PATIENT LEVEL COST OF HOME AND FACILITY BASED CHILD PNEUMONIA CASE TREATMENT IN SUBA SUB COUNTY KENYA

BY

JOEL AMENYA MACHUKI

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DECLARATION

1. STUDENT

I, Joel Amenya Machuki, do hereby declare that this thesis is my original work and has not been submitted for an award of the degree or diploma in any other university or college.

Joel Amenya Machuki

PG/MPH/064/2012

Signature…………………………………. Date……………………….…

2. THE SUPERVISORS

We, the undersigned, confirm that this thesis has been submitted for examination with our approval as University Supervisors:

1. Dr Abong'o B.O (BSc. MSc. PhD)

Faculty of science and Technology, The National University of Lesotho

Department of Biology

Signature…………………………….…. Date…………………………..

2. Dr Maricianah Onono (MBCh.B. MSc)

Kenya Medical Research Institute/ Fogarty Global Health

Signature……………...…………… Date………………………….

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DEDICATION

I dedicate this work most sincerely to my dear wife Bertha and son Carson for those missed family times during the course of my study. I consider it a shared achievement. To my father Dick Machuki, for always believing in me. To my mother, Cecilia Lawa, for her unending zest for more in life and spilling that spirit over to me.

ABSTRACT

Globally Pneumonia is one of the major causes of death in children under 5 years old in 2018. Kenya is ranked among top 15 countries which contribute about 74% of the world's annual pneumonia cases in 2018. Unfortunately, less than fifty percent of children with pneumonia receive appropriate antibiotics for treatment. Homa Bay County implemented pneumonia community case management as recommended by WHO utilizing community health workers. Health care seeking behaviour studies have found that the treatment cost in care seeking influence choice of place to seek care. The patient level cost of home based and facility based treatment of pneumonia in Suba Sub County and its influence on choice of subsequent place to seek care remained uncertain. As such the main objective of this study was to compare the patient level costs of home treatment of pneumonia by community health worker with health facility based treatment and its influences on the choice of subsequent place to seek care. Specifically the objectives of study were: to estimate the patient level costs associated with pneumonia home based treatment by community health worker for children aged 2-59months diagnosed with pneumonia in Suba sub county, Kenya; to estimate the patient level costs associated with facility based treatment of pneumonia for children aged 2-59months diagnosed with pneumonia in Suba sub county, Kenya; to determine how household treatment cost for children aged 2-59 months diagnosed with pneumonia, determines the caregiver's choice of subsequent place to seek care in Suba sub county, Kenya. Using a cross section study design participants were surveyed. This study was nested within the larger iCCM implementation study. A structured questionnaire was used to collect quantitative data from caregivers on direct cost (consultation, medicine, transport) and indirect costs (Opportunity cost) of pneumonia treatment. Based on the Yamane formula 1967 for sample size calculation a total of 208 participants were recruited into the study. The average household cost for the community managed cases was Ksh 122.65($1.29) compared with Ksh 447.46($4.71) for those treated at the health facility, a 4-fold difference. The largest cost drivers for home and health facility treatment were opportunity cost (Ksh 88.25 ($ 0.93)) and Medicine (Ksh 126.16 ($ 1.33)) respectively. A logistic regression conducted found that cost of treatment of pneumonia had a highly significant effect on subsequent place of seeking care $p<0.001$. Consultation fee and medicine increased the odds of choosing a CHW over Health facility by 34% and 11% respectively. This study recommends strengthening of the community case management of pneumonia.

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ABBREVIATION

WHO	**-**	World Health Organization
CHW	**-**	Community Health Worker
ICCM	**-**	Integrated Community Case management
CRF	**-**	Case Recording Form
UNICEF	**-**	United Nations Children's Fund
HIV	**-**	Human Immunodeficiency Virus
AIDS	**-**	Acquired Immunodeficiency Syndrome
QA	**-**	Quality Assurance
SPSS	**-**	Statistical Package for Social Sciences
(CMDs)	**-**	Community Medicine Distributors
RA	**-**	Research Assistant
MoPHS	**-**	Ministry of Public Health Sanitation
US$	-	United State Dollars
SD	-	Standard deviation
ANOVA	-	Analysis of variance
KEMRI	-	Kenya Medical Research Institute
IQR	-	Interquartile Range
HF	-	Health Facility
Ksh	-	Kenya shillings

OPERATIONAL TERMS AND DEFINITIONS

Pneumonia: Child 2-59 months old having cough and/or difficulty in breathing with respiratory rate of 50 breaths per minute or more(WHO, 2014).

Severe Pneumonia: Lower Chest in-drawing regardless of respiratory rate in children with history of cough and/or difficulty in breathing (WHO, 2014)

Fast breathing: 50 breaths or more per minute in a child aged 2-12 months and 40 breaths or more per minute in a child aged 12-59months

Community Health Workers (CHWs): These are persons selected from the communities in which they live and work; they are selected by and are answerable to the communities, are supported by the health system, and undergo shorter training than professional health workers who provide community case management (WHO, 2007a).

Cost: Is the financial quantification of resources a caregiver or patients' families utilizes in addressing the illness and also the productivity losses to an individual caused by the health problem or disease.(Staff, 2008)

Integrated community case management (iCCM): Integrated Community Case Management (iCCM) is an equity-focused strategy to improve access to essential treatment services for pneumonia malaria and diarrhoea in sick children aged 2-59 months (Young *et al*., 2012).

Under-the-table payment- Describing a payment in which no involved party reports the payment to tax authorities.(Staff 2008)

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CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Globally Pneumonia kills an estimated 1.1 million children yearly and this, accounts for 18% of all child mortality worldwide. This makes it one of the largest causes of death in children under five year with a prevalence of 4% globally (WHO, 2017). Pneumonia is a global problem, but is most prevalent in South Asia and sub-Saharan Africa (WHO, 2013).The incidence of pneumonia in children under the age of five years is 29 cases per 100 children, which equates 151.8 million cases annually in developing countries and 4 million cases, occur in developed countries. Fifteen countries contribute 74% of the world's annual pneumonia cases(WHO, 2018). Half the world's deaths due to pneumonia in children under the age of five years occur in Africa(WHO 2013). Kenya is currently ranked among the 15 countries with the highest estimated number of deaths due to clinical pneumonia, the mortality rate being 50.3 per 10,000 under-fives per year. In Kenya, pneumonia is the second leading cause of death among children under the age of five years and causes 16% of deaths among under-fives(WHO, 2018).The mainstay of pneumonia case management is hospital based antibiotic treatment. In Africa the main hindrance towards implementation of proper pneumonia case management is limited access to health care services especially in rural area and its associated costs, (Bill & Melinda gates, 2010).

The estimated costs associated with treatment of a pneumonia episode in under-five children can be divided into direct and indirect out-of-pocket expenses incurred by the household for an episode of pneumonia(Madsen et al., 2009). Direct medical costs are the actual amount paid by the households for consultation, investigations such as radiology, hospital admissions and medicines. Direct non-medical costs are incurred for transportation and meals for caregivers at the health facility. Indirect costs are the opportunity cost of caregiver time and

foregone wages during the time of seeking care for the child. Although care for children under five years is officially free of charge in Kenya, households frequently pay for hospital stay and/or drugs and supplies (henceforth all termed user fees). These payments made by poor households directly to service providers are high and continue to grow(Munge & Briggs, 2014).

Evidence now shows that community case management (CCM) of suspected pneumonia with oral antibiotics can reduce pneumonia-specific mortality by 35% (Sazawal, Black, & Pneumonia Case Management Trials Group, 2003). In Kenya, pneumonia home case management is nested within the Integrated Community case management (iCCM) strategy for malaria, pneumonia, diarrhoea and new-born health. The overall aim of iCCM is to support and strengthen community based case management of malaria, pneumonia and diarrhoea by providing training, job aids and supervision to Community Health Workers (CHWs)(Winch et al., 2005). Treatment at the community level is offered by a CHW who either visits households or come across a child who is sick and offer case management or the caregiver seeks cares from the CHWs' home. Both treatments at the health facility and at home involve direct and indirect cost associated to treatment of pneumonia.

Several studies have tried to estimate the cost of pneumonia treatment at the health facility. For example a study done in Pakistan on the cost of treatment for child pneumonia and meningitis in the Northern Areas of Pakistan found that, the average cost of treatment for a facility based outpatient case of child pneumonia is Ksh 1276.8 ($13.44). (Hussain, Waters, Khan, Omer, & Halsey, 2008). In the Kenyan public regional or district hospitals the mean cost per child treated ranged from Ksh 5135.7 (US $54.06) to Ksh 9429.7 (US $99.26) for pneumonia. The total treatment cost estimates were sensitive to changes depending on where care was sort (Ayieko, Akumu, Griffiths, & English, 2009). This previous study in Kenya was focused on estimating specifically the total cost of treatments of pneumonia at the health

facility only but did not evaluate cost of treatment at home and how the cost of treatment will influence the choice of place to seek next time. The study focused on treatment cost from both the provider and household cost perspective. Therefore The main objective of this study was to compare the patient level costs of home based community health worker treatment of pneumonia versus health facility based treatment and its influences on the choice to seek care next time among children aged 2-59 months diagnosed with pneumonia in Suba Sub County in Western Kenya. The specific objectives of this study were to determine the patient level costs associated with pneumonia home based management by community health worker and also determine costs associated with facility based management of pneumonia for children aged 2-59months diagnosed with pneumonia in Suba Sub County, Kenya

This study also assessed how the household treatment cost of pneumonia Influences the subsequent choices on place to seek care the next time. Studies have shown that cost of treatment plays a key role in determining the choice to seek care next time. (Stekelenburg et al., 2005). A study was done to investigate the impact on health care seeking behaviour of the cost-sharing policies introduced in Ghana between 1985 and 1992 found that the cost recovery policies led to an increase in self-medication and other behaviours aimed at cost-saving. (Asenso-Okyere, Anum, Osei-Akoto, & Adukonu, 1998).

1.2 Statement of the Problem

Under-five mortality in Homa Bay County is 91/1000 compared to the National average of 52/1000. This implies that 1 in every 11 children born in Homa Bay County does not survive to his or her fifth birthday. Among the most critical health conditions for children is pneumonia which accounts for 10% of all morbidity (Bedford & Sharkey, 2014). The high mortality of children under five due to pneumonia can be closely linked to limited access to case management of the disease. The most serious barriers to access of child health services in Homa Bay are inadequate human resources, poor service integration and lack of quality

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care. Despite an adequate number of health facilities, Homa Bay County suffers from inequities in health worker distribution with an average of 4 doctors and 51 nurses per 100,000 populations. The inequity in health worker distribution in Homa Bay has overburdened the health system by having an imbalance in patient: health worker and has compromised health care service provision. To address the inequitable provision of services and the high under- five mortality, Homa Bay was selected to receive the iCCM intervention. The study was done in Suba Sub County because it records the highest under five mortalities of 130/1000 in the County of Homa Bay. It's also one of the sub counties implementing the integrated community case management of pneumonia. Which is a key approach to addressing both these challenges of cost and access to health care. There was thus a need to carry out a study comparing the patient level cost of treatment of pneumonia by source of care at the CHW and health facility and how it influences the place to seek care next time among children 2-59 months of age.

1.3 Broad Objective

To compare the patient level costs of home based CHW treatment of pneumonia versus health facility based management and its influences on the choice of place to seek care next time among children aged 2-59 months diagnosed with pneumonia in Suba sub county, Western Kenya

1.4 Specific Objectives

1. To determine the patient level costs associated with pneumonia home based management by CHW for children aged 2-59months diagnosed with pneumonia in Suba Sub County in Western Kenya

2. To determine the patient level costs associated with facility based management of pneumonia for children aged 2-59months diagnosed with pneumonia in Suba Sub County in Western Kenya

3. To determine how patient level cost of treatment of pneumonia influences the choice of place to seek care among caregivers of children aged 2-59 months in Suba Sub County in Western Kenya.

1.5 Study Questions

1. What is the patient level costs associated with pneumonia home based community health worker case management, among caregivers of children aged 2-59 months with suspected pneumonia in Suba Sub County in Western Kenya?

2. What is the patient level costs associated with facility based management of pneumonia, among caregivers of children aged 2-59months with suspected pneumonia in Suba Sub County in Western Kenya?

3. How does patient level cost of pneumonia treatment, determines the caregiver's choice on where to seek care next time among caregivers of children aged 2-59 months Suba Sub County in Western Kenya?

1.6 Justification of the Study

Between 2003 and 2008, Kenya experienced a decline in mortality of children under the age of five years from 115 per 1000 in 2003 KDHS, to 74 per 1000 in the 2008/9 This represents an annual decline rate of 0.9%. Unless this rate is accelerated using interventions such as pneumonia community case management we are not likely to achieve vision 2030. For universal health coverage to be successful, services must be accessible and affordable to all people. Homa Bay county has the highest child mortality within the country of 130 per 1000 live births compared to the Kenya's child mortality of 73 per 1000 live births. It also records high poverty index of 48.(Kenya National Bureau of Statistics. & UNICEF, 2013).

Delayed treatment and inadequate health seeking behaviours coupled with poor transport network making it difficult to access facilities at the earliest time has contributed immensely to the slow decline in reduction of under 5 mortality. In 2006, Kenya launched the Community Heath Strategy (CHS) under the National Health Sector Strategic Plan (NHSSP) II to deliver the Kenya Essential Package of Health (KEPH) to communities (level 1 of the health system) and to re-vitalize the Primary Health Care concept. The overall goal of the community strategy is to enhance community access to health care in order to improve productivity and thus reduce poverty, hunger, and child and maternal deaths, as well as improve education performance across all the stages of the life cycle. Homa bay being the county where pneumonia community case management was implemented. This study was geared towards comparing the patient level cost of treatment of pneumonia at home by a community health worker versus at the health facility by trained health care provider among children aged 2-59 months of age in Suba Sub County in Western Kenya. It further sought to determine how cost of treatment influences the choice of the caregiver on the place to seek care next time.

1.7 Significance of the Study

This study has potential to inform the policy makers at the county and National level to prioritize strategies in pneumonia case management in terms of cost with a focus of realization of Vision 2030 and the Homa Bay county health strategic plan. The study results aim to support resource mobilization and allocation towards health care interventions to reduce child morbidity and mortality and hence speed up the progress in achievement of Sustainable Developmental Goal 3**:** Ensure healthy lives and promote wellbeing for all at all ages**.** This can only be achieved through provision of evidence on cost analysis of pneumonia case interventions at community level.

The results of this study have provide evidence on how integrated community case management of pneumonia can reduce cost of treatment and enhance accessibility to care which will ultimately reduce under five mortality in Homa Bay County.

<div align="center">**CHAPTER TWO**</div>

<div align="center">**LITERATURE REVIEW**</div>

2.1 Chapter outline

This chapter reviews literature on; pneumonia burden, WHO classification of pneumonia in children, classification of treatment cost of pneumonia, patient level cost of treating child pneumonia at home by a community health worker and at the health facility by a qualified health care provider. It further reviews literature on how cost of treatment influences the choice of place to seek care next time among care givers.

2.2 Pneumonia key facts

2.2.1 Pneumonia Burden

Pneumonia is one of the world's leading causes of morbidity and mortality in children, which causes approximately 1·1 million child deaths per year (Black *et al*., 2010). Over 150 million cases of pneumonia occur yearly, with most deaths occurring in Sub-Saharan Africa and South Asia (Rudan *et al*., 2008; Nya, 2013). Globally, care seeking for pneumonia is low and the proportion of children receiving appropriate antibiotics for pneumonia is only around 30% of children(WHO, 2012).Childhood pneumonia places a large financial burden on society and is a frequent cause of visits to health care providers(Usuf, Mackenzie, Sambou, Atherly, & Suraratdecha, 2016). Each year, there are more than 150 million episodes of pneumonia in young children in developing countries, and more than 11 million children need hospitalization for pneumonia(Scott & Brooks, 2010).

An estimated 1.9 million children die from pneumonia yearly. Half the world's deaths due to pneumonia in children under the age of five years occur in Africa(WHO, 2007). In sub-Saharan Africa, the estimated proportion of death in children aged below 5 years attributed to pneumonia is 17-26% (R. E. Black, Morris, & Bryce, 2003). Kenya is currently ranked

among the 15 countries with the highest estimated number of deaths due to clinical pneumonia, the mortality rate being 50.3 per 10, 000 under-fives per year (Rudan, Boschi-Pinto, Biloglav, Mulholland, & Campbell, 2008). In Kenya, pneumonia is the second leading cause of death among children under the age of five years and causes 16% of deaths in the age group. In 2008 the country had 6,185,800 children under the age of five years, 111,000 of them are estimated to have died, 16% (n=30,000) of them died of pneumonia (Black *et al*., 2010).

The burden of childhood mortality due to pneumonia led the World Health Organization (WHO) to develop a pneumonia control strategy suitable for countries with limited resources and constrained health systems. Management of pneumonia cases formed the cornerstone of this strategy(WHO, 2014).

2.2.2 Who Classification and Treatment of Pneumonia in Children

Case management is a cornerstone of pneumonia control strategies. It consists of classifying the severity of illness using simple clinical signs such as fast breathing, chest in drawing and general danger signs, and then applying the appropriate treatment. Treatment includes home care advice, antibiotics for home therapy, or referral to a higher-level health facility(WHO, 2013).With the goal of getting appropriate treatment to more children, the WHO guidance for classifying and treating childhood pneumonia at the first-level health facility and outpatient department classified pneumonia into two categories.

Children aged 2–59 months with cough, fever, and difficult breathing during regular home visitation schedule, or whose mothers seek care from the CHW will be assessed and classified according to the WHO classification for pneumonia as below. (Table 2.1)

Table 2.1: WHO Classification of pneumonia

Sign or symptom	Classification
Cough or difficulty in breathing with ■ Severe respiratory distress (e.g. grunting, very severe chest in drawing) ■ Signs of pneumonia with a general danger sign (inability to breastfeed or drink, lethargy or reduced level of consciousness, convulsions)	Severe pneumonia (Pneumonia with danger signs)
■ Fast breathing: – ≥ 50 breaths/min in a child aged 2–11 months – ≥ 40 breaths/min in a child aged 1–5 years ■ Chest in drawing	Simple Pneumonia
■ No signs of pneumonia or severe pneumonia	No pneumonia: cough or cold

CHWs will provide oral amoxicillin 80–90 mg/kg per day or 375 mg twice a day to infants aged 2–11 months and 625 mg twice a day for those aged 12–59 months) for 5 days to children with simple pneumonia (includes both chest in drawing pneumonia and fast breathing pneumonia) and give the mother specific guidance about its use(WHO, 2014).

2.2.3 Classification of Treatment Cost of Pneumonia

A number of researchers who have studied cost of treatment of disease have classified cost into two broad groups, "provider" and "personal" or "community". According to (Wandwalo, Robberstad, & Morkve, 2005), provider costs were those associated with developing and operating a health care service. They included staff costs, supplies and equipment. Provider's costs were incurred by the health system. Personal or community costs are those incurred by patients and treatment supervisors. They include direct and indirect costs. Direct costs are non-medical costs related to visiting the health facility such as transport costs, buying food and drinks when visiting a health facility(Prado *et al*., 2011). Direct medical costs such as drug costs are included as provider's costs because they were incurred by the health care system. Indirect costs refer to the value of lost time by the patients and treatment supervisors to follow up pneumonia treatment. This should not be confused with overheads of fixed costs used in accounting practices as pointed by some authors(Wandwalo *et al*., 2005). This study mainly focused on patient level costs of treatment of child pneumonia both at home by a community health worker and the health facility by a qualified health care provider.

2.2.4 Pneumonia Case management

According to the meta-analysis by (Sazawal *et al*., 2003) the pneumonia case management at home using amoxicillin oral antibiotics can reduce pneumonia-specific mortality by 35%. Cost-effective interventions against childhood pneumonia are available, but studies on their implementation in low- and middle-income countries has been patchy, resulting in the persistence of a high disease burden(Rudan *et al*., 2008). Antibiotics against bacterial pneumonia have been shown to be efficacious as well as cost-effective. In resource-poor settings such as Homa Bay County in western Kenya, decision-makers find it difficult to justify expenses for seeking hospital based care against home base care. As such there was still a large unmet need for antibiotics for pneumonia (Kenya National Bureau of Statistics. &

UNICEF, 2013).Pneumonia home case management by CHWs was designed to reduce the high mortality and morbidity from the disease due to limited accessibility to adequate treatment(Kinney *et al*., 2010). Community case management of pneumonia consists the selection, training and supervision of CHWs who administer antibiotics in simple pneumonia cases (WHO and UNICEF,. 1986). Several studies have clearly indicated that CHWs who have been well trained, supervised, and well supplied with commodities can significantly reduce childhood mortality and morbidity attributable to pneumonia in countries with insufficient human resources for health care (Winch *et al*., 2005).

2.3 Patient level Cost of Home Based Childhood Pneumonia Treatment

Cost of treatment at home constitutes the direct and indirect cost. Direct cost of treatment includes medical costs such as consultations fees and nonmedical cost such transport incurred when visiting a CHW. Indirect costs include time and opportunity cost that a caregiver incurs when seeking treatment at CHW. The sum of all this costs is termed patient level cost of treatment. In Pakistan a study done on household costs for treatment of pneumonia found out that the average household cost/case for a CHW managed case was Ksh 138.7 ($1.46) compared with Ksh 722 ($7.60) for referred cases. When the cost of antibiotics provided by the CHW program was excluded from the estimates, the cost per case came to $0.25 and $7.51 for the community managed and referred cases, respectively, a 30-fold difference. The authors concluded that expanding severe pneumonia treatment with oral amoxicillin to community level could significantly reduce household costs and improve access to the underprivileged population, preventing many child deaths(Sadruddin *et al*., 2012).

2.4 Patient level Cost of Pneumonia Treatment at Health Facility

Studies have been done measuring cost of treatment of pneumonia at health facilities. (Chola & Robberstad, 2009) Collected data on annual economic and financial costs from urban

health centres in Zambia in 2005–06. The average cost of providing outpatient services was US$ 3 per visit, while the cost per patient visit for childhood pneumonia was US$48. A study in the Northern Areas of Pakistan, (Lorgelly *et al*., 2010) calculated that the average cost of treating simple childhood pneumonia was US$ 13.44.

Other studies done in India to determine patient level cost of the treatment of severe pneumonia in infants and young children admitted to secondary and tertiary level health care facilities, researchers found that the total cost of one episode of childhood pneumonia treated at secondary level facilities was US$ 83.89 and US$ 146.59 at tertiary level facilities. Diagnostic investigations were a large expense and supportive treatment with nebulization and oxygen therapy added to the costs. Mean household expenditure on secondary level was US$ 41.35 and at tertiary level was US$ 134.62the largest single expense being medicines (Madsen *et al*., 2009).

In a Kenyan study, mean provider cost for inpatient treatment of pneumonia was $197.54 at the national hospital, $135.26 at the mission hospital, and $76.64 at the district hospital. Within these facilities, household direct and indirect costs amounted to $27.28, $18.82, and $12.54 for national, mission, and district hospital, respectively. There previous studies show the overall high cost of inpatient treatment of pneumonia and the out of pocket expenditure on the families(Ayieko *et al*., 2009)

2.5 Influence of cost on choice of place to seek care

Cost of treatment associated to health care seeking at a particular place could greatly influence the choice for utilization of health care. According to Stekelenburg *et al* many individual prefer to seek care where cost of treatment is deemed cheaper(Stekelenburg *et al*., 2005). Besides cost of treatment other factors influencing subsequent choice of utilization of health care are quality of care and the treatment outcome from the place health care is

offered. (Stekelenburg *et al*., 2005). These include customer satisfaction , the convenience of care, its coordination and cost and the courtesy shown by providers(Uchendu, Ilesanmi, & Olumide, 2013).

2.6 Emerging Knowledge Gaps

Information on cost of treatment of pneumonia is scanty mostly in African countries. Most importantly studies estimating household cost of pneumonia have focused on health facilities and not the cost incurred while seeking care from a CHW in the community. Most of the studies measuring patient level cost have been done in Asia and therefore results might not be directly generalized to sub Saharan Africa especially in Kenya. There is little documented knowledge on cost of pneumonia treatment at home by a CHW in comparison with treatment at the health facility by a health care provider. Further to this there is little knowledge in the context of Kenya how cost of treatment of pneumonia influences the choice of place to seek care next time among caregivers of children with pneumonia.

2.7 Operational Framework

A conceptual framework is a hypothetical model identifying the concepts under study and their relationships(Mugenda & Mugenda, 2003). It provides a structural description of the relationship between the independent variable (Treatment costs) and the dependent variable (Choice of place to seek care next time), which forms the main concepts of the study. Independent variable is divided into four main sub-variables grouped under it to the left side while the dependent variable is placed to the right hand side. The arrows are used as signs of direct relationship, indicating the connection between the independent and dependent variables.

According to the operational framework below. It is expected that the treatment cost of both at home and at health facility is built from both direct and indirect costs. Direct cost is built

up by independent variables; direct medical costs (Medicine, consultation and investigations) Direct Non-medical costs (transport cost to seek care). The indirect Costs majorly involved Opportunity cost of care givers while seeking care at health facility. All this costs put together form the total treatments costs for pneumonia despite that they are calculated based on source of care. Further to this evaluation of how treatment cost influence the choice to seek care next time.

Independent Variable Dependent variable

Indirect Treatment cost

- opportunity cost of caregiver time
- foregone wages
- Time spent by caregiver during care seeking

Direct Treatment cost
- Medical Consultation cost
- Investigations cost
- Hospital stay (Bed)
- Caregiver transportation to health

Treatment Costs at health facility

Indirect Treatment cost
- opportunity cost of caregiver time and foregone wages
- Lost time by caregiver and other relatives visiting child

Treatment cost at home by a CHW

Direct Treatment cost
- Caregiver   transportation to CHW
- Medical Consultation cost
- Investigations cost
- Hospital stay (Bed)

Total treatment Cost

Subsequent Health Seeking Behaviour

Figure 2.1: Operational Framework for the study

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter gives an outline of research methods that were followed in the study. It provides information on the participants, that is, the criteria for inclusion and exclusion in the study, who the participants were and how they were sampled. It describes the research design that was chosen for the purpose of this study and the reasons for this choice. The instrument that was used for data collection is also described and the procedures that were followed to carry out this study are included. This chapter also discusses the methods used to analyse the data. Lastly, the ethical issues that were followed in the process are also discussed.

3.2 Study Area

This study was conducted in Suba Sub County, Homa Bay County in Kenya. Homa Bay County located in Nyanza province, in Western Kenya lowlands, commonly referred to as the Lake Victoria basin. Suba is one of the rural Sub counties in Homa Bay County with a population of around 119,000 people. It lies between 0.3333° S, 34.2000° E. See figure 3.1 and 3.2. The county is characterized by a poverty index of 48 whose causes are diverse and includes low farm yields; poor infrastructure; inaccessibility to credit facilities; high death rate due to HIV/AIDS; lack of electricity; and cultural beliefs and practices(world bank, 2011). In addition, the Sub County has a child mortality of 130 deaths per 1000 live births (Kenya National Bureau of Statistics. & UNICEF, 2013). Dispensaries, health centres, district hospitals, sub-district hospitals, and faith-based health facilities provide health services. There exists a large number of CHWs who are supported by various non-governmental organizations. It has 240 Integrated Community Case Management (iCCM) trained CHWs working in the 26 community Units. Each CHW is in charge of 500 people (between 50-100

households). ICCM is being implemented in the Sub County by KEMRI and MOH with support from the division of child and adolescent health, The United Nations Children's Fund and World Health Organization. Malaria, diarrheal diseases and pneumonia remain the top causes of child morbidity and mortality in Suba Sub County(UNICEF, 2011). According to the World Bank, 2014 the per capita health expenditure in Kenya was $77.7, of which 22.6% was public expenditure. The rest was ($52.4) private out-of-pocket expenditure.

The five most common diseases in Homa Bay County, accounting for more than 70 per cent of all morbidity are malaria (36%), Upper Respiratory Tract Infection (15%), diarrhoea (11 per cent), Pneumonia (10 per cent) and skin diseases (10 per cent). Prevalence of diseases such as pneumonia, meningitis, and tuberculosis have been noted to be on the rise and, save for cases of malaria and diarrhoea, up to 30 per cent of these diseases are linked to HIV/AIDS(UNICEF, 2011).
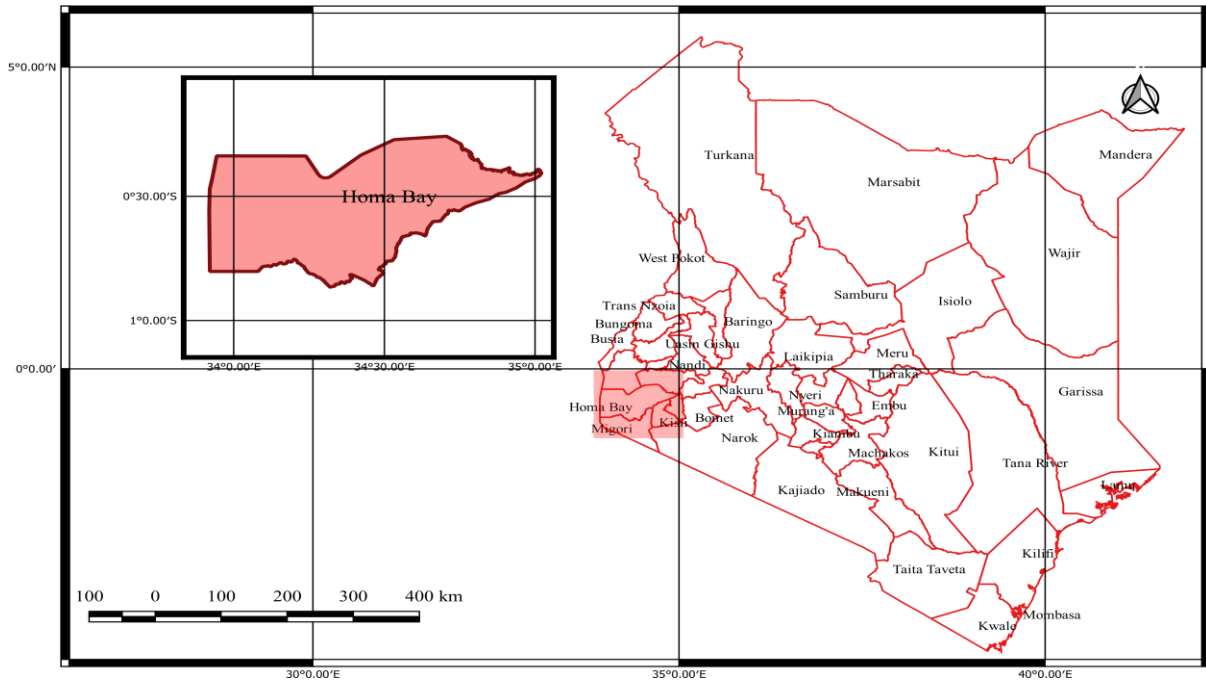
Figure3.1: A map of Kenya showing the location of Homabay County
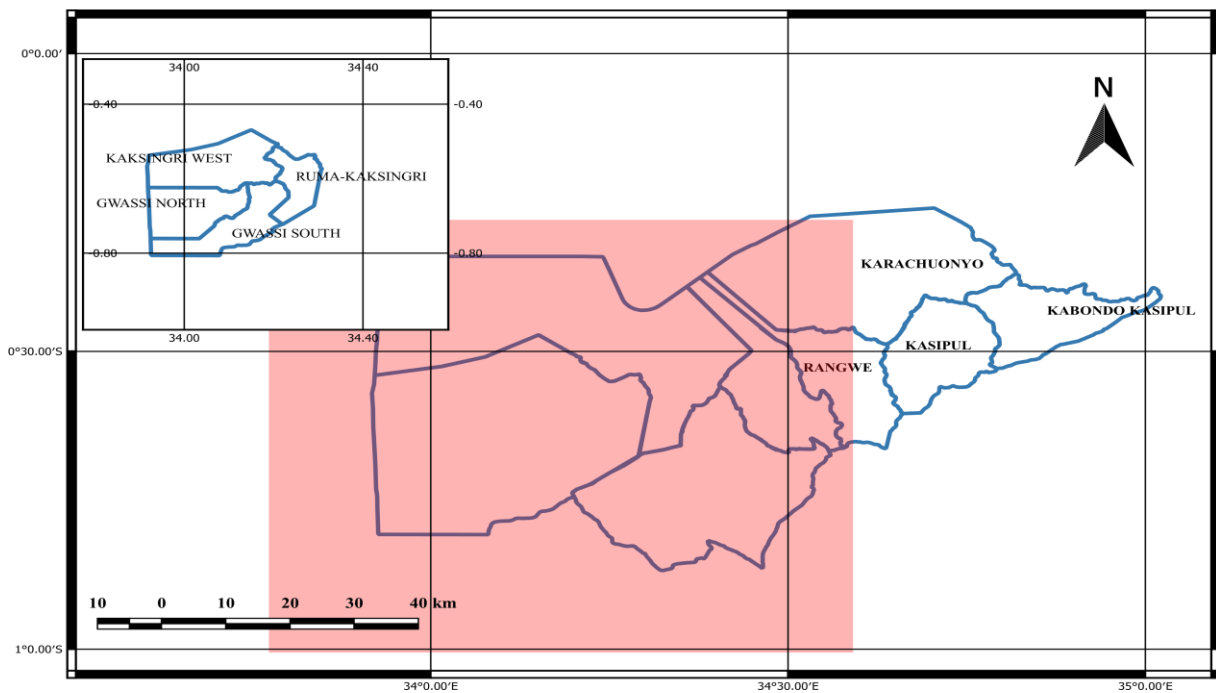
Figure 3.2: A map of Homabay County showing the location of Suba Sub-County

3.3 Study Design

This was a cross sectional descriptive study utilizing quantitative methods. The costing study was nested within an implementation study for iCCM of pneumonia which was

being conducted in Homa Bay County Suba Sub County. (Trial registration number: ACTRN12614000208606). The parent study was an implementation study determining whether trained, supervised and well supplied CHWs in hard-to-reach areas such as Homa Bay County could correctly perform iCCM and increase the proportion of children under five years receiving antibiotics for pneumonia. The caregivers with children diagnosed with pneumonia were approached with a questionnaire measuring the direct and indirect costs incurred during treatment of their children.

3.4 Target Population

The study was conducted in Suba Sub-County of Homa-Bay County, among the local community households. The Sub-County is made up of four administrative wards, namely Kaksingri East-Ruma, Kaksingri West, Gwassi North and Gwassi Central wards. It had a total population of 119,000 people of which 51.2% are female while 48.8% are male leaving in a total of 13,351 households (KNBS, 2009). The study focused on358 caregivers of children aged 2-59 months diagnosed and treated with pneumonia in the previous 1month in all the 26 Community units in Suba Sub County, Western Kenya. They included caregivers who sought care at the health facility and the ones that sought care at home from a community health worker.

3.4.1 Inclusion Criteria

Study participants were;

- Consenting caregiver of child aged 2 to 59 months diagnosed with pneumonia in the previous one month

- Residing within the study area in the 6 month prior to the study

- Caregiver of a child with pneumonia and sort care from a CHW or health facility

- Those whose parents or caregivers agreed to give informed consent

- Children treated of simple pneumonia treated as outpatient cases

- Children who sort care at the CHW or health facility worker who had been trained on the WHO standard guideline in treating simple pneumonia using oral amoxicillin.

3.4.2 Exclusion Criteria

Participants were excluded from the study if:

- Caregiver refusal to participate in study nor withdrew consent

- They were away during the time of the study.

- The sick child treated as an in patient

- Child with diarrhea and dehydration

- Severely malnourished child

- Children who had received treatment from multiple sources

- Children treated from severe pneumonia

- Children treated as inpatient at the health facility

3.5 Sample Size Estimation

Taro Yamane formula was used to calculate the sample size. These formula best suits this research as the populations of under five children who are vulnerable to pneumonia was 17900

Taro Yamane's formula: (Yamane, 1967)

$$n = {}^{N}\!/_{[1 + Ne^2]}$$

Where:
n = sample size
N = population size

The numbers of children who developed pneumonia were 358. This is arrived at since the incidence of pneumonia among under-fives in Suba was 2% and therefore out of 17900 under

five children registered in the iCCM midline survey in Suba Sub County, 358 form part of new cases of pneumonia developing

e = sampling error (5% or 0.05)

Therefore:

n=358/ [1+358x0.05^2]

n= 189

Therefore, the sample size with a 5% margin of error and 95% confidence level is 189 children seeking care at health facility and at home. With addition of 10 percent loss, the final total sample size became 208 participants in which 50% of the sample size covered the caregivers seeking care at health facility and the rest sought care at home.

3.6 Sampling Technique

The sample frame for this study was all the caregivers of under-five children treated of pneumonia in all the 26 community health units in Suba Sub County. Participants were selected into the study ensuring that 50% of participants were caregivers who sought care at the Health facility and 50% at home from a CHW. Those that met the inclusion criteria for the study were selected to participate upon consenting. The participants were identified and selected purposively from the treatment register used by the CHWs and also from the under-five outpatient register used by health care providers. The caregiver that sought care at the health facility must have been treated as outpatient cases of simple pneumonia to ensure similar characteristics of children treated either at the CHW or at the health facility. The caregivers who sought care at the health facility were traced using their phone numbers written in the under-fives register at the outpatient departments. They were called and followed up to their home where the interviews were conducted. The care givers who sought care from a CHW were interviewed on day 14 follow up visit by a research assistant who traced them using the caregiver's phone number written on the sick child recording form.

3.7 Data Collection

3.7.1 Recruitment and Training of Research Assistants

The study recruited three Research Assistants based on the following Qualifications/ criteria:

1. The candidate understood the iCCM activities at the community level.

2. Experience in participating in iCCM activities was an asset.

3. Flexible and able to move in the community from household to household

4. Was fluent in English, Kiswahili and Dholuo

5. Had knowledge on good clinical practice

6. Understood the study area well for efficient follow ups.

Upon recruitment the research assistants were taken through one-day training on the data collection process. The training involved both theory and practical.

3.7.2 Concepts to be measured in Pneumonia Treatment Cost

The patient level cost of treatment was divided into two major categories; direct and indirect costs. The direct costs were further divided into direct medical costs and direct nonmedical cost. Direct medical costs include the amount of money paid by the households or caregiver for consultation, laboratory test and radiology. This cost was derived from the payment receipts for these services. The cost of drugs prescribed are valued by the retail price. Direct non-medical costs included costs incurred for transportation, meals for caregivers at the health facility, and under-the-table payments made for services at the health facility(Krishnan, Arora, Pandav, & Kapoor, 2005).

Indirect costs included opportunity cost of caregiver time and foregone wages measured at the household level. Opportunity cost was estimated as the approximate value of non-wage household activity to account for time spent on care seeking and child care based on the

assumption that if the person was working, how much will be the expected earnings. For calculating time cost, lost minutes was recorded and converted into number of working days. Mean monthly income of the head of the house hold is converted into daily income and opportunity cost is calculated as days lost multiplied by mean daily income of the head of the household. Foregone earning is that which is self-reported by the households because of absence from work to take a child to the health facility and for child care.(Ayieko *et al*., 2009).

3.7.3 Data Collection Process

Data was collected using a semi structured questionnaire (See Appendix II) which focused on collecting Data on household demographics, income, and out-of-pocket expenses incurred by the caregiver during the treatment of pneumonia episode was collected from caregiver interviews. Subsequent health seeking behaviour also was sought from the care giver.

The care givers were identified from the treatment registers which the CHWs used after treatment at home and the outpatient registers for the children treated at the health facility as outpatient cases. The research Assistant completed the questionnaire on Day 14 follow-up of the enrolled child. They interviewed the head of the household or the caregiver to verify the information in the CRFs on provider consultations, services availed (laboratory, radiology, or other tests), medicine prescription filled, and out-of-pocket expenses for each of the previous items. They also asked about the sources of travel to the Health care provider/facility, travel time in minutes, cost of transportation, time spent on child care, and lost wages.

3.7.4 Study Pilot

Data collection was done using a questionnaire that was adopted from a study done in Pakistan, "Household cost for treatment of pneumonia in Pakistan". The tool was developed and tested by (Sadruddin *et al*., 2012)The data collection tool was pretested in Mbita Sub

County to check for its reliability and validity. The pretesting involved 21 participants who were 10% of the study sample size. Mbita was chosen since it shares similar demographic characteristics with Suba and it also implemented iCCM services. It also checked for homogeneity. The pilot concluded that the questionnaire was valid and reliable to use in the study.

3.8 Data Analysis

Data was cleaned in two phases. The first cleaning was done daily where the paper data collection tools were sorted according to their categories and checked for completeness and consistency. The second phase of data cleaning was done after quantitative data had been entered in the computer.

The data was analysed using a Statistical software SPSS version 20. Descriptive analysis was done for the costs and the subsequent health seeking behaviour and the results presented as means, (Standard Deviations (SD)) and medians) for Objective 1 and 2. Other descriptive statistics included percentages and frequencies. Bivariate analysis comparing the total treatment costs covered by households when seeking pneumonia treatment at home based community health worker versus at the health facility was performed using t-test procedures reporting the p values for both direct cost and indirect costs of treatment. Objective 3 was analysed using a logistic regression analysis to find out on how cost of treatment influences choice of place to seek care next time.

3.9 Ethical Considerations

The proposal was submitted to the School of Graduate Studies for academic approval (Appendix III) while ethical approval was obtained from Kenya Medical Research Ethics Review Committee as this study was nested under a KEMRI study (See Appendix IV). In carrying out the study, informed consent was sought from the participants with full

information being provided and comprehension being affirmed (See Appendix V). Confidentiality was ensured through anonymity (using unique numbers), privacy during interviews and withdrawal at any point was utilized.

CHAPTER FOUR

RESULTS

4.1 Introduction

Results of the study are presented in this chapter according to the objectives of the study. The first section has the sample characteristics of the participants; the second section reports the Cost of treatment of pneumonia when seeking care at the CHW; the third section reports the cost of treatment of pneumonia at the health facility; they fought section compares the cost of treatment of pneumonia at the CHW and health facility, and the fifty section determines how cost of treatment of pneumonia influences the choice of place to seek care next time.

4.2 Sample characteristics.

A total of 204 (104 treated by the CHW and, 100 treated by the medically trained health workers i.e Clinical Officer or Nursing officer) cases of pneumonia were enrolled in the study. The mean age of children whose caregivers were interviewed was 2 years. The relationship of respondent to the child does not influence place to seek health care with a p value of 0.921 and x^2 of 1645. There was no age difference in the group that sort care at the CHW and the group that sort care at the health facility with a t vale of 0.01 and a p value of 0.99. The median household monthly income was Ksh 9000 IQR (8000-20000) and Ksh 19600 IQR (6500-45000) in the group treated by CHW and health worker respectively. Less than 40% of the participants were formally employed. Majority of the household heads had attained Secondary education; (mothers 42% and fathers 26%) and (mothers 24% and fathers 44%) for the households that sort care at the health facility and CHW respectively. (Table 4.1)

Table 4.1: Social-demographic characteristics of children seeking pneumonia treatment both at the CHW and Health facility in Suba Sub County, Kenya

Participant Characteristics	Facility-based Management N=100	Home based management N=104	t value	P value
Childs' Age Mean (SD)	**2(1.5)**	**2(1.4)**	0.01	0.99

Participant Characteristics	Facility-based Management	Home based management	x^2 value	P value
Respondent relationship to the child				
Father	9(9)			
Mother	91(91)		**0.1645**	**0.921**
Education level (Mother's)	n (%)	n (%)		
None	6(6)	7(7)		
Primary	63(63)	68(65)		
Secondary	26(26)	25(24)		
Post-secondary	5(5)	4(4)		
Education level (Father's)				
Primary	1(1)	49(46)		
Secondary	42(42)	46(44)		
Post-secondary	57(57)	9(10)		
			2.6	**0.76**
Parents formally employed				
Mother (Yes)	7(7)	10(10)		
(No)	93(93)	94(90)		
Father (Yes)	37(37)	40(38)		
(No)	63(63)	64(62)		
			1.6	**0.203**
Household monthly income, median(IQR)	19600(6500-45000)	9000(8000-20000)		

4.3 Cost of treatment of pneumonia at the CHW.

The total Cost of treatment of pneumonia when seeking care at the CHW is Ksh 122.65. The largest cost drivers are; the Indirect cost which contributes Ksh 88.25, followed by direct non-medical cost of Ksh 22.86. While the lowest cost driver when seeking care at the CHW is the direct medical cost of an average Ksh 11.54.

Table 4.2: Cost of treatment of pneumonia at the CHW (N=104)

Cost of treatment of pneumonia at the CHW

Particular	Cost at CHW in Ksh Mean (SD)	
Direct Medical Cost		
Consultation	0.00 (0.00)	
Medicine	11.54(29.96)	
Lab test	-	
Sub Total		11.54
Direct Non medical Cost		
Transport	22.86(19.57)	
Sub Total		22.86
Indirect Cost		
Average monthly income (A)	4755.80(4080.55)	
Average days worked in a month (B)	22.52(3.27)	
Average hours worked in a day (C)	6.79(1.79)	
Average time lost in hours per day (D)	1.21(1.18)	
Average hrs worked in a month (E) (BXC)	152.91	
Income per hour F: (A/E)	72.94	
Average money lost in a day (FXD)	88.25	
Sub Total		88.25
Total in ksh		**122.65**

4.4 Cost of treatment of pneumonia at the Health Facility

The average Cost of treatment of pneumonia when seeking care at the health facility was Ksh 447.46. The largest cost drivers are the direct medical costs which contributes an average of Ksh 248.89, followed by indirect cost of averagely Ksh 155.15. While the lowest cost driver when seeking care at the health facility is the direct non-medical cost of an average of Ksh 43.42.

Table 4.3:Cost of treatment of pneumonia at the health facility (N=100)

Particular	Health facility in Ksh Mean (SD)	
Direct Medical Cost		
Consultation	30.0 (26.10)	
Medicine	126.16(105.50)	
Lab test	92.73 (57.62)	
Sub Total		248.89
Direct Non-medical Cost		
Transport	43.42(29.41)	
Sub Total		43.42
Indirect Cost		
Average monthly income (A)	6449.71(5462.65)	
Average days worked in a month (B)	23.63(3.39)	
Average hours worked in a day (C)	7.56(1.55)	
Average time lost in hours per day (D)	1.77(0.70)	
Average hours worked in a month (E) (BXC)	178.64	
Income per hour F: (A/E)	87.66	
Average money lost in a day (FXD)	155.15	
Sub Total		155.15
Total		**447.46**

4.5 Comparison of the different cost drivers for both treatments at the CHW and at the health facility

4.5.1. Direct Medical Cost

The total average direct medical cost for the care givers who sort care at the CHW was Kshs 11.54 compared with Ksh 248.89 for the group which sort care at the health facility. Among the group that sort care at the CHW, 100% of the direct medical costs were incurred from medicine. Consultation cost was free so no cost was incurred. No cost was incurred on, lab tests, radiology and admissions. The group that sort care at the health facility had their costs distributed over; Consultation 12.05%, Medicine: 50.69% Laboratory test 37.26%, there was a statistically significant difference in the mean average cost for consultation and medicine ($p< 0.0001$) among the groups that sort care at the CHW and health facility. The was no comparison for the other costs such as laboratory tests, Radiology and admission because this cost were only incurred in the group that sort care at the health facility only (Table 4.4)

Table 4.4: Comparison of the direct medical costs among care givers that sort care at CHW and health facility in Suba Sub County

Particular	Whole Sample Mean	HF Mean	CHW Mean	95% CI for difference	P-value
Consultation	15.55 (23.30)	30.0 (26.10)	0 (0.00)	23.81-33.98	<0.001
Medicine	47.72(91.25)	126.16(105.50)	11.54(29.96)	52.94-179.33	<0.001
Lab test	-	92.73 (57.62)	-	-	-

Number of cases by facility: HF-Health facility =100; CHW-Community Health Worker= 104, degrees of freedom=204
Note: Figures in brackets are standard deviations

4.5.2. Direct Non-Medical Cost

The average whole sample direct non-medical cost was Ksh 40.15 with a standard deviation of Ksh 28.91 and a range of 10-167. The mean non-medical cost for the clients who sought care at HF wa 43.0, standard deviation of 29.21 and range 30-100 compared to those who sought care at CHW who had a mean non-medical cost of 22.86 with standard deviation of 19.57 and range 10-67. There was no statistical significant difference in transport cost between clients who sought care at HF and those who sought care at CHW, $p>0.08$, t value and $df=202$ as shown in the table below. (Table 4.5)

Table 4.5: Comparison of direct non-medical costs of treatment of pneumonia among caregivers that sought care at CHW and health facility in Suba Sub County

Particulars	Whole sample Mean	HF Mean	CHW Mean	95% CI of difference	t-value (df)	P-value
Transport Costs	40.15 (28.91)	43.0(29.21)	22.86(19.57)	2.91-44.04	2.56 (202)	0.08

Number of cases: HF-Health facility = 100; CHW-Community Health Worker= 104, degrees of freedom=204
Note: Figures in brackets are standard deviations

4.5.3 Indirect Costs.

These costs were estimated as opportunity cost of caregiver time. The average total time lost in hours when seeking care by both groups was 1.49 hours. The average total time lost by caregivers was 1.21 hours for CHW group and 1.77 hours for health facility group. The Average opportunity cost incurred for care givers that sort care at the health facility was Ksh 155.15 while the ones that sort care at the CHW was Ksh 88.25 (Table 4.6)

Table 4.6:Comparison of Indirect costs of treatment of pneumonia when seeking care at CHW and health facility

Particular	Whole Sample Mean	HF Mean	CHW Mean	t-value	p-value
Average monthly income (A)	5259.79 (4983.03)	6449.71 (5462.65)	4755.80 (4080.55)	5.23**	p<0.0001
Average days worked in a month (B)	23.08 (3.37)	23.63 (3.39)	22.52 (3.27)	4.68**	p<0.0001
Average hours worked in a day (C)	7.18 (1.72)	7.56 (1.55)	6.79 (1.79)	6.40**	p<0.0001
Average time lost in hours per day (D)	1.49 (0.61)	1.77 (0.70)	1.21 (1.18)	14.89**	p<0.0001
Average hrs worked in a month (E) (BXC)	165.71	178.64	152.91	-	
Income per hour F: (A/E)	82.57	87.66	72.94	-	
Average money lost in a day (FXD)	123.03	155.15	88.25	-	

Number of cases: HF-Health facility = 100; CHW-Community Health Worker= 104, degrees of freedom=204
* imply significance at 0.05 significant level
Note: Figures in brackets are standard deviations

4.6Logistic regression: Breakdown of indirect and direct costs effect on place to seek care next time.

Approximately 50% of the clients sought care at the health facility. (Health Facility=0 and CHW=1) The main factors influencing where to seek care next time include Consultation fees, Medicine, transport, average days worked, average time worked in a day, lost time when seeking care and monthly income.

Since the outcome variable, in this case is dichotomous; place of seeking care next time, a binary logistic regression model was fit with seven effects in the model and adjusted for occupation. Thereafter, we estimated the Hosmer–Lemeshow goodness-of-fit statistic. The Hosmer-Lemeshow X^2 = 97.12, p<0.001 suggested no evidence of lack of fit implying that one or more of the 7 effects in the model is important for predicting the probability of seeking health care at a public facility. The tests for parameters suggest that consultation fee had a highly significant effect on place of seeking care , OR=1.34 and p<0.001. For instance, consultaion fee increased the likelihood of choosing a CHW over Health facility for the next

visit by 34% (Positive effect). Medicine costs had a significant effect on place of seeking care, with an odds ratio of 1.11 and $p < 0.05$. Medicine costs increased odds of choosing CHW over Health facility for the next visit by 11% (Positive Effect). Cost of transport had a significant effect on place of seeking care with odds ratio 1.05 and $p < 0.05$. Transport cost increased likelihood of choosing CHW over Health facility for the next visit by only 5% (positive effect). Total lost time was 14 times likely to influence someone choosing CHW over Health facility for the next visit to seek health care (positive effect). Average number of days worked in a month reduces the likelihood of choosing CHW over Health facility for the next visit by 3% (Negative effect). There was no statistical significance effect of average number of days worked in a month on place of seeking care (No effect). Monthly income had no effect on choice of place of seeking care. Overall, the model was highly significant, $p < 0.0001$ and $R^2 = 0.83$ implying that 83% of variability was attributed to the model. (Table 4.7)

Table 4.7: Logistic regression breaking down of direct and indirect costs effect on place to seek care next time

Dependent variable: choosing a CHW over Health facility
(50% of participant visited CHW and 50% visited Health facility)

Variable	OR	SE(OR)	P-value	95% CI for OR
Direct medical cost				
Consultation	1.34	0.08	p<0.001	1.20-1.50
Medicine	1.11	0.01	0.012	0.99-1.23
Transport	1.05	0.02	0.022	1.01-1.09
Indirect Cost				
Average days worked in a month	0.97	0.09	0.767	0.81-1.17
Average hours worked in a day	1.89	0.4	0.003	1.25-2.86
Total lost time	14.89	9.3	p<0.001	4.38-50.65
Monthly Income	1	0	0.34	0.99-1.01
Overall Model			**p<0.001**	

Note: $R^2 = 83\%$

CHAPTER FIVE

DISCUSSION

5.1 Introduction

The Overall Aim of this study was to compare the patient level costs of home based CHW treatment of pneumonia versus health facility based management and its influences on the choice of place to seek care next time among children aged 2-59 months diagnosed with pneumonia in Suba Sub County, Western Kenya. The study only focussed on those children who were treated on simple pneumonia based on the WHO guideline where both sources of care offered a standard prescribed outpatient treatment.

The study found that there was a substantial difference in household out of pocket expenditure for treatment of pneumonia at home by the CHWs compared to those who sort care at the health facility. The average household cost for the community managed cases was Ksh 122.65($1.29) compared with Ksh 447.46($4.71) for those treated at the health facility. The difference is quite important for poor households with limited resources such as Homa Bay County which records a high poverty index where 48% of the population live below the poverty line. Considering a conversion rate of: (1USD = 95Ksh) at the time of data collection. The difference was caused by both direct (consultation, medicines, bed charges, and transportation) and indirect (opportunity cost and lost earnings) costs.

According to our knowledge this is the only study that has been done in Kenya estimating the cost of pneumonia treatment at community level from the household perspective. No study has been identified measuring house hold cost of treatment of simple pneumonia in Kenya.

5.2 Cost of treatment of pneumonia at the CHW

The average total household cost of treatment of pneumonia was Ksh 122.65($1.29) for the care givers that sought care at the CHW. The highest cost driver was indirect costs incurred when seeking treatment. The average cost of treatment of a pneumonia episode among caregivers that sort care at CHW was lower because of CHW availability for prompt diagnosis and management. This may have influenced care seeking behaviour of care givers that sought care at the CHW, thus lowering the cost of treatment.

The study found that direct home based treatment costs for pneumonia was Ksh 0 ($0.00) which is similar a study by Matovu *et al* (2014) in Uganda who found also zero household direct costs of treatment of pneumonia for the caregivers that sort care at home. (Matovu, Nanyiti, & Rutebemberwa, 2014)This similarity is due to a comparable setting of implementation of the study. The medicines that were offered at the community level were issued free of charge through donor contribution towards implementation of integrated community case management.

The direct non-medical costs incurred in our study majorly involved cost of transport incurred to and fro the point of source of care. Comparing our study with that of Matovu *et al*(2014), there was some difference in total time lost by households in the group that sought care at the CHW being 72.6 minutes and the opportunity cost being Ksh 88.25 ($0.93) in relation to Matovu and others who found that the average time lost when seeking care at the CHW is 27minutes (Matovu *et al*, 2014) This can be attributed to a difference in study locations.

The time spent when seeking care at home is deemed short since the CHW had standard treatment tools for use and also there are no long queues at the home based treatment of pneumonia unlike treatment sought at the health facility. However, these indirect costs are

likely to be subject to recall biases since some caregivers interviewed had visited the CHW about 4 weeks prior to the date of the interview.

5.3 Cost of treatment of pneumonia at the health facility

The average household cost of treatment of pneumonia when seeking care at the health facility Ksh 447.46($4.71) in our study was substantially lower than in India through a study by Madsens *et al* who found that the mean household cost of treatment of pneumonia in a second level health facility was US$ 41.35(Madsen *et al*., 2009). This difference can be attributed to the type of hospitals where care was sought. In our study most health facilities were health centre and dispensaries which tend to charge cheaper compared to level four and five where Madsen collected his data. On the other hand a study conducted in Kenya on the economic burden of paediatric care in Kenya: household and provider costs for treatment of pneumonia, malaria and meningitis found that the mean direct and indirect household cost of treatment of pneumonia was $12.54 in those patients that sought care at the district hospital(Ayieko *et al*., 2009). Ayieko's study was conducted in National and provincial hospitals which also tend to charge higher for treatment. This is clearly indicated by the largest cost driver for treatment of pneumonia in Ayieko's study being consultation cost.

Another study in India by Hussain *et al* found that the largest cost driver for treatment of pneumonia at the health facility was medicine ($22.64) (Hussain et al., 2006) This is over 4 fold of the cost incurred in Suba sub County, Kenya.

The average household's monthly income for the caregivers seeking care at the health facility was Ksh 6449.71 while the average total household cost incurred for seeking care at the health facility being Ksh 447.46 meaning that for every case of pneumonia to be treated at the health facility 7% of the household monthly income is spent.

5.4 pneumonia treatment Cost influence on subsequent choice of place to seek care

Cost of treatment is generally known to influence where a caregiver will choose to seek care. In our study there was a significant association between place of treatment and reason for seeking treatment from that place, p<0.0001. Majority of the respondents, 62% chose a place for treatment for subsequent illness due to it being cheaper. In comparison with Stekelenburg *etal*(2005) in his study on Health care seeking behaviour and utilization of traditional healers in Kalabo, Zambia. He reports that many individuals prefer to seek care where cost of treatment is deemed cheaper.(Stekelenburg *et al*., 2005).

Our study determined how the different cost drivers influence the choice of place to seek care next time. Direct medical costs for instance, consultation fee increased the likelihood of choosing a CHW over Health facility for the next visit by 34%. Medicine costs had a significant effect on place of seeking care, with an odds ratio of 1.11 and p<0.05. Medicine costs increased odds of choosing CHW over Health facility for the next visit by 11%. Cost of transport had a significant effect on place of seeking care with odds ratio 1.05 and p<0.05. Also Indirect medical costs such as transport cost increased likelihood of choosing CHW over Health facility for the next visit by only 5%.In view of this it is important to note that unregulated direct charges often constitute a major access barrier to needed health care and contribute to high out-of-pocket payments generating problems of financial protection. This study agrees with Opon's (2016) & Ngugi (2017) that cost treatment especially distance affect health care utilization rate.

CHAPTER SIX

CONCLUSION AND RECOMMENDATION.

6.1 Conclusions

1. The patient level costs associated with simple pneumonia treatment at home by a trained community health worker was Ksh 122.65($1.29)in Suba Sub County, Kenya.

2. The patient level costs associated with simple pneumonia treatment at the health facility was Ksh 447.46($4.71) in Suba Sub County, Kenya.

3. Treatment costs covered by households when seeking pneumonia treatment increased the likelihood of choosing the CHW over health facility.

4. Extending pneumonia treatment to the community level will not only improve access, and better treatment outcomes, but will decrease economic burden on the families.

5. Treatment of mild pneumonia at home by the community health worker will go a long way in enhancing healthcare utilization and ultimately accelerating Kenya's progress toward achieving SDG 3

6.2 Recommendations

1. Community sensitization on utilization of pneumonia community case management services which reduces the household out of pocket expenditure.

2. Further studies to measure the quality of care both at the health facility and at home through community health workers in Suba Sub County, Kenya.

3. Further studies on cost effectiveness of community case management of pneumonia in Suba Sub County, Kenya.

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APPENDICES

APPENDIX I; DATA COLLECTION TOOL

The questionnaire will be filled out from the information obtained from the households.

Please seek consent from before proceeding with the interview   (i) Yes   (ii) No

Interviewer/ Supervisor

Name_____

Date   _____/_____/_____

Keyed By _____

Questionnaire Code_____

Result codes

Completed

No suitable respondents (incomplete)

Other (Specify)_____

Section- 1   Household and Health Care Facility Identification

Q.1	Address / Contact household:	
	Name of child	Mother's name:
	Sex of the child: Boy….1 Girl.….2	Father's name:
	Child's date of birth Day/Month/Year	Total number of household members
	Date of assessment: ___/___/___	Health Facility worker/CHW Name :_____
	Village name_____ Community Unit_____	Household ID
	Health Facility Visited	Date Child was treated Day/Month/Year __/__/__

Section- 2   Socio-Economic and Demographic Variables

	Question	Options	Responses
Q.2 *	Relationship of respondent to the child?	1. Father, 2.Mother, 3. Female guardian 4. Other (specify)	1 2 3 4 (circle one)
Q.3	How many other children live in home who are 5 or under 5 years of age?		No._____
Q.4	Parental age in years	Number of years	Mother Father -------years --------years
Q.5	Educational attainment of parents	Literate 1. Yes 2. No	Mother Father --------- -----------
Q.6	Highest education level reached by parents	1. None 2. Primary school 3. Secondary School 5. College 6. Bachelor's degree /BA 7. University degree 8. Other (specify)	Mother Father --------- ----------- (enter only one option for each)
Q.7	Is the parent formally employed now?	Yes No Self-employed	Mother Father --------- -------- --- (enter only one option for each)
Q.8	On Average how many Hours do you work in a day?		_____
Q.9	How many Days do you work in a week?		
Q.10	What is your main occupation?	Services Sector Business	Mother Father

		Government Laborer Farmer Other (specify)	--------- -------- --- (enter only one option for each)
Q.1 1	What is the total household monthly income?	State total income of each parent, if applicable, otherwise write 0.	Mother Father Ksh --------- Ksh ------
Q.1 2	If not employed what is your main activity?	Duties in the home Student Other work Unemployed	<u>Mother</u> <u>Father</u> --------- -------- --- (enter only one option for each)
Q.1 3	If not employed, total income from other sources.	1. Cutting down on other expenses 2. Using savings 3. Borrowing 4. Selling assets 5. Asking for 6.Donations from friends and relatives 7. Others, specify	State Value (1) ---- (2)------- (3) ---------- (4)----(5)----(6)-----(7)------
Q.1 4	List the source of treatment 1 No treatment: 2 Home remedy 3 Private Clinic 4 Public hospital (OPD) 5. CHW 6 Mganga (Traditional healer) 7 Chemist 9. Hospital (In patient) 10 Others: Specify		Circle options
Q.1 5	Number of Attendances/Visit with same problem. 1. Private Clinic 2. Public hospital		Number 1_____ 2_____ 3_____ 4_____

	(OPD) 3. CHW 4. Mganga (Traditional healer) 6 Chemist 7. Hospital (In patient) 8. Others: Specify		5_____ 6_____ 7_____ 8_____
Q.16	During the course of treatment, did the CHW make a referral to the hospital?	Yes No	
Q.17	Was the child hospitalized? Number of days of the child was hospitalized.	Yes No	Number of bed days_____
Q.18	Type of hospital ward	1. General public 2. Semi Private 3. Private	Circle one

SECTION 4 DIRECT MEDICAL COSTS

Q. 19	Response	Follow-up Question	Consulta-tion	Medicine	Lab Tests	Total
CHW Management	Yes No	If yes, how much did you pay	Ksh_____	Ksh ____	Ksh ____	Ksh ____
Private Clinic	Yes No	If yes How much did you pay?	Ksh_____	Ksh_____	Ksh_____	Ksh_____
Public facility (OPD)	Yes No	If Yes, how much did you pay?	Ksh_____	Ksh_____	Ksh_____	Ksh_____
Chemist	Yes No	If yes, how much did you pay?	Ksh_____	Ksh_____	Ksh_____	Ksh_____
Total		If yes, how much did you pay?	Ksh_____	Ksh_____	Ksh_____	Ksh_____

Section -5 Direct Non-Medical Costs and Indirect Costs

5.1 Source of Travel and Time to Travel

Q.20	How did you travel to the health facility?	Walked Private car Taxi Bicycle Motor Cycle Other (specify)	Circle options
Q.21	How long did it take to travel from home to the facility? (Round trip)	1. CHW 2. Private Clinic 3. Public hospital 6. Chemist 7. Any other	Check one and state approximate time spent in travel _____minutes
Q.22	Who took the child to the health facility?	1.Mother 2.Father 3.Mother and Father 4.Mother and Relative 5. Father and Relative 6. Any other (specify)	Circle one
Q.23	How much time was spent away from your normal day activity for taking the child to the Health Facility?	1.Mother 2.Father 3.Mother and Father 4.Mother and Relative 5.Father and Relative 6. Any other (specify)	Circle one Total time in minutes
Q.24	Total time spent away from normal day activity by the care taker during your visit to seek care		Circle options Total time in minutes……………

5.2 Costs of Travel

Q.25	Response	Bus	Car	Bicycle	Motor Cycle	Others	Total
Did you have to pay anything to travel to the **CHW**	Yes/No	Ksh_____	Ksh_____	Ksh_____	Ksh_____	Ksh_____	Ksh_____
Private Clinic	Yes/No	Ksh_____	Ksh_____	Ksh_____	Ksh_____	Ksh_____	Ksh_____
Public facility (OPD)	Yes/No	Ksh_____	Ksh_____	Ksh_____	Ksh_____	Ksh_____	Ksh_____
Chemist	Yes/No	Ksh_____	Ksh_____	Ksh_____	Ksh_____	Ksh_____	Ksh_____
Others (specify)	Yes/No	Ksh_____	Ksh_____	Ksh_____	Ksh_____	Ksh_____	Ksh_____
Total		Ksh_____	Ksh_____	Ksh_____	Ksh_____	Ksh_____	Ksh_____

6.3 Cost of Food and Cost of Care Taker Time

Q.26	Response	Food	Caretaker	Miscellaneous	Total
Did you have to pay for food, caretaker , miscellaneous while visiting the 1. CHW?	Yes/No	Ksh_____	Ksh_____	Ksh_____	Ksh_____
2. Hospital (In patient)	Yes/No	Ksh_____	Ksh_____	Ksh_____	Ksh_____
3.Private Clinic	Yes/No	Ksh_____	Ksh_____	Ksh_____	Ksh_____
4.Public Hospital (OPD)	Yes/No	Ksh_____	Ksh_____	Ksh_____	Ksh_____
6. Mganga	Yes/No	Ksh_____	Ksh_____	Ksh_____	Ksh_____
7. Chemist	Yes/No	Ksh_____	Ksh_____	Ksh_____	Ksh_____
8. Others (Specify)	Yes/No	Ksh_____	Ksh_____	Ksh_____	Ksh_____
Total	Yes	Ksh_____	Ksh_____	Ksh_____	Ksh_____

OTHER COSTS

Q.27 If called a health care provider, How many minutes did you use in calling the CHW on phone? _____

Q.28 How much money did you spend calling the CHW? _____

Q.29 How much time did it take as your child was treated until you were discharged home in hours?

<0.5 (1)

0.5-1 (2)

1-2 (3)

2-3 (4)

3-6 (5)

6-12 (6)

Other_____ (specify) (5)

Q. 30 If you wouldn't seek care for the child, what would you have done during that time?

☐Nothing   =   1

☐ Housework   = 2

☐ Looking after my children　　　= 3
☐ Working (specify)_____　　　=　4
☐　Other (specify)_____ =　　5
☐　　Don't know　　　　=　　6
Q. 31 How much money would you have made in Ksh from the activity that you would have done? _____

---

32 Has the illness affected the family　　　Yes=1
financially?　　　　　　　　　　　　No=2
Q.33 What are the total expenses of the household where the child lives, including rent and other "fixed" expenses?

Item/ amount	Per day	Per week	Per month
Food			
Education			
Rent			
Household item			
Total			

SECTION 6: HEALTH SEEKING BE8HAVIOR
Q.34a Within 14 days of your child's illness how many times did you seek for care
　　　　　Twice　　　　　　　　[1]
　　　　　Once　　　　　　　　[2]
Three times   [3]
Q34b If you sort care more than once did you maintain the same place you sort care previously
Yes (1)
NO (2)
Q34c what is the reason for your above action?
_____
_____
___
Q34d Are there any other expenses that you had to pay for the extra visits? Yes (1) No (2)
How Much Ksh _____
Please explain what those heads and their associated costs.
_____
_____
_____
Q.35 Where do you usually first seek care when sick?
　　　　　Governemnt Hospital　　　　　　[1]
　　　　　Private clinic　　　　　　　　[2]
　　　　　Traditional healer　　　　　　[3]
　　　　　Pharmacy　　　　　　　　[4]
CHWs home　　　　　　[5]
　　　　　Don't know　　　　　　　　[6]
Q.36 How Long did it take you to decide to seek care for yoursick child
1-3 Hrs　　　　　　　　[1]
3-6 Hrs　　　　　　　　[2]

6-12Hrs   [3]

12-24Hrs   [4]

Other _____

Q.37 Why did you choose to seek treatment from (Name where the caregiver sort care)

Its cheap   [1]

Its near   [2]

They treat me well   [3]

I trust their care   [4]

Q.38. How would you rate the amount of time you waited at the Health facility/ CHW before your child was seen?

Very Long

Long

Fair

Short

Very Short

Decline to state

Q.39 Did you consider putting off going to the Health Facility/ CHW because you thought it was too expensive?

Yes

No

Decline to state

Q.40 How did you feel about the amount of money you had to pay for your visit to the health facility/ CHW (Rate price even if it is zero.)

Very poor

Poor

Fair

Good

Very Good

Excellent

Decline to state

Q.41 **where do you prefer to seek care next time your child gets sick?**

CHW

Health facility

Magician

Spiritual leader

Others

Q.42 Why will you prefer to seek care from the place?

Because it is cheap

Because they offer quality services

Other_____

Q.43 Where will you advice other people to seek care from the when there children are sick?

CHW

Health facility

Magician

Spiritual leader

Others

Q.44 Why will you advice the other people to seek care from the place?

Because it is cheap
Because they offer quality services
Other_____

Signature of research assistant:_____ Date: ____/____/_____

Signature of study coordinator: _____ Date: ____/____/_____

Comments of Study Coordinator, if any:

Section- 6   Outcome Variables Information

This section needs to be filled in by the Study coordinator

Study Coordinator Name _____

Signature of research assistant: _____ Date: ____/____/_____

Signature of Field / Study Coordinator_____ Date: ____/____/_____

Comments of research assistant (if any)
_____
_____
_____
_____
Comments of Field/ Study Coordinator, (if any)
_____
_____
_____
_____
Comments of Parent/ Guardian (if
any)_____
_____
_____
_____

APPENDIX II: SCHOOL OF GRADUATE STUDIES APPROVAL

MASENO UNIVERSITY
SCHOOL OF GRADUATE STUDIES

*Office of the Dean*

Our Ref: PG/MPH/00064/2012

Private Bag, MASENO, KENYA
Tel:(057)351 22/351008/351011
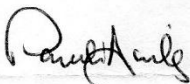FAX: 254-057-351153/351221
Email: sgs@maseno.ac.ke

Date: 16th June, 2015

TO WHOM IT MAY CONCERN

RE: PROPOSAL APPROVAL FOR JOEL AMENYA MACHUKI— PG/MPH/00064/2012

The above named is registered in the Master of Public Health of the School of Public Health and Community Development, Maseno University. This is to confirm that his research proposal titled "A Comparative Study on Patient Level Cost of Treating Child Pneumonia at Home versus in the Health Facility in Suba Sub-County, Kenya" has been approved for conduct of research subject to obtaining all other permissions/clearances that may be required beforehand.

17 JUN 2015
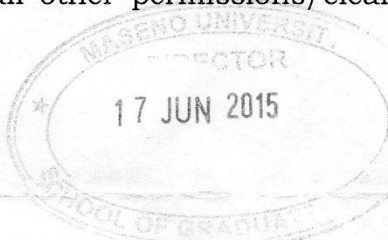
Prof. P.O. Owuor
DEAN, SCHOOL OF GRADUATE STUDIES

Maseno University   *ISO 9001:2008 Certified*

APPENDIX III: KEMRI ETHICS REVIEW COMMITTEE APPROVAL

KENYA MEDICAL RESEARCH INSTITUTE

P.O. Box 54840-00200, NAIROBI, Kenya
Tel (254) (020) 2722541, 2713349, 0722-205901, 0733-400003, Fax: (254) (020) 2720030
E-mail: director@kemri.org   info@kemri.org   Website:www.kemri.org

KEMRI/RES/7/3/1   May 13, 2015

TO: DR. MARICIANAH ONONO
           PRINCIPAL INVESTIGATOR

THROUGH: THE DIRECTOR, CMR,
           NAIROBI   *Forwarded 22/5/15*

Dear Madam,

RE: SSC NO: 2424 *(REQUEST FOR ANNUAL RENEWAL)* INTEGRATED
           COMMUNITY CASE MANAGEMENT OF PNEUMONIA, MALARIA AND
           DIARRHOEA AMONG UNDER 5 IN HOMABAY COUNTY

Thank you for the continuing review report for the period June 2014 to March 2015.

This is to inform that during the 239th A meeting of the KEMRI Scientific and Ethics Review
Committee held on 12th May 2015, the Committee conducted the annual review and
approved the above referenced application for another year.

This approval is valid from **May 13, 2015** through to **May 12, 2016**. Please note that
authorization to conduct this study will automatically expire on May 12, 2016. If you plan to
continue with data collection or analysis beyond this date please submit an application for
continuing approval to the SERU by 31st March 2016.

You are required to submit any amendments to this protocol and other information pertinent to
human participation in this study to the SERU for review prior to initiation.

Yours faithfully,

MR. AMBROSE RACHIER,
CHAIR,
KEMRI ETHICS REVIEW COMMITTEE

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APPENDIX IV: CONSENT DETAIL
ADULT CONSENT TO BE A RESEARCH SUBJECT
(For mothers or primary caretakers of under 5's treated at home for pneumonia)
A COMPARATIVE STUDY ON PATIENT LEVEL COST OF TREATING CHILD
PNEUMONIA AT HOME VERSUS IN THE HEALTH FACILITY IN SUBA SUB
COUNTY KENYA

Name	Institutional affiliation	Role
Joel Machuki	Maseno University	Principal investigator
Dr. MaricianahOnono	KEMRI	Co-investigator
Dr Bernard Abong'o	Maseno University	Co-investigator
Kevin Owuor	KEMRI	Co-investigator/ statistician

RESEARCHERS' STATEMENT: There is a study being conducted by researchers from the Kenya Medical Research Institute (KEMRI) and Maseno University. The purpose of this consent form is to give you the information you will need to help you decide whether to be in the study or not. You may ask questions about the purpose of the research, what happens if you participate, the possible risks and benefits, your rights as a volunteer, and anything else about the research or this form that is not clear. When we have answered all your questions, you can decide if you want to be in the study or not. This process is called 'informed consent.' We will give you a copy of this form to keep.

A. WHAT IS THIS STUDY ABOUT? The researchers above are collecting information about the cost of treatment of pneumonia among children between 2-59 months of age who are managed by Community Health Workers at home or by qualified health workers at the health facility in Suba Sub County. The purpose of this study is to compare the patient level

costs of home based community health worker treatment of pneumonia versus health facility based management among children aged 2-59 months diagnosed with pneumonia in Suba sub county and, Western Kenya. They will also investigate how this patient level treatment cost of pneumonia influences the subsequent health seeking behaviour. You are being asked to take part in this study because you are the mother or primary care taker of a child under the age of 5 who has been recently diagnosed, treated or referred for pneumonia by a community health worker or qualified health worker.

B. HOW MANY PEOPLE WILL TAKE PART IN THIS STUDY? Around 208 mothers or primary caretakers will be enrolled.

C. WHAT WILL HAPPEN IF YOU DECIDE YOU WANT TO BE IN THIS RESEARCH STUDY?

- **You are considered to be eligible** to participate in the study because your child is between the ages 2-59months and has been recently diagnosed, treated or referred for pneumonia at home by a community health worker or at the Health facility by a qualified health worker.

- The interview will last approximately 30-40 minutes. Information that will be collected during this visit will include, cost incurred during seeking treatment for your child, the investigations done, treatment given, traveling cost, the lost time when seeking treatment in either of the places and the subsequent health seeking behaviour.

- You will continue to receive your regular health services from the community health worker and the health facility.

D. WILL ANY PARTS OF THIS STUDY HURT OR HAVE OTHER RISKS?

- The interview may take time to complete and may cause some discomfort. The recall of illnesses and deaths may cause some upset and bring memories of grief and sorrow. You are free to decline to answer any questions you do not wish to answer or stop the interview at any time.

- One potential risk of study involvement is loss of privacy. We will do our best to ensure that your personal information is kept private, but we cannot guarantee total privacy. Your personal information may be given out if required by law. If study information is published or presented at scientific meetings, your name and other personal information will not be used. Organizations that may look at and/or copy your research records for study purposes include: KEMRI and Maseno University.

- Information identifying you will be kept in a secure location until the researchers can collect information from your medical records about your medical care up to one year from the time you enrol in this study.

- For more information about risks, **please ask the researcher who is reading this form to you**.

E. BENEFITS: There will be no direct benefit to you from participating in this study. However, the information that you provide may help researchers to learn more about how best to provide health services to sick children under 5 years of age.

F. COSTS: There will be no costs to you as a result of taking part in this study.

G. REIMBURSEMENT: You will be not be reimbursed for your participation in this study

H. WHAT IF YOU HAVE QUESTIONS? This study has been approved by the Kenya Medical Research Institute. If you have further questions or concerns about participating,

please call our study staff at 0725062171. If you have questions or concerns, you should contact the researchers listed above, or ask me before or after the interview. Do you have any questions now?

I. YOUR DECISION TO PARTICIPATE IN RESEARCH IS VOLUNTARY. You are free to decline participation in the study and you can withdraw from the study at any time. If you decide not to take part in this study, there will be no penalty to you.

I have read the foregoing information, or it has been read to me. I have had the opportunity to ask questions about it and any questions that I have asked have been answered to my satisfaction. I consent voluntarily to participate as a participant in this study.

Print Name of Parent or Guardian _____

Signature of Parent of Guardian_____

Date _____

Day/month/year

BY: _____

_____
NAME OF STAFF MEMBER   SIGNATURE OF STAFF MEMBER

If illiterate

I have witnessed the accurate reading of the consent form to the mother/ primary caretaker of the child, and the individual has had the opportunity to ask questions. I confirm that the individual has given consent freely**.**

Print name of witness_____ AND Thumb print of participant

Signature of witness _____

Date _____

Day/month/year

BY: _____
_____
NAME OF STAFF MEMBER   SIGNATURE OF STAFF MEMBER