Kindly liaise with the Senior Assistant Chief Nurse, Paediatrics for facilitation.

You will also be required to submit a report of your study findings to the Department of Paediatrics after completion of your study.

**DR. IRENE INWANI**  
**HEAD OF DEPARTMENT, PAEDIATRICS**

Cc. Senior Assistant Chief Nurse, Paediatrics



## Appendix 4: Questionnaires

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### Screening Form

Directions: Admission logs should be used to identify eligible children, but please ask mother, father or guardian these questions to make sure the child is eligible to participate.

No.	Question Text	Responses	Skip
1	Name of the hospital	<input type="checkbox"/> Kenyatta National Hospital <input type="checkbox"/> Kilifi County Referral Hospital <input type="checkbox"/> Nakuru County Referral Hospital <input type="checkbox"/> Siaya County Referral Hospital	
2	Date of interview (dd/mmm/yyyy)	<input type="text"/> / <input type="text"/> / <input type="text"/>	
3	Are you a primary caretaker of this child?	<input type="checkbox"/> Yes <input type="checkbox"/> No	(If NO, ask if primary caretaker is available now or later to continue interview. If primary caretaker not available, then <b>NOT ELIGIBLE</b> )
4	What is the date of birth of this child? (dd/mmm/yyyy)	<input type="text"/> / <input type="text"/> / <input type="text"/>	
5	How old is this child?	<input type="text"/> months	(If >59 months (5 years) then <b>NOT ELIGIBLE</b> )
6	Will this child stay overnight at the hospital?	<input type="checkbox"/> Yes <input type="checkbox"/> No	(If NO, then <b>NOT ELIGIBLE</b> )
7	What is the main reason that this child is at the hospital?	<input type="checkbox"/> Acute gastroenteritis <input type="checkbox"/> Other <input type="text"/>	(If Other, then <b>NOT ELIGIBLE</b> )
8	How many days did this child have diarrhea before coming to the hospital? <small>(Diarrhea means that during his or her sickness, the child had at least 3 loose motions in one 24hr period.)</small>	<input type="text"/> days	If >7 days, then <b>NOT ELIGIBLE</b>

If NOT ELIGIBLE, "Thank you very much for your time."

If ELIGIBLE : Did the caretaker give consent to participate in the study?  Yes  No

Will the interview take place?  Yes  No

Why will the interview not take place?  Caretaker unavailable

Caretaker refused

N/A

Other

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### Admission Form

Directions: Complete a separate form for each child 0-59 months old who has been selected AND whose caregiver has consented AND who is eligible

No.	Question Text	Responses	Skip
	Patient Hospital ID (Medical Record ID)	<input type="text"/>	
2	Study ID:1st digit is hospital ID	<input type="text"/> . <input type="text"/>	
3	Patient date of birth(dd/mmm/yyyy)	<input type="text"/> / <input type="text"/> / <input type="text"/>	
4	Patient sex	<input type="checkbox"/> Male <input type="checkbox"/> Female	
5	Date of admission(dd/mmm/yyyy)	<input type="text"/> / <input type="text"/> / <input type="text"/>	
6	Date Interviewed(dd/mmm/yyyy)	<input type="text"/> / <input type="text"/> / <input type="text"/>	
7	Interviewer Initials	<input type="text"/>	
8	Has the child been vaccinated against rotavirus?	<input type="checkbox"/> Yes <input type="checkbox"/> No	If yes go to Q9
9	Please list the dates of vaccination, from the Mother-Child Booklet.	Dose 1 <input type="text"/> / <input type="text"/> / <input type="text"/> Dose 2 <input type="text"/> / <input type="text"/> / <input type="text"/>	
10	Name of the hospital	<input type="checkbox"/> Kenyatta National Hospital <input type="checkbox"/> Kilifi County Referral Hospital <input type="checkbox"/> Nakuru County Referral Hospital <input type="checkbox"/> Siaya County Referral Hospital	
11	DSS number (where applicable)	<input type="text"/> - <input type="text"/> - <input type="text"/> - <input type="text"/>	
First I would like to ask you about what happened before you and your child came to the hospital.			
No.	Question Text	Responses	Skip
12	What is your relationship to the child?	<input type="checkbox"/> Mother <input type="checkbox"/> Father <input type="checkbox"/> Brother/Sister <input type="checkbox"/> Grand Mother/Father <input type="checkbox"/> Aunt/Uncle <input type="checkbox"/> Other <input type="text"/>	
13	What kind of transportation did you use to bring your child to this hospital?  <i>Select all that apply</i>	<input type="checkbox"/> Personal car/vehicle <input type="checkbox"/> Taxi <input type="checkbox"/> Matatu/bus <input type="checkbox"/> Ambulance <input type="checkbox"/> Motor bike/Bicycle/tricycle/Tuktuk <input type="checkbox"/> Foot/Other	
14	How much did you and everyone pay in total to bring your child to this hospital?	<input type="text"/> . <input type="text"/> Kes	
15	How long does it usually take to get from your home to the hospital?	<input type="text"/> Hours <input type="text"/> Minutes	
16	Did you go anywhere else for your child's illness prior to this hospitalization?	<input type="checkbox"/> Yes <input type="checkbox"/> No	If No, go to END of Form1

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Which of the following places did you go to before this hospitalization? [Interviewer, ask one by one, and then ask for each:] How much did you have to pay in each category?

	Place sought care	Y/N	Drugs	Diagnostics tests	Consult fees	Other costs
15	Hospital/Clinic	<input type="checkbox"/> Yes <input type="checkbox"/> No	□□□□□.□□ Kes	□□□□□.□□ Kes	□□□□□.□□ Kes	□□□□□.□□
16	Chemist/Pharmacy	<input type="checkbox"/> Yes <input type="checkbox"/> No	□□□□□.□□ Kes	□□□□□.□□ Kes	□□□□□.□□ Kes	□□□□□.□□
17	Shop/Kiosk	<input type="checkbox"/> Yes <input type="checkbox"/> No	□□□□□.□□ Kes	□□□□□.□□ Kes	□□□□□.□□ Kes	□□□□□.□□
18	Traditional healer	<input type="checkbox"/> Yes <input type="checkbox"/> No	□□□□□.□□ Kes	□□□□□.□□ Kes	□□□□□.□□ Kes	□□□□□.□□
19	Friend/relative	<input type="checkbox"/> Yes <input type="checkbox"/> No	□□□□□.□□ Kes	□□□□□.□□ Kes	□□□□□.□□ Kes	□□□□□.□□
20	Other:	<input type="checkbox"/> Yes <input type="checkbox"/> No	□□□□□.□□ Kes	□□□□□.□□ Kes	□□□□□.□□ Kes	□□□□□.□□

\*\*\* [END of section to be completed upon admission] \*\*\*

Name of Interviewer: □□□□□□□□□□ code of Interviewer: □□□□

Name of person completing field QC: □□□□□□□□□□ code : □□□□

Date of field QC: □□ / □□□□ / □□□□

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**Discharge Form**

*To be completed immediately before discharge.*

Question Text	Responses	Skip	
1 Patient Hospital ID (Medical Record ID)	<input type="text"/>		
2 Study ID:1st digit is hospital ID	<input type="text"/> . <input type="text"/>		
3 Date Interviewed(dd/mmm/yyyy)	<input type="text"/> / <input type="text"/> / <input type="text"/>		
4 Was the patient discharged?	<input type="checkbox"/> Yes <input type="checkbox"/> No	If No,go to 7	
5 Date of discharge(dd/mmm/yyyy)	<input type="text"/> / <input type="text"/> / <input type="text"/>		
6 Outcome on discharge	<input type="text"/>		
7 If not discharged, why	<input type="text"/>		
Thank you for taking the time to speak with me again before going home.			
Question Text	Responses	Skip	
8 Since this child was hospitalized, have you or other household members traveled from home to visit the child?	<input type="checkbox"/> Yes <input type="checkbox"/> No	If No,go to 10	
9 How many times did people from your household visit, using each of these ways of transportation? How much did it cost for each trip?  Please add thecost and total for each means of transport	Mode	No. Times	Cost/trip
	Personal car/vehicle	<input type="text"/>	<input type="text"/>
	Taxi	<input type="text"/>	<input type="text"/>
	Matatu/bus	<input type="text"/>	<input type="text"/>
	Ambulance	<input type="text"/>	<input type="text"/>
	Motorbike/Bicycle/tricycle (tuktuk)	<input type="text"/>	<input type="text"/>
Other	<input type="text"/>	<input type="text"/>	
10 Are you the main income provider in the household where this child lives?	<input type="checkbox"/> Yes <input type="checkbox"/> No		
11 Do you work to earn a living? <i>This question is about the caregiver personally</i>	<input type="checkbox"/> Yes <input type="checkbox"/> No	If No,go to 20	
12 What is your main way of earning a living? <i>[Single response: Select only one]</i>	<input type="checkbox"/> Farming/Shamba work <input type="checkbox"/> Formal employment <input type="checkbox"/> Shop keeping <input type="checkbox"/> Hawking (buy and sell) <input type="checkbox"/> Skilled labour <input type="checkbox"/> Unskilled labour <input type="checkbox"/> Fishing <input type="checkbox"/> Student <input type="checkbox"/> Other <input type="text"/>		

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No.	Question Text	Responses	Skip																																				
13	How much income do you typically make for your work? Please tell me your best guess, however is easiest for you.	Hourly:Kes <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Daily:Kes <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Weekly:Kes <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Monthly:Kes <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <i>Interviewer, please record and tick whichever option the caregiver indicates. Ex. if caregiver gives hourly wage, record in the hourly box and tick "hourly"</i>																																					
14	Did you miss any days of work because of this child's illness?	<input type="checkbox"/> Yes <input type="checkbox"/> No	If No, go to 20																																				
15	How many days of work?	<input type="text"/> <input type="text"/>																																					
16	Did you lose any income for missing work for this child's current illness?	<input type="checkbox"/> Yes <input type="checkbox"/> No																																					
17	How many people live in your household in total?	<input type="text"/> <input type="text"/>																																					
18	How many adults?	<input type="text"/> <input type="text"/>																																					
19	How many children?	<input type="text"/> <input type="text"/> children < 5 <input type="text"/> <input type="text"/> children 5 - 17 years old																																					
20	How much income does each household member make usually? Please make your best guess however is easiest for you <i>Interviewer, please record in Kes and indicate units (H for hourly, D for daily, W for weekly, M for monthly)</i> <i>If a specified member does not earn income for the household, put "0".</i> <i>If a specified member does not exist in the household, put "9999"</i> <i>For the person answering the questionnaire, put "88"</i>	<table border="1"> <thead> <tr> <th>Household member</th> <th>Typical income(Kes)</th> <th><input type="checkbox"/> H</th> <th><input type="checkbox"/> D</th> <th><input type="checkbox"/> W</th> <th><input type="checkbox"/> M</th> </tr> </thead> <tbody> <tr> <td>1 Father / husband</td> <td><input type="text"/><input type="text"/><input type="text"/><input type="text"/><input type="text"/><input type="text"/><input type="text"/><input type="text"/><input type="text"/><input type="text"/><input type="text"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td>2 Mother / wife</td> <td><input type="text"/><input type="text"/><input type="text"/><input type="text"/><input type="text"/><input type="text"/><input type="text"/><input type="text"/><input type="text"/><input type="text"/><input type="text"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td>3 Uncle</td> <td><input type="text"/><input type="text"/><input type="text"/><input type="text"/><input type="text"/><input type="text"/><input type="text"/><input type="text"/><input type="text"/><input type="text"/><input type="text"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td>4 Older child</td> <td><input type="text"/><input type="text"/><input type="text"/><input type="text"/><input type="text"/><input type="text"/><input type="text"/><input type="text"/><input type="text"/><input type="text"/><input type="text"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td>5 Other <input type="text"/><input type="text"/><input type="text"/><input type="text"/><input type="text"/><input type="text"/><input type="text"/><input type="text"/><input type="text"/><input type="text"/><input type="text"/></td> <td><input type="text"/><input type="text"/><input type="text"/><input type="text"/><input type="text"/><input type="text"/><input type="text"/><input type="text"/><input type="text"/><input type="text"/><input type="text"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> </tbody> </table>	Household member	Typical income(Kes)	<input type="checkbox"/> H	<input type="checkbox"/> D	<input type="checkbox"/> W	<input type="checkbox"/> M	1 Father / husband	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	2 Mother / wife	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	3 Uncle	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	4 Older child	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	5 Other <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
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21	Did any other household member miss work?	<input type="checkbox"/> Yes <input type="checkbox"/> No	If No, go to 25																																				
22	How many days of work did each other household member miss?  <i>For the caregiver answering the questionnaire, put "88."</i> <i>If a person does not exist in the household, put "99"</i>	<table border="1"> <thead> <tr> <th>Household member</th> <th>Number of work days</th> </tr> </thead> <tbody> <tr> <td>1 Father / husband</td> <td><input type="text"/><input type="text"/></td> </tr> <tr> <td>2 Mother / wife</td> <td><input type="text"/><input type="text"/></td> </tr> <tr> <td>3 Uncle</td> <td><input type="text"/><input type="text"/></td> </tr> <tr> <td>4 Older child</td> <td><input type="text"/><input type="text"/></td> </tr> <tr> <td>5 Other</td> <td><input type="text"/><input type="text"/></td> </tr> </tbody> </table>	Household member	Number of work days	1 Father / husband	<input type="text"/> <input type="text"/>	2 Mother / wife	<input type="text"/> <input type="text"/>	3 Uncle	<input type="text"/> <input type="text"/>	4 Older child	<input type="text"/> <input type="text"/>	5 Other	<input type="text"/> <input type="text"/>																									
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4 Older child	<input type="text"/> <input type="text"/>																																						
5 Other	<input type="text"/> <input type="text"/>																																						

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No.	Question Text	Responses	Skip
23	Did any other household member lose income?	<input type="checkbox"/> Yes <input type="checkbox"/> No	If No, go to 25
24	Which household member(s) lost income? <i>Check all that apply. Do not include the caregiver answering the study.</i>	<input type="checkbox"/> Father / husband <input type="checkbox"/> Mother / wife <input type="checkbox"/> Uncle <input type="checkbox"/> Older child <input type="checkbox"/> Other	
25	Did you have to pay any extra lodging cost for yourself or other family members during this hospital visit for your child's diarrheal illness?	<input type="checkbox"/> Yes <input type="checkbox"/> No	If No, go to 29
26	What was the total number of nights?	<input type="text"/> <input type="text"/> nights	
27	What was the total cost paid for this lodging?	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> . <input type="text"/> <input type="text"/> Kes	
29	Did you have to pay somebody to care for your other children during this hospital visit for this child's diarrheal illness?	<input type="checkbox"/> Yes <input type="checkbox"/> No	If No, go to 31
30	What was the total cost you paid this person?	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> . <input type="text"/> <input type="text"/> Kes	
<i>I would now like to ask about the costs that you have had to pay during this hospitalization. Please give me your best guess of what you have had to pay at the hospital for each type of cost. I will read.</i>			
31	Drugs / medications	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> . <input type="text"/> <input type="text"/> Kes	
32	Tests / diagnostics	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> . <input type="text"/> <input type="text"/> Kes	
33	Consultation fee(s)	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> . <input type="text"/> <input type="text"/> Kes	
34	Other fees	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> . <input type="text"/> <input type="text"/> Kes	
35	Total Paid	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> . <input type="text"/> <input type="text"/> Kes	
36	Amount Waived	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> . <input type="text"/> <input type="text"/> Kes	
37	Has this illness affected the family's financial situation?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
38	Where did the money come from to pay for these costs? <i>[indicate all that apply]</i>	<input type="checkbox"/> Cutting down on other costs <input type="checkbox"/> Using savings <input type="checkbox"/> Borrowing <input type="checkbox"/> Selling belongings <input type="checkbox"/> Donations from friends or relatives <input type="checkbox"/> Insurance <input type="checkbox"/> Other <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	
<i>We would like to speak with you again in one or two weeks, after your child goes home from the hospital.</i>			
39	Do you have/own a phone where I can call you to ask more questions?	<input type="checkbox"/> Yes <input type="checkbox"/> No	If No, go to 41
40	What are the telephone numbers that are best if we want to reach you for more questions? <i>[list all the possible numbers in order of convenience]</i>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	

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No.	Question Text	Responses	Skip
41	Do you have a relative/friend whose phone we can call you on?  <i>If No, ask caregiver to stop by if she happens to come to the hospital again (for a different reason) in the next two weeks</i>	<input type="checkbox"/> Yes <input type="checkbox"/> No	
42	What are their names and telephone numbers?	Name: <input type="text"/>  Phonenumber: <input type="text"/>	
43	We need to know how we can refer to you when we call this person. How is this person related to you?	<input type="checkbox"/> Mother/Father <input type="checkbox"/> Brother/Sister <input type="checkbox"/> Grand Mother/Father <input type="checkbox"/> Aunt/Uncle <input type="checkbox"/> Friend <input type="checkbox"/> Other <input type="text"/>	

\*\*\* Thank you for your time! \*\*\*

Name of Interviewer:  code of Interviewer:

Name of person completing field QC:  code :

Date of field QC:  /  /

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**Post-Discharge Follow-up Questionnaire**

Directions: Complete a separate form for each child 0-59 months old who has been selected AND whose caregiver has consented AND who is eligible

No.	Question Text	Responses	Skip
1	Patient Hospital ID (Medical Record ID)	<input type="text"/>	
2	Study ID:1st digit is hospital ID	<input type="text"/> . <input type="text"/>	
3	Patient date of birth(dd/mmm/yyyy)	<input type="text"/> / <input type="text"/> / <input type="text"/>	
4	Patient sex	<input type="checkbox"/> Male <input type="checkbox"/> Female	
5	Date Interviewed(dd/mmm/yyyy)	<input type="text"/> / <input type="text"/> / <input type="text"/>	
6	Interviewer Initials	<input type="text"/>	
7	Name of the hospital	<input type="checkbox"/> Kenyatta National Hospital <input type="checkbox"/> Kilifi County Referral Hospital <input type="checkbox"/> Nakuru County Referral Hospital <input type="checkbox"/> Siaya County Referral Hospital	
8	Status of the interview	<input type="checkbox"/> Conducted <input type="checkbox"/> Not conducted	
9	If not conducted, why	<input type="checkbox"/> Child died <input type="checkbox"/> Caregiver could not be contacted <input type="checkbox"/> Caregiver refused <input type="checkbox"/> Other <input type="text"/>	
<p><i>First, ask for the person that answered baseline. If not available, ask if somebody else knows about the child's recent illness. Thank you for agreeing to speak with me (again). I would like to ask you about what happened and any costs you had to pay in the week after your child went home from the hospital. This includes the day you went home (after leaving the hospital) and the six days after. I am interested in costs that you had to pay because your child's diarrheal illness</i></p>			
10	What is your relationship to the child?	<input type="checkbox"/> Mother <input type="checkbox"/> Father <input type="checkbox"/> Brother/Sister <input type="checkbox"/> Grand Mother/Father <input type="checkbox"/> Aunt/Uncle <input type="checkbox"/> Other <input type="text"/>	
11	Is the child back to feeling better? (His / her usual status)	<input type="checkbox"/> Fully recovered <input type="checkbox"/> Some improvement of diarrhea <input type="checkbox"/> No improvement <input type="checkbox"/> Child's sickness has gotten worse <input type="checkbox"/> Sick with a new illness <input type="checkbox"/> Died	If fully recovered, continue. Else go to 13
12	When (what date) do you think the child was fully better after this illness? (dd/mm/yyyy)	<input type="text"/> / <input type="text"/> / <input type="text"/>	
13	Were you told to give your child any medication or drugs after he/she was sent home from the hospital?	<input type="checkbox"/> Yes <input type="checkbox"/> No	If No, go to 16

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No.	Question Text	Responses	Skip			
14	Did you give your child all of the doses that he/she was supposed to get after he/she was sent home from the hospital?	<input type="checkbox"/> Yes <input type="checkbox"/> No	If Yes, go to 16			
15	What was the main reason why the child did not receive all of the doses that he/she was supposed to get?	<input type="checkbox"/> Did not have money to buy <input type="checkbox"/> Forgot to buy <input type="checkbox"/> Forgot to give doses <input type="checkbox"/> Did not want to give doses <input type="checkbox"/> Reacted to medication <input type="checkbox"/> Child is still receiving medication <input type="checkbox"/> Other <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>				
16	Did the child get more medical care during the first 7 days after he/she went home from the hospital?	<input type="checkbox"/> Yes <input type="checkbox"/> No	If No, go to 26			
17	What was the main reason you took the child to get more medical care?	<input type="checkbox"/> Routine follow-up visit <input type="checkbox"/> Continued illness <input type="checkbox"/> Different illness <input type="checkbox"/> Other <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	If 1 or 2, go to 19			
18	What type of illness?	<input type="checkbox"/> New diarrheal or vomiting illness <input type="checkbox"/> Respiratory illness (cough / flu / cold) <input type="checkbox"/> Malaria or other fever illness <input type="checkbox"/> Other <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>				
Where did you/member of the household seek medical care for the child? Please remember, we are talking about AFTER the child was discharged. [Interviewer, ask one by one, and then ask for each:] How much did you have to pay in each category?						
	Place sought care	Y/N	Drugs	Diagnostics tests	Consult fees	Other costs
19	Hospital/Clinic	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Kes	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Kes	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Kes	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
20	Chemist/Pharmacy	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Kes	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Kes	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Kes	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
21	Shop/Kiosk	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Kes	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Kes	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Kes	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
22	Traditional healer	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Kes	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Kes	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Kes	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
23	Friend/relative	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Kes	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Kes	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Kes	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
24	Other:	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Kes	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Kes	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> Kes	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>

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No.	Question Text	Responses			Skip
25	How many times did people from your household visit, using each of these ways of transportation? How much did it cost for each trip?  All items should be described one-way.  In the seven days after the child went home from the hospital, how did you travel to a new medical visits? how many times? what did you pay for each trip?  Interviewer, Indicate the total cost for each means of transport	Mode	No. Times	Cost	
		Personal car/vehicle	<input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	
		Taxi	<input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	
		Matatu/bus	<input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	
		Ambulance	<input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	
		Motorbike/Bicycle/tricycle (tuktuk)	<input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	
		Other	<input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	
26	Did you miss any days of work AFTER the child was discharged, as a result of his or her illness?	<input type="checkbox"/> Yes <input type="checkbox"/> No			If No, go to 29
27	How many days of work?	<input type="text"/> <input type="text"/> days			
28	Did you lose any income for missing work for this child's current illness, AFTER he or she was discharged?	<input type="checkbox"/> Yes <input type="checkbox"/> No			
29	Did any other household member miss work AFTER the child was discharged, as a result of the child's illness?	<input type="checkbox"/> Yes <input type="checkbox"/> No			If No, go to END
30	How many days of work did each other household member miss?  <i>For the caregiver answering the questionnaire, put "88."</i> <i>If a person does not exist in the household, put "99"</i>	Household member	Number of work days		
		1 Father / husband	<input type="text"/> <input type="text"/>		
		2 Mother / wife	<input type="text"/> <input type="text"/>		
		3 Uncle	<input type="text"/> <input type="text"/>		
		4 Older child	<input type="text"/> <input type="text"/>		
		5 Other	<input type="text"/> <input type="text"/>		
31	Did any other household member lose income AFTER the child was discharged, as a result of the child's illness?	<input type="checkbox"/> Yes <input type="checkbox"/> No			If No, END
35	Which household member(s) lost income?  Indicate all that apply	<input type="checkbox"/> Father / husband <input type="checkbox"/> Mother / wife <input type="checkbox"/> Uncle <input type="checkbox"/> Older child <input type="checkbox"/> Other			
*** Thank you for your time! ***					
Name of Interviewer: <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> code of Interviewer: <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>					
Name of person completing field QC: <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> code : <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>					
Date of field QC: <input type="text"/> <input type="text"/> / <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> / <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>					

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### Appendix 5: Data Dictionary

Variable	Type	Question	Values
AdmitDate	Date	Date of admission	
adults	Num	How many adults?	
AgeCat_1_above	Char	Age category	A. under 12mo B.12mo+
AgeCat_2	Char	Age category	A.under 24mo B.24mo+
AgeCat_3	Char	Age category	A.Under 12m B.12-23mo C.24mo+
AgeCat_5	Char	Age category	A.Under 6mo B.6-11mo C.12-17mo D.18-23m E.24mo+
AgeMo	Num	Age in months	
BirthDate	Date	Date of birth	
borrowed_money	Num	whether money was borrowed to pay costs	1 - Yes, 0 - No
Chemist	Num	Place sought care:Chemist/Pharmacy	1 - Yes; 2 - No
child_absconded	Num	Child absconded - yes/no	1 - Yes, 0 - No
child_died	Num	Child died - yes/no	1 - Yes, 0 - No
children1	Num	How many children? < 5?	
children2	Num	How many children? 5 - 17	
clinic	Num	Place sought care:Hospital/Clinic	1 - Yes; 2 - No
comorbidities_complications_YN	Num	Child had any complications or comorbidities Y/N	1 - Yes, 0 - No
convulsions	Num	Child had convulsions Y/N	1 - Yes, 0 - No
cut_down_othercosts	Num	whether family cut down on other costs to pay for diarrheal illness	1 - Yes, 0 - No
DisDate	Date	Date of discharge	
DM_chemist1	Num	Direct medical costs paid to chemist, BEFORE this admission	
DM_clinic1	Num	Direct medical costs paid to clinic/hospital, BEFORE this admission	
DM_consult	Num	Direct medical costs for CONSULTS (entire illness)	
DM_costs_during	Num	Direct medical costs paid DURING this admission	

DM_costs_post	Num	Direct medical costs paid AFTER this admission	
DM_costs_pre	Num	Direct medical costs paid BEFORE this admission	
DM_costs_tot	Num	TOTAL direct medical costs paid by family (entire illness)	
DM_diagnostics	Num	Direct medical costs for DIAGNOSTICS (entire illness)	
DM_drugs	Num	Direct medical costs for DRUGS (entire illness)	
DM_friend1	Num	Direct medical costs paid to friend, BEFORE this admission	
DM_other	Num	Direct medical costs for OTHER (entire illness)	
DM_shop1	Num	Direct medical costs paid to shop, BEFORE this admission	
DM_TradHealer1	Num	Direct medical costs paid to traditional healer, BEFORE this admission	
DNM_alltransport	Num	Direct non-medical costs paid for TRANSPORT (entire illness)	
DNM_childcare	Num	Direct non-medical costs paid for CHILDCARE	
DNM_costs_all	Num	TOTAL direct NON-medical costs paid by family (entire illness)	
DNM_lodging	Num	Direct non-medical costs paid for LODGING	
financial_state	Num	Has this illness affected the family's financial situation?	1 - Yes; 2 - No
Friend	Num	Place sought care:Friend/relative	1 - Yes; 2 - No
Gender	Num	Gender	Male-1, Female -2
indirect_costs	Num	TOTAL INDIRECT costs to family	
just_borrowing	Num	Family used ONLY borrowing money to pay for costs of child illness	1 - Yes, 0 - No
just_cuttingdown	Num	Family used ONLY cutting down on other costs to pay for child illness	1 - Yes, 0 - No
just_donations	Num	Family used ONLY donations to pay for child illness	1 - Yes, 0 - No

just_insurance	Num	Family used ONLY insurance to pay for child illness	1 - Yes, 0 - No
just_ngo	Num	Family used ONLY NGO to pay for child illness	1 - Yes, 0 - No
just_other	Num	Family used ONLY other source to pay for child illness	1 - Yes, 0 - No
just_paidbywaiver	Num	Family used ONLY waiver to pay for child illness	1 - Yes, 0 - No
just_savings	Num	Family used ONLY savings to pay for child illness	1 - Yes, 0 - No
just_soldbelongings	Num	Family ONLY sold belongings to pay for child illness	1 - Yes, 0 - No
LOS	Num	Length of stay	
malaria	Num	Child had malaria	1 - Yes, 0 - No
malnutrition	Num	Child had malnutrition of some sort	1 - Yes, 0 - No
meningitis	Num	Child had meningitis	1 - Yes, 0 - No
moadmit	Num	Month of admission	
Money_Source	Num	Where did the money come from to pay for these costs?	Cutting down on other costs 1 Using savings 2 Borrowing 3 Selling belongings 4 Donations from friends and relatives 5 Other 6 Insurance 7
MoneySourceCat	Char	Money source	A.1 source B.2 sources C.3 or more sources D.Missing source
ngo_paid	Num	NGO paid at least some costs	1 - Yes, 0 - No
numabx	Num	Number of antibiotics that child received	
numantimalarial	Num	Number of antimalarials that child received	
numantipar	Num	Number of antiparasitics that child received	
numsource		Number of sources of money that family used to pay for child illness	
Other_Care	Num	Place sought care:Other	1 - Yes; 2 - No

other_rep_comorbidity		Child had some other comorbidity other than malaria, pneumonia, meningitis, malnutrition, convulsions, sepsis	1 - Yes, 0 - No
Outcome	Char	Outcome on discharge	
paid_bywaiver	Num	Family paid by waiver for child illness	1 - Yes, 0 - No
parental_income_per mo	Num	Parental income per month	
PatientID	Num	Medical record ID	
people	Num	How many people live in your household in total?	
pneumonia		Child had pneumonia	1 - Yes, 0 - No
relationship	Num	What is your relationship to the child?	Mother 1 Father 2 Brother / sister 3 Grandmother / father 4 Aunt / uncle 5 Other 6
Rota_dose1fix	Date	Date of rota dose 1	
Rota_dose2fix	Date	Date of Rota dose 2	
Season_admit		Season of admission	
seekcare	Num	Did you go anywhere else for your child's illness prior to this hospitalization?	1 - Yes; 2 - No
sepsis_septicaemia	Num	Child had sepsis / septicaemia	1 - Yes, 0 - No
shop	Num	Place sought care:Shop/Kiosk	1 - Yes; 2 - No
Site	Num	Site	Kenyatta National Hospital 1 Nakuru County Referral Hospital 3 Siaya County Referral Hospital 4
sold_belongings		Family sold belongings to pay for at least some of cost of child illness	1 - Yes, 0 - No
StudyID	Num	Study ID	
tot_fam_income_monthly	Num	Total family income (many missings)	
TOTAL_fam_costs	Num	TOTAL costs to family (direct and indirect) over entire illness	
Trad_Healer	Num	Place sought care:Traditional healer	1 - Yes; 2 - No
used_donations	Num	Family used donations to pay at least some of cost of child illness	1 - Yes, 0 - No

used_insurance	Num	Family used insurance to pay at least some of cost of child illness	1 - Yes, 0 - No
used_other2	Num	Family used a different source to pay at least some of cost of child illness	1 - Yes, 0 - No
used_savings	Num	Family used savings to pay for at least some of cost of child illness	1 - Yes, 0 - No
Vacci_rota	Num	Has the child been vaccinated against rotavirus?	1 - Yes; 2 - No