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### Describing The Health Care Needs Of School-Age Children In Sub-Saharan Africa In Order To Develop A Model Of A Nurse-Run School-Based Health Clinic

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Describing the Health Care Needs of School-Age Children in Sub-Saharan Africa in Order to  
Develop a Model of a Nurse-Run School-Based Health Clinic

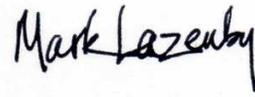
Capstone  
Submitted to the Faculty  
Yale University School of Nursing

In Partial Fulfillment  
of the Requirements for the Degree  
Doctor of Nursing Practice

Bonnie Tong, MSN, RN

May 18, 2015

The capstone is accepted in partial fulfillment of the requirements for the degree Doctor of Nursing Practice.

A handwritten signature in black ink that reads "Mark Lazenby". The signature is written in a cursive style with a horizontal line through the middle of the letters.

James Mark Lazenby, PhD, APRN  
Assistant Professor

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February 27, 2015

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Signed: Bonnie Tong

May 18, 2015

## ACKNOWLEDGEMENTS

Several people were pivotal to not only the completion of this capstone, but to the journey itself. Dr. Mark Lazenby, tirelessly read multiple copies of this capstone and guided me through the whole DNP process. Along with Dr. Ruth McCorkle, a vessel of knowledge, both her and Dr. Lazenby supported this capstone from the beginning.

To my brother, Andy, who has been my cheerleader since we were children, has always empowered me to think outside the box and to believe that nothing is impossible.

I thank Reverend Evalyn Wakhusama, the founder and director of the Nambale Magnet School and those I came in contact with at the Nambale Magnet School, and Nambale, Kenya, for opening their homes to me and sharing their stories. I am honored that Reverend Wakhusama, gave me an opportunity to be a part of a project that will better the community of Nambale, Kenya. The findings of this capstone will be handed over to Reverend Wakhusama and the Nambale Magnet School, in the hopes that the information will provide a foundation for increasing access for the children of Nambale, Kenya. I am indebted to Lilyan Wanyama, who took my ideas and plans for my duration in Kenya and made it a reality. Without Reverend Whakusama and Ms. Wanyama's connections and assistance in scheduling appointments with key stakeholders, this capstone would cease to exist.

Wilson Young, my husband to be, encouraged me and showed me endless support during this whole process. Without him advising me to apply to the Yale School of Nursing's DNP program, I would not be where I am today.

## ABSTRACT

**Objective:** Rural Kenya is affected by health disparities and poor health outcomes among school-age children. This paper identifies gaps in health care among school-aged children in rural Kenya, in order to identify a health care model to meet those gaps.

**Design:** The results of a systematic review on the health care needs were triangulated with field notes from interviews of stakeholders in a rural Kenyan village. Needs were then compared with currently available health care resources to identify gaps.

**Sample:** Multiple databases were searched to identify relevant articles published between the years 2000- 2014. Interviews were conducted with health workers, parents/caretakers, and church leaders in Nambale, Kenya.

**Measurements:** 38 articles met the inclusion criteria for review. Publicly available data on health care needs of school-aged children in sub-Saharan Africa, Kenya, and Busia County, Kenya, were obtained from multiple sources. 49 stakeholder interviews were performed.

**Results:** Health care access in rural Kenya is affected by a shortage of health care resources including health care facilities, hospital beds, specialty services, and health care providers.

**Conclusions:** A nurse-run school-based clinic is a care model that can address the health care gaps faced by school-aged children in rural Kenya.

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## Introduction

Sub-Saharan African countries have made great strides at improving health outcomes: maternal and child health continue to improve (UNICEF, World Health Organization [WHO], The World Bank, United Nations, 2013; WHO, UNICEF, United Nations Population Fund [UNFPA], The World Bank, and the United Nations Population Division, 2014) and life expectancy in sub-Saharan Africa has increased from 55.36 to 56.4 years of age from 2010 to 2012 (The World Bank Group, 2015). However, providing health care to school-aged children remains a concern in less resource-rich parts of the continent. In Kenya in 2012, for example, the under-5 mortality was 73 deaths per 1000 live births; as a comparison, in the United States in 2012, the under-5 mortality was 7 deaths per 1000 live births (UNICEF, WHO, The World Bank, United Nations, 2013). It is not entirely clear the sources of poor child health in Kenya, particularly in rural areas. Nor is it clear which model of health care delivery will meet the health care needs of children in rural Kenya.

The overall purpose of this paper is to describe the health care needs and resources available to meet those needs of school-aged children in rural Kenya, in order to identify a model for providing health care to school-aged children. To accomplish this purpose, in this paper we (a) systematically review the literature on the health care needs of school children in rural Kenya, (b) triangulate the review's results with field notes from interviews of stakeholders concerning the health care needs of school-aged children in a Kenyan rural village, and (c) compare those needs with available health care resources, as determined through publicly available sources.

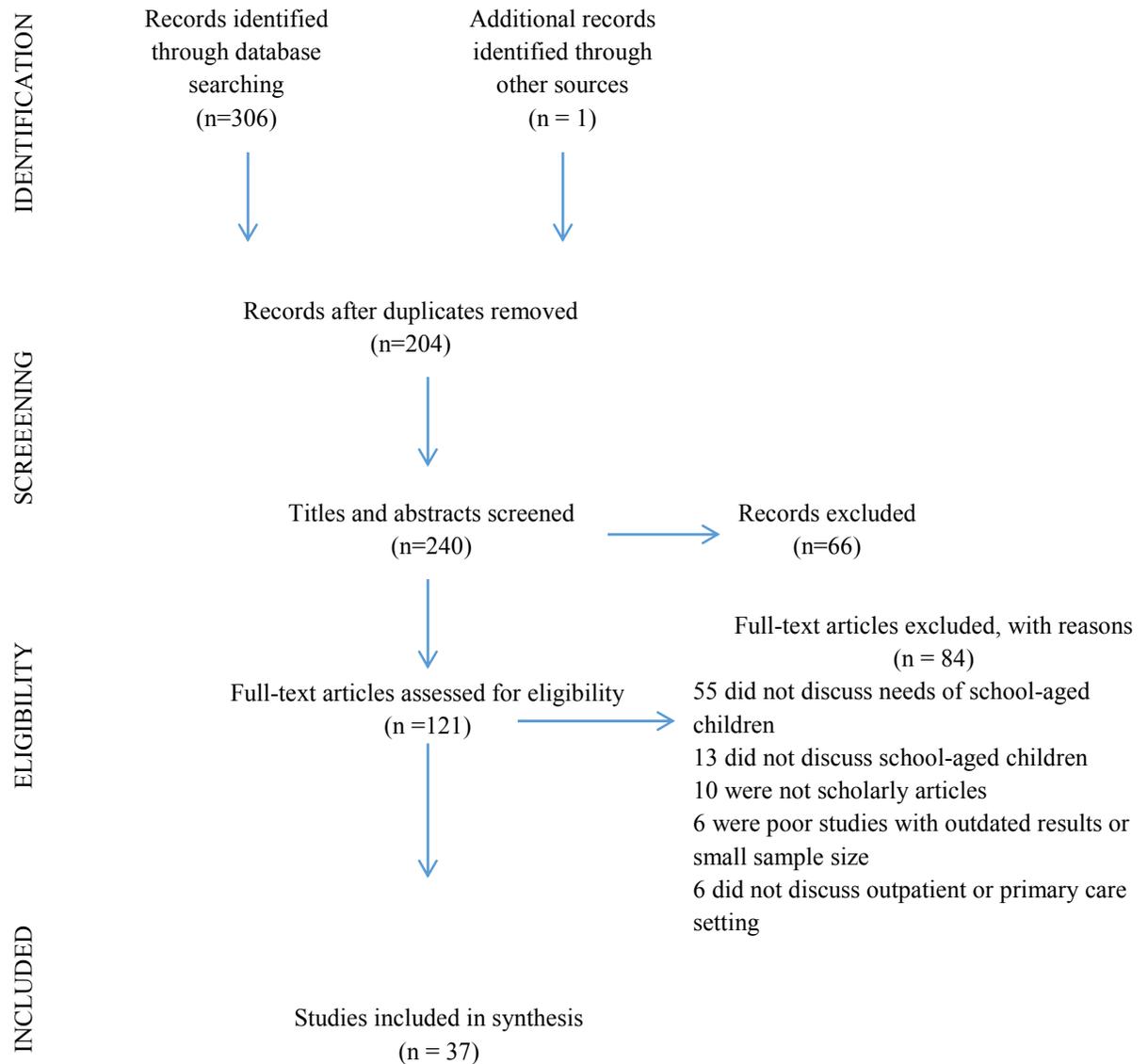
## **Methods**

### **Design and Sample**

The PubMed, SCOPUS, Web of Science, and CINAHL databases were searched between December 28, 2013, and September 19, 2014, to identify relevant articles published between the years 2000- 2014 in the English language. Search terms included “health care,” “needs,” “children,” “Africa,” “rural,” “sub-Saharan Africa,” “Kenya,” “Busia County,” and “Nambale”, “rural Africa”, and “rural Kenya”. Studies were included for full review if they were scholarly articles, discussed the needs of school-aged children, discussed primary care, and took place in rural underserved areas. Articles were excluded if they were not scholarly journal articles, had a poor study design or unclear results, did not discuss the needs of school-aged children, or did not discuss health care in a primary care setting. Reference lists of articles included for full review were hand-searched for articles not identified in the search. Thirty-eight articles met criteria for inclusion. Figure 1 presents the data flowchart according to PRISMA guidelines.

Figure 1

*Data Flowchart According to PRISMA Guidelines*



*Note: Adapted from Moher, D., Liberati, A., Tetzlaff, J., Altman, D. G., & The PRISMA Group. (2009).*

*Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. Annals of Internal Medicine, 151(4), 264-269.*

On February 9-16, 2014, interviews were conducted with 17 parents/caretakers of the students and two staff members of the Nambale Middle School (NMS), Nambale, Kenya; one church leader and 29 community and non-governmental organization (NGO) health workers from seven different organizations in the surrounding area. Of note, one of the staff members is a distinguished leader of the church community, but for the purposes of this paper, will be included in the NMS interviews. No children were interviewed. Field notes were kept. Nambale, a rural part of Busia County in western Kenya, has a population of 205,982 and a landmass of approximately 433.9 square kilometers (Kenya National Bureau of Statistics [KNBS], 2014b). Two hundred fifty students between 3-12 years attend NMS, 118 of whom board. Half of the children are often cared for by grandparents or distant cousins (E. Wakhusama, personal communication, January 14, 2014; WIKS-USA, Inc. n.d.). Currently, the school has 30 employees.

## **Measures**

Data extracted from the articles included in the systematic review included authors' and publication details, purpose and design of study, study participants and setting, findings, limitations, and level of evidence (Table 1).

Table 1

*Study Characteristics*

<b>Author(s) &amp; Publication Year</b>	<b>Title</b>	<b>Journal</b>	<b>Purpose of Study</b>	<b>Number of Participants</b>	<b>Participant Characteristics</b>	<b>Study Setting</b>	<b>Study Design/Methods</b>	<b>Findings/ Conclusions</b>	<b>Comments/ Limitations</b>	<b>Level of Evidence</b>
<b>Hall, Bobrow, Brooker, Jukes, Nokes, Lambo, ...Toan (2001)</b>	Anaemia in schoolchildr en in eight countries in Africa and Asia	Public Health Nutrition	Assess the prevalence of anemia in rural schoolchildren in Asia and Africa	6941 boys and 7042 girls	Primary and junior secondary schoolchildre n aged from 7-18 years	8 countries in Asia and Africa: Ghana, Indonesia, Kenya, Malawi, Mali, Mozambique, Tanzania, Vietnam	Finger prick blood samples collected during health survey	Anemia is of great concern in schoolchildren in SSA	Only children enrolled in school were assessed and recording of age can be inaccurate	Case-Control Study, 3b
<b>Thiong'o, Luob, and Ouma (2001)</b>	Intestinal helminthes and schistosomia sis among school children in a rural district in Kenya	East African Medical Journal	Determine extent of intestinal helminthes and schistosomiasis	3158	Schoolchildre n aged 5-20 years	50 primary schools in Bondo District, Kenya	Cross Sectional Study	Intestinal schistosomiasis, ascariasis, hookworm, and trichuriasis infections are endemic in schoolchildren in Bondo and Usigu divisions	Schoolchildren located near Lake Victoria had higher rates compared to inland	Case – control study, 3b

Author(s) & Publication Year	Title	Journal	Purpose of Study	Number of Participants	Participant Characteristics	Study Setting	Study Design/Methods	Findings/Conclusions	Comments/Limitations	Level of Evidence
<b>Esamai, Ayaya, and Nyandiko (2002)</b>	Prevalence of asthma, allergic rhinitis and dermatitis in primary school children in Uasin Gishu district, Kenya	East African Medical Journal	Assess the prevalence of allergic rhinitis, asthma, and dermatitis in primary schoolchildren	3258	Children aged 13-14 years	72 rural, primary schools in Rift Valley province of Kenya	Cross sectional, comparative study	There was an increase in prevalence of rhinitis, eczema, and asthma from 1995-2001	Age group is limited and cannot be generalized to other age groups of children	Case-control study, 3b
<b>Abuya, Molyneux, Orago, Were, and Marsh (2004)</b>	Quality of care provided to febrile children presenting in rural private clinics on the Kenyan	African Health Sciences	Assess the quality of care provided to febrile children presenting to private clinics on the Kenyan	92 observations of practitioners and caretakers with febrile children	Members of the district health management team, private practitioners from 7 clinics and caretakers of febrile	Rural area of Kilifi District, Kenyan Coast	Descriptive study, qualitative and quantitative methods	There are opportunities for improvement in the quality of care provided in private clinics in the rural area of Kilifi	May not be generalizable due to small number of clinics included in the study	Case series, 4

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coast

Coast

children age

6 months- 10

years who

attended the

7 clinics

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<b>Author(s) &amp; Publication Year</b>	<b>Title</b>	<b>Journal</b>	<b>Purpose of Study</b>	<b>Number of Participants</b>	<b>Participant Characteristics</b>	<b>Study Setting</b>	<b>Study Design/Methods</b>	<b>Findings/Conclusions</b>	<b>Comments/Limitations</b>	<b>Level of Evidence</b>
<b>Ikamari (2004)</b>	An upsurge in early childhood mortality in Kenya: A search for explanations	African Journal of Health Science.	Assess the trends of infant and child mortality	N/A	Infants, children, and children under 5	Kenya	Review of statistical data	There has been an upward trend in childhood mortality in the past decade	Although there is a significant decline in childhood mortality in Nairobi, Central and Coast Provinces, there is only a marginal decline in the Western Province of Kenya	Level 5

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Author(s) & Publication Year	Title	Journal	Purpose of Study	Number of Participants	Participant Characteristics	Study Setting	Study Design/Methods	Findings/Conclusion	Comments/Limitations	Level of Evidence
Adazu, Lindblade, Rosen, Odhiambo, Ofware, Kwache, ... Slutsker (2005)	Health and demographic surveillance in rural Western Kenya: a platform for evaluating interventions to reduce morbidity and mortality from infectious diseases	The American Journal of Tropical Medicine and Hygiene	Obtain health and demographic data to provide information to establish future health interventions	Total population: 134,990 33,990 households, 20,560 compounds	45.4% children < 15 years of age, 6% adults ≥ 65 years of age, 46.6% of total population are males	Rural Western Kenya: 75 villages in Nyanza Province, Asembo and 142 villages in Gem	Household surveillance using interviews, socioeconomic surveys, outpatient health facility surveillance, and verbal autopsy questionnaires	Majority of child mortality (665 of 778 deaths) consisted of children 1m to < 12 years old. Sepsis/meningitis was the most common cause of death among neonates and malaria was the most common cause of death in post neonates.	Population culturally homogenous, not generalizable	Retrospective cohort, 2b

Author(s) & Publication Year	Title	Journal	Purpose of Study	Number of Participants	Participant Characteristics	Study Setting	Study Design/Methods	Findings/Conclusions	Comments/Limitations	Level of Evidence
Houweling, Kunst, Moser, and Mackenbach (2006)	Rising under-5 mortality in Africa: Who bears the brunt?	Tropical Medicine and International Health	Identify the socioeconomic and geographical groups most vulnerable to an increase in under-five mortality in SSA	7 countries in sub-Saharan Africa	Data obtained from Demographic and Health Surveys (DHS). Majority of children born in rural areas	All SSA countries with at least 2 DHS: Burkina Faso, Cameroon, Cote D'Ivoire, Kenya, Zimbabwe	DHS data for sub-Saharan African countries for late 1980s-1990s with time trends in under-five mortality assessed	Under-five mortality ranged from an increase of 3.2% per year in Kenya to 5.5% in Cote D'Ivoire. The mortality increase in Burkina Faso and Kenya was concentrated among less educated and rural areas. Cote D'Ivoire saw an increase in all groups except in highest educated. Cameroon saw the highest increase in under-five mortality in the higher	Gives an overview of the trends in under-five mortality in sub-Saharan Africa	Ecological Study, 2c

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educated while

Zimbabwe saw a

higher increase

in child mortality

compared to

infant mortality

among higher

educated and

urban areas.

In Kenya,

chronic

malnutrition

increased in less

educated.

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Author(s) & Publication Year	Title	Journal	Purpose of Study	Number of Participants	Participant Characteristics	Study Setting	Study Design/Methods	Findings/Conclusions	Comments/Limitations	Level of Evidence
<b>Mung'ala-Odera, Meehan, Njuguna, Mturi, Alcock, and Newton (2006)</b>	Prevalence and risk factors of neurological disability and impairment in children living in rural Kenya	International Journal of Epidemiology	Determine the prevalence and risk factors of neurological impairment in older children in Africa	10,218 children	Children aged 6-9: 50.5% males. 29% aged 6, 25% aged 7, 23% aged 8, and 23% aged 9	Kilifi District in rural Western Kenya	Phase 1: survey using Ten Questions Questionnaire (TQQ) Phase 2: Comprehensive clinical and psychological assessment	251 children were found to have neurological impairment with epilepsy being the most common followed by hearing and cognitive impairment.	TQQ is more reliable in moderate/severe cases not mild case	3b
<b>Lindblade, Hamel, Feikin, Odhiambo, Adazu, Williamson, ... Slutsker (2007)</b>	Mortality of sick children after outpatient treatment at first-level health facilities in rural western Kenya	Tropical Medicine and International Health	Compare the mortality rate of sick children who had a recent visit to a first level health facility with that of the general	1387 children were eligible with a total of 1697 sick visits made	Sick children aged 2-59 months	7 participating first-level health facilities in Asembo in rural Western Kenya	Standardized mortality ratio computed to compare their mortality rate in the 30 days after a sick visit with that of the community	Risk factors for mortality include age < 24 m, malaria, severe PNA, and anemia. Compared to the general population, sick children had a 5.3 times higher	Improvements of first level health facilities are needed in order to provide better treatment for ill children	4

population  
in rural  
Western  
Kenya  
between  
May 1-  
September  
30, 2003

chance of  
mortality

Author(s) & Publication Year	Title	Journal	Purpose of Study	Number of Participants	Participant Characteristics	Study Setting	Study Design/Methods	Findings/Conclusions	Comments/Limitations	Level of Evidence
Little, Thorne, Luo, Bunders, Ngongo, McDermott, and Newell (2007)	Disease progression in children with vertically-acquired HIV infection in sub-Saharan Africa: Reviewing the need for HIV treatment	Current HIV Research	Review the literature on the morbidity and mortality of vertically-infected children with HIV	6 articles on mortality rates of vertically infected children and 10 articles on mortality rates in HIV infected and uninfected children born to HIV infected mothers compared to children born to	English language peer reviewed articles on mother to child HIV transmission searched on PubMed	PubMed articles	Literature Review	HIV accounts for 10% of child mortality across Africa and is affected by mothers' HIV status. Most common symptoms in children with HIV include diarrhea, PNA, and lymphadenopath	Only one database searched	5

uninfected  
 mothers were  
 included

Author(s) & Publication	Title	Journal	Purpose of Study	Number of Participants	Participant Characteristics	Study Setting	Study Design/Methods	Findings/Conclusions	Comments/Limitations	Level of Evidence
<b>Obure, Mbakaya, Kariuki, Karanja, Juliao, Quick, ...Woodruff (2007)</b>	Baseline data from the Nyando Integrated Child Health and Education Project - Kenya	MMWR. Morbidity and Mortality Weekly Report	Determine socioeconomic, health, behavior and demographic data in the Nyando District of Western Kenya	1,049 children aged < 3 years old and 905 primary school children from 1,596 households	Primary school children from grades 4-8 (age 9-13 years) and children aged 6-35 months were sampled	Nyando District in Nyanza Province, rural Western Kenya	Survey, blood draws, height/weight measurements	86.1% of households were in the poorest quintile.  47.9% of households rely on surface water for drinking.  Prevalence of chronic malnutrition in children aged 6-35 months is 28%.  21.5% of children 6-35	Results were used for NICHE intervention	2b

months reported  
acute respiratory  
illness 24 hours  
prior.  
14.8% of  
primary school  
children were  
found positive  
for intestinal  
parasites.

Author(s) & Participants	Title	Journal	Purpose of Study	Number of Participants	Participant Characteristics	Study Setting	Study Design/Methods	Findings/Conclusions	Comments/Limitations	Level of Evidence
<b>Tornheim, Many, Oyando, Kabaka, Breiman, and Feikin (2007)</b>	The epidemiology of hospitalized pneumonia in rural Kenya: the potential of surveillance data in setting public health	International Journal of Infectious Diseases	Define the epidemiology of hospitalized pneumonia and to show the advantage of including such data in the National Surveillance	2,466 residents hospitalized for acute pneumonia	43.7% of residents admitted were children under 5 years and 58.3% were female.	All eight hospitals that admitted patients in Bondo District in Nyanza Province in Western Kenya	Data from admission registrars in all hospitals were analyzed	Pneumonia admissions accounts for 12.8% of all admissions in Bondo District, 21.6% of children under 5 years of age was admitted for pneumonia compared to	Underestimates the incidence of pneumonia as it does not account for those with pneumonia who were not admitted	2b

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priorities

System

9.8% in children

5 years and older. The total death rate from hospitalized pneumonia was 32 deaths per 100000 person-years. Death rate for children <5 years was 65 per 100,000 person-years and 24 per 100,000 in patients  $\geq 5$  years.

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<b>Author(s) &amp; Publication Year</b>	<b>Title</b>	<b>Journal</b>	<b>Purpose of study</b>	<b>Number of Participants</b>	<b>Participant Characteristics</b>	<b>Study Setting</b>	<b>Study Design/Methods</b>	<b>Findings/Conclusion</b>	<b>Comments/Limitations</b>	<b>Level of Evidence</b>
<b>Bejon, Mohammed, Mwangi, Atkinson,</b>	Fraction of all hospital admissions and deaths	American Journal of Clinical Nutrition	Determine the role malnutrition plays in	Data analyzed from 13,307 admissions, 674 deaths, 3,068	Children aged 6-60 months	Kilifi District Hospital, rural Kenya	Prospective collection of standardized clinical,	Attributable fractions for malnutrition were 11-41% for	Attributable fractions for death due to malnutrition	2b

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<b>Osier, Peshu,</b>	attributable		child	admissions in			anthropometric,	admissions and	was lower	
<b>...Berkley</b>	to		morbidity	children with			and lab data of	28-51% lower	among older	
<b>(2008)</b>	malnutrition		and	severe disease			children	among older	children	
	among		mortality	and			admitted to	children		
	children in						pediatric units			
	rural Kenya			562 community controls						
<b>Idro, Gwer,</b>	The	BMC	Examine the	4,921 children	Children age	Kilifi District	Admission data	Incidence of	Only assesses	2b
<b>Kahindi,</b>	incidence,	Pediatrics	burden,		0-13 years	Hospital, rural	assessed, lab	seizures in	the seizure	
<b>Gatakaa,</b>	aetiology		etiology and		from the	Kenya	work performed	children 0-13	burden for	
<b>Kazungu,</b>	and outcome		outcome of		study area			years of age was	children	
<b>Ndiritu,</b>	of acute		seizures in		admitted to			425 per	admitted to	
<b>...Newton</b>	seizures in		children in		Kilifi District			100,000/year	Kilifi District	
<b>(2008)</b>	children		rural malaria		Hospital from			with overall	Hospital	
	admitted to a		endemic		Dec 1 <sup>st</sup> 2004-			incidence of		
	rural		area in		Nov 30 <sup>th</sup>			status epilepticus		
	Kenyan		Kenya		2006 were			being 46 per		
	district				included.			100,000/year.		
	hospital				Those that			Over 80% of		
					did not have			seizures were		
					seizures were			associated with		
					included in			infectious		
					the			illnesses, with		
					comparison			malaria being the		
					group.			most common.		

Author(s) & Publication Year	Title	Journal	Purpose of Study	Number of Participants	Participant Characteristics	Study Setting	Study Design/Methods	Findings/Conclusions	Comments/Limitations	Level of Evidence
<b>Othero, Orago, Groenewegen, Kaseje, and Otengah (2008)</b>	Home management of diarrhea among underfives in a rural community in Kenya: household perceptions and practices	East African Journal of Public Health	Determine the perceptions of caregivers on causes of diarrheal diseases in children under five years of age and their management practices prior to seeking medical care	927	96.7% of caregivers were female and aged 15-25 years and 3% were grandparents aged 49-56 years	Nyando District, Kenya	Household longitudinal study	Perceived cause of diarrhea was mainly unclean water followed by ingestion of bad food. 76.4% of mothers were not able to recognize danger signs of dehydration. 45.3% of mothers gave their child anti-diarrheal medications and 18.7% administered home-made fluids	There is a lack of education on diarrhea and dehydration management in mothers/caregivers.	2c

Author(s) & Publication Year	Title	Journal	Purpose of Study	Number of Participants	Participant Characteristics	Study Setting	Study Design/Methods	Findings/Conclusions	Comments/Limitations	Level of Evidence
<b>Bukachi, Wandibba, and Nyamongo (2009)</b>	The treatment pathways followed by cases of human African trypanosomiasis in western Kenya and eastern Uganda	Annals of Tropical Medicine and Parasitology	Determine the treatment pathways for those diagnosed with human African trypanosomiasis (HAT)	203 Former cases of HAT	Subjects come from the Busoga focus, which includes Busia, Teso and Bungoma in western Kenya and Tororo and Busia districts in eastern Uganda	Hospital records between 1990-2002 were obtained from the Trypanosomiasis Research Centre (TRC) in Kikuyu, Kenya and the National Livestock Health Research Institute (NALIRI) in Tororo, Uganda	Descriptive study with case history analysis	55% of cases were in age range 11-40, 11 cases (5.4%) were in age range 0-10, and 49 cases (24.1%) were in age range 11-20. Health seeking behaviors included the following: 48.2% treated HAT with over the counter anti-malarial medications and 71.9% sought help in the late stages of the disease.	Provides an overview of health seeking behaviors utilized. Recall method may affect accuracy of case histories	4

Author(s) & Publication Year	Title	Journal	Purpose of Study	Number of Participants	Participant Characteristics	Study Setting	Study Design/Methods	Findings/Conclusions	Comments/Limitations	Level of Evidence
Kendall-Taylor, Kathomi, Rimba, and Newton (2009)	Comparing characteristics of epilepsy treatment providers on the Kenyan coast: implications for treatment-seeking and intervention.	Rural Remote Health	Understand the characteristics of providers and treatment options in the determination of treatment seeking in children with epilepsy	8 traditional healers and 12 biomedical workers	Traditional healers were 35-60 years old; Biomedical workers included physicians, nurses, neurological technicians, research staff, and general health aides	Kilifi District, Kenya	Traditional healers participated in 200 hours of interview and observations. Field notes and audiotaped interviews used. interviews and observational data on biomedical workers were obtained from year 2005-2007	Treatment provided by traditional healers and biomedical workers were different in communication style, payment, explanation of causes, location, referrals, and the social roles of the providers, with many preferring traditional healers	Provides an understanding of why traditional healers are still used by many	2c

Author(s) & Publication Year	Title	Journal	Purpose of Study	Number of Participants	Participant Characteristics	Study Setting	Study Design/Methods	Findings/Conclusions	Comments/Limitations	Level of Evidence
Nguihu, Kariuki, Magambo, Kimani, Mwatha, Muchiri, ... Mkoji (2009)	Intestinal polyparasitism in a rural Kenyan community	East African Medical Journal	Determine the prevalence and co-occurrence of intestinal parasitism in Kibwezi, Makueni District, Kenya	1, 045 (511 children, 534 adults)	Participants comprised of 263 adult males and 271 adult females > 15 years of age, 232 boys, and 279 girls < 15 years of age.	Kiteng'ei village, Kambu in the Kibwezi, Makueni District, Kenya	Cross sectional study design	53.4% were infected by at least one parasite species and 41% had both protozoan infections and helminth infections. Most common protozoans in the community were <i>Entamoeba coli</i> (17%), <i>Entamoeba histolytica/Entamoeba dispar</i> (13%) and <i>Giardia lamblia</i> (4%). Protozoan infections peaked in age groups 5-14 years and 15-24	Results may not be generalizable to other areas as the study took place in one village	2c

Author(s) & Publication Year	Title	Journal	Purpose of Study	Number of Participants	Participant Characteristics	Study Setting	Study Design/Methods	Findings/Conclusions	Comments/Limitations
Van Hemelrijck, Lindeblade, Kubaje, Hamel, Odhiambo, Phillips-Howard, ... Feikin (2009)	Trends observed during a decade of paediatric sick visits to peripheral health facilities in rural western Kenya, 1997-2006	Tropical Medicine and International Health	Assess the use of longitudinal surveillance in peripheral health facilities in documenting trends in disease burden, healthcare practice, and utilization in children	64,394 sick child visits were made to 14 outpatient clinics	Children younger than 5 years of age who attended participating outpatient clinics and were residents of Asembo for greater than four months were included	Asembo in Bondo District, Nyanza Province, Kenya Six health facilities were included for the full 10 years and 8 were included for 1-4 years	Data on sick child visits were collected in the form of a structured questionnaire	Fever and cough were the most common symptoms, malaria and upper respiratory tract infections were the most common diagnoses. Younger children < 2 years of age accounted for a large number of sick child visits. Trends in sick child visits correlated with the changes in treatments and	Provides decade long data from a large number of participants

Author(s) & Publication Year	Title	Journal	Purpose of Study	Number of Participants	Participant Characteristics	Study Setting/Location	Study Design/Methods	Findings/Conclusion	Comments/Limitations	Level of Evidence
<b>Anie, Egunjobi, and Akinyanju (2010)</b>	Psychosocial impact of sickle cell disorder: Perspectives from a Nigerian Setting	Globalization and Health	Examine the psychosocial impact in adolescents and adults with sickle cell disease (SCD)	408 (adolescents and adults)	Patients with SCD attending sickle cell outpatient clinics in Lagos	Sickle cell outpatient clinics in Lagos, Nigeria: Lagos University Teaching Hospital, Gbagada General Hospital, Massey Street Children Hospital, and National Sickle Cell Centre	Cross sectional study utilizing a 28 item questionnaire called the "Psychosocial Impact of Sickle Cell Disorder"	Many noted that there are negative images of SCD attitudes and perceptions with 84% of adolescents reported feeling depressed. Most of the participants agreed that SCD needs more awareness.	Study took place in Nigeria, providing data from a variety of sub-Saharan African country	3b

Author(s) & Publication Year	Title	Journal	Purpose of Study	Number of Participants	Participant Characteristics	Study Setting	Study Design/Methods	Findings/Conclusions	Comments/Limitations	Level of Evidence
Chuma, Okungu, and Molyneux (2010)	Barriers to prompt and effective malaria treatment among the poorest population in Kenya	Malaria Journal	Investigate barriers to access to malaria treatment in the poorest populations in Kenya	708 households, 34 health workers in charge of health facilities, and 359 patients who requested care from participating health facilities	Focus group participants included men/women in their reproductive age with several focus groups included older people due to their role in decisions regarding treatment seeking.	Four districts in rural Kenya: Kwale district on the coast, Bondo district on the shores of Lake Victoria, Gucha district in Western Highlands, and Makueni district	Cross-sectional survey, focus group discussions, and interviews/exit interviews	More fevers reported among children < 5 years old (33.1%) with most fevers treated within first two days. Approximately 32% of fevers in children <5 years old were treated using drugs bought from shops with small number of fevers treated at health facilities. Affordability was the most common barrier to effective malaria treatment. Other	Some data was obtained from comments made by participants	, 4

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(Kwale)

barriers included

perceptions of  
young health  
care workers as  
inadequately  
trained, distrust  
in quality of  
care, facility  
hours, poor  
treatment  
adherence,  
location of  
facilities, and  
organization of  
health services

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<b>Author(s) &amp; Publication Year</b>	<b>Title</b>	<b>Journal</b>	<b>Purpose of Study</b>	<b>Number of Participants</b>	<b>Participant Characterist ics</b>	<b>Study Setting</b>	<b>Study Design/Methods</b>	<b>Findings/Concl usions</b>	<b>Comments/Li mitations</b>	<b>Level of Evidence</b>
<b>Feikin, Olack, Bigogo, Audi, Cosmas, Aura, ...Breiman (2011)</b>	The burden of common infectious disease syndromes at the clinic and	PLoS One	Characterize the burden of common infectious diseases in rural and urban Kenya	Surveillance population: Asembo 25,489 and Kiberia 33,881. 1,181,788 interviews of	Asembo Surveillance Population: 3,576 < 5 years of age Kiberia Surveillance	Health facilities present in Asembo in rural Western Kenya included three 1 <sup>st</sup> level Ministry of Health clinics	Longitudinal population based surveillance	20,830 visits were made to referral clinics in Asembo and 38, 857 were made in Kiberia.	Symptoms in households were verbally reported	2b

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household	household	Population:	within the	
level from	members	5,794 < 5	surveillance area	Acute respiratory
population-	completed in	years of age	and three more	infections were
based	Asembo and		several	common in both
surveillance	710,997 in		kilometers	clinic sites. Rates
in rural and	Kiberia		outside were	were highest in
urban Kenya			included.	young children
			Health facilities	with cough and
			in Kiberia in	difficulty
			urban Nairobi,	breathing. Rate
			Kenya included	of acute lower
			5 registered non-	respiratory tract
			Ministry of	infections
			Health clinics	leading to clinic
			within	visit lower in
			surveillance	Asembo in
			areas and eight	children < 5
			others within 1	years were
			km to 2 km.	higher in clinics
			Clinic	than in
			surveillance	households.
			included	Diarrhea leading
			Asembo- St.	to clinic visits
			Elizabeth Lwak	was lower in
			Mission Hospital	Asembo in
			Kiberia- Tabitha	children < 5

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Clinic  
years of age.

household  
surveillance  
included  
eligible health  
centers located  
within 5 km and  
1 km from  
designated  
referral clinics

Acute febrile  
illness was  
higher in  
Asembo in  
children < 5  
years of age.

Overall,  
mortality rates  
higher for all  
groups in  
Asembo  
especially at the  
extremes of age.

Author(s) & Publication Year	Title	Journal	Purpose of Study	Number of Participants	Participant Characteristics	Study Setting	Study Design/Methods	Findings/Conclusions	Comments/Limitations	Level of Evidence
Kariuki, Ikumi, Ojal, Sadarangani, Idro, Olotu, ...Newton (2011)	Acute seizures attributable to falciparum malaria in an endemic	Brain	Examine the incidence of seizure admissions over a seven year period and whether	4486 children admitted with seizures	Children aged 0-13 years admitted with a history of seizures	Kilifi District Hospital, Kilifi, Kenya	Clinical and laboratory data were collected, data collected from admissions database	7150 (21%) of children admitted during study period had asexual P. falciparum parasites	The study did not account for those with seizures who were not referred/admitted to the	2b

area on the Kenyan coast	there is a correlation between the reduction in acute seizures and hospital admissions for seizures and malaria in children	group (children admitted with heterogeneous non-infectious diagnoses)	reviewed	detected and 5580 (16%) children admitted had a seizure history.	hospital
				The reduction in malaria has reduced the number of seizures attributable to malaria.	

Author(s) & Publication Year	Title	Journal	Purpose of Study	Number of Participants	Participant Characteristics	Study Setting	Study Design/Methods	Findings/Conclusion	Comments/Limitations	Level of Evidence
Opwora, Laving, Nyabola, and Olenja (2011)	Who is to blame? Perspectives of caregivers on barriers to accessing healthcare for the under-fives in Butere	BMC Public Health	Determine the barriers to access to health care services in children less than five years of age	397 caregivers of children under five years old who attended Mother & Child Health clinics at the six public health facilities in the	97.7% of caregivers were biological mothers, 2.3% were male (8 fathers and 1 grandfather)	Butere District, Kenya	Descriptive cross sectional study	Understaffing and lack of drugs were the main reasons in seeking alternative health care providers such as traditional healers. 11.3%	Exit interview bias was complemented by focus group discussions	4

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District,	district	with 61.2%	of caregivers
Western		between ages	reported not
Kenya		20-29 and at	taking action
		least 13	when their child
		(3.3%) below	was sick and
		the age of 18	reasons reported
			were financial
			constraints, past
			experiences with
			poor services,
			and failure to
			understand the
			severity/extent of
			the illness

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<b>Author(s) &amp; Publication Year</b>	<b>Title</b>	<b>Journal</b>	<b>Purpose of Study</b>	<b>Number of Participants</b>	<b>Participant Characteristics</b>	<b>Study Setting</b>	<b>Study Design/Methods</b>	<b>Findings/Conclusions</b>	<b>Comments/Limitations</b>	<b>Level of Evidence</b>
<b>Ettarh and Kimani (2012)</b>	Determinants of under-five mortality in rural and urban Kenya	Rural and Remote Health	Determine the role of geography and maternal factors have on under-five mortality in	16,612 children born in the 5 years preceding the survey	Of the 16,612 participants, 13,149 were from rural Kenya and 3,013 were in urban Kenya	Sample from 400 primary sampling units across 8 provinces.	National cross-sectional demographic and health survey	Under-five mortality was more frequent in rural Kenya in mothers aged above 21 years and higher prevalence of	This was a nationally representative study of Kenya	2c

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rural and  
urban Kenya

under-five  
mortality was  
noted in rural  
areas in the  
Coast and  
Western and  
Nyanza  
provinces

Author(s) & Publication Year	Title	Journal	Purpose of Study	Number of Participants	Participant Characteristics	Study Setting	Study Design/Methods	Findings/Conclusion	Comments/Limitations	Level of Evidence
<b>Kahabuka, Moland, Kväle and Hinderaker (2012)</b>	Unfulfilled expectations to services offered at primary health care facilities: experiences of caretakers of underfive children in rural Tanzania	BMC Health Services Research	Determine the expectations and perceptions of health services provided at primary health facilities of caregivers of children under five	47 caregivers of children under 5 years old	11 participants were men	Muheza District of Tanga region in northeastern Tanzania	Focus group discussions utilized	Caregivers reported lack of quality health care at primary health facilities as well as unacceptable behavior from health care workers. Availability and accessibility of primary health facilities caused	The caregivers perceptions of primary health facilities in Tanzania are similar to those in Kenya	4

years of age

frustration in  
many  
participants

Author(s) & Publication Year	Title	Journal	Purpose of Study	Number of Participants	Participant Characteristics	Study Setting	Study Design/Methods	Findings/Conclusions	Comments/Limitations	Level of Evidence
<b>Kariuki, Abubakar, Holding, Mung'ala-Odera, Chengo, Kihara, ...Newton (2012)</b>	Behavioral problems in children with epilepsy in rural Kenya	Epilepsy Behavior	Compare the prevalence of behavioral problems among children with epilepsy with those of healthy children and investigate risk factors	110 children with epilepsy (73 inactive epilepsy and 35 active epilepsy)	Children born between June 1 <sup>st</sup> 1991 and December 31 <sup>st</sup> 1995 (Age 6-9) were included. The Mijikenda community formed much of the study population.	Kilifi District, rural coastal Kenya	Cross sectional study. The "Child Behavior Questionnaire for Parents" was utilized	Behavioral problems were found in 52 (49%) of children with epilepsy and 28 (29%) of children in control group. Behavioral scores were worse in children with active epilepsy and cognitive impairment was more common in active epilepsy.	There is a need for epilepsy treatment with behavioral therapy	3b

Author(s) & Publication Year	Title	Journal	Purpose of Study	Number of Participants	Participant Characteristics	Study Setting	Study Design/Methods	Findings/Conclusions	Comments/Limitations	Level of Evidence
<b>Katz, Lebo, Emukule, Njuguna, Aura, Cosmas, ... Breiman (2012)</b>	Epidemiology, seasonality, and burden of influenza and influenza-like illness in urban and rural Kenya, 2007-2010	Journal of Infectious Diseases	Determine the burden of influenza and lower respiratory tract disease in urban and rural Kenya	4140 cases of acute lower respiratory tract (LRT) illness were evaluated in Kibera with 1197 specimens collected. 6733 cases of acute LRT illness were evaluated in Mwak with 1641 specimens collected	Patients who attended the study clinic with acute LRT symptoms were asked to participate.	Gatwikira and Soweto villages in Kibera in Nairobi, Kenya and Lwak in rural Western Kenya	Nasopharyngeal and oropharyngeal swabs were obtained	In Kibera, 319 specimens were positive for influenza and in Lwak, 359 were positive for influenza. Rates of influenza associated acute LRT illness was highest in ages < 2 and lowest in ages $\geq 50$ .	Only those attending the study clinics were assessed for influenza resulting in a possible underestimation of influenza cases	2c
<b>Kinuthia, Gicheru, Ngunjiri, and Kabiru (2012)</b>	Lifestyles and practices that enhance malaria and typhoid fever in Njoro District,	Journal of Community Health	Determine the correlation between malaria and typhoid fever and local	336 households and two health centers	61% of respondents were women and 67.56% had a family size with 4-9 children. 79.8% were	Njoro District, Kenya	Cross sectional retrospective study	62% did not boil water, 61.1% did not always wash their hands after using the latrine, and only 31.6% used mosquito nets. The average	Reveals the importance of public health and health education and the wellbeing of a population	2c

Kenya	practices in rural Kenya	under low economic status	frequency of malaria and typhoid fever was 29 and 24% respectively.
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Author(s) & Publication Year	Title	Journal	Purpose of Study	Number of Participants	Participant Characteristics	Study Setting	Study Design/Methods	Findings/Conclusions	Comments/Limitations	Level of Evidence
<b>Mazigo, Bahemana, Konje, Dyegura, Mnyone, Kweka, ... Heukelbach (2012)</b>	Jigger flea infestation (tungiasis) in rural western Tanzania: high prevalence and severe morbidity.	Transactions of the Royal Society of Tropical Medicine and Hygiene	Assess the prevalence of tungiasis in rural Tanzania	586	Individuals were > 5 years of age and were permanent inhabitants of the study areas, 49.5% were female with median age of 14 years	Nyansha and Nyakitonto villages at the Kasulu district in the Kigoma region of rural Western Kenya	Cross sectional study	A total of 249 participants were infected by tungiasis. 39.9% of those aged 6-9 years had tungiasis, 34.8% aged 10-14 years were affected, and 27.3% aged 15-24 years were affected with the majority affected by tungiasis being $\geq$ 45 years	Single study in one community in Tanzania	3b

Author(s) & Publication Year	Title	Journal	Purpose of Study	Number of Participants	Participant Characteristics	Study Setting	Study Design/Methods	Findings/Conclusion	Comments/Limitations	Level of Evidence
O'Reilly, Jaron, Ochieng, Nyaguara, Tate, Parsons, ...Mintz. (2012)	Risk factors for death among children less than 5 years old hospitalized with diarrhea in rural Western Kenya 2005-2007: A cohort study	PLoS Medicine	Identify risk factors for mortality in children < 5 years hospitalized with diarrhea	1,146	Children < 5 years of age hospitalized with diarrhea at two district hospitals were included	Bondo and Siaya District Hospitals in Nyanza Province, Western Kenya	Hospital surveillance	107 children died (median age: 9 months) with non-typhoidal salmonella (22%) and shigella (11%) being the most commonly identified organisms. Children who died had longer durations of diarrhea.	Only accounted for those who died in hospitals and did not account for the mortality in children with diarrhea in the community	2b

Author(s) & Publication Year	Title	Journal	Purpose of Study	Number of Participants	Participant Characteristics	Study Setting	Study Design/Methods	Findings/Conclusions	Comments/Limitations	Level of Evidence
Puffer, Drabkin, Stashko, Broverman, Ogwang-Odhiambo, and Sikkema. (2012)	Orphan status, HIV risk behavior, and mental health among adolescents in rural Kenya	Journal of Pediatric Psychology	Assess the role of orphan status in psychosocial and HIV risk in adolescents in Kenya	325 randomly selected students in standards 5-8	Participants were between 10 and 18 years of age: 175 were non-orphans, 104 were single orphans, and 46 were double orphans	14 primary schools in Muhuru Bay in Nyanza Province, Western Kenya	Surveys and 90 minute interviews	Both single and double orphans reported emotional problems, psychosocial problems, and a lack of support with more double orphans reporting less support and more PTSD compared to single orphans. In addition, the longer the time elapsed from parent's death was associated with increased PTSD, higher rates of traumatic stress	The study provides information on psychosocial concerns of orphans	4

and more  
barriers to  
communications  
regarding sex  
and HIV.

Author(s) & Publication Year	Title	Journal	Purpose of Study	Number of Participants	Participant Characteristics	Study Setting	Study Design/Methods	Findings/Conclusions	Comments/Limitations	Level of Evidence
<b>Ben-Farhat, Gale, Szumilin, Balkan, Poulet, and Pujades-Rodríguez (2013)</b>	Paediatric HIV care in sun-Saharan Africa: Clinical presentation and 2-year outcomes stratified by age group	Tropical Medicine and International Health	Examine differences in patient mortality and program attrition by age groups in infants and children with HIV and enrolled in HIV treatment centers	6,261 children (<15 years old) who entered one of four HIV programs between April 8, 2011- December 22, 2010 and attended 2 or more visits	21.1% of children were under 2 years old, 30.1% were 2-4 years old, 42.8% were 5-14 years old	4 HIV programs supported by French section of Medecins sans Frontieres: one in Uganda, one in Malawi, and two in Kenya	Socio-demographic, clinic-immunological, and treatment information were recorded	2 -year mortality rates were higher in children < 2 years old and 2 - year attrition rates were higher among children < 2 years old. 557 patients died, 1142 were lost to follow up, 63.3% were started on ART, 36.7% was never started on ART, 5.9% of children < 2 years old had	More children with HIV are living longer requiring the need for better programs and support for adolescents with HIV.	4

a history of prophylaxis use for PMTCT and < 0.2% of children 2-14 years had history of PMTCT prophylaxis use.

Author(s) & Publication Year	Title	Journal	Purpose of Study	Number of Participants	Participant Characteristics	Study Setting	Study Design/Methods	Findings/Conclusions	Comments/Limitations	Level of Evidence
Ngugi, Bottomley, Scott, Mung'ala-Odera, Bauni, Sander, ...Newton (2013)	Incidence of convulsive epilepsy in a rural area in Kenya.	Epilepsia.	Determine the incidence of convulsive epilepsy in Kilifi District, rural Kenya	151,408 in cohort with 194 incident cases of convulsive epilepsy identified	55% of residents of Kilifi District had a monthly income of 10 USD and residents were mainly Mijikenda of the Bantu tribes, 80% depend on subsistence	Kilifi Health and Demographic Surveillance System which covers 891 km <sup>2</sup> in Kilifi District	2 cross sectional surveys	194 cases of convulsive epilepsy identified with median age of 19.5. Highest incidence of CE was in age range of 6-17 years old and lowest in age range of 28-48 with an increase noted in the ≥ 50 year range.	The study requires those to recall information regarding their epilepsy incidences	3b

Author(s) & Publication year	Title	Journal	Purpose of Study	Number of Participants	Participant Characteristics	Study Setting	Study Design/Methods	Findings/Conclusions	Comments/Limitations	Level of Evidence
Pettitt, Greifinger, Phelps, and Bowsky (2013)	Improving health services for adolescents living with HIV in sub-Saharan Africa: a multi-country assessment	African Journal of Reproductive Health	Determine the needs of adolescents living with HIV in SSA	34 interviews	Interviews were conducted with 26 managers/service providers and 8 peer educators between ages 18-25. 16 females, 18 males within 29 organizations	Program managers/service providers come from the following countries: Botswana (2), Uganda (8), Tanzania (1), Mozambique (2), Malawi (1), Zimbabwe (1), Kenya (2), Rwanda (1), South Africa (7), and Swaziland (1). Peer educators come from Uganda (4) and Botswana	Interviews were performed	Interviews reported that access to ART is still a challenge with adequate training on treatment and care of adolescents with HIV for community health workers lacking. There is a need for adolescent friendly centers, which can provide psychological and social support and	Interviews were performed with providers from 10 countries	4

Author(s) & Publication year	Title	Journal	Purpose of Study	Number of Participants	Participant Characteristics	Study Setting	Study Design/Methods	Findings/Conclusions	Comments/Limitations	Level of Evidence
<b>Breiman, Cosmas, Audi, Mwit, Njuguna, Bigogo, ...Feikin (2014)</b>	Use of population-based surveillance to determine the incidence of rotavirus gastroenteritis in an urban slum and a rural setting in Kenya	Pediatric Infectious Disease Journal	Determine disease burden of rotavirus gastroenteritis in children presenting to study clinics with diarrhea	48,337 patients enrolled in Kibera and 35,063 patients enrolled in Lwak	Patients of all ages with diarrhea were included	Population-based infectious disease surveillance (PBIDS) from 2 sites in Kenya: Lwak (within Rarieda District in Siaya County) in rural Nyanza province in Western Kenya and urban slum in Kibera, Nairobi	PBIDS system by trained community interviewers' visiting patients' homes every 2 weeks and weekly during influenza A H1N1 season and stool was collected from patients' homes within 4 hours of clinic appointment (if unable to produce at the clinic) from	In Kibera, rotavirus was detected in 7.8% of patients with diarrhea compared to 6% of control patients. In Lwak, rotavirus was detected in 11.4% compared to 1% of control group.	Study had a large sample size	2c

those who meet  
 criteria.  
 was associated  
 with detection  
 compared to  
 urban Kibera  
 residents. Rural  
 Lwak had a  
 greater  
 proportion of  
 rotavirus  
 gastroenteritis  
 associated with  
 dehydration,  
 especially in  
 children less  
 than 4 years of  
 age.

Author(s) & Publication Year	Title	Journal	Purpose of Study	Number of Participants	Participant Characteristics	Study Setting	Study Design/Methods	Findings/Conclusions	Comments/Limitations	Level of Evidence
Harper, Riplinger, Neubauer, Murphy, Velcoff, and Bangi	Ecological factors influencing HIV sexual risk and resilience	Health Education Research	Understand the ecological factors that influence HIV risk and	199 young people aged 14-24 years	55% females and 45 % males, mean age of female 18, mean age of males is 19	Rural communities located in Limuru and Kikuyu divisions of the Kiambu	9 semi structured focus groups using Bronfenbrenner's BST	Factors influencing risk and resilience included lack of knowledge of HIV	The study identified many factors that can be addressed in school clinics.	2a

<b>(2014)</b>	among young people in rural Kenya: implications for prevention	resilience in young people in Kenya and gauge their thoughts on what prevention programs are needed	West District of Kenya	transmission/prot ection, substance abuse, peer pressure, lack of parent-child communication, sexual violence, lack of role model, excessive free time, traditional and religious beliefs.
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<b>Author(s) &amp; Publication year</b>	<b>Title</b>	<b>Journal</b>	<b>Purpose of Study</b>	<b>Number of Participants</b>	<b>Participant Characterist ics</b>	<b>Study Setting</b>	<b>Study Design/Methods</b>	<b>Findings/Concl usions</b>	<b>Comments/Li mitations</b>	<b>Level of Evidence</b>
<b>Keino, Plasqui, Ettyang, and van den Borne  (2014)</b>	Determinant s of stunting and overweight among children and adolescents in sub- Saharan Africa	Food and Nutrition Bulletin	To determine the determinants of stunting and overweight in SSA	18 studies were included	Inclusion criteria: articles were published between 1990 and 2012 and contained relevant information on children	Sub-Saharan Africa	Systematic review	Stunting and overweight are significantly affected by demographic, socioeconomic and environmental factors. Malnutrition was	Nutrition should be addressed in schools in sub- Saharan Africa as malnutrition and overweight are both prevalent	2a

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aged 0-18  
from SSA

prevalent in both  
preschool  
children and  
adolescents with  
stunting and  
overweight being  
more prevalent  
in boys.

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Note: Level of Evidence assigned according to the Oxford Centre for Evidence-based Medicine-Levels of Evidence (March 009).

Data extracted from publicly available records on health care needs of school-aged children in SSA, Kenya, and Busia County, Kenya, were obtained from the KNBS and the Kenyan Ministry of Health (Kenyan MOH) and listed in Table 2. Interview questions focused on common primary health care needs of, and the health care resources available to, the NMS children, and health care seeking behaviors of parents/caretakers.

Table 2

*Publicly Available Data on Child Health in Kenya and Busia County, Kenya*

Data Source	Kenyan Ministry of Health (MOH)		Kenya National Bureau of Statistics (KNBS) (2013)	
Location (Busia County or overall Kenya)	Kenya	Busia County, Kenya	Kenya	Busia County, Kenya
Data Trend on Health Care of Children in Kenya:				
Top Causes of Outpatient Morbidity in Children < Age 5				Malaria (confirmed cases 115,275, clinical cases 78,642), diseases of the skin including wounds (25,057), diarrhea (24,968), pneumonia

Top Causes of  
Outpatient  
Morbidity in  
Person  $\geq$  Age  
5

(Note:  
diseases that  
normally  
affect adults  
were not  
included, such  
as  
hypertension)

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(12,247),  
eye  
infections  
(3,786), ear  
infections  
(3,183),  
intestinal  
worms  
(3,123),  
urinary tract  
infections  
(2,665),  
anemia  
(2,494),  
dysentery  
(1,090)

Malaria  
(confirmed  
cases  
63,090,  
clinical  
cases  
153,907),  
disease of  
the skin  
(57,789),  
typhoid  
fever  
(13,908),  
diarrhea  
(11,277),  
accidents  
(10,820),  
urinary tract  
infections  
(10,802),  
pneumonia  
(6,226), eye  
infections  
(5,696), ear

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				infections (4,352), bites from animals, snakes, etc. (2,996), dysentery (2,417), anemia (1,890), epilepsy (1,217)
Present Health Care Resources:				
Registered doctors per 100,000 population	7 (public institutions, 2012)	6 (public institutions, 2012)	21 (public and private institutions)	N/A
Registered nurses per 100,000 population	49 (public institutions, 2012)	67 (public institutions, 2012)	91 (public and private institutions)	N/A
Enrolled nurses per 100,000 population			64 (public and private institutions)	
Bsc nurses per 100,000 population			4 (public and private institutions)	
Registered pharmacists per 100,000 population			5 (public and private institutions)	
*Number of Healthcare	9,880	96		

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Facilities (2013)	ART therapy, inpatient services, family planning, HIV counseling and testing, immunization, blood transfusion center, eye clinics, maternity homes, radiology, laboratory facilities, dispensaries,	ART therapy, inpatient services, family planning, HIV counseling and testing, immunization, dispensaries	There is an overall shortage of medical personnel.	There is an overall shortage of medical personnel.  Number of new AIDS cases in Busia County is in children less than 5 years of age is 9 and 206 in people 5 years and older. Projected
Healthcare gaps	There is an overall shortage of hospital beds and specialty services. There is also an overall shortage of medical personnel.	Rural areas have a shortage of specialty services, laboratory facilities and radiology facilities. There is also a shortage of hospital beds and medical personnel	There is an overall shortage of medical personnel.	There is an overall shortage of medical personnel.  Number of new AIDS cases in Busia County is in children less than 5 years of age is 9 and 206 in people 5 years and older. Projected

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life expectancy from years 2015-2020 in males with HIV is 61.3 years and without HIV is 66.1 years. Projected life expectancy from years 2015-2020 in females with HIV is 66.6 years and 72.8 without HIV.

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*Note: \* BSc nurses denote nurses with a Bachelor of Science Degree in Nursing*

*\*\*Number of healthcare facilities includes clinics, dispensaries, blood transfusion centers, maternity homes, nursing homes, health projects, and specialty clinics. Specialty clinics include dental clinics, eye clinics/centers.*

### **Analytic Strategy**

The combination of elements of both data triangulation and method triangulation has been used to review and interpret the findings. The triangulation analytic plan follows steps laid out by UNAIDS Monitoring and Evaluation Division (UNAIDS, n.d.). (1) The literature review data were analyzed for trends, which (2) were compared with interview field notes for points of convergence (validity) and divergence (invalidity) for a final description of health care needs. (3) Health care resource data were analyzed for trends and compared with the validated description of health care needs to describe current access to and gaps in needed health care resources. (4)

This description was compared with field notes of personal interviews for points of convergence (validity) and divergence (invalidity).

The study was considered exempt by the Yale University Human Subjects Committee.

## **Results**

### **Common Illnesses Affecting Children**

The childhood mortality rate in SSA started to increase in the 1990s, with the under-five mortality increasing at a higher rate in Kenya compared to other SSA countries (Ettarh & Kimani, 2012; Ikamari, 2004; Houweling, Kunst, Moser, & Mackenbach, 2006), due to infectious and non-communicable diseases (NCDs). Malaria, diarrheal diseases, and pneumonia are the leading causes of child mortality in children under five years of age (WHO, 2014a) while HIV is one of the top five leading causes of death in adolescents (WHO, 2014b).

Parasitic (such as schistosomiasis, and African trypanosomiasis), bacterial (such as non-typhoidal salmonella and shigella), and helminth infections (such as hookworm, ascariasis, and trichuriasis) can result in malnutrition, a leading cause of morbidity in children (WHO, 2014a) and anemia, a leading cause of morbidity in children aged 10-14 years (WHO, 2014b).

Additionally, NCDs, such as sickle cell disease and epilepsy/seizures, have also affected child morbidity in SSA (Anie, Egunjobi, & Akinyanju, 2010; KNBS, 2014b; Ngugi et al., 2013).

Improved antiretroviral treatment (ART) allows children to live longer with HIV, which is now managed as a chronic illness. However, chronic HIV and malaria increase risk for sepsis, meningitis, diarrhea, seizures, and pneumonia (Little et al., 2007). The prevalence of other chronic diseases, including rhinitis, eczema, and asthma, is on the rise (Esamai, Ayaya, & Nyandiko, 2002). Anemia, due to diseases such as intestinal and parasitic infections and

malnutrition, from an inadequate food supply, also affect children's health (Bejon et al., 2008; Hall et al., 2001; Keino, Plasqui, Ettyang, & van den Borne, 2014). In addition, children living with sickle cell disease, HIV, and epilepsy can experience psychosocial sequelae, such as depression and post-traumatic stress disorder (PTSD) (Anie et al., 2010; Kariuki, Abubakar, et al., 2012; Puffer et al., 2012).

The top causes of morbidity in children less than 5 years of age in Busia County, Kenya, in 2013 include more known causes such as malaria, pneumonia, intestinal worms, dysentery, and diarrhea (KNBS, 2014b). Common, but lesser-known causes of morbidity in children younger than 5 years of age in Kenya include skin diseases, eye and ear infections, urinary tract infections, and anemia (KNBS 2014b). Other top causes of morbidity include burns and malnutrition (KNBS, 2014b).

The top causes of morbidity in people 5 years and older in Busia County, Kenya, in 2013, include malaria, skin disorders including wounds, typhoid fever, diarrhea, accidents, urinary tract infections, pneumonia, eye and ear infections, bites (from animals, snakes, etc.), dysentery, anemia, and epilepsy (KNBS, 2014b). Table 3 lists the top causes of morbidity in children in Kenya and Busia, County Kenya.

Community members interviewed identified malaria, skin conditions, diarrhea, pneumonia, and sickle cell disease as the most prevalent diseases children in the community face.

Table 3

*Causes of Morbidity in Children of Busia County, Kenya, 2013*

<b>Children Below Age 5 years:</b>	<b>Reporting Rates</b>
Confirmed Malaria	115,275
Clinical Malaria	78,642
Skin Diseases (including burns)	25,057
Diarrhea	24,968
Pneumonia	12,247
Eye Infections	3,786
Ear Infections	3,183
Intestinal Worms	3,123
Urinary Tract Infections	2,665
Anemia	2,949
Burns	1,122
Dysentery	1,090
Malnutrition	928
Individuals 5 Years and Older	

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Clinical Malaria	153,907
Confirmed Malaria	63,090
Skin Diseases (including wounds)	57,789
Typhoid Fever	13,908
Diarrhea	11,277
Accidents (including fractures and injuries)	10,820
Urinary Tract Infections	10,802
Pneumonia	6,226
Eye Infections	5,696
Ear Infections	4,352
Bites (including animals and snakes)	2,996
Dysentery	2,417
Anemia	1,890
Epilepsy	1,217

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*Note: Adapted from Kenya National Bureau of Statistics. (2014b).  
Statistical abstract 2014.*

## **Lack of Health Education**

Families' lack of knowledge regarding signs and symptoms of and treatment for diseases, such as diarrhea and dehydration (Othero, Orago, Groenewegan, Kaseje, & Otengah, 2008) has affected childhood mortality and morbidity, by delaying medical treatment or by caretakers misdiagnosing their children and using ineffective treatments. Education on sanitation, including hand washing and the continued use of unsafe surface water for drinking, and the lack of boiling water prior to use (Kinuthia, Gicheru, Ngure, & Kabiru, 2012; Obure et al., 2007), result in avoidable cases of typhoid fever and diarrheal diseases. Due to this, education on hygiene, such as hand washing is provided to communities by visiting community health workers (parent of child, personal communication, February 10, 2014).

## **Health Seeking Behaviors**

Distrust in medical providers, poor service, understaffing, lack of medications, distance, and affordability (Kahabuka, Moland, Kvåale, & Hinderaker, 2012; Opwora, Laving, Nyabola, & Olenja, 2011) have resulted in many rural Kenyans seeking alternative forms of treatment, such as traditional healers, which field notes confirmed. Several parents and caretakers in rural Kenya reported seeking traditional healers out of desperation due to lack of funds. Traditional healers will oftentimes accept alternative forms of payment, such as a hen or whatever the caretaker can afford (parent of child, personal communication, February 10, 2014). Other forms of treatment for an ill child include traveling to a free medical camp for treatment or to their local church for a prayer. As stated by one caretaker, "I pray and leave the child in the hands of God" (parent of child, personal communication, February 10, 2014).

## **Present Health Care Resources and Needs**

**Health care workforce shortage.** Kenya has a total of 159 nurses per 100,000 people and 21 physicians per 100,000 people in Kenya (KNBS, 2014a). In rural Busia County, Kenya, there are only six physicians and 67 nurses per 100,000 people working in public institutions in Busia County, compared to Kenya, as a whole, with 49 nurses per 100,000 population (Kenyan MOH, n.d.). As noted in the KNBS statistics for 2014, the numbers do not account for those not practicing in the country. Although there is an overall shortage of health care workers in Kenya, many of the trained health workers are located in urban areas.

**Health care facility and hospital bed shortage.** Kenya has a total of 9,880 health facilities including clinics, hospitals, dispensaries, blood transfusion centers, maternity homes, health training centers, nursing homes, health programs/projects, and specialty clinics. Specialty clinics include laboratory centers, radiology centers, dental clinics and eye clinics/centers (Kenyan MOH, 2014). In Busia County, Kenya, there are 1,132 hospital beds and 108 hospital cots, including those available in nursing homes. In Nambale, however, a smaller, more rural part of Busia County has eight health care facilities with only six hospital beds and one hospital cot (Kenyan MOH, 2014).

**Shortage of specialty services.** Kenya has a small number of specialty clinics such as eye clinics/centers (3/10) laboratory facilities (58), a blood bank (1), a regional blood transfusion center (1), radiology units (9), and dental clinics (30), but none are located in Busia County (Kenyan MOH, 2014). Clinic is the term used for privately owned health care facilities and center is used for government run facilities (E. Wakhusama, personal communication, December 29, 2014). As noted above, eye and ear infections are two of the top causes for morbidity in both

children less and older than 5 years of age, but only 13 health facilities specializing in ophthalmology exist and there is a lack of facilities specializing in the ear. Currently, eye clinics/centers are located in the counties of Meru, Nairobi, Trans Nzoia, Kirinyaga, Nyeri, and Vihiga.

Mental health care is also lacking. Children and adolescents affected by diseases such as sickle cell disease, epilepsy/seizures, and HIV can result in psychosocial disorders such as post-traumatic stress disorder, emotional/behavioral problems (Kariuki, Abubakar et al, 2012; Puffer et al, 2012), and depression (Anie et al., 2010). In Busia County, new cases of HIV infection in children less than 5 years of age is nine, and in people 5 years and older, 206 (KNBS, 2014b). The projected life expectancy in years 2015-2020 in males with HIV is estimated to be 61.3 years, and without HIV, 66.1 years. The projected life expectancy in the same timeframe for females with HIV is 66.6 years and 72.8 without HIV (KNBS, 2014b). Individuals with and without HIV are expected to have similar life expectancies and are living longer, revealing a need for HIV services that not only address the medical concerns, but also services that address the psychosocial needs.

Table 4 lists the barriers to health care reported by individuals in the local community. Access to health care is affected by lack of transportation, lack of staffing, inadequate care, and a lack of available medications and equipment/supplies. Managers of community health groups, clinics and hospitals shared stories of difficulties with sustainability due to these same concerns. One private faith-based clinic reported lack of funds to provide nursing salaries and another clinic in rural Kenya reported having an x-ray machine, but no one to run it. Community health workers from a non-governmental organization (NGO) reported community and government support for gender-based violence victim centers, but the lack of funds and staffing prevented

implementation of the plan. Such stories were heard from several people and reflect the shortages of health care resources reported in the literature.

Table 4

*Field Notes*

<b>Group</b>	<b>Common Illnesses Affecting Children</b>	<b>Barriers to Health Care</b>	<b>Current Health Care Seeking Behaviors</b>
Parents/Caretakers, teachers	Malaria, measles, AIDS, complications of HIV tuberculosis, asthma, typhoid, ulcers/wounds, arthritis, skin conditions (ring worm, fungal infections), worm infestation, fever, diarrhea, PNA, oral thrush, eye infections, SCD, malnutrition, overall poor health	Shortage of medical staff, overwhelmed medical staff, inadequate care given at health facilities, no transportation, referring hospitals often run out of medications, lack of funds for medical care and medications	Seek out free medical camps staffed by foreign clinicians, brings child to church for prayers, some only go to medical providers, brings child to the hospital is they become very ill, medicine men, dispensaries
Community Health Workers	Malaria, diarrhea, typhoid, jiggers, anemia, skin infections (scabies, ring worm), ear infections, pneumonia, cellulitis, HIV, tuberculosis, child abuse, lack of education on hygiene	Lack of access to specialty services, lack of lab services, inadequate staffing, lack of necessary equipment, no transportation during the night, cost of transportation (especially at night), lack of medications, lack of adequate	Emergency vehicles to medical facilities currently include motorbikes.

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		care in health centers	
Health Care Providers at Rural Health Clinics and Hospitals	Malaria, respiratory diseases, skin disorders, wounds, typhoid, convulsive disorders, complications in children with HIV infected mothers, vomiting	Lack of staffing, lack of equipment, lack of beds available at facility, lack of medications, lack of payment from patients, lack of transportation (no functioning ambulance at some clinics), clinics lack the funds for necessary medications and supplies and salaries	
Church Leaders	Malaria, typhoid, lack of treatment resulting in complications	Lack of sanitation, lack of emergency transportation, poverty, limited medical services at the local health centers	Prayers, over the counter pain medication

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## Discussion

In this paper, we sought to describe the health care needs and resources available to meet those needs of school-aged children in rural Kenya by systematically reviewing the literature on health care needs of schoolchildren in rural Kenya, comparing those needs with available health care resources, and triangulating the findings with field notes of interviews with key stakeholders of the NMS, in a rural area of western Kenya, in order to recommend a model of care that will close identified gaps.

The literature search revealed that the health of children in rural SSA are affected by both communicable diseases, such as HIV, parasitic, bacterial, and helminth infections, and non-communicable diseases, such as sickle cell disease, epilepsy/seizures, and psychosocial disorders. These findings were corroborated with community members of Nambale, Kenya, many of whom report lack of access to health care and health education as some of the health care gaps affecting their children.

Such effects on childhood mortality and morbidity are not specific to Kenya, but seen in other under-resourced areas in SSA. Anemia, including sickle cell disease, is of great concern in Kenya, as well as Ghana, Malawi, Mozambique, Nigeria and Tanzania (Anie et al, 2010; Hall et al, 2001). Psychosocial impacts of communicable diseases on children and adolescents is universally seen throughout under-resourced areas in SSA, including Botswana, Uganda, and Rwanda, due to a lack of needs specific to children living with HIV and AIDS (Pettitt, Greifinger, Phelps, & Bowsky, 2013). Similarly, the rate of under-five child mortality appears to be concentrated in areas with a higher number of less educated individuals in not only rural areas in Kenya, but also in Burkina Faso and Cote D'Ivoire, emphasizing the importance of health care education (Houweling et al., 2006).

Data from the KNBS and the Kenyan MOH reveal that health care gaps include workforce shortage, health care facility shortage, a shortage of hospital beds, and a lack of specialty services throughout Kenya, but more so in rural areas. This has resulted in the inability for affected areas, such as Nambale, to provide adequate care to its children, as well as provide appropriate education to its community on disease prevention.

Only five out of the 49 priority countries in SSA have a health care workforce density greater than the critical threshold of 2.3 health care workers per 1000 people (WHO, 2010). The WHO lists Kenya as one of the 49 priority countries under the critical threshold of health care workforce density, along with Tanzania, Uganda, Ethiopia, and Somalia (WHO, 2010). Currently, Kenya has a physician workforce density of 0.181 per 1000 people compared to 2.45 in the United States and a nurse/midwife workforce density of 0.792 compared to 9.915 in the United States (WHO, 2013). Due to shortage of physicians in comparison to nurses, nurses play a vital role in health care delivery.

### **Nurse-Run School-Based Clinics**

Nurse-run school-based health clinics in rural Kenya have the potential to increase access to quality health care for school-aged children. Nurse-run clinics are used throughout SSA and have been effective in increasing access to health care for rural communities. In rural Kenya, child and wellness nurse-run clinics were found to be successful in treating malaria and increasing disease awareness in the community (Chiguzo, Mugo, Wacira, Mwenda, & Njuguna, 2008). In addition, in Malawi, nurses were found to be just as effective in the management of pediatric patients on antiretroviral medications compared to clinical officers (Weigel et al., 2012).

There is lack of literature on school-based health clinics in under-resourced countries, especially in the rural setting. However, de-worming programs have benefitted from using schools to access children in under-resourced countries, including Kenya, India, and Uganda (Evidence Action, n.d.). School-based clinics have been used in the United States to increase health care access among vulnerable children from low-income families for over 30 years and have been increasingly used in rural areas. For example, 62% of school-based clinics in Arkansas, 83% of those in New Mexico, and 81% in West Virginia are in rural areas (School-Based Health Alliance, n.d.). In addition, a nurse-led school-based clinic in New Zealand reported positive feedback from the community regarding the treatment of skin infections and strep throat in schoolchildren (Gray, Lennon, Anderson, Stewart, & Farrell, 2013). Such programs reveal the potential for nurse-run school-based health clinics to close the gaps in health care for school-aged children in rural SSA.

### **Implications for Practice**

The strong link between education and health provides justification for quality health care for children in the location in which they are educated. As child mortality decreases and with an increase in support for education, more children are enrolling in school, making schools a suitable choice for improving children's health (UNESCO, UNICEF, WHO, World Bank and Education International Inter-agency flagship programme in EFA, 2002). A nurse-run school-based clinic at the NMS will provide the opportunity for schoolchildren to continue their education without fear of morbidity and mortality from treatable illnesses.

## **Limitations**

Interviews were conducted in one community, Nambale, and so they may not be generalizable to other parts of rural SSA. However, field notes from these interviews validated findings in the systematic literature review of studies from other parts of SSA. There are limited articles on the evidence of nurse-run- clinics in the treatment of children and school-based clinics in resource-constrained areas. In addition, it must be noted that several nurse-led clinics reported in the literature were organized with the financial assistance of large non-profit organizations, which may bias the success of these clinics.

## **Conclusion**

Child morbidity and mortality in rural Kenya can be reduced with access to health care and health education. A nurse-run school-based clinic is a model of care that can address the health care gaps faced by school-aged children in rural Kenya and may be a model for other resource-constrained areas of SSA. Implementation studies are needed to determine the feasibility and sustainability of nurse-run school-based clinics in under-resourced rural areas of SSA.

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## Curriculum Vitae

### EDUCATION

Yale University, New Haven, CT Doctor of Nursing Practice	Expected May 2015
New York University, New York, NY Master of Science in Nursing Acute Care Nurse Practitioner Program	May 2009
New York University, New York, NY Bachelor of Science in Nursing, Cum Laude Registered Nurse: New York Greenidge International Scholarship 2004 International Education Experience: Makerere University, Kampala Uganda HIV/AIDS Pandemic: Strategies for the Promotion of Wellness	January 2005
Binghamton University, Binghamton, NY Bachelor of Science in Biology	May 2003

### PROFESSIONAL EXPERIENCE

Nurse Practitioner, ADS-Tele Cardiology Service, Mount Sinai Hospital, New York, NY April 2010- Present  
Manage care for acutely ill cardiac patients with ACS, CHF, pulmonary hypertension, valvular disease, and arrhythmias.  
Involved in the pre-operative stages of care for patients requiring an LVAD and heart transplant.  
Involved in discharge planning for chronic cardiac patients and patients status post cardiac catheterization, BAV, TAVI, and ablation/DCCV.  
Formulate plan of care for cardiac patients admitted to the emergency room, direct admissions, and outside hospital transfers.  
Act as liaison between attending physicians, consultants, and patients.  
Act as resource to nurse practitioner students and nurses.  
Write grants in support of annual Mount Sinai Nurse Practitioner Symposium.  
Ambassador to visiting nurses in part of the Nursing Leadership Study Tour for Nurses from Hong Kong.

Clinical Nurse, Mount Sinai Hospital, New York, NY November 2007- April 2010  
Provided direct care to critically ill patients admitted to the cardiothoracic ICU.  
Managed the care of patients post open heart and thoracic surgeries including heart transplants, valve replacements/repairs, coronary artery bypass, and lung transplants.  
Provided direct care to patients with ventricular assistive devices and open chests.  
Managed the hemodynamic stability of patients.  
Interpreted blood gases.  
Management of fluid status utilizing CRRT and CHF solutions.  
Assisted in bedside surgical procedures including re-opening of chests, tracheotomies, and PEG placements.

Clinical Nurse, Mount Sinai Hospital, New York, NY March 2005- November 2007  
Provided direct care to patients on 35 bed CCU step-down unit.  
Managed patients with wide variety of cardiac illnesses such as heart failure, pulmonary hypertension, coronary artery disease, pre and post cardiac catheterization and pre and post pacemaker/AICD insertion.  
Managed the unit's staffing, admissions, and overall operation as charge nurse.  
Monitored cardiac patients on intravenous medications such as flolan, dobutamine, milrinone, natreacor, and dopamine.

#### RELATED EXPERIENCE

Board Member, Sigma Theta Tau, Upsilon Chapter	October 2014-Present
Member of Programming Committee, American Heart Association Cardiovascular and Stroke Nursing Symposium	January 2013- Present
Co-Chair of Steering Committee, Mount Sinai Hospital, New York, NY Center for Nursing Research and Education- APN Division	January 2013- 2014
Co-editor, Mount Sinai Hospital Newsletter for Nurse Practitioners	January 2012-Present
Research on Nurse Practitioner Satisfaction, Mount Sinai Hospital, New York, NY Co-investigator	January 2012- Present
Adjunct Faculty, New York University, New York, NY Lab instructor for graduate level nursing course titled Common Health Problems	January 2012-Present
<b>Member of Programming Committee</b> , Harlem Healthy Heart, a community outreach program in Central Harlem, NY	March 2013-Present
Clinical Preceptor, New York University, New York, NY Preceptor for adult-geri acute care nurse practitioner students on cardiology unit	June 2011-November 2011
Independent Research in Immunology, Binghamton University, Binghamton, NY Assisted in research on the affects of various antigens on colon cancer cells. Independent research project on the affects of various antigens on fibrinogen. Presented correlating evidence to the directors and members of the research team.	September - December 2002

#### PUBLICATIONS

Takahashi M, Gohil S, Tong B, Lento P, Filsoufi F, Reddy, R. (2012). Early and mid-term results of off pump endarterectomy of the left anterior descending artery. *Interactive Cardiovascular and Thoracic Surgery*, 16 (3), 301-305. doi:10.1093/icvts/ivs482.

Tong, B. (2013). Case commentary. whose bed? commentary. *The Hastings Center Report* 2013  
March-April 2013.

Tong, Bonnie. The Center for Nursing Research and Education: Implementation of the APRN division. (2013, November). *NP Newsletter for Nurse Practitioners at The Mount Sinai Hospital*, 2(3).

#### PROFESSIONAL/ ORGANIZATION MEMBERSHIPS

Member of the American Heart Association Council of Cardiovascular and Stroke Nursing Program Committee  
Member of the American Nurses Association  
Member of the Nurse Practitioner Professional Practice Committee at Mount Sinai Hospital  
Sigma Theta Tau International Honor Society

#### CERTIFICATIONS

ACLS certified  
BCLS certified  
American Nurses Credentialing Center Certified (ACNP-BC)

