CHILD HEALTH IN KENYA: SYNERGY OF PROVIDER AND CONSUMER QUALITY OF HEALTHCARE

Isabella Jebiwott Kiplagat

X80/99128/2015

A THESIS SUBMITTED TO THE SCHOOL OF ECONOMICS, UNIVERSITY OF NAIROBI IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF THE DEGREE OF DOCTOR OF PHILOSOPHY IN ECONOMICS.

December, 2022

DECLARATION

This thesis is my original work and has not been presented for a degree in any other University

Signature…..……...Date…….5/12/2022…….

Isabella Jebiwott Kiplagat

Reg. No.:X80/99128/2015

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

Signature…..……. Date…….5/12/2022.....

Dr. Mercy Mugo

Department of Economics and Development Studies

University of Nairobi

Signature…..……. Date…….5/12/2022……

Dr. Martine Odhiambo Oleche

Department of Economics and Development Studies

University of Nairobi

DEDICATION

I dedicate this thesis to my children; Joy, Jean and Jake who had to be independent as I pursued this degree programme, and to my grandmother Grace, who without having gone to school herself instilled in me the value of education and hard work, but who unfortunately did not live to see me graduate as was her wish.

ACKNOWLEDGEMENT

First and foremost, I am forever indebted to my lead supervisor Dr. Mercy Mugo for her unwavering support, commitment and patience throughout my thesis writing journey. Thank you for your tireless guidance in ensuring that I sharpen my writing skills and for your technical and motherly advice. You went out of your way to ensure that you understood what my thesis was all about even when I was not able to clearly put across my ideas. I am also very grateful to my second supervisor, Dr. Martine Oleche for his unfailing support and insightful discussions and inputs into my work. I am particularly grateful for guiding me through the methodological approaches to this thesis.

I will not forget to mention two professors who really helped me see that there was something worth investigating in this thesis. To Prof. Germano Mwabu and the late Prof. Fondo Sikod (rest in eternal peace), I appreciate your view of this thesis and your expertise, comments, advice and encouragement especially at the very initial stages of this thesis. This thesis also benefited a lot from two African Economic Research Consortium (AERC) Biannual Workshops and various seminars at School of Economics, University of Nairobi where I received many useful comments from resource persons and participants. I wish to thank all my lecturers who taught me theoretical aspects applicable to my research, both at University of Dar es Salaam and at Joint Facility for Electives (JFE) at Kenya School of Monetary studies.

I am grateful to all my friends and colleagues without whom it would not have been easy to survive the PhD journey and remain sane. Your support, friendship and the light moments that we shared eased the journey of acquiring this degree a little bit-you know how. Many thanks to Isaac, Phillip, Moses, Kassim, Judy, Innocentia, Rhonet, Esther, Tiriongo, Madata and Joachim.

Most importantly, I wish to convey my heartfelt appreciation and love to my dear husband, Sammy Biwott for his selfless dedication and sacrifice in taking care of our young children as I pursued this degree. Thank you for undying support and for believing in me as I pursued my dream. To my whole family, my parents, sisters, brothers and in-laws, thank you for your support and for constantly reminding me that I needed to complete my studies. Your question, "*karibu unamaliza?*" though unpleasant, always reminded me that I had unfinished business.

This thesis would not have been possible without funding from AERC and Government of Kenya. Many thanks for awarding me full PhD scholarship. I wish also to thank my employer, The National Treasury and Planning for granting me study leave to enable me to pursue my studies.

Lastly, I am grateful to Almighty God for guiding me through this PhD programme. May God bless you all.

Abstract

Besides access to health services, quality of healthcare is recognized as a key element in putting an end to preventable childhood illnesses which in turn contributes to improved population health outcomes. Quality of healthcare and its effects on health is often assessed at the facility level while neglecting the role of consumers of healthcare as co-producers of quality healthcare; they are capable of using their knowledge and resources to enhance their own (and their children's) health. Moreover, existing theoretical and empirical evidence does not explore the synergistic health effects of provider and consumer quality of healthcare on health outcomes. To address the existing knowledge gap, this thesis addressed three objectives. To begin with, we assessed provider quality of healthcare in Kenya and establishing its determinants. We then developed a measure for consumer quality of healthcare and examined the determinants of household level quality of healthcare. Lastly, we sought to model theoretically and empirically the interaction effect of provider and consumer quality of healthcare on child health. This thesis has its theoretical foundations on microeconomic models of utility maximization, the agency models and health production theories. We utilize two data sets; the 2018 Kenya Health Service Delivery Indicators (SDI) survey data and the 2014 Kenya Demographic Health Survey data. The ordered logit model and Instrumental Variables Approach were employed appropriately for estimation of regression results. The results of the analysis point to the following main conclusions: First, on the supply side, being male, higher education and training level as well as having been trained in Integrated Management of Childhood Illnesses were more likely to result in provision of quality healthcare. Health facility characteristics, mainly, higher facility tier, government ownership and urban location were significant in improving provider quality of healthcare. Secondly, the demand side quality of healthcare was mainly determined by child characteristics such as child's age and twin status as well as maternal level of education level and a household's wealth index. Lastly, the effect of the interaction term between provider and consumer quality of healthcare on child health, was positive and significant suggesting that consumer quality of healthcare enhances child health given provider quality of healthcare. Other explanatory variables among them twin birth, birth-order number as well as socioeconomic status as indicated by wealth index and education level were key in influencing child health status. Policies should therefore focus on simultaneously improving both supply and demand side quality of healthcare. While provider side quality of healthcare has been the focus for many governments, the demand side quality of healthcare could be enhanced through enhanced maternal education and creating awareness on the importance of implementing recommended interventions at the family level.

Table of Contents

List of Figures

List of Tables

Abbreviations and Acronyms

2SRI	Two Stage Residual Inclusion
AIC	Akaike Information Criterion
AMA	American Medical Association
BIC	Bayesian Information Criterion
CFA	Control Function Approach
CQHI	Consumer Quality of Healthcare Index
DALYs	Disability Adjusted Life Years
FBOs	Faith-Based Organizations
GOK	Government of Kenya
HALE	Health-Adjusted Life Expectancy
HALYs	Health Adjusted Life Years
HAZ	Height-for-age Z-scores
HBM	Health Belief Model
HIV	Human Immunodeficiency Virus
HPM	Health Production Model
HRQoL	Health Related Quality of Life
IMCI	Integrated Management of Childhood Illnesses
IMR	Infant Mortality Rate
IOM	Institute of Medicine
IVs	Instrumental Variables
KDHS	Kenya Demographic Health Survey
KHP	Kenya Health Policy
KHSSP II	Kenya Health Sector Strategic Plan
KIPPRA	Kenya Institute for Public Policy Research Analysis
KMO	Kaiser-Meyer-Olkin
KNBS	Kenya National Bureau of Statistics
LMICs	Low-and Middle- Income Countries
MDG(s)	Millenium Development Goal(s)
MOH	Ministry of Health
MOMS	Ministry of Medical Services
MOPHS	Ministry of Public Health and Sanitation
NGOs	Non-Governmental Organizations
OECD	Organisation of Economic Cooperation and Development
OLS	Ordinary Least Squares
ORS	Oral Rehydration Salts
PCA	Principal Component Analysis
PGLE	Potential Gains in Life Expectancy
QALYs	Quality-Adjusted Life Years
ROK	Republic of Kenya
SDG(s)	Sustainable Development Goal(s)
SDI	Service Delivery Indicators
STEEP	Safety, Timeliness, Effectiveness, Efficiency, Equity and Patient-centeredness
U5MR	Under-Five Mortality Rate

UNDP	United Nations Development Program
UNFPA	United Nations Population Fund
UNICEF	United Nations Children's Fund
WAZ	Weight-for- age Z-scores
WHO	World Health Organisation
WHZ	Weight-for-height Z-scores
YPLL	Years of Potential Life Lost

CHAPTER 1

INTRODUCTION

1.1 Background to the Study

It is widely recognized that a healthy nation is a wealthy nation (Bloom & Canning, 2000). Good health status is not only fundamental to human well-being but also contributes to economic advancement and poverty reduction (WHO, 2002). The positive relationship that health has on growth and poverty reduction occurs through a number of mechanisms. First, better health has a direct positive effect on output since it enhances labour productivity, not only as a result of fewer worker illnesses but also because healthy individuals are more mentally and physically prepared for work. Further, health has an indirect effect on productivity as it reduces mortality rates and morbidity, thereby lowering absenteeism rates and improving cognitive development leading to better learning outcomes among school children (Barro, 2013; Weil, 2005; Bloom et al., 2004).

An additional spillover effect is that good health status frees resources that would otherwise have been used for treatments for other alternative uses (*i* Casasnovas et al., 2005). It is just as likely that causality runs in both directions (Bloom et al., 2004; Thomas & Frankenberg, 2002) in that, better educated individuals with higher incomes can afford better medical care and live in healthier environments with better food and shelter (Weil, 2005; Deaton, 2002; Grossman, 1972).

The benefits of good health have contributed to its enshrinement in the global obligations. The ongoing development agenda encompasses a set of seventeen Sustainable Development Goals (SDGs) to be attained by the year 2030 (United Nations General Assembly, 2015; Pisano, et al., 2015). Among these goals is a health-related goal-SDG goal 3, which aims at ensuring healthy

lives and promoting well-being for all ages. This inclusion underscores the unrelenting importance of health in economic development process. Moreover, health is closely connected to majority of the other SDGs, either as a contributor to or a beneficiary of these goals. In particular, health is seen as a contributor to poverty and hunger eradication (WHO, 2001), is crucial for attainment of education (Barro, 2013) and enhances economic progress (Loewe & Rippin, 2015; Bloom et al., 2004; Bhargava et al, 2001). Health as well is a beneficiary of responsible consumption, affordable and clean energy and also clean water and sanitation (Loewe & Rippin, 2015).

At the national level, improvement in population health is recognized as one of the interventions that will drive Kenya towards fulfillment of her long-term development blueprint-the Kenya Vision 2030. This document spells out the desire to propel the country to a newly industrialized middle-income country by the year 2030 (Government of Kenya, 2007). This realization justifies the country's continuous endeavor to achieve better population health indicators through provision of high-quality healthcare (Ministry of Health, 2014).

The various Kenya demographic health surveys indicate that the country's general performance of some health indicators has improved overtime. In particular, there have been considerable gains in reduction of deaths at infancy and early childhood since 1990. The under-five mortality rate (U5MR) declined from 101 and 103 deaths per 1000 live births in the 1980s and 1990s respectively, to 52 deaths per 1000 live births in 2014 (Kenya National Bureau of Statistics and ICF Macro, 2015). Similarly, the infant mortality rate (IMR) stood at 39 deaths per 1000 live births in 2014 down from 74 and 52 deaths per 1000 live births in 1998 and 2008 respectively (Kenya National Bureau of Statistics and ICF Macro, 2015).

According to UNICEF 2018 estimates, further improvement in IMR and U5MR were registered at 31 and 46 deaths per 1000 live births, respectively (UNICEF, 2019). Despite the observed successes, it is worth noting that the country did not achieve the IMR and U5MR targets set at 26 and 33 deaths per 1000 live births respectively, for achievement of Millenium Development Goals (MDGs) whose implementation period ended in 2015. The SDGs have set an even lower U5MR target of 25 deaths per 1000 live births which the country commits to achieve by the year 2030. Subsequently, the SDGs are mainstreamed in the third Medium Term Plan (MTP III) which is the current implementation plan for the Kenya Vision 2030 (Republic of Kenya, 2018).

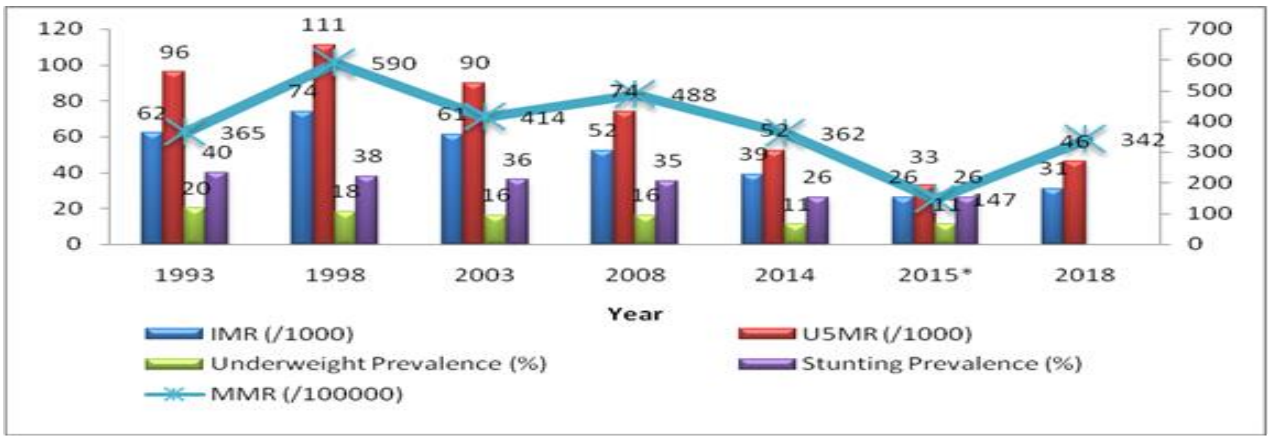
In the same vein, the nutritional status of the Kenyan under-five children as reflected by underweight (low weight-for-age) and stunting (low-height-for-age) prevalence declined from 20 percent and 40 percent respectively in 1993 to 11 percent and 20 percent respectively in 2014. Wasting (low-weight-for-height) declined from 7 percent in 1993 to 4 percent nationally in 2014 (Kenya National Bureau of Statistics and ICF Macro, 2015). While the country achieved the MDG target of reducing the underweight prevalence to 11 percent and was close to achieving the MDG level of stunting target of 25 percent, these improvements were unevenly distributed within the country and among different education levels and wealth quintiles (Kenya National Bureau of Statistics and ICF Macro, 2015). The country is committed to achieving the internationally agreed targets to reduce stunting among the under-five children by 40 percent (WHO, 2014a) and SDGs target to put to an end all manifestations of malnutrition by 2030 (United Nations General Assembly, 2015).

The country's maternal mortality ratio (MMR) was 590 maternal deaths per 100,000 live births during the 1993-1998 period but declined to 414 deaths per 100,000 live births between 1998 and

2003 before increasing to 488 deaths per 100,000 live births by 2009 (KNBS and ICF Macro, 2010; KIPPRA 2010). The MMR was 362 deaths per 100,000 live births in 2014 (Kenya National Bureau of Statistics and ICF Macro, 2015). According to WHO (2019), MMR is estimated to have dropped further to 342 deaths per 100,000 live births in 2018. This figure is far above the SDG target of 70 maternal deaths per 100,000 live births by 2030.

The trends in health status has been attributed to the county's contextual factors among them, population growth, absolute poverty levels, literacy levels, gender disparities (MOH & MOPHS, 2012) and economic performance (Mugo, 2012). Some selected country's health indicators are presented in Figure 1.1.

Figure 1. 1: Trends in Selected Health Indicators in Kenya



***** 2015 MDG targets

Source: KIPPRA, 2010; KNBS and ICF Macro (2010); UNICEF, 2015; MOMS & MOPHS, 2012; KNBS and ICF Macro, 2015; UNICEF, 2019; WHO, 2019

1.1.1 The Concept of Health and Its Measurement

The general conception of the term 'health' is the absence of disease or disability (Bergner & Rothman, 1987; Larson, 1999; Dolan & Olsen, 2002; Grad, 2002). This is a narrow approach to

definition of health as it focusses mainly on an individual body's mechanical functioning (Saylor, 2004) and limits the role of observation of body functioning to medical professionals (Dolan & Olsen, 2002; Saylor, 2004). The World Health Organization (WHO) broadly defines 'health' as *"*a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity*"* (WHO, 2014b). This definition provides for consideration of dimensions of mental and social health over and above the physical health (Larson, 1999).

Although the WHO definition has been supported for many years (Larson, 1999; Bergner & Rothman, 1987), it has received criticism especially as regards the word 'complete'. It is argued that the term is absolute in nature, difficult to operationalize and tends to medicalize health (Huber et al., 2011; The Lancet, 2009; Smith, 2008; Larson, 1999). Despite its conceptual limitations, the definition of health by WHO motivated efforts for its operationalization to suit assessment of the health status of an individual or a population (Breslow, 2006; Bergner & Rothman, 1987). Consequently, several summary indicators have been proposed as measures of health outcomes (Parrish, 2010).

1.1.1.1 Summary Measures of Population Health

The approaches to measuring population health range from mortality, morbidity and disability health measures to disease specific and nutritional health measures (Thacker et al., 2006). Historically, mortality related health indicators including crude mortality rate and life expectancy at birth (Parrish, 2010; Thacker et al., 2006) have been in use (Van der Maas, 2003; Gardner & Sanborn, 1990). Crude mortality rate refers to all deaths that occur in a population regardless of age, sex or cause. This measure is largely a good measure of health as it allows for observation of trends in overall health over time. However, the measure fails to account for population age structure or age comparison (Alameda Public Health Department, 2017). Age-adjusted mortality

rate considers the differences in age structure or age composition, thus ensuring direct comparison of populations of different age distributions (Alameda Public Health Department, 2017).

Life expectancy at birth entails a calculation of the number of years between any given age and a population's average age of death. The assumption in its computation is that current mortality rates continue throughout an individual person's lifespan, thus giving an expectation of how long babies are likely to live in a wholly hypothetical way (Alameda Public Health Department, 2017). Life expectancy measure is normally used in comparisons with health status across subgroups, time periods and areas (Alameda Public Health Department, 2017).

The mortality-related measures, while important in measurement of population mortality and longevity, do not inform on the leading causes of deaths (Parrish, 2010; Gold et al., 2002). Correspondingly, cause-specific mortality rate measures among them, leading causes of death, cause-specific mortality rates, Years of Potential Life Lost (YPLL) and Potential Gains in Life Expectancy (PGLE) have been considered for purposes of preventive and program planning (Alameda Public Health Department, 2017). Leading causes of death focusses simply on the number of deaths while cause-specific mortality rate adjusts for the age composition of the population (Alameda Public Health Department, 2017). YPLL estimates the average number of years a person would have lived if one had not died prematurely. It lays emphasis on specific causes of death in proportion to their burden as measured by productivity loss to the society (Gardner & Sanborn, 1990). PGLE ranks leading causes of death by the average number of years a person would still have lived by eliminating specific causes of death (Alameda Public Health Department, 2017).

Over the years, mortality rates have declined progressively due to increasing effectiveness of preventive and curative healthcare in bringing changes in disease patterns and morbidity (Van der Maas, 2003). With decreased mortality rates and increased longevity, the concern in assessment of population health has shifted from focusing mainly on survival measures to *health related quality of life* (HRQoL). This is a measure that indicates an individual function in everyday life and their perception of well-being (Hays & Reeve, 2008; Hyder & Morrow, 2006). Accordingly, alternative population health measures that combine mortality and morbidity indicators simultaneously have been suggested (Gold et al., 2002). These measures assess HRQoL through two approaches; self-perceived health status and generic measures of population health (Hays & Reeves, 2008).

Self-perceived/rated health status subjectively measures an individual's own health status based on individual awareness or experience (Cleary, 1997). Individual level self-perceived health measures may be aggregated to assess population health outcomes (Parrish, 2010). Since self-reported health measures are subjective in nature, they are susceptible to reporting error. As such, the measure may be interpreted differently by different survey respondents, depending on among others, their understanding and expectations of own health, financial incentives when utilizing healthcare, and their conception of the survey questions posed (Bago d'Uva et al., 2006). Consequently, objective measures such as assessment of the ability of an individual to perform physical, mental and social tasks can be more reliable and valid and may compliment self-rated health status measures (Johnstone, 2007). HRQoL profile measures include a 36-item Short-Form Survey (SF-36) which examines among others, individual limitations in undertaking physical tasks due to ill health and a EuroQol five-dimension (EQ-5d) instrument (Karimi & Brazier, 2016; Hays & Reeves, 2008; Rabin & Charo, 2001).

Health–Adjusted Life Years (HALYs), is an umbrella measure for a family of generic measures that allows for simultaneous consideration of combined impact of mortality and morbidity (Salomon, 2014; Gold et al., 2002). They include, Disability-Adjusted Life Years (DALYs) and Quality-Adjusted Life Years (QALYs) (Gold et al., 2002). DALYs is a summary measure of overall disease burden estimated as total years lost due to premature death (YLLS) and years lived with disability (YLDs) (Chen et al., 2015; Salomon, 2014; Murray et al., 2012; Audibert, 2009; Molla et al., 2003). DALYs incorporate weights to reflect disability levels by assigning higher weights to current and productive years of life than future and nonproductive years of life (Salomon, 2014; Gold et al., 2002; Molla et al., 2003). In addition to measurement of the burden of disease, DALYs is used as a measure of cost-effectiveness of health programmes (Salomon, 2014).

QALYs are utilised primarily for analysis of cost-effectiveness of health interventions (Neumann & Cohen, 2018; Salomon, 2014; Gold et al., 2002; Sassi, 2006). This in turn enables comparison of value of different interventions and benchmarking against alternative with lowest ratios (Neumann & Cohen, 2018). QALYs are computed simply by multiplying the time a person is likely to spend in some state of health by a utility score from standard valuations. Weight is usually assigned to utility scores with a scale of ‘one’ equivalent to perfect health and ‘zero’ equivalent to death (Neumann & Cohen, 2018; Sassi, 2006). Health-adjusted life expectancy (HALE), another quality of life related measure, estimates the average number of years that a person at a given age is likely to live in the equivalent of full health (Gold et al., 2002).

The measurement of nutritional status through anthropometric values is another commonly used marker of health in populations (Audibert, 2009). Anthropometry utilizes body measurements including weight, height, Waist to Hip Ratio (WHR), knee-heel length, arm circumference and Body Mass Index (BMI) to assess the nutritional status of individuals or groups (Sánchez-García et al., 2007; Gorstein & Akrea, 1988). The anthropometric values are compared across individuals using a standardized age and sex-specific growth reference (WHO, 1986).

1.1.1.2 Child Health Outcome Measures

The available wide range of summary measures of population health status are applicable as well in assessment of child health since they can easily be disaggregated by age. In particular, child health is commonly assessed using a number of indicators including: mortality rates; disease-specific incidence; indices such as the proportion of newborns born small or prematurely; and proxy-reported ratings of health or activity limitations (National Research Council and Institute of Medicine (IOM), 2004).

Among the common measures of child health in developing countries is child mortality measures, which indicate the risk of death in children (Hill, 1991). Child mortality is generally viewed as a measure of population health because it is a sensitive indicator of environmental, social, economic, quality of healthcare services and delivery situation in a country (Uddin et al., 2009; Hill, 1991), and especially where child death rates are still high (Currie, 2008). Child mortality rate is usually disaggregated into number of deaths in children: under twenty eight (28) days (neonatal mortality rate); less than one (1) year (infant mortality rate); and between 1 and 4 years per 1000 live births (child mortality rate). U5MR estimates the likelihood of a child death between birth and five years expressed per 1000 live births.

HRQoL are gradually being applied in measurement of child health status and hence the development of a considerable number of instruments to assess HRQoL including physical, psychological and social domains in children (Solans et al., 2008; Rajmil et al., 2004; Raat et al., 2002). While HRQoL measuring tools may provide an objective assessment of child health status, they can be designed to measure the respondent's subjective point of view regarding HRQoL (Radsel et al., 2016; Solans et al., 2008). As such, the wide range in content, dimensions and items of HRQoL are likely to reveal differences in an individual's development process, the theoretical framework applied, the target population, and/or the instrument's intended use (Solans et al., 2008). However, HRQoL instruments for young children especially below five years do not consistently include the same core dimensions of HRQoL including social, emotional and physical well-being measures (Germain et al., 2019).

Anthropometric measures are used to assess a child's nutritional status and growth. Upon correct measurement of child's age, weight and arm or head circumference, z-scores expressed as standard deviations (SDs) below or above some reference population value are calculated to obtain malnutrition measures namely, weight-for-age (WAZ), height-for-age (HAZ) and weight-for-height (WHZ) (WHO, 1986). WHZ is useful for assessing short-lived changes in nutritional status and in detecting the presence of wasting which may be as a result of starvation or illnesses particularly diarrhea. HAZ is a long-term measure of child nutritional status and it reflects cumulative linear growth. WAZ on the other hand is a combination of both WHZ and HAZ scores (WHO, 1986). Broadly, whereas height reflects a combination of both physical and genetic influences before birth and during the early years of childhood, weight is a contemporaneous indicator of general health and nutritional intake (Mugo, 2012).

This thesis focuses on child health in particular, since child health indicators and especially those relating to children aged below five years provide a good judgement of the overall health status of the entire population (Mugo, 2012). Additionally, health in childhood is an important factor in predicting health and productivity in adulthood (Hertzman et al., 2010; Blanco, 2003). Investing in child health is therefore a vital economic decision for governments to take since it not only results in better educated and more productive adults, but also contributes to favourable demographic changes (Belli et al., 2005).

1.2 Healthcare and Quality of Health Care

The term "healthcare" is defined as "an entirety of measures and activities conveyed by the community and especially its integral part – the health'' (Socic & Donev, 2007). It encompasses the health service along with individual efforts and activities undertaken to prevent and promote own health and health of the other people (Sosic & Donev, 2007). This definition corresponds with the WHO's broad definition of health and therefore views the role of healthcare as not only to deal with disease, but also with their prevention and modes of maintenance (Sosic & Donev, 2007).

According to Dolan & Olsen (2002), healthcare comprises two different concepts. It refers to all resources that a society utilizes in an attempt to treat or care for persons in ill health. It also refers to activities aimed at preventing people from falling ill in the first place. They further summarize the role of healthcare as cure, care and prevention (Dolan & Olsen, 2002). The primary purpose of each of the three identified types of healthcare differs in that, cure is concerned with 'improvements in health'. Care indirectly improves health by providing dignity to a sick person. Prevention's main role is to 'reduce the probability of illness or premature death'. Healthcare types also differ in terms of availability of alternatives to healthcare and time horizon. As regards the

former, there are alternative measures to preventive healthcare for instance, formal as opposed to informal healthcare. Cure however has few if any alternatives hence the stronger argument for its subsidization. While both cure and care are concerned with the present, prevention addresses the future (Dolan & Olsen, 2002).

Sartorius (2006) notes that both the narrow and broad approach to definition of health have an implication on participation in health promotion. In particular, the conceptualization of health as "the absence of any disease or impairment" and "as a state that allows the individual to cope with all demands of daily life" (the narrow approach) limits the participation on healthcare promotion to medical professionals. In this case, individuals do not have a hand in promotion of their health. Broadly stated and in line with the WHO definition, Sartorius (2006) define health as "a state of balance, an equilibrium that an individual has established within himself and between himself and his social and physical environment". This definition allows for involvement of individuals in an active way towards enhancement of their health-the co-production of health.

In health economics, healthcare is seen as a commodity that exists in the healthcare market. However, unlike other goods and services, healthcare is consumed not because it yields satisfaction in itself, but instead because of its positive relationship with health (Dolan & Olsen, 2002). Healthcare is also seen as an unusual commodity in that it exhibits unique characteristics. Largely, health/medical care is among those commodities for which both the product and the activity of production are identical (Arrow, 1963). In such a case, the customer cannot test the quality of the product before consuming it and the relationship between the healthcare provider and the consumer is based on trust (Mwabu, 2007; Arrow, 1963). In addition, healthcare services are intangible and heterogeneous (Arrow, 1963; Mosadeghrad, 2014).

The concept of quality is difficult to define because it is subjective and intangible in nature. The concept is even more difficult when applied to healthcare given its distinctive characteristics (Mosadeghrad, 2014). Furthermore, healthcare providers, patients and other stakeholders may have differing perceptions of healthcare quality (Piligrimienė and Buciuniene, 2008; Levine et al., 2012), thus making its conceptualization and measurement even harder (Nylenna et al., 2015).

While the concept of quality is applicable to various fields, this thesis focusses on definition of quality in relation to healthcare. The terms "quality of care" and "quality of healthcare" may therefore be used interchangeably in this thesis, to imply quality of care provided to patients both at healthcare facility and family/household levels. While it is impossible to produce an error-free measure of quality of care (Brook et al., 2014), a lot of effort has been made in an attempt to develop a thorough and applicable definition of the concept in relation to healthcare (Blumenthal, 1996; Piligrimienė and Buciuniene, 2008). The existence of a large number of quality of healthcare definitions is partly as a result of non-linearity of quality of healthcare concept (Campbell et al., 2000; Levine et al., 2012).

The three most commonly cited definitions of quality of healthcare in the literature are put forth by Donabedian (1980), the American Medical Association (1986) and the Institute of Medicine (1990) (Brownson and Petitti, 2006; Legido-Quigley et al., 2008). Donabedian defines quality of healthcare as the kind of care which is expected to maximize an inclusive measure of patient welfare, after one has taken account of the balance of expected gains and losses that attend the process of care in all its parts (Brownson and Petitti, 2006; Legido-Quigley et al., 2008). The American Medical Association (AMA) Council on Medical Service define high quality care as

care "which consistently contributes to improvement or maintenance of the quality or duration of life" (Council on Medical Services, 1986). The definition of quality of healthcare according to Institute of Medicine (IOM) is "degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge" (Lohr, 1990). The three definitions are conceptually similar in that they relate quality of healthcare to health outcomes but vary in their focus on quality of life, processes of care and delivery of services as components of quality (Brownson and Petitti, 2006).

In an effort to operationalize the proposed definitions of quality of healthcare, a number of features characterizing quality of care have been put forth. The AMA Council identified eight essential elements of quality as: improvement in health outcomes, emphasis on health promotion, provision of timely care, informed cooperation of patients in the process of care, adherence to appropriate technological and professional resources and medical science, attention to psychosocial aspects of illness, cost-effectiveness and appropriate documentation in the medical record (Council on Medical Services, 1986). IOM (2001) in their seminal report titled "*Crossing the Quality Chasm"* sets out six domains to conceptualize quality of healthcare services. These domains are: safety, timeliness, effectiveness, efficiency, equity and patient-centeredness (the STEEEP acronym). The definitions of the proposed dimensions of quality are provided in Appendix 1A.

Yet another view of healthcare quality involves differentiating among responsibilities in the various parts of the healthcare system. This view recognizes the importance of engaging and involving patients and their families in the process of healthcare provision (WHO, 2006a). Although management of interpersonal process by the healthcare provider influences implementation of care by and for the patient, the patient is equally responsible for the outcome of

care (Donabedian, 1988). Thus, quality in healthcare in this context is seen as a collaborative effort where consumers have critical roles in identifying their own needs and preferences as well as in managing their own health with appropriate support from health-service providers (WHO, 2006a).

The multidimensionality in the definition of quality of healthcare brings with it the issue of accurate measurement of the concept. A valid measure helps in establishment and application of appropriate strategies for service quality improvement and management (Piligrimienė and Buciuniene, 2008). Logically, the existence of different definitions of quality implies that there are many dimensions to its measurement as well (Blumenthal, 1996). The different methods of quality measurement are also as a result of the presence of different perspectives on healthcare quality by various stakeholders (Blumenthal, 1996; Piligrimienė and Buciuniene, 2008). Measurement of quality of healthcare among physicians and other healthcare professionals is driven by medical outcomes. Patients on the other hand, tend to evaluate healthcare quality according to its responsiveness to their specific needs. Healthcare administrators often consider managerial input measures such as the average number of nursing hours required for an outpatient surgery as measures of healthcare quality (Blumenthal, 1996; Piligrimienė and Buciuniene, 2008).

Taking into consideration the various perspectives to quality of healthcare measurement, two approaches are commonly used in its assessment. The first systematic approach to measuring quality of healthcare was proposed by Donabedian (1988). The framework proposes three dimensions of assessment of quality namely, structure of the healthcare system, the process of care and outcomes of care. *Structure* quality refers to the presence of hospital buildings, human resources and equipment. It denotes attributes of the settings in which care takes place including geographical location and accessibility to services. *Process* quality assesses whether

recommended medical or health care practices is applied or not. Processes comprise patient's activities including timeliness in seeking care and adherence to treatment regime as well as the practitioner's competence, patient-centered activities in making diagnostic tests, technical communication and recommending correct treatment. *Outcomes* refer to impact of healthcare on individuals. These include restoration of function, mortality and patient satisfaction.

The second approach to measurement of quality of healthcare entails assessment of patients' perspective based on their experiences with healthcare services. The patient's perspective is embodied in outcomes such as perception of symptoms, functional status, and satisfaction with outcomes and processes of care (Katz and Sangha, 1997). This is informed by the view that perception directly influences the pattern and choice of treatment, which are based mainly on prior experience. Patient's satisfaction with dimensions of care such as physician competence, availability of services, patient-centred care and physical setting is normally subjectively assessed to establish quality of healthcare provision (Cleary and McNeil, 1988).

Empirically, a range of quality of healthcare indicators have been utilized while investigating the effect of these measures on demand for healthcare and health outcomes. These studies could be grouped into two; in the first group, quality of healthcare is measured explicitly through the use of structural measures such as availability of physical infrastructure, stock of medical supplies, total number of assigned personnel, availability of refrigeration units and electricity and availability of healthcare services (Muriithi, 2013; Mariko, 2003; Alderman and Lavy, 1996; Lavy et al., 1996; Frankenberg, 1995; Lavy and Germain, 1994; Mwabu et al., 1993; Hotchkiss, 1993). In the same line, other studies employ process quality of healthcare measures which relate to healthcare worker actions during the clinical processes (Houck et al., 2004; Gleason et al., 1999; Meehan et al., 1997).

The second strand of empirical works do not explicitly measure quality of healthcare, probably due to lack of data, but instead use provider type as a proxy for provider quality of healthcare. Generally, these studies assume that quality differences are embodied in provider type. For example, Lavy and Quigley (1991) assumed that quality of healthcare is synonymous with provider type while Gertler et al., (1987) subsumes quality in the characteristics of providers and patients.

Provision of quality healthcare is now recognized as a primary objective of health systems in a number of developing countries, due to its contribution to attainment and maintenance of population health (WHO, 2006b). Quality healthcare is key as well in ending avoidable childhood illnesses (which are a hindrance to child survival in Sub-Saharan Africa) (WHO/UNCEF, 2013). Furthermore, improvement in quality of healthcare could eventually contribute to enhanced overall health status of an individual, hence a reduction in demand for healthcare (Mwabu et al., 1993). As such, quality of healthcare (or lack of it) is integral to every debate concerning better population health (Peabody et al., 2006).

The link between quality healthcare and health indicators is well documented in existing empirical literature with some studies reporting a positive effect of higher provider quality on healthcare demand (Muriithi, 2013; Audo et al., 2005; Hotchkiss, 1995; Lavy and Germain, 1994; Mwabu et al., 1993). Still, other studies concerned with the relationship between provider quality of healthcare and child health showed a positive relationship (Lavy, 1996; Frankenberg, 1995). Generally, the concern of majority of quality of healthcare related empirical researches is provider

quality of healthcare at the facility level, mostly as indicated by the environment in which healthcare takes place or by processes of healthcare especially in provision of clinical services.

Although higher provider quality of healthcare (both within the facility and among healthcare workers) contributes to better health outcomes, healthcare service delivery requires high consumer involvement in the delivery process (WHO, 2006; Donabedian, 1988). Hibbard (2003) puts forth three critical roles that the consumers of healthcare play in any effort to improve quality of care; the informed choice role, the co-producer role and the evaluator role.

The informed choice role is observed when quality of care forms the basis for choice of providers of care and healthcare plans. The co-producer role entails the consumer (patient) being involved in the healthcare process by acting as active partners with providers of care. As a co-producer, patients may among other activities, make decisions about when and where to seek care, provide relevant information about their health to help in diagnosis and treatment, implement recommended healthy lifestyles and adhere to agreed-on treatment regimens (Hibbard, 2003). The evaluator role encompasses the aspect of provision of data on provider and system performance by consumers and their participation in defining the parameters of quality.

The three consumer roles to some extent have been the focus of existing demand side healthcare related studies. A number of empirical studies for instance, document the importance of perceived quality of care in influencing consumer choice of healthcare-the informed choice role (Audo et al., 2005; Hotchkiss, 1995; Lavy and Germain, 1994). Similarly, some studies point to the role played by healthcare consumers in assessing quality of healthcare at the facility level (the evaluator role) based on their perception and experiences (Turkson, 2009; Batussen et al., 2002). The active role

(the co-producer role) of healthcare consumer in seeking healthcare in a timely manner (Mebratie et al., 2014; Webair and Bin-Gouth, 2013; Källander et al., (2008) and in complying with treatment advice (Griffith, 1990) among other activities is also well documented.

While these demand side studies recognize the role of healthcare consumer in assessing provider quality of healthcare and the consequent effect of this assessment on choice of healthcare, they fail to examine production of quality healthcare at the family/household level. Yet, just like at the facility level, quality healthcare can as well be produced at this level (WHO, 2006a; Donabedian, 1988). In particular, timely health seeking behavior, management of illness symptoms as recommended, uptake of preventive behaviors among other actions can be viewed as consumer quality of healthcare. To bridge the knowledge gap in existing empirical studies, we innovatively develop a composite index that measures consumer process quality of healthcare. Further, to understand the factors that determine production of quality healthcare at the household level, we subsequently investigate the determinants of the developed consumer quality of healthcare index.

Production of healthcare is a sum of interaction between healthcare providers and consumers in an organizational and social context and within a system of infrastructure (Wonderlich and Jones, 2007). For instance, in production of child health, prompt and effective case management has the potential to substantially reduce child mortality. Successful case management however, depends not only on the structural quality of the healthcare system such as availability of services provided by trained healthcare personnel, but also on the quality of care at home and within the community (Claeson et al., 2000).

From the foregoing, collaborative effort of healthcare providers and consumers is necessary for health improvement of the population. However, the role of healthcare system consumers as producers of quality healthcare as well as whether health outcomes will be improved when provider side quality of care is accompanied by household level quality of healthcare has not previously been modeled theoretically and empirically. This study seeks to fill this knowledge gap, thereby contributing to evidence, policy formulation and literature on ways to improve child health outcomes.

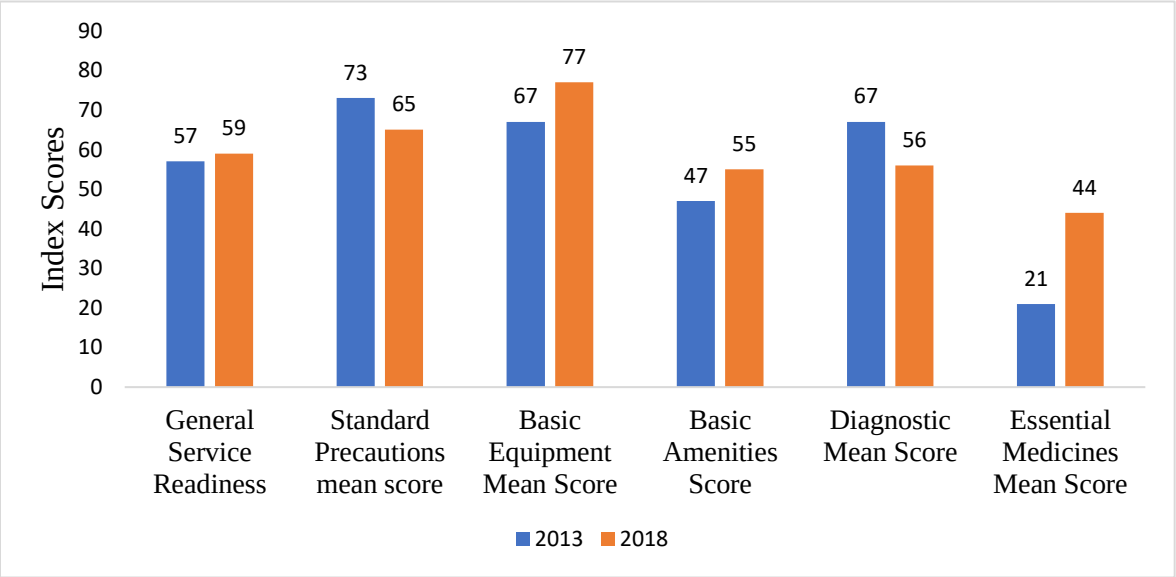
1.2.1 Overview of Quality of Healthcare in Kenya

Kenya, endeavours to enhance provision of quality health services as envisaged in various policy documents (MOH, 2014; GOK, 2010; GOK, 2007). Consequently, there is concerted effort to achieve universal health coverage through expansion of the healthcare facilities and the health workforce. According to KIPPRA (2018), the number of health facilities in the country increased from 8,616 in 2013 to 11,324 in 2017 translating to improvement in the national facility density from 17 health facilities per 10,000 population to 24 health facilities per 10,000 population respectively. The number of registered healthcare professional, that is, doctors, clinical officers, nurses, pharmacy, pharmacy technologists and dentists increased from 97,970 in 2013 to 162,233 in 2020 (Okoroafor et al., 2022). Kenya's total stock of health workers stood at 164,556 in 2018 (WHO, 2021). The country reported a national core health workforce (medical officers, clinical officers, nurses and lab technicians) density of 15.6 per 10,000 population in 2018 against the WHO's recommended health worker target of 23 per 10,000 population (MOH, 2019).

General service readiness which is a measure of the health facilities' capacity to provide general health services encompasses five key elements for provision of quality healthcare. The elements include availability of basic amenities, basic equipment, essential medicines, standard precautions

for infection prevention as well as diagnostic capacity. General service readiness is described as an index score usually computed by aggregating the mean scores of each of the five domain elements (WHO, 2015). Kenya's general service readiness index as indicated in Figure 1.2, improved modestly from 57 percent in 2013 to 59 percent in 2018. Overall, there was an improvement in basic equipment, basic amenities and essential drug mean scores from 67 to 77 percent, 47 to 55 percent and 41 to 44 percent respectively, between 2013 and 2018. The standard precautions and diagnostic mean scores dropped from 73 to 65 percent and 67 to 56 percent respectively, between 2013 and 2018. This implies that the county's readiness to provide infection control measures and diagnostic services is low.

Figure 1. 2: Health facility General Readiness Indicators



Source: Service Availability and Readiness Assessment Mapping (SARAM) Report (2013); MOH, 2021

Service Delivery Indicators (SDI) are used to track progress of a country's education and health quality improvements and policy makers' performance over time (World Bank, 2014a). The key dimensions of health service delivery include: availability of key inputs such as drugs, equipment

and infrastructure; and health worker's effort in applying knowledge and skills to illness diagnosis and in adherence to clinical guidelines.

The health SDI surveys allow for the assessment of how these elements (Martin and Pimhidzai, 2013). The 2018 Kenya SDI survey indicates that there were gaps in the health service delivery dimensions in the country. Table 1.1 shows that 54 percent of essential drugs were available across the survey health facilities. The public healthcare facilities had a slightly higher availability of essential drugs (56 percent) as opposed to the private facilities (53 percent). Similarly, urban based health facilities had a higher drug availability (55 percent) when compared to their rural counterparts (52 percent). About half of healthcare facilities were in possession of the minimum medical equipment expected at a health facility. Privately owned facilities registered a higher availability of basic equipment (61 percent) compared to public facilities (42.4 percent). Facilities located in urban facilities areas had better availability of (62 percent) than their rural counterparts (46 percent).

Health worker ability is measured by diagnostic accuracy and adherence to clinical guidelines. The diagnostic accuracy for four illness conditions (acute diarrheoa, pneumonia, diabetes mellitus and pulmonary tuberculosis was 68 percent. Health workers in public health facilities had a higher diagnostic accuracy (69 percent) when compared to their counterparts in private facilities (66 percent). Rural based health workers did better in illness diagnosis (70 percent) as opposed to those in urban based facilities (66%). Adherence to clinical guidelines for the four tracer conditions was low with only 44 percent of healthcare providers having adhered to clinical guidelines. The lowest adherence was reported among health workers in private health facilities (42 percent) while urban based healthcare providers had the highest adherence (50 percent).

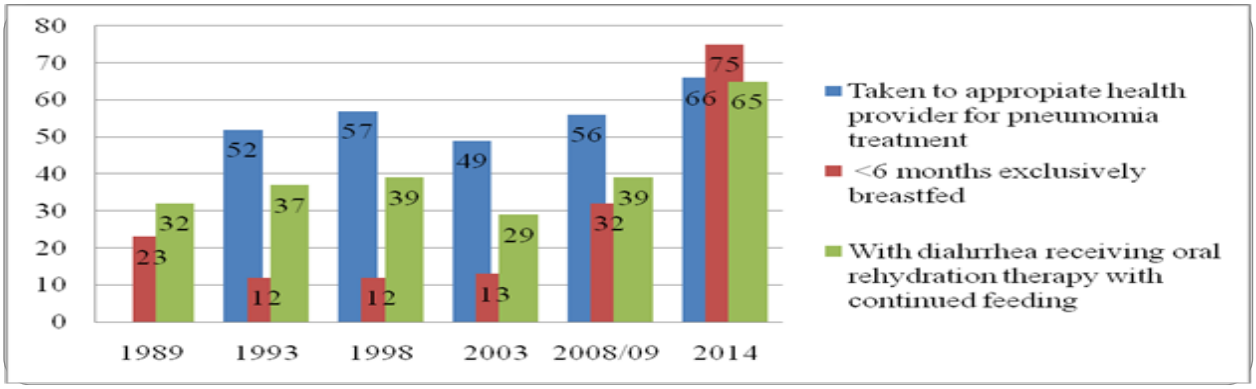
Table 1. 1: Selected Health Service Delivery Indicators

	All	Public	Private	Rural	Urban
Drug Availability (% of drugs)	54.1	55.5	52.6	51.6	55.3
Basic Equipment Availability (% of facilities)	50.9	42.4	60.6	61.7	45.8
Diagnostic Accuracy (% of clinical cases)	67.5	68.5	65.9	70.2	65.9
Adherence to Clinical Guidelines (% of clinical guidelines)	43.5	46.2	41.8	43.6	49.7

Source: World Bank and ROK, 2019

At the demand side of healthcare, implementation of recommended health promoting actions is sub-optimal. A large proportion of caregivers of children with pneumonia signs only initiate treatment when the illness is severe. One in six children with malaria symptoms access medication with the recommended line of treatment within twenty four hours (Kenya National Bureau of Statistics and ICF Macro, 2015). The Kenya Policy on Management of Diarrhea in children aged five years and below recommends the use of zinc supplements with Oral Rehydration Therapy (ORT) which entails an increase in intake of fluids or Oral Rehydration Salts (ORS) as effective response to diarrhea illness. However, about 35 percent of the children experiencing diarrheal incident did not receive a solution prepared using a packet of ORS in 2014 (Kenya National Bureau of Statistics and ICF Macro, 2015). Exclusive breastfeeding, an important intervention that promotes growth and development of children stood at 75 percent with 53 percent of the children being breastfed to the recommended age of two years (Kenya National Bureau of Statistics and ICF Macro, 2015).

Figure 1. 3: Level of Some Selected Desired Child Health Practices in Kenya



Source: KNBS and ICF Macro, 2015; KNBS and ICF Macro, 2010; NCPD, Central Bureau of Statistics (CBS) and Macro International Inc. (MI), 1999.

1.3 Overview of Kenya's Healthcare System

Prior to promulgation of the constitution in 2010 and consequent devolution, Kenya's healthcare system remained largely centralized. The decisions concerning healthcare in the country were undertaken at the Ministry of Health (MOH) headquarters and then conveyed to the district level through the Provincial Medical officers (Kenya Institute for Public Policy Research and Analysis (KIPPRA), 2018). The Constitution of Kenya saw the transfer of functions, power and authority (devolution) from the centralized system government to the forty-seven (47) counties listed on the First Schedule of the Constitution. Consequently, the country's healthcare system was devolved with an aim of among others, promoting access to health services throughout the country and addressing the problem of low-quality health services (Government of Kenya, 2010).

The constitution distributes functions of the health sector between the national and county levels of government. The national government: formulates health policy and guidelines on health service charges; provides technical support; monitors quality of health services; conducts research related

to health services management and administration; and handles national referral health facilities and national health services (Government of Kenya, 2010). The county governments are in charge of county health services which entail county health facilities, pharmaceutical services, promotion of primary health care, public health and sanitation among others (Government of Kenya, 2010).

The Kenyan health sector comprises of both public and private (both for-profit and not-for-profit) healthcare providers (KIPPRA, 2018). The public sector has the largest representation in the formal sector (KIPPRA, 2018). According to Kenya Health Sector Strategic Plan 2013-2017, government owned facilities totaled 3956 countrywide, while the privately owned health facilities were 2652. The total number of Faith Based Organisations (FBOs) and Non-Governmental Organisations (NGOs) stood at 1187 (Ministry of Medical Services and Ministry of Public Health and Sanitation, 2014). The private sector includes the informal sector which constitutes alternative medicine practitioners (traditional healers and unregistered drug shops) as well as individuals and households who have the role of providing care and support to their families and communities within which they live (KIPPRA, 2018).

The country's previous healthcare system was pyramidal and comprised of six levels of healthcare. The first level was the community level. Levels two and three comprised of dispensaries and health centers respectively. The district and provincial referral hospitals formed the fourth and the fifth levels respectively. At the peak of the pyramid were two parastatal national referral hospitals, Kenyatta National Hospital (Nairobi) and Moi Teaching and Referral Hospital (Eldoret) (MOH 2012).

The organization of healthcare in the devolved healthcare system, while still pyramidal is four-tiered with the lowest tier being the community level. This first tier is responsible for demand creation and health promotion activities as well as specified supply services, mostly delivered at the community. The second tier combines former levels two and three in addition to maternity/nursing homes to form primary care level. This forms the first physical level of care where most client's health needs are addressed. At tier three is the county referral level which comprises hospitals which were previously in level 4 and level 5. These hospitals operate in and are managed by the county governments. They allow for provision of a more comprehensive package to patients, thus complementing primary care level. The national referral level (tier four) consists of facilities that provide highly specialized services. The national government is responsible for five referral hospitals namely, Kenyatta National Hospital, Moi Teaching and Referral Hospital, Kenyatta University Teaching, Research and Referral Hospital and Mathari Hospital (a psychiatric facility) and National Spinal Injury Hospital (Mulaki & Muchiri, 2019; Ministry of Medical Services and Ministry of Public Health and Sanitation, 2014).

The private health care providers complement the public health sector and contribute significantly to the government's effort to ensure equity and access to healthcare. The private hospitals are distributed across the four tiers with clinics and private nursing homes falling within the second tier. The medium and large-sized clinics are in the third tier. Private referral hospitals categorized under the fourth tier include among others, The Mater Hospital, Aga Khan University Hospital, Nairobi Hospital, M.P Shah, Karen Hospital and Avenue Hospitals (Ministry of Medical Services and Ministry of Public Health and Sanitation, 2014).

1.4 Statement of the Research Problem

Substantial progress towards improvement in child health has been made in Kenya since 1990. That notwithstanding, most children still suffer and die from preventable childhood illnesses, top in the list being; pneumonia (15%); diarrhea (9%) and malaria (7%) (Kenya National Bureau of Statistics and ICF Macro, 2015). This is saddening as suffering from these illnesses could be alleviated through implementation of proven, simple, cost-effective interventions. These interventions do not require any technological advances and could be undertaken at health facilities by clinicians or at home by caregivers (WHO/UNICEF, 2013).

According to UNICEF (2016), there exists at least one effective preventive intervention and one effective treatment for each of these diseases. Examples include: administering vaccines; use of simple, standardized guidelines such as Integrated Management of Childhood Illness (IMCI) for identification and treatment of communicable illnesses; exclusive breastfeeding for six months and continued breastfeeding for at least two years; use of Oral Rehydration Salts (ORS) and zinc supplements to treat diarrhea and promotion of key hygiene practices (WHO/UNICEF, 2013).

Yet, there is evidence of systematic deficits in quality of healthcare, both at the facility and family/household levels of care. At the supply side, 54 percent of recommended essential drugs were available the Kenyan facilies. Only half of the health facilities across the country had the minimum basic equipment for health service delivery. Healthcare provider diagnostic accuracy for adult and childhood illnesses was 68 percent on average, while adherence to clinical guidelines in management of illness conditions stood at 44 percent (World Bank and ROK, 2019). At the household level, there were delays in initiating treatment upon observation of major childhood illnesses. Only 15 percent of children suffering from diarrhoea received increased fluids with

continued feeding as recommended. Exclusive breastfeeding rated was reported at 61 percent (Kenya National Bureau of Statistics and ICF Macro, 2015).

There is ample evidence confirming that provider quality of healthcare contributes to improvement in health outcomes (Muriithi, 2013; Audo et al., 2005; Mariko, 2003; Mwabu et al., 1993). There is also a greater recognition of the key role played by healthcare consumers/users in providing feedback to improve provider quality of healthcare service-the evaluator role (Turkson, 2009; Hibbard, 2003; Batussen et al., 2002). Nevertheless, individuals and households are not only evaluators of the processes of healthcare provision but are also co-producers. Specifically, individuals/households are capable of using their knowledge and resources to enhance their own (and their children's) health.

Appropriate and prompt health seeking behavior on observation of illness symptoms as well as observation of preventive and treatment advice at the household level, among other activities entail process quality of healthcare (Donabedian, 1988). This implies that households are also involved in production of quality healthcare. While this is the case, existing studies have paid inadequate attention to the role of households in producing quality healthcare with their focus largely being provider quality of healthcare (Muriithi, 2013; Audo et al., 2005; Mariko, 2003; Mwabu, Ainswoth and Nyamete, 1993). This study therefore adds to existing knowledge by not only assessing provider quality of healthcare in Kenya, but also developing a healthcare consumer quality of healthcare measure and establishing its determinants.

Success in reduction of child mortality requires not only availability of health services with well trained personnel but also a partnership with caretakers of the children. However, existing studies

document the separate health effects of provider quality of healthcare (Chou et al., 2019; Kruk et al., 2018; Houck et al., 2004; Battleman, et al., 2002) and recommended family level health promotion activities (Nigatu et al., 2019; Naser et al., 2019; Pattison et al., 2019; Khan and Islam, 2017; Grube et al., 2015). Thus, this study also seeks to investigate the child health effects of the combined effort between healthcare providers and users (individuals/households) by interacting the supply side quality of healthcare measure as proxied by facility type first visited on observation of child diarrheal symptoms with the developed consumer quality of healthcare index. To the best of our knowledge, no study has sought to investigate the interaction effect of the supply side (provider quality of healthcare) and demand side (consumer quality of healthcare) quality of healthcare in improving child health outcomes. This study therefore addresses this existing knowledge gap in the literature.

1.5 Study Objectives

The overall objective of the thesis is to establish the extent to which provider and consumer quality of healthcare interaction affects child health in Kenya. Specifically, the study seeks to:

I. Examine the determinants of provider quality of healthcare in Kenya.
II. Investigate the determinants of consumer quality of healthcare in Kenya.
III. Establish the effect of the interaction between provider and consumer quality of healthcare on child health in Kenya.

1.6 Contribution of the Thesis

This thesis makes contributions to existing knowledge gap on quality of healthcare and its effect on health outcomes. Firstly, we undertake a comprehensive analysis of provider quality of

healthcare in Kenya. In particular, we focus on provider process quality of healthcare as indicated by health worker accuracy in diagnosis of common childhood illnesses. Process quality of healthcare measures, as opposed to other measures of quality of healthcare are more useful in providing feedback for quality improvement as they reflect the care delivered by clinicians. Past studies assessing provider process quality of healthcare in Kenya are scanty, not nationally representative and do not simultaneously explain the factors that determine provision of poor and high quality of healthcare. This thesis therefore not only seeks to provide an understanding of provider process quality of healthcare in Kenya, but also draws implications for policy by providing an analysis of factors determining provider process quality of healthcare in the country.

Healthcare is often deemed as an activity that occurs in a health facility. Yet the healthcare process is initiated at homes where preventive behaviors are undertaken, recognition of illness symptoms done and medical/treatment advice implemented. The implication of this is that, quality healthcare can also be produced at individual, family or household level through implementation of simple recommended interventions. Majority of existing empirical studies assess provider quality of healthcare while ignoring quality of healthcare at the household level. This study addresses the existing knowledge gap as follows: First, we innovatively develop a measure of consumer quality of healthcare based on recommended simple preventive and treatment interventions that could be undertaken at the household level on observation of child diarrheal illness. Second, an analysis of the determinants of household level provision of quality healthcare is conducted and policy recommendations suggested on the basis of the findings.

The concept of co-production in healthcare is increasingly receiving attention as the debate shifts from the traditional model of healthcare service production where patients were seen as passive

recipients of care to the contemporary understanding of the patient's active role in healthcare production process (Vennik et al., 2016; Hibbard, 2003). The construct of co-production together with other concepts including co-care, co-creation, co-design, shared-decision making, patient-centered care, collaborative care and patient engagement put emphasis on the importance of interaction between providers and users of healthcare in the process of healthcare provision. Production of health is complimentary in reality in that, provision of quality healthcare at the facility should be accompanied by implementation of recommended actions at the individual/family/household level. Yet, numerous empirical studies separately document the effect of provider (both facility and healthcare worker) and consumer quality of healthcare aspects on health outcomes. To address the existing knowledge gap in the literature, we begin by modifying existing theoretical model to include an interaction term that brings together the supply side and the demand side quality of healthcare as an interaction term. Based on this model, an empirical analysis of the effect of this interaction term on child health as measured by child nutritional status is conducted.

1.7 Structure of the Thesis

The rest of this thesis is organized as follows: each of the subsequent chapters two, three and four corresponds to objectives one, two and three respectively. We begin by assessing provider and consumer quality of healthcare in Kenya in chapters two and three respectively. Specifically, chapter two focusses on provider quality of healthcare in Kenya. The contents of the chapter include a motivation to the study, theoretical foundations, empirical literature and methodology. Utilizing data from 2018 Service Delivery Indicators Survey conducted in Kenya, the chapter also provides a descriptive analysis of provider process quality of healthcare as indicated by health

worker accuracy in illness diagnosis. This is followed by a presentation of regression results on determinants of provider process quality of healthcare in Kenya.

The third chapter centers on the second objective which aims at measuring and assessing determinants of consumer quality of healthcare in Kenya. Consequently, the chapter entails motivation to the study, literature review and methodology related to determinants of quality of healthcare at the household level. Based on the 2014 Kenya Demographic Survey data, an index that measures quality of healthcare at the household level is developed. The determinants of the consumer quality of healthcare measure are then established, reported and discussed in the chapter.

In the fourth chapter we provide an answer to objective three which seeks to establish the separate and combined effect of provider's and consumers' quality of healthcare on child health in Kenya. We begin the chapter by first modelling theoretically the effect of provider-consumer quality of healthcare interaction term on health outcome. The latest available Kenya Demographic Health Survey (KDHS) data collected in 2014 is then used to establish the effect of this interaction term on child nutritional status, the results of which are discussed in the chapter. Chapter five puts together a detailed summary of the whole thesis detailing the discussion of its three objectives together with overall conclusions and recommendations.

CHAPTER 2

PROVIDER QUALITY OF HEALTHCARE AND ITS DETERMINANTS IN KENYA

2.1 Background and Motivation

The concept of quality of healthcare is multi-dimensional in nature and different definitions have been put forth based on differing perspectives (Piligrimienė & Buciuniene, 2008; Blumenthal, 1996). Blumenthal (1996) classified these perspectives into four; the healthcare providers perspective, the patient perspective, the healthcare plans and organization perspective and the purchaser perspective. Healthcare providers who encompass professionals in healthcare usually view quality in terms of the characteristics and output of care, resulting in definitions of quality that underscore the technical capability and the features of patient-healthcare provider relationship. On their part, patients are inclined to understanding quality in relation to their individual preferences and values, hence the definitions that point to patient satisfaction with care and results of care (Blumenthal, 1996).

Health care plans including insurance programs and organizations such as private managed-care organizations tend to emphasize more on the health status of the enrolled population and the organization's role. Hence the definition of quality that reflects on the plan's ability to address the needs of those enrolled. Purchasers of healthcare, for instance health care organizations, tend to place more emphasis on population-based indicators of quality as well as organizational performance. The definition of quality in this sense is the same as that of health care organizations. Nevertheless, buyers are more focused on "value" of care, which generally concerns the price of healthcare and efficiency of care delivery (Piligrimienė & Buciuniene, 2008; Blumenthal, 1996).

The implication of the varied perspectives and definitions of quality of healthcare is the existence of differing approaches to its measurement and evaluation (McGlynne, 1997). There have been efforts to establish a unifying measure of quality of healthcare. According to Counte, (2007), Donabedian's 1980 structure-process-outcome framework is commonly adopted for assessing the different perspectives of quality of healthcare. Structure quality measures (also known as structural measures) assess infrastructure of healthcare settings including availability and capability of equipment, the policy environment and availability of resources within a facility. Process quality measures examine the extent of implementation of recommended guidelines of care by healthcare providers. Outcome measures on the other hand, evaluate the health effects resulting from care received by a patient (Donabedian, 1988). This framework forms the basis for this chapter's assessment of provider quality of healthcare in Kenya.

Structural measures of quality are common in numerous studies (Muriithi, 2013; Mwabu et al., 1993) but are limited in that they have a minimal and indirect impact on health outcomes (Donabedian, 1988). Outcome measures on the other hand are slow to move as their occurrence may be infrequent and data on them is costly to collect (Das and Gertler, 2007). Moreover, health outcomes are affected as well by other non-healthcare related factors such as physical and social environment, lifestyle, poverty, societal social structure and accessibility to healthcare services (CSDH, 2008; Mant, 2001). Consequently, process measures are more useful in providing feedback for quality improvement since they provide information that is actionable; they reflect the care delivered by clinicians (Rubin et al., 2001). These measures are also more responsive to differential quality of care and are a direct measure of facility-level quality of healthcare when compared to structural quality (Mant, 2001).

Process quality of healthcare encompasses healthcare professionals' actions in the process of healthcare delivery. It includes both provider technical quality and patient's experience when receiving healthcare. This quality measure is generally assessed in the literature through two approaches. On the one hand, interpersonal relations such as healthcare providers' attitude towards patients, communication, waiting period and time spent with the patient are viewed as important measures of process quality (Amporfu et al., 2013; Adeoti & Lawal, 2012; Das & Gertler, 2007). The other strand includes assessment of clinician's competence as indicated by accurateness in illness diagnosis and adherence to clinical guidelines by healthcare providers (Das et al., 2008).

The latter component of process quality of healthcare is commonly assessed using a number of tools among them, standardized patients, clinical vignettes, abstraction of medical records, simulations or clinical drills, and direct clinical observations (Aung et al., 2012). A standardized patient also known as a simulated patient, mystery client or patient actor, is a trained person who acts as a real patient. In assessing provider quality of healthcare, the standardized patient typically arrives unannounced to the healthcare facility, presents simulated symptoms of an illness and evaluates the performance of the healthcare provider using an assessment checklist (Aung et al., 2012). Clinical Vignettes are hypothetical cases where healthcare practitioners, following a written clinical case, responds to questions that imitate certain steps of an actual clinic visit, for example taking a history of an illness, ordering tests and prescription of a treatment plan (Akachi and Kruk, 2017; Aung et al., 2012; Das et al., 2008). Abstraction of medical records is a commonly used approach in evaluating clinical performance and involves a manual search of information from medical records to detect standards-based practice. Its validity is however undermined by inconsistency of records particularly in resource-poor environments (Aung et al., 2016). Simulation and clinical drills are cases in which the healthcare practitioners are required to

demonstrate clinical skills on a mannequin based on a given scenario (Akachi and Kruk, 2017; Aung et al., 2012). Clinical observation is an effective evaluation method which entails a direct observation of an actual patient (Aung et al., 2012).

Improvement in quality of healthcare has recently been a subject of health policy in developing countries (Lee et al., 2016; Peabody et al., 2006). This is evidenced by increasing interest in assessment of quality of healthcare as well as development and implementation of quality-related policies[1] in several African countries (Adindu, 2010). Furthermore, "access to quality essential healthcare services" is one of the targets of the health-related Sustainable Development Goal (SDG) 3 whose aim is to "ensure healthy lives and promote well-being for all at all ages" (Leadership Council Sustainable Development Solutions Network, 2015; UN General Assembly, 2015). Kenya's effort to enhance the overall health status of her citizenry is reflected in her obligation to provide quality healthcare services as articulated in various policy documents including: Constitution of Kenya (GoK, 2010), Kenya Vision 2030 (GoK, 2007) and Kenya Health Policy (KHP) (RoK, 2014; MOMS and MOPHS, 2012), among others.

There is a general realization that quantitative improvement of healthcare, through increased access to healthcare services as well as enhanced availability of infrastructural inputs (structural measures of quality) do not necessarily result in better health outcomes. Instead, the mismatch between availability of essential services at health facilities and a higher than expected poor health outcomes is attributed to poor facility quality of care including, delays in treatment and clinical management gaps (Powell-Jackson et al., 2015; Okeke & Chari, 2014; Souza et al., 2013).

[1]Some examples of policy documents and strategies include: A policy on quality in Healthcare for South Africa (National Department of Health, 2007); Ghana National Healthcare Quality Strategy (Ministry of Health, 2016); Ethiopian National Health Care Quality Strategy (2016-2020), Ministry of Health, 2016)

Kenya's healthcare service delivery has improved considerably with existing surveys pointing to increased availability of structural inputs such as medical equipment and essential medical supplies (KIPPRA, 2018; World Bank, 2014b). However, there is still under provision especially in terms of process quality of healthcare measures. The various Service Delivery Indicators (SDI) surveys, for instance indicate that there is provider knowledge gap in illness diagnosis and in adherence to illness treatment guidelines. The 2012/13 SDI survey indicates that only 16% of health workers were able to correctly diagnose five common illnesses, namely; malaria with anaemia, diarrhea, tuberculosis, diabetes and pneumonia. As well, only 43% of health workers in public health facilities adhered to clinical guidelines for these conditions with only 13% of healthcare providers adhering to at least half of the clinical guidelines (Martin and Pimhidzai, 2013). The same was replicated in the 2018 Kenya Health SDI survey where only 20% of healthcare providers arrived at a correct diagnosis of four tracer conditions (severe dehydration, pneumonia, pulmonary tuberculosis and diabetes mellitus (type II)) and 44% adhered to clinical guidelines for management of these conditions (World Bank and ROK, 2019).

Two of the tracer conditions in the 2018 Kenya Health SDI survey, that is, severe dehydration (usually as a result of diarrhea) and pneumonia are among the leading causes of the under-five deaths in Kenya which stands at 52 per 1000 live births (Kenya National Bureau of Statistics and ICF Macro, 2015). Yet, the two childhood conditions had the lowest diagnostic accuracy rate at 32% for severe dehydration and 82% for pneumonia (World Bank and ROK, 2019). Given the place accorded to child health particularly as a key indicator of population health and as a predictor of productivity in adulthood (Hertzman et al., 2010; Blanco, 2003), an understanding of factors

contributing to health worker provision of quality healthcare in relation to childhood illnesses is important for health policy intervention.

Research studies document the effect of a myriad of factors on quality healthcare delivery. The environment in which healthcare takes place as indicated by availability of physical inputs such as medical equipment and supplies, laboratory, hospital beds and medical personnel is associated with patient satisfaction and provision on quality healthcare services (Kraska et al., 2017; Mahato et al., 2017; Ross and Vakentesh, 2015; Nyongesa et al., 2014; Naseer et al., 2012). Health worker characteristics including higher level of training (Uwemedimo et al., 2018; Maestad et al., 2010) and facility characteristics among them facility ownership and facility tier (Adhikary et al., 2018; Uwemedimo et al., 2018; Hu et al., 2016) have been shown to have an effect on provision of quality healthcare. Overall, a number of empirical studies examine factors influencing provider quality of healthcare. However, only a few of the studies relate to quality delivery of child health (Uwemedimo, 2018; Hansen et al., 2008) while others are largely concerned with the effect of Integrated Management of Childhood Illnesses (Tawfiq et al., 2020; Lal et al., 2020; Nguyen et al., 2013). Moreover, studies on factors affecting provider process quality of healthcare in Kenya (Nyongesa et al., 2014; Wanjau, et al., 2012) are at best scanty, not nationally representative and are mostly descriptive implying that they lack the power to explain why healthcare provision may be of low or high quality.

This chapter therefore seeks to analyse provider process quality of healthcare in Kenya with a focus on accuracy in diagnosing childhood related illnesses. The specific objectives of this chapter are: first, to provide a descriptive analysis of provider process quality of healthcare in Kenya and

second, to provide an empirical analysis of individual healthcare worker and facility level factors that influence health worker process quality of healthcare.

2.2 Literature Review

This section discusses the theoretical foundations that form the basis for analysis of provider quality of healthcare in Kenya. The section also presents documented empirical literature on factors affecting provision of quality healthcare services, while focusing on both individual healthcare worker and facility-level characteristics.

2.2.1 Theoretical Approaches

Theoretical literature on provider quality could be categorised into two stands depending on their respective definition of healthcare provider. The first strand relates to hospital behaviour where a hospital is treated as an "entity" with its own goals, usually stated in terms of some aspects of performance including profits, quantity and quality of healthcare. The second strand focusses on individuals who use the hospital to attain their goals for instance physicians or doctors and other healthcare workers, hence the models of physician behaviour (Jacobs, 1974).

Traditional economic theory of utility maximisation largely forms the basis for explaining both hospital and physician behaviour with some models incorporating quality of healthcare as an aspect of performance. While noting the application of utility maximisation behaviour to hospital behaviour, Liu and Mills (2008) observe that hospital utility maximisation objective had the potential to comprehensively explain the objectives of all hospitals including improvement in quality of care.

Among the utility maximising models explaining hospital behaviour is Newhouse's (1970) model for non-profit institution. The model suggests that a hospital decision maker seeks to maximise a weighted function of quality and quantity subject to a budget constraint. The model defines quantity as hospital services provided at the facility level including medical care provided and number of patients visiting a hospital. A consumer is better off consuming more of these services hence its entry into the decision maker's maximand. Since the decision maker in this case is not focussed on making profis, he may be interested in other factors including the institution's prestige which in turn is affected by other variables such as the size of the facility and quality of its products. The definition of quality variable in this model is not clear due to difficulties associated with its measurement, although it is assumed that quality is represented by "a vector of characteristics, some of which may not be quantifiable except in the sense of being present or absent".

In another utility maximising model of hospital behaviour, Lee (1971) postulates a hospital administrator's utility maximising model which includes among other variables, "salary, prestige, security, power and professional satisfaction" and which in turn depends on the prestige and status of an organisation, that is, hospitals in which the administrator is associated. The model further assumes that the status of the hospital varies depending on the variety of services available and the level to which expensive and specialized equipment and personnel are available. The administrator in this case seeks to maximise an index of inputs that yield prestige subject to an income constraint. Lee's model places quality of inputs in the hospital's objective function while ignoring the quality of output that could be produced from such inputs (Jacobs, 1974).

As regards physician behaviour, economic theory views physicians as skilled professionals whose motivation is to serve their patients to improve their health and well-being (Frank, 2004).

According to McGuire and Pauly (1991), physicians are utility maximizers implying that they value items besides profit. In their benchmark model, they posit that physicians derive utility from net income and leisure. They, on the other hand derive disutility from inducement which is a physician's own effort to induce a patient to demand more care than is medically necessary.

The traditional economic theories that rely on rational utility maximising consumers and producers and efficient market equilibriums have greatly contributed to the design of public policy in healthcare (Culyer and Newhouse, 2000). However, the application of the traditional models to healthcare markets has proven difficult, given the unique characteristics of the market (Arrow, 1963; Mwabu, 2007). The healthcare market for instance, is characterised by information asymmetry problem among other characteristics (Arrow, 1963). Usually, the asymmetry is double-sided since on the one hand, the healthcare provider is well knowledgeable about their individual treatment effort, of which the patient is ill-informed. The consumer of healthcare on the other hand is informed about his or her treatment compliance effort, but the providers are ignorant of this effort (Mwabu, 2007). The implication of this informational advantage is that there may be the problem of moral hazard in which case the party with more information has an incentive to act inappropriately (Hwa, 2005; Leonard and Leonard, 1998).

A proposed alternative to the neoclassical economic models is the application of behavioural economic models. These models have particularly been useful in advancing the understanding of the healthcare market and institutions (Frank, 2004). Behavioural economics is particularly applied to the analysis of provider-patient relationship where this relationship is perceived as an agency one in health economics (Stavropoulou, 2012; Smith and Wright, 1994; Hwa, 2005). The principal-agent theory is applicable to situations where one person-the "principal" needs some other person-

the “agent” to undertake some assignment on his or her behalf. When employed in the case of a physician and a patient, the patient (principal) delegates authority to the doctor (agent) to take an action such as medical decision on behalf of the principal (Hwa, 2005).

The neoclassical model of utility maximization applies to the principal-agency framework in that both the principal (patient) and the agent (healthcare provider) are trying to maximize utility derived from the service received and service provided respectively. However, unlike in other commodity markets, these utility functions are interdependent in the healthcare market. The agent in this case acts not only to maximize his or her utility but also the principal’s utility (Arrow, 1963). In addition, unlike typical agency situations found mainly in the insurance and labour markets where the principal can evaluate the agent’s action by designing contracts, the patient does not design contacts with their doctors. In most cases, a third party such as the government and insurance companies design the contact on behalf of the patient (Hwa, 2005).

Considering patient satisfaction which is an outcome measure of quality of healthcare, Gill and White (2009) summarizes patient satisfaction related theories largely developed in the 1980s into five key categories: The first category is the “Discrepancy and transgression theories” by Fox and Storms (1981) which observed differences in patient orientation toward healthcare and in healthcare providers’ conditions of healthcare. Thus, patients’ satisfaction with healthcare was dependent on whether there was a congruence between patient orientation and provider condition of care. Where orientations and conditions were corresponding, then there was satisfaction and vice versa. The second category is “Expectancy-value theory” of Linder-Pelz (1982). This theory hypothesizes five determinants of satisfaction with healthcare as expectations, value, entitlement,

occurrences and interpersonal comparisons. Particularly, prior expectations about healthcare encounters influence patient satisfaction with care.

The third category by Ware et al. (1983)-the "Determinants and components theory" proposes eight key dimensions of provider characteristics that determine a patient's satisfaction with healthcare; interpersonal style, accessibility, funds, technical quality, physical environment, efficacy and continuity. The Fourth group, the "Multiple models theory" proposed by Fitzpatrick and Hopkins (1983) argues that expectations were facilitated on a social basis and they reflected the patient's health goals and the extent to which their personal sense of self was violated by an illness and healthcare. Lastly, the fifth model is the "Healthcare quality theory" of Donabedian (1980) which posits that patient satisfaction is the patient's verdict of all characteristics of quality of healthcare, but particularly the interpersonal process of care (Gill and White, 2009).

The economic theories discussed are applicable to the current study. In particular, we employ utility maximization theory in physician agency model to establish the determinants of provider quality of healthcare in Kenya. This is informed by the fact that we are looking at a doctor-patient relationship where a hypothetical patient presents illness symptoms to the doctor who is then expected to provide a correct diagnosis of the illness.

2.2.2 Empirical Literature

Existing literature documents the effect of both factors within and outside the healthcare system on quality of healthcare. While factors outside the healthcare system among them institutional, economic and socio-cultural factors affect the provision of quality healthcare services (Mosadeghrad, 2014; Amporfu et al., 2013), an analysis of the effect of these factors is beyond the

scope of this study. Hence, the review in this section focuses on factors within the healthcare system, in particular, individual and facility level characteristics that are associated with different measures of quality of healthcare. The indicators of quality of healthcare are varied and include observable quality of healthcare measures such as appropriate clinical processes, perceived quality of healthcare measures as well as patient satisfaction with healthcare- a useful indicator of quality of service delivery (Ross and Venkatesh, 2015; Picker Institute Europe, 2009; Davies and Ware, 2008).

2.2.2.1 Health Facility Characteristics and Quality of Healthcare

Empirical evidence suggests that the environment in which healthcare takes place (as reflected by availability of physical facilities) is associated with quality of healthcare services. A systematic review examining factors affecting quality of maternal healthcare services established that lack of equipment, drugs and trained staff was a hindrance to provision of quality healthcare (Mahato et al., 2017). Moyimane et al., (2017) opined that unavailability and/inadequate medical equipment impacted negatively on nursing care, as it hampered implementation of recommended clinical processes. Mosadeghrad (2014) note that in addition to availability of medical equipment, their quality affects provision of quality healthcare. In particular, inadequate and low-quality medical equipment results in prolonged clinical procedures and unreliable results. Khamis and Njau (2016) postulate that perceived poor physical infrastructure, lack of medical equipment and inadequate essential medicines was associated with perceived low quality of care.

Some research studies have concluded that availability of physical inputs and infrastructure was associated with patient's satisfaction with healthcare. Nyongesa et al., (2014) established that unavailability of drugs, among other factors was associated with patient satisfaction with

healthcare in that, patients affirming availability of drugs were relatively likely to indicate satisfaction with care. Ross and Vakentesh (2015) noted that physical environment ranked high among other factors which were perceived to influence patient satisfaction. A similar conclusion is made by Ko et al., (2009) who report an association between a positively perceived physical environment and patient's satisfaction with healthcare. Naseer et al., (2012) reveal that unavailability of beds had a negative effect on patient satisfaction with care. Kraska et al., (2017) noted that increased hospital size (increase in beds), in addition to high staffing per bed ratios resulted in lower levels of patient satisfaction.

Other resources such as staffing levels and availability of a technology including a laboratory and effective communication channels have been associated with provision of quality healthcare. Khamis & Njau (2016), conclude that low staffing levels as a result of increased workload and high clinician to patient ratio was related to low quality of care. Aiken et al., (2008) established that a reduction of nurse workload significantly lowered the odds of patient mortality, an outcome measure of quality of healthcare. Haegdorens et al., (2019) established that an increase in nursing hours per patient reduced the occurrence of adverse health outcomes including proportion of patients experiencing unexpected death. Hussain et al., (2019) opine that availability of laboratory services was a key predictor of patient satisfaction with care as it facilitated healthy consultations. Bawate et al., (2016) established that availability of a functional laboratory was correlated with compliance with malaria treatment guidelines and prompt receipt of test results. Wanjau et al., (2012) opined that poor technology adoption and ineffective communication channels hindered provision of quality healthcare.

Other studies however, report an insignificant relationship between healthcare physical inputs and provider quality of healthcare. Leslie et al., (2017) postulate that there is a limited association between infrastructural inputs and adherence to clinical guidelines leading to their conclusion that facility infrastructure should not be used as a measure of quality. Maestad, et al., (2010) did not establish any relationship between availability of drugs and existence of a laboratory on quality of health services.

From the foregoing, physical environment in which care takes place affects provision of quality healthcare. As evidenced, availability of infrastructural inputs including medical equipment, drugs, beds, trained staff and technology contributes to improved processes of care (Umemedimo et al., 2018; Moyamane et al., 2017). Conversely, unavailability of these physical inputs was indicated to result in adverse health outcomes (Haegdorens et al., 2019; Aiken et al., 2008) and lowers patient satisfaction with healthcare (Kraska et al., 2017; Ross and Vakentesh, 2015; Nyongesa et al., 2014; Naseer et al., 2012; Ko et al., 2009). However, structural inputs, while necessary, are not sufficient for improving provider processes of healthcare (Leslie et al., 2017; Maestad et al., 2010). A number of studies were mostly descriptive (Moyamane et al., 2017; Khamis and Njau, 2016; Mosadeghrad, 2014; Nyongesa et al., 2014) and therefore lack the predictive power to assess determinants of process quality of healthcare indicators. In addition, these studies utilize sub-national level data, that is, select location (Moyamane et al., 2017), single medical personnel cadre (Moyamane et al., 2017; Aiken et al., 2008) and single healthcare facilities (Khamis and Njau, 2016; Wanjau et al., 2012). This limits exploration of factors that affect provider quality of care in a broader context with a view to addressing different healthcare systems.

2.2.2.2 Health Worker Characteristics and Quality of Healthcare

Existing literature identifies health worker characteristic that influence delivery of quality health services. One such factor is physician's knowledge as indicated by level of training, that is, cadre type. Uwemedimo et al., (2018) established that there was a positive association between higher cadre type and healthcare provider adherence to clinical guidelines with clinicians portraying better performance when compared to nurses. Hansen et al., (2008) conclude that doctors provided higher quality of care than nurses while Maestad et al., (2010), established that being a clinical officer and above (Physician) was associated with more effort per patient as opposed to being in lower cadres. This is in contrast with other research studies where adherence to clinical guidelines was reported among the lower level cadres (Bawate et al., 2016; Selemani et al., 2013; Naimoli et al., 2006). Possible reasons for this finding were indicated as: high presence of lower cadres in rural areas as opposed to medical officers/doctors, lack of alternative diagnoses and treatment and the fact that higher cadres' clinical judgement may override guidelines (Selemani et al., 2013).

Some studies explore the association between provider technical skills as perceived by the patients and patient satisfaction with healthcare. For instance, Tung & Chang (2009) established that a doctor's perceived technical skill had the largest odds ratio of patient's satisfaction with care. In the same vein, Lin et al., (2010) conclude that a patient's perception of physician's ability was related to patient satisfaction with care. Besides professional training, targeted training on management of childhood illnesses enhanced quality of care provided. In particular, systematic reviews have shown that training in Integrated Management of Childhood Illnesses (IMCI) result in improved healthcare worker performance (Nguyen et al., 2013; Amaral and Victora, 2008) and resulted in improvement of processes of care (Tawfiq et al., 2020; Lal et al., 2020; Wiendyasari et al., 2018; Naimoli et al., 2006).

The effect of other health worker characteristics including provider age and sex on quality of healthcare is mixed. A systematic review to establish the association between physician clinical experience and quality of care conclude that older physicians may perform worse on process quality indicators as a result of declining clinical knowledge and less adherence to standards of treatment (Choudhry et al., 2015; Norton et al., 1997). Further, Norton et al., (1997) established that female physicians had better quality of care scores. Kim et al., (2005) concludes that gender had a small influence on quality of healthcare while noting that females as opposed to male physicians were more likely to undertake recommended procedures for diabetes. However, other studies established that gender variable did not affect quality healthcare delivery (Jackson et al., 2020; Maestad et al., 2010; Hansen et al., 2008).

Several studies document the effect of facility characteristics including facility ownership and level on quality of healthcare measures. Herrera et al., (2014) conclude that facility ownership was not a consistently significant factor in influencing provider quality of healthcare measures. This conclusion is portrayed in differing conclusions provided by different research studies. Adhikary et al., (2018) reveal that patients were more satisfied with private health facilities as opposed to those receiving care from public facilities. This, they associated with better cleanliness and private settings in privately owned health facilities. Maun et al., (2015) observed that privately owned primary care centers received higher levels of satisfaction when compared to publicly owned facilities. Kraska et al., (2017) established that private-for-profit as opposed to not-for-profit hospitals were associated with poor quality of healthcare. In contrast, Bamiselu et al., (2016) established that compliance with diagnosis and treatment guidelines was significantly high in

government-owned health facilities. Moscelli (2018) did not find any significant difference in quality of healthcare between privately-and publicly-owned health facilities.

Hu et al., (2016), in a study to examine effect of facility type on quality of healthcare established that there was a significant relationship, with community health centres performing better than secondary and tertiary hospitals. This was attributed to reforms to strengthen infrastructure at lower levels of healthcare. In contrast, Uwemedimo et al., (2018) observed that although correct diagnosis was less likely in a dispensary as opposed to hospitals, health centres and clinics, the association was not statistically significant.

The effect of facility location and/or remoteness on provision of quality healthcare has been a subject of existing empirical works. Spasojevic (2015) report a significant rural-urban difference in performance with urban based facilities performing better in terms of accessibility and availability of consumables such as medical drugs and parenteral injections. Thornton et al., (2017) established that location of a health center influences patient satisfaction. Particularly, patient satisfaction was high among health centres located in rural and urban cities as opposed to those in inner cities. Also, patients in urban cities were more satisfied with care than their counterparts in rural cities (Thornton et al., 2017; Lin et al., 2010). Other studies pointed out that being in non-urban areas was associated with higher patient satisfaction, mainly due to healthcare reforms to improve services in these areas (Yan et al., 2011; Farmer et al., 2005).

Other empirical works seek to understand the interpersonal relationships between the healthcare provider and patient and what goes on in the process of healthcare provision. Adeoti & Lawal (2012) conclude that interpersonal factors such as greetings, complimentary remark, personal

communication, listening, handshake and jokes were important in improving patient's satisfaction with healthcare delivery. Naseer et al., (2012) opines that improper referrals, long waiting time at referral facilities, non-involvement of patients in decision making on treatment methods and non-continuity of care lowered patient satisfaction with healthcare. Wolf et al., (2008) observed that patient-centered care (PCC) was related to high level of patient satisfaction with care.

Largely, this review shows that health worker characteristics, processes of care and health facility characteristics including location affect provision of quality healthcare. These studies were however mostly descriptive (Bawate et al., 2016; Kim et al., 2005; Norton et al., 1997), lack national representation (Selemani et al., 2013; Maestad et al., 2010) and focusses on single childhood illnesses (Uwemedimo et al., 2018). Table 2.1 presents a summary of the reviewed empirical research studies on factors associated with various measures of quality of healthcare.

Table 2. 1: A Summary of Empirical Studies on Provider Quality of Healthcare

Study objective/country of study/sample		**Indicators**	**Impact/effect on provider Quality of Care**	**Remarks**
To identify factors associated with delivery of quality services. The studies were conducted in South Africa[2], Iran[4] Tanzania[3], Kenya[5,] India[6] Uganda[12], Pakistan[13,] Study population; healthcare workers[2,3, 4]	Structural/physical inputs	Medical equipment[1,2, 3,4] Medicines/Drugs[1,3, 5] Perceived Physical environment[6,7] Beds[8,9] Staffing levels[3,10,11] Laboratory Services[12, 13] Communication channels and technology[14]	Shortage and non-functional or outdated medical equipment and/or drugs hinders delivery of quality healthcare through delayed clinical procedures, low-worker productivity and unreliable results Unavailability or increasing beds was associated with lower levels of patient satisfaction Low staffing levels has a negative effect on outcomes of care as it results in reduced consultation time and increases probability of medical errors. Laboratory services is positively associated with provider quality of healthcare Availability of laboratory services enhances patient satisfaction with care as it facilitates a healthy consultation. Poor technology adoption and ineffective communication channels hindered provision of quality healthcare.	Descriptive studies[2,3,4, 5] Perceived physical inputs is subjective[2,4] Narrow focus-rural based facility[2], single cadre[2, 10], Single healthcare facility[3,14] Patients asked retrospectively to assess their satisfaction leading to bias[8,9]
Factors associated with provider quality of healthcare	Health worker/Physician characteristics	Medical personnel/clinician cadre [12, 15, 16,17,18,	Higher physician/clinician training level associated with process quality of healthcare indicators (diagnosis[15], clinical processes[16,18]	A Few studies focusing on childhood illnesses[15]

Study objective/country of study/sample		Indicators	Impact/effect on provider Quality of Care	Remarks
Studies conducted in Iran[4], Uganda[12] Afghanistan[16], Malawi[15], Taiwan[33,34] Tanzania[17,18] Uganda[12], Canada[19] Study population; healthcare facilities[15,16, 33] physicians/clinicians[16, 17 18, 19, 20], patients [16, 17, 20, 34]			Lower cadre was associated with higher clinical performance such as compliance with treatment guidelines [12,17]	Sub-national data [17,18] Descriptive (not predictive) approach[12,19,20]
		IMCI[36,37,38,39,40] Technical skills[33,34]	Training in Integrated Management of Childhood Illness (IMCI) improves process quality of care[36,37,38,39,40] Perceived quality of healthcare increases odds of satisfaction[33]	
		Provider sex[16, 18 19,20,36] Provider age[19]	Older physicians have poor health outcomes[19, 36] Female physicians [19, 20] had higher quality of healthcare scores No gender differentials in delivery of quality healthcare [16, 18]	
Factors influencing quality of healthcare Study conducted in Nigeria[24], England Bangladesh[22,] Germany[9], Sweden[23], China[26], Federation of Bosnia and Herzegovina[27], Philadelphia	Facility characteristics	Facility ownership[9,21,22,23,24, 25]	Public facilities significantly associated with adherence to diagnosis and treatment guidelines[24] Private health facilities receive higher levels of patient satisfaction with care[9,22,23]	Studies were descriptive[24,27] Mixed results on the effect of facility ownership with perception studies tending to favour private healthcare facilities
		Facility level[15,26]	Higher level facility performed better in quality of healthcare indicators[26] Facility level did not have a significant effect on process quality of healthcare [15]	

Study objective/country of study/sample		Indicators	Impact/effect on provider Quality of Care	Remarks
Study population; Healthcare workers[24], patients[27]		Facility location and/or remoteness[27,28,29,30]	urban based facilities performing better in terms of structural quality of healthcare measures (medical drugs, parenteral injection)[27] Patient satisfaction was high among health centres located urban cities[28,32] Patients in non-urban areas was associated with higher patient satisfaction, mainly due to healthcare reforms to improve services in these areas[29,30]	
Effect of interpersonal factors on patient satisfaction with care		Interpersonal skills[4, 33, 35] Waiting time[8] Consultation time[8] Continuity of care[34]	Interpersonal skills for in instance, communication, greeting improves satisfaction with care[4,33,35] Reduced waiting time and increased consultation time increases patient satisfaction level[8]	Patients asked retrospectively to assess their satisfaction leading to bias[4,8,33,34] This is beyond the scope of this study

References: 1=Mahato et al.,2017; 2=Moyimane et al., 2017; 3=Khamis and Njau, 2016; 4=Mosadeghrad, 2014; 5=Nyongesa et al., 2014; 6=Ross and Venkatesh, 2015; 7=Ko et al., 2009; 8=Naseer et al., 2012; 9=Kraska et al., 2017; 10=Aiken et al., 2008; 11=Haegdorens et al., 2019; 12=Bawate et al., 2016; 13=Hussain et al., 2019; 14=Wanjau et al., 2012; 15= Uwemedimo et al., 2018;16=Hansen et al., 2008; 17=Selemani et al., 2013; 18=Maestad et al., 2010; 19=Norton et al.,1997; 20=Kim et al., 2005; 21=Herrera et al., 2014; 22=Adhikary et al., 2018; 23=Maun et al., 2015; 24= Bamiselu et al., 2016; 25= Moscelli, 2018; 26=Hu et al., 2016; 27= Spasojevic, 2015; 28= Thornton et al., 2017; 29=Farmer et al., 2005; 30= Yan et al., 2011; 31= Tung and Chang, 2009; 32=Lin et al., 2010; 33= Adeoti and Lawal, 2012; 34= Wolf et al., 2008; 35=Choudhrey et al., 2005; 36=Tawfiq et al., 2020; 37=Lal et al., 2020; 38=Wiendyasari et al., 2018; 39=Nguyen et al., 2013; 40=Naimoli et al., 2006

2.2.3 Overview of Literature Review

Existing theoretical and empirical works provide an understanding of the predictors of provider quality of healthcare. From the review, it is observed that structural, individual health worker characteristics and facility features have an influence on various quality of healthcare measures. Research studies document the effect of structural measures of quality of healthcare as indicated by infrastructural inputs on provision of quality healthcare services. The results from these studies are mixed with some studies pointing to a positive relationship between availability of physical infrastructure and high provider quality of healthcare (Mahato et al., 2018; Mosadeghrad, 2014). On the other hand, some studies did not establish any significant effect of infrastructural inputs on provider quality of healthcare measures (Leslie et al., 2017; Maestad et al., 2010).

Infrastructural inputs were found to be particularly key in determining patient satisfaction with healthcare-an outcome measure of quality of care. Such inputs include; availability of supplies, beds, medical equipment and drug supplies (Nyongesa et al., 2014; Naseer et al., 2012). Besides infrastructural inputs, patients were more interested in provider actions in the process of healthcare service delivery. Patient satisfaction for instance was linked to interpersonal factors such as greetings, personal communication, listening, continuity of care and patient centered care among other factors (Adeoti and Lawal, 2012; Wolf et al., 2008).

Existing empirical works demonstrate the link between health worker demographic characteristics and delivery of quality healthcare. Some studies indicate that older healthcare workers perform worse while undertaking healthcare processes (Choundry et al., 2015; Norton et al.,1997). Others found that female healthcare workers had better clinical quality of healthcare performance (Norton

et al., 1997). Still, some other studies did not find gender variability in delivery of quality healthcare (Maestad et al., 2010; Hansen et al., 2008).

One other health worker related factor that has been cited as key in influencing provider process quality of healthcare is physician's knowledge as indicated by level of training. Higher health worker cadre is associated with provision of high-quality healthcare (Uwemedimo et al., 2018; Maestad et al., 2010; Hansen et al., 2008). However, some empirical works conclude that lower level cadres were more compliant with clinical guidelines (Bawate et al., 2016; Selemani et al., 2013).

Research also highlights the effect of other facility related factors including facility ownership, type and location on provider quality of healthcare. Empirical results on the effect of ownership on quality is not consistently significant (Herrera et al., 2014). Health provider type was a significant factor in determining provider quality of healthcare measures. Hue et al., (2016) established that lower level healthcare facilities performed better than their counterparts at higher levels, although this was associated with reforms at this level. In other studies, the effect was not statistically significant (Uwemedimo et al., 2018). Facility location was particularly a significant factor in influencing patient satisfaction with healthcare in that better healthcare was mostly observed among urban based facilities (Thornton et al., 2017; Spasojevic 2015; Lin et al., 2010).

From the foregoing, a number of empirical studies examine factors influencing provider quality of healthcare. However, only a few of the studies relate to quality delivery of child healthcare (Uwemedimo, 2018; Hansen et al., 2008) with a number focusing on effect of Integrated Management of Childhood Illnesses (Tawfiq et al., 2020; Lal et al., 2020; Nguyen et al., 2013).

Moreover, studies on factors affecting provider process quality of healthcare (Nyongesa et al., 2014; Wanjau, et al., 2012) are not nationally representative and fail to explain why healthcare provision may be of extremely low quality, low quality or high quality. This study therefore addresses this knowledge gap by adopting an ordered logit model to identify factors associated with probability of provision of different levels of healthcare quality. We utilize a nationally representative dataset-the 2018 Kenya Health SDI Survey data in the analysis.

2.3 Methodology

2.3.1 Theoretical Model

The study considers a healthcare provider, defined as a healthcare worker who may be a medical doctor, a clinical officer or a nurse. The patient, who in this case is a surveyor acts as a case study patient (Patient Case Simulations) has symptoms of two different childhood illnesses (severe dehydration and pneumonia). He or she presents these symptoms to the healthcare worker for correct illness diagnosis. We assume that the "patient" does not have precise information about his or her state of health and relies on the doctor to make accurate diagnosis. Thus, the doctor-patient interaction depicted in this study is an agency one where the doctor is expected to maximise the patient's welfare and utility function through accurate illness diagnosis. The application of the agency theory is based on McGuire's (2000) work and several other papers in health economics (Conrad, 2015; Mullen et al., 2010; Frank, 2004).

In the healthcare provider-patient relationship, the consumer (patient) is trying to maximise her utility. The patient's main interest is his or her health. The patient's health is modelled as a function

of several factors including quality of healthcare received. The patient's health function is represented in equation (2.1)

$$H = H(Q, X)\,; Q^{'} \geq 0, Q^{''} \leq 0 \ldots\ldots (2.1)$$

Where, Q is quality of treatment or healthcare services. The health function is concave in quality indicating a decreasing marginal impact with additional units of quality. X are other consumption goods.

In providing quality treatment to the patient, the objective of the healthcare worker is to maximize a combination of individual net salary and patient's health. Both outputs are influenced by the quality and quantity of service. Quality generally refers to patient experience with care, clinical quality, quality of service and health outcomes. Quantity entails among others, units of service and units of treatment episodes (Conrad, 2015). Applying the labour economics theory, the quantity and quality of treatment is assumed to depend on physician's effort and remuneration (Thurston and Libby, 2002). Thus, the physician's utility function is as expressed in equation 2.2.

$$U = U(W, e) \ldots\ldots (2.2)$$

Where W is the healthcare worker's income which in this case refers to physician salary which is fixed and determined by the government or institution and e is the physician effort.

Following Calub (2014), we add the quality of healthcare variable denoted Q to the physician utility function since providing quality healthcare services yields psychic benefits to the physician. The new physician utility function is stated in equation 2.3:

$$U = U(W, e, Q) \ldots\ldots (2.3)$$

This quality variable Q is not observable to the principal but he or she can observe its benefits (Mullen et al., 2010). According to Mullen et al., (2010), the quality invested in could be multidimensional, formally represented as

$Q = Q_1, \ldots, Q_j$ ……………………………………………………………….(2.4)

The principal derives benefit $B(Q)$ when the agent chooses Q level of quality. The benefit derived may also be unobservable to the principal. On the other hand, the cost incurred by the agent in producing quality at level Q is denoted as $C(Q)$ where in this case C is weakly increasing in Q and strictly convex- with a global minimum. The costs in this case may include the opportunity cost of effort exerted by the health personnel.

Since the level of quality Q and the resultant benefit $B(Q)$ are not observable to the principal, what is observed are instead a set of signals, which indicate the quality invested and are denoted as:

$y = (y_1, \ldots, y_K)$ … . … … … … 2.5.

These indicators are partly due to the quality Q invested, indicating that other factors apart from the agent's choice of quality invested could also contribute to the observed signal as denoted in equation (2.6):

$y = \mu(Q) + \varepsilon$…… … … … … ……………………………………………………(2.6)

Where $\varepsilon_k \text{I } Q \sim F_k, k = 1 \ldots \ldots K$ with $E[\varepsilon_k \text{I Q}] = 0$ and $E[\varepsilon_k \varepsilon_{k'} \text{I Q}] = 0$

In this paper, such indicators include health worker characteristics, health facility characteristics and availability of essential drugs and infrastructure.

Let $R(y)$ denote the compensation received by the agent. In this model, we assume that the health worker's compensation is fixed, that is, it does not depend on quality of healthcare provided. Thus:

$$R(y) = C(Q) \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (2.7)$$

The agent in this case chooses Q to minimize cost:

$$\frac{\partial C}{\partial Q} = 0, j = 1, \ldots, j \ldots \ldots \ldots \ldots \ldots \ldots (2.8)$$

Provision of healthcare is usually regulated by the government. Thus, the regulator's/ministry's preferences are given by the difference between the benefit when agent chooses quality q and total cost of production (Ma, 1994). This is expressed as follows:

$$B(Q) - C(Q) \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (2.9)$$

Solving equation (2.9) yields efficient allocation of quality enhancement efforts. Hence,

$$Q = f(R, X) \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (2.10)$$

Where X denotes other factors that affect determination of provider quality of healthcare.

2.3.2 Empirical Model

This study examined provider process quality of healthcare and its determinants in Kenya. The dependent variable is defined as the total number of correctly diagnosed cases out of two childhood illness conditions (severe dehydration as a result of diarrhea episode and pneumonia). Subsequently, the dependent variable is categorized into three responses; 0 cases, 1 case, 2 cases if the health worker provided a correct diagnosis of none, one and two cases out of the total two conditions. We use the total number of correctly diagnosed common childhood illnesses as cut-off points in a cumulative distribution of quality of care. The assumption is that the more illnesses that are correctly diagnosed, the higher the provider knowledge, hence the higher the quality of healthcare provided. An incorrect diagnosis of any of the childhood illnesses and correct diagnosis

of one out of two illnesses denotes poor knowledge and thus poorest and poor quality of healthcare respectively. A correct diagnosis of all the illnesses denote higher provider quality of healthcare. The analysis was handled using a polychotomous model, specifically ordered logit regression model. The choice of this model is justifiable because the categories are more than two and are ordered in nature (the higher the number, the better the quality of care) hence the application of ordered logit in estimation of the relevant probabilities (Green, 2002)

Assuming the underlying response model (latent regression model) is as specified in equation 2.11:

$$y_i^* = \beta' X_i + \varepsilon_i, i = 1, \ldots, n \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2.11)$$

Where: $X_i = [1, X_{i2}, X_{i3}, \ldots, X_{ik}]$ is a vector of explanatory variables. This includes both healthcare worker individual characteristics as well as facility-level characteristics; $\beta = [\beta_1, \beta_2, \ldots, \beta_k]$ is a vector of parameters to be estimated; and y_i^* is a latent and continuous measure of provider quality of healthcare.

The observed and coded provider quality of healthcare, y_i is determined from the model as expressed in equation 2.12:

$$y_i = \begin{cases} 0 \; if \; -\infty \leq y_i^* \leq \mu_1 \; 0 \; cases \\ 1 \; if \; \mu_1 < y_i^* \leq \mu_2 \; 1 \; case \\ 2 \; if \; \mu_2 < y_i^* \leq \infty \; 2 \; cases \end{cases} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2.12)$$

Where μ_i denotes the thresholds (cut points) estimated along with parameter vector β.

From equations (2.11) and (2.12), we can derive the probabilities associated with the coded responses as follows:

$$Pr\,o\,b(y_i = j | X_i) = \varphi(\mu_j - \beta' X_i) - \varphi(\mu_{j-1} - \beta' X_i) > 0 \ldots\ldots\ldots\ldots\ldots\ldots\ldots (2.13)$$

Where : $j = 1,..., J$ is response category; $Pr\ o\ b(y_i = j)$ is the probability that individual i responds in manner j; ϕ is the cumulative logistic distribution and the μ_j's are the equivalent of μ's in equation (2.12)

The likelihood function is presented in equation (2.14). This equation is maximized and solved iteratively by numerical methods to yield maximum likelihood estimates (MLE) of the ordered logit model.

$$L = \prod_{i=1}^{n} \prod_{j=0}^{J} \varphi(\mu_j - \beta' X_i) - \varphi(\mu_{j-1} - \beta' X_i)^{m_{ij}} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2.14)$$

To compute MLE, a log-likelihood function is obtained by taking the logarithm of the likelihood function (equation 2.14) to yield equation (2.15):

$$log\ L = \sum_{i=1}^{n} \sum_{j=0}^{j} m_{ij}\ log[\phi(\mu_j - \beta' X_i) - \phi(\mu_{j-1} - \beta' X_i)] \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2.15)$$

Where m_{ij} =1 if $y_i = j$ and 0 otherwise.

2.3.3 Description of Variables

2.3.3.1 Dependent Variable

The dependent variable is health worker quality of healthcare defined in this study as the accuracy in childhood illness diagnosis (Chen et al., 2014; Donabedian, 1988). Using vignettes, the 2018 Kenya Health SDI survey asked medical personnel in different cadres mainly, doctors, clinical officers and nurses to diagnose four illness conditions, two of which were common childhood tracer conditions. The conditions are severe dehydration and pneumonia. The response was coded

as 1 for correct diagnosis and 0 for wrong diagnosis of each of the illnesses. These responses were summed up to obtain the outcome variable defined as the total number of correctly diagnosed cases out of the possible two childhood illnesses. The variable is coded as ordered categorical variable taking the values between 0 and 2 representing inability to correctly diagnose any of the illnesses on the one hand and accurate diagnosis of both illness cases on the other.

2.3.3.2 Independent Variables

The choice of independent variables considered in the regression analysis was informed by existing theoretical and empirical literature. In particular, the explanatory variables are focused on both health worker and facility characteristics. Table 2.2 presents a summary of the study variables.

Table 2. 2: Summary of Variables and Expected Results

Variables	Measurement/ Definition	Expected Sign
Outcome Variable		
Provider quality of healthcare	Total cases of childhood illnesses correctly diagnosed (0 cases=1, 1 case=2, 2 cases=3)	
Explanatory Variables		
Sex of the healthcare provider	A dummy variable (male=1, female=0)	Indeterminate
Age	Health worker age in years	Indeterminate
Age squared	Health worker age squared	Indeterminate
Health worker Cadre type	Categorical variable for healthcare provider/worker cadre (Nurse=1, Clinical officer=2, Medical Doctor/physician=3)	Positive (+)
Education level	Categorical variable for education level attained (Basic (primary and secondary) =1, College=2, Degree/Post-graduate=3	Positive (+)
IMCI Training	Trained on IMCI (Trained=1, Not-trained=0)	Positive (+)
Health worker caseload	Number of outpatient visits per day per health worker	Negative (-)
Facility location	Dummy variable for location (Urban=1, Rural =0)	Positive (+)
Facility ownership	Categorical variable for facility ownership (Government=1, Private-not-for-profit=2, Private-for-profit=3)	Indeterminate
Facility tier	Categorical Variable for facility tier (Dispensary and clinic=2, Health Center=3, Hospital=4)	Positive (+)
Travel time to sub-county headquarters	Travel time by car in minutes to sub-county headquarters	Negative (-)

Variables	Measurement/ Definition	Expected Sign
Time to sub-county squared	Travel time squared	Positive (+)
Availability of internet services	Proxy for access to information technology (Yes=1, No=0).	Positive (+)
Availability of power	Dummy variable for access to power (electricity or solar) (Yes=1, No=0)	Positive (+)
Availability of laboratory services	Dummy variable for availability of laboratory (Yes=1; No=0)	Positive (+)
Availability of essential medicines	Index for availability of essential medicines for diarrhea and pneumonia (0=none; 1=one available; 2=2 available; 3=all three available)	Positive (+)

2.3.3.3 Data sources

The study utilized Health Service Delivery Indicators data collected in Kenya in 2018. Service Delivery Indicators (SDI) is a nationally representative set of indicators collected with the overall objective of estimating the quality of service delivery in education and health sectors. A total of 3094 health facilities composed of 1781 government-owned facilities and 1313 privately-owned facilities were randomly selected for the 2018 Kenya Health SDI survey. A total of 4430 health workers were assessed for competence in diagnosis and treatment of selected child and adult-related illnesses.

The data collection survey instrument was structured around five modules: module 1 collected information on facility including facility ownership and type, infrastructure, medical supplies and medical equipment availability; module 2 focused on healthcare worker characteristics such as cadre type, age, gender, education level and absenteeism; module 3 assessed medical personnel knowledge through the use of clinical vignettes to diagnose hypothetical cases of patients with illnesses such as severe dehydration, pneumonia, diabetes and pulmonary tuberculosis; module 4 collected information on facility funds, that is, receipts and facility expenditures together with information on financial management; module 5 captured information on family planning. To conduct analysis on the determinants of provider process quality of healthcare at the facility level,

modules 1, 2 and 3 were merged using the “merge” STATA command based on common facility and staff identifiers in the datasets.

2.4 Results

This paper sought to provide an analysis of Kenya’s provider process quality of healthcare as indicated by accuracy in illness diagnosis for two common childhood diseases. We provide a descriptive analysis of the analytic sample in section 2.4.1. Results of the bivariate analysis between provider quality of healthcare measure and selected possible determinants are then presented in section 2.4.2. This is followed by presentation of results from multivariate ordered logit regression model on determinants of provider quality of healthcare in section 2.4.3 and a discussion of key findings in section 2.4.4.

2.4.1 Sample Description

The analytic sample descriptive statistics are presented in Table 2.3. Results reveal that majority of health workers (55%) arrived at a correct diagnosis of one out of the two cases of childhood tracer conditions, that is, severe dehydration and pneumonia. Overall, 26% of healthcare workers were able to correctly diagnose both childhood illnesses while 18% were unable to provide an accurate diagnosis of any of the two cases. Diagnostic accuracy rate for individual childhood illnesses was 29% for severe dehydration and 78% for pneumonia. These results largely point to an existing quality gap in diagnosis of childhood illness conditions. This has an implication on child health outcomes in that, patients are likely to receive the wrong medication and treatment.

As regards health worker characteristics, both male and female healthcare workers were equally represented (50%) and were on average 38 years of age. Majority were nurses (60%) with the rest being clinical officers (36%) and medical doctors/physicians (4%). Most of these workers (81%) had attained college level of education while 58% had been trained on Integrated Management of Childhood Illnesses (IMCI). The average health worker caseload, that is, the average number of outpatients per worker per day was 13.

Healthcare facilities were largely government owned (63%) with the remaining facilities being private-for-profit (25%) and private-not-for-profit (12%). On average, 77% of the healthcare facilities were in the first tier of healthcare facilities which mainly includes dispensaries and clinics. The facilities were mostly located in rural areas (73%) and were within a distance of 17 minutes by car to sub-county headquarters (63%). Less than half of the healthcare facilities (32%) were accessible to internet services during the survey period. Majority of the healthcare facilities had laboratory services (69%) and were accessible (90%) to a power source, that is, either electricity or solar power. Further, most of the health facilities had two out of three recommended first line treatment medicines for childhood diarrhea and pneumonia, that is, amoxicillin (paediatric), ciprofloxacin and Oral Rehydration Salts (ORS) and/or Zinc supplements.

Table 2. 3: Sample Description

Variable	Number of Observations	Mean	Standard Deviation	Minimum	Maximum
Total cases correctly diagnosed					
0 cases	4071	0.18	0.39	0	1
1 case	4071	0.55	0.50	0	1
2 cases	4071	0.26	0.44	0	1
Severe dehydration	4083	0.30	0.46	0	1
Pneumonia	4071	0.78	0.41	0	1
Sex	4294	0.50	0.50	0	1
Age	4294	37.56	12.25	19	99
Age squared	4294	1560.80	1203.75	361	9801
Cadre type	3998	1.44	0.58	1	3
Nurse	3998	0.60	0.49	0	1
Clinical Officer	3998	0.36	0.48	0	1
Medical Doctor/ Physician	3998	0.04	0.20	0	1
Education level	4075	1.95	0.44	1	3
Basic (primary/secondary)	4075	0.12	0.33	0	1
College	4075	0.81	0.39	0	1
Degree/post-graduate	4075	0.07	0.25	0	1
IMCI training	4294	0.58	0.49	0	1
Case load	4277	13.10	42.77	0	1607.143
Facility ownership	4294	1.63	0.86	1	3
Government	4294	0.63	0.48	0	1
Private-not-for-profit	4294	0.12	0.32	0	1
Private-for-profit	4294	0.25	0.44	0	1
Facility Tier	4294	1.29	0.58	1	3
Dispensary or clinic	4294	0.77	0.42	0	1
Health Center	4294	0.17	0.37	0	1
First level hospital	4294	0.06	0.24	0	1
Location	4294	0.27	0.44	0	1
Time to Sub-County headquarters	4294	16.68	15.28	0	59
Time squared	4294	511.52	634.39	0	3481
Availability of Internet services	4294	0.32	0.47	0	1
Availability of power	4294	0.90	0.30	0	1
Availability of laboratory services	4294	0.69	0.46	0	1
Availability of essential medicines	4294	2.82	0.83	1	4
None available	4294	0.07	0.26	0	1
One available	4294	0.25	0.43	0	1
Two available	4294	0.48	0.50	0	1
Three available	4294	0.20	0.40	0	1

Source: Author's computation from SDI survey data, 2018

2.4.2 Bivariate Analysis

The results of bivariate analysis (mainly row frequencies) of accuracy in illness diagnosis by cadre type are presented in Table 2.4. Overall, 86% of nurses provided an incorrect diagnosis of the two childhood illnesses followed by clinical officers (13%) and medical doctors (2%) respectively. Results show that 59% of nurses were able to correctly diagnose only one of the two cases as opposed to 37% of clinical officers and 4% of medical doctors. Still, majority of the nurses (57%) provided a correct diagnosis of both cases compared to 39% of clinical officers and 4% of medical doctors. The relationship between cadre type and accuracy in illness diagnosis is significant ($p<0.05$) reflecting the association between health worker training and provision of quality healthcare. The observed pattern indicates that nurses who are in the lowest cadre of training were likely to incorrectly diagnose childhood illnesses. On the other hand, they were also most likely to arrive at a correct diagnosis of all the illnesses. This could largely be attributed to the overall distribution of these cadres where nurses are more represented among the healthcare workers. As such, they are likely to provide an incorrect diagnosis of childhood illnesses on one hand, perhaps due to their lower medical knowledge as opposed to the higher cadres. On the other hand, nurses are likely to provide a correct diagnosis as a result of enhanced experience arising from their greater involvement in clinical tasks in an effort to address the problem of health workforce shortages.

Table 2. 4: Accuracy in Illness diagnosis by Provider Cadre Type

Total Cases Diagnosed	(1) Nurses (n=2383)	(2) Clinical Offices (n=1431)	(3) Medical Doctor (n=166)	(4) Total (n=3980)
0 cases (n=698)	85.67	12.75	1.58	100
1 Case (n=2213)	58.56	37.14	4.29	100
2 Cases (n=1069)	56.74	38.64	4.62	100
Total (n=3980)	59.87	35.95	4.17	100
$\chi^2(4) = 283.8$; p = 0.000				

Source: Author's computation from Kenya SDI Health survey data, 2018

To understand the distribution of healthcare cadres in the country, we conducted cross tabulations of health worker cadres by facility tier, ownership and location. The results of these tabulations are presented in Table 2.5. Cadre type by facility ownership shows that nurses and clinical officers were mostly employed in government owned health facilities at 73% and 48% respectively. Majority of medical doctors (49%) were employed in private -for-profit health facilities as opposed to 40% of nurses in public health facilities and 11% of clinical officers in private-not-for-profit health facilities.

Considering health worker by facility tier, the results indicate that tier 2 which comprises of dispensaries and clinics had the highest representation of all cadre types, that is, 77% of nurses, 79% of clinical officers and 73% of medical doctors. Tier 3 had the second highest representation of nurses (18%) and clinical officers (15%) while medical doctors were equally represented at 13% for tier 3 and 4. As for facility location, nurses and clinical officers were mostly employed in rural-based facilities at 87% and 56% respectively while doctors were mostly (67%) in urban-based health facilities.

Table 2. 5: Cadre Type by Facility Ownership, Tier and Location

	Facility Ownership			Facility Tier			Facility Location		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Cadre Type	Public	Private-not-for profit	Private-for-profit	Tier 2	Tier 3	Tier 4	Rural	Urban	Total
	(n=2492)	(n=477)	(n=1011)	(n=3084)	(n=657)	(n=239)	(n=135)	(n=333)	(n=3980)
Nurse (n=2383)	72.85	9.53	17.62	76.96	17.50	5.54	87.45	12.55	100
Clinical Officer (n=1431)	48.22	16.14	35.64	78.83	15.23	5.94	55.97	44.03	100
Medical Doctor (n=166)	39.76	11.45	48.80	73.49	13.25	13.25	33.13	66.87	100
Total	62.61	11.98	25.40	77.49	16.51	6.01	73.87	26.13	100
	Chi2 (4) =285.33; Pr=0.000			Chi2 (4) =20.04; Pr=0.000			Chi2 (2) =607.89; Pr=0.000		

Source: Author's computation from Kenya SDI Health survey data, 2018

Table 2.6 shows the cross-tabulation results for accuracy in illness diagnosis by gender. Both female and male healthcare workers had an almost equal representation in correct diagnosis of childhood illnesses. Specifically, 53% of female health workers and 47% of male health workers were unable to correctly diagnose any of the two childhood illnesses. An equal number of male and female health workers (50%) provided a correct diagnosis of one out of the two illnesses. 48% and 52% of female and male health workers arrived at a correct diagnosis of the two illnesses respectively. However, the relationship between accuracy in illness diagnosis and health worker sex was not statistically significant ($p>0.05$).

Table 2. 6: Accuracy in Illness diagnosis by Sex

Total Cases Diagnosed	(1) Female (n=2038)	(2) Male (n=2033)	(3) Total (n=4071)
0 cases (n=738)	52.98	47.02	100
1 case (n=2256)	49.91	50.09	100
2 Cases (n=1077)	48.38	51.62	100
Total (n=4071)	50.06	49.94	100
$\chi^2(2) = 3.76; \Pr = 0.152$			

Source: Author's computation from Kenya SDI Health survey data, 2018

We also sought to establish the association between accuracy in illness diagnosis and health facility characteristics namely, facility ownership, tier and location. As regards facility ownership, results presented in Table 2.7 indicate that 65% of health workers in government owned facilities, 12% in privately-not-for profit facilities and 23% in private-for-profit healthcare facilities provided an incorrect diagnosis of the two childhood illnesses. This is also observed in health worker ability to diagnose any one of the two cases; 60%, 12% and 27% of health care providers in government owned facilities, private-not-for-profit facilities and private-for-profit facilities respectively, managed to diagnose a single case. The significant chi square ($p<0.05$) implies that there is an association between accuracy in illness diagnosis and facility ownership.

Table 2. 7: Accuracy in Illness diagnosis by Facility ownership

	(1) Government	(2) Private-not-for profit	(3) Private-for-profit	(4) **Total**
Total Cases Diagnosed	(n=2549)	(n=490)	(n=1032)	(n=4071)
0 Cases (n=738)	65.18	12.20	22.63	100
1 Case (n=2256)	60.42	12.15	27.44	100
2 Cases (n=1077)	65.46	11.70	22.84	100
Total (n=4071)	62.61	12.04	25.35	100
$\chi^2(4) = 12.76; Pr = 0.013$				

Source: Author's computation from Kenya SDI Health survey data, 2018

The results of association between provider accuracy in illness diagnosis and facility tier are presented in Table 2.8. Overall, 74% of health workers in tier 2 provided an inaccurate diagnosis of the two childhood illnesses as opposed to 21% and 6% of health workers in tier 3 and tier 4 respectively. Among the health workers who provided a correct diagnosis of half of the illnesses, 80% were in the second tier, 15% were in the third tier and 5% were in the fourth tier of healthcare facilities. 73%, 17% and 10% of health workers in tier 2, tier 3 and tier 4 respectively, were able to correctly diagnose the two childhood illnesses. The relationship between accuracy in illness diagnosis and facility tier was statistically significant ($p<0.05$).

Table 2. 8: Accuracy in Illness diagnosis by Facility Tier

	(1) Tier 2	(2) Tier 3	(3) Tier 4	(4) **Total**
Total Cases Diagnosed	(n=3139)	(n=679)	(n=253)	(n=4071)
0 Cases (n=738)	73.58	20.60	5.83	100
1 Case (n=2256)	80.10	15.20	4.70	100
2 Cases (n=1077)	73.26	17.08	9.66	100
Total	77.11	16.68	6.21	100
$\chi^2(4) = 44.77$; $\Pr = 0.000$				

Source: Author's computation from Kenya SDI Health survey data, 2018

Table 2.9 presents the results of the analysis of illness diagnostic accuracy by facility location. Poor performance was portrayed among health workers in rural-based health facilities as majority

(81%) provided an incorrect diagnosis of the two childhood illnesses as opposed to 19% in urban-based healthcare facilities. Conversely, 74% and 69% of the rural-based health workers arrived at a correct diagnosis of one and both childhood illnesses as opposed to 31% and 26% in urban-based facilities respectively. The association between provider diagnostic accuracy and facility location was statistically significant (p<0.000).

Table 2. 9: Accuracy in Illness diagnosis by Facility Location

Total Cases Diagnosed	(1) **Rural** (n=3014)	(2) **Urban** (n=1057)	(3) **Total** (n=4071)
0 Cases (n=738)	80.89	19.11	100
1 Case (n=2256)	74.16	25.84	100
2 Cases (n=1077)	69.08	30.92	100
Total (n=4071)	74.04	25.96	100
$\chi^2(2) = 31.83; Pr = 0.000$			

Source: Author's computation from Kenya SDI Health survey data, 2018

2.4.3 Regression Results: Determinants of Provider Quality of Health Care in Kenya

This chapter sought to examine the determinants of process quality of healthcare among the healthcare workers as indicated by provider knowledge. The dependent variable is the total number of illnesses correctly diagnosed and ranked into three mutually exclusive categories; no cases correctly diagnosed (category 1), one case correctly diagnosed (category 2) and two cases correctly diagnosed (category 3). These categories have a natural order, that is, categories 1, 2 and 3 represent extremely low quality, low quality and high quality respectively. Subsequently, ordered logit is applied in the estimation of relevant probabilities. We employ the logit model since the assumptions of standard normal (standard logistic) distributions of error term in ordered probit models or ordered logit models usually produce similar estimation results (Wooldridge, 2013).

To start with, we conducted the proportional odds assumption/parallel regression diagnostic tests on the ordered logit model to establish its correctness. The model summary and results of the diagnostic tests are presented in Table 2.10. A total of 3962 observations in the 2018 Health SDI survey data set were utilized in the analysis and the ordered logit model convergence was achieved after five iterations. The log likelihood ratio Chi-Square test (LR Chi-squared (17) = 337.95; p= 0.0000) indicates that the ordered logit regression model as a whole was statistically significant in predicting cumulative probability for provider diagnostic levels when compared to the null model with no independent variables.

The Pseudo R-squared also known as McFadden's R-squared was 0.0433 suggesting that the relationship between the response variable, that is, provider quality of care and the predictor variables is small. Unlike ordinary least square R-squared which signifies the proportion of explained variance, pseudo-R squares are based on maximisation of model log-likelihood and they represent the improvement in model likelihood against the null model (Hemmert et al., 2016). To test the parallel regression assumption for the ordinal logistic model, we conducted the Brant test using the STATA program 'brant, detail' command. The test results presented in Table 2.10 show significant chi-square values for 'all model' and also for seven out of twenty (20) variables. This indicates that the proportional odds/parallel regression assumption that the dependent variable's categories are parallel is violated. Consequently, the generalized ordered logit model is estimated. This model relaxes the parallel assumption model for the variables that violate proportional odds assumption (Williams, 2006).

Table 2. 10: Ordered Logistic Model Summary and Diagnostic Tests

Model Summary			
Iteration 0: log likelihood = -3898.9574		Log likelihood =-3729.98	
Iteration 1: log likelihood = -3732.1251		Number of observations = 3962	
Iteration 2: log likelihood = -3729.9827		LR chi2(20) = 337.95	
Iteration 3: log likelihood = -3729.98		Prob > chi2 = 0.0000	
Iteration 4: log likelihood = -3729.98		Pseudo R2 = 0.0433	
Model Diagnostic Test- Brant Test			
Variables	**Chi2**	**P-value**	**Degrees of Freedom**
All	86.79	0.000***	20
Sex	0.12	0.724	1
Age	0.29	0.588	1
Age squared	0.56	0.455	1
Clinical Officer	33.75	0.000***	1
Medical Doctor/ Physician	5.96	0.015**	1
College	0.05	0.821	1
Degree/post-graduate	0.08	0.775	1
IMCI training	0.63	0.428	1
Case load	0.34	0.558	1
Private-not-for-profit	0.09	0.763	1
Private-for-profit	6.54	0.011**	1
Health Center	11.05	0.001**	1
First level hospital	12.69	0.000***	1
Location	6.89	0.009**	1
Time to Sub-County headquarters	2.05	0.152	1
Time squared	1.58	0.209	1
Availability of internet services	0.89	0.346	1
Availability of laboratory services	4.22	0.040**	1
Access to power source	1.21	0.272	1
Availability of essential medicines	0.72	0.397	1

*** p<0.01, ** p<0.05, * p<0.1

Source: Author's computation from Kenya SDI Health survey data, 2018

The results of the estimated generalized ordered logit model are presented in Table 2.11. Specifically, we present corresponding marginal effects for each diagnostic accuracy/provider quality of healthcare category. Marginal effects present results as differences in probabilities and are therefore more informative than odds ratios. In addition, they are easy to interpret (Breen et al., 2018). The results indicate that the predictors of the three categories of provider quality of healthcare as indicated by the ability to provide a correct diagnosis of childhood illnesses are health worker sex, cadre type, education level, Integrated Management of Childhood Illness (IMCI)

training, facility ownership, facility tier, facility location and access to power source. In particular, these variables affected the likelihood of health workers being placed in the lower or higher level of provider quality of healthcare.

Among the health worker characteristics, the coefficient of health worker sex was found to be statistically significant at 10% for the category of accurate diagnosis of none of the cases, one case and both cases. The results show that male compared to female health workers were 1.5% less likely to provide an incorrect diagnosis of the childhood illnesses and also 0.6% less likely to provide a correct diagnosis of only one out of the two illness conditions. They were 2% more likely to provide a correct diagnosis of both childhood illnesses as opposed to their female counterparts.

In the health worker cadre groups, the coefficient of a clinical officer was statistically significant at 1% for none of the cases and both cases categories. It was statistically significant at 5% for only one case category. A clinical officer compared to a nurse was 18.9% less likely to arrive at an incorrect diagnosis of childhood tracer conditions, 4.1% more likely to correctly diagnose one of the two cases and 14.8% more likely to diagnose both childhood cases correctly. The coefficient of a medical doctor was statistically significant at 1% for both zero cases and both cases and statistically significant at 10% for one case. Compared to a nurse, a medical doctor was 17.9% less likely to provide an incorrect diagnosis of the childhood illnesses, 7.4% more likely to arrive at a correct diagnosis of one of the illnesses and 10.5% more likely to correctly diagnose both cases of childhood illnesses.

The coefficient of health worker education level was statistically significant at 1% for inaccurate for inaccurate diagnosis and at 1% and 5% for correct diagnosis of both childhood illnesses.

Compared to health workers with basic level of education, those with college level of education were 5.3% less likely to provide an incorrect diagnosis of any of the childhood illnesses and 1% less likely to arrive at a correct diagnosis of one of the two illnesses. They were 6.3% more likely to arrive at a correct diagnosis of both illnesses. Health workers with degree and/or postgraduate level of education were 7% less likely to provide an incorrect diagnosis of the childhood illnesses as opposed to those with basic level. They were 8.9% more likely to arrive at a correct diagnosis of both childhood illnesses.

The coefficient of health worker training in IMCI was statistically significant at 1% across all the outcome categories. Results show that health workers with training in IMCI were 3% and 1.1% less likely to fail in diagnosis of any of the illnesses and to arrive at a correct diagnosis of only one of the illnesses, respectively. They were 4.1% able to correctly diagnose both illnesses when compared to those who were not trained in IMCI.

As regards health facility characteristics, facility ownership, facility level, location and access to power source were significant across all or some of the provider quality categories. The coefficient of a private-not-for profit health facility was statistically significant at 1% for correct diagnosis of zero, one and two cases of childhood illnesses. Specifically, health workers in these facilities as opposed to government health facility were 4% and 1.3% likely to provide an incorrect diagnosis and correct diagnosis of only one out of the two childhood illnesses, respectively. They, on the other hand, were 5.3% less likely to correctly diagnose both cases of childhood illnesses. The coefficient of a private-for-profit facility was statistically significant at 1% for correct diagnosis of one of the two illnesses and for both cases. Health workers in a private-for-profit health facility

were 6.7% more likely to provide a correct diagnosis of only one out of the two cases and 9% less likely to correctly diagnose both cases when compared to those in government health facilities.

The coefficient of the health center variable was statistically significant at 5% and 1% for accurate diagnosis of none and one of the cases respectively. Health workers in a health center were 4.2% more likely than those in dispensaries to arrive at an incorrect diagnosis of childhood illnesses and 6.5% less likely to accurately diagnose one of the two cases. Those in hospitals were 16.3% less likely (at 1% significance level) to correctly diagnose one out of the two cases and 15.4% more likely (at 1% significance level) to correctly diagnose the two illnesses when compared with those working in dispensaries.

The coefficient of location was statistically significant at 1% and 5% for correct diagnosis of one and both childhood illnesses respectively. Health workers employed in urban-based health facilities were 6% less likely to provide a correct diagnosis of one out of the two illness conditions and 4% more likely to arrive at a correct diagnosis of both cases. The coefficient of access to power was statistically significant at 10% across the three outcome categories. Health workers in healthcare facilities with access to power source were 2.6% and 1% less likely to arrive at an incorrect diagnosis of any of the illnesses and only one of the cases, respectively. They were 3.6% more likely to arrive at a correct diagnosis of both cases of childhood illnesses.

Table 2. 11: Generalised Ordered Logit Model-Determinants of Provider Process Quality of Healthcare

Variable	0 Cases Diagnosed (extremely poor)		1 Case Diagnosed (poor)		2 Cases Diagnosed (High quality)	
	Marginal Effects	Z-statistic	Marginal Effects	Z-statistic	Marginal Effects	Z-statistic
Health Worker Characteristics						
Sex	-0.0146*	-1.74	-0.00558*	-1.72	0.0202*	1.74
Age	-0.000825	-0.52	-0.000314	-0.52	0.00114	0.52
Age squared	1.19e-05	0.73	4.54e-06	0.73	-1.64e-05	-0.73
Cadre Type (Reference category: Nurse)						
Clinical Officer	-0.189***	-15.68	0.0406**	2.29	0.148***	8.77
Medical doctor	-0.179***	-7.07	0.0743*	1.70	0.105**	2.23
Education level (Reference category: Basic level)						
College	-0.0529***	-3.38	-0.0104***	-4.87	0.0633***	3.86
Degree/post graduate	-0.0698***	-2.84	-0.0193	-1.60	0.0891**	2.55
IMCI training	-0.0296***	-3.40	-0.0113***	-3.23	0.0409***	3.41
Case load	6.48e-05	0.65	2.47e-05	0.65	-8.94e-05	-0.65
Health Facility Characteristics						
Ownership (Reference category: Government)						
Private-not-for-profit	0.0395***	2.64	0.0134***	3.54	-0.0529***	-2.88
Private-for-profit	0.0228	1.34	0.0674***	3.26	-0.0902***	-5.18
Facility Tier (Reference category: Dispensary)						
Health Center	0.0416**	2.49	-0.0648***	-3.04	0.0232	1.22
Hospital	0.00918	0.35	-0.163***	-4.79	0.154***	4.80
Location	0.0207	1.17	-0.0603***	-2.74	0.0395**	2.12
Time to sub-county headquarters	-0.000527	-0.60	-0.000201	-0.60	0.000728	0.60
Time squared	1.15e-05	0.54	4.37e-06	0.54	-1.58e-05	-0.54
Access to internet services	7.27e-05	0.01	2.77e-05	0.01	-0.00010	-0.01
Availability of lab services	-0.0111	-1.12	-0.00422	-1.12	0.0153	1.12
Access to power	-0.0263*	-1.81	-0.0100*	-1.78	0.0364*	1.81
Availability of essential medicine	-0.00144	-0.28	-0.000547	-0.28	0.00198	0.28
	Observations		3,962			
	Log likelihood		-3689.2328			
	Prob>Chi2		0.0000			
	Pseudo R2		0.0538			

*** p<0.01, ** p<0.05, * p<0.1

Source: Author's computation from Kenya SDI Health survey data, 2018

2.4.4 Discussion

The results suggest that provider process quality of healthcare for childhood illnesses in Kenya was sub-optimal as majority of health workers could not arrive at a correct diagnosis of the two presented childhood illnesses. It was noted that accuracy in illness diagnosis was high for pneumonia but low for severe dehydration, thus resulting in a generally low provider quality average. This may be explained by an existing knowledge gap in some of the questions asked with regards to diagnosis of severe dehydration. The 2018 Kenya Health (SDI) survey shows that health worker accuracy by some specific questions asked such as “child offered drink”, “oedema of feet” and “weight check” stood at a low of 28%, 7% and 5% respectively (World Bank and ROK, 2019).

With regard to distribution of health worker cadres, the results indicate that doctors were the least represented cadre. Nurses were the majority and were relatively most likely to be employed in rural areas. This finding mirrors the overall distribution of healthcare workers in the country. In 2013, nearly 60% of health workers were nurses while registered clinical officers stood at 10.6%. Medical officers/doctors accounted for only 4.6% of the health workers (GOK, 2014). The skewed geographic distribution of health workers could be due to implementation of task shifting strategy. The strategy arises from the shortage and uneven distribution of medical doctors coupled with a high burden of infectious diseases in the country. It addresses the health worker shortage by delegating tasks to already available human resource (WHO, 2006). Consequently, with some training and experience, clinical officers and nurses have been entrusted with provision of healthcare services in the absence of medical doctors at the lowest levels of healthcare and in the rural areas.

The multiple regression results show the importance of health worker gender, level of education and training in enhancing provider quality of healthcare. The finding that male health workers performed better than their female counterparts in illness diagnosis contrasts with existing studies which report better performance in process quality of care among female health workers (Reid et al., 2010; Norton et al., 1997) and no gender differential at all (Jackson et al., 2020; Maestad et al., 2010; Hansen et al., 2008). Our finding is reasonable given the distribution of health workers by levels of training. The proportion of female health workers is reportedly high among the nurses and lower among the higher levels of training, that is, clinical officers and medical doctors (World Bank and ROK, 2019).

The positive association between health worker qualification and quality of healthcare conforms with other existing empirical studies (Uwemedimo et al., 2018; Maestad et al., 2010; Hansen et al., 2008). Similarly, studies exploring the association between provider technical skills and patient satisfaction with healthcare found that there was a positive effect of perceived provider ability on satisfaction with healthcare (Lin et al., 2010; Tung and Chang, 2009). In contrast, some studies found that higher provider quality was reported among lower cadres (Bawate et al., 2016; Selemani et al., 2013). Lower provider quality as was indicated by non-adherence to clinical guidelines among health workers considered to be more trained- the doctors was explained by the tendency of the higher cadres to apply clinical judgement as opposed to guidelines (Selemani et al., 2013). Besides provider qualification, training in IMCI played a key role in improving provider quality of care. This finding corroborates other existing studies (Tawfiq et al., 2020; Lal et al., 2020; Maestad et al., 2010).

Contrary to the prevailing assumption that private health facilities are more efficient than public health facilities (Rosenthal and Newbrander, 1996), the finding in this study supports other research studies (Bamiselu et al., 2016; Basu et al., 2012) which report better performance in public health facilities. This could be linked to the fact that a large number of health workers in public health facilities attend trainings in IMCI. Although surprising, the observation that better performance was reported in lower level healthcare facilities is not unusual (Hu et al., 2016). The finding that health workers in hospitals had better performance in illness diagnosis may perhaps be associated with higher representation of medical personnel in higher cadres at the hospitals (World Bank and ROK, 2019).

Health workers in urban-based facilities performed better that those in rural areas. The conclusion is supported by other empirical studies (Thornton et al., 2017; Lin et al., 2010) but in contrast with others (Yan et al., 2011; Farmer et al., 2005) that report more satisfaction with healthcare (a measure of quality of healthcare) in rural areas. Based on the finding that higher cadres performed better in illness diagnosis, we conclude that the rural-urban differentials in quality of healthcare could be attributed to the skewed distribution of health workers. As observed, facilities in the rural areas are mostly manned by the lowest cadre of medical personnel.

Better performance was also reported among facilities with access to power source. Research studies indicate that availability of electricity enhances functionality of essential equipment (Chen et al., 2019; Amaghionyeodiwe, 2008). Studies have also indicated that availability of power has a positive effect on diagnostic quality as it attracts qualified personnel (Mueller, *et al*., 2011).

2.5 Conclusion and Recommendations

This chapter sought to address objective one of the thesis, whose aim was to examine provider process quality of healthcare as measured by health worker/ provider accuracy in illness diagnosis for common childhood tracer conditions in Kenya. The two childhood illnesses considered, that is, severe dehydration (which results from diarrhea) and pneumonia are among the leading causes of childhood illnesses in the country. The study employed a generalized ordered logit model on 2018 Kenya Health SDI data.

The study points to low provider knowledge in diagnosis of childhood illnesses hence sub-optimal quality of healthcare in Kenya. Among the factors that contribute to high quality of healthcare are: being male, higher provider education level and cadre, training in IMCI, higher facility tier, government ownership, urban location and access to power. Based on this finding, there is need to design training programmes to enhance lower cadre health worker's care management, given their involvement in provision of healthcare through the task shifting strategy. This could be done through refresher courses and continued training in Integrated Management of Childhood Illnesses (IMCI).

Better performance in quality of healthcare among urban-based healthcare facilities and facilities in higher tiers could be linked with inequality in distribution of health human resources and infrastructural inputs. The policy implication of this finding is that there is need to have balanced infrastructural development and equipping of all the facilities across counties. The existing strategy to train, recruit, deploy and redistribute healthcare workers should be fully implemented, especially with the devolution of healthcare services in the county.

CHAPTER 3

A CONSUMER QUALITY OF HEALTHCARE MEASURE AND ITS DETERMINANTS IN KENYA

3.1 Introduction and Motivation

The Donabedian's triad model for assessment of quality of healthcare; the structure-process-outcomes model (Donabedian 2005; Donabedian, 1988) provides a commonly used approach to assessment of quality of healthcare (Counte, 2007). Structure quality measures assess infrastructure of healthcare settings including availability and capability of equipment, the policy environment and availability of resources within an institution. Process quality measures examine the extent of implementation of recommended healthcare guidelines and actions by healthcare providers and users. Outcome measures evaluate the health effects resulting from care received by a patient (Donabedian, 1988).

The debate on quality of healthcare improvement is largely inclined to facility provision of healthcare services (Nash, 2010; Peabody et al., 2006). As such, conceptualization and assessment of quality of healthcare in existing literature tends to be biased towards healthcare providers (Muriithi, 2013; Amporfu et al., 2013; Adeoti and Lawal, 2012; Das et al., 2008; Das and Gertler, 2007; Mwabu et al., 1993). A healthcare provider usually refers to a health plan, a healthcare professional (who could be an individual health worker) or a healthcare facility (Morris and Bailey, 2014). The role of consumers of healthcare in quality improvement efforts is basically limited to assessment of provider quality of healthcare. This is founded on the view that a patient's satisfaction, perceptions and experiences with healthcare contributes to improvement in healthcare service delivery (Hall et al., 2018; Bos et al., 2012; Stubbe et al., 2007), as they inform strategies for quality improvement (Al-Abri and Al-Balushi, 2014).

Hibbard (2003) acknowledges the foregoing role of healthcare users as evaluators in the process of production of quality healthcare, but also points to a highly neglected role; the co-producer role which basically refers to healthcare consumers or patients participating in 'producing' health. As a co-producer, a healthcare consumer may among other activities, make decisions to seek appropriate healthcare in a timely manner, engage in self-care and manage health conditions as advised by healthcare providers, provide useful information for diagnosis and treatment, implement recommended treatment advice and invest in preventive behaviors (Hibbard, 2003).

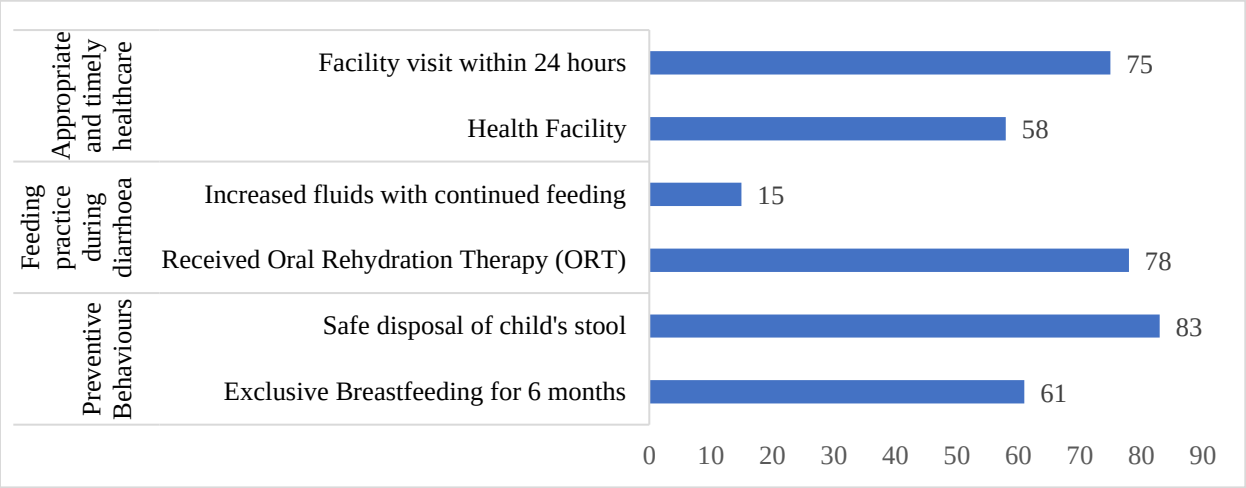
Non-implementation of the recommended interventions has been cited as a source of poor health outcomes. Failure to seek care in a timely manner for instance results in complications that impact negatively on the effectiveness of medical care (Mishra et al., 2019; Musinguzi et al., 2018; Webair et al., 2013). Further, non-compliance with preventive and treatment regime is associated with inadequate and unsuccessful therapy, extended treatment and increased healthcare costs (Dawood et al., 2010; Jin et al., 2008; Matsui, 1997).

Implementation of recommended actions in essence falls within the definition of process quality of healthcare; it denotes whether what is known to be good medical or health care practice is applied or not (WHO, 2006; Donabedian, 1988). To address existing knowledge gap in quality of healthcare assessment, this study aggregates multiple recommended preventive and treatment interventions (WHO, 2004) into a single measure of consumer quality of healthcare. Given the multi-dimensional nature of the concept of quality of healthcare (Piligrimienė and Buciuniene, 2008; Blumenthal, 1996), the aggregation is expected to present a clearer picture of overall quality of care at the household level (Schang et al., 2016; Jacobs et al., 2007). It could also facilitate

comparisons and provide a systems-based approach to addressing quality of healthcare that will result in improvement in care across several domains including household level preventive and curative interventions (Peterson et al., 2010).

The selected interventions are simple, affordable and could be undertaken at the household level to alleviate symptoms of childhood diarrhea. Diarrheal disease is among the leading causes of under-five morbidity and mortality in Kenya (KNBS and ICF Macro, 2015). Generally, implementation of the recommended interventions that could prevent or alleviate diarrheal symptoms at the household level remains a challenge. The latest available 2014 Kenya Demographic Health Survey (KDHS) indicates that 61 percent of the children aged below six months were exclusively breastfed. Safe disposal of the youngest child's stool stood at 83 percent. On average, 78 percent of the children experiencing diarrheal episode were treated with Oral Rehydration Therapy (ORT) which either entails giving a child Oral Rehydration Salts or other homemade solutions. Only 15 percent of them were offered increased fluids with continued feeding. The proportion of children who visited a health facility for diarrheal treatment was 58 percent. Healthcare was sought within twenty four hours for 75 percent of children suffering from diarrheal symptoms (KNBS and ICF Macro, 2015).

Figure 3. 1: Selected Desired Child Health Practices for Alleviating Diarrheal Illness in Kenya



Source: Kenya National Bureau of Statistics and ICF Macro, 2015

Clearly, there are quality gaps in provision of healthcare at the household level in the country. An understanding of factors that contribute to consumer provision of low-quality healthcare is important for health policy intervention. Thus, besides developing a measure that assesses consumer quality of healthcare in relation to child diarrheal illness, this study further seeks to establish the variables that influence consumer quality of healthcare in Kenya.

3.1.1 Recommended Family Level Practices and Diarrheal Illness

Naturally, families and more specifically mothers/caregivers are the first providers of child healthcare (WHO, 2004). They are responsible for early diagnosis of illness symptoms (Othero et al., 2008) and are also involved in the treatment process through consistent adherence to treatment requirements, thus contributing the most (about 80%) to child healthcare (WHO, 2004). The Integrated Management of Childhood Illnesses (IMCI) approach developed in 1990 takes cognizance of the key role of family, households and community in management of childhood diseases. The World Health Organisation groups the recommended family practices that could improve child health into four categories: Advancement of growth and development of the child

including implementation of recommended breastfeeding behaviors; Prevention of diseases for example through proper faecal disposal and sleeping under treated bed nets; Appropriate care at home including continued feeding and fluid intake when sick; and Appropriate health seeking behaviors. The activities/simple interventions under each of these categories are listed in Appendix 3A (WHO, 2004).

There is ample evidence on the effect of implementation of the recommended family level practices in reducing child morbidity and mortality. One such intervention is optimal breastfeeding practice, that is, breastfeeding of infants within one hour of birth; exclusively breastfeeding for the first six months of life; and thereafter continued breastfeeding along with proper complementary feeding up to the age two or above (WHO, 2009; WHO, 2003). Breast milk is rich in nutrients and anti-bacterial/viral agents (Morrow et al., 2005; WHO, 2004) which minimizes infectious diseases, especially diarrhea and associated child morbidity and mortality as is observed in a number of research studies (Gizaw et al., 2017; Ogbo et al., 2017; Santos et al., 2016; Begum and Absar, 2016; Rohmah et al., 2015; Kramer and Kakuma, 2012; Lamberti et al., 2011; Kramer et al., 2003; Bhandari et al., 2003).

A commonly ascribed reason for high diarrheal incidence is exposure to feacal-oral pathogens following inadequate Water, Sanitation and Hygiene (WASH) practices (WHO, 2014c). The effectiveness of WASH interventions in lessening incidence of diarrheal disease among children is documented in numerous studies (Local Burden of Disease Diarrhea Collaborators, 2020; Mshida et al., 2017; Diouf et al., 2014; Bartram and Cairncross, 2010). Poor management of children excreta in particular is attributed to a higher risk of diarrhea among children (Megersa et al., 2019; Bawankule, 2017). Due to their behaviors such as crawling, playing and putting fingers

in their mouths, children are more predisposed to feacal pathogens and are therefore more susceptible to the risk of diarrheal disease than adults (Wang et al., 2018; WHO and UNICEF, 2006).

Suffering from diarrhea results in dehydration due to excess loss of fluids, electrolytes via the gastrointestinal tract and zinc in liquid stools (WHO, 2013). It also causes malnutrition due to reduced food and fluid intake, malabsorption of food and sometimes withholding of food ("The infant and young child," 1989; Hoyle et al., 1980; Hirschhorn, 1980). These effects are more pronounced in infants and children due to greater rate of water turnover in relation to their body weight, inability to express their needs or even hydrate and feed on their own (Vega and Avva, 2020). The World Health Organisation proposes various simple and cost-effective strategies for management of diarrheal illness at home; Oral Rehydration Therapy (ORT), zinc supplementation and increased food and fluid intake (WHO, 2013; WHO, 2004). Evidence of effectiveness of these interventions in management of childhood diarrhea is well documented (Munos et al., 2010; Baltazar et al., 2002; Miller and Hirschhorn, 1995).

While appropriate home care is recommended for childhood illnesses, caregivers should be on the lookout for signs indicating the need to seek appropriate, that is, professional care outside the home. Research studies have attributed deaths among children to inability to perceive danger signs, inappropriate and delayed care-seeking behaviors (Chandwani, 2015; Bryce et al., 2005; Olenja, 2003; Terra de Souza et al., 2000). Caregiver's visits to healthcare providers ought to go hand in hand with compliance with treatment advice so as to ensure quick and complete recovery and to avoid resistance to medications, extended treatment and unnecessary healthcare costs (Jin et al., 2008; Matsui, 1997).

3.2 Literature Review

3.2.1 Theoretical Literature

The health belief model (HBM) is among the earliest psychosocial models that has been utilized in explaining preventive health behaviors, sickness management behaviors including adherence to treatment regime and health seeking behaviors. The model developed in the 1950s assumes that people's positive health actions are motivated by the desire to avoid an undesirable health consequence. The traditional HBM is based on five key constructs: perceived susceptibility, perceived severity, perceived benefit, perceived barriers and cues to action (Becker et al., 1977). Perceived susceptibility denotes an individual's subjective perception of chances of being taken ill while perceived severity is the feeling of how serious a condition is and also entails evaluations of both the medical and social effects of an illness. Perceived benefits are the perceptions regarding the efficacy of the numerous actions undertaken to diminish the seriousness of the impact of the illness. Perceived barriers go hand in hand with the construct of perceived benefits and comprises a cost benefit analysis that evaluates the action's effectiveness against costs including tangible costs, negative side effects and inconvenience of the actions.

The HBM suggests a fifth construct which is cues to action. This refers to events, people, or things that make a person feel the need to act. They may either be internal (perception of health status) or external (interpersonal relation and mass media communication). Self-efficacy construct was an addition to the HBM in the 1980s and denotes an individual's certainty in his or her capability to pursue a behavior (Sharma and Romas, 2012; Janz and Becker, 1984). While the HBM may shed light on the reasons for non-implementation of recommended health improvement behaviors,

the model in itself may not be adequate for this study as it focusses more on cognitive factors and beliefs which are beyond the scope of this study.

Andersen (1995) suggested a behavioral model to health seeking behavior. This framework assumes that healthcare utilization is an outcome of a person's predisposition, enabling factors and the need to use healthcare services. Predisposing factors influences the possibility of healthcare utilization and are categorized into: demographic factors for example: age and sex; social factors for instance education level, employment and ethnicity; and health beliefs, that is, a person's attitudes, values and knowledge about health and healthcare. Predisposing to use factors go with enabling characteristics, that is, the means to actually use the services including income level, health insurance status and accessibility of health services. Need characteristics involve individual's perception of their health along with evaluated morbidity which represents professional judgment concerning a person's health status. Andersen's model is relevant to the current study as it partly informs conceptualization of factors that determine implementation of recommended health behaviors at the household level.

In the field of economics, Becker (1965) incorporated the Household Production Model (HPM) in the traditional consumer behavior analysis. Becker's model notes that most economists in their costing of healthcare items did not include the time used in the health production process. It therefore postulates that households combine market goods and services with their individual time and capacities to produce commodities preferred by the households. In this model, households are seen as producers as well as consumers of goods. Basically, production of commodity quantities is an outcome of maximization of a utility function of the commodity set subject to prices and a constraint on resources. Commodity prices are measured by the sum of the costs of their goods

and time inputs while resources encompass a sum of money income and that foregone by the use of time and goods to obtain utility, that is, full income. This model is applicable to studies on production of health stock since individuals and households are both consumers and producers of health stock. This includes production of children's health-an apparent source of satisfaction for many households (You, 2005).

Grossman's (1972) household health production theory builds heavily on Becker's (1965) HPM idea that individuals could allocate their resources and time to investments that improve their health. The benefits of improved health include enhanced future utility flows as well as increased time available for market and non-market production. The former implies that health is a consumption good while the latter views health as a capital (investment) good. Further, the model observes that health is a commodity that differs from other goods and services in that, individuals cannot purchase health but rather, they purchase health care services with the aim of enhancing their health. In other words, health has value-in-use but not value-in-exchange. Thus, demand for healthcare is derived from demand for health (Hren, 2012).

The Grossman's model has received theoretical criticisms including its failure to address uncertainty and the assumption that an individual has perfect information in the decision to maximize utility. The model is also criticized in that it applies to an individual while in reality majority of individuals live within families. Moreover, this model does not analyse children's demand for health and healthcare and it fails to take into consideration the fact that individual demand can be influenced by other family members (Hren, 2012). Consequently, models that extend Grossman's model have been put forth; in some models, parents are assumed to maximize

a family and not an individual utility function (Rosenzweig and Shultz, 1983). Other models treat family health demands as outcomes of strategic interactions (Bolin et al., 2002; Jacobson, 2000).

Despite these criticisms, Grossman model of health production remains largely applicable to the understanding of the study of health and healthcare. The model particularly illustrates the complexity of the three key demands in health economics, that is, demand for health, healthcare and health insurance (Hren, 2012). Grossman's model lays the foundation for this study since the users of healthcare are motivated by their demand for health to undertake health promoting behaviors. Thus, the maximise utility through production and consumption of healthcare. The model is applied to the study while taking into consideration any necessary modifications as captured by related models such as child health production models (Mwabu, 2008; Rosenzweig and Shultz, 1983).

3.2.2 Empirical Literature

This review acknowledges that health seeking behavior is a process that involves implementation of simple recommended preventive behaviors, identification of illness symptoms and subsequent visit to an appropriate healthcare provider as well as complying with medical care advice. Thus, this section discusses factors that determine: preventive behaviors (breastfeeding and proper sanitation practices) for childhood illnesses including diarrheal disease; timely health seeking behavior; and compliance with simple treatment interventions at the family level. These interventions are later utilized in developing a consumer quality of healthcare composite index in section 3.3.2.

3.2.2.1 Determinants of Illness Preventive Behaviors at the Household Level

The determinants of breastfeeding and sanitation practices are summarized into child and maternal demographic characteristics, maternal socio-economic indicators and household related characteristics including area of residence, family size and headship characteristics

Child and Maternal Demographic Characteristics

The effect of demographic factors on recommended breastfeeding practices is well documented in existing empirical work. A child's age is shown to affect implementation of the recommended breastfeeding practices with a number of studies pointing to a less likelihood of exclusive breastfeeding among older children as a result of introduction of complementary feeding mostly at mid-infancy (Tadesse et al., 2019; Bhandari et al., 2019; Adugna et al., 2017; Agho et al., 2011).

Empirical findings on the influence of a child's sex on breastfeeding practices are mixed. In a meta-analysis study, Habtewold (2019) concludes that exclusive breastfeeding was inclined more to male newborns than their female counterparts. This conforms with other existing studies (Agho et al., 2011; Ghwass and Ahmed, 2011) and is probably due to sociocultural reasons especially in developing countries where parents have preference for boys over girls (Hafeez and Quintana-Domeque, 2017; Das, 1987). In contrast, Mututho et al., (2017) conclude that a female infant was exclusively breastfed compared to a male infant. A similar finding is reported in other existing studies (Hassan et al., 2018; Tambe et al., 2018; Oganda, 2014; Kimani-Murage et al., 2011). The studies attribute the finding to the believe that male infants demand more feeding, hence their need for complimentary feeding.

A child's birth order number has been found to be related with breastfeeding practices. Jayachandran and Kuziemko (2011) and Yalçın et al., (2014) established that continued breastfeeding was positively related to birth order number in that, eldest children were breastfed for shorter periods compared to their younger siblings. Perera et al., (2012) noted that second born children had a higher chance of being exclusively breastfed than first born ones. Senarath et al., (2007) report a lower current breastfeeding rate among the first borns perhaps due to lack of previous experience in child management among primiparous mothers. The finding could also be linked to the view that prolonged breastfeeding reduces the chance of having more children, hence its application by mothers with high birth order to stop having more children (Jayachandran & Kuziemko, 2011). In other studies, however, the relationship between birth order number and breastfeeding practices was not statistically significant (Makate, 2016).

The association between maternal age and implementation of recommended breastfeeding practices is well documented. Empirical works show that older mothers tend to have the highest breastfeeding rates and were more likely to engage in exclusive breastfeeding practices (Rana et al., 2020; Asare et al., 2018; Gizaw et al., 2017; Asemahagn, 2016; Dubois and Girard, 2003). This finding is basically attributed to mother's enhanced experience in child management with increase in age. Other studies did not register any significant relationship between mother's age and recommended breastfeeding practice (Benova et al., 2020).

Demographic characteristics have also been found to have an influence on hygienic and sanitation practices at the household level. Some research studies have established that there is a tendency of caregivers to engage in safe child faecal disposal for older children (Bauza et al., 2019; Irianti and Prasetyoputra, 2018; Islam, 2018; Azage and Haile, 2015). This is justified by the fact that older

children may be in a position to defecate independently or possibly due to the view that a young child's stool is less harmless than those of adults; they are smaller, less stinky and have fewer visual residues (Brown et al., 2013; Gil et al., 2004).

The effect of maternal age on appropriate child waste disposal is also documented. The findings by Islam (2018) suggest that unsafe waste disposal had an inverse association with maternal age in that, younger mothers were more likely to practice safe faecal disposal as opposed to older ones. This was associated with higher education levels among the younger mothers implying that they are more conscious about proper child waste disposal and have an understanding causes of childhood illness. This contrasts with other studies that observed better performance in human waste disposal among older mothers (Ayele et al., 2017; Azage and Haile, 2015), a finding that was linked to better experience in child care and greater cognizance of the health effect of waste management.

Socio-Economic Status (SES)

The socioeconomic status and its indicators such as income, education and employment status are widely acknowledged as variables associated with breastfeeding practices. Some empirical studies have found that mothers belonging to wealthier households have a higher chance of exclusively breastfeeding as opposed to those from poorer households (Habibi et al., 2018; Ogbo et al., 2015). In contrast, Noh et al., (2019) report a less likelihood of breastfeeding among mothers in higher wealth quintiles. Tadesse et al., (2019) established that a lower monthly income was associated with higher inclination towards exclusive breastfeeding. The observation was attributed to unaffordability of alternative forms of feeding such as infant formula and cow milk by the poor, thus making breastfeeding their only option. Several studies conclude that mothers in employment

were less likely to exclusively breastfeed (Bhandari et al., 2019; Adugna et al., 2017; Chekol et al., 2017; Ryan et al., 2006) since they lack frequent contact with their babies, hence an early introduction to complimentary feeding (Tadesse et al., 2019; Arage and Gedamu, 2016).

Maternal education is mostly linked to implementation of recommended breastfeeding practices (Tang et al., 2019; Noh et al., 2019; Tambe et al., 2018; Habibi et al., 2018; Atimati and Adam, 2018; Arora et al., 2017; Kimani-Murage et al., 2011; Flacking et al., 2007; Heck et al., 2006). In contrast, other studies found that low maternal education was associated with exclusive breastfeeding (Asare et al., 2018; Matias et al., 2012), a conclusion explained by the likelihood of educated mothers to engage in formal employment resulting in reduced contact with infants. Still, other studies did not find any significant relationship between maternal education and breastfeeding practices (Karim et al., 2019).

Empirical studies establish a positive relationship between socioeconomic status and Water, Sanitation and Hygiene (WASH) practices with high socioeconomic status being associated with good sanitation practices. Households in higher wealth quintiles practiced safe child faeces disposal (Aliyu and Dahiru, 2019; Azage and Haile, 2015), perhaps because a higher wealth index implies better standards of living and a higher motivation to safe sanitation practices. A similar finding is reported in a number of other empirical studies (Sahiledengle, 2019; Mohd and Malik, 2017). Lower education level is associated with unsafe child faecal disposal in other studies (Majorin et al., 2019; Preeti et al., 2016; Azage and Haile, 2015; KNBS and ICF Macro; 2010). This has been linked to the believe that educated mothers may understand more the causes of childhood illnesses as opposed to their uneducated counterparts (Azage and Haile, 2015).

Household Characteristics

Household's area of residence is associated with breastfeeding outcome in existing research studies. Some studies conclude that implementation of recommended breastfeeding behaviors was inclined towards urban residence (Santana et al., 2018; Liben and Yesuf, 2016; Senarath et al., 2007). However, in other studies, rural-based mothers were more likely to engage in good breastfeeding practices (Agho et al., 2019; Balogun, 2017; Asfaw et al., 2015). This is so because mothers in urban areas tend to be educated and in employment and are therefore more likely to introduce early weaning due to shorter maternity leaves and unfavourable work environment (Asfaw et al., 2015).

The relationship between geographical location and sanitation practices is also evidenced in the literature. Urban residence is associated with proper child waste disposal in a number of studies (Abubakar 2018; Bawankule, 2017; Azage and Haile, 2015), although other studies indicate otherwise (Irianti and Prasetyoputra, 2018). The positive relationship between urban residence and proper sanitation practices is explained by existence of higher poverty levels among rural based households and the nature of economic activity-agrarian which entails long stays away from sanitation facilities (Abubakar, 2018). Household size is a significant factor in influencing good sanitation practices in that larger household size increases the chance of unsafe human waste disposal (Osumanu et al., 2019). However, Adzawla et al., (2020) observed a lower likelihood of practicing proper feacal disposal among smaller household size.

3.2.2.2 Determinants of Appropriate and Prompt Health Seeking Behavior

Numerous factors affecting healthcare utilization are documented in existing literature. This section groups these factors into: socio-economic characteristics including indicators such as

maternal income and education level; individual child and maternal demographic characteristics; and household features for instance, place of residence, household size and household headship.

Socio-Economic Status

Research studies indicate that a higher socioeconomic status increases the likelihood of seeking healthcare at health facilities (Mishra, et al., 2019; Siddique, 2016; Burton et al., 2011). Several other studies cite medical costs as one of the reasons for failing to seek appropriate or timely healthcare (Mahejabeen et al., 2015; Alex-Hart et al., 2014). Family income increases the likelihood of appropriate and timely healthcare seeking behaviors (Sreeramareddy et al., 2006), although Taffa and Chepngeno (2005) observe that this association is up to certain threshold levels.

A number of empirical studies conclude that a higher maternal education level is associated with health seeking at a facility (Mahejabeen et al., 2015; Omore et al., 2013; Page et al., 2013; Ndugwa and Zulu, 2008; Kosimbei, 2005) and in a timely manner (Wambui et al., 2018; Ogunlesi, and Olanrewaju, 2010). This relationship is perhaps as a result of the fact that educated mothers/caregivers are more knowledgeable on common health problems and understand better shared health information. Hence, they are more likely to seek appropriate healthcare for their young ones without delay (Wambui et al., 2018; Nigatu et al., 2015).

Demographic Characteristics

Studies have established that mothers/caregivers were likely to seek healthcare at a facility when the infants and children were younger (Lungu et al., 2020; Klootwijk et al., 2019; Abegaz et al., 2019; Dagnew., 2018; Omore et al., 2013; Ogunlesi, and Olanrewaju, 2010; Taffa and Chepngeno, 2005). This may be associated with close contact between the much younger children and their

caregivers resulting in close monitoring and subsequent visit to a health facility when unwell. It could also be because caregivers are aware of faster disease progression among younger children relative to the older ones (Lungu et al., 2020).

The results of studies on the effect of a child's sex on appropriate and timely health seeking behavior are mixed, in that, some studies document that being male was correlated with health seeking at a healthcare facility (Adinan et al., 2017; Gelaw et al., 2014; Taffa and Chepngeno, 2005) while others indicated otherwise (Noordam, 2015; Sepehri et al., 2008). Still, others do not find any relationship between child sex and health seeking behavior (Aniugbo et al., 2018; Sreeramareddy, 2006). Birth order number variable is related to a mother's health seeking behavior with studies observing a lower likelihood of seeking appropriate healthcare for later borns (Chandwani and Pandor, 2015; Ogunlesi and Olanrewaju, 2010).

Maternal age determines a mother's health seeking behavior for children, with research studies indicating that older mothers were more likely to seek medical care (Adedokun and Yaya, 2020; Dagnew et al., 2018; Gelaw et al., 2014). The explanation behind this positive association is that one gains experiences with increase in age which could in turn help in identifying illness symptoms and seeking appropriate healthcare (Dagnew et al., 2018).

Household-Related Characteristics

Documented studies have established that urban based households seek healthcare more as opposed to rural dwellers (Noordam et al., 2015; Chandwani and Pandor, 2015; Taffa and Chepngeno, 2005). This was associated with socioeconomic differentials where rural based households tend to have lower education levels and wealth status (Begashaw et al., 2016;

Matthews et al., 2010; Magadi et al., 2003). Other household related factors that affect appropriate and prompt health seeking behavior include: household size where larger households have a lower chance of seeking healthcare (Dagnew et al., 2018; Kassile et al., 2014; Sepehri et al., 2008) and household headship characteristics where appropriate and prompt healthcare seeking behavior is inclined to female headed households (Adinan et al., 2017) and older household heads (Oyekale, 2015).

3.2.2.3 Determinants of Compliance with treatment Regime

Research results suggest that compliance is influenced by patient, medication and prescriber related factors (Kalogianni, 2011; Vlasnik, 2005; Oehl et al., 2000). Compliance commonly refers to "the extent to which a person's behavior (in terms of taking medications, following diets, or executing lifestyle changes) coincides with medical or health advice" (Jay et al., 1984). The patient related characteristics affecting compliance are summarized in this section as demographic factors (both child and maternal) and caregiver's socioeconomic factors.

Demographic Characteristics

Empirical literature has established that compliance with medication was better for younger children as opposed to older ones (Garg and Gupta 2014; Souares et al., 2009). This is mainly due to parental influence and also because the older children may have more responsibilities mostly undertaken outside the household for instance going to school, thus affecting caregiver supervision. Other studies observe that better adherence among patients was associated with older patients (Basheti et al., 2016; Whittle et al., 2016; Kirkman et al., 2015; Van Der Werf et al., 1990). However, some studies Asadi-Pooya (2014) did not find a significant effect of patient age on drug compliance.

Socio-Economic Status

The effect of socioeconomic status on patient observance of treatment is a subject of discussion in existing literature. Reviews conducted on the association between a patient's socioeconomic status and adherence to treatment advice indicate that parameters such as higher education and income levels were associated with compliance with illness specific preventive and treatment advice (Basheti et al., 2016; Whittle et al., 2016; Kilgore et al., 2016; Kirkman et al., 2015; Peltzer and Pengpid, 2013).

In particular, these factors have been found to have an influence on management of childhood diarrhea. Maternal education has a strong influence on implementation of diarrheal prevention and treatment activities including Oral Rehydration Therapy (Mulatya and Ochieng, 2020; Ghimire et al., 2018; Desmennu et al., 2017; Desta et al., 2017; Ansari et al., 2012). This is justified by the fact that more educated mothers are more knowledgeable in diarrheal management (Desta et al., 2017). Other studies however do not find any association between wealth status and/or education level and use of Oral Rehydration Therapy (ORT) (Alemu et al., 2012; Asakitikpi, 2010).

3.2.3 Health Performance and Use of Composite Indices

Healthcare performance is multi-dimensional in nature, implying that its measurement is not easily captured by use of a single measure. There is an increasing interest by policy makers and the public in performance aspects such as efficiency, outcomes, equity, accessibility and quality of healthcare (Goddard and Jacobs, 2010). This, coupled with advancement in information technology has led to worldwide efforts to capture data on numerous performance dimensions. Availability of such

complex information makes it difficult for the policy makers and potential users to interpret and make overall judgments about relative performance; complex information is difficult to comprehend, may conceal poor performance and increases the processing burden as it requires the users to make trade-offs between multiple performance dimensions (Shwartz et al., 2015; Goddard and Jacobs, 2010).

To address the foregoing problem, indices or composite measures have been developed not only in healthcare (Wilhelm et al., 2019; Profit et al., 2011; O'Brien et al., 2007; Grossbart, 2006), but also in other fields including environment, societal development and economic progress (UNDP, 2018; Santos and Santos, 2014; Emerson et al., 2010). A composite indicator is a variable that is formed when individual indicators are aggregated into a single index, on the basis of an underlying model of the multi-dimensional concept that is being measured (Nardo et al., 2005; OECD, 2004). Aggregating individual performance indicators into a summary score is useful in presenting a "big picture" of multidimensional phenomena. This simplicity allows for benchmarking against high performing institutions and in turn informs strategies to improve performance as it draws policy maker's attention to particular issues (Kelley and Simmons, 2015; Peterson et al., 2010; Nardo et al., 2005).

However, composite indices have received considerable criticisms in the literature, particularly due to the element of subjectivity in the process of their computation (Booysen, 2002). If poorly constructed, composite indices may result in distorted policy messages. Indices are averages of individual indicator components and may therefore conceal the root causes of poor performance. They are also sensitive to methodological choices. Further, they may ignore other dimensions of

performance thus distorting behavior (Quentin et al., 2019; Barclay et al., 2019; Schang et al., 2016; Jacobs et al., 2007).

Despite the highlighted criticisms, composite indices are still widely applied to measurement of different phenomena including healthcare quality (Barclay et al., 2019; Mazziotta and Pareto; 2013). Bandura (2011) points to the existence of over 400 country level indices in varied fields (political, economic, social and environmental) while Ashraf et al., (2019) captures 27 health related indices. The astounding popularity of composite indices has motivated efforts to provide methodological solutions in response to conceptual and methodological criticisms (Barclay et al., 2019; Mazziotta and Pareto; 2013; OECD, 2008). The proposed approaches guide the development of the proposed composite index in this study.

The construction of a composite index involves a number of steps which are coherent in nature. The steps in general encompass: identification of theoretical framework; indicator selection; imputation of missing data; conducting multivariate analysis subject to satisfaction of specific criteria (Capella and Detinho, 2012; Field, 2000); normalization of indicators; weighting and aggregation; and assessment of the robustness of the composite indicator (Greco et al., 2018; OECD, 2008; Nardo et al., 2005). Other steps that may be undertaken include decomposition of composite index to its underlying indicators, correlation of the composite index with existing relevant composite indices and visualization of the composite index (OECD, 2008).

3.2.4 Overview of Literature Review

A great body of empirical works points to common determinants of health seeking and investment behaviors including implementation of recommended preventive behaviors and compliance with treatment advice. Among the identified determinants are child demographic characteristics. Undertaking of exclusive breastfeeding is found to be lower among older children perhaps due to introduction of complementary foods at mid infancy (Bhandari et al., 2019; Adugna et al., 2017; Agho et al., 2011). Compliance with treatment advice has been observed among younger children, mainly due to greater parental influence at lower ages (Garg and Gupta 2014; Souares et al., 2009). Mothers/caregivers tend to seek appropriate and timely care for younger children (Lungu et al., 2020; Abegaz et al., 2019; Klootwijk et al., 2019; Dagnew et al., 2018; Omore et al., 2013; Ogunlesi and Olanrewaju, 2010). This finding is associated with close contact between the much younger children and their caregivers resulting in close monitoring and subsequent visit to a health facility when unwell (Lungu et al., 2020). Further, caregivers are likely to engage in safe child faecal disposal for older children (Bauza et al., 2019; Irianti and Prasetyoputra, 2018; Islam, 2018; Azage and Haile, 2015) possibly due to the view that a young child's stool is less harmless than those of adults; they are smaller, less stinky and have fewer visual residues (Brown et al., 2013; Gil et al., 2004).

Gender disparity in health seeking and investment behavior is reported in developing countries. Some empirical studies indicate that recommended breastfeeding practices (Habtewold, 2019; Agho et al., 2011; Ghwass and Ahmed, 2011) and health seeking at a healthcare facility (Adinan et al., 2017; Gelaw et al., 2014) were inclined to male children. This was associated with sociocultural factors where parents tend to have higher preference for a male child as opposed to a female child (Aniugbo et al., 2017; Hafeez and Quintana-Domeque, 2017). Others studies

however observe good breastfeeding practices among female children (Hassan et al., 2018; Tambe et al., 2018; Mututho et al., 2017) largely due to feeding patterns among male children which require complimentary feeding.

The child's birth order number has also been linked to preventive behaviors with empirical studies pointing to good breastfeeding practice among later-borns (Yalçın et al., 2014; Perera et al., 2012; Senarath et al., 2007). This perhaps is due to lack of previous experience in child management among primiparous mothers (Jayachandran & Kuziemko, 2011). In contrast, found that appropriate and timely health seeking is less likely to be sought for later born children (Chandwani and Pandor, 2015; Ogunlesi and Olanrewaju, 2010).

There is ample evidence of the effect of maternal characteristics including maternal age and socio-economic characteristics on preventive and health seeking behaviors. Studies have linked higher maternal age to good breastfeeding practices (Asare et al., 2018; Gizaw et al., 2017; Asemahagn, 2016; Dubois and Girard, 2003), health seeking in timely manner (Dagnew et al., 2018) and compliance with treatment advice (Basheti et al., 2016; Whittle et al., 2016; Kilgore et al., 2016). Maternal socio-economic status improves implementation of recommended breastfeeding (Noh et al., 2019; Habibi et al., 2018; Flacking et al., 2007) and sanitation practices (Aliyu and Dahiru, 2019; Sahiledengle, 2019; Venkatashiva et al., 2017; Mohd and Malik, 2017). Educated mothers are more likely than their uneducated counterparts to implement recommended breastfeeding practices (Tang et al., 2019; Tambe et al., 2018; Atimati and Adam 2018), practice safe waste disposal (Majorin et al., 2019; Preeti et al., 2016; Azage and Haile, 2015), seek appropriate healthcare in a timely manner (Mahejabeen et al., 2015; Omore et al., 2013, Ogunlesi and

Olanrewaju, 2010) and correctly manage childhood diarrheal illness (Mulatya and Ochieng, 2020; Ghimire et al., 2018; Desmennu et al., 2017; Desta et al., 2017; Ansari et al., 2012).

Location of residence has an influence on recommended practices; urban residence is related to good breastfeeding practices (Santana et al., 2018; Liben and Yesuf, 2016; Senarath et al., 2007) proper sanitation practices (Azage and Haile, 2015) and appropriate health seeking behavior (Noordam et al., 2015; Chandwani and Pandor, 2015). Household size has been found to have an effect on health investment behaviors. Larger households lower the chance of good sanitation practices (Osumanu et al., 2019) and healthcare facility visits (Dagnew et al., 2018; Kassile et al., 2014; Sepehri et al., 2008). In addition, household headship characteristics are indicated to have an influence on health seeking behavior where appropriate and prompt healthcare seeking behavior is inclined to female headed households (Adinan et al., 2017) and older household heads (Oyekale, 2015).

The empirical evidence discussed represent existing demand side studies. These studies focus on the actions of healthcare consumers but they do not view these behaviors explicitly as consumer related quality of health care measures that could have an effect on health outcomes if implemented simultaneously. While quality of healthcare is mostly assessed at the supply side in the literature (Muriithi, 2013; Das and Gertler, 2007; Mwabu et al., 1993) with the role of consumer being identified mainly as an evaluator of provider quality of healthcare (Hall et al., 2018; Piligrimienė and Buciuniene, 2008), the patient has a role to play as a co-producer of this measure (Hibbard, 2003). This study thus contributes to existing knowledge on child health seeking behavior by innovatively developing a composite index which we utilize in the study as a measure of consumer

quality of healthcare. Besides, we seek to establish the determinants of the quality of healthcare index thereof.

3.3 Methodology

3.3.1 Theoretical Model

Health seeking behaviors including preventive, appropriate, timely as well as implementation of treatment regime are derived demand for health; individuals demand "good health" and not the consumption of preventive and curative care (Grossman, 1972). This view forms the basis for analyzing determinants of demand for healthcare services (Asteraye, 2002). This study seeks to develop a consumer quality of healthcare index and to examine the determinants of this measure for children suffering from diarrhoea. The empirical analysis on determinants of consumer quality of healthcare index is based on theoretical framework of constrained utility maximization as applied in earlier child health production models (Rosenzweig and Shultz, 1983; Mwabu, 2008).

Following Rosenzweig and Shultz, (1983) and Mwabu (2008), we assume that child health production is embedded in the utility maximizing behavior of the mother. This utility function is stated in equation (3.1).

$$U = U(C, H) \quad \ldots\ldots (3.1)$$

Where C is a vector of non-health related consumer goods, for example mother's clothing; and H is the child health status.

Following Lavy and Germain (1994), a quality of healthcare variable (Q) is introduced into the health production function. The variable is a measure of consumer quality of healthcare that aggregates recommended healthcare behaviors implemented at the family level to promote child health. Thus, the utility function is restated in equation 3.2:

$$U = U(C, H, Q) \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (3.2)$$

In maximizing utility, the mother is faced with the child health production equation 3.3.

$$H = H(Q, X, \mu) \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (3.3)$$

Where Q is as defined in equation 3.2; X is the purchased market inputs such as medical care that affect child health status and μ is the component of child health status due either to genetic or environmental conditions.

The mother maximizes equations (3.2) and (3.3) subject to the budget constraint in equation (3.4):

$$I = XP_X + QP_Q + CP_C \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (3.4)$$

Where I is the household's exogenous income; P_X, is the price of health related goods, X; P_Q is the price of quality healthcare, Q. The cost may include travel cost to the facility, waiting time at the facility as well as lost earnings by the households in travelling to the facility and in taking care of the sick; P_C is price of non-health related goods, C. The investment good X is assumed to improve the child's health status and therefore enters the mother's utility function only through H (Mwabu, 2008).

Solving the utility maximization problem (3.2) given health production function (3.3) and subject to budget constraint (3.4) yields a set of reduced form demand functions of the form:

$$X = D_X(P_X, P_Q, P_C, I, \mu) \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (3.5(a))$$

$$Q = D_Q(P_X, P_Q, P_C, I, \mu) \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (3.5(b))$$

$$C = D_C(P_X, P_Q, P_Z, I, \mu) \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (3.5(c))$$

Reference is made particularly to equation 3.5(b) as it is related to production of quality healthcare (the equation system 3.5(a)-3.5(c) are hybrid demand functions). The equation states that quality healthcare is a function of commodity prices, exogenous income and unobserved parameter, μ. Since demand for quality healthcare is derived demand for health, the study also incorporates the determinants of child health status such as individual attributes, socio-economic factors and household characteristics in the estimation for equation 3.5(b).

3.3.2 Empirical Model

The study seeks to develop a consumer quality of healthcare composite index (CQHI) and to establish its determinants. In developing the composite index-the outcome variable, the study employed a five-step approach as guided by Organisation of Economic Cooperation and Development (OECD) for development of composite indices (OECD, 2008).

Step 1: Conceptual/Theoretical Framework

The Donabedian’s (1988) Structure-Process-Outcome framework forms the basis for assessment of consumer quality of healthcare. The process quality of healthcare component of the framework encompasses not only provider actions in provision of healthcare, but also implementation of

recommended healthcare consumer actions in seeking and undertaking care. The choice of place or level of care-the home, is informed by the continuum of care (COC) framework for maternal, neonatal and child health. This framework is an integrated approach to health service delivery developed for low-and middle-income counties (Kerber et al., 2007). Thus, a metric for measuring the extent of provision of quality at home is the current study's focus. United Nations Children's Fund (UNICEF) and World Health Organization recommends a set of sixteen practices that could be undertaken at home/family level to "ensure child survival, reduce morbidity, and promote healthy growth and development". The practices are categorized into four broad domains, that is, promotion of growth and development of a child, disease prevention, appropriate care at home and care-seeking outside home (WHO, 2004). This study considers these categories as dimensions within which quality healthcare can be produced at home or household level.

Step 2: Selection of Indicator Variables

At least one indicator variable for each category of recommended practices at home was selected for development of the consumer quality of healthcare composite index. Fundamentally, the selected indicators: could alleviate child diarrheal illness; are proven, simple, cost-effective and actionable at home; includes elements of the three roles of healthcare, that is cure, care and prevention; and are routinely available in demographic health surveys. The indicators are: continued breastfeeding for two years (recommended intervention for promotion of growth); proper child waste disposal (illness preventive behaviors), amount offered to drink and eat, oral rehydration therapy and zinc supplementation (appropriate care at home during diarrheal episode illness episode); and timely health seeking behavior, that is, time taken before first visit to a health facility.

Step 3: Normalisation of selected indicators

To enable aggregation of indicators into a composite index, the re-scaling approach was utilized to enable comparability of the variables. The re-scaling was done in such a way that lowest values denoted poor quality of care while highest values indicated high quality of care. The dummy variables, that is, breastfeeding for two years, disposal of child waste, oral rehydration therapy and zinc supplementation received a score of '1' for implementation and '0' for non-implementation. The feeding patterns were recoded such that lower value scored as '1' indicates much less fluid or food offered and higher value scored as '4' indicates more fluid or food offered. Time to health facility, a continuous variable was transformed into a dichotomous variable taking a value of '1' for timely first visit (within 24 hours) to a health facility on observation of child diarrheal illness symptoms and '0' for delayed visit.

Step 4: Imputation of missing data

The response rate for the 2014 KDHS data was above average at 94%. However, the dataset contains missing values in some of the selected indicator variables mainly, breastfeeding, disposal of child waste and timeliness in seeking care. This could be associated with errors in data collection, entry or reporting, thus systemic and random in nature. Multiple value imputation was employed to deal with the issue of missing data (Rubin and Schenker, 1991).

Step 4: Weighting and Aggregation of the Composite Index

The CQHI is developed by means of principal component analysis (PCA) using polychoric correlations. Generally, PCA transforms a large number of variables into a smaller and more coherent set of uncorrelated (orthogonal) factors (principle components) which account for much of the variance among the set of original variables (Krishnan, 2010). The problem with the standard

PCA is that it is applied only if the variables are numeric and have linear relationships-the Gausian distributional assumption (Kolenikov and Angeles, 2005). Some of the indicators used for computing CQHI were discrete and ordinal in nature. Polychoric PCA was therefore appropriate for development of CQHI. With this technique, the proportion of explained variance estimated is more accurate than in standard PCA (Kolenikov and Angeles, 2005). The approach assumes that a latent continuous variable underlies every ordinal variable (Njong and Ningaye, 2008). The use of PCA is informed by its ability to generate component loadings or weights that have an intuitive meaning. In particular, the magnitude of the coefficients of individual variables indicate the importance of that variable to the principal component irrespective of the other variables. Specifically, PCA has been found to produce a set of weights that account for the largest variation in the original set of variables when compared to other methods such as Multivariate Correspondence Analysis (MCA) (Njong and Ningaye, 2008).

Following Njong and Ningaye, (2008), we specify the composite index form as follows:

$$C_{Qi} = \sum_{k=1}^{n} w_k x_k \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots. (3.6)$$

Where C_{Qi} is the CQHI score for mother i. The index is defined as a weighted aggregate of the variable scores with weights equal to the component loadings of the first principal component. n is the number of indicator variables; w_k is the weight attached to each variable k with $0 < w_k < 1$ and $\sum w_k = 1$; and x_k is the score of indicator variable k.

The CQHI may consist of negative and positive values. For ease in interpretation of the developed index, negative values are removed from the index and the variable adjusted to between 0 and 1 as expressed in equation 3.7.

$$C_{Qi}(A) = \frac{C_{Qi} - C_{Qimin}}{C_{Qimax} - C_{Qimin}} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3.7)$$

Where $C_{Qi}(A)$ is the adjusted CQHI, C_{Qi} is the unadjusted CQHI, C_{Qimin} is the minimum value of CQHI in the sample; and C_{Qimax} is the maximum value of CQHI in the sample.

Prior to performing principal component analysis, we assessed the suitability of data for factor analysis. Barlett Test of Sphericity and Kaiser-Meyer-Olkin (KMO) tests of appropriateness were conducted to assess the sampling adequacy and to determine the factorability of the matrix as a whole. Principal components with eigen values greater than 1 were retained for index construction.

Step 5: Sensitivity Analysis and Robustness Check

The composite index obtained from PCA is simply a summary statistic computed from a set of original variables. Such transformation may result in information loss, hence the need for sensitivity and robustness check. To do this, an alternative aggregation method, that is, a simple additive method is used to develop CQHI. Before aggregation, all the indicator variables are first recoded into binary entries. The new composite index as well as one of the indicators in its natural form (time before first visit to a health facility) are used to check the stability of the corresponding regression results on determinants of the PCA based quality of healthcare composite index. In particular, the results would indicate if there is any variation (both in terms of statistical

significance and consistency of factors that have an effect on quality of healthcare) when composite indices and variables in their natural form are used as outcome variables.

To establish the determinants of the developed consumer quality of healthcare index which is a continuous variable, we estimate the Ordinary Least Squares (OLS) model for equation 3.5(b) expressed in equation 3.8:

$$Y_{ij} = \beta_1 X_{ij}^E + \beta_2 X_{ij}^A + \beta_3 X_{ij}^P + \varepsilon_i \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots. (3.8)$$

Where Y_{ij} is a measure of mother/caregiver i's quality of healthcare in household j, that is, the consumer quality of healthcare composite index score; $X_{ij}^E, X_{ij}^A, X_j^P$ are vectors of socio-economic factors (education level and employment status), individual attributes (both child and maternal such as age and sex) and household related factors including area of residence, household size, household leadership characteristics and wealth index respectively. ε_i is the stochastic error term.

Simple OLS estimation is likely to produce biased and inconsistent coefficients as a result of endogeneity problem. Endogeneity may arise from: omission of variables, mainly due to data limitations; measurement errors; or reverse causality where at least one of the explanatory variables is simultaneously determined with the dependent variable (Wooldridge, 2013). In this study, the wealth index variable is potentially endogenous to provision of quality of healthcare at the household level in that there is a likely reverse causality. Wealth index is a composite measure of economic well-being constructed from a household's assets and dwelling characteristics (Pirani, 2014). Wealthier households are more likely to access health promoting goods, thus reducing the risk of child diarrheal illness than their poorer counterparts. On the other hand, quality healthcare leads to better health outcomes which in turn may improve productivity hence higher incomes.

Further, the coefficients of OLS model may be biased as a result of unobserved heterogeneity affecting both the outcome and the explanatory variables, possibly arising from unobserved characteristics or misreporting.

To address potential estimation issues, the study employs an Instrumental Variables (IVs) Approach-the Control Function Approach (CFA) (Woolridge, 2015). The approach involves two steps: In the first step, the wealth index variable is regressed on exogenous variables (including the IVs) and residuals are obtained. The second stage estimates the quality of healthcare equation where the wealth index variable together with its residuals and all other exogenous variables are included as explanatory variables. A t-test is then performed on the coefficient of the predicted residuals. If the coefficient is statistically different from zero, then the potentially endogenous variable is indeed endogenous and thus the IV estimation strategy should be interpreted. To address potential heterogeneity, the wealth index residuals are interacted with actual value of wealth index and other potentially heterogenous variables. If it is established that this correlation is non-linear, then the CFA estimates are unbiased and consistent. The potential instruments for the household's wealth index are time to the nearest water source and to the nearest the nearest market. Intuitively, these variables are likely to influence quality of healthcare through the various components of the composite index such as timely health seeking behavior.

3.3.3 Description of Variables

3.3.3.1 Dependent Variable

The dependent variable is a composite index developed to measure consumer quality of healthcare. The index presents an overall picture of the demand side quality of healthcare. It was constructed

from information given by respondents to indicate: preventive behavior; timeliness in seeking healthcare upon observation of symptoms of diarrheal illness among the under-five children; and whether simple recommended treatment interventions at the household level are adhered to. Preventive behaviors include implementation of recommended breastfeeding practices and proper disposal of a young child's waste/faeces. Simple interventions that could be undertaken at the household level during diarrhea episode include: administration of ORS or recommended home solution, Zinc Supplementation, continued feeding and giving more than usual fluids or food to take. The index was adjusted to between 0 and 1 indicating poor and high quality of healthcare respectively.

3.3.3.2 Independent Variables

The choice of explanatory variables is based on existing theoretical and empirical literature on factors affecting the various components of the CQHI.

Child's characteristics

Child's age is likely to affect consumer provision of quality healthcare at the household level. This expectation is based on the proposition that young children are at a higher risk of dying than older children hence the need to channel attention to them (Ogunlesi and Olanrewaju, 2010). This could perhaps explain the conclusion by a number of empirical studies that older children received less attention as opposed to younger children (Dagnew et al., 2018; Omore et al., 2013; Ogunlesi and Olanrewaju, 2010). Based on this explanation, the study hypothesizes that an increase in a child's age decreases the quality of healthcare that a child receives. This variable considers children aged below five years and is measured in years. The square of a child's age is included to assess the possibility of u-shaped relationship between this variable and quality of healthcare, that is, whether

the expected negative effect of age decreases at an increasing rate. This would imply that as children grow much older, they receive and less quality of care.

Gender disparity in health seeking behavior and investment in health in developing countries could be explained by sociocultural factors where parents tend to have higher preference for a male child as opposed to a female child (Aniugbo et al., 2017). Controlling for child sex could therefore provide a test on whether there is any differential treatment of children of different genders in terms of quality of care. A positive relationship between being male and consumer quality of healthcare is expected. The child sex variable is coded as 1 for a male child and 0 otherwise.

We also include a child's birth order number in the list of explanatory variables. It is noted that parents tend to invest more in the well-being of lower as opposed to higher order births (Makate, 2016). The birth order variable is measured as a continuous variable from the first birth to higher order numbers and is expected to be negatively related to quality of healthcare composite index. In addition, we control for twin variable since multiple births have been associated with neonatal and post neonatal mortality (Uthman et al., 2008; Hong, 2006). With this realization, there is a likelihood of a positive relationship between a twin birth and investment in child health through provision of quality healthcare. The twin variable is coded as 1and 0 for a twin/multiple birth and single birth respectively.

Mother's /Caregiver's Characteristics

The health of children especially the under-five is determined by the mother's/ caregiver's health investment and seeking behavior which in turn is determined by maternal characteristics. Based on existing literature, we consider the mother's age in years as an explanatory variable. A higher

age reflects more experience in child management including the ability to identify a child's illness symptoms and implement simple recommended interventions on observation of illness symptoms as opposed to younger ages (Dagnew, et al., 2018; Asare et al., 2018; Asemahagn, 2016). It is therefore hypothesized that belonging to a higher age is positively related to consumer quality of healthcare index. In addition, we include the square of maternal age to establish if the relationship between age and quality of healthcare portrays an inverted u-shaped, that is, if the effect increases at a decreasing rate.

Socio-economic status

Predisposition characteristics such as income and insurance enable health seeking behaviors (Andersen, 1995). Wealth index is utilized as a proxy for income level and is measured as a composite index calculated from household assets and house characteristics. Based on Andersen's model (1985), we include mother's employment status, a variable considered as an enabler in consumer health seeking behavior, in which case, the effect on quality of care will be positive. However, a mother's absence due to being in employment may compromise on quality of care. Thus, the expected effect of this variable on quality of healthcare is indeterminate. Employment status is measured as a dummy variable indicating whether the mother/caregiver was in employment or had been in employment one year prior to the survey.

We also control for maternal education level. This variable is recognized as important in determining health seeking behavior and compliance with treatment advice. This is because of the view that educated individuals make informed choices regarding issues that could have an effect on health including ability to: eat a balanced diet, adopt healthy lifestyles and use medical care efficiently (Grossman, 1972). The education level variable is categorical in nature indicating the

mother's level of education which could be no education at all, primary, secondary or post-secondary level of education. It is expected that the education variable is positively related to consumer quality of healthcare index.

Household level related factors

Household headship characteristics specifically, the age and sex of the household head are controlled for in the multiple regression analysis. These characteristics are important in influencing intrahousehold decision making including health related decisions (Mikalitsa, 2015; Levine et al., 2001). The effect of sex of the household head on consumer quality of healthcare is expected to be positive with male being represented by 1 and female 0. Age of the household head is measured in years and is expected to negatively affect decisions to invest in health (Wickrama and Keith, 1990).

The study also controls for household size, a continuous variable indicating the number of household members. This variable is expected to be negatively associated with provision of quality healthcare. Area of residence is measured as a dummy variable labeled as 1 and 0 otherwise. It is expected that the urban dwellers have higher quality of care when compared to their rural based counterparts mainly due to socioeconomic differentials. Table 3.1 provides a summary, definition and expected sign of the study variables.

Table 3. 1: Summary of Variables and Expected Results

Variables	Measurement/ Definition	Expected Sign
Outcome Variable		
Consumer quality of healthcare	Composite index based on implementation of recommended interventions for diarrhea illness (Continuous variable)	
Explanatory Variables		
Sex of the child	Sex of the child (male=1, female=0)	Positive (+)
Age of child	Age of the child in months	Negative (-)
Child's squared	Square of the child's age	Indeterminate
Birth order number	Child's birth order number (continuous)	Negative (-)
Twin birth	Dummy variable (Twin/Multiple=1; Single=0)	Positive (+)
Maternal age in years	Mother's age in years	Positive (+)
Maternal age squared	Square of mothers age in years	Negative (-)
Age of household head	Age in years of household head	Positive (+)
Household's head age squared	Age of household head squared	Negative (-)
Sex of the household head	Sex of the head of the household (male=1, female=0)	Positive (+)
Mother's Education level	Categorical variable (No education=1; Primary=2; Secondary=3; Post-secondary=4)	Positive (+)
Employment status	A dummy variable (1= currently working/worked 12 months prior to survey, 0=otherwise)	Indeterminate
Wealth index	Composite index based on household assets and housing characteristics (continuous)	Positive (+)
Household size	Number of household members (continuous)	Negative (-)
Place of residence	A dummy variable (1=urban, 0=rural)	Positive (+)

3.3.3.3 Data Sources

This study utilized the 2014 Kenya Demographic Health Survey (KDHS) cross-sectional household survey data. This survey is the latest available nationally representative data. It uses multistage cluster sampling technique to collect data on household's health situation in the country which includes child morbidity and mortality. In particular, mothers aged between 15 and 49 years with under-five children were asked whether their children had previously suffered from childhood illness symptoms such as malaria, fever/cough or diarrhea; whether they sought any medical treatment, which facility was visited first and after how long.

As concerns diarrhea episode, mothers/caregivers were asked whether they had undertaken simple interventions believed to alleviate sickness including ORS therapy, Zinc supplements and whether the child was given more than usual to drink or eat. The survey data also captured information on investment in child health and preventive behaviors among the mothers and at the household level. These include sleeping under a mosquito bed net, washing of hands before preparation of meals, proper disposal of youngest child's stool and breastfeeding practices.

The survey data accessed upon request at https://dhsprogram.com/data/new-user-registration.cfm had initially been subjected to data cleaning, editing, validation and weighting to ensure representativeness by KNBS and ICF International group before its storage under the DHS program. This dataset was downloaded in STATA and further data cleaning done before its utilization in this study. This dataset was merged with the Geographic Information System (GIS) dataset ("KEBR70FL.DTA") to obtain information on distance to nearest community infrastructure/market.

3.4 Results

3.4.1 Sample Description

The descriptive statistics of the analytic sample is presented in Table 3.2. Fifty two percent (52%) of the under-five children who had experience diarrheal symptoms two weeks prior to the 2014 KDHS survey were male. Majority (97%) of these children were from single births, twenty three months old and mostly third in birth order. Most mothers had primary level of education (49%), were 27 years of age and belonged to households with an average wealth index score equals to 0.36. Seventy percent (70%) of the under-five children lived in male headed households and

mostly resided in rural areas (68%). Eighty four percent (84%) of the mothers were in employment or had been in some form of employment (professional/managerial, agriculture, domestic service, sales and services or unskilled manual) twelve months prior to KDHS survey. The mean number of household members was 6 whereas the average age of the household head was 37 years.

The statistics indicate that 15% of the under-five children had suffered from a bout of diarrhea. A look at implementation of promotion of growth, preventive and curative interventions among children who had suffered from diarrhea symptoms indicates that 17% of the mothers/caregivers had breastfed for the recommended period of two years and above. Majority (76%) practiced proper child's stools/waste disposal, that is, disposed in the toilet/latrine, threw into a ditch/garbage or buried. Majority of the under-five children with diarrheal symptoms were offered about the same amount of fluids (37%) and much less food to eat (35%). Those offered ORS and zinc supplementation were 52% and 8% respectively. Most of the mothers (75%) had sought treatment within 24 hours on observation of child diarrhea symptoms. The composite index score[2] ranges between 0 and 1 with a mean score of 0.5 indicating average quality of healthcare. The below optimal score could be explained by the poor performance of some of the components such as feeding patterns when ill and zinc supplementation.

[2] The index score is developed in Section 3.4.2

Table 3. 2: Sample Description

Variable	Sample size	Mean	Standard deviation	Min	Max
Child Characteristics					
Child sex (Male=1)	2953	0.52	0.50	0	1
Child age in months	2906	22.82	14.69	0	59
Child age squared	2906	736.62	844.00	0	3481
Twin birth (Twin=1)	2953	0.03	0.16	0	1
Birth order number	2953	3.36	2.29	1	12
Maternal Characteristics					
Mother's age in years	2953	27.47	6.55	15	49
Mother's age squared	2953	797.56	392.08	225	2401
Education level (None=1)	2953	1.08	0.73	1	4
None	2953	0.19	0.39	0	1
Primary	2953	0.58	0.49	0	1
Secondary	2953	0.19	0.39	0	1
Post-secondary	2953	0.04	0.20	0	1
Employment status	2953	0.84	0.37	0	1
Household Characteristics					
Wealth index	2953	0.36	0.15	0	1
Sex of the head (Male=1)	2953	0.70	0.46	0	1
Age of the head in years	2953	37.10	12.33	18	95
Age of the head squared	2953	1528.62	1131.53	324	9025
Area of residence	2953	0.32	0.47	0	1
Household size	2953	5.90	2.58	1	23
Index Components					
Breastfeeding (Two years/still breastfeeding=1)	2914	0.17	0.37	0	1
Proper disposal of young child's faeces (Yes=1)	2895	0.76	0.43	0	1
Fluids offered to drink (Much less=1)	2946	2.61	0.99	1	4
Much less	2946	0.17	0.38	0	1
About less	2946	0.25	0.43	0	1
About same	2946	0.37	0.48	0	1
More	2946	0.20	0.40	0	1
Food offered to eat (Much less=1)	2948	2.01	0.87	1	4
Much less	2948	0.35	0.48	0	1
About less	2948	0.31	0.46	0	1
About same	2948	0.31	0.46	0	1
More	2948	0.03	0.16	0	1
ORS (Yes=1)	2936	0.52	0.50	0	1
Zinc (Yes=1)	2942	0.08	0.26	0	1
Time before first visit to health facility (< 24 hours=1)	2903	0.75	0.43	0	1
Consumer quality of healthcare index (adjusted)	2885	0.51	0.20	0	1
Instrumental Variables					
Time to water source (minutes)	2946	55.18	130.87	1	720
Time to nearest market (minutes)	2937	24.77	19.30	0.16	152.58

Source: Author's computation KDHS, 2014

3.4.2 Suitability of Data for Principal Component Analysis

The results of the tests for adequacy of sampling (KMO test) and the strength of the relationship among the indicator variables (Bartlett's test) are presented in Table 3.3. The value of KMO of 0.503 exceeds the recommended minimum value of 0.5 (Field, 2000) indicating that the sampling is adequate. The Bartlett's test of sphericity is statistically significant (P<0.005) supporting the factorability of the correlation matrix. The chi-square statistic of 684.3 implies that the original variables are correlated. Thus, the results support the use of Principal Component Analysis (PCA).

Table 3.3: KMO and Bartlett's Tests

Test	Values
Kaiser-Meyer-Olkin measure of sampling adequacy (KMO)	0.503
Bartlett's test of sphericity Approx. (Chi-square)	684.273
Degrees of freedom	21
P-value	0.0000

Source: Author's computation KDHS, 2014

Further, an examination of the anti-image correlations in Table 3.4 shows that there is a low degree of correlation between the off-diagonal values when the other variables are held constant. Most of the values are close to zero implying that the use of principal component analysis is suitable.

Table 3.4: Anti-Image Covariance Coefficients

Variable	ORS	Fluids offered to drink	Food offered to eat	Zinc Supplement	Disposal of youngest child waste	Breastfeeding for at least two years	Time before seeking care
ORS	0.9402						
Fluids offered to drink	-0.0215	0.8645					
Food offered to eat	0.0844	-0.3148	0.8515				
Zinc Supplement	-0.1966	0.0015	0.0184	0.9470			
Disposal of youngest child waste	-0.0243	0.0043	-0.0441	-0.0802	0.9749		
Breastfeeding for at least two years	0.0212	0.0300	-0.0561	0.0095	-0.0643	0.9902	
Time before seeking care	-0.0633	0.0298	-0.0296	0.0113	-0.0963	0.0285	0.9837

Source: Author's computation KDHS, 2014

This study employed polychoric PCA for development of CQHI, to portray the quality of healthcare at the household level. The developed index uses 7 indicators, all of which measure varied dimensions of care. Based on Kaiser criterion, the study identified and retained four components which cumulatively explain 76% of the total variance as presented in Table 3.5. The first eigen value is equal to 1.704 and explains 24% of the variance in the original data. The second, third and fourth eigen values equal to 1.422, 1.119 and 1.022. They explain 21%, 16% and 15% of the variance respectively.

Table 3. 5: Polychoric PCA factors used for Construction of CQHI

Component	Eigen value	Variability (%)	Cumulative Variance (%)
1	1.704419	0.243488	0.243488
2	1.442649	0.206093	0.449581
3	1.119141	0.159877	0.609458
4	1.021543	0.145935	0.755393
Number of observations=2885			

Source: Author's computation KDHS, 2014

Table 3.6 presents the PCA factor loadings for the first (F1) and second (F2) factors (The factor loadings for F3 and F4 are not presented since they are below 0.5). The highest factor loadings for each variable are presented in bold. The first factor is strongly correlated with ORS (0.6361) and zinc supplementation (0.6750). The second factor is strongly correlated with amounts offered to drink (0.5490) and amounts offered to eat (0.5554). The PCA analysis informs the creation of weights and consequent development of CQHI.

Table 3.6: Factor Scores and other Summary Statistics for First Principal Component Analysis

Variable	Factor Scores	
	F1	**F2**
ORS	**0.6361**	-0.0646
Fluids offered to drink	0.0094	**0.5490**
Food offered to eat	-0.0986	**0.5554**
Zinc Supplementation	**0.6750**	-0.0403
Disposal of youngest child waste	0.1257	0.0569
Breastfeeding for at least two years	-0.0451	0.0383
Time before seeking care	0.0601	-0.0022

Number of observations=2885

Source: Author's computation KDHS, 2014

3.4.3 Robustness Analysis

For robustness checks, the composite indices constructed using polychoric PCA and simple aggregation method are regressed on predictors of quality of healthcare under a simple OLS models whose results are presented in column (1) and (2) in Table 3.7 respectively. We also present the regression results of the linear probability model on determinants of timely health seeking behavior (one of the index components in its natural form) in column (3). The results show that all the three models in columns (1), (2) and (3) had significant coefficients for child's age, twin birth, education level and area of residence. Further, the models were consistent in terms of the direction of association. However, the magnitudes of the coefficients vary across the models, mainly due to differences in indicator measurement and aggregation methods. The additive model (column 2) is based on dummy variables while the polychoric PCA utilizes both dummy and categorical variables. The child sex coefficient was significant only for timeliness in seeking healthcare model (model 3) while the wealth index coefficient was not statistically significant for the latter model. As earlier explained, the variation could be due to difference in measurement of the dependent variable and possible endogeneity of the wealth index variable (potential endogeneity is addressed in section 4.4).

Table 3. 7: Regression models for Alternative Outcome Measures

VARIABLES	(1) Polychoric PCA (OLS)	(2) Additive Index (OLS)	(3) Time to First Visit to Health Facility (LPM)
Child Sex	-0.00686	0.0485	-0.113***
	(0.00714)	(0.0441)	(0.0158)
Child's age in months	0.00312***	0.0561***	0.00733***
	(0.000931)	(0.00575)	(0.00206)
Child's age squared	-0.000662***	-0.00697***	-0.00134***
	(0.000161)	(0.000997)	(0.000357)
Twin birth	0.0649***	0.395***	0.116**
	(0.0221)	(0.137)	(0.0490)
Birth order number	0.00370	0.0126	0.00273
	(0.00292)	(0.0180)	(0.00646)
Woman's age in years	0.00134	0.0249	0.00483
	(0.00423)	(0.0261)	(0.00936)
Woman's age squared	-0.000420	-0.00385	-0.00111
	(0.000697)	(0.00430)	(0.00154)
Primary	0.0443***	0.364***	0.0554**
	(0.0107)	(0.0663)	(0.0238)
Secondary	0.0795***	0.515***	0.0693**
	(0.0143)	(0.0880)	(0.0316)
Post-Secondary	0.0840***	0.717***	0.174***
	(0.0229)	(0.142)	(0.0507)
Employment Status	-0.00963	0.117*	0.0597***
	(0.00989)	(0.0611)	(0.0219)
Area of residence	0.0213**	0.213***	0.0606***
	(0.00900)	(0.0556)	(0.0199)
Wealth index	0.130***	0.748***	0.0380
	(0.0356)	(0.220)	(0.0787)
Household Size	0.00118	-0.0230**	0.00150
	(0.00186)	(0.0115)	(0.00412)
Sex of household head	-0.000960	0.0104	-0.00424
	(0.00803)	(0.0496)	(0.0178)
Household's head age in years	-0.00110	0.00574	0.00416
	(0.00178)	(0.0110)	(0.00395)
Age of the household head squared	5.42e-05	-0.000465	-0.000659
	(0.000186)	(0.00115)	(0.000413)
Constant	0.409***	1.170***	0.493***
	(0.0681)	(0.420)	(0.151)
Observations	2,879	2,879	2,881
R-squared	0.059	0.131	0.046

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Source: Author's computation KDHS, 2014

3.4.4 Regression Results: Determinants of Consumer Quality of Healthcare Composite Index

Following the development of a measure of consumer quality of healthcare, we sought to assess the determinants of provision of quality healthcare at the household level. This section therefore presents the multiple regression results of the analysis of these factors and provides a discussion of the results. The regression results on the determinants of the developed consumer quality of healthcare index are presented in Table 3.8. The results of the basic OLS regression model which treats the wealth index variable as exogenous are presented in column 1. The CFA results accounting for endogeneity and heterogeneity that may arise from unobservable determinants of household level quality of healthcare are presented in columns (2), (3), (4) and (5). Specifically, column (2) presents the first stage results with wealth index as the dependent variable. The model tests the effect of the two IVs, that is, distance to the nearest community infrastructure (market) and to a water source in minutes, while controlling for other factors. The second stage results presented in columns (3) and (4) include the wealth index residuals derived from the reduced form CQHI model and interaction terms between the wealth index residuals and wealth index variable, respectively. Column (5) presents CFA results with other interaction terms.

The basic OLS model in column (1) indicates that an increase in the wealth index score by one unit significantly increases the quality of healthcare index score by 0.13 units when all other factors are held constant. This implies that quality of healthcare is positively associated with a household's wellbeing. On controlling for potential endogeneity of the wealth index, the first stage results in column (2) show that the two instrumental variables-distance to water source and distance the nearest market were negatively and significantly associated with the wealth index variable with coefficients of 0.02 and 0.03 respectively. The results suggest that limited access to infrastructural

facilities such as water and community infrastructure is highly associated with poorer households as opposed to wealthier households. Three instrumental variables diagnostic tests were conducted. First, the under-identification test statistic was significant, $\chi 2(2) = 451.5$, $p < 0.0000$, suggesting that our IVs were significantly correlated with the wealth index variable. Second, the F-Statistic of the first stage results on excluded instruments was statistically significant (F-statistic=266.35; p-value=0.0000) implying that it was reasonable to exclude distance to water source and to the nearest market from the prediction of quality of healthcare in the second stage of regression. Lastly, the Sargan-Hansen test of over-identifying restrictions was not statistically significant (Sargan-statistic=1.093; p-value=0.2958) implying that we do not reject the validity of the instrumental variables.

To establish if a household's wealth index was indeed endogenous, Durbin-Wu-Hausman test of exogeneity was conducted. The results presented in column (3) indicate that the coefficient of the wealth index residual was not statistically significant which suggests that the wealth index variable was not endogenous to quality of healthcare model. The coefficient remains non-significant even with inclusion of interaction terms in columns (4) and (5). The coefficient of the interaction term between the wealth index residuals and wealth index was statistically significant at one percent level indicating the presence of heterogeneity arising from the interaction of wealth index with unobserved determinants of quality of healthcare. The coefficients of other interaction terms in column (5) were not statistically significant suggesting that the unobserved factors were mean independent of education level, area of residence and sex of the household head. Based on the results of the heterogeneity tests, we interpreted the results of the Control Function Model in column (4) as it provides better estimates than the basic OLS model.

The results in Column (4) indicate that a unit's increase in the wealth index score significantly increases the quality of healthcare score by 1.10 units. This implies that children whose mothers were from wealthier households received quality care than their counterparts in poorer households. Also, a woman's level of education had a significant effect on consumer quality of healthcare. Mother's/caregivers with primary, secondary and post-secondary levels of education had 0.18, 0.36 and 0.36 quality of healthcare index scores higher respectively, in reference to no education at all.

The coefficients of child characteristics, mainly, age and twin birth were statistically significant in determining consumer quality of healthcare at 5 percent and 1 percent significance level respectively. Holding other factors constant, an increase in a child's age by one month increases consumer quality of healthcare index score by 0.009 units, implying a higher quality of care among older children. We find an inverted U-shape relationship between a child's age and consumer quality of healthcare suggesting that the positive effect of a child's age on consumer quality of healthcare increases at a decreasing rate and therefore would reduce when a child is much older. A twin birth as opposed to single birth significantly increases the quality of healthcare index score by 0.36 units.

Table 3. 8:Regression Model Results- Determinants of Consumer Quality of Healthcare

Variables	(1) Basic OLS model	(2) First stage Results	(3) CFA with wealth index residual	4 CFA with wealth index residual interaction	5 CFA with other Interactions
Child sex	-0.0361	-0.00548	-0.0239	-0.0260	-0.0285
	(0.0399)	(0.00346)	(0.0401)	(0.0400)	(0.0401)
Child age in months	0.00819**	-8.75e-05	0.00847**	0.00851**	0.00849**
	(0.00379)	(0.000327)	(0.00380)	(0.00380)	(0.00380)
Child age squared	-0.373***	-0.00564	-0.377***	-0.386***	-0.383***
	(0.116)	(0.0101)	(0.117)	(0.117)	(0.117)
Twin birth	0.359***	-0.00246	0.360***	0.356***	0.347***
	(0.105)	(0.0110)	(0.105)	(0.106)	(0.106)
Birth order number	0.0221	-0.0119***	0.0288	0.0211	0.0210
	(0.0164)	(0.00142)	(0.0177)	(0.0177)	(0.0177)
Woman's age in years	0.00832	0.00628***	0.00492	0.00820	0.00787
	(0.0226)	(0.00203)	(0.0230)	(0.0231)	(0.0231)
Woman's age squared	-0.00247	-0.000494	-0.00224	-0.00245	-0.00235
	(0.00371)	(0.000334)	(0.00373)	(0.00373)	(0.00373)
Education Level (Reference Category=None					
Primary	0.245***	0.0966***	0.180**	0.175**	0.189**
	(0.0608)	(0.00520)	(0.0841)	(0.0838)	(0.0840)
Secondary	0.447***	0.149***	0.359***	0.356***	0.376***
	(0.0810)	(0.00672)	(0.117)	(0.117)	(0.117)
Post-secondary	0.457***	0.214***	0.346**	0.363**	0.386**
	(0.134)	(0.0128)	(0.176)	(0.176)	(0.176)
Employment status	-0.0504	0.00593	-0.0523	-0.0535	-0.0522
	(0.0561)	(0.00487)	(0.0565)	(0.0565)	(0.0565)
Area of residence	0.121**	0.0673***	0.0647	0.105	0.106
	(0.0486)	(0.00547)	(0.0715)	(0.0733)	(0.0742)
Household size	0.00582	0.00199**	0.00649	0.00846	0.00720
	(0.0103)	(0.000961)	(0.0103)	(0.0104)	(0.0104)
Sex of household head	-0.00293	0.00499	-0.0104	-0.00902	-0.00871
	(0.0451)	(0.00390)	(0.0456)	(0.0456)	(0.0456)
Age of household head in years	-0.00676	0.00188**	-0.00886	-0.00791	-0.00784
	(0.0103)	(0.000833)	(0.0104)	(0.0103)	(0.0104)
Household head age squared	0.000374	-0.000189**	0.000577	0.000478	0.000490
	(0.00109)	(8.74e-05)	(0.00109)	(0.00108)	(0.00109)

Wealth Index	0.728***		1.209**	1.103**	1.029**
	(0.202)		(0.504)	(0.506)	(0.508)
Instrumental Variables					
Log of distance to water source	…….	-0.0165***	……..	…….	……..
		(0.00111)			
Log of distance to the nearest market	……	-0.0320***	……..	…….	……..
		(0.00199)			
Wealth index residual	……...	……	-0.544	1.231	1.200
			(0.542)	(0.792)	(0.884)
Wealth index*residual	……...	……...	……..	-3.820***	-3.623***
				(1.151)	(1.365)
Primary education*wealth residual	……..	……...	……..	……..	-0.664
					(0.587)
Secondary education*wealth residual	……..	……..	……...	…….	-0.348
					(0.738)
Post-secondary education*wealth residual	……..	…….	……..	…….	-1.510
					(1.060)
Area of residence*wealth residual	……..	…….	…….	…….	0.146
					(0.480)
Sex of household head*wealth residual	…….	…….	…….	…….	0.666
					(0.475)
Constant	2.354***	0.233***	2.347***	2.331***	2.348***
	(0.377)	(0.0347)	(0.378)	(0.378)	(0.379)
Observations	2,879	2,883	2,856	2,856	2,856
R-squared	0.057	0.586	0.058	0.062	0.063
Tests for excluded instruments					
Underidentification test ($\chi2(2) = 451.5$, $p < 0.0000$); Wald F statistic=F(2, 2837)=266.35; p=0.0000; Sargan Statistic ($\chi2$ (1)=1.093; p=0.2958					

*Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1*

Source: Author's computation KDHS, 2014

3.4.5 Discussion

This study developed a quality of healthcare composite index based on WHO's recommended household level interventions that could prevent childhood diarrheal illnesses and reduce morbidity upon observation of diarrhea symptoms among the under-five. The developed consumer quality of healthcare composite index was able to explain 75% of the variation of the demand side quality of healthcare. ORS, zinc supplementation and amounts of food and drinks offered upon experiencing diarrheal symptoms were strongly correlated with the factors with the highest variation, indicating the importance of these factors in management of diarrhea among the under-five. This finding resonates with existing knowledge on interventions that could alleviate diarrhea symptoms among children (WHO, 2013; WHO, 2004).

Higher quality of healthcare was reported among older children. This is contrary to our expectation and with other studies that find a negative association between a child's age and components of quality of healthcare measure. Timely health seeking behavior has been reported for younger children (Lungu et al., 2020; Klootwijk et al., 2019; Abegaz et al., 2019; Dagnew, 2018; Omore et al., 2013; Ogunlesi, and Olanrewaju, 2010; Taffa and Chepngeno, 2005). The finding also differs with studies on optimal breastfeeding practices (Tadesse et al., 2019; Bhandari et al., 2019; Adugna et al., 2017; Agho et al., 2011). However, in line with our study, proper disposal of child faeces has been reported among older children (Bauza et al., 2019; Irianti and Prasetyoputra, 2018; Islam, 2018; Azage and Haile, 2015). Our finding could be explained by the belief that infants should only be breastfed and not introduced to other fluids including ORS (Gao et al., 2013). Since mothers are likely to resort to healthcare facilities for management of ill infants (Lungu et al., 2020), it is also likely that the alternative for much older children is to provide quality healthcare

at home. The u-shaped effect of the child's age on quality of healthcare indicates a likelihood of lower quality of care among much older children.

The positive effect of the twin variable on quality of healthcare could perhaps be as a result of the well-known health risks (Rahman and Hug, 2009) and developmental problems such as low birthweight, usually associated with children of multiple births (Kabubo-Mariara, 2008). With this knowledge, caretakers are likely to provide quality healthcare for children of multiple births.

The significant positive association between socioeconomic indicators and quality of healthcare is common in existing research studies focusing on different components of the composite index. It is documented that mothers with higher education level implement recommended breastfeeding practices (Noh et al., 2019; Tambe et al., 2018; Habibi et al., 2018; Atimati and Adam, 2018; Kimani-Murage et al., 2011 and Heck et al., 2006) and proper child waste disposal practices (Majorin et al., 2019; Preeti et al., 2016; Azage and Haile, 2015; KNBS and ICF Macro; 2010). They also seek appropriate and timely healthcare (Wambui et al., 2018; Mahejabeen et al., 2015; Omore et al., 2013; Page et al., 2013; Ogunlesi, and Olanrewaju, 2010; Ndugwa and Zulu, 2008, Kosimbei, 2005) and comply with preventive advice and treatment regime (Basheti et al., 2016; Whittle et al., 2016; Kilgore et al., 2016; Kirkman et al., 2015; Peltzer and Pengpid, 2013). The positive effect of education on quality of healthcare composite index is linked to better knowledge on health problems and a higher understanding of the need to invest in a child's health.

We established that higher wealth index is related to better quality of healthcare. This observation is confirmed by existing studies that document the effect of income on different components of the consumer quality measure. Higher income and socioeconomic status are associated with

prompt health seeking behavior (Mahejabeen et al., 2015; Alex-Hart et al., 2014). This variable was also a significant factor in influencing other health investment behaviors including good breastfeeding habits (Habibi et al., 2018; Tambe et al., 2018; Ogbo et al., 2015) and good sanitation practices (Majorin et al., 2019; Sahiledengle, 2019; Aliyu and Dahiru, 2019; Mohd and Malik, 2017; Preeti et al., 2016; Azage and Haile, 2015). Higher wealth index implies higher income levels and therefore ability to afford better healthcare when needed. It also points to higher living standards which call for behaviors that reflect such standards including good sanitation practices.

3.4.6 Summary, Conclusions and Recommendations

This chapter sought to address the second objective of this thesis. The study first sought to develop a consumer related quality of healthcare measure. The consumer quality of healthcare measure is an innovatively developed composite index from indicators that reflect healthcare consumer preventive behaviors (implementation of recommended breastfeeding practices and proper disposal of a child's stools), prompt health seeking behavior upon observation of diarrhea symptoms among the under-five and implementation of simple household level recommended interventions during diarrheal episode. This being an attempt to measure quality of healthcare outside of health facilities walls, is expected to elicit discussions on measurement and improvement of quality of healthcare at the demand side of the healthcare market. By combining the healthcare quality indicators in different health care dimensions into an integrated measure, the index might allow policymakers and healthcare researchers to scrutinize households with low quality of healthcare scores.

The study then examined the determinants of the developed consumer quality of healthcare index. Overall, household level provision of quality healthcare for the under-five Kenyan children is sub-

optimal. Based on a linear regression model, it was established that a child's characteristics (age and twin status) and maternal socio-economic indicators namely, education level and wealth index were significant factors in influencing consumer quality of healthcare index score. The positive effect of a household's economic status and maternal education level persists even with the holistic perspective of household level quality of healthcare. However, accounting for unobserved heterogeneity increases the magnitude of the effect of economic status. The stability of the obtained results not only assures policy makers of robustness of the developed composite index but also strengthens the call for an integrated approach to management of common childhood illnesses.

From the foregoing, we recommend that there is need to enhance awareness campaigns on the importance of first, preventing occurrence of diarrheal symptom through implementation of simple preventive behaviors and timely health seeking upon observation of illness symptoms which should in turn be accompanied by compliance with treatment advice and implementation of simple recommended interventions at the household level. Preventive and appropriate health seeking behaviors should be enhanced through awareness campaigns and education. Healthcare providers should advice patients on importance of compliance with treatment and undertaking simple interventions like giving more fluids during diarrheal episodes. The media should be utilised in reaching families including the less educated so as to enhance implementation of these simple interventions at the household level.

The Free Primary Education policy and the recently introduced Free Secondary Education should be sustained so as to ensure that more mothers attain higher levels of education in future and hence boost consumer quality of healthcare. On the same note, the affirmative action on the vulnerable

groups should be fully implemented and monitored to ensure that women benefit from the programme hence leading to improved livelihood among these women.

CHAPTER 4

EFFECT OF SYNERGY BETWEEN PROVIDER AND CONSUMER QUALITY OF HEALTHCARE ON CHILD HEALTH

4.1 Introduction and Motivation

Quality is recognised as a key driver for improved population health outcomes in developing countries (WHO, 2007). While efforts to meet Millennium Development Goals (MDGs) led to a notable increase in coverage of healthcare services including maternal and child services (Leslie et al., 2017), it is opined that increased access to healthcare is insufficient where care is of poor quality (Leslie et al., 2017; Peabody et al, 2006). It is perhaps against this understanding that access to quality essential healthcare services is indicated as one of the targets towards achievement of the health-related Sustainable Development Goal (SDG)-goal 3, on ensuring healthy lives and promoting well-being for all at all ages (Akachi and Kruk, 2017; UN General Assembly, 2015; LCSDSN, 2015).

The link between provider quality of healthcare and demand for healthcare is well documented in the literature with empirical studies demonstrating a negative relationship between poor provider quality and healthcare utilisation (Wellay et al., 2018; Gage et al., 2018; Karim et al., 2015; Aggrey and Appiah, 2014; Fotso and Mukiira, 2012; Munga, 2008; Chawla and Pellis, 2000). Empirical evidence also points to an association between higher provider quality of healthcare and better health outcome indicators (Houck et al., 2004; Battleman et al., 2002; Gleason et al., 1999, Meehan et al., 1997; Lavy, 1996; Frakenberg, 1995). These studies largely focus on assessment of effect of supply side quality of healthcare including availability of infrastructure, medical services, medical equipment and drugs on health outcomes. While still concentrating on the supply side,

other empirical studies assess effect of health worker actions in the process of treatment on health outcomes (Houck et al., 2004; Mariko, 2003; Meehan et al., 1997).

At the household level, that is, the demand side, most empirical studies examine health seeking behaviours and not healthcare user's quality of care *per se.* Some actions at this level including timeliness in seeking healthcare and provision of appropriate care at home during illness episodes, to the extent that their undertaking contribute to improvement in health could be defined as quality healthcare (WHO, 2006; Donabedian, 1988). The link between such actions and health outcomes is extensively examined in existing literature. Studies for instance have shown that delay in seeking healthcare upon observation of illness symptoms results in worse health outcomes (Spivak, 2018; Gebreegziabher, Bjune and Yimer, 2016; Kraft et al., 2009). Empirical studies have also established that preventive behaviours (Dwivedi et al., 2018; Bauza and Guest, 2017; Bawankule, 2017) and implementation of recommended simple interventions (Munos, et al., 2010; Brown et al., 1995) at the household level have an influence on health outcomes.

Existing quality of healthcare related empirical studies seem to be focussing on separate effects of supply side and demand side measures of quality on health outcomes. Yet, healthcare services, just like other services including education, banking and security are co-produced (Batalden et al., 2015). The concept of co-production entails involvement of service users in the process of service provision (Realpe and Wallace, 2010). Co-production questions the impression of a passive customer and suggests a situation where the service provider and user play equivalently active roles in service delivery (Realpe and Wallace, 2010). In view of this, current medical models identify the role of healthcare patients/consumers as co-producers in the course of healthcare service provision, mainly through their decisions on when to seek care, engagement in self-care

and adherence to treatment regime (Batalden, et al., 2015; Hibbard, 2003). Bitner et al., (1996) categorises this form of consumer participation as a 'high level of participation' since the consumers are involved in co-creating the service, failure to which the service outcome is affected.

Fundamentally, success in production of health outcomes requires not only the effort of healthcare professionals such as doctors but also calls for patients to take actions. For common childhood infectious diseases in particular, adherence to illness diagnosis and treatment guidelines by health professionals at the facility level and concurrent appropriate care at the household level are necessary for achievement of better health outcomes. Childhood diarrhoea episode for instance, requires both the expertise of professionals in illness diagnosis and case management as well as implementation of recommended family practices such as increased fluids and food intake, continued breastfeeding and correct use of modern medicine (WHO, 2005). Kenya's healthcare system takes cognisance of the need for provider-community partnerships in improving overall population health outcomes (Ministry of Health, 2020). Hence the country's adoption of the Integrated Management of Childhood Illnesses (IMCI) strategy whose areas of focus entail: improvement of health worker case management skills; strengthening the health systems for service delivery; and enhancing family and community involvement through implementation of recommended preventive and health promotion practices (WHO, 2004).

Provider-patient interaction in the process of healthcare provision is a cornerstone for quality of healthcare improvement and consequently translates to better health outcomes (Hibbard, 2003). Nonetheless, the subject of numerous studies on quality of healthcare (Muriithi, 2013; Lavy, 1996; Lavy and Germain, 1994; Mwabu et al., 1993) does not appreciate the importance of co-production of quality of healthcare between healthcare suppliers and healthcare users in improving health

outcomes. Yet, interventions are complimentary in nature in that delivery of quality healthcare at the facility level during an illness episode should go hand in hand with provision of quality healthcare at the family level. We thus hypothesize that partnership in co-creation of quality healthcare between providers and consumers in the process of healthcare service delivery is likely to improve child health outcomes.

No study to the best of our knowledge seeks to explore the synergistic health effects of provider and consumer quality of healthcare on health outcomes thus creating a knowledge gap in existing quality of healthcare studies. A unique focus of this study therefore, is that it seeks to investigate the effect of combined effort between supply side and demand side on health outcomes in Kenya by interacting provider and consumer quality of healthcare measures. To achieve this, we first model theoretically the interaction effect of facility level and family/household quality of healthcare on health outcomes. Based on the theoretical model, empirical evidence on effect of interaction between healthcare provider and consumer quality of healthcare on child health is then presented.

4.2 Literature Review

4.2.1 Theoretical Foundations

While healthcare is a commodity that exists in the market, it is an unusual commodity in that it exhibits unique characteristics. Largely, health/medical care belongs to a class of commodities for which the product, that is, treatment and the activity of production are identical (Arrow, 1963). Consequently, the customer cannot test the quality of the product before consuming it and only

relies on the doctor's advice which is acknowledged by the patient on the basis of degree of trust (Mankiw, 2017).

The healthcare market is also characterised by information asymmetry problem. Usually, the asymmetry is double-sided since on the one hand, the healthcare provider is well-versed about his or her own treatment effort, of which the patient is ill-informed. The consumer of healthcare on the other hand is knowledgeable about his or her treatment compliance effort, but the providers are ignorant of the same (Mwabu, 2007). The implication of this informational advantage is that there may be the problem of moral hazard in which case the party with more information has an incentive to act inappropriately. For instance, the patient's inability to assess the doctor's effort and actions may lead to the moral hazard problem (Hwa, 2005; Leonard and Leonard, 1998).

The foregoing characteristics of healthcare market point to the underlying reasons why the provider-patient relationship is sometimes cited as a classic example of the agency model in health economics (Stavropoulou, 2012; Smith and Wright, 1994; Hwa, 2005). In this case, the patient (principal) sets objectives and the doctor (agent) takes an action such as medical decision on the behalf of the principal (Newman and Newman, 2007; Hwa, 2005). The general outline of the principal-agent model in the healthcare market is that both the principal and agent seek to maximize their expected utility. Unlike in the standard agency theory, their utility functions are interdependent (Mooney and Ryan, 1993). Recent economic theory developments place great weight on the informed consumers who are capable of making decisions about the goods and services they purchase (Vick and Scott, 1988).

In a seminal paper entitled, *A Theory of the Allocation of Time*, Becker (1965) proposed the theoretical foundation for the study of health production. In this model, a household is assumed to produce and consume a vector of commodities which are associated with different activities undertaken by the household including leisure, from which utility is derived. The household maximizes utility subject to the budget constraint and time. Based on Becker's model, Grossman (1972) modelled a household health production function, where households combine various inputs (purchased goods and services and knowledge) and their time to produce health. In this model, the demand for goods and services as well as behaviors that affect health is derived demand for good health since inputs such as goods, services and behaviors that influence health are not valued in themselves, but rather because they influence health.

Grossman (1972) further observes that the stock of health is valued as a consumption commodity and also as an investment commodity. As a consumption commodity, health enters utility function directly since people receive satisfaction from being healthy. As an investment commodity, health determines the time available for market and non-market activities and affects the length of one's lifetime. The stock of health depreciates with age but can be enhanced by investing in health for example by exercising, eating a nutritious diet and seeking medical care.

Rosenzweig and Shultz (1983) model the behavior of mothers as inputs in the production of child health. In this model, they first illustrate the need to examine jointly the demand for health production inputs or parental behavior. They then demonstrate the relationship between behavioral inputs and output which is the newborn's heath production function. The model embeds health production function in a utility maximizing framework and distinguishes among the various goods that affect the utility function. The goods can be categorized into those that: do not directly affect

the child health but are demanded for their own benefits; affect child health but are not demanded for direct utility they provide; and augment both parental satisfaction directly and also affect child health outcomes that indirectly affect parent utility.

Observing the failure of the earlier theoretical frameworks to incorporate quality of care, Lavy and Germain (1994) model theoretically the utility maximization model as a function of individual's health, quality of care and other consumption goods. In this model, individuals choose between a finite number of alternatives which include self-treatment and treatment by various healthcare providers. Each healthcare provider offers an anticipated improvement in health for a specific price. From this view, there exists a household production function conditional on the quality of provider and on the characteristics of the household.

The aim of healthcare systems is improved health outcomes, equity and consumer welfare (Berman 1989). Existing frameworks model heath production functions with the aim of understanding the role of various heath inputs in achieving these desires. The health production function postulated in Grossman (1972) assumes that in order to produce health, households combine inputs such as medical care, services, knowledge and time. Rosenzweig and Shultz (1983) modeled a child health production function embedded in a utility function where the production function depends on the child's health status, health related goods and health neutral goods. Mwabu (2007) adopts the approach by Rosenzweig and Shultz (1983) and develops a health production function for low-income countries. A common feature in these models is that they adopt a Cobb-Douglas production function, since they relate inputs to the production of healthcare at the household or individual level thus assuming substitutability of inputs.

Still, models incorporating the supply side inputs, for instance, the role of healthcare providers in improving health outcomes (Lavy and Germain, 1994) fail to suggest complementarity between the inputs and more specifically the interdependency between the supply and demand side in production of health outcomes. In other words, the existing frameworks and their applications, while separately showing the importance of the demand side factors for instance individual and household health seeking behaviors and the supply side factors including among others, availability of health care services together with the possible interactions within these divisions (Mwabu 2007; Fuchs,1982), the models fail to model the synergy between the demand side and the supply side in contributing to improved health outcomes.

Yet, central to health outcomes is the simple interaction between healthcare users and providers, where the demand for a service is met by the provision of that service (Berman, 1999). Moreover, even when there is sufficient supply of healthcare, the consumers must respond positively to this supply for the whole process of improving health outcomes to be successful. The feature is completely ignored in the existing health production models hence an attempt by this thesis to model the provider and consumer interaction in production of health.

To assess the interaction effect of provider and consumer quality of healthcare on child health outcomes, this study is based on the child health production function as suggested by Rosenzweig and Shultz (1983) and on the health production function for low income countries put forth by Mwabu (2007). Following the steps by Lavy and Germain (1994), we modify the existing health production functions to include the interaction between the healthcare provider and consumer quality features.

4.2.2 Empirical Literature

This section reviews empirical evidence on effect of various provider (both facility and healthcare worker) quality of healthcare indicators on demand for healthcare services and health outcomes. Employing Donabedian's (1988) model of quality of healthcare assessment, these indicators are mostly structural and process quality measures. Studies on patient's perception of provider structure and process quality of healthcare measures and their consequent health seeking behaviors are also reviewed in this section. Given that quality healthcare could also be implemented at the household level (Donabedian, 1988), we conduct a review of effect of selected simple interventions at this level on health outcomes. A summary of the reviewed studies is presented in Table 4.1.

4.2.2.1 Effect of Provider Quality of Healthcare on Healthcare Demand

Structural quality indicators

There is ample evidence that better structural quality measures are linked to increased utilization of healthcare. Structural measures including availability of physical infrastructure, stock of medical supplies, staff, refrigeration units, laboratory and electricity are found to result in increased demand for healthcare (Jung and Kim., 2020; Liu et al., 2019; Gage et al., 2018; Muriithi, 2013; Mariko, 2003; Acharya and Cleland, 2000; Mwabu et al., 1993). These variables had an effect on utilization of healthcare even when they are combined into a composite index (Jung and Kim., 2020; Liu et al., 2019; Gage et al., 2018; Acharya and Cleland, 2000).

Process quality Indicators

In addition, the effect of process indicators of quality of healthcare such as waiting time, doctor-patient consultation time, implementation of various stages of consultation and adherence to

treatment guidelines, on healthcare utilization patterns has been a subject of several empirical studies. The results of a number of these studies point to increased healthcare utilization with better processes of healthcare. Lépine and Nestour (2013) established that quality of healthcare indicators such as healthcare provider medical competence increased probability of utilizing healthcare. Mariko, (2003) observe that an improvement of process of care quality indicators increased the use of healthcare facilities.

Gage et al., (2018) note that utilization of primary healthcare was correlated with service delivery quality indicators especially in rural areas. However, the effect was not significant for utilization of child care due to caregiver's decision to seek healthcare from the nearest facility regardless of quality when the child needs urgent attention. Liu et al., (2019) also report the non-significant relationship between facility quality of healthcare and utilization of healthcare for children. The explanation behind this was the problem of information asymmetry where patients do have adequate information about what constitutes clinical processes.

Perceived Quality of Healthcare

Patient's perception and their expectations of quality of healthcare has been associated with healthcare utilization behaviour. Asteraye (2002) found that perception of quality of treatment as good attracted patients to private healthcare facilities. Audo et al., (2005) reported that perceived quality by households led to a tendency to utilize the District and Provincial hospitals more than the municipal facilities for child and maternal healthcare. Wellay et al., (2018) established that the likelihood of opting for public and private healthcare facility was higher in relation to self-treatment. A similar conclusion is reported in a number of other empirical studies which indicate

higher demand for healthcare among facilities with higher quality ratings (Gage et al., 2018; Karim et al., 2015; Aggrey and Appiah, 2014; Fotso and Mukiira, 2012; Munga, 2008; Sahn et al., 2003).

Patient's perception of provider quality of healthcare has been associated with the phenomena of bypassing a healthcare facility to an alternative source even in instances where provision of services was costly (Karim et al., 2014; Aggrey and Appiah, 2014). This behavior is observed in a number of empirical studies on utilization of healthcare services. Akin and Hutchinson (1999) noted that there was a tendency for the severely ill to bypass and travel further due to non-availability of structural measures of quality of health care. These include drugs, good appearance/ condition of the health facility, more working hours per week, beds, presence of a "Western doctor" as well as more non-medical personnel in the bypassed facility.

Leonard et al., (2003) established that individuals seek healthcare from facilities that offer high quality consultations and prescriptions, are well stocked with essential supplies and have more knowledgeable medical personnel but bypass those that use injections repeatedly or overprescribe medication. Kahabuka, (2011) noted the element of bypassing behavior among caretakers of the under-five children due to poor quality as indicated by unavailability of drugs and diagnostic facilities, lack of skilled workers and generally poor services.

4.2.2.2 Effect of Provider Structure and process Quality of Healthcare on Health Outcomes

The link between healthcare quality and health outcomes is well documented in existing literature. In their estimation, Chou et al., (2020) conclude that Low- and Middle-Income Countries (LMICs) could save 0.67 million neonatal lives and avert 0.52 million still births with address of structure and process quality of care. Kruk et al., (2018) note that poor quality could contribute to about two

thirds of amenable deaths including: cardiovascular mortality and deaths from some infectious diseases.

Meehan et al., (1997), assessed the effect of quality of healthcare on mortality among elderly patients hospitalized with pneumonia while focusing on processes of care including time to diagnostic tests and initiation of treatment. The results show that there was a significant negative relationship between mortality and these processes, that is, non-initiation of antibiotics and blood culture within twenty-four hours of hospital arrival led pneumonia fatalities. Several other studies document similar relationship between processes of care and patient morbidity and/ mortality (Houck et al., 2004; Battleman, et al., 2002).

A few other studies with a focus on child health report mixed results on the effect of provider quality of healthcare. Frankenberg (1995) established that structural quality of care indicators decreased the chances of infant mortality by 15 per cent. In particular, an increase in doctors decreased an infant's odds of dying. However, the effect of an additional health worker increased the odds of infant mortality, an observation explained by the fact that health workers are widely available and increasing the numbers does not increase access to their services.

Lavy (1996) examined the effect of quality of healthcare as measured by availability of child health services and essential drugs as well as public infrastructure on child survival and health in Ghana and concludes that the effect of these factors was positive and significant. Health facility characteristics for instance availability of more doctors was positively associated with child height for age but not with weight for height. Facilities with more nurses and support staff were positively associated with shorter children. Other facility characteristics including availability of

immunization services and drug supplies had a positive effect on a child's nutritional status. Alderman and Lavy (1996) observe that while longer distance to health facility and waiting time for a service has a negative effect on utilization of healthcare, the effect on child health was less clear and only depended on the level of education or income.

4.2.2.3 Effect of Household Level Simple Interventions on Health Outcomes

Breastfeeding practices

Health seeking behaviors can reflect quality aspects at the household level. This is because households have a responsibility of undertaking preventive behaviors, identifying illness symptoms, initiating first contact with healthcare provider in a timely manner and implementing recommended treatment regime which in turn would have an impact on health outcomes. Existing empirical literature documents the effect of these household interventions on health outcomes.

Preventive behaviors at the household level have been associated with better health outcomes. One such preventive behavior that is linked to better child health is breastfeeding as per health experts' recommendations. Empirical studies have indicated that undertaking recommended breastfeeding practices reduces the risk of infections and childhood illnesses as a result of improved immunity (Nigatu et al., 2019; Naser et al., 2019; Khan and Islam, 2017; Ehlayel et al., 2009; Diallo et al., 2009).

Implementation of recommended breastfeeding practices was also associated with improved child nutritional status (Pattison et al., 2019; Grube et al., 2015; Kuchenbecker et al., 2014; Muchina and Wiathaka, 2010). However, the effect was not significant in some studies (Khan and Islam,

2017) perhaps due to inappropriate feeding including untimely introduction of complimentary foods (Ayisi and Wakoli, 2014; Brown et al., 1995). Still, other studies conclude that optimal breastfeeding practice enhances: child cognitive development (Jedrychowski et al., 2011; Quinn et al., 2001) and motor development (Belfield and Kelly, 2012; Dewey et al., 2001).

Sanitation Practices

Numerous studies demonstrate that there is a link between Water, sanitation and hygiene (WASH) practices on health outcomes. Evidences on the health impact of improvements in one or more of these three components indicate that there were reduced rates of morbidity and better nutritional status particularly among children, in developing countries (Merchant et al., 2003; Esray et al., 1991). Focusing on sanitation component (one of the components in the developed consumer quality of healthcare index), existing studies indicate that proper sanitation practices are associated with various health outcomes including better child health. Cronin et al., (2016) conclude that unsafe disposal of child excreta was related to higher odds of diarrhea among the children. A similar finding is reported as well in other empirical studies (Usman et al., 2019; Bawankule et al., 2017; Aziz et al., 1990).

Further, some studies investigating interlinkage between proper child faeces disposal and improved child nutritional status suggest that these variables have a positive relationship. Bauza and Guest (2017) established that safe disposal of child faeces reduced stunting incidences and increased height for age. Still, Dwivedi et al., (2018) revealed that unsafe stool disposal was associated with stunting as well under-five mortality. Other studies however report mixed (Morita et al., 2016) or non-significant relationship between unsafe child feacal disposal and diarrhea, probably due to already existing good sanitation habits among the caregivers (Islam et al., 2018)

Prompt Health Seeking Behavior

The effect of early recognition of illness symptoms and consequent appropriate and timely health seeking behaviors on health indicators is well documented in existing literature, with majority of empirical studies associating worse health outcomes to delays in seeking care. Källand**e**r et al., (2008) revealed that fatal pneumonia illnesses in Uganda was as a result of late arrival of sick children to a health facility. Kraft et al., (2009) established that delay in seeking healthcare increased the chance that a child would be wasted or have positive C-Reactive Protein by 4.6 percent and 11.2 percent respectively. A similarly observation is made among adults where delay in seeking medical services was associated with poor health indicators such as blood pressure and metabolic abnormalities (Spivak et al., 2018) and unfavourable tuberculosis treatment outcome (Gebreegziabher et al., 2016).

Simple diarrhea case management Interventions

The beneficial health effects of implementation of simple recommended interventions for treatment of diarrheal symptoms are documented in existing literature. Oral rehydration therapies and zinc supplementation are among these interventions. Studies have shown that zinc supplementation on observation of diarrheal symptoms decreases the duration and severity of diarrhea (Yakoob et al., 2011; Brown et al., 2009). Munos et al., (2010) concluded that ORS was likely to avert diarrhea deaths by 93 per cent.

Table 4. 1: A summary of Empirical Studies on the Effect of Quality of Healthcare on Health Outcomes

Study objective/country of study/sample	Quality of Healthcare Measure	Indicators of quality of healthcare	Impact/effect on health demand and outcomes	Remarks
Determinants of health seeking behavior Effect of provider quality of healthcare on health outcomes Studies conducted in Mali[3], Nepal[4,] Haiti[5], Malawi[6,10]; Kenya [2, 11],	Structure Quality of healthcare indicators	Quality of health composite index/ physical infrastructure composite index/score [2, 4, 5, 6,10] Medical drugs[3, 4, 5] Equipment[5] Staffing and Staff training[3,4, 11] Physical infrastructure (water, electricity, ambulance, laboratory, waiting room, examination room, toilet facilities) [3, 4, 10,11]	Higher structural quality of healthcare increases the use of healthcare services[11] including child health services [4,10]	Availability of physical inputs enhances utilization of health services which in turn is expected to improve health outcomes.
Determinants of healthcare utilization; demand for health Studies conducted in Mali[3,] Haiti[5], Malawi[6]	Process quality of healthcare indicators	Process quality of healthcare index [5, 6,10] Patient-doctor consultation time[3] Stages of consultation[3] Timeliness[5] Patient-Centered care[5] Provider competence[5,11]	Process indicators of quality healthcare indicators led to an increase in use of healthcare facilities including both private and public health facilities[3,] primary healthcare[5] Process quality of healthcare did not have a significant effect on child healthcare utilisation[5,6]	Mixed results; improvements in processes of care is associated with utilization of healthcare and a non-significant effect on utilization of healthcare is reported, particularly in child healthcare utilization.

Study objective/country of study/sample	Quality of Healthcare Measure	Indicators of quality of healthcare	Impact/effect on health demand and outcomes	Remarks
Determinants of demand for healthcare Studies were conducted in Ethiopia[1,7,] Kenya[8], Sri Lanka [13]; Tanzania[9,14,15]	Perceived quality of healthcare	Perceived quality of healthcare in terms of infrastructure and processes of care[1,7,8]	Higher perceived quality of healthcare ratings was associated with increased demand for healthcare services (utilization of healthcare)[1,7,8,9]	Perceived quality of healthcare determines healthcare facility choice. This informs the use of health facility visited as a proxy for quality where measures of quality of healthcare are not available.
	Bypassing phenomena	Bypassing behavior in healthcare demand[13, 14, 15]	Sub-optimal structure[13, 14, 15] and process quality[14] of healthcare is associated with bypassing behavior	
Effect of provider quality of healthcare on health outcomes Studies conducted in USA[18,20] Phillipines[19], Indonesia[21], Ghana[22] Study samples included LMICs[16,17] health facilities[18], patients[19,20]	Structure and process quality of healthcare	Health systems Quality of healthcare[16,17] Time to initiation of treatment[18,19] Appropriate antibiotic selection[20] Staffing[21,22] Essential drugs[21] Waiting time[23]	Poor quality health systems result in high estimated high mortality in LMICs[16,17] Poor quality processes were associated with morbidity and/or mortality[19,20] Good structure quality of healthcare indicators was associated with better child health outcomes[21,22]although the effect was not clear in other instances[23]	Few studies investigate effect of quality of healthcare indicators on child health. The effect of quality of healthcare indicators on child health outcomes is mixed Measurement of quality of healthcare is facility focused. There is need to investigate combined effect of facility and household quality of healthcare on child health
Effect of Breastfeeding on child health outcomes and Child development Studies conducted in Ethiopia[24]; Bangladesh[25]; Malawi[26]; Guinea[27]; Palestine[28]; Qatar[29]; Kenya[30]; US[31, 32]; Germany[33]; Poland[34]; Honduras[35]	Breastfeeding practices	Optimal breastfeeding practices Exclusive breastfeeding[24,25]; Breastfeeding initiation[31] Duration of breastfeeding[31,32]	Exclusive breastfeeding has protective effects against Childhood illnesses (diarrhoea, respiratory infection, gastrointestinal infections, otitis media)[25,25,27,28,29]	Preventive behaviors could alleviate childhood illnesses hence a quality of healthcare indicator at the household level. The studies ignore the possibility of an interaction between such quality of healthcare indicators that indicators produced at the

Study objective/country of study/sample	Quality of Healthcare Measure	Indicators of quality of healthcare	Impact/effect on health demand and outcomes	Remarks
Study Sample: -children under 6 months[24,25,26, 27]; age 1 to 5 years[29]; 1-3[31] Cohort of term infants [32,35]			Sub-optimal breastfeeding resulted in poor child nutritional status[24,26,30,33] Duration of breastfeeding was associates with child cognitive development[32, 34]; motor development[35]	household level and provider quality of healthcare on health. The results on the effect of sanitation practices on child health are mixed[43]
Effect of sanitation practices on child health Indonesia[36]; Ethiopia[37]; India[38]; Peru[39] Study sample includes: under 24 months children[36]; under five[37,41]; Households[40]	Sanitation Practices	Proper (safe) child feacal disposal[36,37,38, 40]	Unsafe child waste disposal increases chances of childhood illnesses[36,37,38] Proper children faeces disposal was associated with improved child nutritional status[40,41] and lower mortality[41] There was no association between proper sanitation practices and diarrheal occurrence[42]	
Studies conducted in Philipines[44] Uganda[45] The study sample was largely under five children[44,45]	Prompt health seeking behavior	More than 2 days before admission[44]	Delays in seeking appropriate healthcare results in poor child health outcomes including child deaths[45] and poor nutritional status[44] Delay in seeking healthcare is also associated with poor health among adults[45,46]	Consumer actions in the treatment process affects health outcomes. This implies that poor quality of healthcare at the household level also results in poor health outcomes. Studies ignore the synergistic effect of consumer and provider process quality

Study objective/country of study/sample	Quality of Healthcare Measure	Indicators of quality of healthcare	Impact/effect on health demand and outcomes	Remarks
Preventive zinc supplementation System review studies[47,48,49]	Simple diarrhea case management Interventions	Zinc Supplementation[47,48] ORS	Zinc supplementation lowers diarrhea incidence[47,48] ORS prevents diarrhea deaths[49]	indicators on child health outcomes

Asteraye, 2002=1; Muriithi, 2013=2; Mariko, 2003=3; Acharya and Cleland, 2000=4; Gage et al., 2018=5; Liu et al., 2019=6; Wellay et al., 2018=7; Audo et al., 2005=8; Sahn et al., 2003=9; Jung and Kim, 2020=10; Muriithi, 2013=11; Lépine and Nestour, 2013=12; Akin J. and Hutchinson, 1999=13; Leonard et al., 2003=14, Kahabuka, 2011=15; Chou et al., 2020=16; Kruk et al., 2018=17; Meehan et al., 1997=18; Houck et al., 2004=19; Battleman et al., 2002=20; Frankenberg, 1995=21; Lavy, 1995=22; Alderman and Lavy, 1996=23; Nigatu et al., 2015=24; Khan and Islam, 2017=25; Kuchenbecker et al., 2014=26; Diallo et al., 2009=27; Naser et al., 2019=28; Ehlayel et al., 2009=29; Muchina and Waithaka, 2010=30; Pattison et al., 2019=31; Belfield and Kelly, 2012=32; Grube et al., 2015=33; Jedrychowski et al., 2011=34; Dewey et al., 2001=35; Cronin et al., 2016=36; Usman et al., 2019=37; Bawankule et al., 2017=38; Gil et al., 2004=39; Bauza and Guest, 2017=40; Dwivedi et al., 2018=41; Islam et al., 2018=42; Morita et al., 2016=43; Kraft et al., 2009=44; Spivak et al., 2018=45; Gebreegziabher et al., 2016=46; Brown et al., 2009=47; Yakoob et al., 2011=48; Munos et al., 2010=49

4.2.2.4 Overview of Literature

Largely, the existing empirical studies on effect of quality of healthcare on health outcomes can be categorized into two strands of literature; the supply side and the demand side-related studies. The first strand relates to studies that seek to investigate the effect of provider quality of healthcare on health outcomes. Mostly, the results of these studies show that good structure and process quality of healthcare indicators are associated with increased utilization of healthcare (Jung and Kim., 2020; Liu et al., 2019; Gage et al., 2018; Muriithi, 2013; Mariko, 2003; Lépine and Nestour, 2003; Acharya and Cleland, 2000; Mwabu et al., 1993). Other empirical studies have attributed patient's perception of provider quality of healthcare to healthcare demand where facilities with higher quality of healthcare ratings were utilized more (Wellay et al., 2018; Gage et al., 2018; Karim et al., 2015; Aggrey and Appiah, 2014; Fotso and Mukiira, 2012; Munga, 2008, Audo et al., 2005; Sahn et al., 2003; Asteraye, 2002). Perceived quality of healthcare has been linked to the phenomena of bypassing behavior by the households when seeking healthcare services (Karim et al., 2014; Aggrey and Appiah, 2014; leonard et al., 2003; Akin and Hutchinson, 1999).

A few other studies in the strand demonstrate the link between provider quality of healthcare and measures of health. The results largely show that improved provider quality of healthcare was associated with higher morbidity and/ mortality (Chou et al., 2020; Kruk et al., 2018; Houck et al., 2004; Battleman, et al., 2002; Gleason et al., 1999; Meehan et al., 1997). Studies with a focus on child health obtained similar results (Lavy, 1997; Frankenberg, 1995), although the effect was less clear in some instances (Alderman and Lavy, 1996).

The second strand of literature relates to the demand side studies which examine the health effect of preventive and treatment actions at the household level. There is ample evidence of the positive effects of preventive behaviors such as proper breastfeeding practices (Nigatu et al., 2019; Naser et al., 2019; Pattison et al., 2019; Khan and Islam, 2017; Grube et al., 2015; Kuchenbecker et al., 2014; Muchina and Wiathaka, 2010; Ehlayel et al., 2009; Diallo et al., 2009) and appropriate sanitation practices (Usman et al., 2019; Bawankule et al., 2017; Cronin et al., 2016; Aziz et al., 1990) on child health outcomes.

Appropriate and timely healthcare seeking behaviour on observation of illness symptoms is documented in numerous studies as having a positive effect on health outcomes (Spivak, 2018; Gebreegziabher, Kraft et al., 2009). Likewise, the positive health effects of compliance with treatment advice through undertaking of simple recommended interventions on health outcomes is well documented. For instance, studies have associated implementation of simple interventions such provision of ORS, continued breastfeeding, provision of more than usual food to take and food to drink with better health outcomes among children suffering from diarrheal episodes (Yakoob et al., 2011; Brown et al., 2009; Munos, et al., Brown et al., 1995).

The two strands of empirical work clearly demonstrate the stand-alone effect of provider and healthcare consumer quality of healthcare indicators on health outcomes. Efficacy in production of health however, requires combined effort between healthcare providers and consumers. In an environment where majority of child deaths is as a result of preventable illnesses, more research is necessary to establish if some form of complementarity between provider and consumer quality of healthcare will improve health outcomes. In recognition of this existing knowledge gap, we seek to bring together the demand and supply side and explore their interactive effect on child

health. Thus, this study adds to existing health production theory and empirical work, first, by adding an interaction term between the supply and demand side quality of healthcare to the health production function and second, by examining the subsequent synergistic effect of the interdependency between quality provision at the facility and household levels on child health outcomes.

4.3 **Methodology**

4.3.1 **Theoretical Framework:**

Economic models propose that health capital production is a function of medical care and an individual's health behavior(s) (Becker, 2007; Grossman, 1972). In this study, the initial structure of the theoretical model resembles the classic models of demand for health where the individual's decisions are based on maximizing utility. Thus, the utility maximization problem is a function of health and consumption of other goods which may or may not have an effect on health but directly affect the utility function (Mwabu 2007; Rosenzweig and Schultz, 1983). Formally, the utility function is expressed in equation (4.1).

$$U = U(C, H) \quad \text{.....(4.1)}$$

Where C is a set of health and non-health related consumption goods and H is health status, in this case, child health status.

Following Lavy and Germain (1994), we introduce a quality of healthcare variable into the health production function. We modify this to include a consumer quality of healthcare measure in addition to provider quality of healthcare. Fundamentally, improvement in health status is an

outcome of an interaction between healthcare providers and consumers in production of quality healthcare which in turn is likely to result in improvement of health outcomes.

As an illustration, provider quality of healthcare indicators among others, availability of health facilities, modern infrastructure, qualified personnel and medicines, while important in improving health outcomes, cannot be effective if a healthcare consumer does not take the initiative to visit the facility in a timely manner or even fails to comply with treatment advice. On the other hand, the latter, would be futile if indicators of provider quality of healthcare are lacking in a health facility.

From the foregoing, there is some form of complementarity in the process of healthcare production between the healthcare supply side and the demand side. This study's theoretical model captures the interdependency between provider and consumer quality of healthcare in production of child health, thus providing a modest insight into quality of healthcare interactions that may be important in health production process. We employ the generalized Leontief production function proposed by Diewert (1971). Under certain circumstances, this production function results in complementarity of inputs. Moreover, the model is flexible and can allow for elasticity of substitution to vary, therefore making it suitable for the case of health production with various possible combinations of inputs and varied outcomes. For instance, a situation may arise in the healthcare market where a timely visit and quality health provision such as trained personnel results in death, while in another instance, a timely and poor quality of healthcare results in better health outcome.

Formally, the child health production function is expressed in equation 4.2.

$$H = H\left(C_H^i, Q_F^i, Q_i, \sqrt{(Q_F^i Q_i)}, \mu\right) \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (4.2)$$

Where: H is as defined in equation 4.1. In this study, we focus on child health status. C_H^i is individual $i's$ health related consumption goods. Q_F^i represents provider F quality of healthcare as observed by individual i and Q_i is individual consumer i quality of healthcare. $\left(\sqrt{(Q_F^i Q_i)}\right)$ describes an interaction between provider F quality of healthcare and consumer i quality of healthcare. μ is the error term which represents a set of unobservable characteristics, for instance genetic traits.

The household faces the budget constraint in equation 4.3.

$$I = P_{cu}C_u + P_Q Q + P_{cH}C_H \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (4.3)$$

Where; I is household income; P_{cu} is price of consumption goods that contribute only to utility, P_Q is the price of quality healthcare Q, a variable denoting provider and/ consumer quality of healthcare measure since we assume that the expenditures for both are incurred by the consumer. The costs may include user fees, travel cost to the facility, waiting time at the facility as well as lost earnings by the households in travelling to the facility and in taking care of the sick. P_{cH} is price of health-related inputs for instance, medical care. The household maximizes equation 4.1 and 4.2 subject to the budget constraint (equation 4.3). Solving the maximization problem yields the hybrid health demand function of the form:

$$H = H(C_H, I, P_{cH}, P_{cu}, Q) \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (4.4)$$

4.3.2 Model Specification

4.3.2.1 Structural Model

This section presents a general analytical framework employed in determining the interaction effect of provider and consumer measures of healthcare quality on child health outcome. While the structure-process-outcome framework proposed by Donabedian (1988) for assessment of quality of healthcare was appropriate for definition of quality of healthcare in this study, this was not employed due to data constraints (Kenya Demographic Health Surveys do not collect data on provider quality of healthcare). Thus, the study utilises proxies as measures of quality of healthcare.

Following Lavy and Germain (1994) and others (Lavy and Quigley, 1991; Gertler et al., 1987), provider quality of healthcare is proxied by healthcare provider first visited upon observation of child diarrheal illness symptoms. The assumption is that consumers gravitate towards high quality healthcare providers (Lavy and Germain, 1994). Places of visit could either be a public health facility (government hospital, health centre or dispensary) or private health facility which includes a private-for-profit hospital or clinic and a private-not-for profit (mission) hospital. Other options considered include a visit to a pharmacy and shops.

We define consumer quality of healthcare as a composite index (developed in chapter 3). The index aggregates selected recommended preventive and treatment interventions that could be undertaken at individual/household level to alleviate an illness, in this case, childhood diarrheal illness.

The proposed provider and consumer quality of healthcare measures are potentially endogenous and hence the possibility of an endogenous interaction term as well. Endogeneity may arise because of possible reverse causality between child health outcome and both provider and consumer quality of healthcare measures. Specifically, the choice of healthcare provider on observation of child illness and general child health investment behaviors may be influenced by unobservable variables such as the 'health mindedness' of the mother/caretaker. In addition, there is a possibility of self-selection into forms of care that are perceived to be of high quality by individuals with poor health indicators as opposed to the less severe cases (Leonard et al., 2003; Akin and Hutchinson, 1999). Further, the selected components of the consumer quality of healthcare composite index for example, timeliness in seeking healthcare may also be influenced by consumer's perception of the child's illness severity (Webair and Bin-Gouth, 2013; Nyamongo and Nyamongo, 2006; Sreeramareddy et al., 2006).

An estimation of the child health model without addressing the endogeneity problem is likely to bias the estimated coefficients (Green, 2002). The method of Two-Stage-Residual-Inclusion (2SRI) is utilized to address endogeneity problem because of its suitability in cases where non-linear relationships exist (Terza et al., 2008; Terza 2017). In addition, its estimator has been found to be generally consistent when compared to Two-Stage Predictor Substitution (2SPS) estimator (Terza et al., 2008).

2SRI approach encompasses two steps: in the first step, separate estimation of provider quality of healthcare, consumer quality of healthcare index and provider-consumer quality of healthcare interaction auxiliary equations is conducted. Subsequently, the generalized residuals from each of the estimated equations are obtained. The second stage estimates the child health equation where

the potentially endogenous variables together with their respective generalized residuals and all other exogenous variables are included in the child health equation as explanatory variables. A t-test is then performed on the coefficient of the predicted residuals. A statistically significant coefficient implies that the potentially endogenous variable is indeed endogenous and thus the IV estimation strategy should be interpreted.

The instrumental variables chosen in the first stage should be such that they are correlated with the endogenous variable(s) and uncorrelated with the error term (Green, 2002). In this context, we use three instruments, that is, distance to nearest community infrastructure (nearest market), annual average rainfall and an interaction between distance to community infrastructure and average monthly temperatures. Literature suggests that distance to community infrastructure is an indicator of the remoteness of a household's residential area and may influence availability and hence selection of healthcare provider (Escamilla et al., 2018). Moreover, it is likely to have an effect on consumer quality of care index through its various components including timely health seeking behavior. Longer distances coupled with high temperatures is expected to create higher disutility in travelling to a health facility hence the addition of an interaction term between distance and temperatures as another instrument. Rainfall generates disutility of travelling to the health facility in that heavy rains discourage individuals from visiting a health facility (Adhvaryu and Nyshadham, 2010). It also results in delays in seeking healthcare hence affecting consumer quality of healthcare measure. Intuitively also, it may lead to implementation of simple interventions at the household level such as provision of home solutions during diarrheal cases thus positively affecting quality of care at home. Intuitively, these variables are therefore expected to affect a child's health indirectly through their direct effect on both the choice of health facility and the consumer quality of healthcare composite index.

To analyse the effect of interaction between provider and consumer quality of healthcare on child health outcome therefore, we estimate jointly a system of four equations whose dependent variables are: provider quality of healthcare, consumer quality of healthcare index, provider-consumer quality of healthcare interaction and child health as measured by child nutritional status, that is, Weight-for-Age (WAZ). Specifically, the first, second and third equations are auxiliary equations for provider quality of healthcare, consumer quality of healthcare and provider-consumer quality of healthcare interaction respectively. The fourth estimation model is the structural equation for child health production function which is estimated in the second stage.

4.3.2.2 Analytical Model

Equation (4.5) provides the overall structural equation to be estimated.

$$H_{nj} = \gamma + \sum_{ij} a_{ij} Q_F^{1/2} Q_i^{1/2} + \sum_i a_i Q_F^{1/2} + \sum_j a_j Q_i^{1/2} + \delta Z + \mu + \varepsilon \quad \text{.....(4.5)}$$

H_{nj} is child n health outcome in household j. This outcome is measured using the weight-for-age Z-score (WAZ).

γ, a_i, a_j, δ and a_{ij} are technical parameters to be estimated. a_{ij} are technological parameters which are unobservable in this case and they indicate the effect of the interaction between provider side (healthcare provider) and demand side (consumer) quality of healthcare on health outcome. These parameters are such that $a_{ij} = a_{ji}$ and $a_{ij} \geq 0$. The sign of a_{ij} determines whether inputs Q_i and Q_j are substitutes or compliments.

Q_F is provider quality of healthcare while Q_i is individual consumer/caretaker quality of healthcare index. Z is a vector of control variables including socioeconomic characteristics such as: mother's level of education, occupation and wealth index; individual child and maternal demographic characteristics (mother's and child's age, sex of the child, child's birth order number, twin birth); and household related characteristics, that is, household location, size and headship characteristics. ε is a random error term and μ is unobserved household characteristics or endowments which are known to households but they do not have control over them for instance genetic inheritances.

Equation (4.5) was estimated using 2SRI model in Terza (2017) which is presented in equation (4.6).

$$Y = exp(X_e\beta_e + X_0\beta_0 + X_u\beta_u) + e \quad \ldots\ldots (4.6)$$

Where, Y = is the Z-score of weight-for-age (WAZ), X_u is a scalar representing unobservable variables that are potentially correlated with child health, e is the regression error term, X_e is a vector of endogenous variables, X_0 is a vector of control variables that are uncorrelated with X_u and e, and β_s is a vector of coefficients.

4.3.3 Description of variables

4.3.3.1 Dependent Variable

The outcome variable is child health outcome as measured by the under-five Weight-for-Age Z-scores (WAZ). This measure was chosen because a child's weight can be affected by short-term

episodes of reduced food intake as well as current illnesses and infections including diarrheal cases, unlike Height-for-Age (HAZ) which is affected by long-term past malnutrition (McMurray 1996).While Weight-for-Height (WHZ) combines both chronological and short-term malnutrition and has an advantage over WAZ and HAZ in that it is not dependent on availability of correctly reported ages, this measure was not used because it had few observations (only 5 percent of the children reportedly had a very low WHZ). The WAZ Z-scores were computed using STATA inbuilt zscore06 programme, which converts child's weight and height into number of standard deviations that these measures (weight and height) deviate from the median value of the international reference population for children of the same age and gender. Usually, a Z-score of minus 2 standard deviations (-2 SD) is used as a cut-off point for all nutrition status where those children whose WAZ scores is below the cut-off are said to be underweight. Since dummy variables may lead to loss of useful data, the WAZ score variable is measured as a continuous variable.

4.3.3.2 Independent variables

Provider-Consumer Quality of Healthcare Interaction Term

The key variable of interest in this thesis is an interaction variable indicating the combined effect of provider quality of healthcare and consumer quality of healthcare measures on child health. The interaction term aims at establishing the synergistic effect of the supply side and demand side quality of healthcare on child health outcomes as indicated by WAZ Z-Scores. Provider quality of healthcare is proxied by healthcare facility first visited on observation of diarrheal symptoms among the under-five children while the consumer quality of healthcare is measured by consumer quality of healthcare composite index.

On observation of child diarrhea symptoms, mothers/caretakers may decide to seek medication from various health facilities which could either be privately owned or a public health facility. Private health facilities include a private clinic, a mission hospital or Non-Governmental Organization (NGO)). Public health facilities are at different levels of healthcare system and they include a dispensary, a health centre and a government hospital. Visits to other forms of healthcare such as shop and pharmacy are also reported in the KDHS dataset and are considered in the analysis. These options are coded as 1, 2, 3, 4, 5 and 6 representing; other places of first visit (shops and pharmacy), private hospital/clinic, mission/NGO hospital, dispensary, health centre and hospital respectively.

The demand side quality of healthcare is indicated by consumer quality of healthcare composite index. This composite index was constructed based on recommended preventive and treatment interventions at household level during diarrheal episode among children. The quality of healthcare index is a continuous variable and ranges between 0 for poor quality of healthcare and 1 for high quality of care. The expectation is that the interaction of this variable with provider quality of healthcare measure will have a positive sign, that is, given provider quality of healthcare (health facility), an increase in consumer quality of healthcare index score results in improvement in child health.

Control Variables

Control variables including: child characteristics, mother's characteristics and household related characteristics were considered as explanatory variables. The choice of these variables was based on existing theoretical and empirical evidence on factors influencing health outcomes.

Child characteristics

Child related variables controlled for in the study include: child's sex, age, single birth and birth order number. A child's sex is treated as a dummy variable denoted 1 for a male child and 0 otherwise. The effect of this variable on child health is mixed in existing literature hence an indeterminate expectation. Age is a continuous variable indicating the child's current age in years. It is expected that older children have better health outcomes when compared to the younger ones in this study. However, an Inverted-U relationship is expected between a child's age and his/her health. The variable on whether a child was a multiple birth or single is coded as 1 and 0 respectively. We expect that multiple-birth children are more likely to have poor health when compared to singleton births. The child's birth order number variable is measured as a continuous variable whose expected effect on child nutritional status is negative since earlier-borns tend to receive more attention relative to later-born children.

Maternal characteristics

Among maternal characteristics considered in the study are age, education level, wealth index and occupation. Maternal age and its square are measured in years. We hypothesize that an increase in mother's/caretaker's age is positively related to child nutritional status since older mothers have experiences in attending to their children's health needs. However, a non-linear relationship is expected where much older women are expected to have worse child health outcomes.

The mother's education level variable is categorized into no education, primary, secondary and post-secondary and is coded as 1, 2, 3, and 4 respectively. It is hypothesized that educated mothers are capable of making informed choices on matters related to health (Abuya, et al., 2012; Grossman, 1972), hence a positive association between the variable and child health.

We also include the wealth quintile/index to which a mother/caretaker belongs as an indicator of availability of economic resources. Demographic and Health Surveys utilize data on ownership of housing characteristics, household durable assets, utility and sanitation variables to generate asset-based proxy indices. These indices are then classified into quintiles and are coded as 1, 2, 3, 4 and 5 for lowest, second lowest, middle, fourth and highest quintile respectively. Belonging to a higher wealth index as opposed to lowest wealth index is hypothesized to be positively related to child nutritional status.

Mother's employment status and occupation is controlled for and coded as 1 if the mother is not in any form of employment and 2, 3 and 4 if the mother is employed in agriculture, managerial/professional position or others which could be domestic, manual or services, respectively. An indeterminate relationship between this variable and child health is expected due to mixed results observed in empirical studies.

Household characteristics

Among the household related control variables included in the study are headship characteristics (sex and age), household's place of residence and household size. The sex of the household head is coded as 1 for male and 0 for female. The expected effect of this variable on child nutritional status is indeterminate as the results are mixed in empirical reviews. We also control for age of the household head. Higher age is associated with greater experience in health decision making. It is therefore expected that the age of the household head measured in years is positively related to child health status. This is however expected to increase at a decreasing rate hence an expected negative relationship between the square of the age variable and child health.

The residence variable is coded as a dummy where 1 represents urban residence and 0 is rural residence. It is hypothesized that rural residence is associated with poor health largely due to rural-urban socio-economic differences. The household size variable is continuous and measures the number of household members. This variable is expected to be inversely related to child health.

Table 4. 2: Summary of Variables and Expected Results

Variables	**Measurement/ Definition**	**Expected Sign**
Outcome Variables		
Weight-for-Age (WAZ)	A measure of child health (Continuous variable)	
Explanatory Variables		
Provider quality of healthcare/Health facility type	Dummy (Self-treatment=1, Dispensary=2, Health centre=3, Hospital=4, Private clinic/hospital=5; Private mission hospital=6)	Positive (+)
Consumer quality of healthcare index	Composite Index (Continuous variable)	Positive (+)
Provider quality* Consumer quality of healthcare index	Interaction between provider (supply side) and consumer (demand side) quality of healthcare measures	Positive (+)
Child's sex	Dummy variable (male=1, Female=0)	Indeterminate
Child's age	Age in years (continuous variable)	Positive (+)
Child's age squared	Age in years squared	Negative (-)
Twin birth	Dummy variable (twin birth=1, single birth=0)	Negative (-)
Birth order number	Continuous variable measuring the birth order number of a child	Negative (-)
Mother's age	Age in years (Continuous)	Positive (+)
Mother's age squared	Age in years squared (Continuous)	Negative (-)
Mother's Education level	Dummy variable (No education=1, Primary=2, Secondary=3, Post-secondary=4)	Positive (+)
Mother's Occupation	Categorical variable (1= unemployed, 2=Agricultural, 3=professional/managerial, 4=Others (domestic, manual and services)	Indeterminate
Wealth index (wealth quintile)	Categorical variable (1=poorest, 2= second, 3=middle, 4=Fourth and 5= Highest)	Positive (+)
Sex of household head	Dummy variable (male=1, female=0)	Indeterminate
Age of the household head	Age in year (Continuous)	Positive (+)
Age of the household head squared	Age in years squared (Continuous)	Negative (-)
Household size	Number of household members (Continuous)	Negative (-)
Place of residence	Dummy variable (urban=1, rural=0)	Positive (+)

4.3.3.3 Data Type and Sources

This study utilized cross-sectional household survey data from the 2014 Kenya Demographic Health Survey (KDHS) which is the most recent KDHS dataset. This survey conducted between May and October 2014 utilized a two-stage sampling design is nationally representative and covered a total of 40,300 households from 1612 clusters with 995 clusters in rural areas and 617 clusters in urban areas. The dataset was collected using three questionnaires; a household questionnaire, a questionnaire for women age 15-49, and a questionnaire for men age 15-54 (Kenya National Bureau of Statistics and ICF Macro, 2015).

Of interest to this study is the individual women questionnaire which collected information on among other characteristics: maternal education level, area of residence, women's occupation, reproductive history, breastfeeding and infant feeding practices, child nutritional status, childhood mortality, childhood illnesses, mother's/caretakers health seeking behaviors on observation of childhood illnesses and implementation of simple recommended interventions on observation of diarrheal symptoms among the under-five. We utilized the data set labeled "KEBR70FL.DTA" provided upon request by the Kenya National Bureau of Statistics (KNBS). Besides, providing information on every child born to interviewed women, the dataset provides detailed information on household related characteristics including age and gender of the household head and household wealth index.

The 2014 KDHS also collected geographic coordinates of the sampled clusters. The Geographic Information System (GIS) data is geographically displaced to protect the confidentiality of the respondents. The displacement distance was between 0 and 2 km for urban clusters and between 0 to 5 km for rural clusters, with a further randomly selected 1% of rural clusters displaced between 0 and 10 km. This data set collected geographic information including distance to nearest

community infrastructure, average monthly temperatures and average annual rainfall. To enable utilization of 2SRI approach this data set was merged with the "KEBR70FL.DTA" module using cluster identifiers.

The 2014 KDHS survey data accessed upon request at https://dhsprogram.com/data/new-user-registration.cfm. The dataset had initially been subjected to data cleaning, editing, validation and weighting to ensure representativeness by KNBS and ICF International group before its storage under the DHS program. This dataset was downloaded in STATA and further data cleaning done before its utilization in this study.

4.4 **Results**

4.4.1 Sample Description

The analytic sample summary statistics are presented in Table 4.3. The mean Z- score for WAZ was -0.74 which implies that an average child aged below five years was 0.7 standard deviations shorter than the international reference mean. Using a -2 standard deviations cut-off, the overall prevalence of the underweight among the under-five was 13%. This is close to the figure reported in the 2014 Kenya Demographic Health Survey which was 11%.

On average, 15% of the under-five children had experienced diarrheal symptoms, two weeks preceding the survey. Majority of mothers'/caregivers' (35%) first place of visit on observation of diarrheal illness symptoms was a dispensary. Other facilities first visited were government health centres (19%), government hospital (18%), private hospitals and clinics (11%) and mission hospitals (3%). Still, others (14%) resorted to self-treatment which includes visits to pharmacies, shops, traditional practitioners and relatives. The distribution of first visits could be informed by

quality of healthcare aspects such as accessibility (dispensaries are mostly available across the country).

The average score for consumer quality of healthcare index is 0.51 which generally indicates sub-optimal consumer quality of healthcare (the ideal score is 1). This could be explained by low implementation of recommended care on observation of diarrheal illness symptoms. As reported in chapter three, 52% and 8% of the sick under-five received oral rehydration solutions and zinc supplementation respectively. It could also be due to poor feeding patterns during an illness episode where a sick child is likely to take much less fluids and food. Further, the finding could be explained by other factors that are significantly related to healthcare seeking behavior including low incomes and education levels among the mothers/caretakers.

Considering the instrumental variables, the mean average annual rainfall in was 1173 millimeters. The mean distance to the community infrastructure (market) as indicated by travel time by foot was 257 minutes which translated to about four hours. When converted to kilometers at an average of 15 minutes per km, it translates to about 17 kilometers which varies from the existing average of 5km. The variance is explained by the point displacements to conceal the respondent's identity in the survey. This is not likely to affect the use of the distance variable as an instrumental variable since the displacement process results in uniformly distributed displaced distances. The average annual temperature was 21^0C. These variables were transformed into their logarithmic forms to normalize the positively skewed data.

The under-five children were mostly (98%) from single births indicating higher chances of survival. They were 2 years of age on average, third-bornes and mostly male (51%). Their

mothers/caretakers were on average 29 years of age with majority (53%) having primary level of education and belonging to the lowest wealth quintile (34%). Majority (56%) of the mothers/caretakers indicated that they were employed in agriculture while 18% were not in any form of employment. Majority of the households to which the under-five belong were male headed (70%), resided in rural areas (67%) and had 6 household members on average. The average age of the household head was 38 years.

Table 4. 3: Sample Description

Variables	Number of Observations	Mean	Standard Deviation	Minimum	Maximum
Child nutritional status					
Weight-for-age Z-score (WAZ)	18987	-0.74	1.20	-5.97	4.97
WAZ (0=normal; 1=underweight)	18987	0.13	0.33	0	1
Diarrhea Episode					
Diarrhea in last two weeks (Yes=1)	19889	0.15	0.36	0	1
Quality of healthcare (Provider type)	1954	2.85	1.32	1	6
Self-treatment	1954	0.14	0.35	0	1
Dispensary	1954	0.35	0.48	0	1
Health Centre	1954	0.19	0.39	0	1
Hospital	1954	0.18	0.38	0	1
Private health clinic	1954	0.11	0.32	0	1
Mission Hospital (NGO)	1954	0.03	0.16	0	1
Consumer quality of healthcare index	2924	0.51	0.20	0	1
Instruments for Endogenous provider and consumer quality of healthcare					
Distance to the nearest market (minutes)	19971	257.33	208.83	1.64	1525.75
Average annual rainfall (millimeters)	19876	1173.20	533.74	115.29	2243
Average annual temperature (°C)	19830	21.17	3.85	11.57	30.49
Child Characteristics					
Child sex (male=1)	20093	0.51	0.50	0	1
Child current age in years	20093	2.01	1.40	0	4
Child current age in years squared	20093	6.00	5.85	0	16
Twin birth (Twin=1)	20093	0.02	0.16	0	1
Child's birth order number	20093	3.41	2.29	1	15
Maternal Characteristics					
Mother's age in years	20093	28.70	6.55	15	49
Mother's age in years squared	20093	866.75	401.55	225	2401
Wealth Quintile (lowest=1)	20093			1	5

Variables	Number of Observations	Mean	Standard Deviation	Minimum	Maximum
Lowest	20093	0.34	0.47	0	1
Second	20093	0.21	0.40	0	1
Middle	20093	0.17	0.37	0	1
Fourth	20093	0.15	0.36	0	1
Highest	20093	0.13	0.34	0	1
Mother's education level (No education=1)	20093	1.10	0.81	0	3
No education	20093	0.22	0.41	0	1
Primary	20093	0.53	0.50	0	1
Secondary	20093	0.19	0.39	0	1
Higher (post-secondary)	20093	0.06	0.24	0	1
Mother's Occupation (Unemployed=1)	20093	2.67	0.93	1	4
Not working/unemployed	20093	0.18	0.38	0	1
Professional/technical/Managerial	20093	0.12	0.32	0	1
Agricultural	20093	0.56	0.50	0	1
Others	20093	0.15	0.35	0	1
Household Characteristics					
Sex of the household head (male=1)	20093	0.70	0.46	0	1
Age of household head in years	20092	37.96	12.23	15	95
Age of household head in years squared	20092	1590.27	1135.23	225	9025
Area of residence (urban=1)	20093	0.33	0.47	0	1
Household size (number of members)	20093	5.91	2.46	1	23

Source: Author's computation KDHS, 2014

4.4.2 Bivariate Analysis

The results of cross-tabulations between selected child, maternal and household characteristics and child nutritional status are presented in Table 4.3. The results show that the underweight under-five children were mostly from the poorest (56%), male headed (68%) and rural-based (78%) households. Their mothers/caretakers mostly had primary level of education (51%) were in professional/managerial employment (53%). Male children (55%) and those from single births (94%) were more likely to be underweight. The latter finding is explained by the low number of children from multiple births.

Table 4.3: Under-Five Weight-for-Age (WAZ) by Selected Sample Characteristics

Variable	Categories	Normal (%)	Underweight (%)	p-value (Pearson Chi Square)
Education Status	No education	78.71	21.29	0.000
	Primary	87.63	12.37	
	Secondary	92.79	7.21	
	Higher (Post-secondary)	96.09	3.91	
Wealth index (Quintile)	Lowest	79.28	20.72	0.000
	Second	87.43	12.57	
	Middle	91.03	8.97	
	Fourth	92.94	7.06	
	Highest	95.94	4.06	
Mother's Occupation	Not working	21.92	20.73	0.000
	Agricultural	25.90	13.26	
	Professional/managerial	25.52	53.60	
	Others	26.65	12.41	
Area of Residence	Rural	66.00	77.64	0.000
	Urban	34.00	22.36	
Mother's age group	15-24	29.31	25.75	0.001
	25-34	50.36	51.65	
	35-44	18.74	21.00	
	45 and above	1.60	1.59	
Child sex	Female	50.09	45.12	0.000
	Male	49.91	54.88	
Twin birth	Single birth	97.97	94.48	0.000
	Twin birth	2.03	5.52	
Sex of the household head	Male	29.53	32.32	0.004
	Female	70.47	67.68	

Source: Author's computation KDHS, 2014

4.4.3 Regression Results- Synergistic Effect of Provider and Consumer Quality of Healthcare on Child Health

This section presents the regression results of the child health model which examined the effect of interaction between provider and consumer quality of healthcare on child weight-for-age Z-score (WAZ). We begin by presenting the results for the endogeneity tests.

4.4.3.1 Testing and Addressing the Endogeneity Problem

The potential endogeneity of provider and consumer quality of healthcare measures was tested to establish if indeed it was present or not. This would then inform the decision on which estimation

technique to use between the Ordinary Least Squares (OLS) model and Instrumental Variable (IV) Approach.

Validity of Instruments

A valid instrument meets the following characteristics: first, it is relevant in that its effect on a potentially endogenous explanatory variable is statistically significant; second, it is strong, that is, it has a 'large' effect; and third, the instrument is uncorrelated with the structural equation error term (Mwabu, 2008). The first stage results (presented in Appendix 4A) indicate that there was at least one statistically significant instrumental variable in each of the reduced form equations. In model 1, higher amounts of rainfall had a negative effect on consumer quality of healthcare with an absolute z-value equal to 2.15. This implies that higher amounts of rainfall discourage visits to a health facility thus indirectly affecting the child health. In the second model (model 2), longer travel times had a negative effect on probability of a first visit to a hospital, private clinic and mission with z-values equal to 3.92, 2.39 and 4.02 respectively. For the provider-consumer quality of healthcare interaction model (model 3), the effect of the distance to community-average temperature interaction term was positive (z-value=2.69). Therefore, the respective instrumental variables were relevant.

Since there are multiple (three) potentially endogenous variables, we employ Sanderson-Windmeijer (SW) multivariate F test of excluded instruments and Kleibergen-Paap LM statistics to test for weak instrumentation and under-identification (Sanderson and Windmeijer, 2016). From Table 4.4, the results of these tests were statistically significant suggesting that we reject the null hypothesis that our instrumentation was weak and under-identified. The Andersen Stock-Write S statistic was statistically significant. Thus, we do not reject the null hypothesis that the coefficients

of the endogenous regressors in the structural equation were jointly equal to zero and that the overidentifying restrictions were valid. Our conclusion is that the instruments were valid and hence, we proceeded to test whether the potentially endogenous variables were indeed endogenous.

Table 4. 4:Tests for Validity of Instruments

Test-First Stage Regression	Dependent Variable Performance
Sanderson-Windmeijer F test of excluded instruments: (Prob > F)	5.24** (0.0221)
Kleibergen-Paap rk LM statistic (under-identification) (p-value)	4.18** (0.0410)
Stock-Write LM S statistic Wald weak-instrument-robust inference test: (Prob>F)	25.73 *** (0.0000)
Sargan statistic (overidentification test)	Equation exactly identified

*** p<0.01, ** p<0.05, * p<0.1

Source: Authors computation, 2014 KDHS

The Two Stage Residual Inclusion (2SRI) results are presented in Table 4.5. The absolute t-values for the coefficients of the healthcare provider type and consumer quality of healthcare index residuals were low (<1.64) implying that we do not reject the null hypothesis of no endogeneity problem. The conclusion in this case is that both provider and consumer quality of healthcare variables are not endogenous. However, the coefficient of the provider-consumer interaction term was statistically significant (t-value=1.72). Therefore, we conclude that the interaction term was endogenous and hence the use and interpretation of the regression results of the 2SRI model as presented in Table 4.5.

4.4.3.2 Regression Results- Child Health Model

The purpose of this study was to test the hypothesis that consumer quality of healthcare can affect the relationship between provider quality of healthcare and child health. The results of the interaction effects of provider and consumer quality of healthcare on child health are presented in

Table 4.5. The results show that the effect of the interaction between provider and consumer quality of healthcare was positive and significant in all provider/consumer quality of healthcare combinations. Specifically, the coefficient of the interaction between a dispensary and consumer quality of healthcare score was 0.816 (z-value=2.12). This implies that an additional unit of consumer quality of healthcare index score leads to an increase in WAZ score by 0.816 units for a dispensary. The coefficients for the other three combinations (health center-consumer quality of healthcare interaction, hospital-consumer quality of healthcare interaction, private hospital/clinic-consumer quality of healthcare interaction and mission-consumer quality of healthcare interaction) were positive and statistically significant at 10% level. This suggests that when consumer quality of healthcare index score increases by one unit, the child WAZ scores increases by 1.404 (z-value=1.88), 2.05 (z-value=1.83), 2.826; (z-value=1.90) and 3.336 (z-value=1.78) for a health centre, hospital, private hospital/clinic and mission hospital respectively. The significant effect of the interaction terms indicates that there is a synergistic effect between provider and consumer quality of healthcare on child health as indicated by WAZ.

Considering the control variables, child characteristics, mainly twin/multiple births and birth order number were significant in influencing a child's health outcome. As expected, the effect of a multiple birth on child nutritional status was negative. A twin birth decreases the WAZ score by 1.3 (z-value=6.51) when other factors are held constant. A child's birth order number was negatively related to a child's WAZ score. An increase in birth order number by 1 significantly decreases the WAZ score by 0.3 units (z-value=1.67). This implies that later borne children have poor nutritional status.

Among the maternal characteristics, the wealth index variable had a strong significant effect on child health. Holding other factors constant, mothers in the second, middle, fourth and fifth wealth index had 1.1 (z-value=2.03), 1.6 (z-value=2.51), 1.4 (z-value=2.25) and 2.6 (z-value=2.36) z-scores higher respectively when compared to their counterparts in the poorest wealth index category. Maternal education level was also significantly related to child nutritional status. In particular, post-secondary education level as opposed to no education increased the WAZ score by 1.7 scores (z-value=1.82). This perhaps reflects the ability of the highly educated mothers to understand the implication of better healthcare. Primary and secondary levels of education did not have a significant effect on child health.

As hypothesized, the effect of a household's place of residence child nutritional status was positive. Specifically, children in urban-based households had 1.2 (z-value=1.79) higher WAZ z score when compared to their counterparts in rural areas. Other household characteristics including household size and headship characteristics did not significantly affect a child's nutritional status.

Table 4. 5: Empirical Results on Interaction Effect between Provider and Consumer Quality of Healthcare on Child Health

Variables	Child Health Model			
	OLS (Basic Model)		2SRI Model	
	Coefficients	t-value	Coefficients	z-value
Child Characteristics				
Child sex	-0.162***	-3.05	0.192	0.72
Childs age in years	-0.493***	-7.44	0.238	0.40
Child's age squared	0.0864***	4.99	-0.00751	-0.09
Twin birth	-1.308***	-8.41	-1.258***	-6.51
Birth order number	-0.00689	-0.32	-0.257*	-1.67
Mother's/Caretaker Characteristics				
Age in years	0.0271	0.88	-0.00892	-0.23
Age in years squared	-0.000330	-0.65	0.00177*	1.89
Mother's educational level (Reference category=No education				
Primary	0.0911	1.12	-0.269	-1.55
Secondary	0.102	0.97	0.404	0.88
Post-secondary	0.217	1.25	1.679*	1.82
Occupation (Reference Category: Unemployed)				
Agricultural	-0.104	-1.00	0.173	0.58
Professional/Managerial	-0.0316	-0.42	0.209	0.93
Others	-0.0198	-0.21	-0.120	-0.83
Household Characteristics				
Wealth Index/Quintile (Reference Group=Lowest)				
Second	0.222***	2.88	1.122**	2.03
Middle	0.366***	4.24	1.622**	2.51
Fourth	0.365***	3.69	1.395**	2.25
Highest	0.578***	4.66	2.622**	2.36
Place of residence	-0.0410	-0.60	1.227*	1.79
Household size	-0.0138	-0.98	-0.00776	-0.39
Sex of household head	-0.0348	-0.59	0.117	1.34
Age of household head	0.0152	1.15	0.0195	1.10
Age squared	-0.000156	-1.12	-0.000317	-1.44
Quality of Healthcare Indicators				
Dispensary	0.118	0.30	0.463	1.09
Health Centre	0.148	0.35	0.473	1.01
Hospital	-0.0431	-0.10	0.280	0.62
Private Clinic/hospital	0.394	0.87	0.825*	1.72
Mission	-0.347	-0.53	0.237	0.27
Consumer quality of healthcare index	0.0182	0.20	-4.070	-1.47
Provider-Consumer Quality of Healthcare Interaction				
Dispensary*Consumer quality index	0.0862	0.85	0.816**	2.12
Health centre*Consumer quality index	0.0455	0.41	1.404*	1.88
Hospital*Consumer quality index	0.0556	0.49	2.050*	1.83
Private clinic*Consumer quality index	0.158	1.30	2.826*	1.90
Mission*Consumer quality index	0.0132	0.07	3.336*	1.78

Variables	Child Health Model			
	OLS (Basic Model)		2SRI Model	
	Coefficients	t-value	Coefficients	z-value
Predicted Provider Quality of Healthcare Residuals				
Health center residual			0.490	0.30
Hospital residual			0.501	0.38
Private clinic residual			-1.636	-1.13
Mission residual			-2.305	-1.34
Predicted consumer quality residual			4.651	1.49
Predicted provider*consumer quality residual			-0.638*	-1.72
Constant	-1.034*	-1.70	-13.41113	-1.30
Observations	1,872			1825
R-squared	0.126			
F-Statistic	F (33, 1838)*** = 8.02		AIC = 3.101193 BIC= -11131.25	

*** p<0.01, ** p<0.05, * p<0.1

Source: Authors computation, 2014 KDHS

4.4.4 Discussion

A key finding of this study was that the interaction between provider and consumer quality of healthcare significantly increased the WAZ scores for all provider visited/consumer quality of healthcare index combinations. Among mothers/caregivers of the under-five children who reported to have visited a health facility (whether private or public) the interaction term with consumer quality of healthcare index was strongly associated with child health measure. Thus, we conclude that a synergy effect exists between consumer quality of healthcare and provider quality of healthcare. Basically, this novel study established that there is some form of complementarity between the providers of healthcare and healthcare users in production of quality healthcare which in turn is linked to improvement in child health.

The negative coefficient of twin birth was corroborated by a number of existing empirical studies (Ntenda and Chuang, 2018; Kabubo-Mariara, 2008; Uthman et al., 2008). This finding could perhaps be as a result health risks and developmental problems such as low birthweight, inadequate

breastfeeding and competition for nutritional intake usually associated with children of multiple births (Ooki, 2010; Kabubo-Mariara, 2008; Yokoyama, 2004). In addition, we found an inverse relationship between a child's birth order number and child nutritional status. This is similar to results of other empirical researches (Bishwakarma and Villa, 2019; Horton, 1988; Behrman, 1988). These studies relate this finding to competition for available resources including food due to increased number of siblings and less attention paid to children born later.

This study reports better nutritional status among children whose mothers/caregivers were wealthier and educated. This substantiates results in other existing studies (Ashagidigbi et al., 2018; Lartey et al., 2016; Mostafa et al., 2010; Kabubo-Mariara, 2008) where wealth and education were among significant predictors of child health. Generally, the relationship is explained by ability to afford healthcare services and the better knowledge on importance of investing in child health among individuals with higher incomes and education levels respectively.

4.5 Summary, Conclusion and Recommendations

This study sought to examine the interaction effect of provider and consumer quality of healthcare on child health outcome as measured by Weight-for-height (WAZ). The provider side quality of healthcare was proxied by the type of health facility first visited by the child's mother or caregiver upon observation of diarrheal symptoms. Facility visited could be a public health facility (dispensary, Health Centre or a hospital) or a privately-owned facility (private clinic or a mission hospital). Still, others resorted to self-treatment which entails a visit to pharmacies, shops, traditional healers or friends. A consumer quality of healthcare index was constructed on the other hand to measure household level quality of healthcare. Undertaking preventive behaviors,

implementation of simple recommended interventions and compliance with treatment advice are the main components of the composite index.

The multivariate regression results show that the effect of the interaction term between provider and consumer quality of healthcare on child nutritional status is significant. The implication of this is that there is a synergistic effect of the combined effort between healthcare providers and consumers in production of quality healthcare which in turn translates to better child health nutritional status. This indicates that if the Kenyan healthcare system focuses on simultaneously improving supply side and demand side quality of healthcare, it is likely to achieve significant improvements in child health outcomes.

Socio-economic status as indicated by a higher wealth index and maternal education level improves the child's nutritional status. Other variables that were significant in determining child health were child related characteristics, mainly, a twin birth/multiple birth and birth order number and a household's place of residence.

From the findings of this study, we recommend that both provider and consumer related quality of healthcare should be enhanced so as to ensure improvement in child health status. This can be done by pursuing an integrated approach to healthcare provision where both producers and consumers of healthcare should be encouraged to simultaneously produce quality healthcare. In particular, an improvement of facility quality of healthcare across the country, through better infrastructure and skilled personnel should be implemented. This should be accompanied by enhanced preventive behaviors, timely initiation of treatment upon observation of an illness and compliance with medical advice. Further, there is need strengthen the first tier of Kenya's healthcare system, that

is, the community level to include the households since they play a critical role in improving child health through implementation of simple interventions.

An improvement of household socio-economic status should be pursued through establishment of income generating activities (both formal and informal) for women across the country. Strategies aimed at enhancing education levels among women should be developed and/or implemented. In addition, more awareness should be created among mothers on the biological reasons leading to poor health among children of multiple births and higher birth orders. This could be done by healthcare workers at the health facilities and through social media.

CHAPTER 5

SUMMARY, CONCLUSIONS AND POLICY IMPLICATION

5.1 Summary

This thesis sought to examine the interaction effect of healthcare provider and healthcare consumer quality of healthcare on health outcomes as measured by child anthropometric measures, that is, Weight-for-Age (WAZ). The thesis addressed three objectives as follows: first, we examine provider quality of healthcare in Kenya while investigating its determinants. Second, we establish the determinants of an innovatively developed measure of consumer quality of healthcare-the consumer quality of healthcare composite index. Lastly, we explored the effect of the interaction between these quality of healthcare measures, that is, provider and consumer quality of healthcare on child nutritional status. These objectives form distinct chapters of the thesis, namely, chapters two, three and four respectively. Chapter one introduces the thesis while chapter five presents a summary of the thesis' findings, conclusions and policy implications of the study findings, as well as limitations and suggestions for further research. The study utilised two sets of data; 2018 Kenya Health Service Delivery Indicators survey data to address objective one and the 2014 Kenya Demographic Health Survey (KDHS) data to address objectives 2 and 3.

The thesis was motivated by the fact that existing theoretical and empirical literature are inclined to separate effects of provider and consumer quality of healthcare on health. Yet, in reality, successful production of health requires combined effort in production of quality healthcare by both the suppliers and consumers of healthcare-the concept of co-production. Following this understanding, this study sought to interact provider and consumer quality of healthcare measures

and to investigate the effect of this interaction on child health. It is also important to understand the environment in which production of quality healthcare takes place, hence the focus on provider and consumer quality of healthcare in the thesis.

In assessing the environment in which healthcare takes place, we sought to examine the determinants of provider and consumer quality of healthcare in objectives one and two respectively. Specifically, the first objective of the thesis examined provider quality of healthcare in Kenya. The outcome variable was measured using a process quality of healthcare indicator; health worker accuracy in illness diagnosis for two common childhood illnesses, that is, severe dehydration and pneumonia. The generalized ordered logistic regression results show that healthcare provider education and training had a significant effect on the ability to arrive at correct diagnosis of childhood illness; higher cadres, high level of education and IMCI training was associated with likelihood of arriving at a correct diagnosis of all the presented childhood illnesses. Also, being male causes a positive coefficient of the ability to provide quality healthcare. Health facility characteristics, mainly, higher facility tier, government ownership and urban location were particularly significant for provision of high-quality healthcare.

The second objective examined the factors that influence consumer quality of healthcare as proxied by consumer quality of healthcare composite index. The dependent variable was developed based on implementation of recommended simple preventive and treatment interventions at the household level. Results from estimation of an OLS regression model found that child characteristics, mainly older children, being a twin increases consumer quality of healthcare index scores. Mother's/caregiver's belonging to higher socio-economic status had better consumer

quality of healthcare scores with the results indicating that higher education levels and higher wealth index increased consumer quality of healthcare index scores as opposed to no education at all, poor wealth and being unemployed respectively.

The third objective brings the demand side and the supply side together and seeks to establish the interaction effect of provider and consumer quality of healthcare on child health outcomes. From the 2SRI regression results, the coefficient of the interaction term is positive and significant which implies that when provider quality of healthcare is accompanied by consumer quality of healthcare, there is a synergistic and positive effect on child health. Among control variables, child characteristics among them twin/multiple births and birth order number were found to be important determinants of child health. Among the maternal related characteristics, the wealth index variable was key in improving child nutritional status.

5.2 **Conclusions**

Improvement in child health requires combined effort between the supply and demand side. The synergistic effect of the combined effort between healthcare providers and consumers will yield better child health outcomes. While still focusing on improving quality of healthcare at the facility level, there is need for greater involvement of healthcare consumers in the quality of healthcare production process. Thus, active partnership between providers and consumers of healthcare is necessary for enhanced production of health outcomes among the under-five. This will in the long run reduce the disease burden and healthcare costs.

Our analysis of the environments in which healthcare takes place reveals that health worker training influences provider quality of healthcare in that, health workers with higher level of education, in higher cadres and who had been trained in IMCI had higher diagnostic accuracy as opposed to their counterparts with no education, in lower cadres and with no training in IMCI respectively. In addition, facility tier, ownership and location affect provision of quality healthcare. At the same time, the results of the demand side analysis point to the importance of socioeconomic indicators such as education and wealth index in improving consumer quality of healthcare score. Child related characteristics including age and twin status also influence quality of healthcare at the household level.

5.3 Policy Recommendations

The results of this thesis offer important policy options for improving child health in Kenya by addressing quality of healthcare. First, strategies to improve quality of healthcare should simultaneously address both the supply and demand side. The findings suggest that there is a significant effect of the interaction term between provider and consumer quality of healthcare. That is, given provider quality of healthcare, better consumer quality of healthcare will lead to better child health outcomes. The government should therefore employ a concurrent approach to improve quality of healthcare in the country.

A first step would be to review the existing healthcare system to include the family/household level. As it is, the system's lowest level of healthcare is community level which is mainly concerned with delivery of services at the community level. This implies that the role of household/individual families in the healthcare system is ignored hence the need to include them

at the lowest level of healthcare. A second strategy would entail enhancing infrastructure at the lowest level of healthcare, that is, the dispensaries. This level plays a significant role in provision of healthcare in the country, as it constitutes the majority of healthcare facilities across the country.

Strategies to improve quality of healthcare should target the environments in which healthcare takes place; that is, at the facility level (provider quality of healthcare) and household level (consumer quality of healthcare). This study established that there were quality gaps in provision of quality healthcare as indicated by inability of some healthcare providers to accurately diagnose some common childhood illnesses. To address this challenge, the government should facilitate targeted trainings especially among the lower level cadres. This will not only enhance provider quality of healthcare but also ensure effective implementation of the task shifting strategy in Kenya, given that the lower level cadres are tasked to undertake the role of doctors especially in rural areas. In addition, a strategy to recruit, deploy and redistribute health workers should be developed in consultation with County governments.

At the household level, implementation of simple recommended interventions which include preventive, and treatment measures should be encouraged through intensive awareness campaigns and education. This should be done though the healthcare providers whenever they are in contact with the patients and also through the media. Healthcare providers should advice healthcare users/patients on effective preventive and treatment interventions. Different forms of media should be utilised to reach a wider audience. There is need for sustained Free Primary Education policy and the recently introduced Free Secondary to ensure that more girls attain higher education levels and in turn boost quality healthcare among consumers. On the same note, the affirmative action

on the vulnerable groups should be fully implemented and monitored to ensure that women benefit from the programme hence leading to improved livelihood among these women.

To improve both provider and consumer quality of healthcare, policy should also be directed towards enhancing infrastructure especially in the rural areas. This will address the negative effect of location on both measures of quality of healthcare. Balanced infrastructural development will not only address the skewed distribution of higher cadres of healthcare but will also promote appropriate and timely health seeking behaviors.

5.4 Areas of Further Research

In investigating factors affecting consumer quality of healthcare, this study focusses on children who suffered from diarrheal episodes. Yet, besides this illness, children suffer from other illnesses including malaria and respiratory tract infections which are also preventable and could be addressed using simple preventive and curative interventions at the household level. It would be important therefore to understand what really happens when such interventions are combined with various measures of facility quality of healthcare.

The study also suffers from use of proxy variables as measures of quality of healthcare. It would be interesting to interact quality of healthcare variables such as time at the facility versus delay before seeking healthcare to establish whether there would be a significant effect on health outcomes.

References

Abegaz, N. T., Berhe, H. & Gebretekle, G. B. (2019). Mothers/Caregivers Healthcare Seeking Behavior Towards Childhood Illness in Selected Health Centers in Addis Ababa, Ethiopia: A Facility-Based Cross-Sectional Study. *BMC Pediat*, **19:**220. https://doi.org/10.1186/s12887-019-1588-2.

Abubakar, I. R. (2018). Exploring the Determinants of Open Defecation in Nigeria Using Demographic and Health Survey Data. *Science of the Total Environment*, 637-638C:1455-1465

Abuya, B. A., Ciera, J., and Kimani-Murage, E. (2012). Effect of Mother's Education on Child's Nutritional Status in The Slums of Nairobi. *BMC Pediatrics*. 12:80 http://www.biomedcentral.com/1471-2431/12/80

Acharya, L. B. and Cleland, J. (2000). Maternal and Child Health Services in Rural Nepal: Does Access or Quality Matter More? *Health Policy and Planning*; 15(2): 223–229

Adedokun, S.T., Yaya, S. (2020). Factors Influencing Mothers' Health Care Seeking Behaviour for Their Children: Evidence from 31 Countries in Sub-Saharan Africa. *BMC Health Serv Res*. **20,** 842. https://doi.org/10.1186/s12913-020-05683-8

Adeoti, J. O. and Lawal, A. I. (2012). The Impact of Interpersonal Factors on Quality Health Delivery in Kwara State Government Hospitals. *African Journal of Social Sciences*.2 (2):34-40

Adhikary, G., Shawon, M., Ali, M. W., Shamsuzzaman, M., Ahmed, S., Shackelford, K. A., Woldeab, A., Alam, N., Lim, S. S., Levine, A., Gakidou, E. & Uddin, M. J. (2018). Factors influencing patients' satisfaction at different levels of health facilities in Bangladesh: Results from patient exit interviews. *PloS one*, *13*(5), e0196643. https://doi.org/10.1371/journal.pone.0196643

Adhvaryu, A. R. and Nyshadham, A. (2010). *Healthcare Choices, Information and Health Outcomes*. Yale University Economic Growth Center Discussion Paper No. 994, Yale Economics Department Working Paper No. 88. https://ssrn.com/abstract=1816485

Adinan, J., Damian, D. J., Mosha, N. R., Mboya, I. B., Mamseri, R., & Msuya, S. E. (2017). Individual and contextual factors associated with appropriate healthcare seeking behavior among febrile children in Tanzania. *PloS one*, *12*(4), e0175446. doi:10.1371/journal.pone.0175446

Adindu, A. (2010). Assessing and Assuring Quality of Healthcare in Africa. *African Journal of Medical Sciences*. 3(1):31-36

Adugna, B., Tadele, H., Reta, F. and Berhan, Y. (2017). Determinants of Exclusive Breastfeeding in Infants Less Than Six Months of Age in Hawassa, An Urban Setting, Ethiopia. *International Breastfeeding Journal*, 12:45 DOI 10.1186/s13006-017-0137-6

Adzawla, W., Alhassan, H. & Jongare, A. I. (2020). Explaining the Effects of Socioeconomic and Housing Characteristics on the Choice of Toilet Facilities among Ghanaian Households. *Journal of environmental and public health, 2020*, 4036045. https://doi.org/10.1155/2020/4036045

Aggrey, M. and Appiah, S. (2014). The Influence of Clients' Perceived Quality on Health Care Utilization. *International Journal of Innovation and Applied Studies* ISSN, 9(2):918-924. http://www.ijias.issr-journals.org/ .

Agho, K. E., Dibley, M. J., Odiase, J. I. and Ogbonmwan, S. M. (2011). Determinants of Exclusive Breastfeeding in Nigeria. *BMC Pregnancy and Childbirth*. 11:2. http://www.biomedcentral.com/1471-2393/11/2

Agho, K. E., Ezeh, O.K., Pramesh Raj Ghimire, P. R. *et al*., (2019). Exclusive Breastfeeding Rates and Associated Factors in 13 "Economic Community of West African States" (ECOWAS) Countries. Nutrients. 11: 3007. ts 2019, 11, 3007. doi:10.3390/nu11123007

Aiken, L. H., Clarke, S. P., Sloane, D. M., Lake, E. T. & Cheney, T. (2008). Effects of Hospital Care Environment on Patient Mortality and Nurse Outcomes. *The Journal of nursing administration*, *38*(5), 223–229. https://doi.org/10.1097/01.NNA.0000312773.42352.d7

Akachi, Y. & Kruk, M. E. (2017). Quality of care: measuring a neglected driver of improved health. *Bulletin of the World Health Organization*, *95*(6), 465–472. https://doi.org/10.2471/BLT.16.180190

Akin J. and Hutchinson (1999). **"**Healthcare Facility Choice and the Phenomenon of Bypassing." *Health Policy and Planning*. **14**(2): 135–151

Akin, J. S., Guilkey, D. K., & Hazel, D. E. (1995). Quality of Services and Demand for Health Care in Nigeria: A Multinomial Probit Estimation. *Social Science & Medicine, 40(11), 1527–1537*.doi:10.1016/0277-9536(94)00274-w

Al-Abri, R. & Al-Balushi, A. (2014). Patient Satisfaction Survey as A Tool Towards Quality Improvement. *Oman medical journal*, *29*(1), 3–7. https://doi.org/10.5001/omj.2014.02

Alameda County Public Health Department (2017). *An Introduction to Measures of Mortality: Assessing Overall Health, Cause of Death Rankings, Health-Adjusted Life Expectancy, and Socioeconomic Conditions in Alameda County*. Oakland, California.

Alderman, H. and Lavy, V. (1996). Household Responses to Public Health Services: Cost and Quality Tradeoffs. *The World Bank Research Observer*. 11(1):3-22

Alemu, B. M., Berhane, Y. and Worku, A. (2012). Predictors of Oral Rehydration Therapy use Among Under-Five Children with Diarrhea in Eastern Ethiopia: A Community Based Case Control Study. *BMC public health*. 12(1):1029. Doi:10.1186/1471-2458-12-1029.

Alex-Hart, B. A., Dotimi, D. A., & Opara, P. I. (2014). Mothers' recognition of newborn danger signs and health seeking behaviour." *Nigerian Journal of Paediatrics*, *41*(3), 199-203.

Aliyu, A.A. and Dahiru, T. (2019). Factors Associated with Safe Disposal Practices of Child's Faeces in Nigeria: Evidence from 2013 Nigeria Demographic and Health Survey. Nigerian Medical Journal, 60(4): 198–204. doi: 10.4103/nmj.NMJ_3_19

Amaghionyeodiwe, L. A. (2008). Determinants of the choice of health care provider in Nigeria. *Health care management science*, *11*(3), 215-227.

Amaral, J. and Victora, C. (2008). The Effect of Training in Integrated Management of Childhood Illness (IMCI) On the Performance and Healthcare Quality of Pediatric Healthcare Workers: A Systematic Review. *Revista Brasileira de Saúde Materno Infantil.* 8 (2): 151-162. DOI.10.1590/S1519-38292008000200002.

Amporfu, E., Nonvignon, J. and Ampadu, S. (2013). Effect of Institutional Factors on Quality of Ghana's Healthcare Delivery. *Journal of African Development*. 15(1):99-115

Andersen, R. (1995). Revisiting the Behavioural Model and Access to Medical Care: Does it Matter? *Journal of Health and Social Behaviour*. 36 (March), 1-10

Aniugbo, B., King, K., Hayes, C. and John, J. (2017). The Socio-Demographic Determinants of Health Care Seeking Behaviour by Carers of Children with Diarrhoea in Rural Communities in Enugu State, Nigeria. *International Journal of Current Research*, 9(11):61330-61345.

Ansari, M., Ibrahim, M. I., Hassali, M. A., Shankar, P. R., Koirala, A., & Thapa, N. J. (2012). Mothers' beliefs and barriers about childhood diarrhea and its management in Morang district, Nepal. *BMC research notes*, *5*, 576. https://doi.org/10.1186/1756-0500-5-576

Arage, G. and Gedamu, H. (2016). Exclusive Breastfeeding Practice and Its Associated Factors among Mothers of Infants Less Than Six Months of Age in Debre Tabor Town, Northwest Ethiopia: A Cross-Sectional Stud**y.** *Advances in Public Health.* Vol. 2016. https://doi.org/10.1155/2016/3426249

Arora, A., Manohar, N., Hayen, A., Bhole, S., Eastwood, J., Levy, S. and Scott, J. A (2017). Determinants of Breastfeeding Initiation Among Mothers in Sydney, Australia: Findings from A Birth Cohort Study. *International Breastfeeding Journal,* 12:39 DOI 10.1186/s13006-017-0130-0

Arrow, K. (1963). Uncertainty and the Welfare Economics of Medical Care. *The American Economic Review*. 53(5):941-973

Asadi-Pooya, A. A. (2005). Drug Compliance of Children and Adolescents with Epilepsy. *Seizure, 14(6), 393–395.*doi:10.1016/j.seizure.2005.05.003

Asakitikpi, A. (2010). Acute Diarrhoea: Mothers' Knowledge of ORT and Its Usage in Ibadan Metropolis, Nigeria. *Studies on Ethno-Medicine*, 4 (2): 125-130. Doi. 10.1080/09735070.2010.11886370.

Asare, B.Y., Preko, J.V., Baafi, D., and Dwumfour-Asare, B. (2018). Breastfeeding Practices and Determinants of Exclusive Breastfeeding in A Cross-Sectional Study at A Child Welfare Clinic in Tema Manhean, Ghana. *Int Breastfeed J* ;**13 (**12). https://doi.org/10.1186/s13006-018-0156-y

Asemahagn, M. (2016). Determinants of Exclusive Breastfeeding Practices Among Mothers in Azezo District, Northwest Ethiopia. *International Breastfeeding Journal*, 11:22. DOI 10.1186/s13006-016-0081-x

Asfaw, M. M., Argaw, M. D. & Kefene, Z. K. (2015). Factors Associated with Exclusive Breastfeeding Practices in Debre Berhan District, Central Ethiopia: A Cross Sectional Community Based Study. *Int Breastfeed J,* 10:23. https://doi.org/10.1186/s13006-015-0049-2

Ashagidigbi W.M., Adewumi O.B., Olagunju K.O. and Ogunniyi A.I. (2018). Maternal Education Household's Wealth and Child Mortality in Rural Nigeria. *J Nutri Bio*, 4(1): 207-216. doi: 10.18314/JNB.V4I2.1347

Ashraf, K., Ng, C. J., Teo, C. H., & Goh, K. L. (2019). Population indices measuring health outcomes: A scoping review. *Journal of global health*, *9*(1), 010405. https://doi.org/10.7189/jogh.09.010405

Asteraye, N. (2002). Determinants of Healthcare Services in and their Implication on Healthcare Financing: The Case of Bure Town. Ethiopian Journal of Economics. Xi (1):87-122

Atimati, A. and Adam, V. (2018). Breastfeeding Practices Among Mothers of Children Aged 1–24 Months in Egor Local Government Area of Edo State, Nigeria. *South African Journal of Clinical Nutrition*, 0(0):1-7. DOI: 10.1080/16070658.2018.1493071

Audibert, M. (2009). Issues and Challenges of Measurement of Health: Implications for Economic Research. 22. 2011. https://halshs.archives-ouvertes.fr/halshs-00554267/document

Audo, M., Ferguson, A. and Njoroge, P. (2005). "Quality of Health Care and its Effects in the Utilisation of Maternal and Child Health Services in Kenya." *East African Medical Journal*. 82(11)

Aung, T., Montagu, D., Schlein, K., Khine, T. M. and McFarland, W. (2012). Validation of a New Method for Testing Provider Clinical Quality in Rural Settings in Low and Middle-Income Countries: The Observed Simulated Patient. *PLoS ONE* 7(1): e30196. doi:10.1371/journal.pone.0030196

Ayele, Y., Yemane, A., Redae, G. and Mekibib, E. (2017). Child Feces Disposal Practice and Associated Factors: A Dilemma in Tigray, Northern Ethiopia. *Journal of Water, Sanitation and Hygiene for Development*, 8(1):62-70. https://doi.org/10.2166/washdev.2017.129

Ayisi, R. K. and Wakoli, A. B. (2014). Exclusive Breastfeeding Practice: Its Implication on Nutrition Status, Growth and Morbidity Pattern Among Infants Aged 0-6 Months. *Global Journal of Biology, Agriculture and Health Sciences,* 3(1):254-258.

Azage, M. and Haile, D. (2015). Factors Associated with Safe Child Faeces Disposal Practices in Ethiopia: Evidence from Demographic and Health Survey. *Archives of Public Health,* **73**:40 https://doi.org/10.1186/s13690-015-0090-z

Aziz, K. M., Hoque, B. A., Hasan, K. Z., Patwary, M. Y., Huttly, S. R., Rahaman, M. M., & Feachem, R. G. (1990). Reduction in Diarrhoeal Diseases in Children in Rural Bangladesh By Environmental and Behavioural Modifications. *Transactions of the Royal Society of Tropical Medicine and Hygiene, 84*(3), 433–438. https://doi.org/10.1016/0035-9203(90)90353-g

Bago d'Uva, T., Van Doorslaer E., Lindeboom M., O'Donnell, O. and Chatterji S. (2006). Does Reporting Heterogeneity Bias the Measurement of Health Disparities? *HEDG Working Paper no. 06/03,* University of York.

Balogun M.R., Okpalugo O.A., Ogunyemi A.O. and Sekoni A.O. (2017). Knowledge, Attitude and Practice of Breastfeeding: A Comparative Study of Mothers in Urban and Rural Communities of Lagos, Southwest Nigeria. *Nigerian Medical Journal*. 58(4) :123-30.

Baltazar, J.C., Nadera, D.P., and Victora C. G. (2002). Evaluation of the National Control of Diarrhoeal Disease Programme in the Philippines, 1980–93. *Bulletin of the World Health Organization*. 80(8).

Bamiselu, O. F., Ajayi, I., Fawole, O., Dairo, D., Ajumobi, O., Oladimeji, A. and Steven, Y. (2016). Adherence to Malaria Diagnosis and Treatment Guidelines Among Healthcare Workers in Ogun State, Nigeria, *BMC Public Health,* 16:828. https://DOI 10.1186/s12889-016-3495-x

Bandura, R. (2011). *Composite Indicators and Rankings: Inventory 2011*. Technical report, New York: Office of Development Studies, United Nations Development Programme (UNDP).

Barclay, M., Dixon-Woods, M. and Georgios Lyratzopoulos, G. (2019). The Problem with Composite Indicators. *BMJ Qual Saf,* 28:338–344. doi:10.1136/bmjqs-2018-007798

Barro, R. (2013). "Health and Economic Growth." *Analysis of Economics and Finance*. 14(2):329-366

Bartram J, Cairncross S (2010) Hygiene, Sanitation, and Water: Forgotten Foundations of Health. *PLoS Med*. 7(11): e1000367. https://doi.org/10.1371/journal.pmed.1000367

Basheti, I. A., Saqf el Hait, S, Qunaibi, E. A., Aburuz, S. and Bulatova N. (2016). Associations Between Patient Factors and Medication Adherence: A Jordanian Experience. *Pharmacy Practice*. 14(1):639. doi: 10.18549/PharmPract.2016.01.639

Basu, S., Andrews, J., Kishore, S., Panjabi, R. & Stuckler, D. (2012). Comparative Performance of Private and Public Healthcare Systems in Low- And Middle-Income Countries: A Systematic Review. *PLoS medicine, 9*(6), e1001244. doi:10.1371/journal.pmed.1001244

Batalden, M., Batalden, P., Margolis, P., Seid, M., Armstrong, G., Opipari-Arrigan, L., & Hartung, H. (2015). Coproduction of Healthcare Service. *BMJ Quality & Safety, 25(7), 509–517.* doi:10.1136/bmjqs-2015-004315

Battleman, D. S., Callahan, M. and Thaler, H. T. (2002). Rapid Antibiotic Delivery and Appropriate Antibiotic Selection Reduce Length of Hospital Stay of Patients with Community-Acquired Pneumonia. *Archives of Internal Medicine, 162(6), 682.*doi:10.1001/archinte.162.6.682

Batussen, R. M., YE, Y., Haddad, S. and Sauerborn, R. S. (2002). Perceived Quality of Care of Primary Health Care Services in Burkina Faso. *Health Policy and Planning*, 17(1):42-48

Bauza, V., & Guest, J. S. (2017). The Effect of Young Children's Faeces Disposal Practices on Child Growth: Evidence from 34 Countries. *Tropical Medicine & International Health, 22(10), 1233–1248.*doi:10.1111/tmi.12930

Bauza, V., Reese, H., Routray, P. and Clasen, T. (2019). Child Defecation and Feces Disposal Practices and Determinants among Households after a Combined Household-Level Piped Water and Sanitation Intervention in Rural Odisha, India. *American Journal of Tropical Medicine and Hygiene*, 100(4):1013–1021. doi:10.4269/ajtmh.18-0840

Bawankule, R., Singh, A., Kumar, K. and Pedgaonkar, S. (2017). Disposal of Children's Stools and Its Association with Childhood Diarrhea in India. *BMC Public Health;* 17(12). https://doi.org/10.1186/s12889-016-3948-2

Bawate, C., Callender-Carter, S., Nsajju, B. and Bwayo, D. (2016). Factors Affecting Adherence to National Malaria Treatment Guidelines in Management of Malaria Among Public Healthcare Workers in Kamuli District, Uganda. *Malaria Journal*. 15 :112

Becker, G. (1965). A Theory of the Allocation of Time. *The Economic Journal*, 75(99):493-517

Becker, M. H., Haefner, D. P., Kasl, S. V., Kirscht, J. P., Maiman, L. A., & Rosenstock, I. M. (1977). Selected psychosocial models and correlates of individual health-related behaviors. *Medical care*, *15*(5 SUPPL), 27–46. https://doi.org/10.1097/00005650-197705001-00005

Begashaw, B., Tessema, F., & Gesesew, H. A. (2016). Health Care Seeking Behavior in Southwest Ethiopia. *PloS one*, *11*(9), e0161014. https://doi.org/10.1371/journal.pone.0161014

Begum, M. and Absar, M. N. (2016). Diarrhea in Breastfed versus Formulafed Baby: A Hospital Based Study in 150 Children. *Journal of Bangladesh College of Physicians and Surgeons*, 34 (1): 21-25

Behrman, J. R. (1988). Nutrition, Health, Birth Order and Seasonality. *Journal of Development Economics, 28(1), 43–62.* doi:10.1016/0304-3878(88)90013-2

Belfield, C. and Kelly, I. (2012). The Benefits of Breast Feeding across the Early Years of Childhood. *Journal of Human Capital, 6*(3), 251-277. doi:10.1086/667415

Belli, P., Bustreo, F. and Preker, A. (2005). "Investing in Children's Health: What are the Economic Benefits?" *Bulletin of the World Health Organisation*. 83:777-784

Benova, L., Siddiqi, M., Abejirinde I-O. O. and Badejo, O. (2020). Time Trends and Determinants of Breastfeeding Practices Among Adolescents and Young Women in Nigeria, 2003–2018. *BMJ Global Health*;5:e002516. doi:10.1136/ bmjgh-2020-002516

Bergner, M. and Rothman, M. (1987). Health Status Measures: An Overview and Guide for Selection. *Annual Reviews Public Health.* 8:191-210

Berman, P. (1998). Rethinking health care systems: private health care provision in India. *World Development,* 26(8), 1463-1479

Bhandari, S., Thorne-Lyman, A.L., Shrestha, B. Sumanta Neupane, S., Nonyane, B. A. S., Manohar, S., Klemm, R. D. W and West Jr, K. P. (2019). Determinants of Infant Breastfeeding Practices in Nepal: A National Study. *Int Breastfeed J* ,14 **(**14). https://doi.org/10.1186/s13006-019-0208-y

Bhandari, N., Bahl, R., Mazumdar, S., Martines, J., Black, R. E., and Bhan, M. K. (2003). Effect of Community-Based Promotion of Exclusive Breastfeeding on Diarrhoeal Illness and Growth: A Cluster Randomised Controlled Trial. *The Lancet, 361(9367), 1418–1423.* https://doi:10.1016/s0140-6736(03)13134-0

Bhargava, A., Jamison, D. T., Lau, L. J. & Murray, C. J. (2001). Modeling the Effects of Health on Economic Growth. *Journal of health economics, 20*(3), 423-440.

Bishwakarma, R., & Villa, K. M. (2019). First Come, First Served? Birth Order Effects on Child Height in South Africa. *Journal of Demographic Economics, 85(01), 71–94.* doi:10.1017/dem.2018.23

Bitner, M. J., Faranda, W. T., Hubbert, A. R., & Zeithaml, V. A. (1997). Customer contributions and roles in service delivery. *International journal of service industry management*.

Blanco, C. E. (2003). Critical period for programming: a never-ending story. *Pediatr Res*; 54:787–788.

Bloom, D. E. & Canning, D. (2000). The Health and Wealth of Nations. *Science (Washington),* 287(5456), 1207-1209.

Bloom, D. E., Canning, D. & Jamison, D. T. (2004). "Health, Wealth, and Welfare." *Finance and development*. *41*:10-15.

Bloom, D. E., Canning, D. & Sevilla, J. (2004). The Effect of Health On Economic Growth: A Production Function Approach. *World development*, *32*(1), 1-13.

Blumenthal, D. (1996). Quality of Care — What is It? *New England Journal of Medicine, 335(12), 891–894.*doi:10.1056/nejm199609193351213

Bolin, K., Jacobson, L. and Lindgren, B. (2002). The Family as the Health Produce-When Spouses Act Strategically. *Journal of Health Economics.* 21(3):475-495

Booysen, F. (2002). An Overview and Evaluation of Composite Indices of Development. *Social Indicators Research*, *59*(2), 115–151. http://www.jstor.org/stable/27527024

Bos, N., Sturms, L. M., Schrijvers, A. J. and van Stel, H. F. (2012). The Consumer Quality Index (CQ-Index) in an Accident and Emergency Department: Development and First Evaluation. *BMC Health Serv Res* 12**:** 284. https://doi.org/10.1186/1472-6963-12-284

Breen, B., Karlson, K. B. and Holm, A. (2018). Interpreting and Understanding Logits, Probits and Other Nonlinear Probability Models. *Annual Review of Sociology*, 44:(1):39-54.

Breslow L. (2006). Health Measurement in The Third Era of Health. *American Journal of Public Health*, *96*(1), 17–19. https://doi.org/10.2105/AJPH.2004.055970

Brook, R. H., McGlynn, E. A. and Cleary, P. (2014). Quality of Healthcare. *The New England Journal of Medicine.* 435(13):966-970

Brown, K. H., Peerson, J. M., Baker, S. K., & Hess, S. Y. (2009). Preventive zinc supplementation among infants, preschoolers, and older prepubertal children. *Food and nutrition bulletin*, *30*(1 Suppl), S12–S40. https://doi.org/10.1177/15648265090301S103

Brown, J., Cairncross, S., & Ensink, J. H. (2013). Water, sanitation, hygiene and enteric infections in children. *Archives of disease in childhood*, *98*(8), 629–634. https://doi.org/10.1136/archdischild-2011-301528

Brown K. H., Creed-Kanashiro H., Dewey K. G. (1995). Optimal Complementary Feeding Practices to Prevent Childhood Malnutrition in Developing Countries. *Food and Nutrition Bulletin*;16(4):1-21. doi:10.1177/156482659501600407

Brownson, R. and Petitti, D. (2006). *Applied Epidemiology: Theory to Practice*. Oxford University Press.

Bryce, J., Boschi-Pinto, C., Shibuya, K., & Black, R. E. (2005). WHO estimates of the causes of death in children. *The Lancet, 365(9465), 1147–1152.* doi:10.1016/s0140-6736(05)71877-8

Burton, D.C., Flannery, B., Onyango, B. *et al*., (2011). Healthcare-seeking Behaviour for Common Infectious Disease-Related Illnesses in Rural Kenya: A Community-Based House-to-House Survey. *Journal of Health, Population and Nutrition*, 61-70.

Calub, A. (2014). *Physician Quality and Payment Schemes: A Theoretical and Empirical Analysis*. MPRA Paper No. 92604. https://mpra.ub.uni-muenchen.de/92604/

Campbell, S. M., Roland, M. O. and Buetow, S.A. (2000). Defining Quality of Care. *Social Science and Medicine*. 51(11):1611-1625

Chandwani, H., & Pandor, J. (2015). Healthcare-Seeking Behaviors of Mothers regarding their Children in a Tribal Community of Gujarat, India. *Electronic physician*, *7*(1), 990–997. doi:10.14661/2015.990-997

CSDH, (2008). *Closing the Gap in a Generation: Health Equity through Action on the Social Determinants of Health. Final Report of the Commission on Social Determinants of Health*, Geneva, World Health Organisation. https://www.who.int/publications/i/item/WHO-IER-CSDH-08.1

Chou, Victoria B.; Walker, Neff; Kanyangarara, Mufaro; Persson, Lars Åke (2019). Estimating The Global Impact of Poor Quality of Care on Maternal and Neonatal Outcomes in 81 Low- and Middle-Income Countries: A Modeling Study. *PLOS Medicine, 16(12), e1002990–*. doi:10.1371/journal.pmed.1002990

Choudhry, N. K., Fletcher, R. H. & Soumerai, S. B. (2005). Systematic Review: The Relationship Between Clinical Experience and Quality of Health Care. *Annals of internal medicine*, *142*(4), 260–273. https://doi.org/10.7326/0003-4819-142-4-200502150-00008

Chawla, M. and Pellis, R. (2000). The impact of financing and quality changes on health care demand in Niger. *Health Policy and Planning*; 15(1): 76–84

Chekol, D.A., Biks, G.A., Gelaw, Y.A. and Melsew, Y. A. (2017). Exclusive breastfeeding and mothers' employment status in Gondar town, Northwest Ethiopia: a comparative cross-sectional study. *International Breastfeeding Journal.* 12 **(**27):2-9. https://doi.org/10.1186/s13006-017-0118-9

Chen, Y. J., Chindarkar, N. & Xiao, Y. (2019). Effect of Reliable Electricity on Health Facilities, Health Information, And Child and Maternal Health Services Utilization: Evidence from Rural Gujarat, India. *J Health Popul Nutr*; **38(**7) https://doi.org/10.1186/s41043-019-0164-6

Chen, A., Jacobsen, K.H., Deshmukh, A.A. & Cantor, S.B. (2015). The Evolution of the Disability-Adjusted Life Year (DALY). *Socio-Economic Planning Sciences*. 49 (2015):10-15. https://doi.org/10.1016/j.seps.2014.12.002

Chen A., Dutta, A. and Maina, Thomas (2014). Assessing the Quality of Primary Healthcare Services in Kenya: Evidence from the Pets-Plus Survey 2012. *Health Policy Project*

Claeson, M., & Waldman, R. J. (2000). The evolution of child health programmes in developing countries: from targeting diseases to targeting people. *Bulletin of the World Health Organization*, *78*(10), 1234–1245.

Cleary, P. (1997). Subjective and Objective Health Measures-What do they tell us? *Journal of Health Service Res Policy*, 2(1)

Cleary, P. D. & McNeil, B. J. (1988). Patient Satisfaction as an Indicator of Quality Care. *Inquiry: a journal of medical care organization, provision and financing*, 25(1), 25–36.

Conrad, D. A. & Perry, L. (2009). Quality-Based Financial Incentives in Health Care: Can We Improve Quality by Paying for It? *Annual review of public health, 30*, 357-371.

Conrad, D. A. (2015). The Theory of Value-Based Payment Incentives and Their Application to Health Care. *Health Services Research,* 50: 2057–2089. doi:10.1111/1475-6773.12408

Council on Medical Services. (1986). Council Report: Quality of Care. *JAMA*, 256: 35-7.

Counte MA (2007). *Health Care Quality Assessment*, School of Public Health, Saint Louis University

Cronin, A. A., Sebayang, S. K., Torlesse, H. and Nandy, R. (2016). Association of Safe Disposal of Child Feces and Reported Diarrhea in Indonesia: Need for Stronger Focus on a Neglected Risk. *International Journal of Environmental Research and Public Health*; 13, 310; doi:10.3390/ijerph13030310

Culyer. A. J. and J. P. Newhouse (2000). *Handbook of Health Economics*, North – Holland

Currie, J. (2008). "Child Health and Mortality," in Larry Blume and Steven Durlauf (eds.) *The New Palgrave Dictionary of Economics, 2nd Edition*," (London: Macmillan).

Dagnew, A. B., Tewabe, T. & Murugan, R. (2018). Level of modern health care seeking behaviors among mothers having under five children in Dangila town, north West Ethiopia, 2016: a cross sectional study. *Italian journal of pediatrics, 44*(1), 61. doi:10.1186/s13052-018-0503-z

Das, N. (1987). Sex Preference and Fertility Behavior: A Study of Recent Indian Data. *Demography*. 24(4), 517-530

Das, J and Gertler, P. J. (2007). Variations in Practice Quality in Five Low-Income Countries: A Conceptual Overview. *Health Affairs (Millwood),* 26:296-309.

Das, J., Hammer, J. & Leonard, K. (2008). The Quality of Medical Advice in Low-Income Countries. *The Journal of Economic Perspectives*, *22*(2), 93-114.

Davies, A. R. & Ware, J. E. (1988). Involving consumers in quality of care assessment. *Health affairs, 7*(1), 33-48.

Dawood, O. T., Ibrahim, M. I. M. and Palaian, S. (2010). Medication compliance among children. *World Journal of Pediatrics,* 6(3). doi:10.1007/s12519-010-0218-8

Deaton, A. (2002). Policy Implications of the Gradient of Health and Wealth. *Health Affairs, 21*(2), 13-30.

Desmennu, A. T., Oluwasanu, M. M., John-Akinola, Y. O., Oladunni, O., & Adebowale, A. S. (2017). Maternal Education and Diarrhea among Children aged 0-24 Months in Nigeria. *African journal of reproductive health*, *21*(3), 27–36. https://doi.org/10.29063/ajrh2017/v21i3.2

Desta, B. K., Assimamaw, N. T., & Ashenafi, T. D. (2017). Knowledge, Practice, and Associated Factors of Home-Based Management of Diarrhea among Caregivers of Children Attending Under-Five Clinic in Fagita Lekoma District, Awi Zone, Amhara Regional State, Northwest Ethiopia, 2016. *Nursing Research and Practice, 2017, 1–8.* doi:10.1155/2017/8084548

Dewey, K.G., Roberta J. Cohen, R. J., Brown, K.H. and Leonardo Landa Rivera, L. L. (2001). Effects of Exclusive Breastfeeding for Four versus Six Months on Maternal Nutritional Status and Infant Motor Development: Results of Two Randomized Trials in Honduras, *The Journal of Nutrition*, 131(2): 262–267, https://doi.org/10.1093/jn/131.2.262

Diallo, F. B. Linda Bell, L., Moutquin, J., and Garant, M. (2009). The Effects of Exclusive Versus Non-Exclusive Breastfeeding on Specific Infant Morbidities in Conakry (Guinea). PanAfrican Medical Journal. 2 (2). http://www.panafrican-med-journal.com/content/article/2/2/full

Diewert, W. (1971). An Application of the Shephard Duality Theorem: A Generalized Leontief Production Function. *Journal of Political Economy*. 79. 481-507. doi: 10.1086/259764.

Diouf, K., Tabatabai, P., Rudolph, J., & Marx, M. (2014). Diarrhoea Prevalence in Children Under Five Years of Age in Rural Burundi: An Assessment of Social and Behavioural Factors at The Household Level. *Global Health Action, 7(1), 24895.* doi:10.3402/gha.v7.24895

Dolan, P. and Olsen, J. (2002). *Distributing Healthcare: Economic and Ethical Issues*. Oxford University Press, New York

Donabedian, A. (2005). "Evaluating the Quality of Medical Care". *The Milbank Quarterly*, *83*(4), 691–729. http://doi.org/10.1111/j.1468-0009.2005.00397.x

Donabedian, A. (1988). "The Quality of Care: How can it be assessed?" *JAMA. 260:*1745-1748

Dubois, L., & Girard, M. (2003). Social Determinants of Initiation, Duration and Exclusivity of Breastfeeding at the Population Level: The Results of the Longitudinal Study of Child Development in Quebec (ELDEQ 1998-2002). *Canadian Journal of Public Health / Revue Canadienne De Sante'e Publique*, *94*(4), 300-305. http://www.jstor.org/stable/41993668

Dwivedi, L. K., Banerjee, K., Jain, N., Mukesh, R., and Dixit, P. (2018). Child Health and Unhealthy Sanitary Practices in India: Evidence from Recent Round of National Family Health Survey-IV. *SSM - Population Health*.doi:10.1016/j.ssmph.2018.10.013

Ehlayel, M. S., Bener, A. and Abdulrahman, H. M. (2009). Protective Effect of Breastfeeding on Diarrhea Among Children in A Rapidly Growing Newly Developed Society, *The Turkish Journal of Pediatrics*; 51: 527-533

Emerson, J., Esty, D. C., Levy, M. A., Kim, C. H., Mara, V., de Sherbinin, A. and Srebotnjak, T. (2010). 2010 *Environmental Performance Index.* New Haven: Yale Center for Environmental Law and Policy. https://epi.yale.edu/

Escamilla, V., Calhoun, L., Winston, J., & Speizer, I. S. (2018). The Role of Distance and Quality on Facility Selection for Maternal and Child Health Services in Urban Kenya. *Journal of urban health: bulletin of the New York Academy of Medicine*, *95*(1), 1–12. doi:10.1007/s11524-017-0212-8

Esrey, S.A., Potash, J.B., Roberts, L. and Shiff, C. (1991). Effects of Improved Water Supply and Sanitation on Ascariasis, Diarrhoea, Dracunculiasis, Hookworm Infection, Schistosomiasis, and Trachoma. *Bulletin of the World Health Organization;* 69 (5): 609-621

Eva, K. W. (2002). The aging physician: changes in cognitive processing and their impact on medical practice. *Academic Medicine*, *77*(10), S1-S6.

Farmer, J., Hinds, K., Richards, H. & Godden, D. (2005). Urban Versus Rural Populations' Views of Health Care in Scotland. *Journal of Health Services Research & Policy*, 10(4), 212–219. doi:10.1258/135581905774414240

Field, A. (2000). *Discovering Statistics using SPSS for Windows.* London – Thousand Oaks – New Delhi: Sage publications.

Fitzpatrick, R. and Hopkins, A. (1983). Problems in The Conceptual Framework of Patient Satisfaction Research: An Empirical Exploration. *Sociology of Health & Illness*, 5(3):297-311.

Flacking, R., Nyqvist, K. and Ewald, U. (2007). Effect of Socioeconomic Status on Breastfeeding Duration in Mothers of Preterm and Term Infants. *European Journal of Public Health.* 17(6):579-84. DOI:10.1093/Eurpub/Ckm019.

Fotso, J. C. and Mukiira, C., (2012). Perceived Quality of and Access to Care Among Poor Urban Women in Kenya and their Utilization of Delivery Care: Harnessing the Potential of Private Clinics? *Health Policy and Planning*, 27 (6): 505–515, https://doi.org/10.1093/heapol/czr074

Fox, J. G. and Storms, D. M. (1981). A Different Approach to Sociodemographic Predictors of Satisfaction with Healthcare. *Social Science and Medicine*, 15(5): 557-564. https://doi.org/10.1016/0271-7123(81)90079-1

Frank, R. G. (2004). *Behavioural Economics and Health Economics*. NBER working Paper 10881

Frankenberg, E. (1995). The Effects of Access to Healthcare on Infant Mortality in Indonesia. *Health Transition Review*, 5:143-163

Fuchs, R., Pamuk, E., & Lutz, W. (2010). Education or Wealth: Which Matters More for Reducing Child Mortality in Developing Countries? *Vienna Yearbook of Population Research*, *8*, 175-199. Retrieved from http://www.jstor.org/stable/23025514

Gage, A. D., Leslie, H. H., Bitton, A., Jerome, J. G., Joseph, J. P., Thermidor, R., & Kruk, M. E. (2018). Does quality influence utilization of primary health care? Evidence from Haiti. *Globalization and health*, *14*(1), 59. doi:10.1186/s12992-018-0379-0

Gao, W., Yan, H., Wang, D. and Dang, S. (2013). Oral rehydration salt use and its correlates in low-level care of diarrhea among children under 36 months old in rural Western China. *BMC Public Health* 13, 238. https://doi.org/10.1186/1471-2458-13-238

Gardner, J. and Sanborn J (1990). Years of Potential Life Lost (YPLL)—What Does it Measure? *Epidemiology* 1:322-9

Garg, A. and Gupta, R. (2014). Predictors of Compliance to Gluten-Free Diet in Children with Celiac Disease. International Scholarly Research Notices. International Scholarly Research Notices, Article ID 248402. http://dx.doi.org/10.1155/2014/248402

Gebreegziabher, S.B., Bjune, G.A. and Yimer, S.A. (2016). Total Delay Is Associated with Unfavorable Treatment Outcome among Pulmonary Tuberculosis Patients in West Gojjam Zone, Northwest Ethiopia: A Prospective Cohort Study. *PLOS ONE* 11(7): e0159579. https://doi.org/10.1371/journal.pone.0159579

Gelaw, Y., Biks, G., and Alene, K. (2014). Effect of Residence on Mothers' Health Care Seeking Behavior for Common Childhood Illness in Northwest Ethiopia: A Community Based Comparative Cross – Sectional Study. *BMC Research Notes*, 7(705):2-8. http://www.biomedcentral.com/1756-0500/7/705

Germain, N., Aballéa, S. & Toumi, M. (2019). Measuring the Health-Related Quality of Life in Young Children: How Far Have We Come? *Journal of market access & health policy*, *7*(1), 1618661. https://doi.org/10.1080/20016689.2019.1618661

Gertler, P., Locay L. and Sanderson W. (1987). *Are User Fees Regressive? The Welfare Implications of Health Care Financing Proposals in Peru*, Working Paper No. 2299. National Bureau of Economic Research, Massachusetts

Ghimire, P. R., Agho, K. E., Renzaho, A. M. N., Dibley M. and Raynes-Greenow, C. (2018). Association Between Health Service Use and Diarrhoea Management Approach Among Caregivers of Under-Five Children in Nepal. *PLoS ONE*, 13(3): e0191988. https://doi.org/10.1371/journal.pone.0191988

Ghwass, M. M. E. A., & Ahmed, D. (2011). Prevalence and Predictors of 6-Month Exclusive Breastfeeding in a Rural Area in Egypt. *Breastfeeding Medicine, 6(4), 191–196.* doi:10.1089/bfm.2011.0035

Gil, A., Lanata, C., Kleinau, E. and Penny, M. (2004). *Children's Feces Disposal Practices in Developing Countries and Interventions to Prevent Diarrheoal Diseases*. Environmental HealthProjectUSAID: http://www.ehproject.org/PDF/Strategic_papers/SR11Child%20Excreta%20Format.pdf.

Gill, L & White, L. (2009). A Critical Review of Patient Satisfaction. *Leadership in Health Services.* 22. 8-19. 10.1108/17511870910927994.

Gizaw, Z., Woldu, W., & Bitew, B. D. (2017). Exclusive breastfeeding status of children aged between 6 and 24 months in the nomadic population of Hadaleala district, Afar Region, northeast Ethiopia. *International breastfeeding journal, 12*, 38. doi:10.1186/s13006-017-0129-6

Goddard, M., & Jacobs, R. (2010). Using composite indicators to measure performance in health care. In P. Smith, E. Mossialos, I. Papanicolas, & S. Leatherman (Eds.), *Performance Measurement for Health System Improvement: Experiences, Challenges and Prospects* (Health Economics, Policy and Management, pp. 339-368). Cambridge: Cambridge University Press. doi:10.1017/CBO9780511711800.013

Gold, M., Stevenson, D. and Fryback, D. (2002). HALYS and QALYS and DALYS, Oh My: Similarities and Differences in Summary Measures of Population Health. *Annual Reviews Public Health*, 23:115–34

Gorstein, J. & Akre, J. (1988). The Use of Anthropometry to Assess Nutritional Status. *World health statistics quarterly. Rapport trimestriel de statistiques sanitaires mondiales*. 41: 48-58.

Gould, M. I., & Moon, G. (2000). Problems of providing health care in British island communities. *Social Science & Medicine, 50(7-8), 1081–1090.* doi:10.1016/s0277-9536(99)00356-1

Government of Kenya (2007). *Kenya Vision 2030: A Globally Competitive and Prosperous Kenya*, Nairobi: Ministry of Planning and National Development and the National Economic and Social Council (NESC).

Government of Kenya (2010). *The Constitution of Kenya*. Available at http://www.kenyalaw.org/kl/index.php?id=398. Accessed on 01082019.

Government of Kenya (2014). *Kenya Service Availability and Readiness Assessment Mapping (SARAM)*. Ministry of Health. Nairobi Kenya.

Grad, F. P. (2002). The Preamble of the Constitution of the World Health Organization : public health classics / Frank P. Grad. http://www.who.int/iris/handle/10665/71722 Accessed on 16/01/2009

Greco, S., Ishizaka, A., Tasiou, M. and Torrisi, G. (2018). On the Methodological Framework of Composite Indices: A Review of the Issues of Weighting, Aggregation,

and Robustness. *Soc Indic Res (2019)* 141:61–94. https://doi.org/10.1007/s11205-017-1832-9

Green, W. (2002) (Fifth Edition). *Econometric Analysis*. Prentice Hall. New Jersey.

Griffith, S. (1990). A Review of the Factors Associated with Patient Compliance and Taking of the Prescribed Medicines. *British Journal of General Practice.* 40:114-116

Grossbart, S. R. (2006). What's the Return? Assessing the Effect of "Pay-for-Performance" Initiatives on the Quality of Care Delivery. *Medical Care Research and Review*, 63(1_suppl), 29S–48S. doi:10.1177/1077558705283643

Grossman, M. (1972). On the Concept of Health Capital and Demand for Health. *The Journal of Political Economy, Vol.80 (2): pp.223-255*

Grube, M. M., von der Lippe, E., Schlaud, M., & Brettschneider, A. K. (2015). Does breastfeeding help to reduce the risk of childhood overweight and obesity? A propensity score analysis of data from the KiGGS study. *PloS one*, *10*(3), e0122534. https://doi.org/10.1371/journal.pone.0122534

Gulavani, S. and Kulkarni, R. (2010). *Role of Information Technology in Health Care.* Proceedings of the 4th National Conference; INDIACo. Bharati Vidyapeeth's Institute of Computer Applications and Management, New Delhi. http://bvicam.in/INDIACom/news/INDIACom%202010%20Proceedings/papers/Group1/74_Paper%20(2).pdf

Habibi, M., Laamiri, F. Z., Aguenaou, H., Doukkali, L., Mrabet, M., & Barkat, A. (2018). The impact of maternal socio-demographic characteristics on breastfeeding knowledge and practices: An experience from Casablanca, Morocco. *International journal of pediatrics & adolescent medicine*, *5*(2), 39–48. https://doi.org/10.1016/j.ijpam.2018.01.003

Habtewold, T. D., Sharew, N.T., and Alemu, S.M. (2019). Evidence on the Effect of Gender of Newborn, Antenatal Care and Postnatal Care on Breastfeeding Practices in Ethiopia: A Meta-analysis and meta-Regression Analysis of Observational Studies. *BMJ Open*; 9:e023956. doi:10.1136/ bmjopen-2018-023956

Haegdorens, F., Van Bogaert, P., De Meester, K. and Monsieurs, K.D. (2019). The Impact of Nurse Staffing Levels and Nurse's Education on Patient Mortality in Medical and Surgical Wards: An Observational Multicentre Study. *BMC Health Services Research*. 19:864 https://doi.org/10.1186/s12913-019-4688-7

Hafeez, N. and Quintana-Domeque, C. (2018). Son Preference and Gender-Biased Breastfeeding in Pakistan. *Economic Development and Cultural Change,* 66(2), 179–215. doi:10.1086/695137

Hall, A. E., Bryant, J., Sanson-Fisher, R. W., Fradgley, E. A., Proietto, A. M. & Roos, I. (2018). Consumer input into health care: Time for a new active and comprehensive model of

consumer involvement. *Health expectations: an international journal of public participation in health care and health policy*, *21*(4), 707–713. doi:10.1111/hex.12665

Hansen, P., Peters, D., Edward, A., Gupta, S., Arur, A., Niayesh, H. & Burnham, G. (2008). Determinants of Primary Care Service Quality in Afghanistan. *International Journal for Quality in Healthcare*, 20(6), 375-383. https://doi.org/10.1093/intqhc/mzn039.

Hassan, A.A., Taha, Z., Ahmed, M.A.A., Ali, A.A.A and Adam, I. (2018). Assessment of Initiation of Breastfeeding Practice in Kassala, Eastern Sudan: A Community-Based Study. *International Breastfeeding Journal;* **13 (**34). https://doi.org/10.1186/s13006-018-0177-6

Hays, R. D. & Reeve, B. B. (2008). Measurement and Modeling of Health-Related Quality of Life. *International Encyclopedia of Public Health*, 241–252. doi:10.1016/b978-012373960-5.00336-1

Heck, K. E., Braveman, P., Cubbin, C., Chávez, G. F. & Kiely, J. L. (2006). Socioeconomic Status and Breastfeeding Initiation among California Mothers. *Public Health Reports*, *121*(1), 51–59. https://doi.org/10.1177/003335490612100111

Hemmert, G. A. J., Schons, L. M., Wieseke, J. & Schimmelpfennig, H. (2016). Log-likelihood-based Pseudo-R2 in Logistic Regression: Deriving Sample-sensitive Benchmarks. *Sociological Methods & Research*, 47(3), 507–531. doi:10.1177/0049124116638107

Herrera, C. A., Rada, G., Kuhn-Barrientos, L. & Barrios, X. (2014). Does ownership matter? An overview of systematic reviews of the performance of private for-profit, private not-for-profit and public healthcare providers. *PloS one*, *9*(12), e93456. doi:10.1371/journal.pone.0093456

Hertzman, C., Siddiqi, A., Hertzman, E., Irwin, L., Vaghri, Z., Houweling, T. A. J., Bell, R., Tinajero, A. & Marmot, M. (2010). Tackling Inequality: Get Them While They're Young. *British Medical Journal*, 340(7742), 346-348.

Hibbard, J. (2003): "Engaging HealthCare Consumers to Improve the Quality of Care." *Medical Care*. 41(1), Supplement.

Hill, K. (1991). Approaches to The Measurement of Childhood Mortality: A Comparative Review. *Population Index*. 57(3):368-382.

Hirschhorn, N. (1980). The Treatment of Acute Diarrhea in Children. An Historical and Physiological Perspective. *The American Journal of Clinical Nutrition*, 33(3), 637–663. doi:10.1093/ajcn/33.3.637

Hong, R. (2006). Effect of Multiple Birth on Infant Mortality in Bangladesh. *Journal of Paediatrics and Child Health, 42(10), 630–635.* doi:10.1111/j.1440-1754.2006.00940.x

Horton, S. (1988). Birth Order and Child Nutritional Status: Evidence from the Philippines. *Economic Development and Cultural Change*. 36(2):341-354

Hotchkiss, D. (1993). *The Role of Quality in the Demand for Health Care in Cebu, Philippines*. Small Applied Research Paper No. 12. Bethseda, USA.

Houck, P. M., Bratzler, D. W., Nsa, W., Ma, A. & Bartlett, J. G. (2004). Timing of Antibiotic Administration and Outcomes for Medicare Patients Hospitalized with Community-Acquired Pneumonia. *Archives of Internal Medicine,* 164(6), 637.doi:10.1001/archinte.164.6.637

Hoyle, B., Yunus, M., & Chen, L. C. (1980). Breast-Feeding and Food Intake Among Children With Acute Diarrheal Disease. *The American Journal of Clinical Nutrition, 33(11), 2365–2371.* doi:10.1093/ajcn/33.11.2365

Hren, R. (2012). Theoretical shortcomings of the Grossman model. *Bulletin: Economics, Organisation and Informatics in Healthcare, 28(1).*doi:10.2478/v10221-011-0020-5 http://apps.who.int/iris/bitstream/10665/43006/1/9241591951_V1.pdf Roberta Capello, Tomaz Ponce Dentinho

Huber, M., Knottnerus, J. A., Green, L., Horst, H. v. d., Jadad, A. R., Kromhout, D., Leonard, B., Lorig, K., Loureiro, M. I., Meer, J. W. M. v. d., Schnabel, P., Smith, R., Weel, C. v., and Smid, H. (2011). How Should We Define Health. *BMJ*, 343, 4163–4163. doi:10.1136/bmj.d4163

Hu, R., Liao, Y., Du, Z., Hao, Y., Liang, H. and Shi, L. (2016). Types of Health Care Facilities and The Quality of Primary Care: A Study of Characteristics and Experiences of Chinese Patients in Guangdong Province, China, *BMC Health Services Research*, 16:335. DOI 10.1186/s12913-016-1604-2

Hussain, A., Sial, M., Usman, S., Hwang, J., Jiang, Y. and Shafiq, A. (2019). What Factors Affect Patient Satisfaction in Public Sector Hospitals: Evidence from an Emerging Economy. *International Journal of Environmental Research and Public Health.* 16. 1-14. 10.3390/ijerph16060994.

Hwa, Y. S. (2005). Principal-Agent Relationship in Medical Care: Eliciting Patients' Preferences in Patient-Doctor Relationship. *Jurnal Ekonomi Malaysia*, *39*, 71-88

Hyder A, A. and Morrow R, H. (2006). *Measures of health and disease in populations* in M H Merson, R E Black and A J Mills (eds). International Public Health: Diseases, Programs, Systems and Policies (2nd edn.) Sudbury, Massachusetts

i Casasnovas, G. L., Rivera, B. & Currais, L. (Eds.). (2005). *Health and Economic Growth: Findings and Policy Implications*. MIT Press.

IOM (2001): *Crossing the Quality Chasm: A New Health System for the 21st Century*. Washington DC. The National Academies Press

Irianti, S. and Prasetyoputra, P. (2018). Unsafe Disposal of Child Feces in Indonesia, *Jurnal Ekologi Kesehatan*, 17(1), pp. 1-10. doi: 10.22435/jek.17.1.101.1-10.

Islam, M., Ercumen, A., Ashraf, S., Rahman, M., Shoab, A.K., Luby, S.P. and Unicomb, L. (2018). Unsafe disposal of feces of children <3 years among households with latrine access in rural Bangladesh: Association with household characteristics, fly presence and child diarrhea. *PLoS ONE* 13(4): e0195218. https://doi.org/10.1371/journal.pone.0195218

Jackson, J. L., Farkas, A. and Scholcoff, C. (2020). Does Provider Gender Affect the Quality of Primary Care? *J Gen Intern Med* , 35(7):2094–8. DOI: 10.1007/s11606-020-05796-0

Jacobs P. (1974). A survey of economic models of hospitals. *Inquiry : a journal of medical care organization, provision and financing*, *11*(2), 83–97.

Jacobs, R., Goddard, M., and Smith, P. C. (2007). *Composite Performance Measures in The Public Sector*. Centre for Health Economics. http://www.york.ac.uk/inst/che/publications/hpolicypubs.htm a

Jacobson, L. (2000). The Family as Producer of Health-An Extended Grossman Model. *Journal of Health Economics*. 19:611-637

Janz, N. and Becker, M. (1984). "The Health Belief Model. A Decade Later." *Health Education Quarterly*. Vol 11(1): 1-47

Jay, S., Litt, I. F., & Durant, R. H. (1984). Compliance with therapeutic regimens. *Journal of adolescent health care : official publication of the Society for Adolescent Medicine*, *5*(2), 124–136. https://doi.org/10.1016/s0197-0070(84)80012-1

Jayachandran, S. & Kuziemko, I. (2011). Why Do Mothers Breastfeed Girls Less Than Boys? Evidence and Implications for Child Health in India, *The Quarterly Journal of Economics*, 126, 1485–1538. doi:10.1093/qje/qjr029.

Jedrychowski, W., Perera, F., Jankowski, J., Butscher, M., Mroz, E., Flak, E., Kaim., I., Ilona Lisowska-Miszczyk, I., Skarupa, A. and Sowa, A. (2011). Effect of Exclusive Breastfeeding on the Development of Children's Cognitive Function in the Krakow Prospective Birth Cohort Study. *European Journal of Pediatrics*; 171(1):151-8. DOI: 10.1007/s00431-011-1507-5

Jin, J., Sklar, G. E., Min Sen Oh, V. & Chuen Li, S. (2008). Factors Affecting Therapeutic Compliance: A Review from the Patient's Perspective. *Therapeutics and clinical risk management*, *4*(1), 269–286.

Johnstone, D., Propper, C. and Shields, M. (2007). Comparing Subjective and Objective Measures of Health: Evidence from Hypertension for the Income/Health Gradient. *Discussion Paper No. 2737*. Institute for the Study of Labour, IZA

Jung, D. and Kim, B. (2020). *The Effect of Health Service Quality on Health Facility Choice and Health Outcomes in Malawi.* KDI School of Public Policy and Management. Working Paper 20-04. http://www.kdischool.ac.kr/new/eng/faculty/working.jsp

Kabubo-Mariara, J., Ndenge, G. K., & Mwabu, D. K. (2008). Determinants of Children's Nutritional Status in Kenya: Evidence from Demographic and Health Surveys. *Journal of African Economies,* 18(3), 363–387.doi:10.1093/jae/ejn024

Kahabuka, C., Kvåle, G., Moland, K. M. and Hinderaker, S. G. (2011) Why caretakers bypass Primary Health Care facilities for child care - a case from rural Tanzania. *BMC Health Serv Res* **11,** 315. https://doi.org/10.1186/1472-6963-11-315

Kaiser, H. F. (1960). The Application of Electronic Computers to Factor Analysis. *Educational and Psychological Measurement,* 20(1), 141–151. doi:10.1177/001316446002000116

Källander, K., Hildenwall, H., Waiswa, P., Galiwango, E., Peterson, S. & George Pariyo, G. (2008). Delayed Care Seeking for Fatal Pneumonia in Children Aged Under-five Years in Uganda: A Case-series Study. *Bulletin of the World Health Organization.* 86:332–338.

Kalogianni, A. (2011). Factors Affect in Patient Adherence to Medication Regimen. *Health Science Journal*. 5(3)

Karim, F., Khan, A., Tasnim, F., Chowdhury, M., Billah, S. M., Karim, T., Arifeen, S. E. & Garnett, S. P. (2019). Prevalence and determinants of initiation of breastfeeding within one hour of birth: An analysis of the Bangladesh Demographic and Health Survey, 2014. *PloS one*, *14*(7), e0220224. https://doi.org/10.1371/journal.pone.0220224

Karim, R.M., Abdullah, M.S., Rahman, A.M. and Alam. A.M. (2015). Identifying influence of perceived quality and satisfaction on the utilization status of the community clinic services; *Bangladesh context. Bangladesh Med Res Counc Bull*; 41: 1-12

Karimi, M. & Brazier, J. (2016). Health, Health-Related Quality of Life, and Quality of Life: What is the Difference? *PharmacoEconomics,* 34(7), 645–649. doi:10.1007/s40273-016-0389-9

Kassile, T., Lokina, R., Mujinja, P. and Mmbando, P. (2014). Determinants of Delay in Care Seeking Among Children Under Five with Fever in Dodoma Region, Central Tanzania: A Cross-Sectional Study. *Malaria Journal*, 13:348. http://www.malariajournal.com/content/13/1/348

Katz, J. N. & Sangha, O. (1997). Assessment of The Quality of Care. *Arthritis care and research :the official journal of the Arthritis Health Professions Association,* 10(6), 359–369. https://doi.org/10.1002/art.1790100604

Kelley, J. G., & Simmons, B. A. (2015). Politics by number: Indicators as social pressure in international relations. *American journal of political science*, *59*(1), 55-70.

Kenya Institute for Public Policy Research and Analysis (KIPPRA) (2018). *An Assessment of Healthcare Delivery in Kenya under the Devolved System*. Special Paper No. 19/2018; Nairobi, Kenya

Kenya Institute for Public Policy Research Analysis (KIPPRA) (2010): *Kenya Economic Report 2010: Enhancing Sectoral Contribution towards Reducing Poverty, Unemployment and Inequality in Kenya*, Nairobi: KIPPRA.

Kenya National Bureau of Statistics and ICF Macro - KNBS (2010): *Kenya Demographic and Health Survey 2008-2009*, Calvento, Maryland: KNBS and ICF Macro.

Kenya National Bureau of Statistics and ICF Macro (2015). *Kenya Demographic and Health Survey 2014*. Rockville, MD, USA: http://dhsprogram.com/pubs/pdf/FR308/FR308.pdf.

Kerber, K. J., de Graft-Johnson, J. E., Bhutta, Z. A., Okong, P., Starrs A. and Lawn, J. E. (2007). "Continuum of Care for Maternal, Newborn, and Child Health: From Slogan to Service Delivery," *Lancet*, 370 (9595),1358–1369. https://doi.org/10.1016/S0140-6736(07)61578-5 PMID: 17933651

Khamis, K. and Njau, B. (2016). Health Care Worker's Perception About the Quality of Health Care at The Outpatient Department in Mwananyamala Hospital in Dar Es Salaam, Tanzania. *Tanzania Journal of Health Research*, 18(1). http://dx.doi.org/10.4314/thrb.v18i1.5

Khan, M. N. and Islam, M. M. (2017). Effect of Exclusive Breastfeeding on Selected Adverse Health and Nutritional Outcomes: A Nationally Representative Study. *BMC Public Health*. 17:889 DOI 10.1186/s12889-017-4913-4

Kilgore, K., Pulungan, Z., Teigland, C., & Parente, A. (2016). *The Impact of Demographic and Socio-Economic Factors on Medication Adherence. Value in Health, 19(3), A289.*doi:10.1016/j.jval.2016.03.751

Kim, C., McEwen, L. N., Gerzoff, R. B., Marrero, D. G., Mangione, C. M., Selby, J. V. & Herman, W. H. (2005). Is Physician Gender Associated with the Quality of Diabetes Care? *Diabetes Care, 28(7), 1594–1598.*doi:10.2337/diacare.28.7.1594

Kimani-Murage, E.W., Madise, N.J., Fotso., Kyobutungi, C., Mutua, M, K., Gitau, T, M., and Yatich, N. (2011). Patterns and determinants of breastfeeding and complementary feeding practices in urban informal settlements, Nairobi Kenya. *BMC Public Health* **11,** 396 (2011). https://doi.org/10.1186/1471-2458-11-396

Kirkman, M. S., Rowan-Martin, M. T., Levin, R., Fonseca, V. A., Schmittdiel, J. A., Herman, W. H., & Aubert, R. E. (2015). Determinants of adherence to diabetes medications: findings from a large pharmacy claims database. *Diabetes care*, *38*(4), 604–609. https://doi.org/10.2337/dc14-2098

Klootwijk, L., Chirwa, A. E., Kabaghe, A. N. and van Vugt, M (2019). Challenges Affecting Prompt Access to Adequate Uncomplicated Malaria Case Management in Children in Rural Primary Health Facilities in Chikhwawa Malawi. *BMC Health Serv Res*, 19:735. https://doi.org/10.1186/s12913-019-4544-9

Ko, H. H., Zhang, H., Telford, J. J. & Enns, R. (2009). Factors Influencing Patient Satisfaction When Undergoing Endoscopic Procedures. *Gastrointestinal Endoscopy, 69(4), 883–891.e1*. https://doi.org/10.1016/j.gie.2008.06.024

Kolenikov, S. and Angeles, G. (2005). *The Use of Discrete Data in Principal Component Analysis for Socio-Economic Status Evaluation*.

Kosimbei, G. (2005). Child Healthcare Seeking Behaviour in Kenya. *KIPPRA Discussion Paper* No. 50

Kraft, A. D., Quimbo, S. A., Solon, O., Shimkhada, R., Florentino, J., & Peabody, J. W. (2009). The Health and Cost Impact of Care Delay and The Experimental Impact of Insurance on Reducing Delays. *The Journal of pediatrics, 155*(2), 281–5.e1. doi:10.1016/j.jpeds.2009.02.035

Kramer, M. S. & Kakuma, R. (2012). Optimal Duration of Exclusive Breastfeeding. *Cochrane Database of Systematic Reviews.* https://doi:10.1002/14651858.cd003517.pub2

Kramer, M. S., Guo, T., Platt, R. W., Sevkovskaya, Z., Dzikovich, I., Collet, J. P., Shapiro, S., Chalmers, B., Hodnett, E., Vanilovich, I., Mezen, I., Ducruet, T., Shishko, G., & Bogdanovich, N. (2003). Infant growth and health outcomes associated with 3 compared with 6 mo of exclusive breastfeeding. *The American journal of clinical nutrition*, *78*(2), 291–295. https://doi.org/10.1093/ajcn/78.2.291

Kraska, R. A., Weigand, M. and Geraedts, M. (2017). Associations Between Hospital Characteristics and Patient Satisfaction in Germany. *Health Expectations*. 20:593-600

Krishnan, V. (2010). "*Constructing an Area-based Socioeconomic Index: A Principal Components Analysis Approach"* Early Child Development Mapping Project (ECMap), Community-University Partnership (CUP), Faculty of Extension, University of Alberta, Edmonton, Alberta T5J 4P6, CANADA

Kruk, M. E., Gage, A. D., Arsenault, C. Jordan, K., Leslie, H., Roder-DeWan, S., Adeyi, O., Barker, P., Daelmans, B., Doubova, S. V., English, M., Elorrio, E. G., Guanais, F., Gureje, O., Hirschhorn, L., Jiang, L., Kelley, E., Lemango, E. T., Liljestrand, J., Malata, A., Marchant, T., Matsoso, M. P., Meara, J. G., Mohanan, M., Ndiaye, Y., Norheim, O. F., Reddy, K. S., Rowe, A. K., Salomon, J. A., Thapa, G., Twum-Danso, N. A. Y. and Pate, M. (2018). High-quality health systems in the Sustainable Development Goals era: time for a revolution. *The Lancet Global Health,* 6:1196-1252 doi:10.1016/S2214-109X(18)30386-3

Kuchenbecker, J., Jordan, I., Reinbott, A., Herrmann, J., Jeremias, T., Kennedy, G., Muehlhoff, E., Mtimuni, B. and Krawinkel, M. B. (2014). Exclusive Breastfeeding and Its Effect on Growth of Malawian Infants: Results from A Cross-Sectional Study. *Paediatrics and International Child Health*; 0(0):1-10

Lakdawalla, D., & Philipson, T. (1998). *Nonprofit Production and Competition*. NBER Working Paper No. 6377. doi:10.3386/w6377

Lal, P., Upadhyay, A., Garg, S. K. and Pandey, A. K. (2020). Impact of Integrated Management of Childhood Illness (IMCI) Training on Case Identification and Management Skills Among Undergraduate Medical Students in a Developing Country: A Case-control Study. *Journal of Medical Education*; 19(4):e110046. doi: 10.5812/jme.110046.

Lamberti, L.M., Walker, C. L. F., Noiman, A., Victora, C., Robert, E. and Black, R. E. (2011). Breastfeeding and The Risk for Diarrhea Morbidity and Mortality. *BMC Public Health*. 11(Suppl 3):S15. http://www.biomedcentral.com/1471-2458/11/S3/S15

Larson, J. (1999). The Conceptualization of Health. *Medical Care Research and Review*. 56(2):123-136

Lartey, S. T., Khanam, R., & Takahashi, S. (2016). The impact of household wealth on child survival in Ghana. *Journal of health, population, and nutrition*, *35*(1), 38. doi:10.1186/s41043-016-0074-9

Lavy V., Strauss J., Thomas D. and de Vreyer P. (1996). Quality of Care, Survival and Health Outcomes in Ghana. *Journal of Health Economics*, 15: 333–57.

Lavy, V. (Ed.). (1995). *The impact of the quality of health care on children's nutrition and survival in Ghana* (Vol. 106). World Bank Publications.

Lavy, V. and Germain, J. M. (1994). *Quality and Cost in Healthcare Choice in Developing Countries. Living Standards Measurement.* Working Paper 105. Washington DC: World Bank.

Lavy, V. & Quigley J. M. (1991). *Willingness to Pay for the Quality and Intensity of Medical Care: Evidence from Low Income Households in Ghana*. Working Paper No. 91-178. Berkeley, California

Leadership Council Sustainable Development Solutions Network (LCSDSN) (2015). Indicators and a Monitoring Framework for the Sustainable Development Goals: Launching a Data Revolution. https://sustainabledevelopment.un.org/content/documents/2013150612-FINAL-SDSN-Indicator-Report1.pdf.

Lee, E., Madhavan, S. and Bauhoff, S. (2016). Levels and Variations in the Quality of Facility-Based Antenatal Care in Kenya: Evidence from the 2010 Service Provision Assessment. *Health Policy Plan*, 31(6):777-784

Lee, M. (1971). A Conspicuous Production Theory of Hospital Behavior. *Southern Economic Journal*, 38(1), 48-58. doi:10.2307/1056067

Legido-Quigley, H., McKee, M., Walshe, K., Suñol, R., Nolte, E. & Klazinga, N. (2008). How Can Quality of Health Care be Safeguarded Across The European Union?. *Bmj*, 336(7650), 920-923.

Leonard, K. L. and Leonard, D. K. (1998). *Institutional Solutions to the Principal-Agent Problem in African Health Care.* Discussion Paper Series No. 9899-02

Leonard K. L., Mlinga G. R., and Mariam D. H. (2002). *Bypassing Health Centers in Tanzania: Revealed Preferences for Observable and Non-Observable Quality*. Department of economics discussion paper series No. 0102-43

Lépine, A. and Nestour, A. L. (2013). The Determinants of Health Care Utilisation in Rural Senegal, *Journal of African Economies*, 22(1):163–186, https://doi.org/10.1093/jae/ejs020

Leslie H. H., Sun Z. and Kruk M. E. (2017). Association between Infrastructure and Observed Quality of Care in 4 Healthcare Services: A Cross-Sectional Study of 4,300 Facilities in 8 Countries. *PLoS Med* 14(12): e1002464. https://doi.org/10.1371/journal.pmed.1002464

Levin, A., Rahman, M. A., Quayyum, Z., Routh, S., & Barkat-e-Khuda. (2001). The Demand for Child Curative Care in Two Rural Thanas of Bangladesh: Effect of Income and Women's Employment. *The International Journal of Health Planning and Management, 16(3), 179–194.* doi:10.1002/hpm.630

Levine, R., Shore, K., Lubalin, J., Garfinkel, S., Hurtado, M. and Carman, K. (2012). Comparing Physician and Patient Perceptions of Quality in Ambulatory Care. *International Journal for Quality in Health Care.* 24:348-356. http://dx.doi.org/10.1093/intqhc/mzs023

Liben, M. L. and Yesuf, E. M. (2016). Determinants of Early Initiation of Breastfeeding in Amibara District, Northeastern Ethiopia: A Community Based Cross-Sectional Study. *International Breastfeeding Journal.* 11**(**7). https://doi.org/10.1186/s13006-016-0067-8

Lin, B. Y., Lin, C. C., & Lin, Y. K. (2010). Patient Satisfaction Evaluations in Different Clinic Care Models: Care Stratification Under a National Demonstration Project. *Health & place*, *16*(1), 85–92. https://doi.org/10.1016/j.healthplace.2009.08.008

Linder-Pelz, S. (1982). Toward a Theory of Patient Satisfaction. *Social Science and Medicine*, 16: 577-582. DOI: 10.1108/17511870910927994

Liu, X. & Mills, A. (2008). Economic Models of Hospital Behavior. *International Encyclopedia of Public Health, 276–282.* doi:10.1016/b978-012373960-5.00676-6

Liu, L., Leslie, H. H., Joshua, M., and Kruk, M. E. (2019). Exploring the Association Between Sick Child Healthcare Utilisation and Health Facility Quality in Malawi: A Cross-Sectional Study. *BMJ Open*, 9:e029631. doi:10.1136/ bmjopen-2019-029631

Local Burden of Disease Diarrhoea Collaborators (2020). Mapping Geographical Inequalities in Childhood Diarrhoeal Morbidity and Mortality in Low-Income and Middle-Income Countries, 2000-17: Analysis for the Global Burden of Disease Study 2017. *Lancet (London, England)*, 395(10239), 1779–1801. https://doi.org/10.1016/S0140-6736(20)30114-8

Loewe, M. and Rippin N. (2015). *The Sustainable Development Goals of the Post-2015 Agenda, Comments on the OWG and SDSN Proposals*. German Development Institute, Bonn, Germany.

Lohr, K.N., ed. (1990). Medicare: *A Strategy for Quality Assurance*. Vol. 1 and 2. Washington, D.C. National Academy Press. https://www.ncbi.nlm.nih.gov/books/NBK235460/ .

Lungu, E.A., Darker, C. & Biesma, R. (2020). Determinants of Healthcare Seeking for Childhood Illnesses Among Caregivers of Under-Five Children in Urban Slums in Malawi: A Population-Based Cross-Sectional Study. *BMC Pediatr,* 20 **(**20). https://doi.org/10.1186/s12887-020-1913-9

Ma, C. A. (1994). Health Care Payment Systems: Cost and Quality Incentives. *Journal of Economics Management Strategy*, 3(1), 93–112. doi:10.1111/j.1430-9134.1994.00093.x

Maestad, O., Torsvik, G. and Aakvik, A. (2010). Overworked? On the Relationship Between Workload and Health worker Performance. *Journal of Heath Economics*. 29:686-698

Magadi, M. A., Zulu, E. M., & Brockerhoff, M. (2003). The Inequality of Maternal Health Care in Urban Sub‐Saharan Africa in the 1990s. *Population Studies, 57(3), 347–366.* doi:10.1080/0032472032000137853

Mahato, P. K., Teijlingen, E., Simkhada, P. P. & Angell, C. (2017). Determinants of Quality of Care and Access to Basic Emergency Obstetric and Neonatal Care facilities and midwife-led facilities in low and middle-income countries: A Systematic Review. *Journal of Asian Midwives*; 4(2):25–51.

Mahejabin, F., Parveen, S. & Ibrahim, M. (2015). Mother's/Care Giver's Health Seeking Behaviour During Childhood Illness in an Urban Slum Of Dhaka City. *Pulse*. *7*(1), 5-15.

Majorin, F., Nagel, C. L., Torondel, B., Routray, P., Rout, M. and Clasen, T. F. (2019). Determinants of Disposal of Child Faeces in Latrines in Urban Slums of Odisha, India: A Cross-Sectional Study, *Transactions of The Royal Society of Tropical Medicine and Hygiene*, 113(5):263–272, https://doi.org/10.1093/trstmh/try142

Makate, M. (2016): Maternal Health-Seeking Behavior and Child's Birth Order: Evidence from Malawi, Uganda, and Zimbabwe. *MPRA* Paper No. 72722: https://mpra.ub.uni-muenchen.de/72722/

Mankiw, N. G. (2017). The Economics of Healthcare. https://scholar.harvard.edu/files/mankiw/files/economics_of_healthcare.pdf

Mant, J. (2001). Process Versus Outcome Indicators in the Assessment of Quality of Healthcare. *International Journal for Quality in Healthcare.* 13(6):475-480

Mariko, M. (2003). "Quality of Care and the Demand for Health Services in Bamako, Mali: The Specific Role of Structure, Process and Outcome Components." *Social Science and Medicine*. 56 pp. 1183-1196

Martin, G. and Pimhidzai, O. (2013*). Education and Health Services in Kenya: Data for Results and Accountability. Service Delivery.* World Bank, Washington DC. https://openknowledge.worldbank.org/handle/10986/16288 Licence: CC By 3.0 IGO

Matias, S. L., Nommsen-Rivers, L. A. & Dewey, K. G. (2011). Determinants of Exclusive Breastfeeding in a Cohort of Primiparous Periurban Peruvian Mothers. *Journal of Human Lactation, 28(1), 45–54.*doi:10.1177/0890334411422703

Matsui, D. (1997). Drug Compliance in Pediatrics: Clinical and Research Issues. *Pediatric Clinics of North America,* 44(1): 1-14

Matthews, Z., Channon, A., Neal, S., Osrin, D., Madise, N., & Stones, W. (2010). Examining the "urban advantage" in maternal health care in developing countries. *PLoS medicine, 7*(9), e1000327. https://doi.org/10.1371/journal.pmed.1000327

Maun, A., Wessman, C., Sundvall, P., Thorn, J. and Björkelund, C. (2015). Is the Quality of Primary Healthcare Services Influenced by the Healthcare Centre's Type of Ownership? —An Observational Study of Patient Perceived Quality, Prescription Rates and Follow-Up Routines in Privately and Publicly Owned Primary Care Centres. *BMC Health Services Research*, 15:417. DOI 10.1186/s12913-015-1082-y

Mazziotta, M., & Pareto, A. (2013). Methods for Constructing Composite Indices: One for All or All for One. *Rivista Italiana di Economia Demografia e Statistica*, *67*(2), 67-80.

Mebratie A. D., Van de Poel, E., Yilma Z., Abebaw, D., Alemu, G. and Bedi, A. S. (2014). Healthcare-Seeking Behaviour in Rural Ethiopia: Evidence from Clinical Vignettes. *BMJ Open*, 4: e004020. doi: 10.1136/bmjopen-2013-004020

McGlynn E. A. (1997). Six Challenges in Measuring the Quality of Health Care. Health Affairs, 16(3): 7-21. doi: 10.1377/hlthaff.16.3.7.

McGuire, T. G. & Pauly, M. V. (1991). Physician Response to Fee Changes with Multiple Payers. *Journal of Health Economics,* 10(4), 385–410. doi:10.1016/0167-6296(91)90022-f

McGuire, Thomas G., (2000) *"Physician Agency*," in Handbook of Health Economics, Volume 1A, Anthony J. Culyer and Joseph P. Newhouse (eds.), Amsterdam, Elsevier Science B.V.

McMurray C. (1996). Cross-sectional anthropometry: what can it tell us about the health of young children?. *Health transition review: the cultural, social, and behavioural determinants of health,* 6(2), 147–168.

Merchant, A.T., Jones, C., Kiure, A., Kupka, R., Fitzmaurice, G., Herrera, M. G. and Fawzi, W. W. (2003). Water and Sanitation Associated with Improved Child Growth. *European Journal of Clinical Nutrition*; 57:1562–1568. doi:10.1038/sj.ejcn.1601725

Meehan, T. P., Fine, M. J., Krumholz, H. M., Scinto, J. D., Galusha, D. H., Mockalis, J. T., Weber, G. F., Petrillo, M. K., Houck, P. M. & Fine, J. M. (1997). Quality of care, process, and outcomes in elderly patients with pneumonia. *JAMA, 278*(23), 2080–2084.

Megersa S., Benti T. and Sahiledengle B. (2019). Prevalence of Diarrhea and Its Associated Factors among Under-Five Children in Open Defecation Free and Non-Open Defecation Free Households in Goba District Southeast Ethiopia: A Comparative Cross-Sectional Study. *Clinics Mother Child Health*. 16, issue 3 (324).

Mikalitsa, S. M. (2015). Intrahousehold Allocation, Household Headship and Nutrition of Under-Fives: A Study of Western Kenya. *African Journal of Food, Agriculture, Nutrition and Development*, 15(1): 9708- 9721

Miller, P., & Hirschhorn, N. (1995). The effect of a national control of diarrheal diseases program on mortality: The case of Egypt. *Social Science & Medicine*, 40(10), S1–S30. doi:10.1016/0277-9536(95)00001-n

Ministry of Health (MOH), (2012). *Kenya Nursing Workforce Report: The Status of Nursing in Kenya, 2012*. Government of Kenya. Nairobi

Ministry of Health, (2014). Kenya Health Policy 2014-2030: Towards Attaining the Highest Standard of Health. MoH. Nairobi.

Ministry of Health (2016). *Ghana National Healthcare Quality Strategy (2017-2021)*. Accra, Ghana:https://www.moh.gov.gh/wpcontent/uploads/2017/06/National20Quality20Strategy20Ghana.pdf

Ministry of Health (2020). Kenya Community Health Strategy 2020-2025. MOH, Nairobi. https://www.health.go.ke/wp-content/uploads/2021/01/Kenya-Community-Health-Strategy-Final-Signed-off_2020-25.pdf

Ministry of Health (2021): *Kenya Harmonised Health Facility Assessment 2018/19: Popular Version*. MOH, Nairobi. https://www.health.go.ke/wp-content/uploads/2020/01/KHFA-2018-19-Community-Systems-Report-Final.pdf

Ministry of Health (2016). *Ethiopian National Health Care Quality Strategy (2016-2020): Transforming the Quality of Healthcare in Ethiopia. Ethiopia*: https://www.academia.edu/35912047/ETHIOPIAN_NATIONAL_HEALTH_CARE_QUALITY_STRATEGY_Transforming_the_Quality_of_Health_Care_in_Ethiopia

Ministry of Medical Services (MOMS) and Ministry of Public Health and Sanitation (MOPHS) (2012). *Kenya Health Policy 2012-2030*. Government of Kenya. Nairobi

Ministry of Medical Services and Ministry of Public Health and Sanitation (2014). *Health Sector Strategic and Investment Plan (HSSIP) July 2013- June 2017*. Government of Kenya, Nairobi

Mishra, K., Mohapatra, I. and Kumar, A. (2019). A Study on the Health Seeking Behavior Among Caregivers of Under-Five Children in an Urban Slum of Bhubaneswar, Odisha. *J Family Med Prim Care*; 8(2):498-503. http://www.jfmpc.com/text.asp?2019/8/2/498/253050

Mohd, R. and Malik, I. (2017) Sanitation and Hygiene Knowledge, Attitude and Practices in Urban Setting of Bangalore: A Cross-Sectional Study. *J Community Med Health Educ* 7: 540. doi:10.4172/2161-0711.1000540

Molla, M. T., Madans, J. H., Wagener, D. K. and Crimmins, E. M. (2003). *Summary Measures of Population Health: Report of Findings of Methodologic and Data Issues.* National Centre for Health Statistics. Hyattsville, Maryland.

Mooney, G., & Ryan, M. (1993). Agency in Health Care: Getting Beyond First Principles. *Journal of Health Economics, 12(2), 125–135*.doi:10.1016/0167-6296(93)90023-8

Morita, T., Godfrey, S., & George, C. M. (2016). Systematic review of evidence on the effectiveness of safe child faeces disposal interventions. *Tropical medicine & international health: TM & IH*, *21*(11), 1403–1419. https://doi.org/10.1111/tmi.12773

Morrow, A. L., Ruiz-Palacios, G. M., Jiang, X., & Newburg, D. S. (2005). Human-Milk Glycans That Inhibit Pathogen Binding Protect Breast-feeding Infants against Infectious Diarrhea. *The Journal of Nutrition, 135(5), 1304–1307.* doi:10.1093/jn/135.5.1304

Morris, C. and Bailey, K. (2014). Measuring Health Care Quality: An Overview of Quality Measures. *Families USA*. Issue brief May 2014

Mosadeghrad A. (2014). Factors Influencing Healthcare Service Quality**.** *International Journal of Health Policy Management*. 3(2): 77–89

Moscelli, G., Gravelle, H., Siciliani, L. and Gutacker, N. (2018). The effect of hospital ownership on quality of care: Evidence from England. *Journal of Economic Behavior & Organization, Elsevier*, 153(C): 322-344.

Mostafa Kamal S.M., Rosliza, A.M. and Md Aynul, I. (2010). Effects of Wealth on Nutritional Status of Pre-school Children in Bangladesh. *Mal J Nutr*. 16(2):219 – 232

Moyimane, M. B., Matlala, S. F., & Kekana, M. P. (2017). Experiences of nurses on the critical shortage of medical equipment at a rural district hospital in South Africa: a qualitative study. *The Pan African medical journal*, *28*, 100. https://doi.org/10.11604/pamj.2017.28.100.11641

Mshida, H. A., Kassim, N., Kimanya, M. E., & Mpolya, E. (2017). Influence of Water, Sanitation, and Hygiene Practices on Common Infections among Under-Five Children in Longido and Monduli Districts of Arusha, *Tanzania. Journal of Environmental and Public Health*, 2017:1–8. doi:10.1155/2017/9235168

Muchina, E. N., and Waithaka, P. M. (2010). Relationship Between Breastfeeding Practices and Nutritional Status of Children Aged 0-24 Months in Nairobi, Kenya. *African Journal of Food Agriculture Nutrition and Development*; 10(4). DOI: 10.4314/ajfand.v10i4.55329

Mueller, D. H., Lungu, D., Acharya, A. & Palmer, N. (2011). Constraints to Implementing the Essential Health Package in Malawi. *PloS one*, *6*(6), e20741.

Mugo, M. (2012). *Impact of Parental Socioeconomic Status on Child Health Outcomes in Kenya. Paper submitted to CSAE Conference 2012: Economic Development in Africa. 18-20* St. Catherine's College, Oxford.

Mulaki, A. and S. Muchiri, S. (2019). *Kenya Health System Assessment*. Washington, DC: Palladium, Health Policy Plus

Mulatya, D. M., & Ochieng, C. (2020). Disease burden and Risk Factors of diarrhoea in children under five years: Evidence from Kenya's demographic health survey 2014. *International Journal of Infectious Diseases.* doi:10.1016/j.ijid.2020.02.003

Mullen, K., Frank, R. and Rosenthal, M. (2010). Can You Get What You Pay For? Pay-For-Performance and the Quality of Healthcare Providers. *The Rand Journal of Economics*, 41(1): 64-91

Munga, M. (2008). Impact of Cost and Perceived Quality On Utilisation of Primary Health Care Services in Tanzania: Rural-Urban Comparison. *Tanzania Journal of Health Research, 6(2)*.doi:10.4314/thrb.v6i2.14242

Munos, M. K., Walker, C. L. & Black, R. E. (2010). The Effect of Oral Rehydration Solution and Recommended Home Fluids on Diarrhoea Mortality. *International journal of epidemiology*, *39 Suppl 1*(Suppl 1), 75–87. doi:10.1093/ije/dyq025

Muriithi, M. (2013). "The Determinants of Health Seeking Behaviour in a Nairobi Slum, Kenya." *European Scientific Journal*. 9(8):1857-7881

Murray, C. J., Vos, T., Lozano, R., Naghavi, M., Flaxman, A. D., Michaud, C., Ezzati, M., Shibuya, K., Salomon, J. A., Abdalla, S., Aboyans, V., Abraham, J., Ackerman, I., Aggarwal, R., Ahn, S. Y., Ali, M. K., Alvarado, M., Anderson, H. R., Anderson, L. M., Andrews, K. G., … Memish, Z. A. (2012). Disability-Adjusted Life Years (Dalys) for 291 Diseases and Injuries in 21 Regions, 1990-2010: A Systematic Analysis for the Global Burden of Disease Study 2010. *Lancet (London, England)*, *3*80 (9859), 2197–2223. https://doi.org/10.1016/S0140-6736(12)61689-4

Musinguzi, G., Anthierens, S., Nuwaha, F., Van Geertruyden, J., Wanyenze, R. K. and Bastiaens, H. (2018). Factors Influencing Compliance and Health Seeking Behaviour for Hypertension in Mukono and Buikwe in Uganda: A Qualitative Study. *International Journal of Hypertension. ID 8307591*. https://doi.org/10.1155/2018/8307591

Mututho, L. N., Kiboi, W. K. and Mucheru, P. K. (2017). Factors Associated with Exclusive Breastfeeding in Kenya: A Systematic Review. *International Journal of Community Medicine and Public Health.* 4. 4358. 10.18203/2394-6040.ijcmph20175305.

Mwabu, G. (2007). *Health Economics for Low-Income Countries*. Center Discussion Paper No. 955. Economic Growth Center, Yale University

Mwabu, G. (2008). *The Production of Child Health in Kenya: A Structural Model of Birth Weight*. Yale University Economic Growth Center Discussion Paper No. 963; Yale Economics Department Working Paper No. 52. SSRN: https://ssrn.com/abstract=1272468

Mwabu, G., Ainsworth, M. and Nyamete, A. (1993). Quality of Medical Care and Choice of Medical Treatment in Kenya: An Empirical Analysis. *The Journal of Human Resources*. 28(4):838-862

Naimoli, J. F., Rowe, A. K., Lyaghfouri, A., Larbi, R. and Lamrani, L. A. (2006). Effect of the Integrated Management of Childhood Illness strategy on health care quality in Morocco. International Journal for Quality in Health Care, 18(2), 134–144. doi:10.1093/intqhc/mzi097

Nardo, M., Saisana, M., Saltelli, A., Tarantola, S., Hoffman, H. & Giovannini, E. (2005). *Handbook on Constructing Composite Indicators: Methodology and User Guide.* Organisation for Economic Cooperation and Development (OECD). Statistics Working Paper JT00188147, OECD, France.

Naseer, M., Zahidie, A., Shaikh, B. T. (2012). Determinants of patient's satisfaction with health care system in Pakistan: a critical review. *Pakistan Journal of Public Health*. 2(2), 52-61.

Naser, M. H., Hamed, A. T. & Kanoa, B. J. (2019). Breastfeeding and Infant Health Outcomes at 9 Months of Age in The Gaza Strip: A Cross-Sectional Randomised Trial. *The Lancet, 393, S36.* doi:10.1016/s0140-6736(19)30622-1

Nash D. B. (2010). Understanding the Quality Debate in Health Care. *Pharmacy and Therapeutics*, *35*(5), 243–244.

National Council for Population and Development (NCPD), Central Bureau of Statistics (CBS) (Office of the Vice President and Ministry of Planning and National Development) [Kenya], and Macro International Inc. (MI). (1999). *Kenya Demographic and Health Survey 1998*. Calverton, Maryland: NDPD, CBS, and MI.

National Department of Health, (2007). *A Policy on Quality in Health Care for South Africa*. Pretoria South Africa: https://www.gov.za/sites/default/files/gcis_document/201409/qhc-policy.pdf

National Research Council (US); Institute of Medicine (US) (2004). "*Children's Health, The Nation's Wealth: Assessing and Improving Child Health*." Washington (DC): National Academies Press (US); Measuring Children's Health. Available from: https://www.ncbi.nlm.nih.gov/books/NBK92208/

Ndugwa, R. P., & Zulu, E. M. (2008). "Child morbidity and care-seeking in Nairobi slum settlements: the role of environmental and socio-economic factors." *Journal of Child Health Care*. *12*(4), 314-328.

Neumann, P. J. and Cohen, J. T. (2018). QALYs in 2018-Advantages and Concerns. *JAMA*, 319(24), 2473–2474. https://doi.org/10.1001/jama.2018.6072

Newhouse, J. P. (1970), Toward aTheory of Nonprofit Institutions: An Economic Model of a Hospital, *American Economic Review*. 60(1):64-74.

Nguyen, D. T. K., Leung, K.K., McIntyre, L., Ghali, W. A. and Sauve, R. (2013) Does Integrated Management of Childhood Illness (IMCI) Training Improve the Skills of Health Workers? A Systematic Review and Meta-Analysis. *PLoS ONE* 8(6): e66030. doi:10.1371/journal.pone.0066030

Nigatu, D., Azage, M. & Motbainor, A. (2019). Effect of Exclusive Breastfeeding Cessation Time On Childhood Morbidity and Adverse Nutritional Outcomes in Ethiopia: Analysis of The Demographic and Health Surveys. *PLOS ONE,* 14(10), e0223379. doi:10.1371/journal.pone.0223379

Nigatu, S.G., Worku, A.G. & Dadi, A.F. (2015). Level of Mother's Knowledge About Neonatal Danger Signs and Associated Factors in North West of Ethiopia: A Community Based Study. *BMC Res Notes* **8,** 309 (2015). https://doi.org/10.1186/s13104-015-1278-6

Njong, A. M. and Ningaye, P. (2008). Characterizing Weights in The Measurement of Multidimensional Poverty: An Application of Data-Driven Approaches to Cameroonian Data. *OPHI Working Paper No. 21*

Njuguna, J. (2016). Effect of Eliminating Open Defecation on Diarrhoeal Morbidity: An Ecological Study of Nyando and Nambale Sub-Counties, Kenya. *BMC Public Health* 16:712. DOI 10.1186/s12889-016-3421-2

Noh, J., Kim, Y., and Akram, N. *et al*., (2019). Factors Affecting Breastfeeding Practices in Sindh Province, Pakistan: A Secondary Analysis of Cross-Sectional Survey Data. *International Journal of Environmental Research and Public Health*. 16:1689. doi:10.3390/ijerph16101689

Noordam, A. C., Carvajal-Velez, L., Sharkey, A. B., Young, M., & Cals, J. W. (2015). Care seeking behaviour for children with suspected pneumonia in countries in sub-Saharan Africa with high pneumonia mortality. *PloS one*, *10*(2), e0117919. doi:10.1371/journal.pone.0117919

Norton, P. G., Dunn, E. V. & Soberman, L. (1997). What factors affect quality of care? Using the Peer Assessment Program in Ontario family practices. *Canadian family physician Medecin de famille canadien*, *43*, 1739-44.

Ntenda, P. A. M., & Chuang, Y.-C. (2018). Analysis of individual-level and community-level effects on childhood undernutrition in Malawi. Pediatrics & Neonatology, 59(4), 380–389. doi:10.1016/j.pedneo.2017.11.019

Nyamongo, M. and Nyamongo, I. (2006). Health Seeking Behaviour of Mothersof Under-Five-Year-Old Children in the Slum Communities of Nairobi, Kenya. Anthropology and Medicine. 13(1):25-40

Nylenna, M., Bjertnaes, O. A., Saunes, I. S. and Lindahl, A. K. (2015). What is Good Quality of Health Care. *Professions and Professionalism*. 5(1)

Nyongesa, M., Onyango. R. and Kakai, R. (2014). Determinants of clients' satisfaction with healthcare services at Pumwani Maternity Hospital in Nairobi. *International Journal of Social and Behavioural Science*. 2(1):111-017

O'Brien, S. M., DeLong, E. R., Dokholyan, R. S., Edwards, F. H., & Peterson, E. D. (2007). Exploring the Behavior of Hospital Composite Performance Measures: An Example from Coronary Artery Bypass Surgery. *Circulation,* 116(25), 2969–2975. doi:10.1161/circulationaha.107.703553

OECD (2004). Composite Indicator. http://stats.oecd.org/glossary/detail.asp?ID=6278.

OECD (2008). Handbook on Constructing Composite Indicators. Methodology and User Guide. https://www.oecd.org/sdd/42495745.pdf

Oehl, M., Hummer, M., & Fleischhacker, W. W. (2000). Compliance with antipsychotic treatment. *Acta Psychiatrica Scandinavica, 102(s407), 83–86.*doi:10.1034/j.1600-0447.2000.00016.x

Oganda, I. A., (2014). *Effectiveness of Couple Counselling Versus Maternal Counselling in Promoting Exclusive Breast Feeding: A Randomised Controlled Trial in Nyando District, Kenya* (Doctoral dissertation, Kenyatta University, Nairobi, Kenya). https://ir-library.ku.ac.ke/handle/123456789/11910

Ogbo, F. A., Agho, K. E., and Page, A. (2015). Determinants of Suboptimal Breastfeeding Practices in Nigeria: Evidence from The 2008 Demographic and Health Survey. *BMC Public Health, 15(1).* doi:10.1186/s12889-015-1595-7

Ogunlesi, T. A., & Olanrewaju, D. M. (2010). Socio-demographic Factors and Appropriate Health Care-seeking Behavior for Childhood Illnesses. *Journal of Tropical Pediatrics, 56(6), 379–385.*doi:10.1093/tropej/fmq009

Okeke, E. N., & Chari, A. V. (2015). *Can institutional deliveries reduce newborn mortality? Evidence from Rwanda* (No. WR-1072).

Okoroafor, S. C., Kwesiga. B., Ogato, J., Gura, Z., Gondi, J., Jumba, N., Ogumbo, T., Monyoncho, M.,Wamae, A., Wanyee, M., Angir, M., Almudhwahi, M. A., Evalyne, C., Nabyonga-Orem, J., Ahmat, A., Zurn, P. and Asamani, J. A. (2022). Investing in the Health Workforce

in Kenya: Trends in Size, Composition and Distribution from a Descriptive Health Labour Market Analysis. *BMJ Global Health.* 7:e009748. doi:10.1136/ bmjgh-2022-009748. https://gh.bmj.com/content/bmjgh/7/Suppl_1/e009748.full.pdf

Olenja, J. (2003, February). Health seeking behaviour in context. [Editorial]. *East African Medical Journal*, 80 (2), 61-62

Omore R., O'Reilly, C.E., Williamson J., Moke, F., Were, V., Farag, T. H., van Eijk, A. M., Kotloff, K. L., Levine, M. M., Obor, D., Odhiambo, F., Vulule, J., Laserson, K. F., Eric D. Mintz, E. D. and Breiman, R. F. (2013). Health-Seeking Behaviour During Childhood Diarrheal Illness: Results of Health Utilization and Attitudes Surveys of Caretakers in Western Kenya, 2007-2010. *The American Society of Tropical Medicine and Hygiene*. 89(1):29-40.

Ooki S. (2010). The effect of an increase in the rate of multiple births on low-birth-weight and preterm deliveries during 1975-2008. *Journal of epidemiology*, *20*(6), 480–488. doi:10.2188/jea.je20100022

Ooki, S and Yokoyama, Y. (2004). Physical Growth Charts from Birth to Six Years of Age in Japanese Twins. *Journal of Epidemiology*. 14(5):151–60 10.2188/jea.14.151

Osumanu, I., Kosoe, E. and Ategeeng, F. (2019). Determinants of Open Defecation in the Wa Municipality of Ghana: Empirical Findings Highlighting Sociocultural and Economic Dynamics among Households. *Journal of Environmental and Public Health*, 2019. doi.org/10.1155/2019/3075840

Othero, D. M., Orago, A. S., Groenewegen, T., Kaseje, D. O. & Otengah, P. A. (2008). Home Management of Diarrhea among Underfives in a Rural Community in Kenya: Household Perceptions and Practices. *East African Journal of Public Health*. 5: 142-146.

Oyekale, A. (2015). Assessment of Malawian Mothers' Malaria Knowledge, Healthcare Preferences and Timeliness of Seeking Fever Treatments for Children Under Five. *International Journal of Environmental Research and Public Health* , *12*(1), 521-540; https://doi.org/10.3390/ijerph120100521

Page A., Hustache, S., Luquero, F.J., Djibo, A., Manzo, M. and Grais, R.F. (2011). Health Care Seeking Behavior in Children Under 5 in Rural Niger: Results of a Cross-Sectional Survey. *BMC Public Health*, 11, 389

Parrish R, G. (2010). Measuring population health outcomes. *Preventing Chronic Disease.* 7(4). http://www.cdc.gov/pcd/issues/2010/jul/10_0005.htm.

Pattison, K. L., Kraschnewski, J. L., Lehman, E., Savage, J. S., Downs, D. S., Leonard, K. S., Adams, E. L., Paul, I. M. & Kjerulff, K. H. (2019). Breastfeeding initiation and duration and child health outcomes in the first baby study. *Preventive medicine*, *118*, 1–6. https://doi.org/10.1016/j.ypmed.2018.09.020

Peabody, J. W., Taguiwalo, M. M., Robalino D. A. and Frenk, J. (2006). *Improving the Quality of Care in Developing Countries*. In: Jamison DT, Breman JG, Measham AR, et al., editors. Disease Control Priorities in Developing Countries. 2nd edition. Washington (DC), World Bank. Chapter 70. Available from: http://www.ncbi.nlm.nih.gov/books/NBK11790/

Peltzer, K., & Pengpid, S. (2013). Socioeconomic factors in adherence to HIV therapy in low- and middle-income countries. *Journal of health, population, and nutrition*, *31*(2), 150–170.

Perera, P., Nayomi, R., Fernando, M. P., Sampath, W. and Samaranayake, G. B. (2012). Actual Exclusive Breastfeeding Rates and Determinants Among a Cohort of Children Living in Gampaha district Sri Lanka: A Prospective Observational Study. *International breastfeeding journal*. 7(1):21. 10.1186/1746-4358-7-21.

Peterson, E. D., DeLong, E. R. Masoudi, F. A., O'Brien, S. M., Peterson, P. N. and Rumsfeld, J. S. (2010). ACCF/AHA 2010 Position Statement on Composite Measures for Healthcare Performance Assessment. *Journal of the American College of Cardiology*, 55 (16). doi:10.1016/j.jacc.2010.02.016

Picker Institute Europe (2009). *Using Patient Feedback: A Practical Guide to Improving Patient Experience*. King's Med House, Oxford.

Pickering, A. J. and Davis, J. (2012). Freshwater Availability and Water Fetching Distance Affect Child Health in Sub-Saharan Africa. *Environmental Science & Technology*. 46:2391-2397.

Piligrimienė, Ž. and Buciuniene, I. (2008). Different Perspectives on Health Care Quality: Is the Consensus Possible? *Engineering Economics*, 1(56).

Pirani, E. (2014). Wealth Index. Encyclopedia of Quality of Life and Well-Being Research, 7017–7018. doi:10.1007/978-94-007-0753-5_3202

Pisano, U., Lange, L., Berger,G. and Hamertner, M. (2015). *The Sustainable Development Goals and their Impact on the European SD Governance Framework: Preparing for the Post-2015 Agenda*.(ESDN Quarterly Report. No. 32). ESDN: Vienna, Austria. http:// www.sd-network.eu/?k=quarterly%20reports&report_id=35.

Powell-Jackson, T., Mazumdar, S. and Mills, A. (2015). Financial Incentives in Health: New Evidence from India's Janani Suraksha Yojana, *Journal of Health Economics*, http://dx.doi.org/10.1016/j.jhealeco.2015.07.001

Preeti. P. S., Sahoo, S. K., Biswas, D., & Dasgupta, A. (2016). Unsafe Disposal of Child Faeces: A Community-based Study in a Rural Block in West Bengal, India. *Journal of preventive medicine and public health = Yebang Uihakhoe chi*, *49*(5), 323–328. doi:10.3961/jpmph.16.020

Profit, J., Gould, J. B., Zupancic, J.A.F., Stark, A. R., Wall, K. M., Kowalkowski, M. A., Mei, M., Pietz, K., Thomas, E.J., and Petersen, L.A. (2011). Formal Selection of Measures for A

Composite Index of NICU Quality of Care: Baby-MONITOR. *Journal of Perinatology*; 31, 702–710. doi:10.1038/jp.2011.12

Quinn, P., O'Callaghan, M., Williams, G., Najman, J., Andersen, M., & Bor, W. (2001). The Effect of Breastfeeding on Child Development at 5 Years: A Cohort Study. *Journal of Paediatrics and Child Health,* 37(5), 465–469. doi:10.1046/j.1440-1754.2001.00702.x

Raat, H., Bonsel, G. J., Essink-Bot, M. L., Landgraf, J. M. & Gemke, R. J. (2002). Reliability and validity of comprehensive health status measures in children: The Child Health Questionnaire in relation to the Health Utilities Index. *Journal of clinical epidemiology*, *55*(1), 67–76. https://doi.org/10.1016/s0895-4356(01)00411-5

Rabin, R. & Charro, F. de. (2001). *EQ-SD:* A Measure of Health Status from The Euroqol Group. *Annals of Medicine, 33(5), 337–343.* doi:10.3109/07853890109002087

Rahman, M. and Huq, S. S. (2009). Biodemographic and health seeking behaviour factors influencing neonatal and postneonatal mortality in Bangladesh: evidence from DHS data. *East African journal of public health*, *6*(1), 77–84. https://doi.org/10.4314/eajph.v6i1.45754

Rajmil, L., Herdman, M., Fernandez de Sanmamed, M. J., Detmar, S., Bruil, J., Ravens-Sieberer, U., Bullinger, M., Simeoni, M. C., Auquier, P. & Kidscreen Group (2004). Generic health-related quality of life instruments in children and adolescents: a qualitative analysis of content. *The Journal of adolescent health : official publication of the Society for Adolescent Medicine*, 34(1), 37–45. https://doi.org/10.1016/s1054-139x(03)00249-0

Rana, M. M., Islam, M. R., Karim, M. R., Islam, A. Z., Haque, M. A., Shahiduzzaman, M. and Hossain, M. G. (2020). Knowledge and Practices of Exclusive Breastfeeding Among Mothers in Rural Areas of Rajshahi District in Bangladesh: A Community Clinic Based Study. *PLoS ONE*. 15(5): e0232027. https://doi.org/10.1371/journal.pone.0232027

Realpe, A. & Wallace, L. M. (2010). What is co-production. *London: The Health Foundation*, 1-1.

Reid, R. O., Friedberg, M. W., Adams, J. L., McGlynn, E. A. & Mehrotra, A. (2010). Associations between physician characteristics and quality of care. *Archives of internal medicine*, *170*(16), 1442–1449. https://doi.org/10.1001/archinternmed.2010.307

Republic of Kenya (2018). *Third Medium Term Plan 2018-19: Transforming Lives: Advancing Socio-Economic Development through the "Big Four".* Government of the Republic of Kenya, Nairobi

Republic of Kenya (2014). *Kenya Health Policy 2014-2030: Towards Attaining the Highest Standard of Health.* MOH. Nairobi

Rohmah, H., Hafsah, T., and Rakhmilla, L. E. (2015). Role of Exclusive Breastfeeding in Preventing Diarrhea. *Althea Medical Journal*. 2(1):78-81.

Rosenthal, G. & Newbrander, W. (1996). Public Policy and Private Sector Provision of Health Services. *The International Journal of Health Planning and Management, 11(3), 203–216.* doi:10.1002/(sici)1099-1751(199607)11:3<203::aid-hpm432>3.0.co;2-0. Accessed on 24/09/2019

Rosenzweig, M.R. and Shultz, T.P. (1983). Estimating a Household Production Function. Heterogeneity, the Demand for Health Inputs, and their Effects on Birth Weight. *Journal of Political Economy*. 91(5):723-746

Ross, D. S., & Venkatesh, R. (2015). An empirical study of the factors influencing quality of healthcare and its effects on patient satisfaction. *International Journal of Innovative Research in Science, Engineering and Technology*, *4*(2), 54-59.

Rubin, H., Pronovost, P. and Diette G. (2001). The Advantages and Disadvantages of Process-Based Measures of Healthcare Quality. *International Journal for Quality in Healthcare*. 13(6):469-474

Rubin, D. B. and Schenker, N. (1991). Multiple Imputation in Healthcare Databases: An Overview and Some Applications. *Statistics in Medicine,* 10 (4), 585–598. doi:10.1002/sim.4780100410

Ryan, A., Zhou, W. and Arensberg, M. (2006). The Effect of Employment Status on Breastfeeding in The United States. *Women's Health Issues:* official publication of the Jacobs Institute of Women's Health. 16: 243-51. 10.1016/j.whi.2006.08.001.

Sahiledengle, B. (2019). Prevalence and Associated Factors of Safe and Improved Infant and Young Children Stool Disposal in Ethiopia: Evidence from Demographic and Health Survey. *BMC Public Health,* **19(**970). https://doi.org/10.1186/s12889-019-7325-9

Sahn, D. E., Younger, S. D., & Genicot, G. (2003). The Demand for Health Care Services in Rural Tanzania. *Oxford Bulletin of Economics and Statistics*, 65(2), 241–260. doi:10.1111/1468-0084.t01-2-00046

Salomon, J. A. (2014). Disability-Adjusted Life Years. *Encyclopedia of Health Economics*, 200–203. doi:10.1016/b978-0-12-375678-7.00511-3

Sánchez-García, S., García-Peña, C., Duque-López, M.X., Juárez-Cedillo, T., Alma Rosa Cortés-Núñez, A.R. and ReyesBeaman, S. (2007). Anthropometric measures and nutritional status in a healthy elderly population. *BMC Public Health*. **7(**2) https://doi.org/10.1186/1471-2458-7-2

Sandersona, E. and Windmeijer, F. A weak instrument F -test in linear IV models with multiple endogenous variables. *Journal of Econometrics*. 190:212-221

Santana G. S., Giugliani E. R., Vieira T. O. and Vieira, G.O. (2018). Factors Associated with Breastfeeding Maintenance for 12 Months or More: A Systematic Review. *J Pediatr (Rio J).* 94:104-122

Santos, F.S., Santos L. H., Saldan P. C., Santos, F.C. S., Leite, A.M., and Mello, D. F. (2016). Breastfeeding and Acute Diarrhea Among Children Enrolled in The Family Health Strategy. *Texto Contexto Enferm*. 25(1):e0220015. http://dx.doi.org/10.1590/0104-070720160000220015

Santos, M. E. and Santos G. (2014). Composite Indices of Development. In: Currie-Alder, B., Kanbur, R., Malone D. and R. Medhora (eds), *International Development: Ideas, Experience and Prospects*. Oxford: Oxford University Press, pp. 133-150. http://dx.doi.org/10.1093/acprof:oso/9780199671656.003.0009

Sartorius, N. (2006). The Meanings of Health and Health Promotion. *Croat Med. Journal*. 47(4):662-664

Sassi, F. (2006). Calculating QALYs, Comparing QALY and DALY calculations. *Health Policy and Planning*; 21(5):402-408, https://doi.org/10.1093/heapol/czl018.

Saylor, C. (2004). The Circle of Health: A health Definition Model. *Journal of Holistic Nursing*. 22(2):98-115 DOI: 10.1177/0898010104264775.

Schang, L., Hynninen, Y., Morton, A. & Salo, A. (2016). Developing robust composite measures of healthcare quality – Ranking intervals and dominance relations for Scottish Health Boards. *Social Science & Medicine, 162, 59–67.* doi:10.1016/j.socscimed.2016.06.026

Selemani, M., Masanja, I., Kajungu, D., Amuri, M., Njozi, M., Khatib, R. A., Abdulla, S. and de Savigny, D. (2013). Health Worker Factors Associated with Prescribing of Artemisin Combination Therapy for Uncomplicated Malaria in Rural Tanzania. *Malaria Journal*. 12(334).

Senarath, U., Dibley, M. and Agho, K. (2007). Breastfeeding Practices and Associated Factors Among Children Under 24 Months of Age in Timor-Leste. *European Journal of Clinical Nutrition.* 61: 387–397. https://doi.org/10.1038/sj.ejcn.1602536

Sepehri, A., Moshiri, S., Simpson, W. and Sarma, S. (2008). Taking Account of Context: How Important Are Household Characteristics in Explaining Adult Health-Seeking Behaviour? The Case of Vietnam; *Health Policy and Planning*. 23(6):397–407, https://doi.org/10.1093/heapol/czn034

Sharma, M. and Romas, J. (2012). *Theoretical Foundations of Health Education and Health promotion*. Jones and Bartlett Learning, USA

Shwartz, M., Restuccia, J. D., Rosen, A. K. (2015). Composite Measures of Health Care Provider Performance: A Description of Approaches. *The Milbank Quarterly, 93(4), 788–825.* https://doi.org/10.1111/1468-0009.12165

Siddique, K. B., Khan, S., Haque S., Sizear, M. S., Alam, A. U. and Monoarul Haque, M. (2016). Socioeconomic Status & Health Seeking Behavior of Rural People: A Cross Sectional Study in Fatikchhari, Chittagong. *MOJ Public Health*; 4(4):127–131. DOI: 10.15406/mojph.2016.04.00090

Sloan, A. F. (2000). Chapter 21 Not-For-Profit Ownership and Hospital Behaviour, in Handbook of Health Economics. *Elsevier*. 1(part B). 1141-1174

Smith R. (2008, July 8). The end of disease and the beginning of health. *BMJ Group Blogs*; http://blogs.bmj.com/bmj/2008/07/08/richard-smith-the-end-of-disease-and-the-beginning-of-health/.

Smith, K. and Wright, K. (1994). *Principals and Agents in Social Care: Who's on the Case and for Whom?* Discussion Paper 123, Centre for Health Economics, University of York.

Solans, M., Pane, S., Estrada, M., Serra-Sutton, V., Berra, S., Michael Herdman, M., Alonso, J. and Rajmil, L. (2008). Health-Related Quality of Life Measurement in Children and Adolescents: A Systematic Review of Generic and Disease-Specific Instruments. *Value in Health*: 11(4)

Sosic, Z. and Donev, D. (2007). *Contemporary Concept and Definition of Healthcare: In: Health Promotion and Disease Prevention: A Handbook for Teachers, Researches, Health Professionals and Decision Makers.* Hans Jacobs Publishing Company. Germany

Souares, A., Lalou, R., Sene, I., Sow, D. and Le Hesran, J (2009). Factors Related to Compliance to Anti-Malarial Drug Combination: Example of Amodiaquine/Sulphadoxine-Pyrimethamine Among Children in Rural Senegal. *Malaria Journal.* **8,** 118. https://doi.org/10.1186/1475-2875-8-118

Souza, J. P., Gülmezoglu, A. M., Vogel, J., Carroli, G., Lumbiganon, P., Qureshi, Z., ... & Say, L. (2013). Moving beyond essential interventions for reduction of maternal mortality (the WHO Multicountry Survey on Maternal and Newborn Health): a cross-sectional study. *The Lancet*, *381*(9879), 1747-1755.

Spasojevic, N., Vasilj, I., Hrabac, B. & Celik, D. (2015). Rural - Urban Differences in Health Care Quality Assessment. *Materia socio-medica*, *27*(6), 409–411. https://doi.org/10.5455/msm.2015.27.409-411

Spivak, S., Cullen, B. A., Eaton, W., et al., (2018). Delays in Seeking General Medical Services and Measurable Abnormalities Among Individuals with Serious Mental Illness. *Psychiatric Services*; 69:479–482; doi: 10.1176/appi.ps.201700327

Sreeramareddy, C., Shankar, R., Sreekumaran, B., Sonu,S., Joshi, H. and Ramachandran, U. (2006). "Care seeking Behaviour for Childhood Illness- A Questionnaire Survey in Western Nepal." *BioMedCentral International Health and Human Rights: 6(7)*

Stavropoulou, C. (2012). *The Doctor-Patient Relationship: A Review of the Theory and Policy Implications*. In: The LSE Companion to Health Policy. (pp.314-326). Cheltenham: Edward Elgar Publishing Limited. ISBN 9781781004234

Stubbe, J., Brouwer, W. and Delnoij, D. (2007). Patients' experiences with quality of hospital care: The Consumer Quality Index Cataract Questionnaire. *BMC Ophthalmol* , **7:**14. https://doi.org/10.1186/1471-2415-7-14

Tadesse, F., Alemayehu, Y., Shine., Asresahegn, H., and Tadesse, T. (2015). Exclusive Breastfeeding and Maternal Employment Among Mothers of Infants from Three to Five Months Old in The Fafan Zone, Somali Regional State of Ethiopia: A Comparative Cross-Sectional Study, *BMC Public Health* **19,** 1015 (2019). https://doi.org/10.1186/s12889-019-7345-5

Taffa, N. and Chepngeno, G. (2005). Determinants of Health Care Seeking for Childhood Illnesses in Nairobi Slums. *Tropical Medicine and International Health*, 10(3):240-245

Tambe, B. A., Mimboe, C. S, B., Nchung, J, A., Bakwo, C. B., Nyobe, E.C., Pauline N., and Leonie, D, N. (2018). The Determinants of Exclusive Breastfeeding in Cameroon, Sub-Saharan Africa. *Trends in General Practice*. 1(3):1-6, doi: 10.15761/TGP.1000113

Tang, K., Wang, H., Tan, S.H., Xin, T., Qu, X., Tang, T., Wang, T., Liu, Y., and Gaoshan, J. (2019). Association Between Maternal Education and Breast Feeding Practices in China: A Population-Based Cross-Sectional Study *BMJ Open* ;9**:**e028485. doi: 10.1136/bmjopen-2018-028485

Tawfiq, E., Alawi, S. A. S. and Natiq, K. (2020). Effects of Training Health Workers in Integrated Management of Childhood Illness on Quality of Care for Under-5 Children in Primary Healthcare Facilities in Afghanistan. *International Journal of Health Policy and Management*; 9(1):17–26. doi:10.15171/ijhpm.2019.69

Terra de Souza, A., Peterson, K., Andrade, F. M., Gardner, J., & Ascherio, A. (2000). Circumstances of post-neonatal deaths in Ceara, Northeast Brazil: mothers' health care-seeking behaviors during their infants' fatal illness. *Social Science & Medicine, 51(11), 1675–1693.* doi:10.1016/s0277-9536(00)00100-3

Terza, J. V. (2017). Two-Stage Residual Inclusion Estimation in Health Services Research and Health Economics. *Health Services Research, 53(3), 1890–1899.* doi:10.1111/1475-6773.12714. Accessed on 28/02/2020

Terza, J. V., Basu, A., & Rathouz, P. J. (2008). Two-Stage Residual Inclusion Estimation: Addressing Endogeneity in Health Econometric Modeling. *Journal of health economics, 27*(3), 531–543. https://doi.org/10.1016/j.jhealeco.2007.09.009

Thacker, S. B., Stroup, D. F., Carande-Kulis, V., Marks, J. S., Roy, K. & Gerberding, J. L. (2006). Measuring the public's health. *Public health reports (Washington, D. C: 1974), 121*(1), 14-22.

The infant and young child during periods of acute infection. (1989). *Bulletin of the World Health Organization*, *67 Suppl* (Suppl), 85–95.

The Lancet. (2009). What is health? The ability to adapt. *The Lancet,* 373(9666), 781. doi:10.1016/s0140-6736(09)60456-6.

Thomas, D. & Frankenberg, E. (2002). Health, Nutrition and Prosperity: A Microeconomic Perspective. *Bulletin of the World Health Organization. 80*(2):106-113.

Thornton, R. D., Nurse, N., Snavely, L., Hackett-Zahler, S., Frank, K. & DiTomasso, R. A. (2017). Influences on Patient Satisfaction in Healthcare Centers: A Semi-Quantitative Study Over 5 Years. *BMC health services research, 17*(1), 361. doi:10.1186/s12913-017-2307-z.

Thurston, N. K. and Libby, A. M. (2002). A Production Function for Physician Services Revisited. *The Review of Economics and Statistics*, 84(1): 184-191

Tung, Y. C. & Chang, G. M. (2009). Patient Satisfaction with and Recommendation of a Primary Care Provider: Associations of Perceived Quality and Patient Education. *International Journal for Quality in Health Care*, 21(3), 206–213.doi:10.1093/intqhc/mzp006

Turkson, P. K. (2009). Perceived Quality of Healthcare Delivery in a Rural District of Ghana. *Ghana Medical Journal*, *43*(2), 65–70.

Tynkkynen, L., & Vrangbæk, K. (2018). Comparing Public and Private Providers: A Scoping Review of Hospital Services in Europe. *BMC Health Services Research,* **18,** 141. https://doi.org/10.1186/s12913-018-2953-9

Uddin, M., Hossain, M. & Ullah, M. O. (2009). "Child Mortality in a Developing Country: A Statistical Analysis." *Journal of Applied Quantitative Methods*, *4*(3): 270-283.

UN General Assembly (2015), *Transforming our World: The 2030 Agenda for Sustainable Development*, A/RES/70/1, https://www.refworld.org/docid/57b6e3e44.html

UNDP (2018). *Human Development Indices and Indicators: 2018 Statistical Update*. United Nations Development Programme, New York, USA. http://hdr.undp.org/sites/default/files/2018_human_development_statistical_update.pdf

UNDP (2003). *Human Development Report 2003-Millennium Development Goals: A Compact among Nations to end Human Poverty*. Oxford University Press.

UNICEF, (2015). Levels and Trends in Child Mortality: Report 2015. UNICEF

UNICEF, (2015). One is Too Many: Ending Child Deaths From Pneumonia And Diarrhoea. New York. UNICEF

UNICEF, (2019). *Under Five Mortality*. https://data.unicef.org/topic/child-survival/under-five-mortality/

Usman, M. A., Gerber, N. and Von Braun, J. (2019). The Impact of Drinking Water Quality and Sanitation on Child Health: Evidence from Rural Ethiopia. *The Journal of Development Studies*; 5(10):2193-2211. https://doi.org/10.1080/00220388.2018.1493193

Uthman, O. A., Uthman, M. B. and Yahaya, I. (2008). A Population-Based Study of Effect of Multiple Birth on Infant Mortality in Nigeria. *BMC Pregnancy and Childbirth*; 8:41. doi:10.1186/1471-2393-8-41

Uwemedimo, O. T., Lewis, T. P., Essien, E. A., Chan, G. J., Nsona, H., Kruk, M. E. & Leslie, H. H. (2018). Distribution and determinants of pneumonia diagnosis using Integrated Management of Childhood Illness guidelines: a nationally representative study in Malawi. *BMJ global health*, 3(2), e000506. https://doi.org/10.1136/bmjgh-2017-000506

Van der Maas, P. (2003). How Summary Measures of Population Health are Affecting Health Agendas. *Bulletin of the World Health Organization*; 81 (5)

Van Der Werf, T. S., Dade, G. K., & Van Der Mark, T. W. (1990). Patient compliance with tuberculosis treatment in Ghana: factors influencing adherence to therapy in a rural service programme. *Tubercle, 71(4), 247–252.*doi:10.1016/0041-3879(90)90036-8

Vega, R. M. and Avva U. (2020). *Pediatric Dehydration*. [Updated 2020 Aug 8]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing. https://www.ncbi.nlm.nih.gov/books/NBK436022/

Venkatashiva, R. B., Yadlapalli S. K., Chandrakant S. P. (2017). Water and Sanitation Hygiene Practices for Under-Five Children among Households of Sugali Tribe of Chittoor District, Andhra Pradesh, India. *Journal of Environmental and Public Health;* 2017. doi.org/10.1155/2017/7517414

Vennik, F. D., van de Bovenkamp, H. M., Putters, K. and Grit, K. J. (2016). Co-Production in Healthcare: Rhetoric and Practice. *International Review of Administrative Sciences*, 82(1):150–168. DOI: 10.1177/0020852315570553

Vick, S. and Anthony S. (1998). Agency in Health-care. Examining Patients' Preferences for Attributes of the DoctorPatient Relationship. *Journal of Health Economics*, 17, 587- 605

Vlasnik, J. J., Aliotta, S. L., & DeLor, B. (2005). Medication adherence: Factors influencing compliance with prescribed medication plans. *The Case Manager, 16(2), 47–51.*doi: 10.1016/j.casemgr.2005.01.009

Wambui, W. M., Kimani, S., & Odhiambo, E. (2018). Determinants of Health Seeking Behavior among Caregivers of Infants Admitted with Acute Childhood Illnesses at Kenyatta National Hospital, Nairobi, Kenya. *International Journal of Pediatrics, 2018, 1–11.* doi:10.1155/2018/5190287

Wang, Y., Moe, C. L., & Teunis, P. (2018). Children Are Exposed to Fecal Contamination via Multiple Interconnected Pathways: A Network Model for Exposure Assessment. *Risk analysis : an official publication of the Society for Risk Analysis*, *38*(11), 2478–2496. https://doi.org/10.1111/risa.13146

Wanjau, K., Muiruri, B. and Ayodo, E. (2012). Factors Affecting Provision of Service Quality in the Public Health Sector: A Case of Kenyatta National Hospital. *International Journal of Humanities and Social Science*. 2(13).

Ware, J. E JR., Snyder, M. K., Wright, W. R. and Davies, A. R. (1983). Defining and Measuring Patient Satisfaction with Medical Care. *Evaluation and Program Planning*, 6:247-263. doi.org/10.1016/0149-7189(83)90005-8.

Webair, H. H. & Bin-Gouth, A. S. (2013). "Factors Affecting Health Seeking Behavior for Common Childhood Illnesses in Yemen." *Patient preference and adherence*. *7*, 1129.

Weil, D. N. (2005). *Accounting for the Effect of Health on Economic Growth* (No. w11455). National Bureau of Economic Research.

Wellay, T., Gebreslassie, M., Mesele, M., Gebretinsae, H., Ayele, B., Tewelde, A., & Zewedie, Y. (2018). Demand for Health Care Service and Associated Factors Among Patients in The Community of Tsegedie District, Northern Ethiopia. *BMC health services research*, *18*(1), 697. doi:10.1186/s12913-018-3490-2

Whittle, J., Yamal, J. M., Williamson, J. D., Ford, C. E., Probstfield, J. L., Beard, B. L., … ALLHAT Collaborative Research Group (2016). Clinical and demographic correlates of medication and visit adherence in a large randomized controlled trial. *BMC health services research*, *16*, 236. doi:10.1186/s12913-016-1471-x

Wiendyasari, A. R. R., Kusnanto, H. and Wibowo, T. (2018). The Effectiveness of IMCI (Integrated Management of Childhood Illness) Mini Training in Improving Health Workers' Skills in Primary Health Centers in Bantul. *Review of Primary Care Practice and and Education*; 1(3): 129-135.

Wilhelm, D., Lohmann, J., De Allegri, M., Chinkhumba, J., Muula, A. S. and Brenner, S. (2019). Quality of Maternal Obstetric and Neonatal Care in Low-Income Countries: Development of A Composite Index. *BMC Med Res Methodolology*, 19, 154. https://doi.org/10.1186/s12874-019-0790-0

Williams, R. 2006. Generalized Ordered Logit/ Partial Proportional Odds Models for Ordinal Dependent Variables. *The Stata Journal*, 6(1):58-82. http://www.nd.edu/~rwilliam/gologit2/gologit2.pdf .

WHO (1986). Use and Interpretation of Anthropometric Indicators of Nutritional Status. *Bulletin of the World Health Organisation*. 64(6):929-941

WHO, (2001). *Macroeconomics and Health: Investing in Health for Economic Development*, Report of the Commission on Macroeconomics and Health, Geneva

WHO (2002). *Health, Growth and Poverty Reduction: The Report of Working Group 1 of the Commission on Macroeconomics and Health*. Canada: WHO

WHO (2003). *Global Strategy for Infant and Young Child Feeding.* WHO, Geneva, Switzerland. https://www.who.int/nutrition/publications/infantfeeding/9241562218/en/

WHO (2004). Child Health in the Community- "Community IMCI": Briefing Package for Facilitators. Geneva, Switzerland. https://apps.who.int/iris/handle/10665/43006

WHO (2006a). *The World Health Report 2006: Working Together for Health.* Geneva: World Health Organisation. http://www.who.int/whr/2006

World Health Organization (2006b). *Quality of Care: A Process for Making Strategic Choices in Health Systems*. WHO Press. Geneva

WHO (2007). *Everybody's Business: Strengthening Health Systems to Improve Health Outcomes.* WHO, Geneva.https://apps.who.int/iris/bitsream/handle/10665/43918/9789241596077

WHO (2009). Infant and Young Child Feeding: Model Chapter for Textbooks for Medical Students and Allied Health Professionals. WHO Press. Geneva, Switzerland. https://www.who.int/nutrition/publications/infantfeeding/9789241597494.pdf

WHO (2013). *Pocket Book of Hospital Care for Children: Guidelines for the Management of Common Childhood Illnesses*. 2nd edition. Geneva: World Health Organization; 5, Diarrhoea. https://www.ncbi.nlm.nih.gov/books/NBK154434/

WHO, (2014a). *Global Nutrition Targets 2025: Stunting Policy Brief (WHO/NMH/NHD/14.3). Geneva:* World Health Organization. https://www.who.int/nutrition/global-target-2025/en/:Accessed on 04/03/2020

WHO, (2014b). Basic Documents, 48th ed. World Health Organisation. https://apps.who.int/iris/handle/10665/151605

WHO, (2014c). *Preventing Diahrrhoea Through Better Water, Sanitation and Hygiene: Exposures and Impacts in Low-and Middle-Income Countries*. Geneva. WHO. https://www.who.int/water_sanitation_health/diseases-risks/gbd_poor_water/en/

WHO (2015). *Service Availability and Readiness Assessment (SARA): An Annual Monitoring System for Service Delivery: Implementation Guide*, Version 2.2. World Health Organization. https://apps.who.int/iris/handle/10665/183119

WHO, (2021). *The State of the Health Workforce in the WHO African Region.* Brazzaville. WHO.https://apps.who.int/iris/bitstream/handle/10665/348855/9789290234555-eng.pdf?sequence=1

WHO, (2019). Trends in Maternal Mortality 2000 To 2017: *Estimates by WHO, UNICEF, UNFPA, World Bank Group and The United Nations Population Division*. Geneva: World Health Organization; 2019. Licence: CC BY-NC-SA 3.0 IGO.

WHO/UNICEF (2013). *End Preventable Deaths: Global Action Plan for Prevention and Control of Pneumonia and Diarrhoea*. Geneva. WHO

WHO and UNICEF (2006): Core Questions on Drinking-Water and Sanitation for Household Surveys.Geneva: http://www.who.int/water_sanitation_health/monitoring/oms_brochure_core_questionsfinal24608.pdf.

Wickrama, K. and Keith, P. (1990). Use and Evaluation of Healthcare Services by Male-and Female-headed Households in Rural Sri Lanka. *The Journal of Developing Areas*, 25(1):1-14.

Wolf, M. D., Lehman, L., Robert Quinlin, R., Thomas Zullo, T. and Hoffman, L. (2008). Effect of Patient-Centered Care on Patient Satisfaction and Quality of Care. *Journal of Nurse Care Quality*. 23 (4): 316–321

Wonderlich, S. & Jones, R. (2007). *Key topics in healthcare management: understanding the big picture*. Radcliffe Publishing.

Wooldridge, J. M. (2015). Control function methods in applied econometrics. *Journal of Human Resources*, 50(2), 420-445.

Wooldridge, J. (2013). Introductory Econometrics: *A Modern Approach*. South Western, USA

World Bank (2014a). Service Delivery Indicators: http://www.sdindicators.org/about-us/

World Bank (2014b). *Laying the Foundation for a Robust Health Care System in Kenya: Kenya Public Expenditure Review*. Volume 11

World Bank and Republic of Kenya (2019). *Kenya Health Service Delivery Indicator Survey 2018 Report.* World Bank. Washington

World Health Organization (2005), *Handbook: IMCI integrated management of childhood illness. (NLM classification:* WS 200)

Yakoob, M. Y., Theodoratou, E., Jabeen, A., Imdad, A., Eisele, T. P., Ferguson, J., Jhass, A., Rudan, I., Campbell, H., Black, R. E. & Bhutta, Z. A. (2011). Preventive zinc supplementation in developing countries: impact on mortality and morbidity due to diarrhea, pneumonia and malaria. *BMC public health*, *11 Suppl 3*(Suppl 3), S23. https://doi.org/10.1186/1471-2458-11-S3-S23

Yalçın, S. S., Yalçın, S. and Kurtuluş-Yiğit, E., (2014). Determinants of Continued Breastfeeding Beyond 12 Months in Turkey: Secondary Data Analysis of the Demographic and Health Survey. *The Turkish Journal of Pediatrics*; 56: 581-591

Yan, Z., Wan, D. & Li, L. (2011). Patient satisfaction in two Chinese provinces: rural and urban differences. *International journal for quality in health care: Journal of the International Society for Quality in Health Care*, *23*(4), 384–389. https://doi.org/10.1093/intqhc/mzr034

You, W. (2005). *Parental Time and Children's Obesity Measures: A Theoretical and Empirical Investigation*. PhD Dissertation. Accessed from Researchgate

Appendices

Appendix 2A: Areas of Healthcare Quality in the IOM Framework

Domain	Definition
Safety	Patient safety when interacting with the health care system. It specifically includes safety related to diagnosis of conditions (missed diagnoses and incorrect diagnoses), treatment errors, and safety from injury in health care settings.
Effectiveness	Provision of appropriate health services based on a scientific understanding of the risk and benefits associated with care. It includes measures of overuse and underuse and can be applied across the spectrum of care, (ie, preventive, acute, and chronic care and care for specific conditions).
Patient-centeredness	Patients' experiences of care and the presence of an effective partnership among patients, providers, and their families. These interactions allow for medical decisions that respect patients' views and provide them with education to make decisions and participate in their own care.
Timeliness	Minimizing delays in accessing the medical system, delays within the medical system, and delays in coordination between different components of the medical system.
Efficiency	Minimizing waste of equipment, supplies, ideas and energy

Source: Institute of Medicine, 2001.

Appendix 3A: Key Family Practices (Related to Diahrreal Prevention and Treatment)

Key Family Practices	Activities
Promotion of growth and development of the child	• Breastfeed exclusively for the first six months; • From six months, continue breasfeeding while giving quality complementary foods to two years or longer; • Ensure a child receives enough micronutrients – such as vitamin A, iron and zinc – in their diet or through supplements;
Disease prevention	• Dispose of all faeces safely, wash hands after defecation, before preparing meals and before feeding children;
Appropriate care at home	• Continue to feed and offer more fluids, including breast milk to children when they are sick; • Give sick children appropriate home treatment for infections;
Care-seeking outside the home	• Recognize when sick children need treatment outside the home and seek care from appropriate providers; • Take children to complete a full course of immunization before their first birthday; • Follow the health provider's advice on treatment, follow-up and referral;

Source: WHO, 2004

Appendix 4A: First Stage Results

Variables	First Stage Results													
	Model 1 (Consumer Quality of Healthcare)		Model 2 (Provider Quality of Healthcare)										Model 3 (Provider-Consumer quality of Healthcare interaction)	
			Self-treatment/others		Health Centre		Hospital		Private Clinic		Mission			
	Coefficients	z-value	Coefficients	z-value	Coefficients	z-value	Coefficients	z-value	Coefficients	z-value	Coefficients	z-value	Coefficients	z-value
Child Characteristics														
Child sex	0.110***	3.52	-0.0641	-0.43	-0.0160	-0.12	0.0854	0.58	-0.0151	-0.09	-0.119	-0.38	0.228	0.98
Childs age in years	0.300***	7.74	0.138	0.73	0.00723	0.04	-0.0786	-0.43	0.0670	0.32	-0.567	-1.49	0.989***	3.51
Child's age squared	-0.0387***	-3.75	0.0126	0.26	0.00327	0.08	0.0207	0.43	0.00390	0.07	0.171*	1.77	-0.116	-1.60
Twin birth	0.0877	0.91	-0.248	-0.58	0.274	0.76	-0.410	-0.84	-0.779	-1.19	-0.223	-0.27	0.442	0.71
Birth order number	-0.0439***	-3.41	0.190***	3.16	0.00950	0.17	-0.0193	-0.31	0.0161	0.24	0.0422	0.35	0.0674	0.75
Mother's Characteristics														
Age in years	0.0221	1.23	-0.0808	-0.94	-0.0131	-0.17	0.0944	1.04	-0.117	-1.25	-0.0629	-0.37	0.169	1.19
Age in years squared	-0.000125	-0.43	0.000389	0.27	0.000215	0.17	-0.00154	-1.01	0.00210	1.38	0.00125	0.46	-0.00325	-1.39
Education Level (Reference Category=No education)														
Primary	0.175***	3.21	0.453*	1.74	-0.185	-0.86	-0.0893	-0.36	-0.661**	-2.31	-0.497	-1.08	1.503***	3.70
Secondary	0.306***	4.54	0.320	0.98	-0.322	-1.15	-0.243	-0.80	-0.0776	-0.23	-0.812	-1.26	1.677***	3.44
Post-secondary	0.353***	3.66	0.641	1.10	-0.123	-0.22	0.0823	0.16	0.750	1.48	0.431	0.50	0.551	0.68
Wealth quintile/Index (Reference Category =Lowest)														
Second	0.159***	3.32	-0.151	-0.69	0.214	1.16	0.541**	2.41	0.509*	1.87	-0.397	-0.66	-0.333	-1.01
Middle	0.128**	2.40	0.377	1.54	0.540**	2.53	1.101***	4.48	1.113***	3.84	0.745	1.42	-1.013***	-2.77
Fourth	0.201***	3.46	0.412	1.51	-0.0621	-0.23	0.441	1.56	0.947***	2.97	0.508	0.87	0.0735	0.17
Highest	0.200***	2.84	0.690*	1.85	-0.401	-0.94	1.426***	4.26	1.693***	4.48	0.807	1.19	-1.359**	-2.48
Occupation (Reference category=unemployed)														
Agricultural	0.202***	3.31	0.135	0.44	-0.159	-0.64	-0.770**	-2.55	-0.0594	-0.17	0.0243	0.04	1.122**	2.53
Professional	0.145***	3.45	0.271	1.17	-0.180	-0.96	-0.413**	-2.08	0.226	0.92	-0.0564	-0.14	0.819**	2.42
Others	0.160***	2.91	0.237	0.84	-0.0791	-0.34	-0.264	-1.06	-0.155	-0.50	-0.749	-1.18	1.353***	3.26
Household Characteristics														
Place of residence	0.0370	0.87	0.721***	3.51	0.199	1.00	1.732***	9.15	0.738***	3.26	1.395***	3.40	-1.688***	-5.10
Household size	-0.00226	-0.29	-0.0355	-0.93	-0.0717**	-2.00	-0.0143	-0.36	0.00484	0.11	0.0162	0.20	-0.0256	-0.45
Household head sex	0.0201	0.58	-0.176	-1.07	-0.00912	-0.66	-0.108	-0.66	0.118	0.63	-0.0690	-0.20	-0.0143	-0.06
Household head age	0.0126*	1.71	-0.00335	-0.09	-0.0211	0.91	-0.0447	-1.23	0.00629	-0.35	-0.0590	-0.75	0.0909	1.60
Household head age squared	-0.000125	-1.61	0.000158	0.41	0.000301	1.70	0.000480	1.25	-0.000185	0.13	0.000624	0.77	-0.000758	-1.27
Log of average annual rainfall	-0.234**	-2.15	0.267	0.50	0.780*	1.70	1.876***	3.72	0.865	1.54	1.858*	1.72	-2.626***	-3.13
Log of travel time to	0.0683*	1.86	-0.232	-1.28	-0.151	-0.92	-0.665***	-3.92	-0.459**	-2.39	-1.337***	-4.02	0.795***	2.96

Variables	First Stage Results													
	Model 1 (Consumer Quality of Healthcare)		Model 2 (Provider Quality of Healthcare)										Model 3 (Provider-Consumer quality of Healthcare interaction)	
			Self-treatment/others		Health Centre		Hospital		Private Clinic		Mission			
	Coefficients	z-value	Coefficients	z-value	Coefficients	z-value	Coefficients	z-value	Coefficients	z-value	Coefficients	z-value	Coefficients	z-value
Child Characteristics														
nearest market														
Log of distance*average annual temperature	0.175	1.63	-0.398	-0.75	-1.015**	-2.23	-1.788***	-3.60	-1.005*	-1.81	-1.870*	-1.77	2.224***	2.69
Constant	-6.080***	-7.75	3.911	1.03	8.256**	2.48	12.32***	3.40	8.985**	2.25	18.65**	2.43	-32.16***	-5.42
Observations	2,860		1,906										1889	
R-squared			0.0817											
F-Statistic	AIC =6.06298 BIC=32175.59		LR Chi2(125) = (498.74) ***										AIC=6.06298 BIC=32175.59	

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Source: Authors computation, 2014 KDHS