INTEGRATED COMMUNITY CASE MANAGEMENT OF CHILDHOOD ILLNESSES IN THE CONTEXT OF FREE PRIMARY HEALTH CARE IN RURAL SIERRA LEONE

EFFECTS ON CARE SEEKING, TREATMENT AND EQUITY

by

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A dissertation submitted to Johns Hopkins University in conformity with the requirements for the degree of Doctor of Philosophy

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Abstract

Problem statement: Integrated community case management (ICCM) of childhood illnesses by community health workers (CHWs) is an endorsed strategy to reduce child mortality in developing countries. The evidence on the effectiveness of ICCM programs in Sub-Saharan Africa is growing; however, evidence on ICCM in the context of free health care is limited.

Methods: The study examined: (1) CHW influences on pre-post changes in care seeking and treatment, analyzed using a difference-in-differences (DID) analysis; (2) factors associated with CHW utilization, analyzed using weighted logistic regression; and (3) ICCM effect on equitable coverage of care seeking and treatment by ethnicity and socioeconomic status, analyzed using comparative and DID analysis. Study districts were purposively selected; 2 intervention districts had ICCM by CHWs plus free facility care and 2 comparison districts with free facility care only. A household cluster survey was conducted among caregivers of 5,643 and 5,259 children U5 at baseline (2010) and endline (2012), respectively.

Results: ICCM was associated with increased odds in appropriate treatment for pneumonia (OR=2.00, 95%CI: 1.20-3.35) and decreased odds in traditional treatment for diarrhea (OR=0.44, 95%CI: 0.21-0.95) and facility treatments for malaria (OR=0.21, 95%CI: 0.07-0.62). Though no effect on inequalities by wealth, ICCM was associated with increased odds in care seeking (OR=2.98, 95%CI: 1.60-5.54) and appropriate treatment (OR=2.15, 95%CI: 1.12-4.41) and decreased odds in traditional treatments (OR=0.34, 95%CI: 0.14-0.87) among children from ethnic groups other than Mende. ICCM was also associated with increased odds in care seeking (OR=2.17, 95%CI: 1.03-

4.57) and appropriate treatment (OR=2.55, 95%CI: 1.24-5.27) among children whose caregivers reported some education and decreased odds in traditional treatment (OR=0.48, 95%CI: 0.23-0.99) among children whose caregivers reported no education.

Conclusions: ICCM by CHWs was associated with some increases in appropriate treatment, reduced treatment burden at the facility level, and reduced reliance on traditional treatments. Children from disadvantaged groups also appeared to benefit most from ICCM. The availability of trained and supervised CHWs can be an asset to provision of free healthcare in Sierra Leone.

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List of Abbreviations

ACT	Artesunate-amodiaquine Combined Therapy
CCM	Community Case Management
CHV	Community Health Volunteer
CHW	Community Health Worker
CIDA	Canadian International Development Agency
CSO	Civil Service Organization
DHS	Demographic and Health Survey
DHMT	District Health Management Team
DID	Difference-in-Differences
FHCI	Free Health Care Initiative
GPS	Global positioning system
HPQ	Health for the Poorest Quintile
ICCM	Integrated community case management
IMCI	Integrated Management of Childhood Illnesses
IRC	International Rescue Committee
MDG	Millennium Development Goal
MOHS	Ministry of Health and Sanitation
NGO	Nongovernmental organization
ORS	Oral rehydration solution
PDA	Peripheral Digital Assistant
PHU	Peripheral Health Unit
QOC	Quality of Care
TBA	Traditional Birth Attendant
U5	Children less than 5 years of age
U5MR	Under-five mortality rate
UNICEF	United Nations Children's Fund

Definition of Terms

The primary study outcomes of interest include: two-week period prevalence of diarrhea symptoms, presumed malaria and/or presumed pneumonia; overall care seeking and care seeking from an appropriate provider; prompt care seeking, appropriate treatment by symptom, and use of traditional treatment by symptom.

- ***ICCM conditions***: having diarrhea, presumed malaria and/or presumed pneumonia in the two weeks prior to the survey.
- ***Presumed malaria***: having fever, which is the norm for a malaria-endemic country such as Sierra Leone.
- ***Presumed pneumonia***: having a cough with difficulty breathing due to a problem in the chest, regardless of fever.
- ***Overall care seeking***: proportion of children ill in the past 2 weeks for whom care was sought (regardless of provider)
- ***Prompt care seeking***: proportion of children ill in the past 2 weeks for whom care was sought within 24 hours of symptom onset
- ***Care seeking from an appropriate provider***: proportion of children ill in the past 2 weeks for whom care was sought from healthcare professional (i.e. doctor or nurse) or a trained CHW
- ***Appropriate treatment***: proportion of ill children who received appropriate treatment for their symptom (anti-malarials including ACT for malaria, antibiotics including cotrimoxazole for pneumonia, and ORS and zinc for diarrhea) per Ministry of Health and Sanitation (MOHS) of Sierra Leone, UNICEF and WHO guidelines.

- ***Traditional treatment:*** having treatment besides syrups and pills provided by allopathic healthcare workers [1].
- ***CHW utilization:*** proportion of treatments provided by CHWs

Chapter 1: Introduction

The past few decades have seen large decreases in child mortality in most low and middle-income countries. However, the level of under-five mortality has remained very high despite large investments in health system reforms and several child survival programs. Children continue to die needlessly because many are never seen at a health facility due to unavailability of services, because their families lack access to services or choose not to seek care or because families and other caregivers do not recognize the warning signs of life-threatening illness. According to a recent report from the UN Inter-agency Group for Child Mortality Estimation, an estimated 6.6 million (confidence level: 6.3-7.0) children die each year before reaching five years of age from preventable or treatable conditions [2].Pneumonia, diarrhea and malaria are major causes of mortality in children under five years of age (U5) in Sub-Saharan Africa.

Approximately 30 interventions could eliminate more than 60% of child deaths each year if delivered to families and children in need and reach universal coverage [3, 4]. The correct treatment of pneumonia, diarrhea, and malaria is one of the most effective interventions in reducing U5 mortality[5]. Efforts that have been put in place to reduce childhood mortality include increases in immunization coverage and widespread acceptance and use of oral rehydration therapy in treating diarrheal diseases According to Sazawal S and Black RE, 2003[6], interventions to improve child survival in developing countries should be built around management of pneumonia and other life-threatening diseases, in addition to immunizations and other effective preventive approaches. Community case management of pneumonia, malaria, and diarrhea has been shown to be

an effective approach in reducing child deaths and a feasible effective strategy to complement facility-based management for areas that lack access to health facilities [7].

Access to adequate health care has been shown to be associated with child mortality with improved access having a potential for significant reductions in under-five morbidity and mortality in developing countries [8]. Facility-based services alone do not provide adequate access to treatment for childhood illnesses, thus the need to increase coverage at the community level [9]. Strategies to improve access to effective treatment for children include training health workers at remote health posts or community health workers to recognize and treat the common childhood illnesses such as pneumonia, diarrhea and malaria [10]. A large proportion of child deaths can be prevented through appropriate and low-cost treatment of sick children in the home or community with antibiotics, anti-malarials or oral rehydration therapy [7, 11, 12]. The WHO and UNICEF recently released a joint statement supporting the integrated community case management (ICCM) strategy to train, supply and supervise front-line workers to treat children for diarrhea, pneumonia and malaria using ORS and zinc, oral antibiotics and arteminsin-based combination therapy (ACT) respectively [9].

The evidence on the effectiveness of ICCM programs in Sub-Saharan Africa is growing; however, evidence on CHWs' effect on health care seeking patterns and CHW utilization in the context of free health care is limited. With the challenges currently being faced by Sierra Leone's health system (limited facilities, acute shortage in healthcare personnel, long distances to health facilities in rural areas), the availability of trained and supervised community health workers (CHWs) who can provide free services available at all hours in the community could be an addition to improve provision of free

healthcare in Sierra Leone. The results of this thesis research aim to provide evidence of the utility of iCCM by CHWs in the context of free healthcare for children in Sierra Leone.

Research Objective

The overall goal of the study was to investigate the utility of ICCM by CHWs in the context of free health care in Sierra Leone.

Specific Aims

(1) Determine whether the availability of care through ICCM provided by CHWs influenced care seeking behavior and acquisition of appropriate treatment for childhood illnesses in two districts with ICCM compared two districts with no ICCM, after two years of intervention.

(2) Examine the extent to which CHWs are utilized and factors significantly associated with CHW use in the intervention districts at endline.

(3) Evaluate the effect of ICCM on equitable coverage of appropriate care seeking and treatment for childhood illnesses after two years of the ICCM intervention, in two districts with ICCM compared two districts with no ICCM, two years post intervention.

Summary of Research Findings

With an overall utilization rate of 14%, CHW use was significantly associated with children with diarrhea symptoms, from female-headed and poorest households, and whose caregivers reported poor quality of care at health facilities as a barrier to accessing care. Deployment of CHWs to provide ICCM was associated with some increases in

appropriate treatment, reduced treatment burden at the facility level, and reduced reliance on traditional treatments, but no overall increase in coverage within the context of expanding free care. ICCM also appeared to have some equity effect by most benefitting children from disadvantaged backgrounds and decreasing/diminishing inequalities in care seeking and treatment by ethnicity and caregiver educational status.

Paper 1: The study demonstrates that availability of CHWs can influence care seeking and treatment for children U5 ill with diarrhea, malaria, and/or pneumonia. They successfully provided appropriate treatment and reduced treatment burden at health facilities and caregiver reliance on traditional treatments. Despite the FHCI presence in all districts, CHWs still accounted for a significant proportion of treatments delivered in intervention districts, showing acceptability of CHW as providers and part of the formal health sector.

Paper 2: Though utilization was low (14%), CHW use was greater in children from disadvantaged backgrounds (poorest and female-headed) and whose caregivers reported poor quality of care as a barrier to accessing health facilities. However, a more in-depth investigation is needed to better understand caregiver's access, acceptability and utilization of CHW services as well CHWs' experiences providing care in the community.

Paper 3: The ICCM intervention effect on equity in care seeking and treatment for children U5 was mixed. With significant increases in appropriate care seeking and treatment, children from ethnic groups other than Mende and whose caregivers reported some education appeared to benefit the most from the intervention. The intervention was also associated with decreased reliance in traditional treatments for children from

disadvantaged backgrounds (poorest households and whose caregivers reported no education).

The ICCM intervention increased availability of appropriate care in the community and replaced traditional healers with CHWs. Deployment of CHWs was associated with some increase in appropriate treatment, reduced treatment burden at the facility level, and reduced reliance on traditional treatments, but no overall increase in coverage within the context of expanding free care. With the challenges currently faced by Sierra Leone's health system (limited facilities, acute shortage in healthcare personnel, long distances to health facilities in rural areas), availability of trained and supervised CHWs can be an addition to improve provision of free healthcare in the country.

Significance of the research

The results of this thesis research aimed to provide evidence of the utility of ICCM by CHWs in the context of free healthcare for children in Sierra Leone. Previous CHW programs were rarely comprehensive or at scale; now with realization of health system limitations but pressure on countries to achieve universal coverage goals, interest in CHWs has been renewed. In the past decade, several developing countries have invested in CHWs programs as a major part of strategies to reach Millennium Development Goals to reduce child mortality. ICCM is a widely endorsed strategy to save lives in settings with high child mortality with an increasing number of countries adopting CCM policies, programs and plans [9, 13, 14]. Though the evidence on ICCM programs is growing, research gaps remain. Evidence on care seeking for childhood illnesses in Sub-Saharan Africa is limited is limited to health facility surveys or demographic and health surveys in urban areas. There is a paucity of information about

CHW utilization with limited evidence on acceptability and utilization of CHWs. Most of the research on health program impact on equity has been on integrated management of childhood illnesses (IMCI), a facility-based intervention, with little research on equity effects of community-based ICCM [15-17]. Finally, there is limited published evidence about deployment of community health workers in the context of free health care at health facilities; studies either evaluate CCM or free health care, but not both.

The dissertation addressed some of the gaps in the literature and contributes towards developing the evidence base on ICCM programs in sub-Saharan Africa. Specifically, the results of this study provide evidence to the Sierra Leone government and other resource-poor countries currently contemplating developing and/or expanding CHW programs, particularly those that have abolished user fees at government health facilities.

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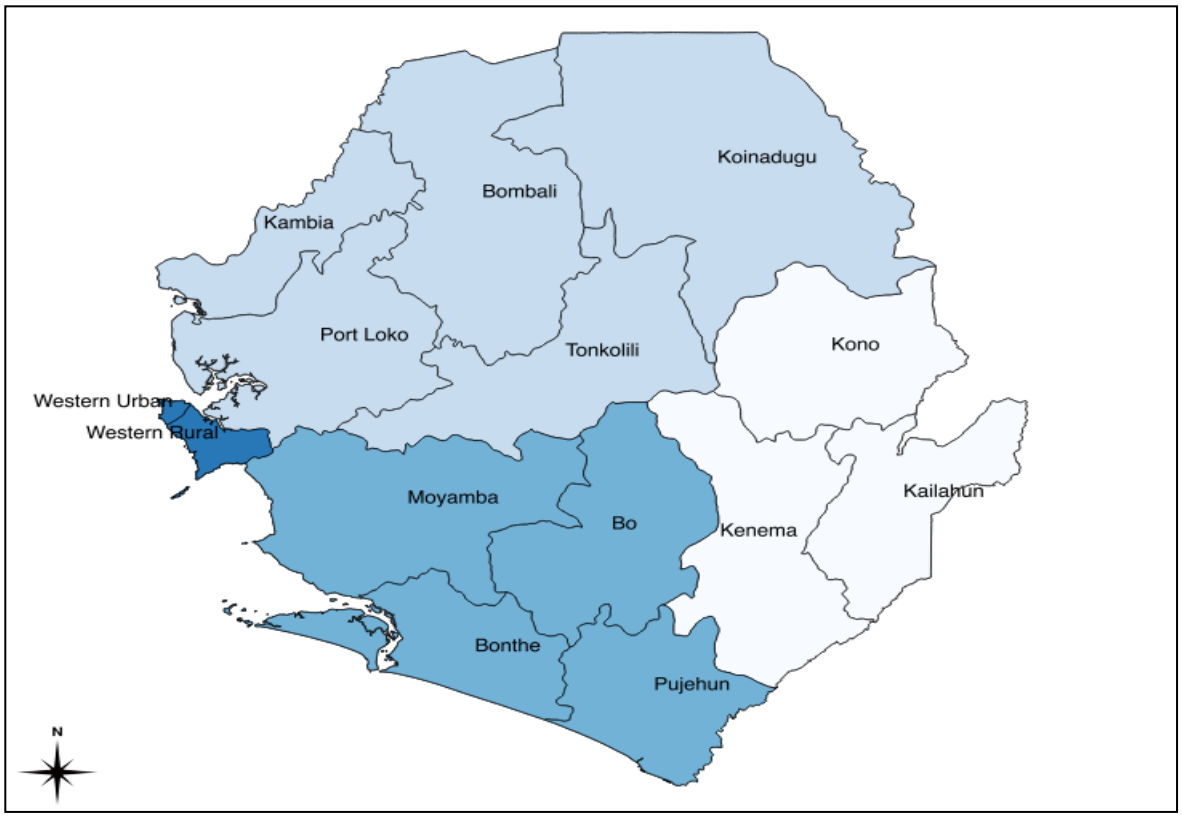
Chapter 2: Background

Country Background

Sierra Leone is administratively divided into three provinces (Northern, Southern, and Eastern) and the Western area, which includes the capital Freetown and its surrounding areas. Each province is subdivided into districts and each district into chiefdoms, with a total 14 districts and 149 chiefdoms. The Northern province has 5 districts with a population of 1.7 million, the Southern province has 4 districts with a population of 1.4 million, the Eastern province has a population of 1.2 million with 3 districts, and the Western Area has a population of 1.5 million with two districts (Western Urban and Western Rural) Statistics Sierra Leone [18].

Figure 1 Administrative Map of Sierra Leone



Reference: QGIS, 2014

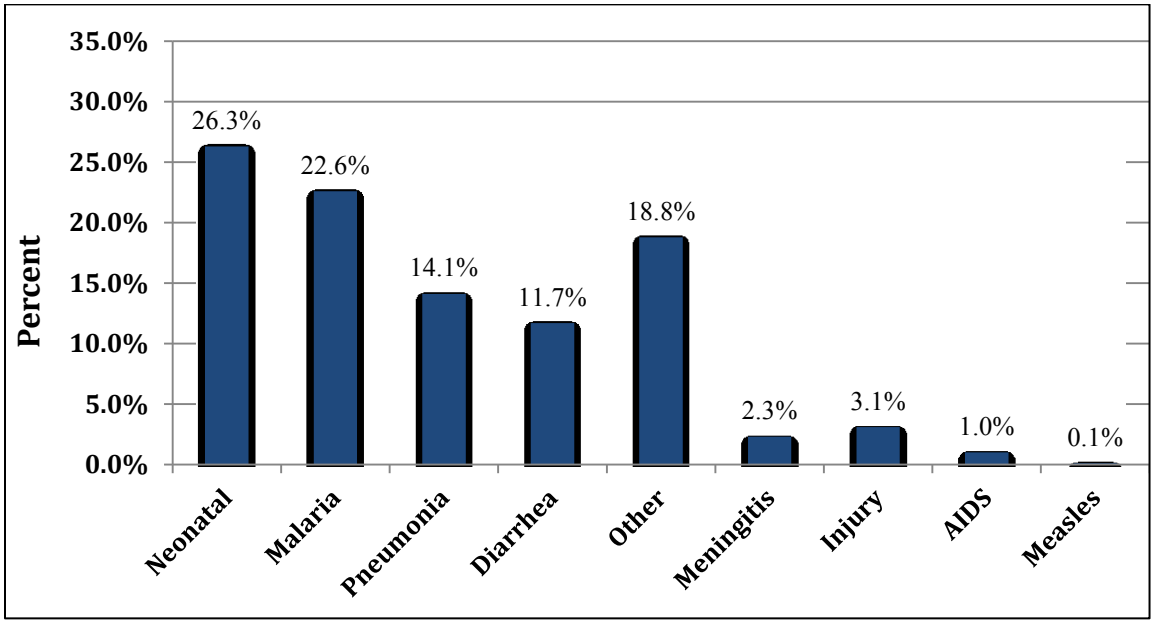
With an estimated population of 6 million, Sierra Leone has one of the world's lowest human development indices (180/187) [19]. The country has some of the poorest health indicators in the world, with a life expectancy of 47 years. Only 49% of the population has access to improved drinking water and 13% to adequate sanitation [20]. Access to health care is a major problem in Sierra Leone. Sierra Leone's health system can be characterized by a lack of appropriately qualified health workers, insufficient supplies of drugs and equipment, poor coordination and management, and previously heavy fees for services [21]. The 10-year civil war in the 1990s virtually destroyed the health infrastructure. The country has less than 10% of the health workers it needs to meet the UN's minimum threshold with an average of less than 5 health workers per 100,000 population [22]. According to 2004 statistics, there were 168 physicians, 1,841 nurses, 5 dentists, 340 pharmacists, 1,227 community health workers providing healthcare services to the whole Sierra Leonean population [23]. Other country-specific factors that have affected access to healthcare include inadequate number of healthcare facilities; long travel times to health centers given poor road conditions; poorly trained and motivated staff; and lack of equipment and supplies in health facilities [24, 25]. Low levels of confidence in the quality of health care also negatively affected demand [25].

Childhood Disease Burden

Sierra Leone has one of the world's poorest child survival indicators. According to the 2008 Demographic and Health Survey (DHS), Sierra Leone's under-five mortality rate (U5MR) is one of the highest in the world with 140 deaths per 1,000 live births. Fourteen percent (14%) of Sierra Leonean babies are born with low weight [20]. Exclusive breastfeeding of infants is very poor with only 11% of mothers exclusively

breastfeeding their children less than 6 months of age [20]. Childhood immunization coverage rates are not optimal with only 40% of children 12-23 months of age fully vaccinated with BCG, measles, 3 doses of DPT and polio [26].

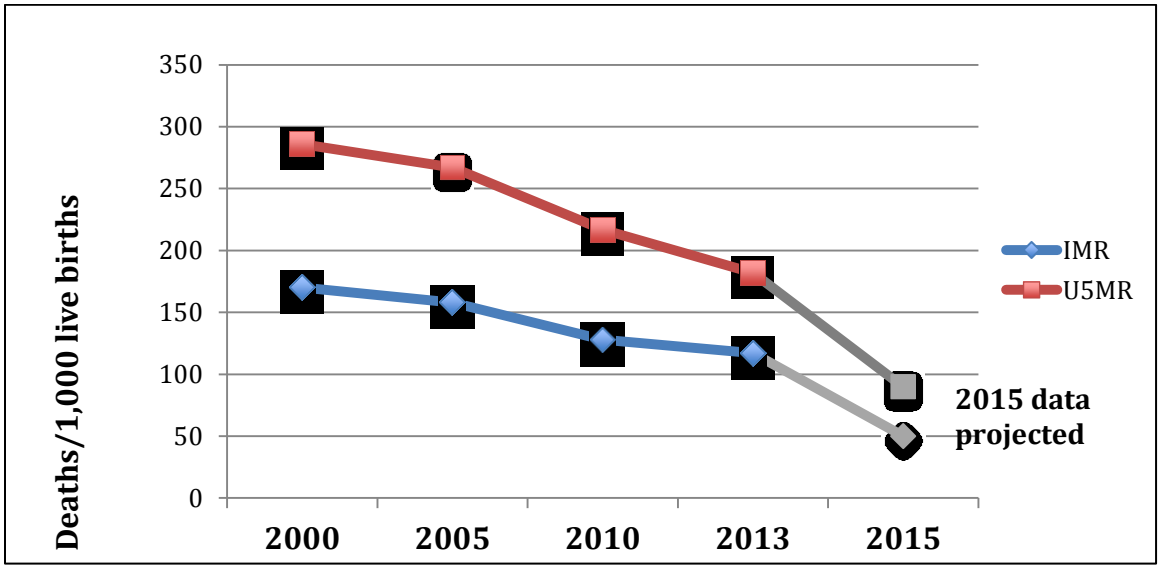
Figure 2 Causes of U5 Deaths in Sierra Leone, 2010



Source: CHERG website, Countdown to 2015, www.cherg.org

The problem of high infant mortality rates in Sierra Leone can be explained by the overwhelming high burden of infectious diseases, under-nutrition, as well as the country's weak healthcare system. Approximately half of under-five deaths in Sierra Leone are due to pneumonia, diarrhea, and malaria (figure 1). Malaria is highly endemic in the country and the main cause of morbidity and mortality especially in children less than 5 years of age [27]. Malaria accounts for 50 - 60% of all hospital admissions and has a case fatality rate of 16-33% [28]. Poor quality of care during labor, delivery and immediate postnatal period contribute to neonatal deaths, which account for 23% of all U5 deaths in Sierra Leone [26].

Figure 3 Trends in U5 and Infant Mortality, Sierra Leone 2000-2015



Source: Data from Sierra Leone Multiple Indicator Surveys (2000, 2005, 2010); UN Interagency Group for Child Mortality Estimation (2013 data); projected data (2015) from Sierra Leone Millennium Development Goals Progress Report, 2010

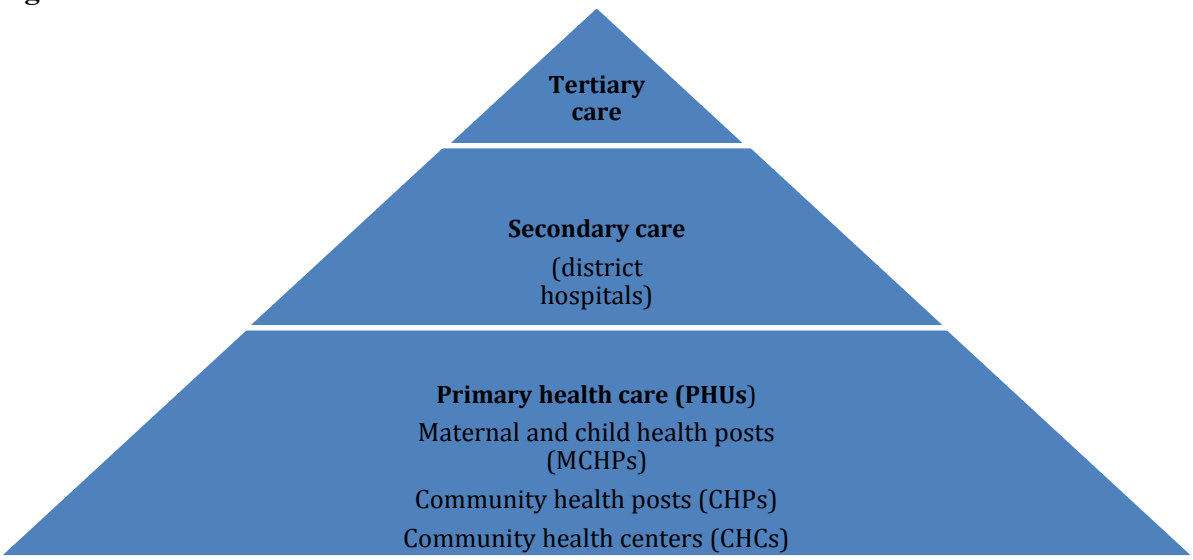
As is shown in the above figure, under-five and infant mortality rates have been steadily decreasing since 2000. However, with the most recent (2013) estimated under-five mortality rate at 182 and infant mortality rate at 117, the country is unlikely to meet its MDG 4 goal of reducing under-five mortality rate to 95 and infant mortality rate to 50 by 2015 [24].

Health Care Infrastructure

The government, religious missions, local and international NGOs and the private sector all provide health care in Sierra Leone. The government owns about 89 per cent (974) of health facilities, while missions, NGOs and the private sector account for about 2.6% (29), 2.5% (27) and 6% (67) respectively [HPQ protocol, 2010]. The public health delivery system is comprised of three levels: (1) peripheral health units (PHUs) for first

line primary health care; (2) district hospitals for secondary care; and (3) regional/national hospitals for tertiary care.

Figure 4 Levels of Health Care



The PHUs are further sub-classified into three levels: community health centers (CHCs), maternal and child health posts (MCHPs), and community health posts (CHPs). The MCHPs are situated at village level for populations of less than 5000. They are staffed by maternal and child health (MCH) Aides who are trained to provide numerous services: antenatal care, supervised deliveries, postnatal care, family planning, growth monitoring and promotion for under-five children, immunization, health education, management of minor ailments, and referral of cases to the next level. Community health workers such as TBAs and community volunteers support the MCH Aides. The CHPs are at the small town level with populations between 5,000 and 10,000 and are staffed by State Enrolled Community Health Nurses (SECHNs) and MCH Aides. They provide the same types of services that are provided at the MCHPs but they also include prevention and control of communicable diseases and rehabilitation. They refer more complicated

cases to the Community Health Centers (CHCs) which are located at Chiefdom level, usually covering a population ranging from 10,000 to 20,000 and staffed with a community health officer (CHO), SECHN, MCH Aides, an epidemiological disease control assistant and an environmental health assistant. They provide all the services provided at the CHP level in addition to environmental sanitation and supervise the CHPs and MCHPs within the Chiefdom.

The district hospital is a secondary level facility providing backstopping for the PHUs. It provides the following services: outpatient services for referred cases from PHUs and the population living within its immediate environs, inpatient and diagnostic services, surgical services, management of accidents and emergencies, and technical support to PHUs. The District Health Management Team (DHMT) is responsible for the overall planning, implementation, coordination, monitoring and evaluation of the district health services under the leadership of the District Medical Officer (DMO). Other members include the medical officer in charge of the district hospital and scheduled officers for various programs and units.

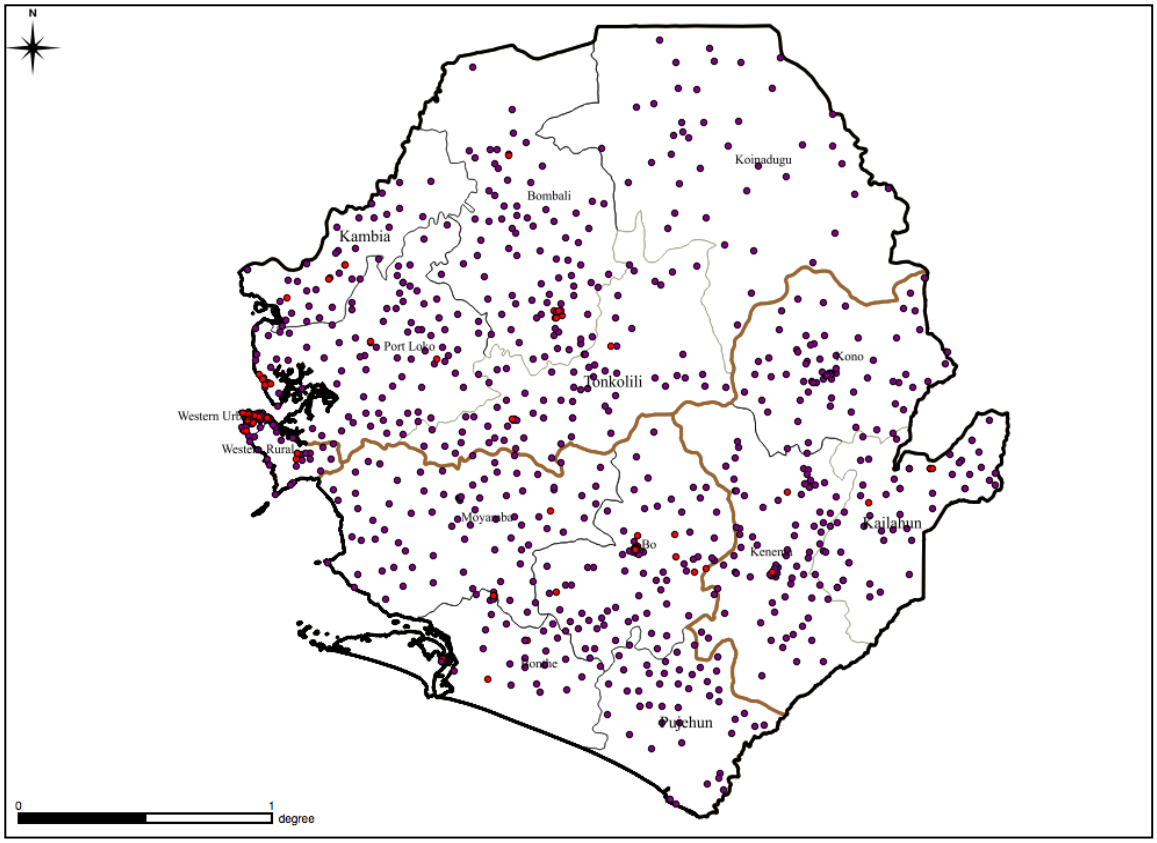
The only tertiary care hospital is located in the capital city Freetown.

Free Healthcare Initiative

In an effort to combat the high maternal and U5MR as well as strive to meet the MDG 4 and 5 goals, the government launched the national Free Healthcare Initiative (FHCI) in April 2010. The initiative provides free services to pregnant and breastfeeding women as well as children less than 5 years of age seen at public healthcare facilities. The initiative is funded mainly by the United Kingdom and United Nations who paid to refurbish hospitals, supply drugs and pay healthcare professionals' wages. Prior to the

FHCI, 88% of people stated that their inability to pay was the greatest barrier to accessing healthcare [25]. Government figures show that more women are accessing antenatal care and delivering babies in health facilities, where the percentage of deliveries occurring in healthcare facilities rose by 45% in the first year of the initiative [29].

Figure 5: Distribution of Health Facilities in Sierra Leone, 2011



Source: map (QGIS), PHU information (UNICEF Sierra Leone)
*purple dots=PHUs, red dots=hospitals; 1 degree = 110.567km (1km=0.01 degrees)

The above figure shows the distribution of health facilities after the launch of the FHCI. Thought health facilities are available in every district, there appears to be clustering of facilities in the Western and central region of the country; particularly for hospitals in the Western area (including the capital city Freetown). Some districts like Tonkolili and Bombali have large areas with no health facilities.

Though the first few years of the initiative show promising results with an increase in health care utilization, the Sierra Leone health system faces many challenges that it needs to overcome in order to adequately and successfully provide free health care to its targeted populations. Government health facility personnel are generally overworked, inadequate both in number and training, and insufficient accommodation for workers. In addition, salary increases were not available for all cadres of the health workforce. There was a breakdown in the cold chain system after implementation of FHC leading to a decline in full immunization by 12 months of age, with a reduction in primary health care activities like outreach due to a heavier workload at health centers[25]. Other challenges include a shortfall in the number and training of health workers, imposed payments for free services, and insufficiency of the health system infrastructure to support an effective nationwide referral system [25]. A survey conducted one year after the launch of the FHCI and government monitoring activities revealed that vital improvements are still needed, with insufficient number of health facilities, many health facilities lacking water, electricity, basic equipment and essential drugs [30]. Consultations with key stakeholders revealed significant problems with drugs procurement and distribution, drug stockouts and late supply of drugs, poor road networks, health personnel leaving posts, lack of ambulances, and poor attitudes of health workers with the worrisome pattern of many health workers across the country still demanding payment for drugs [30]. A 2011 report by Amnesty International showed that the promise of free healthcare was not being fulfilled with numerous women unable to get free treatment due to drug supply stock outs at health facilities or women being charged for medicines and care that are supposed to be provided for free [31]. These

problems are mainly due to drugs and medical supplies leaking out of the free health care system and re-routed as drugs for sale; also, the system for procurement and management of drugs is complex and often poorly managed, creating opportunities for corruption [32]. Despite the free healthcare policy, many continue to pay for essential drugs and those living in poverty continue to have limited access to essential care.

Community Health Workers in Sierra Leone

In 2005 the Ministry of Health of Sierra Leone (MOHS) allowed the use of community health workers (CHWs) to deliver treatments for malaria, pneumonia, and diarrhea (ORS and zinc) as a strategy to increase the coverage of treatment for childhood illnesses given the severe lack of health personnel. The MOHS encouraged organizations to pilot programs using CHWs to assist the MOHS to develop a program of integrated community case management (ICCM) and create a policy. ICCM was first piloted in the Kono district in 2006 with technical assistance from the International Rescue Committee (IRC) and support from the National Malaria Control Program and UNICEF. IRC supported the distribution of approximately 140,000 treatments (57,000 for malaria, 39,000 for pneumonia and 43,000 for diarrhea) to children U5 in Kono District [33]. CHV supervision records, register reviews, and patient visits confirmed high levels of compliance with protocols and adherence to a full course of treatment. As a result of this success, IRC secured additional funding from United States Agency for International Development (USAID) to implement this intervention in Kenema and Koinadugu districts. Prior to the HPQ program, Sierra Leone did not have a formal policy on CHWs to diagnose and treat childhood illnesses at the community level. However, the MOHS

was open to CHW services and helped create a favorable environment for HPQ implementation in the intervention districts.

In November 2011, a Community Health Worker Policy and Strategic Plan 2012-2015 was developed by the Sierra Leone MOHS in collaboration with UNICEF and WHO, which recommended prioritizing deployment of CHWs in hard to reach communities to increase timely access to the treatment with integrated community case management (iCCM) interventions. The policy was validated and signed by the Minister of Health and operationalized with nongovernmental organization (NGO) support. The policy is more of volunteer program with a minimum recommended non-financial incentive package. Like the FHCI, the CHW policy is a strategic approach aimed at reducing infant and maternal deaths and health inequalities, and intended to standardize implementation of the community aspect of the MOHS Basic Package [34]. The policy defines roles and responsibilities of various community-level actors, defines who CHWs are including their roles, supervision and monitoring and training requirements. According to the policy, CHWs are defined as "any and all persons appropriately trained in providing health care or distributing health, nutrition, hygiene and sanitation commodities at the community level." Different types of CHWs exist in Sierra Leone and include: traditional birth attendants (TBAs), community drug distributors (CDDs), community-based distributors of contraceptives (CBDs), community-based providers (CBPs), Blue Flag volunteers (local NGO), Red Cross volunteers, and community-owned resource persons (CORPs). According to the policy, CHW selection criteria includes: a person selected by the community led by Village Health Committees; they should reflect linguistic and cultural attributes of the population served; be honest, trustworthy and

respected; be willing to serve as a volunteer; be available to perform CHW tasks; interested in health and development matters; have good communication and mobilization skills; ideally have past experience working as volunteer or with community projects; need to be able to write in at least one local language; and be at least 18 years of age. CHW tasks include: community sensitization and advocacy for different health and community development projects; conduct home visits for promotion of malaria, water and sanitation, nutrition, maternal, newborn and child health interventions; provide treatment of common childhood illnesses; distribution vitamin A, deworming tablets, oral rehydration solution (ORS) for diarrhea, and ivermectin for treatment of onchocerciasis; and report on vital events and CHW activities. The MOHS recommends a 10-day standardized modular training program for CHWs in one of these areas:

- Community Integrated Management of Newborn Childhood Illnesses (CIMNCI)
- Community Case Management (CCM) including ICCM
- Community Management of Acute Malnutrition (CMAM)
- Community-led Total Sanitation (CLTS)
- Time and Targeted Counseling (TTC)

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Chapter 3: Literature review

This literature review chapter starts with a general discussion of the common causes of child mortality in developing countries with examples of proven interventions to reduce mortality. The literature review then focuses on the specific aims of the dissertation (care seeking, community health workers and inequities in child health). The care seeking section discusses the determinants and barriers to care seeking for childhood illnesses in Sub-Saharan Africa. The section on community health workers (CHWs) discusses the definition and various types of CHWs, history of CHWs, uses of CHWs and CHW program effectiveness in Sub-Saharan Africa. The literature ends with sections on community case management (CCM) and inequities in child health.

Common causes of child mortality in developing countries

The past few decades have seen large decreases in child mortality in most low and middle-income countries. However, the level of under-five mortality has remained very high despite large investments in health system reforms and several child survival programs. Children continue to die needlessly because many are never seen at a health facility due to unavailability of services, because their families lack access to services or choose not to seek care or because families and other caregivers do not recognize the warning signs of life-threatening illness. According to a recent report from the UN Inter-agency Group for Child Mortality Estimation, an estimated 6.6 million (confidence level: 6.3-7.0) children die each year before reaching five years of age from preventable or treatable conditions [1]. Pneumonia, diarrhea and malaria are major causes of morbidity and mortality in children under five years of age (U5). Childhood pneumonia is leading cause of deaths in young children in developing countries with more than 1 million

deaths per year [2]; [3]; [4]; [5]. Diarrhea, the second leading cause of death, accounts for up to 20% of U5 deaths with approximately 0.75 million-child deaths per year [2]; [5, 6]. Malaria is a major public health burden that causes approximately half a million deaths a year, and accounts for 25% of mortality in children less than five years old in Sub Saharan Africa [2]; [7]. In addition, lack of adequate preventive measures, delayed recognition of symptoms and late presentation in health facilities are major contributors of child deaths [8].

Approximately 30 interventions could eliminate more than 60% of child deaths each year if delivered to families and children in need and reach universal coverage [9]; [10]. Proven interventions to improve child survival in developing countries include, but not limited to: correct treatment of pneumonia, diarrhea, and malaria [11], in addition to increased immunization coverage and other effective preventive approaches [4], [12]. CCM of pneumonia can result in a 70% reduction in mortality from pneumonia [13]; [14]. CCM of malaria can reduce malaria-specific under-five mortality by 60% and severe malaria morbidity by 53% [15]; [16]. CCM with ORS and zinc has been shown to be effective in preventing 70-90% of deaths due to acute watery diarrhea and decreasing diarrhea mortality by 11.5% [17]; [18].

Care seeking for childhood illnesses in Sub-Saharan Africa

Prompt and appropriate health care seeking has the potential to reduce the severity and mortality from common childhood illnesses. Care seeking for an ill child depends on many factors, including availability, cost and quality of health services, and the circumstances of the individual households.

Determinants of Care Seeking

Most studies in sub-Saharan Africa have demonstrated that caregivers' choice of seeking care outside the home for a child's illness is associated with etiology or perceived severity of disease, cultural and traditional beliefs, knowledge and symptoms of illness, home treatment and socioeconomic status [19]; [20]; [21] [22]; [8]. Care seeking patterns have been shown to be associated with perceived severity of illness, the presence of danger signs, and the duration and number of symptoms [23]. Health care availability and quality of care is another major factor affects care seeking for childhood illnesses. Other studies in rural and urban areas of Sub-Saharan Africa have documented similar associations between socioeconomic indicators and healthcare seeking behaviors for young children, even in environments that appear to be uniformly impoverished [22].

Predictors of prompt care seeking include distance, type of provider, socioeconomic status, presenting symptoms and home treatment [19], [24]. A study assessing determinants of malaria treatment delay in children U5 in Ethiopia showed mothers who complained about the side effects of anti-malarial drugs, who had no history of child death, and who complained about the high cost of transportation to reach health facilities were more likely to delay seeking care (after 24 hours since onset of symptoms) [25]. In a cross-sectional survey conducted among 168 mother-child pairs in a children's emergency room in a tertiary hospital in Nigeria, prompt care (care sought within 24 hours of symptom onset) was sought for children with fever compared with those with cough and diarrhea; reasons for care seeking delay included non-recognition of the illness severity and poor finances [8].

Barriers to Care Seeking

Barriers to seeking healthcare include perception of symptom severity, distance to health facilities, cost (direct and indirect) and quality of care received [26], [27]. Members of communities that are more distant use health facilities less than those that are nearer [28]. In a community-based survey in rural Kenya, reasons for not accessing a health facility for a child's illness included caregivers not recognizing signs and symptoms of severe illness, and hospitals being too far and/or costly [22]. Lack of money to pay for transportation, past experiences with poor services offered, and failure to appreciate the severity of illness were the main reasons given by Kenyan caregivers who reported not seeking care for an ill child [12]. Studies in other African settings have identified poverty, distance to facilities, and previous negative experiences of mothers with treatment, unequal household gender relations, and women's lack of control of household expenditure as barriers to healthcare seeking for young children [29]. Even in cases where health facilities may be accessible in terms of geographical and economic aspects, services offered in health facilities may not be acceptable to caregivers of children [12].

Reducing caregiver barriers to health-seeking delays can have major impact on child survival [30]. User fees reduce access to services for the more vulnerable (i.e. the poor) which leads to reduced service utilization [31]. A study estimated that abolishing fees for under-fives in 20 Sub-Saharan African countries could save 150,000 - 300,000 lives [32]. However, such exemptions have been rare and generally ineffective in protecting the poorest [31].

Community health workers

Community health worker (CHW) includes a variety of community health personnel selected, trained and working in their own communities [33]. According to the WHO, "community health workers should be members of the communities where they work, should be selected by the communities, should be answerable to the communities for their activities, and should be supported by the health system and have shorter training than professional workers" [34]. CHWs range from salaried staff to volunteers, from simple educators to health care service providers, and from specialists to generalists [35]. Most CHWs in Sub-Saharan Africa do not have professional certification and include generalists (i.e. village health workers and community resource people) who service the primary health care needs of the community, and specialized cadres trained and deployed with a narrowly defined set of skills determined by a population group (i.e. child health) or disease (i.e. malaria) [35, 36].

The concept of using community members to provide basic health services to the communities from which they come has a 50-year history with early programs such as the Chinese barefoot doctor program and the use of community health volunteers in Thailand in the 1950s [33]. Early CHW initiatives in Africa, including those in Tanzania and Zimbabwe, were set in the political context of systemic transformation after decolonization and focused on self-reliance, rural development and the eradication of poverty and inequities ([33]). CHW programs ballooned in the 1980s in the aftermath of the Alma-Ata Declaration of 1978 [37, 38]. The use of outreach workers was a key feature of the Bamako initiative in West Africa with evidence suggesting that use of outreach led to significantly higher levels of childhood immunization and treatment

coverage [39]. However, interest in CWH programs waned in the 1990s, as a result of shifts in policies from self-reliance and basic needs to World-Bank driven policies of structural adjustment and implementation failures due to unrealistic expectations, poor planning, problems of sustainability, and the difficulties of maintaining quality ([33]). There is now renewed interest in CHW programs with the rationale that service needs, particularly in remote and underprivileged communities, are not fully met by existing health systems [33]. Facility-based services alone do not provide adequate access to treatment for childhood illnesses, thus the need to increase coverage at the community level [13]. Some national governments are making CHWs a cornerstone of scaling up community health delivery as a major part of strategies to reduce child mortality [40].

The use of CHWs has been identified as a strategy to address the growing shortage of health workers in low-income countries. The shortage of skilled health workers has been driven by the following factors: dramatic increase of health workers in high-income countries that created a pull of health workers into these countries; increasing morbidity, mortality and absenteeism rates, increasing workloads due to the impact of HIV/AIDS; and inadequately funded and poorly managed and performing health systems [33]; [41]. Compared to health facilities, CHWs are tend to be geographically closer and available; they tend to be from the community and therefore overcome cultural and linguistic barriers that may be present in health facilities [42].

CHWs are essential for treatment scale up and comprehensive primary health care [43]. They are used primarily to provide basic, mostly curative services within homes and communities and to assist health professionals with their tasks. CHWs can make a valuable contribution to community development and can improve access to and

coverage of communities with basic health services [33]. Some of the tasks where CHWs have been successful include health promotion, improving the health environment, supporting health programs, and diagnosis and/or treatment of diseases such as pneumonia and TB [44]. The literature shows that CHWs have a positive impact on health outcomes when they do the following: enable people to look after their own health; encourage increased utilization of health facilities; support preventive health programs and; diagnose and treat a limited range of common diseases [44].

Promotion of household and community health practices through CHWs is among the key strategies to improve child health [45]. The use of CHWs is a potentially effective strategy for bringing early, appropriate and low cost treatment of common childhood illnesses closer to the home [46]. CHWs can expand coverage of effective child health interventions [47].

CHW Program Effectiveness in Sub-Saharan Africa

Studies on the effectiveness of CHW programs in the past show mixed results. There is agreement of the potential of CHW programs to improve access to and coverage of communities with basic health services and to improve health outcomes. However, some CHW programs that have been large-scale national programs have not been successful [43]. As programs scale up, CHWs tend to be inadequately trained and ill equipped for increased and sometimes contradictory roles. CHW program challenges include supervision, accountability, retention and focus; in addition to the struggle for legitimacy in the community because though they provide treatment, they are not health care professionals [48].

Recent studies have demonstrated the effectiveness of CHW programs in Sub-Saharan Africa. CHWs influence care-seeking behavior and improve access to appropriate treatment of common childhood illnesses, particularly in hard-to-reach and poor areas [45, 46, 49-53]. A pre-post evaluation of a CHW program in two villages in Nigeria showed a CHW utilization rate of 26.1%, with decreased use of patent medicine dealers (44.8% to 17.9%) and slight increase in health facility use (30.2% to 32.2%) [46]. Results from an evaluation of malaria CCM pilot program in two hard-to-reach and poor districts of Kenya supported the assertion that CHWs can be influential in changing health seeking behavior of families [46, 51]. In Zambia, CHWs' provision of iCCM showed an increase in CHW use and a decrease in health facility use for children with fever and non-severe pneumonia [52]. Volunteer CHWs were credited with reduced child deaths and improved care-seeking practices for diarrhea and fever/malaria post intervention of a CHW program in rural Uganda [53].

Community case management

Community case management (CCM), a process of identifying and treating illness at the community level, includes the following: home management of malaria by CHWs with pre-packaged anti-malarial drugs [54]; community-based diagnosis and treatment of pneumonia with antibiotics [55]; oral rehydration solution and zinc for management of diarrhea [56]; [17]; and referral of severely ill children for facility care. CCM models differ and can include integrated management of childhood illnesses (IMCI) given by nurses and CCM done by volunteer health workers with limited training [14]. CCM can provide an effective and cost-effective way of increasing access to prompt and effective

treatment of childhood illnesses [57]. With task shifting from health centers, CCM can increase the number of care providers at the community level [58].

Integrated CCM (ICCM) is a strategy used to deliver an integrated package of primary care services at the community level, particularly in areas where there is little access to facility-based services [9]. ICCM targets conditions that cause the most deaths for children in low-income countries, which include pneumonia, diarrhea, malaria and under-nutrition. Improving access to care for remote communities through the implementation of ICCM is an important new focus for global health policy [13]. WHO and UNICEF support ICCM as an essential strategy to foster equity and contribute to sustainable reduction in child mortality [13]. ICCM of pneumonia, malaria, and diarrhea has been shown to be an effective approach in reducing child deaths and a feasible effective strategy to complement facility-based management for areas that lack access to health facilities [49] [36].

Inequities in child health

There has been continuous decline in child mortality in most developing countries over the past decades. However the decline has not been evenly distributed; resulting in major inequities within and between individual countries [59]. Large disparities exist between rich and poor people and areas, public and private health sectors, provinces or districts, and among rural and urban populations [60]. Child health tends to be worse among the poor within countries with growing evidence that rates of child mortality and malnutrition are falling faster among the better off [39]. Studies have shown that health care seeking among the poor is worse than that of the least poor [19]. Access to basic health services of acceptable quality is denied to many of the world's poorest people [61].

Even for public health interventions with high coverage (i.e. immunizations), coverage is lower for poorer families. Child survival strategies have generally been implemented without consideration of equity and a resulting clustering of interventions at the level of the child [62]. Previous approaches tended to reach children who can easily be reached, resulting in children from urban areas and who are at lowest risk of mortality benefiting the most from interventions. Therefore, children at greatest risk (poorest children in rural areas) are the least likely to receive interventions, the basis of which is the inverse equity hypothesis [63].

The determinants of child health inequalities include environmental and socioeconomic factors as well as individual and household level risk factors [59]. Most of the work that has been undertaken in the field of equity has been based on analyses of communities by wealth quintiles, which focused on wealth inequality as the main source of inequity in risk of disease, access to health interventions and mortality [64]. Though poverty is no doubt as a major determinant of inequity, the complete picture is more complex with economic factors being dominant in some communities and geographic or ethnographic factors being dominant in others [64]. For example, settings with more challenging geographic conditions, where much of the population live far from a health facility, economic factors would be less important than geography. The three key indicators of health inequality in Sub-Saharan Africa include poverty, geography and ethnicity [64].

Economic Inequities on Child Health

The impact of economic poverty on childhood morbidity and mortality is well known, with income shown to be the most important contributor to survival inequalities

between poor and non-poor children. Poor households are more inclined to treat themselves and less likely to seek modern healthcare than are the rich [65]. Children from the poorest households are also less likely to receive proven child survival interventions [9]. In most of the countries, immunization and other child survival interventions were delivered disproportionately to the richest quintile while the poorest groups were the last to have access to new health interventions [63].

Results from DHS surveys of 14 countries showed overall improvement in child survival; however, 8 of the 14 countries showed a widening gap in child mortality between the richest and poorest wealth quintiles [66]. A prospective cohort study infants in South Africa measuring inequalities in child mortality, HIV transmission showed disparities in access to care between least poor and most poor families with inequalities shown for all measured child health outcomes. Infant mortality and HIV transmission were higher among the poorest families, with immunization coverage higher among the least poor [67]. The association between four socio-economic indicators (mother's education, father's education, household asset index, and land ownership) and growth stunting (used as a proxy for health and nutrition inequalities) showed higher prevalence of stunting among children of non-educated parents vs. parents educated above secondary school and children from households belonging in the poorest quintile vs. least poor quintile [68].

Geographic Inequities on Child Health

There is considerable evidence that the risk of child death is affected by where one lives, with under-five mortality higher in children who live in rural areas [9]. In most countries, healthcare personnel are concentrated in urban areas where they provide

tertiary level care and are comparatively scarce in rural areas [65]. As health services are rolled out in developing countries, they inevitably reach urban areas first and often do not extend beyond these areas into more deprived rural areas [64]. The impact of distance from a health facility on child mortality is acute in settings where a substantial proportion of the population lives in areas with either difficult or no access to reasonable care. Studies have shown significant increases in mortality in under-five children with increasing distance from health facilities [69].

Perry HB et al. conducted A comprehensive evaluation of the health programs of the Hôpital Albert Schweitzer in Haiti showed reduced access to health services, deficient quality and lower coverage of key services, and higher under-five mortality and malnutrition rates in the peripheral mountainous areas compared to the central plains [70].

Ethnic Inequities on Child Health

Another important determinant of inequity in child health is ethnicity. Dramatic differences in child survival between ethnic groups have been historically attributed to child-rearing practices and differential exposure to environmental factors such as indoor air pollution [64]. Studies in Africa have shown that child mortality risk differs between ethnic groups [71]; [72].

The Nouna Demographic Surveillance study in Burkina Faso showed significant variability in under-five mortality risk even in villages from the same district with higher risk (39%) in one village compared with a mean U5 mortality risk of 16% among the other 38 villages in the study. further studies found that the village was inhabited almost exclusively by an ethnically distinct tribe that experienced less favorable living

conditions (i.e. worse water supply), was more remote and located further from health facilities [73], [64]. Ethnic differentials in child mortality were examined using DHS data in 11 Sub-Saharan African countries showed significant differences in infant and U5 mortality between ethnic groups in all 11 countries [71].

Impact of Child Survival Strategies on Equity

Studies have shown that equity assessment can be incorporated in impact evaluations at relatively low cost; which may point to specific interventions that need to be reinforced [74]. Some program impacts on reducing health inequalities include improvements in service utilization and outcomes; increases in preventive and treatment coverage; decrease in inequalities in utilization of health services; and declines in average infant mortality and reductions in inequalities in infant mortality [63].

Integrated Management of Childhood Illnesses (IMCI), a staple of child survival strategies in developing countries for the past two decades, likely increased inequity in child health outcomes due to its reliance on a functioning primary healthcare system for effective implementation [64]. A study on country experiences with IMCI showed that inequity was increased in countries that implemented IMCI in better developed urban areas (i.e. Brazil) and decreased in countries that implemented the program in the highest mortality areas first (i.e. Peru) [62]. The IMCI impact on the equality of health outcomes and access across socio-economic gradients in rural Tanzania showed mixed results three years after IMCI implementation; equity differentials significantly improved in IMCI districts for six child health outcomes (underweight, stunting, measles immunization, access to treated nets, and treatment of fever with antimalarial) and improved significantly in comparison districts for four indicators (wasting, DPT coverage,

caretakers' knowledge of danger signs and appropriate care seeking). IMCI was significantly associated with improved equity for measles vaccine coverage, whereas the opposite was observed for DPT coverage [74].

An evaluation of a one-year malaria and diarrhea ICCM program implemented in two districts of Cameroon showed that intervention-area children with fever or diarrhea were nearly nine times more likely to receive treatment with artemisinin combination therapy (ACT) or oral rehydration salts (ORS), respectively, compared to neighboring comparison-area children. The CCM program was shown to improve equity with high levels of effective treatment equitable across socioeconomic status in the intervention areas, whereas disparities were observed in comparison areas [75].

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Chapter 4: ICCM Intervention

With the aim to provide cost-effective reductions in childhood mortality, the HPQ program provided high-impact treatment interventions to districts with the highest under-5 mortality and which also represent the poorest (worst-off fifth quintile) of districts. The program prioritized interventions based on diseases that cause the greatest number of deaths in children U5. UNICEF chose three countries in which to implement this initiative in collaboration with governments and CSOs: Uganda, Indonesia and Sierra Leone. The project focused on the top three causes of under-five mortality (apart from neonatal causes) in Sierra Leone: acute respiratory illnesses (pneumonia), diarrhea and malaria. The intervention was carried out by CHWs to provide integrated community case management (ICCM) of diarrhea, diagnosed based on clinical findings and treated with low osmolarity ORS and zinc; malaria, diagnosed symptomatically (fever) and treated with artesunate-amodiaquine combined therapy (ACT), and acute respiratory illnesses (ARI), diagnosed using timers to assess respiratory rate and treated with cotrimoxazole.

The intervention was implemented in two districts: Kambia district by IRC and CARE and in Pujehun district by Save the Children. These CSOs were selected due to their long history of successfully providing health interventions in Sierra Leone. CSOs were selected through a call for applications done by UNICEF with rigorous review process. The CSO eligibility criteria included: registered with the Ministry of Health and Sanitation, prior experience working in Sierra Leone, advocacy for pro-poor initiatives and prior experience with CCM. IRC has previously implemented CCM programs in other districts of Sierra Leone as well other countries in Sub-Saharan Africa. CARE

International has worked in Sierra Leone for decades on various projects including economic development, food security and public health. IRC and CARE have over 10 years experience in Sierra Leone, with CARE present in Kambia since 2007. The CSO has a strong working relationship with DHMT and a local partner, ABC-Development; with whom IRC-Care worked to implement the intervention. IRC has prior experience implementing CCM in two districts of Sierra Leone (Kono and Koinadugu) and other countries including the Democratic Republic of Congo, South Sudan and Rwanda. Save the Children has provided maternal and child health intervention in Kailahun district and Freetown since 2006. Save the Children has prior experience in Pujehun and supports CCM projects in numerous countries including Mali, Pakistan, and Ethiopia. However, the CSO had little experience with CCM in Sierra Leone.

The intervention was standardized with the same training, same reporting forms, and same supervision procedures. The CSOs in conjunction with the DHMT and PHU staff selected, trained, and equipped CHWs to support, assess, classify, counsel, treat, and, as necessary refer children with fever, cough, respiratory distress, and diarrhea. CHWs were provided with simplified algorithms for integrated management of childhood illnesses. They were also provided with a very simple form for recording number of treatments, visits, and deaths. Both the simplified algorithms and forms were developed by IRC for illiterate CHWs and have already been used successfully in the Kono District. Supervision of CHWs took place on a monthly basis and included review of CHW reports and observation of CHWs during visits.

Description of the iCCM Program

Specifics	
Districts selected	Kambia and Pujehun
Under 5 population (2010)	92,666
CSOs selected	Care and International Rescue Committee (Kambia) Save the Children (Pujehun)
CHW Paid	No
CHW Literacy required	No
CHW Initial training length (days)	6 days training package based on WHO IMCI guidelines specially developed for low literate volunteers in Sierra Leone
CHW Refresher training	Yes, after one year of work
CHW activities beyond ICCM	No
List other activities CHWs perform	In most communities CHWs also serve as community-based providers for the National Malaria Control Program
Supervision frequency	Chiefdom and Peer Supervisors – Monthly
Supervisor type	Chiefdom and Peer supervisor/health staff/NGO staff
Date ICCM began	Staggered across districts (October 2010 in Kambia, February 2011)
National Policy	CHW policy since 2011 which includes ICCM

UNICEF worked with the DHMTs and CSOs in Kambia and Pujehun to procure as well as ensure a continuous supply of essential drugs and commodities at the community level. The CSOs keep track of any stock outs and CHWs on a monthly basis and reported to UNICEF any issues that may affect the delivery of the intervention. Key elements reviewed monthly and reported include:

- Stock-outs
- Long absences of any CHWs or delay in hiring
- Travel problems (e.g. rains causing delays or road blockages)
- Trainings provided to CHWs

Recruitment, training and supervision of CHWs

A selection committee with members from participating CSOs, DHMTs and PHU staff and village council recruited CHWs for the intervention. An effort was made to

saturate districts with CHWs, ensuring at least one CHW per town or village. A total of 2,129 CHWs were recruited within a two-year period in the two districts, with a ratio of 2 CHWs per 100 children U5 or per 100 households.

The majority of CHWs were recruited and trained in 2011 (1,691), with 233 trained in 2010 and 205 trained in 2012 (see appendix A). CHW retention was fairly high with a retention rate of 88.8%; 239 of a total 2,129 CHWs either died or abandoned duties. CHWs were trained in the delivery of treatment for diarrhea, malaria, or pneumonia in children less than five years of age, and provided with simplified algorithms for integrated management of childhood illnesses. Diarrhea was diagnosed based on clinical findings and treated with low osmolarity ORS and zinc; malaria was diagnosed symptomatically and treated with artenusate-amodiaquine combined therapy (ACT); and acute respiratory illnesses (ARI) or pneumonia symptoms were diagnosed using timers to assess respiratory rate and treated with cotrimoxazole. CHWs were also provided with a very simple form for recording the number of symptoms, treatments, and referrals (see appendix C). Both the simplified algorithms and forms were developed by the IRC for illiterate CHWs and have already been used successfully in Kono district. After training, CHWs were equipped and supported to assess, classify, advise, treat and occasionally refer children to health facilities. CHWs are provided with drug kits and deployed immediately after training. Supervision of CHWs took place on a monthly basis and included review of CHW reports and observation of CHW visits.

The CHWs are non-paid volunteers with limited or no literacy, selected by their respective communities. Before implementation, CHW services and locations were announced in religious centers (mosques, churches), and community functions. For the

most part community members go to CHW homes to get the treatments or to local health posts. In lieu of payment, CHWs received recognition from the community with extra help with household tasks such as farming.

In addition to the CHWs, the following individuals played an important role in the iCCM intervention:

Peer Supervisors – paid CHWs who are literate

- Reports to PHU's In-Charge
- Link CHW with PHU
- Visit CHWs to observe their work
- Help CHWs improve their skills
- Help CHWs solve problems
- Add up CHW monthly drug supply
- Combine information from the CHWs' reports

CCM Officer – works for CSOs implementing the intervention

- Trains CHWs and Peer Supervisors
- Links CSO with the PHU
- Links CSO with the communities through the PHU, CHWs, and Peer Supervisors
- Provides information to the PHU and Peer Supervisors
- Directly oversees the Peer Supervisors, along with the PHU

DHMT (district health management team)

- Partners with CSOs on community case management
- Oversees the PHUs
- Compiles reports from PHUs

- Provides feedback information about the overall health of the community

Supervision of CHWs took place on a monthly basis and included review of CHW reports and direct observation of CHWs during visits. On average, 68% of CHWs were supervised for duration of the intervention (see appendix A). For the CHWs observed, 97% were able to correctly count respiratory rates for pneumonia diagnosis. With respect to treatment, 88% correctly provided malaria treatment with ACT, 81% correctly provided diarrhea treatment with ORS and zinc and 76% correctly provided pneumonia treatment with cotrimoxazole.

Implementation phase: 2010-2012

The project was implemented in two districts (Kambia and Pujehun) a few months after the baseline survey was conducted in June-July 2010. Implementation start dates were staggered across districts. Implementation of CCM started in Kambia in October 2010 (range in implementation dates: October 2010 – April 2012) and in February 2011 in Pujehun (range: February 2011 – December 2011).

Table 1 ICCM Implementation Duration by Cluster

Implementation dates	**Implementation duration**	**Kambia***	**Pujehun**
		# Clusters	**# Clusters**
January 2012 – June 2012	≤6 months	14	0
July 2011 – December 2011	7-12 months	6	28
January 2011 – June 2011	13-18 months	25	22
July 2010 – December 2010	19+ months	5	0
Total		**48**	**50**

*Missing information for 2 clusters in Kambia

As is shown in the table above, duration of the project differed by district. In Kambia, over half of the clusters had implemented CCM for 12 or more months;

whereas, more than half of the clusters in Pujehun had implemented CCM for less than 12 months.

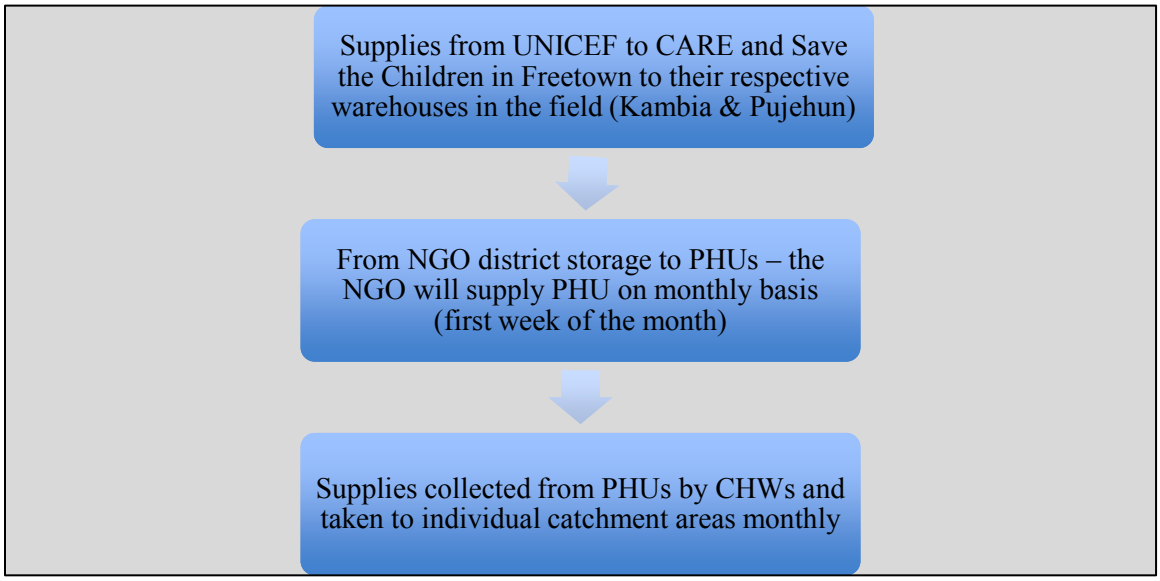
HPQ CSO Program Monitoring Data

The implementing CSOs kept monthly reports on CHW supervision, treatment and referral of children less than 5 years of age, and drug supply. The CSOs developed a standardized reporting form for routine data, which included reporting to DHMTs and inclusion in health facility health management information systems (HMIS). A set of indicators were also developed by the CSOs to assess how well the routine data was integrated into the HMIS system and how well the HPQ program was integrated into the District Health Management Team (DHMT) system.

Drug Supply

Before the start of the project, UNICEF, IRC/CARE and Save the Children agreed on standard operating procedures (SOP) for the management of ICCM drugs and supplies. Both NGOs were provided enough medicines to ensure adequate supplies. UNICEF procured all of the required drugs including and delivered them to the partners for subsequent distribution in the field. In exceptional situations, NGO supervisors carried some drugs to the catchments areas to supply CHWs to avoid stock-outs.

Drugs management (movement flow):

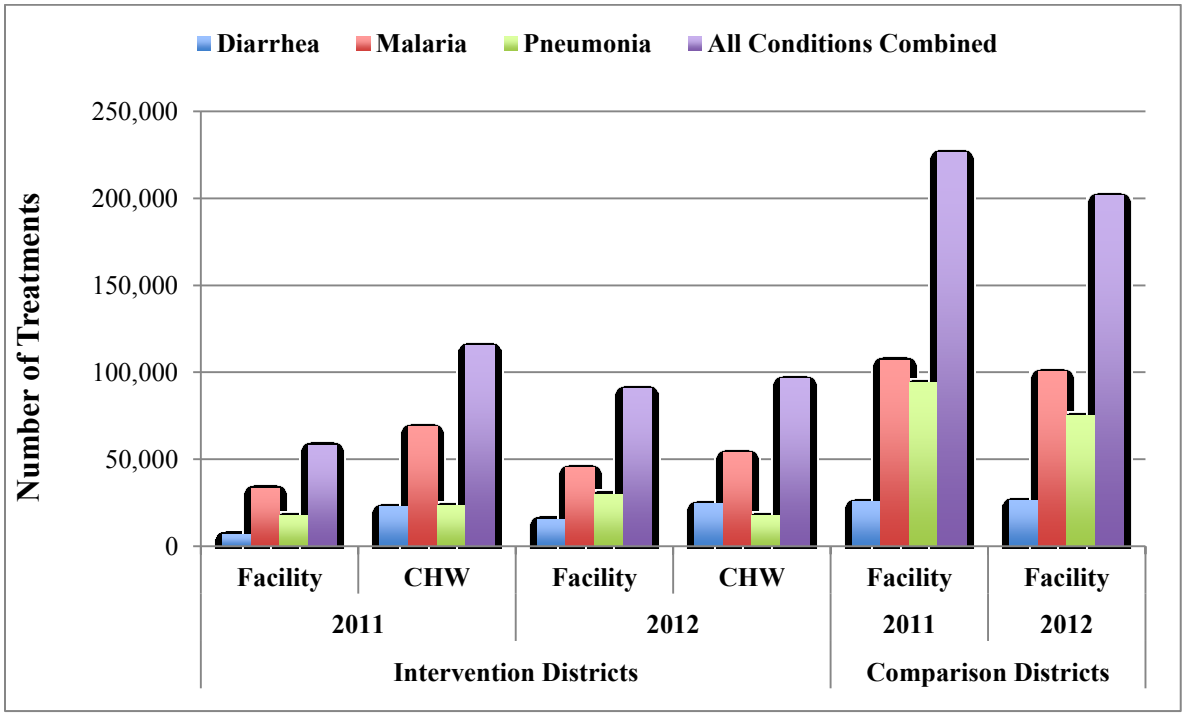


Drug stockouts were low for most of the drugs with only 8% of CHWs reporting drug stockouts for cotrimoxazole and 16% of CHWs reporting drug stockouts for ORS and zinc treatment. There was a higher proportion (25%) of CHWs reporting drug stockouts of ACTs for malaria treatment. Since CHWs received their drug supplies from the PHUs, a national stockout of ACT also affected the program.

Facility and CCM Treatments

CHW treatment coverage was high with over 200,000 children seen over the project period (see appendix B). The highest proportion of treatments was for malaria with a total of 123,767 treatments given followed by diarrhea treatment with a total of 47,904 treatments. Pneumonia treatment was the lowest with a total of 41,314 treatments. The higher number of treatment for malaria is mainly due to the fact that treatment for malaria was based only on symptoms for fever (which is more common than pneumonia) with no diagnostic test given. For pneumonia, respiratory timers were used to validate symptoms reported by caregivers.

Figure 6 Facility and CHW Treatments, 2011-2012



Source: UNICEF, HPQ Final Evaluation Report: Uganda and Sierra Leone, June 2013
Note: no facility data available in 2010: 2012 data is from January – June 2012.

As shown in the above figure and appendix A, treatments received from CHWs accounted for a large proportion of treatments received in the intervention districts. In fact, CHWs provided twice the number of treatments as government health facilities in 2011 (115,422 CHW treatments vs. 58,138 health facility treatments). In 2012, the number of CHW treatments was comparable to health facility treatments. However, even with the additional treatments provided by CHWs in the intervention districts, the comparison districts had a higher proportion of all treatments than the intervention districts. By symptom, the number of diarrhea treatments was higher in the intervention districts, the number of malaria treatments was comparable between intervention and comparison districts, and pneumonia treatments were higher in the comparison districts.

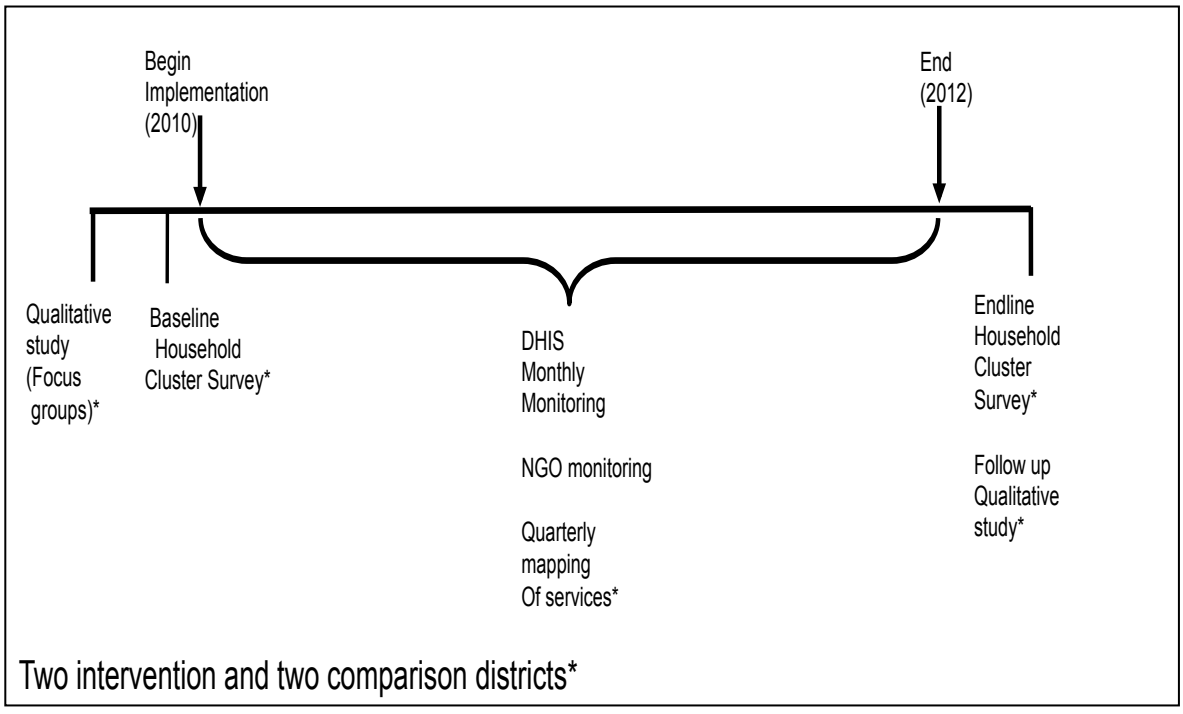
Chapter 5: Methods

Parent Project Overview

The overall project, within which this dissertation is imbedded, was a health program evaluation of the ICCM intervention, whose main objective was to measure the intervention impact on under-five mortality in two districts in Sierra Leone. The monitoring and evaluation for the HPQ project was conducted as follows:

- Intervention areas: quantitative and qualitative baseline and endline household cluster surveys and routine reporting from CHWs and supervisors, HMIS data on facility services, mapping of services, and contextual information (see appendix G)
- Comparison areas: quantitative and qualitative baseline and household cluster surveys, mapping of services and contextual information

Figure 7 HPQ Monitoring and Evaluation Strategy



Specifically, the HPQ program monitoring and evaluation included the following:

- ***Qualitative data*** on community practices for caring of children U5 with diarrhea, pneumonia and malaria; reasons for use of lack of use of health services
- ***District Health Information Systems (DHIS)*** – MOHS and Health Metrics Network (HMN) designed an integrated health information system (HIS) that included reports from PHUs to the districts to the national level
    - Data on diarrhea, malaria, pneumonia for those seeking care
    - Passive reporting of deaths
    - Inclusion of community health worker reports (for study districts)
- ***Monthly CHW reports*** - Key monthly data collected monthly included:
    - Number of children < 5 years of age receiving treatment for Malaria, diarrhea or pneumonia within 24 hours by CHWs
    - Number of children < 5 years of age receiving treatment for malaria, diarrhea, or pneumonia within 24 hours in the peripheral health unit
    - Number of deaths in children <5 years of age
- ***Household Cluster survey***- baseline and endline surveys
- ***Quarterly mapping*** of all ICCM and other health activities occurring in the district (see appendix G)– since there were multiple donors, multiple CSOs and multiple activities being done by the MOHS, these activities were documented within the intervention and comparison districts to assure that final analysis of data can be understood in the context of the multiple interventions that may be taken place within a district. Key data elements collected include:

    - Names of CSOs providing child health and other interventions within the district
    - Types of CCMs being provided for children within the district from both CSOs and MOHS and location of these activities (coverage if available)
    - Any special initiatives to increase health care use for children U5
- ***Baseline district reproductive and child health coverage survey*** – 2010; also used to do GIS mapping of all health facilities in a district. These data were used as the baseline for the quarterly mapping of services.
- ***MICS Survey 2010*** –sampling frame used to provide information at the district level.

Study design

A quasi-experimental pre-post study design with intervention and comparison areas was used to evaluate the impact of the ICCM intervention on care seeking and treatment of malaria, diarrhea and pneumonia in children less than 5 years of age. Data was collected from a two-stage household cluster survey conducted at baseline in June-July 2010 and at the end of the two year intervention period in July-August 2012 in both intervention and control districts. The overall study design consists of:

- A comparison of health care seeking behavior and treatment coverage for childhood illness in two intervention districts at baseline and two years after the intervention.
- A comparison of changes in care seeking and treatment coverage in two intervention districts compared with two comparison districts in which only the usual government interventions are implemented.

The same sampling procedures, training, and questionnaire administration procedures were used for both surveys.

Study Area

The study was conducted in four districts (2 intervention and 2 comparison) that are deemed to be in the lowest socioeconomic quintiles of the country.

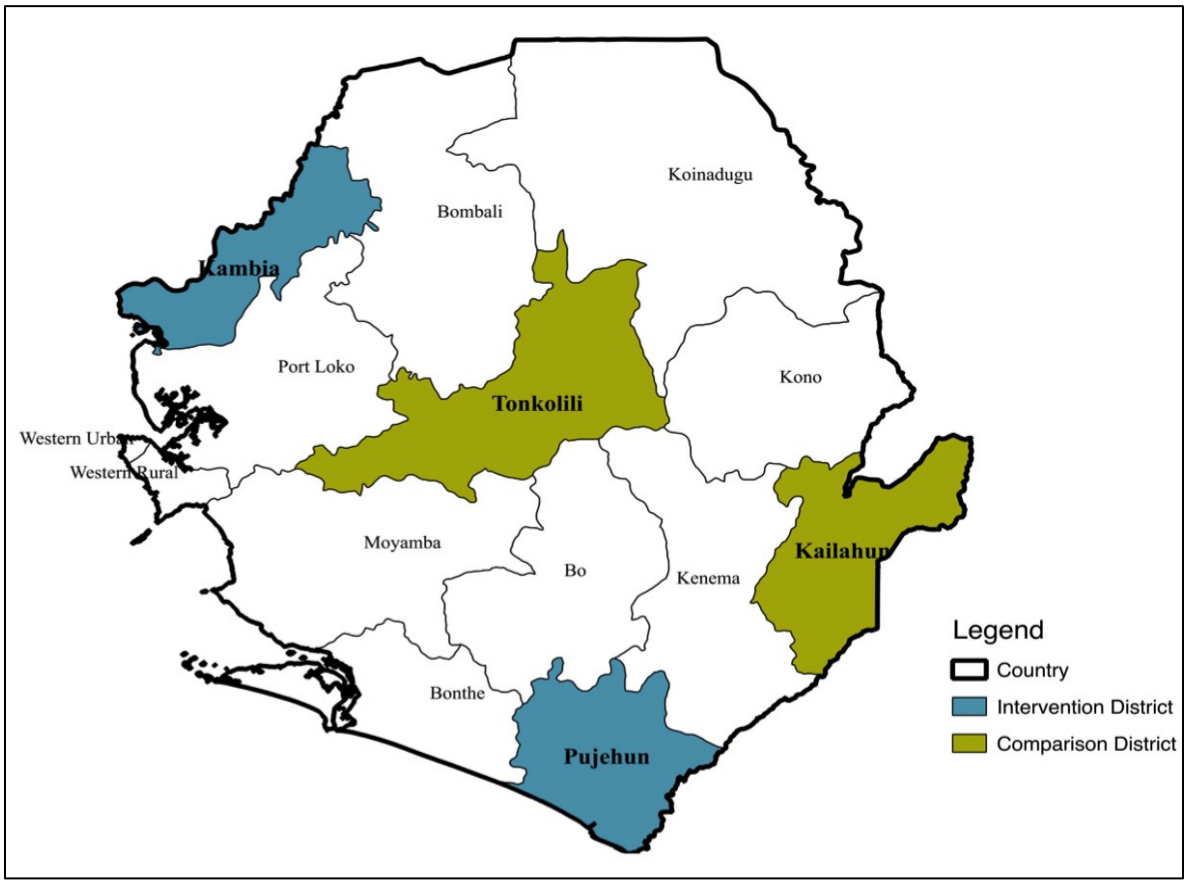


Figure 8 Study Districts

Source: Quantum GIS. Open Source Geospatial Foundation Project [http://qgis.osgeo.org]

The study districts were identified using four criteria. For each criterion, districts were ranked from worst to best. The ranks were then summed and those with the lowest scores were identified. The four criteria were:

1. Immunization coverage [Immunization reporting 2008 MOH Sierra Leone]
2. Nutritional status of under fives using severe stunting [Vulnerability analysis mapping]
3. Availability of emergency obstetric and neonatal care (EmONC) [UNICEF/UNFPA/WFP/WHO, MOHS, Nationwide Emergency Obstetric and Neonatal care Assessment 2008,]
4. Per capita expenditure on health per district [SSL projections from 2004 Census]

Based on scores from the table below, five districts were considered for the HPQ project. These districts were Kambia, Kenema, Kailahun, Kono, and Pujehun. CCM has already been implemented in Kono, so it was deemed as unsuitable as either an intervention or comparison district.

Table 2 District Composite Scores

District	**Immunization coverage**	**Nutrition Stunting**	**EmONC Access Utilization**	**Health expenditure per-capita Level**	
	% (Rank)	% (Rank)	% (Rank)	Leones (rank)	Score
Kambia	63% (1)	17.6% (4)	1.7% (11)	1928 (1)	17
Kailahun	81% (7)	15.1% (8)	0 (2)	2242 (2)	19
Kono	91% (12)	18.3%(3)	0 (5)	1928 (1)	21
Kenema	67% (2)	16.6% (6)	0.9% (7)	2675 (7)	22
Pujehun	88% (11)	18.9% (2)	0 (3)	2641 (6)	22
Bonthe	69% (3)	11.5% (10)	0 (4)	2715(9)	26
Tonkolili	84% (9)	9.1% (12)	0 (1)	2530 (5)	27
Koinadugu	84% (8)	15.8% (7)	1.7% (10)	2421 (3)	28
Western area (Freetown)	74% (4)	10.4% (11)	1.6% (9)	2516 (4)	28
Moyamba	92% (13)	18.9% (1)	0(6)	3864 (11)	31
Bo	78% (6)	12.5% (9)	0.9 (8)	4335 (13)	36
Bombali	85% (10)	17.2% (5)	3.5% (13)	2675 (7)	36
Porto Loko	77% (5)	3.4% (13)	2.1%(12)	3090 (10)	40

The presence of civil society organizations (CSOs) was mapped in the remaining low scoring districts to determine those districts that were least likely to have ongoing interventions. Kambia and Pujehun had the least number of CSOs and were therefore selected to be the intervention districts. Kailahun and Tonkolili were chosen as comparison districts.

Kambia district is in the northwestern part of the country and borders the Republic of Guinea; the district is majority Temne, followed by Susu and Limba ethnic groups. Access from Guinea and the rest of Sierra Leone, including Freetown, is quite good due to a newly built trans-country highway going from the Sierra Leonean capital to the Guinean capital (Conakry). However, difficult terrain in northern areas of the district make travel challenging. Tonkolili was chosen as the comparison for Kambia district. Though a part of the Northern province, Tonkolili district is located at the center of the country and is the most accessible from Freetown of the four study districts. It is a large district with poor road infrastructure and has suffered from neglect in the past by southern-focused governments [99]. Its ethnic make-up is largely Temne, though there are substantial minorities of Koranko, Kono and Limba.

Pujehun district is at the southern most part of the country, borders the Republic of Liberia, and is almost universally Mende in ethnicity. The district is one of the most remote was one of those most affected by the civil war due to its proximity to Liberia. Much of the district is difficult to access during the rainy season and the health infrastructure is poor. Kailahun was chosen as the comparison for Pujehun. Like Pujehun, Kailahun is majority Mende and shares a border with Liberia; the district also shares a border with the Republic of Guinea. It was also greatly affected by the civil war and

remnants of the conflict are still apparent in the pockmarked shop fronts and rusting tanks that appear throughout the district [99]. Some participants in the HPQ endline qualitative study indicated that health services in Liberia were more accessible to them than their "local" health services. Most of the district is difficult to travel due to dense forests and poor road infrastructure, though the main road has recently been improved which should improve access for much of the local population.

Access to primary health care in study areas

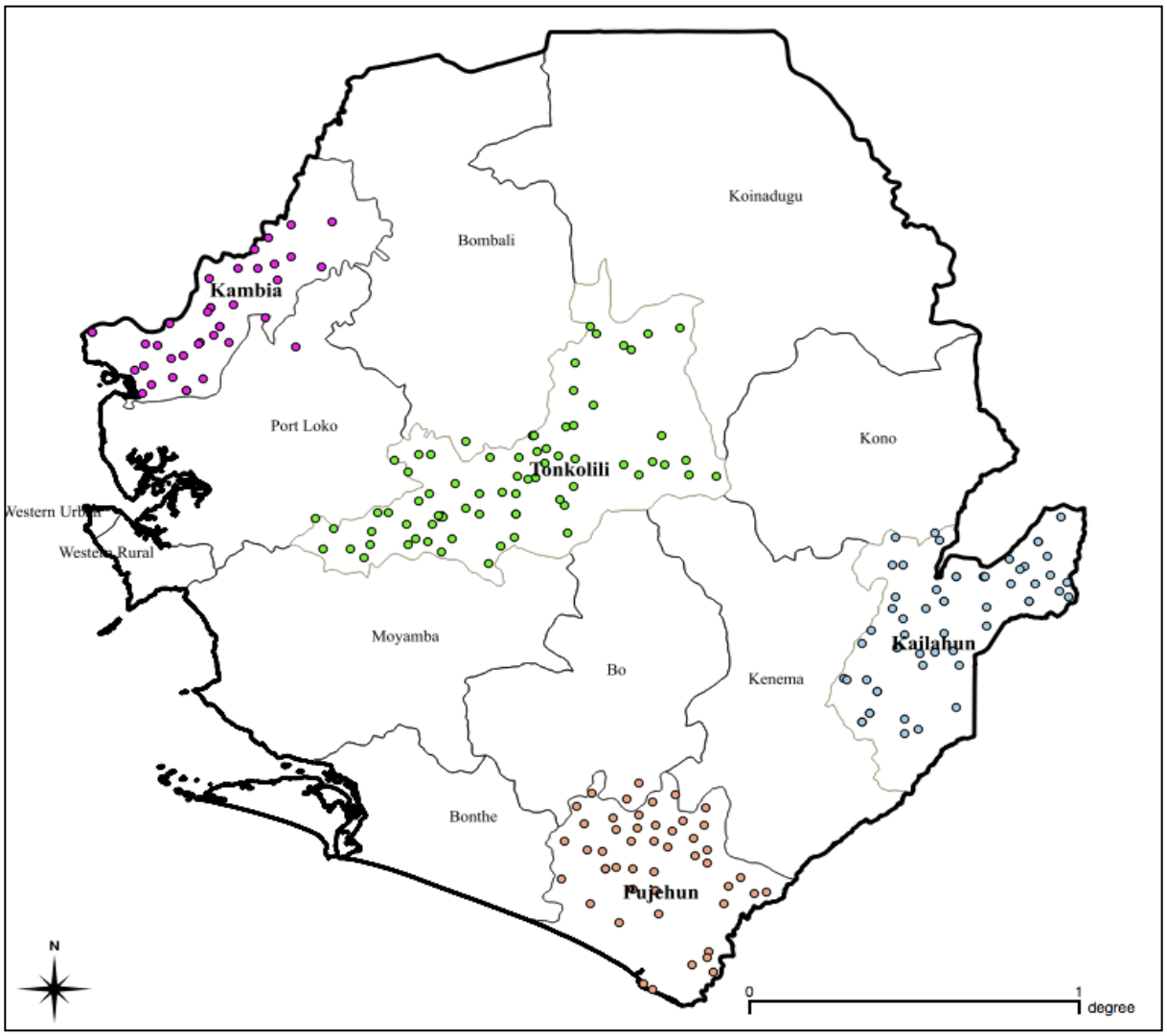
Access to health care is similar across study districts with a ratio of 10-12 PHUs per 100,000 children U5 (see table below). The intervention and comparison districts also had similar population sizes. As of March 2011, Kambia district had a total of 67 health facilities for a ratio of 11 PHUs per 10,000 children U5, Pujehun had a total of 59 health facilities with a ratio of 10 PHUs per 10,00 children U5. The comparison districts had a larger U5 population size but similar PHU to U5 ratios. With the largest U5 population, Tonkolili had the highest number of health facilities (96) with a ratio of 12 PHUs per 10,000 children U5 and Kailahun had 74 total facilities with a ratio of 10 PHUs per 10,00 children U5.

Table 3 Distribution of health facilities by study area

Group	**District**	**Total U5 pop**	**# PHUs**	**# Hospitals**	**# Private facilities**	**Total # facilities**	**PHUs per U5 pop** (*10,000)
ICCM	Kambia	59,026	62	1	4	67	11
	Pujehun	57,894	58	1	0	59	10
No ICCM	Tonkolili	78,589	91	3	2	96	12
	Kailahun	72,288	74	3	0	77	10

Source: UNICEF Sierra Leone, March 2011

Figure 9: Map of Health Facilities by Study District

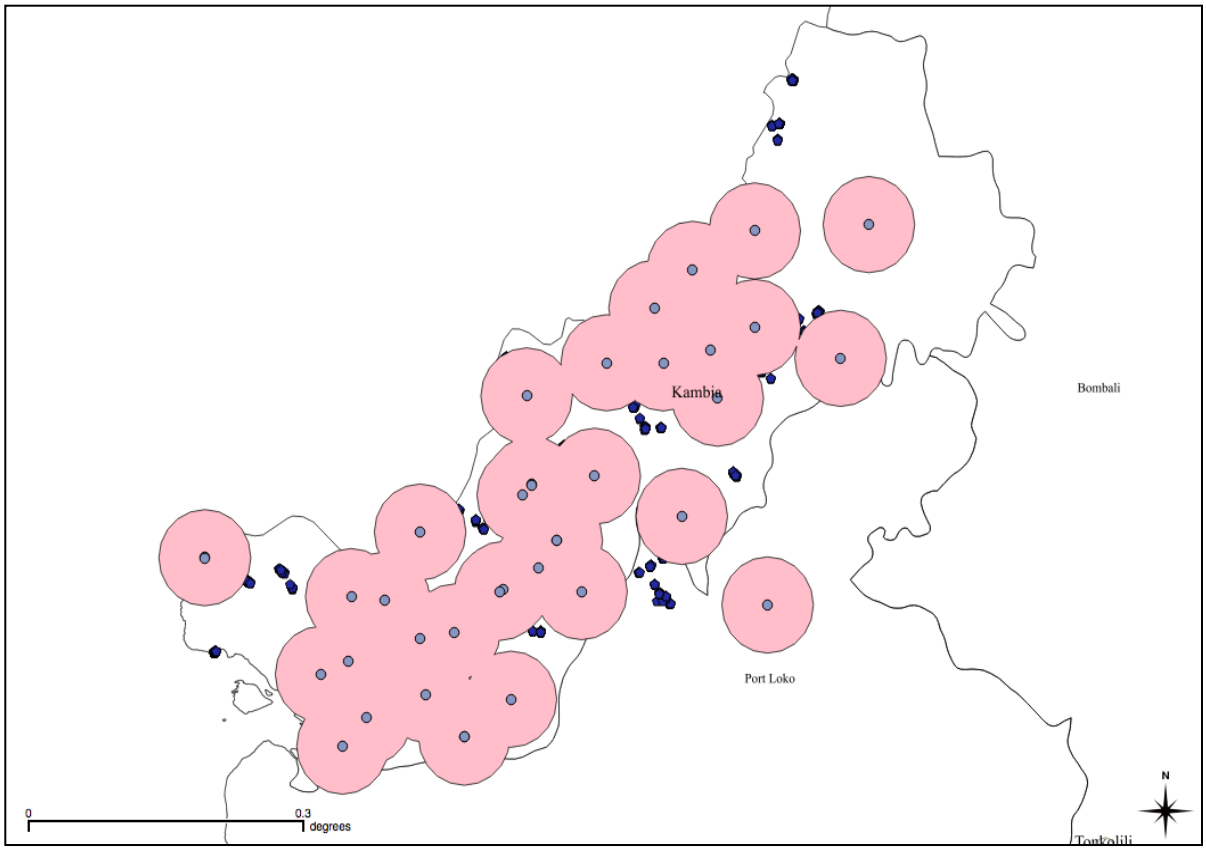


Source: map – QGIS; Health Facility list - UNICEF Sierra Leone, March 2011
1 degree = 110.567km (1km=0.01 degrees)

The map above shows the distribution of health facilities per study district. Health facilities are evenly distributed in the study district for the most part, though some areas show an absence of health facilities. Areas that show lack of or limited number of health facilities include the northeastern and southern-west part of Kambia district, northeastern part of Tonkolili, southern parts of Pujehun and Kailahun.

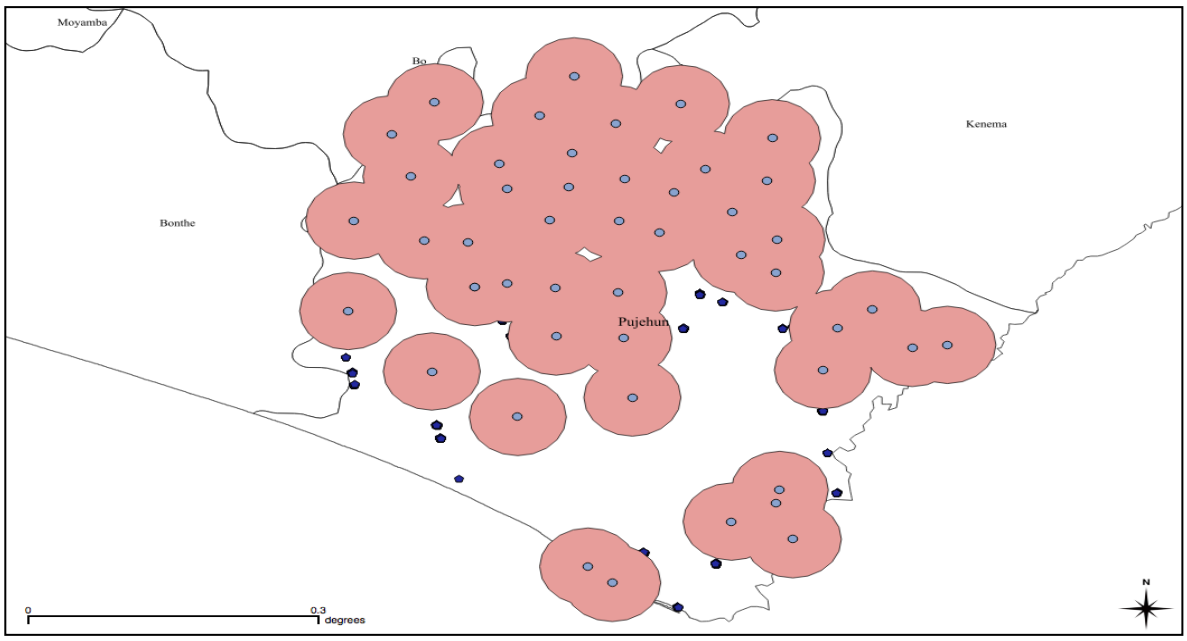
In terms of accessibility of health facilities by selected households, accessibility appears to be better in the comparison districts (Tonkolili and Kailahun) compared to the intervention districts (Kambia and Pujehun), though all districts have parts with no health facilities (see maps below). Kambia district appeared to have more of an accessibility issue with a number of households far from health facilities. Health facilities appeared to be most accessible in Kailahun district.

Figure 10 Kambia District



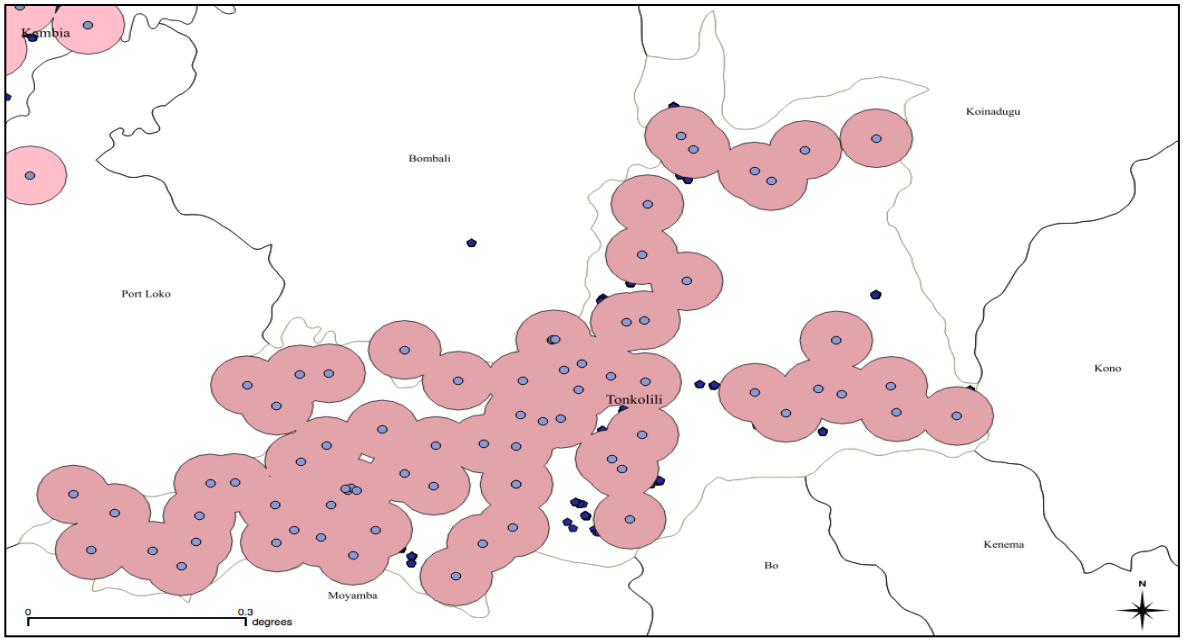
Reference: QGIS, PHUs- UNICEF, 2011; Selected HHs – HPQ study, 2012;
0.3 degrees = 33.3km; blue circles= health facilities; blue pentagons=selected households
Pink circle= 0.5degree (5km) buffer around health facilities

Figure 11 Pujehun District



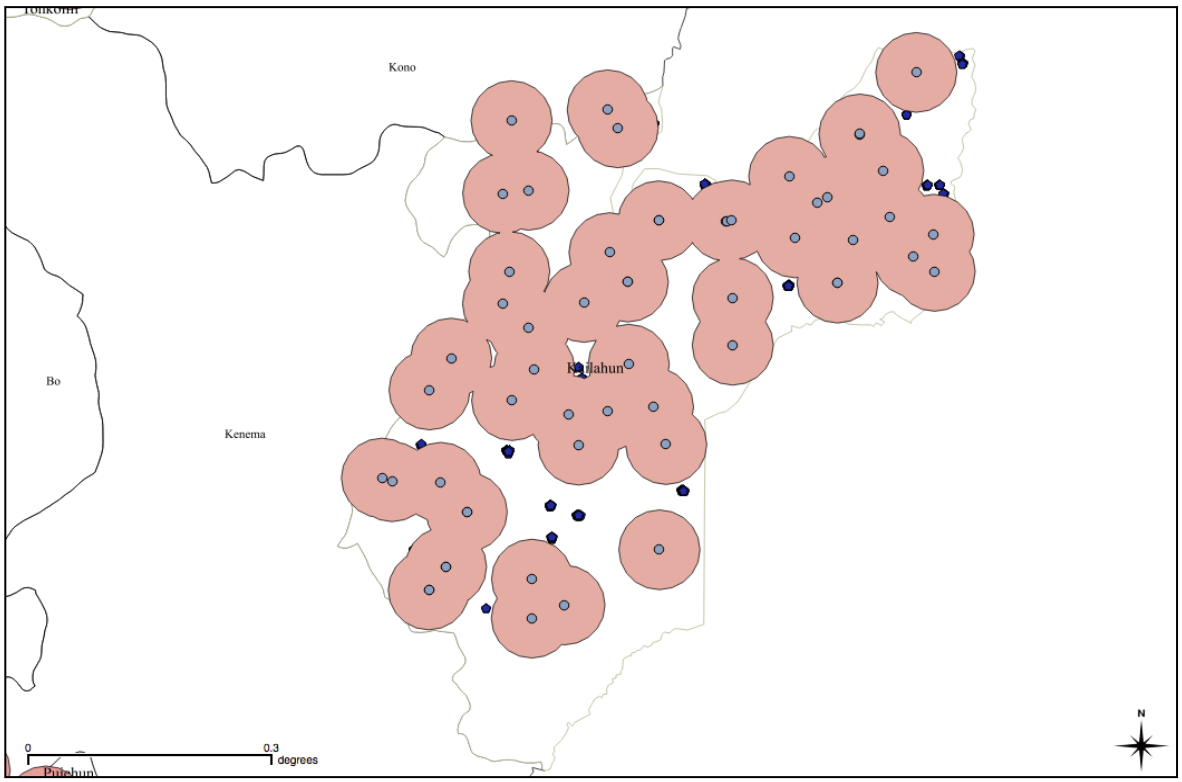
Reference: QGIS, PHUs- UNICEF, 2011; Selected HHs – HPQ study, 2012;
0.3 degrees = 33.3km; blue circles= health facilities; blue pentagons=selected households
Pink circle= 0.5degree (5km) buffer around health facilities

Figure 12 Tonkolili District



Reference: QGIS, PHUs- UNICEF, 2011; Selected HHs – HPQ study, 2012;
0.3 degrees = 33.3km; blue circles= health facilities; blue pentagons=selected households
Pink circle= 0.5degree (5km) buffer around health facilities

Figure 13 Kailahun District



Reference: QGIS, PHUs- UNICEF, 2011; Selected HHs – HPQ study, 2012;
0.3 degrees = 33.3km; blue circles= health facilities; blue pentagons=selected households
Pink circle= 0.5degree (5km) buffer around health facilities

Survey Sampling Methods

To achieve a sample size of 2700 children in each study group, 1500 households were targeted per district (3000 in the two intervention districts combined, and 3000 in the two comparison districts combined) assuming a non-response rate of 10%. For each district, 50 clusters were selected with 30 households randomly in each cluster for a total of 200 clusters and 6000 households. The same sample size was used to conduct the repeated household cluster survey at endline since there were no significant differences in care seeking and treatment coverage rates between intervention and comparison districts at baseline.

Sample Size Calculation

Two sample size estimates were calculated to evaluate the impact of the HPQ project: (1) the sample size necessary to detect a change in treatment coverage in the intervention districts from baseline to endline and (2) sample size needed to detect changes in treatment between intervention and comparison districts. Sample size calculations assumed 80% power, alpha of 0.05; design effect of 1.5 and a 90% response rate. Software used to compute the power calculations was PASS [Number Cruncher Statistical Systems, Kaysville, UT; (www.ncss.com)].

The sample size calculations for the study were based on coverage of treatment for malaria, pneumonia, and diarrhea for children U5. Based on the 2008 Sierra Leone Demographic and Health Survey (DHS) among the poorest quintile, 23.5% of the children had malaria (fever in past 2 weeks), of whom 27.1% received treatment; 6.6% had pneumonia (cough and respiratory distress in past 2 weeks) of whom 26.4% received treatment; and 12.8% had diarrhea, of whom 53.3% received ORS packets. Malaria

treatment was the main intervention used to calculate sample size. The use of the combination of ORS and zinc for diarrhea was assumed to be zero at baseline as zinc had yet to be procured and used for this purpose in Sierra Leone; any change in this parameter over time would be considered important and was thus not used as the primary intervention for the sample size calculation. Pneumonia has a low prevalence, and was not used as the primary intervention to calculate sample size because the sample size would be very large; which would require more time to complete interviews and would be very costly. In the calculations, the aim was to be able to detect at least a 15% increase in malaria treatment in the intervention group. The implications of the proposed sample size on detecting changes in pneumonia and diarrhea treatment were also considered.

Cluster selection

Cluster selection was done based on population proportionate to size sampling (PPS). Sierra Leone is administratively divided into four provinces; each province is subdivided into districts, each district further divided into chiefdoms, and chiefdoms divided into sections. Each section was subdivided into enumeration areas (EAs) during the 2004 Sierra Leone Population and Housing Census (SLPHC 2004). The census EA was used as primary sampling unit (PSU) for the study; referred to as a cluster. The sampling frame excluded the population living in collective housing units, such as hotels, hospitals, work camps, and prisons. Clusters with less than 55 households were grouped together or merged with adjacent clusters to be able to create a sampling frame of clusters with households greater than or equal to 55 households to ensure a sufficient number of households in each cluster to select 30 households for interview.

Table 4 Distribution of chiefdoms, sections and clusters per district

	District	Total Population	#Chiefdoms	#Sections	# Clusters (EAs)
Intervention	Kambia	308,929	7	65	403
	Pujehun	306,700	12	78	355
Control	Tonkolili	421,287	11	76	582
	Kailahun	392,997	14	78	608

To select the clusters for inclusion within each district, chiefdoms were listed in alphabetical order and for each chiefdom, sections were also listed in alphabetical order. Within each section, the EAs were listed along with the number of households in each. The total number of households within the district were then added together and divided by the number clusters needed (50) to determine the sampling interval (SI). A random number between 1 and the SI was generated to determine the random start to begin the cluster selection. The cluster that contains the random start household was selected and then the SI used to determine the next cluster that contains the household corresponding to that SI. This was continued until 50 clusters are selected per district.

Household Listing and Selection

For each random cluster chosen, an enumeration of households was conducted when the survey team arrived on site. A household was defined as *"a group of people eating from the same pot"* based on the definition used for the Census, Multiple Indicator Cluster Survey (MICS) and Demographic and Health (DHS) surveys. Using peripheral digital assistants (PDAs) with global positioning systems (GPS), a team of 3 interviewers and one supervisor conducted the household enumeration and subsequent interviews in each selected cluster. The selected cluster was mapped and divided into 3 areas, with each interviewer given a start number by which to enumerate each household. The PDA

GPS device was pointed at household to record the location, enter the number and a brief description (e.g. red house).

After enumeration of all households and the maps electronically merged, the random selection feature of the PDA was used to randomly select 30 households to participate in the survey. Using the PDA navigation program, interviewers used the map to approach the correct household for interview.

Data collection

We partnered with Statistics Sierra Leone (SSL) for recruitment, training and supervision of interviewers for data collection. Thirteen teams of three interviewers and a supervisor conducted the household cluster surveys in the four districts in a four-week period in June –July 2010 and July – August 2012. With 13 teams, approximately 50 clusters were completed each week and after four weeks all interviews were conducted in the 200 selected clusters. Qualified interviewers were recruited by SSL to serve as supervisors and interviewers, with efforts made to recruit high-caliber personnel who have worked on previous surveys and who have appropriate linguistic and cultural attributes similar to the districts' populations. Efforts were made to use the same interviewers for both household surveys and those with previous PDA experience.

Training and Supervision of Data Collection Staff

A total of 52 people were trained to use the PDA and to conduct interviews for both baseline and endline surveys. To facilitate this process, an interviewer guide was developed for use by interviewers during the training and administration of the questionnaire. The training was conducted during a two-week period in May-June 2010 for the baseline survey and June - July 2012 for the endline survey. The training module

included the following: interviewer roles and responsibilities, how to select households, survey ethics (consent forms and procedures), use of the PDA, review of translations, common terms and practice in four common languages (Krio, Temne, Mende and Limba). The first week of training consisted of lectures, demonstrations, and practice interviews in small groups. The last week of training included a 2-day field practice using the PDA. Two days were devoted to translation of common terms to ensure consistency during data collection. Any problems noted during the field practice were corrected immediately and were tested again to ensure all corrections were adequate. Also, during the second week there was one day of training for team supervisors on how to supervise the fieldwork and how to sync interviews daily into a PDA and check for completeness and accuracy.

Each day the supervisors were responsible for syncing the completed interviews from each interviewer into one PDA and checking for completeness and accuracy. Myself and survey coordinators from Statistics Sierra Leone regularly visited field teams to review their work, monitor data quality and to observe field operations and make corrections as needed.

Questionnaire administration

Data on care seeking and treatment for diarrhea, malaria and pneumonia were collected from caregivers of all children U5 in selected households. Three questionnaires (household, women's and children U5) were used to collect information on household characteristics, health seeking practices, recent child morbidity and mortality, utilization of CHW services and knowledge of symptoms of childhood illnesses. With respect to the study, the children's survey questionnaire was used to collect information from

caregivers on healthcare seeking practices, illness in the previous two weeks, and care seeking for those illness episodes (see appendix E).

Table: Survey questionnaires

Questionnaire	Respondent	Type of questions
Household questionnaire	Head of household	• Ethnicity, religion, and number of spouses of head of household • Duration of residence in the community • Assets • Water and sanitation • Bed nets • Roster of children U5, number of women 15-49 years
Women's questionnaire	All women 15-49 years living in selected household and who provide direct care to children U5	• Birth histories for mortality estimate • Use of antenatal services and tetanus immunization history • Educational level
Children's questionnaire	All women 15-49 years living in selected household and who provide care to children U5	• Age, sex of child • Pneumonia, diarrhea, malaria symptoms past two weeks (period prevalence) • Health seeking and treatment for those who were ill • Promptness of care seeking (endline) • Where and from whom care was sought • What treatment was given including traditional treatments

Since English is the only written language in Sierra Leone, questionnaires were written in English and verbally translated by interviewers into local languages preferred by the respondent (generally Krio, Temne, Mende or Limba), using standardized, pre-tested key words and information obtained on terminology from the baseline qualitative study. The questionnaire was piloted in April 2010 by administering the questionnaires in paper-form to 30 households prior to the baseline survey. Based on the pilot and qualitative study, the questionnaire was modified prior to being programmed for the PDA for both baseline and endline surveys.

The household questionnaire was administered to the head of household, defined as the person recognized by other persons in the household as responsible for their welfare. If this individual was unavailable, a knowledgeable adult was asked to complete the questionnaire. If no one was home, interviewers visited a neighbor to ensure the household is occupied. If occupied, the interviewer returned one other time to administer the questionnaire. Once the household questionnaire was administered, all women 15 - 49 years of age who have consented or assented were administered the women's questionnaire. If a woman was not home the interviewer asked when she is expected to be home and return one other time to complete the interview. In addition all mothers and/or caregivers of children U5 years of age were administered the child questionnaire. Visual aids (photos of common medications used for diarrhea, malaria and pneumonia) were used to assist caregivers with their recollection of treatments received for a child's illness (see appendix F).

Data Management and Analysis

To ensure high quality data, the PDAs were preloaded with the questionnaires using Visual CE Professional version 11, which included automated skip patterns and range and consistency checks. During data collection, direct observation was done for a select number of interviewers to ensure that interviewers accurately followed training guidelines. After each day of interviews, the field supervisors synced the data from each interviewer into one PDA and checked for the total number of interviews and ensured that all fields were entered. The PDAs were protected with a password and were accessed only by project staff. After all interviews were completed, the data were downloaded to an Access database by the survey coordinators. Once the complete data

set was created, all identifying information was removed and a final database was created in SAS.

Descriptive statistics (proportions, means, median, and standard errors as appropriate) were obtained on all the different measures. Proportions, odds ratios (ORs) and 95% confidence intervals (CI) were obtained in STATA 12 from bivariate and multivariable analyses weighted to account for the complex survey design and non-response [100]. A two-sided p-value <0.05 was considered to be significant for all tests.

Analysis by Paper/Specific Aim

***Aim 1/Paper 1*:** ICCM effect on changes in care seeking and treatment for malaria, diarrhea, and pneumonia, pre/post intervention.

- Proportions in the intervention and comparison groups were compared at baseline and endline using a two-sided chi-square test.
- The comparison of the outcome variables between intervention and comparison districts adjusted for differences in the household characteristics (size, ethnicity, religion and wealth).
- A difference-in-differences (DID) analysis was conducted using a multivariable logistic regression model to determine: (1) whether the intervention significantly affected changes in care seeking and treatment and (2) whether the outcomes were significantly different between the intervention and comparison groups over time, as measured by an interaction term, using the following model:

  $$\textit{Log odds (Y)} = \beta_0 + \beta_1 X + \beta_2 T + \beta_3 X*T$$

  Where,

  X= group; 0= comparison group, 1= intervention group

T = time; 0 = baseline, 1= endline

Y = response (care sought/treatment received); 0= no, 1= yes

The estimate of the B_3 coefficient on the interaction between X and T is the *DID* estimator. The test statistic of the interaction coefficient (β_3) is the Z-test for equality of the differences.

Aim 2/Paper 2: CHW utilization rate and factors associated with CHW use:

- The CHW utilization rate was calculated in the intervention group at endline only (0% CHWs at baseline)
- Bivariate and multivariable logistic regression analyses were carried out to identify factors significantly associated with receiving treatment from a CHW, adjusting for child, caregiver, and household-level factors.

$$\textit{Log odds } (Y) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \ldots \beta_p X_p$$

Where,

Y = sought care from CHW; yes =1, no = 0

X's = above covariates of interest at child-level (age, sex, and reported ICCM symptom); caregiver-level (age, educational status, and reported barriers to care seeking); household-level (wealth rank, ethnicity, polygamy, and wealth rank); and intervention program duration

Aim 3/Paper 3: Effect of ICCM on equitable coverage of appropriate care seeking and treatment in two intervention districts vs. two comparison districts

- Factors examined to explain potential inequalities in care seeking and treatment for children U5 included: household wealth index, ethnicity and educational attainment of direct caregivers of children U5.

- Baseline and endline proportions of care seeking and treatment (appropriate and traditional) per household wealth rank, ethnicity, and caregiver education were compared for each study group (intervention and comparison).
- Group comparisons were conducted to determine the level of inequality on our study outcomes at baseline and whether they decreased at endline using weighted bivariate logistic regression comparing wealth rank (least poor vs. poorest), ethnicity (Mende vs. Other), and educational status (some education vs. no education). A ratio of 1 denotes perfect equity; ratio >1 and <1 denotes inequality in our of interest to the benefit (i.e. higher appropriate treatment in least poor group) or detriment (i.e. lower care seeking) of one group over another.
- Difference-in-Differences (DID) analysis done by group (wealth, ethnicity, caregiver education) to assess the intervention effect on changes in inequalities in care seeking and treatment.

Ethical considerations

Consent was obtained from heads of households as well as women ages 15-49 years of age who met our study inclusion criteria. Three consent forms were used, one for the head of household, one for each eligible woman in a selected household, and one for the children U5 questionnaire read to the direct caregiver of an U5 child (see appendix D). The head of the household, typically one who makes decisions for all members of the household in Sierra Leone, was asked to for permission to interview others in the household. In addition, a consent form was read with verbal consent obtained of all women over 18 years of age and girls under 18 who were married or had children in selected households. Interviewers attempted to find a private area within the household to

conduct interviews. Respondents were given a name and contact information of someone they can contact should they have any questions or concerns regarding the survey. Names or other individual identifying information collected as part of the interview were only used to determine which persons needed to be interviewed. Once those interviews were conducted and the data downloaded, all identifying information (e.g. names, GPS coordinates of households) was removed from the database.

The protocol was reviewed by the Institutional Review Board of the Ministry of Health and Sanitation (MOHS) of Sierra Leone and was also submitted to Johns Hopkins Bloomberg School of Public Health IRB for review.

Chapter 5 References

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Chapter 6: Paper 1

Influence of community health workers on care seeking and treatment coverage for common childhood illnesses in the context of free health care in rural Sierra Leone

Abstract

Background

In 2010, the government of Sierra Leone launched the free health care initiative, which provides free treatment to children under five years of age (U5) and pregnant women accessing government health facilities. Shortly afterwards, the Health for the Poorest Quintile (HPQ) intervention deployed trained community health workers to provide integrated and appropriate community case management of diarrhea, malaria and pneumonia to children U5 in two underserved districts of Sierra Leone.

Methods

Using a quasi-experimental study design with intervention and comparison districts, the study examined whether CHWs induced significant changes in care seeking and treatment of ill children with diarrhea, malaria and pneumonia, two years post intervention. A household cluster survey was conducted among caregivers of 5,643 and 5,259 children U5 at baseline and endline, respectively.

Results

The survey response rate was high with 94% (5,239/5,550) and 96% (5,397/5,632) of caregivers participating at baseline and endline. There was no significant baseline to endline difference in prevalence of diarrhea, malaria and/or pneumonia in either study groups. The intervention effect on care seeking from an appropriate provider was not

statistically significant (OR=1.48, p=0.152); it increased from 35.3% to 57.1% (p<0.001) in the intervention group, but also from 36.9% to 48.9% (p=0.004) in the comparison group. For all three illnesses combined, coverage of appropriate treatment increased from 51.6% to 65.3% (p=0.001) in the intervention and 50.5% to 57.7% (p=0.099) in the comparison group. The CHW intervention was associated with a 100% increase in appropriate treatment for pneumonia (OR=2.00, p=0.008), 38% decrease in appropriate treatment for malaria treatment (OR=0.62, p=0.040), 66% decrease in traditional treatment for diarrhea (OR=0.44, p=0.037), and had no effect on appropriate treatment for diarrhea (OR=1.08, p=0.728). The intervention was also associated with decreased facility treatments for malaria (OR=0.21, p=0.005). There was no intervention effect on treatments provided by drug shops or peddlers, which decreased significantly for both study groups.

Conclusion

Deployment of CHWs was associated with some increase in appropriate treatment, reduced treatment burden at the facility level, and reduced reliance on traditional treatments, but no overall increase in coverage within the context of expanding free care.

Keywords: community health workers/volunteers, community case management, health care seeking, children under five years of age, fever, malaria, diarrhea, pneumonia, Sierra Leone

Background

Pneumonia, diarrhea and malaria are major causes of mortality in children under five years of age (U5) in Sub-Saharan Africa, the majority of which can be prevented with interventions effectively delivered at the community level [1]. One such intervention is community case management (CCM), which involves identifying and treating illness at the community level and may include the following: home management of malaria by CHWs with pre-packaged anti-malarial drugs [2]; community-based diagnosis and treatment of pneumonia with antibiotics [3]; oral rehydration solution and zinc for management of diarrhea [4]; [5]; and referral of severely ill children for facility care. CCM models differ and can include integrated management of childhood illnesses (IMCI) given by nurses and CCM done by volunteer health workers with limited training [6]. CCM of pneumonia, malaria, and diarrhea has been shown to be effective in reducing child deaths and a feasible strategy to complement facility-based management for areas that lack access to health facilities [7, 8]. With task shifting from health centers to the community, CCM can increase access to prompt and appropriate treatment of childhood illnesses by increasing the number of trained care providers at the community level [9, 10]. CCM models differ and can include integrated management of childhood illnesses given by nurses and CCM done by volunteer community health workers with limited (focused?) but appropriate training [6].

The cadre "Community health workers" (CHWs) include a variety of community health personnel selected, trained and working in their own communities [11]. CHWs range from salaried staff to volunteers, from simple educators to health care service providers, and from those specialized with regards to a population group (child health) or

disease (malaria) to generalists [12, 13]. CHW programs ballooned in the 1980s in the aftermath of the Alma-Ata Declaration of 1978 [1, 14]. However, interest in CWH programs waned in the 1990s, as a result of shifts in policies to World-Bank driven policies of structural adjustment and implementation failures due to unrealistic expectations, poor planning, problems of sustainability, and the difficulties of maintaining quality ([11]). There is renewed interest in CHW programs with the rationale that service needs, particularly in remote and underprivileged communities, are not fully met by existing health systems [11]. Facility-based services alone do not provide adequate access to treatment for childhood illnesses, thus the need to increase coverage at the community level [15]. Some national governments are making CHWs a cornerstone of scaling up community health delivery as a major part of strategies to reduce child mortality [16].

Sierra Leone has one of the world's highest U5 mortality rates at 140 deaths per 1,000 live births, most of which are due to neonatal causes (26%), malaria (27%), pneumonia (14%), and diarrhea (12%) [17, 18]. To address this, the government launched the Free Healthcare Initiative (FHCI) in April 2010, providing free services to pregnant and breastfeeding women, and children U5 accessing government healthcare facilities nationwide. Since the initiative's inception, health care use has increased by 60% [19].

Though the evidence on the effectiveness of CHWs in providing integrated CCM (ICCM) in Sub-Saharan Africa is growing [1, 8, 20-23], the evidence on CHWs' impact on health care seeking is limited. Also, no data exists on the deployment of CHWs in the context of free health care. The study aimed to investigate CHWs' contribution to increasing appropriate treatment coverage of childhood illness in the context of free

healthcare in Sierra Leone and specifically, to determine whether provision of ICCM by CHWs caused significant changes in care seeking and treatment of diarrhea, malaria and pneumonia in children U5 in two intervention districts (ICCM plus free health care) compared to two comparison districts (free health care alone), two years post intervention.

Methods

Intervention

The Health for the Poorest Quintile (HPQ) intervention was implemented a few months after the launch of the FHCI in late 2010 to early 2011 in two districts of Sierra Leone. The intervention was implemented by civil society organizations (CSOs) in districts with the highest U5 mortality and which also represent the poorest (worst-off fifth) quintile of the country. Using community health volunteers to provide ICCM to children U5, the project focused on the top three causes (besides neonatal causes) of U5 mortality in Sierra Leone: diarrhea, diagnosed symptomatically and treated with low osmolarity oral rehydration solution (ORS) and zinc); malaria, diagnosed symptomatically and treated with artesunate-amodiaquine combined therapy (ACT); and pneumonia, diagnosed using timers to assess respiratory rate and treated with cotrimoxazole. The intervention was implemented in Kambia district by IRC and CARE, and implemented in Pujehun district by Save the Children. IRC has previously implemented CCM programs in other districts of Sierra Leone as well other countries in Sub-Saharan Africa. CARE International has worked in Sierra Leone for decades on various projects including economic development, food security and public health. Save

the Children has provided maternal and child health intervention in Kailahun district and Freetown since 2006.

The CSOs worked with District Health Management Teams (DHMTs) and peripheral health units (PHU) staff to train and equip CHWs to diagnose, treat, and as necessary, refer children to health facilities. DHMTs and CSOs worked with UNICEF to procure and ensured a continuous supply of essential drugs and commodities throughout the duration of the program in the two intervention districts. The CSOs kept monthly reports on CHW supervision, drug supply and CHW reports on treatment and referral of children U5.

A total of 2,129 CHWs were recruited for the intervention, with a ratio of 2 CHWs per 100 children U5 (or per 100 households). A selection committee with members from participating CSOs, DHMTs and PHU staff and village council recruited CHWs for the intervention. The CHWs were non-paid volunteers, with limited or no literacy, and selected by their respective communities. They were trained for one week and provided drug kits with simplified algorithms for ICCM and a simple form for recording number of visits, treatments, and deaths. The algorithms and forms were developed in Sierra Leone for illiterate CHWs and had previously been used successfully in another district [24, 25]. Before implementation, CHW services and locations were announced in religious centers and during community functions. Community members received free treatment from CHW homes or from local health posts where volunteers sometimes provided care. In lieu of payment, volunteers received recognition from the community with extra help with household tasks such as farming and exemption from community labor such as building or repair of roads and bridges. Supervision of

volunteers took place on a monthly basis and included review of CHW reports and direct observation of CHWs during visits.

The intervention was rolled out in the districts using a staggered approach by cluster (i.e. town or cluster of villages). The program was implemented for a mean duration of 12.5 months (range: 3 – 20 months). Over half (53%) of the clusters had ICCM duration of more than 12 months, with some district differences. CHW treatment coverage was high with over 200,000 (212,985) children U5 seen over the project period. The highest proportion of treatments was for malaria with a total of 123,767 treatments given, followed by diarrhea treatment (47,904 treatments) and pneumonia treatment was the lowest with a total of 41,314 treatments [26].

Study Design

A quasi-experimental study design with intervention and comparison districts was used to evaluate the ICCM intervention effect on care seeking and treatment of malaria, diarrhea and pneumonia in children U5. Data were collected from a two-stage household cluster survey conducted at baseline in June-July 2010 and at endline in June-August 2012 in both intervention and comparison districts. The same clusters, sampling procedures, training, and questionnaire administration procedures were used for both surveys.

Study setting and participants

Sierra Leone is administratively divided into three provinces (Northern, Southern, and Eastern) and Western area, which includes the capital Freetown and its surrounding areas. Each province is subdivided into districts and each district into chiefdoms, with a total 14 districts and 149 chiefdoms [27]. The four intervention and comparison districts

(figure 1) were considered to be in the lowest socioeconomic quintiles of the country using a set of criteria, each ranked from worst to best per district. The selection criteria of study districts are discussed elsewhere [25].

In addition to the scores from the selection criteria, the presence of CSOs was mapped to determine districts that were least likely to have ongoing interventions. Kambia, from the Northern province and Pujehun, from the Southern province had the least number of CSOs and were therefore selected as the intervention districts. Kailahun (Eastern province) and Tonkolili (Northern province), among the lowest scoring districts were chosen to be the comparison districts, after disqualifying other low scoring districts that already had CCM [25]. The four study areas had a projected population of 300,000 - 400,000, of which 19% were children U5 [27].

The study population consisted of caregivers of children U5 residing in selected households with at least one U5 child. Caregivers provided information on disease prevalence, care seeking and treatment for children U5 in the two weeks prior to the surveys.

Survey sampling and data collection

Eligible households for the survey were selected using two-stage cluster sampling. Details of the survey sampling and data collection are described elsewhere [25]. Briefly, stage one included the selection of 50 clusters per district based on population proportionate to size (PPS) sampling for a total of 200 clusters. At stage two, 30 households were randomly selected in each selected cluster, for a total sample size of 6,000 households. Using personal digital assistants (PDAs) with global positioning systems, 13 teams of 3 interviewers and one supervisor conducted the household

enumeration and subsequent interviews. Interviewers with previous survey experience and appropriate linguistic skills similar to the districts' populations were recruited for data collection. Efforts were made to use the same interviewers for both household surveys and those with previous PDA experience. About one-third of interviewers participated in both baseline and endline surveys.

Questionnaires were written in English and verbally translated by interviewers into four common local languages preferred by the respondents (Krio, Mende, Temne and Limba), using standardized, pre-tested key words and/or information obtained on terminology from the baseline qualitative study [24, 25, 28]. Two days were devoted to translation and practice using translated common terms to ensure consistency during data collection. The translated terms were validated during the baseline formative research on care seeking and treatment practices for children U5. To ensure high quality data, the PDAs were preloaded with the questionnaires using Visual CE profession version 11 and included automated skip patterns and range and consistency checks.

Data analysis

The primary outcomes of interest include: two-week period prevalence, care seeking from an appropriate provider, appropriate treatment by symptom, and use of traditional treatment by symptom. For this study,

- *Two-week period prevalence:* proportion of children with ICCM symptoms (diarrhea, presumed malaria and/or presumed pneumonia) in the two weeks prior to the survey.
- *Presumed malaria*: having fever, which is the norm for a malaria-endemic country such as Sierra Leone.

- *Presumed pneumonia*: having a cough with difficulty breathing due to a problem in the chest, regardless of fever.
- *Care seeking from an appropriate* is defined as the proportion of children ill in the past 2 weeks for whom care was sought from healthcare professional (i.e. doctor or nurse) or a trained CHW and
- *Appropriate treatment*: proportion of ill children who received appropriate treatment for their symptom (anti-malarials including ACT for malaria, antibiotics including cotrimoxazole for pneumonia, and ORS and zinc for diarrhea) per Ministry of Health and Sanitation (MOHS) of Sierra Leone, UNICEF and WHO guidelines.
- *Traditional treatment*: having treatment besides syrups and pills provided by allopathic healthcare workers [24].

Proportions, odds ratios (ORs) and 95% confidence intervals (CI) were obtained in STATA 12 from bivariate and multivariable analyses weighted to account for the complex survey design and non-response [29]. Proportions in the intervention and comparison groups were compared at baseline and endline using a two-sided chi-square test. The comparison of the outcome variables between intervention and comparison districts adjusted for differences in the household characteristics (size, ethnicity, religion and wealth). A difference-in-differences (DID) analysis was conducted using a multivariable logistic regression model to determine: (1) whether the intervention significantly affected changes in care seeking and treatment and (2) whether the outcomes were significantly different between the intervention and comparison groups

over time, as measured by an interaction term. A two-sided p-value <0.05 was considered to be significant for all tests.

Ethical approval

The Ethics and Scientific Review Committee of the MOHS of Sierra Leone approved the study protocol. In each selected household, permission was asked of head of households to interview others in the household including girls 15 to 17 years of age. In addition, verbal consent was obtained from caregivers of children U5 who were 18 years of age and girls under 18 who were married or had children. Interviewers attempted to find a private area within the household to conduct interviews. Respondents were given a name and contact information of someone they can contact should they have any questions or concerns regarding the survey. Names or other individual identifying information collected as part of the interview were only used to determine which persons needed to be interviewed. Once those interviews were conducted and the data downloaded, all identifying information (e.g. names, GPS coordinates of households) was removed from the database.

Results

The survey response rate was high with 94% (5,239/5,643) and 96% (5,397/5,632) of caregivers of children U5 participating at baseline and endline, respectively. Information was collected on a total of 5,643 children (2,912 intervention, 2,731 comparison) at baseline and 5,259 children (2,279 intervention, 2,980 comparison) at endline.

Sample characteristics

Distribution of the sample characteristics at baseline and endline are displayed in Table 1. The number of U5 children in a household ranged from 1 to 6 with an average 1 and 1.4 per household at baseline and endline, respectively. No group differences existed for U5 and caregiver characteristics for both surveys. Caregivers of children U5 had a mean age of 29 years at baseline and 28 years at endline for both groups. Twenty-six percent (26%) and 23% of caregivers reported ever attending school at baseline and endline respectively.

There were significant group differences for some household characteristics. Islam was the predominant religion with 86% Muslim households in both groups and periods combined, though a significantly higher proportion of households in the intervention group identified as Muslim ($p<0.001$). The Mende ethnic group was the majority in intervention areas (51%), and the Temne ethnic group was the majority in the comparison areas (>40%). A higher proportion of intervention households were larger in size (58.1% vs. 40.8%, $p=0.001$) and polygamous (40.0% vs. 25.8%, $p<0.003$ at baseline, and 31.5% vs. 24.2%, $p=0.042$ at endline) for both surveys. The intervention group showed a 6% decrease in the proportion of poorest households between study periods ($p=0.026$), whereas the comparison group showed no change in wealth rank between surveys.

Disease prevalence and care seeking

Results comparing two-week disease prevalence, care seeking rate, and treatment coverage for the three illnesses by study group at baseline and endline are shown in Table 2. There was no significant baseline to endline difference in the two-week prevalence in both study groups. Prevalence was highest for malaria (66.7% at baseline and 62.5% at

endline); diarrhea prevalence was 25.1% at baseline and 26.0% at endline; and pneumonia prevalence was lowest at 19.7% for both survey periods, with the vast majority (90%) of pneumonia cases also reporting fever. The DID analysis showed no change in reported diarrhea (OR=1.16, 95%CI: 0.76-1.77) and presumed malaria (OR=1.0, 95%CI: 0.79-1.41). Reported pneumonia symptoms increased by almost 100% (OR=1.98, 95%CI: 1.20-3.28) in the intervention vs. comparison group at endline.

Reported care seeking (regardless of provider) was high (>80%) and mainly unchanged for all three illnesses in both study groups, though lower in the intervention group for both survey periods. However, care seeking from an appropriate provider increased significantly from baseline to endline, 35.3% to 57.1% ($p<0.001$) in the intervention and 36.9% to 48.9% ($p=0.004$) in the comparison group. Per DID analysis, the intervention increased care seeking from an appropriate provider by almost 50% for all three conditions combined (OR=1.48, $p=0.152$), though not significant.

Treatment coverage

Coverage of appropriate treatment increased in both study groups and for all three illnesses, and decreased significantly for traditional treatments in the intervention group (Figure 2). The DID analysis indicated no intervention effect in the change in diarrhea treatment with ORS and zinc (OR=1.08, 95%CI: 0.64-1.83) and malaria traditional treatment (OR=0.70, 95% CI: 0.31-1.34). The intervention was associated with a 38% reduction in malaria treatment with ACT (OR=0.62, 95%CI: 0.47-0.76), a 66% reduction in diarrhea traditional treatment (OR=0.44, 95%CI: 0.21-0.95), and a 100% increase in pneumonia treatment with cotrimoxazole (OR=2.00, 95%CI: 1.20-3.35).

A comparison in the changes in source of appropriate treatment is shown in Figure 3. In the intervention group, treatments provided by CHWs increased from 0 to 14.3% for all three conditions combined ($p<0.001$); 0% to 17% for diarrhea treatment with ORS and zinc ($p=0.019$), 0% to 11% for malaria treatment with ACT ($p<0.001$) and 0% to 23.6% for pneumonia treatment with cotrimoxazole ($p=0.046$). Government health facility treatments decreased by 16% (91% to 75%) for cotrimoxazole ($p=0.087$). In the comparison group, health facility treatments increased by 14% (80% to 94%) for ORS and zinc ($p=0.008$), by 7% (90% to 97%) for ACT ($p=0.001$) and by 29% (69% to 97%) for cotrimoxazole ($p=0.018$). The DID analysis indicate that the intervention was significantly associated with reduced health facility treatments for malaria (OR= 0.21, 95%CI: 0.07-0.62) and pneumonia (OR=0.01, 95%CI: 0.001-0.19). The intervention, however, did not have an effect on drug peddler use, which decreased for both study groups at endline.

Discussion

The study findings revealed baseline to endline changes in care seeking and treatment coverage for children U5 with diarrhea, malaria and/or pneumonia, and CHWs' influence on these changes across intervention and comparison areas. Though no major differences in U5 and caregiver characteristics between intervention and comparison groups, differences existed in household characteristics by polygamy, religion and ethnicity. Overall prevalence of the three conditions remained the same at both study periods.

Overall care seeking rates for the three conditions did not change over time and remained fairly high for both groups. However, care seeking from an appropriate

provider increased significantly for both groups. Coverage of appropriate treatment increased and traditional treatments decreased at endline, though some group and condition-specific differences existed. The intervention did not appear to have an effect on changes in appropriate treatment for diarrhea, which increased at similar rates for both intervention and comparison groups (24% increase in intervention vs. 23% increase in comparison). The intervention was however associated with increased appropriate treatment for pneumonia and decreased treatment for malaria with ACT and traditional treatments of diarrhea.

CHW presence did not appear to affect care seeking from an appropriate provider, which increased in both study groups. The little difference in care seeking between study groups may be due to the FHCI, as well as health education and promotion activities in the comparison districts. The non-strategic deployment of CHWs in the intervention districts with CHWs placed all over the districts regardless of accessibility of health facilities may also explain the similar increases in treatment coverage between the study groups. The higher coverage of malaria treatment with ACT in the comparison districts was likely due to nationwide stockout of ACT which affected intervention districts more than comparison districts. During the course of the intervention, the National Malaria Control Program implemented community-based treatment programs for malaria in both comparison districts, while another CSO implemented a malaria project in one of the comparison districts. The findings however showed that CHW presence in the intervention districts was associated with increased use of antibiotics for pneumonia, reduced use of traditional treatment for diarrhea and reduced health facility treatments for malaria. With malaria being the most reported symptom among children U5 in Sierra

Leone, reducing malaria treatment burden at health facilities frees up facilities to focus on more severe illnesses. This reduction can also be explained by the fact that health facilities use rapid diagnostic tests (RDTs) before providing treatment, whereas CHWs did not use RDTs at the time of the intervention. This has changed since the end of the intervention, with CHWs now trained to use RDTs for diagnosis before giving malaria treatment. The low odds ratio (OR=0.01) for the change in health facility treatments for pneumonia was most likely due to the small sample size for pneumonia treatments compared to the other two illnesses. There was a greater increase in health facility treatments for pneumonia (+29%) in the comparison group compared to the 16% decrease observed in the intervention group. Though the change in pneumonia facility treatments was statistically significant (p=0.002), the intervention was associated with a 1% decrease in pneumonia health facility treatments, which is programmatically a null finding (not much of a change). CHWs did not appear to have an effect on drug shops or peddler use, which was already low (14.9%) at baseline for both study groups; the proportion likely due to the fact that they charge money for treatments; whereas treatments were provided free of charge by CHWs and government health facilities.

In addition to free healthcare available to children U5 in government health facilities throughout Sierra Leone, the ICCM intervention was an added source of care. Typically, care available to sick children in Sierra Leone include home remedies, traditional healers, drug sellers, and governmental health facilities [28]. The intervention increased availability of appropriate care in the community and replaced traditional healers with CHWs.

Recent studies have demonstrated the effectiveness of CHW programs in Sub-Saharan Africa. CHWs influence care-seeking behavior and improve access to appropriate treatment of common childhood illnesses, particularly in hard-to-reach and poor areas [8, 20, 30-34]. A pre-post evaluation of a CHW program in two villages in Nigeria showed a CHW utilization rate of 26.1%, with decreased use of patent medicine dealers (44.8% to 17.9%) and slight increase in health facility use (30.2% to 32.2%) [32]. Results from an evaluation of malaria CCM pilot program in two hard-to-reach and poor districts of Kenya supported the assertion that CHWs can be influential in changing health seeking behavior of families [31, 32]. In Zambia, CHWs' provision of ICCM showed an increase in CHW use and a decrease in health facility use for children with fever and non-severe pneumonia [33]. Volunteer CHWs were credited with reduced child deaths and improved care-seeking practices for diarrhea and fever/malaria post intervention of a CHW program in rural Uganda [20].

Due in part to the FHCI and CHW intervention, there appeared to be a shift away from traditional remedies to allopathic treatment for childhood illnesses in Sierra Leone [24]. At baseline, there was a strong association of traditional treatment use and not seeking allopathic care [25]. Caregivers reported using traditional healers because they were nearby, had a more personal relationship with them than facility-based providers, and offered flexible payment mechanisms [24]. By the endline, there was an overall increase in seeking care at governmental health facilities followed by CHWs (in intervention districts) in all study districts. Like in Sierra Leone, some Sub-Saharan countries have removed user fees for U5 children at government health facilities, in an effort to meet MDG 4 goals [35-37]. The number of consultations for curative care at

health facilities doubled after the introduction of free primary health care in South Africa [37]. In rural Niger, the 3.5 times increase in reported care seeking from health facilities for pediatric diarrhea was attributed to the abolition of user fees [35]. The situation was opposite in Uganda, where despite the removal of user fees at government health facilities, the majority (two-thirds) of children were taken to drug shops and private clinics for malaria treatment due to proximity and treatment availability on credit [36]. CHWs, who are from the communities in which they provide treatments, appeared to have similar personal relationships with caregivers as the traditional healers in the intervention districts. Findings from the endline qualitative study showed there was good understanding of the role of CHWs among communities and they are generally perceived to provide helpful services, with respondents stating that they strongly value their work [38].

With increasing care seeking from an appropriate provider in the study districts, there is a need to ensure availability and adequacy of services at both facility and community levels in Sierra Leone. Studies have shown that the removal of user fees are not enough to address community demand for access to prompt and affordable care for children [36]. Despite free healthcare, there are still costs involved in seeking care such as transportation costs, time away from home, and facilities still charging unofficial fees [36, 39]. FHCI led to increases in seeking treatment at the health facility level, putting a burden on an already weak health care infrastructure with limited staff, inadequate drugs and supplies, and long distances to health facilities [19, 39, 40].

The use of CHWs has been identified as a strategy to address the growing shortage of health workers in low-income countries. With task shifting from health

centers, CHWs can increase the number of care providers at the community level [10],[23]. Compared to health facilities, CHWs are geographically closer and available; they are from the community and therefore overcome cultural and linguistic barriers that may be present in health facilities [41].

Evidence on the deployment of CHWs to provide ICCM in the context of free health care is limited in Sub-Saharan Africa. The Sierra Leone MOHS recently developed a CCM policy using CHWs to supplement professional health care providers. The results of this study will provide additional evidence to the MOHS and other resource-poor countries currently contemplating developing and/or expanding CHW programs, particularly those that have abolished user fees at government health facilities.

Limitations

The study comes with some limitations. Due to the quasi-experimental design of the study (i.e. not a cluster randomized trial with only 4 districts), there could be substantial confounding associated with other district-level characteristics. The use of a comparison group however allowed us to measure care seeking and treatment coverage likely to be achieved in the absence of the intervention. Data on care seeking and treatment was based on the recollection of caregivers and may be subject to recall bias. However, the two-week recall period is the standard for household surveys (i.e. DHS and MICS) conducted in developing countries, and has been shown to produce accurate data on child morbidity and care seeking. The interpretation of treatment coverage for suspected pneumonia can be problematic since the denominator of suspected pneumonia may have included a number of cases that were not true pneumonia due to the overlap of pneumonia and malaria symptoms [42].

Reported CHW use may have been underestimated due to some caregivers confusing CHWs with community health officers (CHOs) who are paid facility health personnel or confusing CHWs with health facility staff at PHUs. However, efforts were made during interviewer training and data collection to provide clear definitions of who CHWs were in order to minimize confusion with CHOs and other provider types. The non-comparability of study areas likely affected study results. Though all fairly poor and underserved districts, the two poorest districts were targeted for the ICCM intervention, leaving slightly better off districts for comparison. The baseline differences between study groups were adjusted for in the DIDs analysis, which still showed some CHW effect.

The implementation of the intervention by different CSOs in the two districts might have also affected the study results. However, efforts were made to ensure that the CSOs worked as a consortium using the same criteria for CHW selection, training and program monitoring. The staggered rollout of the intervention may have resulted in varying levels of exposure to the intervention by cluster. In one intervention district, over half (54.2%) of children U5 lived in clusters with less than 12 months of program duration, which might not have been adequate for program saturation.

Conclusion

The study demonstrates that availability of CHWs can influence care seeking and treatment for children U5 ill with diarrhea, malaria, and/or pneumonia. They successfully provided appropriate treatment and reduced treatment burden at health facilities and caregiver reliance on traditional treatments. Despite the FHCI presence in all districts,

CHWs still accounted for a significant proportion of treatments delivered in intervention districts, showing acceptability of CHW as providers and part of the formal health sector.

With the challenges currently faced by Sierra Leone's health system (limited facilities, acute shortage in healthcare personnel, long distances to health facilities in rural areas), availability of trained and supervised CHWs can be an addition to improve provision of free healthcare in the country. However, further research is needed to determine which groups would benefit the most from CHW services and how to effectively and sustainably support CHWs as an integrated part of the health system.

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also want to thank Dalan Development Consultants, Freetown Sierra Leone, who conducted the fieldwork of the qualitative study.

Figure 14 Paper 1 Figures

Figure 1 - HPQ study districts

Map of Sierra Leone, showing the four study districts (two intervention districts in blue and two comparison districts in green).

Figure 2 - Changes in baseline to endline coverage of appropriate and traditional treatments

The figure shows a graph of baseline to endline percentage changes in coverage of appropriate and traditional treatments for diarrhea, malaria and pneumonia symptoms. The graph shows the changes in the intervention group (on the left) and the changes in the comparison group (on the right).

Figure 3 - Changes in baseline to endline source of appropriate treatments

The figure shows baseline to endline percentage changes in source of appropriate treatment.

Figure 1: Study Districts

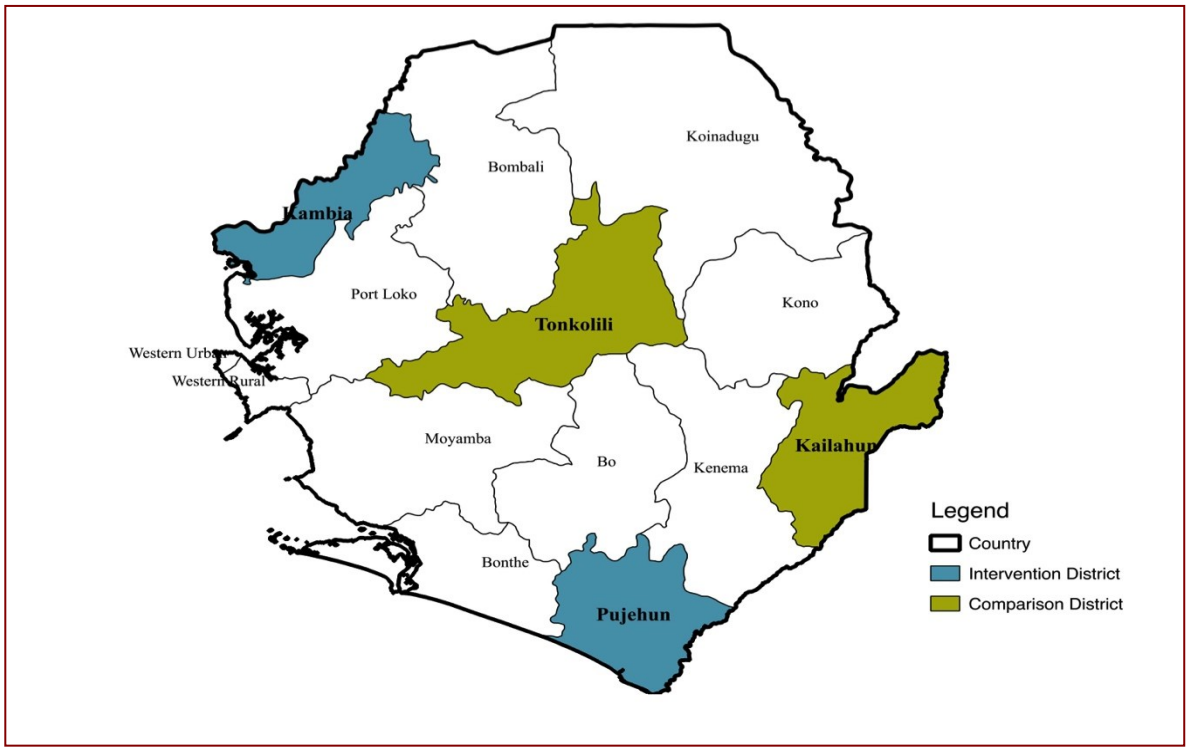
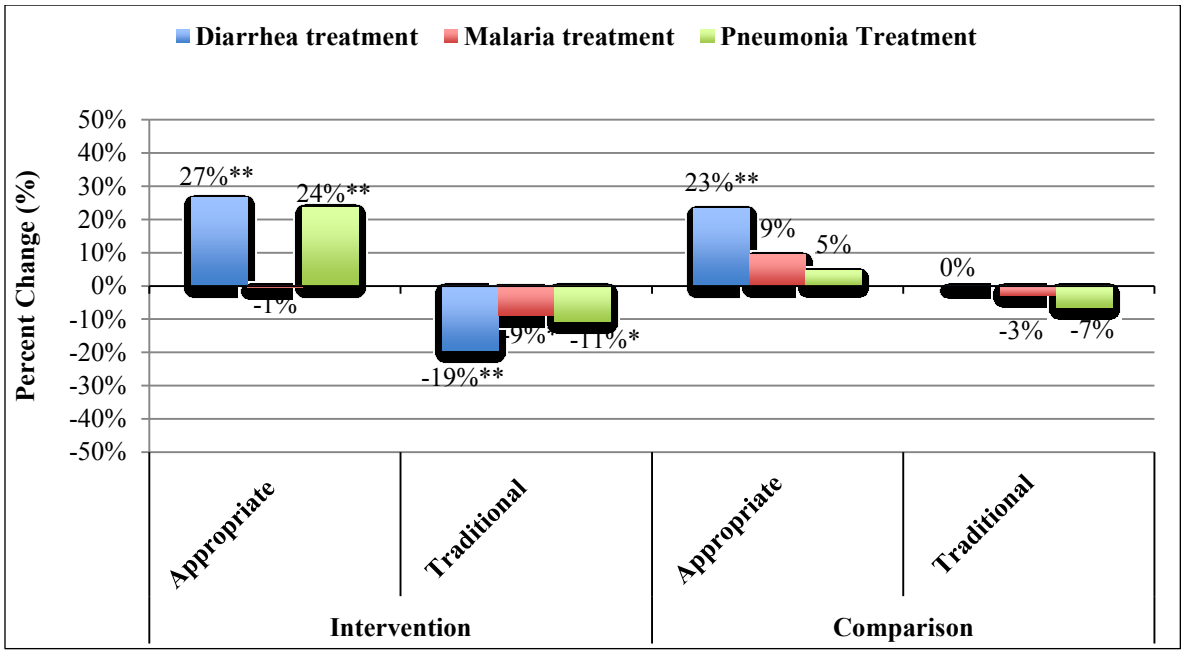
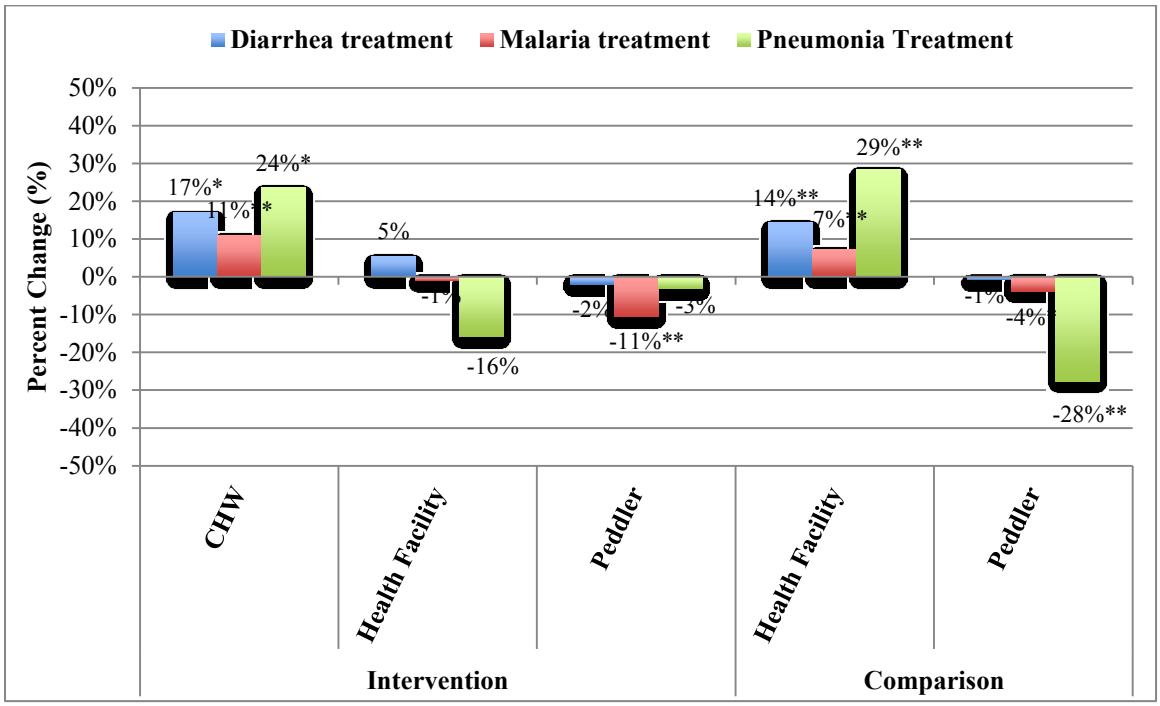


Figure 2 - Baseline to Endline Coverage Changes in Appropriate and Traditional Treatments, Intervention and Comparison Groups, Sierra Leone 2010 to 2012



*Significant change with p-value<0.05; ** Significant change with p-value<0.01

Figure 3 - Baseline to Endline Changes in Source of Appropriate Treatments, Intervention and Comparison Groups, Sierra Leone 2010 to 2012



*Significant change at α-level=0.05; ** Significant change at α-level=0.01

Table 5 Paper 1 Tables

Table 1 - Distribution of child, caregiver, and household characteristics

Table 1 shows the study group comparisons of child, caregiver and household characteristics at baseline (2010) on the left side of the table and at endline (2012) on the right side of the table

Tables 2 - Disease prevalence, care seeking and treatment coverage

Table 2 shows the baseline (2010) and endline (2012) differences in 2-week prevalence, care seeking, and treatment coverage for the three ICCM conditions by study group. The last column of the table shows the HPQ intervention effect on disease prevalence, care seeking and treatment coverage through the DID estimator (intervention differences – comparison differences) and whether the effect is significant.

Table 3 – Source of appropriate treatment

Table 3 shows the baseline and endline differences in appropriate treatment by provider type (health facility personnel, CHW, drug shop/peddler) and study group for the three ICCM conditions. The last column shows the intervention effect on the baseline to endline differences in appropriate treatment by provider through the DID estimator (intervention differences – comparison differences) and whether the effect is significant.

Table 1 - Distribution of child, caregiver, and household characteristics by study group, Sierra Leone, 2010 and 2012

Characteristic	Baseline (2010) Intervention (N=2,912)	Comparison (N=2,731)	p-value[1]	Endline (2012) Intervention (N=2,279)	Comparison (N=2,980)	p-value[1]
	% (95%CI*)	% (95%CI*)		% (95%CI*)	% (95%CI*)	
Child's age (months)			0.416			0.950
0-11	24.9 (22.2-27.6)	23.5 (21.5-25.5)		20.4 (17.3-23.4)	19.7 (16.1-23.3)	
12-23	19.7 (18.4-21.0)	18.9 (17.2-20.6)		17.2 (13.8-20.6)	17.1 (14.5-19.7)	
24-59	55.4 (52.5-58.2)	57.6 (55.1-60.1)		62.4 (58.0-66.9)	63.2 (59.7-66.7)	
Child's gender			0.0601			0.206
Male	51.6 (48.7-54.6)	48.1 (45.9-50.4)		53.1 (49.0-57.2)	49.5 (45.8-53.3)	
Female	48.4 (45.4-51.3)	51.8 (49.6-54.1)		46.9 (42.8-51.0)	50.5 (46.7-54.2)	
Caregiver's age (years)			0.926			0.004
15-29	53.0 (49.8-56.3)	53.3 (48.6-58.0)		45.9 (41.6-50.3)	54.9 (50.6-59.2)	
>30	47.0 (43.7–50.2)	46.7 (42.0-51.4)		54.0 (49.7-58.4)	45.1 (40.9-49.4)	
Caregiver education level			0.363			0.878
None	74.5 (69.5-79.4)	76.5 (72.3-80.8)		79.2 (74.9-83.5)	77.6 (73.2-81.4)	
Primary	17.4 (13.2-21.4)	14.0 (10.7-17.2)		10.9 (8.0-13.7)	12.1 (8.8-15.4)	
Secondary	8.1 (5.7-10.7)	9.5 (6.4-12.5)		10.0 (7.1-12.8)	10.3 (7.5-13.1)	
Household size			0.001			0.119
≤6 people	41.9 (36.9-46.8)	59.2 (52.2-66.1)		58.8 (51.0-66.5)	65.9 (61.0-70.8)	
>6 people	58.1 (53.2-63.1)	40.8 (33.9-47.8)		41.2 (33.5-49.0)	34.1 (29.2-39.0)	
Polygamous Households	40.0 (35.0-44.3)	25.8(18.7-32.9)	0.003	31.5 (26.3-36.8)	24.2 (19.5-29.0)	0.042
Household Religion			0.000			0.000
Christian	5.8 (3.5-8.1)	23.0 (16.6-29.3)		5.0 (2.1-7.8)	19.6 (14.6-24.5)	
Muslim	94.2 (91.9-96.5)	77.0 (70.7-83.4)		95.0 (92.2-97.9)	80.4 (75.5-85.4)	
Household Ethnicity			0.020			0.011
Mende	42.1 (30.6-53.6)	27.9 (17.2-38.6)		60.0 (48.2-71.7)	39.4 (26.9-52.0)	
Temne	35.1 (25.3-44.8)	56.5 (44.2-68.8)		25.6 (15.2-36.0)	48.6 (36.3-61.0)	
Other**	22.8 (15.3-30.3)	15.6 (9.0-22.2)		14.5 (7.7-21.3)	12.0 (8.8-16.9)	
Household wealth rank***			0.060			0.004
Poorest	17.7 (13.2-22.2)	24.9 (19.8-30.0)		12.1 (8.4-15.7)	22.2 (16.9-27.5)	
Poor	61.9 (57.1-66.7)	59.3 (54.7-64.0)		60.9 (54.8-67.0)	58.7 (53.1-64.4)	
Least Poor	20.4 (15.8-25.0)	15.8 (11.7-19.9)		27.1 (21.3-32.8)	19.1 (13.9-24.3)	

[1]Based on two-sided chi-square test for general association

*Confidence Interval **Other = Susu, Limba, Kissi, Koronko and other. ***'Poorest' and 'Least Poor' defined by lowest and highest wealth quintiles based on principal components analysis (PCA) of household assets.

Table 2: Disease prevalence, care seeking and treatment coverage among children U5 at baseline and endline by study group, Sierra Leone 2010 and 2012

Measure	Intervention			Comparison			DID estimator	
	Baseline	Endline	p-value[1]	Baseline	Endline	p-value[1]	OR	p-value[1]
	% (95%CI*)	% (95%CI*)		% (95%CI*)	% (95%CI*)			
2-week Disease Prevalence								
	(N=2,912)	(N=2,279)		(N=2,731)	(N=2,980)			
Diarrhea	25.8 (22.6-29.0)	28.2 (23.4-32.9)	0.445	24.3 (20.7-27.9)	24.6 (19.9-29.2)	0.909	1.16 (0.76-1.77)	0.491
Presumed Malaria	66.9 (62.6-71.3)	62.0 (58.1-65.9)	0.116	66.6 (63.1-70.1)	62.5 (58.1-66.9)	0.123	0.99 (0.79-1.41)	0.985
Presumed Pneumonia	17.7 (12.9-22.5)	23.2 (19.0-27.3)	0.083	21.8 (18.8-24.8)	17.8 (13.8-21.8)	0.104	1.98 (1.20-3.28)	0.009
Care seeking for children ill in past 2 weeks								
All conditions combined	(N=1,980)	(N=1,657)		(N=1,962)	(N=2,102)			
Any care sought	85.6 (82.7-88.5)	82.3 (78.2-86.6)	0.209	90.0 (88.8-92.2)	88.8 (84.9-92.7)	0.616	0.92 (0.87-2.53)	0.786
Care sought	(N=1,696)	(N=1,357)		(N=1,776)	(N=1,907)			
*Appropriate provider***	35.3 (29.2-41.4)	57.1 (49.9-64.3)	0.000	36.9 (30.4-43.3)	48.9 (40.9-56.8)	0.004	1.48 (0.87-2.53)	0.152
Treatment coverage for whom care was sought								
Diarrhea treatment	(N=611)	(N=510)		(N=635)	(N=645)			
ORS and zinc	36.9 (28.4-45.5)	63.4 (52.5-74.3)	0.000	36.3 (30.2-42.4)	59.5 (47.8-71.3)	0.000	1.08 (0.64-1.83)	0.728
Traditional treatment	30.0 (21.9-38.0)	10.6 (5.1-16.0)	0.001	21.8 (15.0-28.6)	21.5 (14.0-29.0)	0.944	0.44 (0.21-0.95)	0.037
Malaria treatment	(N=1,537)	(N=1,104)		(N=1,600)	(N=1,636)			
ACT	37.7 (31.9-43.4)	37.1 (28.9-45.3)	0.879	35.4 (27.7-43.2)	44.8 (36.9-52.8)	0.063	0.62 (0.47-0.76)	0.040
Traditional	21.0 (15.4-26.8)	12.1 (7.5-16.7)	0.026	14.8 (9.8-19.6)	11.8 (7.3-16.3)	0.364	0.65 (0.31-1.34)	0.239
Pneumonia treatment	(N=367)	(N=429)		(N=538)	(N=458)			
Cotrimoxazole	17.1 (10.1-24.0)	40.8 (29.6-52.1)	0.001	19.3 (13.4-25.2)	23.9 (15.0-32.8)	0.359	2.00 (1.20-3.35)	0.008
Traditional	19.4 (12.2-26.9)	8.6 (2.6-15.0)	0.041	20.9 (14.1-27.8)	14.4 (7.0-21.7)	0.188	0.63 (0.30-1.32)	0.218

[1]Based on two-sided chi-square tests.

*Confidence Interval; DID= (baseline/endline differences in intervention group) – (baseline/endline differences in comparison group), adjusted for differences in group differences in household size, religion, ethnicity and wealth; **Appropriate provider – provider (health care professional or CHV) who has received training in provision of appropriate treatment of the 3 ICCM conditions

Table 3- Changes in source of appropriate treatment for children ill with diarrhea, malaria and/or pneumonia in past 2 weeks, Sierra Leone, 2010 to 2012

Treatment	Intervention			Comparison			DID estimator	
	Baseline	Endline	p-value[1]	Baseline	Endline	p-value[1]	OR	p-value[1]
	% (95%CI*)	% (95%CI*)		% (95%CI*)	% (95%CI*)			
Diarrhea treatment with ORS and zinc	**(n=206)**	**(n=282)**		**(n=228)**	**(n=399)**			
CHW	0	17.0 (4.3-30.0)	0.019	0	0	--	--	
Government health facility	73.7 (61.9-85.5)	79.1 (65.6-92.7)	0.583	79.5 (71.4-87.6)	93.8 (88.6-99.0)	0.001	0.27 (0.55-1.33)	0.107
Drug shop/peddler	3.2 (-2.0-8.4)	1.1 (-0.4-2.7)	0.310	4.0 (0.9-7.1)	3.3 (-0.4-7.0)	0.723	0.57 (0.31-10.34)	0.700
Malaria treatment with ACT	**(n=588)**	**(n=412)**		**(n=614)**	**(n=790)**			
CHW	0.2* (-0.2-0.5)	11.0 (3.8-17.9)	0.000	1.3 (0.0-2.5)	0	0.04	--	
Government health facility	86.7 (82.1-91.3)	85.8 (78.3-93.2)	0.710	90.0 (85.3-94.5)	97.3 (95.5-99.1)	0.001	0.21 (0.07-0.62)	0.005
Drug peddler/drug shop	12.4 (7.8-17.0)	1.4 (-0.3-3.1)	0.000	6.1 (3.4-8.8)	2.3 (0.7-3.9)	0.018	0.33 (0.07-1.56)	0.161
Pneumonia treatment with Cotrimoxazole	**(n=79)**	**(n=170)**		**(n=106)**	**(n=120)**			
CHW	0	23.6 (4.6-42.5)	0.046	0	0	--	--	
Government health facility	91.0 (82.2-99.9)	75.1 (56.3-94.0)	0.087	68.7 (56.0-81.4)	97.2 (91.5-100)	0.002	0.01 (0.001-0.19)	0.002
Drug shop/peddler	4.5 (0.1-8.8)	1.3 (-0.7-3.4)	0.256	30.3 (18.8-48.8)	2.7 (-2.9-8.5)	0.003	6.27 (0.54-72.88)	0.141

[1]Based on two-sided chi-square tests; *Confidence Interval

DID= (baseline/endline differences in intervention group) – (baseline/endline differences in comparison group), adjusted for differences in group differences in household size, religion, ethnicity and wealth

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Chapter 7: Paper 2

Care seeking, treatment and community health worker utilization for childhood illnesses in two districts of Sierra Leone

Abstract

Background

In 2010, the Health for the Poorest Quintile (HPQ) intervention deployed trained community health workers (CHWs) to provide integrated and appropriate community case management of diarrhea, malaria and pneumonia to children U5 in two underserved districts of Sierra Leone (Kambia and Pujehun).

Methods

The study examined care seeking, treatment and factors associated with CHW utilization for children U5 with diarrhea, malaria and/or pneumonia symptoms in the two intervention districts. A cross-sectional household-cluster survey was conducted among caregivers of children U5 after two years of program implementation.

Results

Data were collected on a total of 2, 279 children U5. Disease prevalence, appropriate care seeking and treatment were high in both districts, with significant between-district differences. Overall, 73.6% of children were reported ill in the two weeks prior to the survey (28.2% with diarrhea, 62% with malaria and 23.2% with pneumonia symptoms). Overall disease prevalence and care seeking from an appropriate provider were higher in children from Kambia (78.8% vs. 70%, p=0.028 for disease prevalence; 65.9% vs. 51.2%, p=0.042 for care seeking) than children from Pujehun; prompt care seeking was

higher (37.8% vs. 15.7%, p<0.001) in children from Pujehun. Appropriate treatment was high and traditional treatment was low in both districts with most treatments provided by government health facilities followed by CHWs. For the 777 children U5 for whom treatment was sought, 14.0% received treatment from a CHW; by symptom, 17% received diarrhea treatment with ORS and zinc, 11% received malaria treatment with ACT, and 23.6% received pneumonia treatment with cotrimoxazole from a CHW. Children with diarrhea symptoms (OR=3.04, 95%CI: 1.10-8.42), who are from female-headed (OR=5.13, 95%CI: 1.94-13.55) or poorest households (OR=5.9, 95%CI: 1.20-33), and whose caregivers reported poor quality of care as a barrier to seeking care at a health facility (OR=6.10, 95%CI: 2.52-14.72) were more likely to receive treatment from a CHW.

Conclusion

Though utilization was fairly low, CHW use was greater for children from disadvantaged backgrounds (poorest and female-headed) and whose caregivers reported poor facility quality of care as a barrier to accessing care.

Keywords: community health worker, integrated community case management, children U5, care seeking, health care utilization, Sierra Leone

Introduction

Sierra Leone has some of the poorest child survival indicators in the world, with an under-five mortality rate (U5MR) of 140 deaths per 1,000 live births, half of which are due to pneumonia, diarrhea, and malaria [1, 2]. Access to health care has been a major problem in Sierra Leone. The country's 10-year civil war in the 1990s virtually destroyed the health infrastructure, resulting in an acute shortage of health professionals. Sierra Leone has less than 10% of the health workers it needs to meet the UN's minimum threshold with an average of less than 5 health workers per 100,000 population [3]. Other country-specific factors affecting access to healthcare include previously high user fees, inadequate number of healthcare facilities; long travel times to health centers given poor road conditions; poorly trained and motivated staff; and lack of equipment and supplies in health facilities [4, 5]. Low levels of confidence in the quality of health care also negatively affected demand [5]. Despite these challenges, various treatment options are available to children U5 including home remedies, traditional healers, drug seller (i.e. peddlers), government peripheral health facilities (PHUs) and more recently CHWs [6].

Sierra Leone's Millennium Development Goal 4 is to reduce U5MR to 95 per 1,000 live births by 2015 [4]. In an effort to meet the MDG 4 goals as well as address some inequities in child health, the government launched the national Free Healthcare Initiative (FHCI) in April 2010, an initiative providing free basic health care to pregnant and lactating women and children U5 accessing government healthcare facilities. Shortly after the launch of the FHCI, trained community health workers (CHWs) were deployed to provided integrated community case management (ICCM) of diarrhea, malaria and pneumonia in two underserved districts of Sierra Leone.

The cadre "Community health workers" (CHWs) include a variety of community health personnel selected, trained and working in their own communities [7]. CHWs range from salaried staff to volunteers, from simple educators to health care service providers, and from those specialized with regards to a population group (child health) or disease (malaria) to generalists [8, 9]. CHW programs ballooned in the 1980s in the aftermath of the Alma-Ata Declaration of 1978 [10, 11]. However, interest in CHW programs waned in the 1990s, as a result of shifts in policies to World-Bank driven policies of structural adjustment and implementation failures due to unrealistic expectations, poor planning, problems of sustainability, and the difficulties of maintaining quality [7].

There is renewed interest in CHW programs with the rationale that service needs, particularly in remote and underprivileged communities, are not fully met by existing health systems, particularly considering the shortage of health workers in low income countries [7, 12]. Compared to health facilities, CHWs are geographically closer and available; they are from the community and therefore overcome cultural and linguistic barriers that may be present in health facilities [13]. Some national governments are making CHWs a cornerstone of scaling up community health delivery as a major part of strategies to reduce child mortality [14]. With the recent resurgence of CHW programs in Sub-Saharan Africa, more evidence is needed on their acceptability and utilization. The study examined care seeking, treatment and factors associated with CHW utilization in the two intervention districts, two years post implementation.

Methods

Study design

A cross-sectional household cluster survey of caregivers of children U5 was conducted in July to August 2012, two years after ICCM implementation. Data on care seeking and treatment was collected from a total of 1,590 caregivers from randomly selected households in the two intervention districts.

Intervention

The intervention was part of the Health for the Poorest Quintile (HPQ) project implemented in 2010 by two civil society organizations (CSOs), CARE/International Rescue Committee in Kambia and Save the Children in Pujehun. HPQ provided high-impact treatment interventions to districts with the highest under-5 mortality and representing the poorest (worst-off fifth quintile) of districts in three countries Sierra Leone, Indonesia, and Uganda), with focused interventions based on diseases that cause the greatest number of deaths in children U5. The intervention focused on the top three causes (besides neonatal causes) of U5 mortality in Sierra Leone: diarrhea, diagnosed symptomatically and treated with low osmolarity oral rehydration solution (ORS) and zinc); malaria, diagnosed symptomatically and treated with artesunate-amodiaquine combined therapy (ACT); and pneumonia, diagnosed using timers to assess respiratory rate and treated with cotrimoxazole. The CSOs worked with District Health Management Teams (DHMTs) and peripheral health units (PHU) staff to train and equip CHWs to diagnose, treat, and as necessary, refer children to health facilities. CSOs monitored program progress through monthly reports of CHW supervision, treatment and referral of children U5, and drug supply.

A total of 2,129 CHWs were recruited within a two-year period in the two districts, with a ratio of 2 CHWs per 100 households. The majority of CHWs were

recruited and trained in 2011 (1,691), with 233 in 2010 and 205 in 2012. The CHWs were non-paid volunteers, with limited or no literacy, and selected by their respective communities. They were trained for one week on the integrated management of childhood illnesses and provided drug kits with simplified algorithms for ICCM and a simple form for recording number of visits, treatments, and deaths. The algorithms and forms were developed in Sierra Leone for illiterate CHWs and had previously been used successfully in another district [15, 16]. Refresher trainings were provided to CHWs after one year after providing care. Before implementation, CHW services and locations were announced in religious centers and during community functions. Community members received free treatment from CHW homes or from local health posts where volunteers sometimes provided care. In lieu of payment, volunteers received recognition from the community with extra help with household tasks such as farming and exemption from community labor such as building or repair of roads and bridges. Supervision of volunteers took place on a monthly basis and included review of CHW reports and direct observation of CHWs during visits.

Study area and participants

The intervention districts, Kambia and Pujehun (shown in figure 1) represented two of the poorest districts based on immunization coverage; nutritional status of under fives using severe stunting; availability of emergency obstetric and neonatal care (EmONC); per capita expenditure on health per district; and presence of CSOs [16]. Kambia district is in the northwestern part of the country and borders the Republic of Guinea; the district is majority Temne, followed by Susu and Limba ethnic groups. Pujehun district is at the southern most part of the country, borders the Republic of

Liberia and almost universally Mende in ethnicity. Each district has an estimated total population of 300,000; 19% of which are children U5 (58,000-59,000) [17].

Access to care is similar in the two districts with a ratio of 10-11 PHUs (primary health care facilities) per 10,000 children U5. As of March 2011, Kambia had a total of 67 health facilities (62 PHUs, 1 government hospital, and 4 private health centers) and Pujehun had a total of 58 facilities (57 PHUs and 1 government hospital) [18].

Data collection

Eligible households were selected using two-stage cluster sampling. Details of the survey sampling and data collection are described elsewhere [16]. Briefly, stage one included the selection of 50 clusters per district based on population proportionate to size (PPS) sampling for a total of 100 clusters. At stage two, 30 households were randomly selected in each selected cluster, for a total sample size of 3,000 households. Using personal digital assistants (PDAs) with global positioning systems, six teams of three interviewers and one supervisor conducted the household enumeration and subsequent interviews. Questionnaires were written in English and verbally translated by interviewers into local languages preferred by the respondents, using standardized, pre-tested key words and/or information obtained on terminology from the baseline qualitative study [6, 15, 16]. To ensure high quality data, the PDAs were preloaded with the questionnaires using Visual CE profession version 11 and included automated skip patterns and range and consistency checks.

Data analysis

The primary variables of interest include: two-week period prevalence, care seeking from an appropriate provider, appropriate treatment by symptom, and use of

traditional treatment by symptom. These variables are described elsewhere (paper 1). *CHW utilization* was measured as the proportion of children U5 with iCCM symptoms who received appropriate treatment from a CHW.

Proportions, odds ratios (ORs) and 95% confidence intervals (CI) were obtained in STATA 12 from bivariate and multivariable analyses weighted to account for the complex survey design and non-response [19]. Factors associated with CHW utilization were examined using bivariate and multivariable logistic regression. In the bivariate analysis, CHW utilization was compared with child, caregiver, household and district levels characteristics. Variables considered important from the literature and that showed significant association in the bivariate analysis were included in the multivariable logistic model to identify significant factors associated with receiving treatment from a CHW (utilization). The odds ratio (OR) significance level was calculated using the chi-square test of homogeneity. A two-sided p-value <0.05 was considered to be significant for the most tests, except for the bivariate logistic regression model (which used a level of 0.10).

Ethical approval

Permission was asked of head of households to interview others in the household including girls 15 to 17 years of age. In addition, verbal consent was obtained from caregivers of children U5 who were 18 years of age and girls under 18 who were married or had children. Interviewers attempted to find a private area within the household to conduct interviews. Respondents were given a name and contact information of someone they can contact should they have any questions or concerns regarding the survey. Names or other individual identifying information collected as part of the interview were only used to determine which persons needed to be interviewed. Once those interviews were

conducted and the data downloaded, all identifying information (e.g. names, GPS coordinates of households) was removed from the database.

The Ethics and Scientific Review Committee of the Ministry of Health and Sanitation of Sierra Leone reviewed and approved the study protocol.

Results

Study characteristics

Information was gathered on a total of 2,279 children U5 (838 in Kambia and 1,441 in Pujehun) with significant district differences by socio-demographics and program duration, shown in Table 1. About three-fourths (73%) of children in Kambia and 54.3% of children in Pujehun lived in clusters where the program had been implemented for less than 12 months (p=0.022). Kambia district had higher proportion of male children (60.7% vs. 48.4%, p=0.002), lower proportion of caregivers who attended school (16.9% vs. 24%, p=0.095), more polygamous households (41.4% vs. 25.3%; p=0.003), lower proportion of female-headed households (31.6% vs. 46.4%; p=0.005) and longer program duration (72.8% vs. 45.8% U5 living in clusters with over 1 year program duration, p=0.0216). The districts also differed by ethnicity with a Temne majority (65%) in Kambia and almost universal Mende ethnic group (97%) in Pujehun.

Care seeking and Treatment

Tables 2 show overall and district comparisons of disease prevalence, care seeking and treatment coverage for diarrhea, malaria and pneumonia in children U5 in the two intervention districts. About three-fourths of children (73.3%) were reported ill with some symptom in the two weeks preceding the survey, the majority reported with multiple symptoms. As for the 3 ICCM conditions, 28.2% (95% CI: 23.7% - 32.6%) of

children were reported with diarrhea symptoms, 62.0% (95%CI: 58.1% - 65.9%) reported with malaria symptoms, and 23.2% (95%CI: 19.1% - 27.3%) with pneumonia symptoms. Children from Kambia had higher prevalence of reported diarrhea (39.8% vs. 21.0%, $p<0.001$) and pneumonia (30.6% vs. 18.5%, $p=0.005$) than children from Pujehun. Care seeking from appropriate provider was higher for children in Kambia (65.9% vs. 51.2%, $p=0.0418$) for all three conditions combined. Prompt care seeking was however significantly higher for children from Pujehun (37.8% vs. 15.7%; $p<0.001$) compared to children from Kambia.

Figure 2 shows common reported barriers to seeking care at a health facility for a child's illness, which include getting permission to seek care, going alone to a health facility, money for treatment, and distance to and quality of care at health facility. The most common reported barriers in the two districts combined were getting money for treatment (75.4%, 95%CI: 70.8% - 80.0%), distance (64.5%, 95%CI: 56.3% - 72.6%), and poor facility quality of care (53.5%, 95%CI: 45.5% - 61.3%). Less than a third of caregivers reported getting permission (18.3%, 95%CI: 13.9% - 22.7%) and going alone (30.6%, 95%CI: 24.6% - 36.6%) as barriers to accessing health facilities.

Overall coverage of appropriate treatment for children U5 was similar in both districts (70.1% in Kambia vs. 62.2% in Pujehun, $p=0.265$). However, by symptom, children from Pujehun had higher coverage of malaria treatment with ACT (45.2% vs. 23.4%, $p=0.004$), while children from Kambia had higher coverage of pneumonia treatment with antibiotics (62.2% vs. 19.8%, $p<0.001$). Traditional treatments were also similar between districts (12.4% Kambia and 13.6% Pujehun).

Overall 14.0% of appropriate treatments were provided by CHWs for all 3 illnesses and districts combined, with no significant difference by district (11.8% in Kambia vs. 15.8% in Pujehun). However, the majority of appropriate treatments were provided by government health facilities, (figure 3 and Table 3).

Factors associated with CHW utilization

Table 4 shows child, caregiver, household, and district-level factors associated with CHW utilization derived from bivariate logistic regression analysis. CHW utilization was lower for children in clusters with longer program duration compared to clusters with shorter program duration (<12 months) (OR=0.40, 95%CI: 0.14-1.16), though not statistically significant. By child-level factors, there were no significant associations between CHW utilization and age and sex of the child. Children with reported diarrhea symptoms were 2.2 times more likely to receive treatment from a CHW (OR=2.18, 95%CI: 0.88-5.39), with no significant association for the other symptoms.

No significant associations existed for CHW utilization by caregiver age and educational status. By reported barriers to accessing care at a health facility, CHW utilization was significantly higher among caregivers who reported poor health facility quality of care (OR=4.56, 95%CI: 2.10-9.93) and lower among those who reported going alone to a health facility as a barrier (OR=0.29, 95%CI: 0.11-0.81). CHW utilization was not significantly associated with the following reported barriers: permission to seek care (OR=0.4, 95%CI: 0.10-2.84); getting money for treatment (OR=1.12, 95%CI: 0.46-2.71); and distance to health facility (OR=0.96, 95%CI: 0.34-2.75). CHW utilization was higher among children from female-headed households (OR=2.19; 95%CI: 0.87-5.46) and lower for children from least poor households (OR=0.20, 95%CI: 0.05-0.81).

Table 5 shows multivariable logistic regression results of factors associated with CHW utilization. CHW utilization was significantly associated with children with diarrhea symptoms (OR=3.04, 95%CI: 1.10-8.42), who come from female-headed households (OR=5.13, 95%CI: 1.94-13.55), and whose caregivers reported poor facility quality of care as a barrier to accessing health facilities (OR=6.10,95%CI: 2.52-14.72). CHW utilization was significantly lower for children from least poor households (OR=0.17, 95%CI: 0.03-0.84) and whose caregivers reported going alone to a facility as a barrier to seeking care (OR=0.17,0.07-0.44).

Discussion

The study results show care seeking and treatment coverage as well as factors significantly associated with CHW utilization for ill children U5 in the two intervention districts. There were significant district differences in the study population by ethnicity, child gender, polygamy, type of household head, and program duration. Disease prevalence and care seeking from an appropriate provider was significantly higher among children from Kambia compared to children from Pujehun. Coverage of appropriate treatment was similar between districts, though higher malaria treatment in Pujehun and higher pneumonia treatment in Kambia. CHW utilization increased from 0% in 2010 (no CHWs at baseline) to 14% after two years of the intervention. CHWs provided 17% of diarrhea treatment with ORS and zinc, 11% of malaria treatment with ACT, and 24% of pneumonia treatment with cotrimoxazole. Children with diarrhea symptoms, who are from female-headed and poorest households and whose caregivers reported poor facility quality of care as a barrier to accessing care at health facilities were significantly more likely to receive treatments from CHWs.

Most studies in sub-Saharan Africa have demonstrated that caregivers' choice of seeking care outside the home for a child's illness is associated with etiology or perceived severity of disease, cultural and traditional beliefs, knowledge and symptoms of illness, home treatment and socioeconomic status [20-24]. Also, care seeking depends on previous interactions with providers, social considerations, geographic and financial availability of care [6]. Though CHW utilization was lower in this study, the findings on factors significantly associated CHW utilization are similar to other recent CHW studies in Sub-Saharan Africa, with higher CHW use among children from rural areas and poorest households [25-27].

Recent studies on CHW programs in Sub-Saharan Africa show varying levels of CHW utilization, ranging from 26% to 78% [26-31]. Poorest household wealth quintile, increased caregiver knowledge of malaria illness and a child not having fever, were significantly associated with use of community medicine distributors for malaria and pneumonia ICCM in Uganda [25]. A study on CHW utilization in Kenya showed CHW use was significantly higher in poorest vs. least poor households, in smaller villages with less than 200 households vs. larger villages, and when prompt treatment (within 24 hours of symptom onset) [26]. The use of CHWs for the management of febrile illnesses in Eastern Uganda was associated with child being from poorest household and prompt care seeking [27]. Location, skills and recommendation from a family member were reasons for seeking care from a CHW and drug stock outs and lack of knowledge of CHW services were reasons given for not seeking care from a CHW in a study on CHW access, acceptability and utilization in Uganda [30]. Symptom recognition and severity is another factor associated with CHW use. The significant use of CHWs for diarrhea treatment was

likely due to the fact that diarrhea in children is easy to recognize and therefore easy to seek care. Provider quality of care is another important factor for caregiver's decision to seek care, including seeking care from a CHW. For this study, caregivers who reported poor quality of care in health facilities as a barrier were more likely to seek care from CHW (OR=6.10). Unfriendliness of health facility staff has been one of the reported common barriers to accessing facility care in Sierra Leone, which might explain the higher CHW utilization among those who reported facility quality of care as a barrier [32]. In fact, those who reported poor quality of care were 76% less likely to seek treatment at a health facility (OR=0.24, 95%CI: 0.11-0.49). In Kenya, caregivers gave high ratings for quality of care of services received from CHWs [29]. In Uganda, caregivers' perceived quality of care was significantly higher for services provided by CHWs compared to services provided by facility-based providers [33].

The staggered implementation of the intervention did not appear to have an effect on utilization, which was similar for longer and shorter durations of the intervention. The higher disease prevalence (particularly for diarrhea) and care seeking from Kambia district was likely due to a cholera outbreak that occurred in the district during the survey period. However, this did not affect CHW utilization, with similar CHW use in both study districts.

The higher CHW use in female-headed households appears to be a possible change from the baseline qualitative study of care seeking practices to for the HPQ project in Sierra Leone, where marginalized women with no husband or extended family showed greater reliance on health facility staff versus other types of providers [6]. This was likely due to the fact that these caregivers did not need to negotiate care seeking

decisions with their husbands, who are more likely to make care seeking and treatment decisions for ill children.

The low CHW utilization was likely due to the preference for health facility personnel who are likely seen to be more qualified than volunteers in the community. The study results are similar to other studies with low CHW use, with low utilization likely due to preference for health facility personnel, low sensitization of CHW services, and CHW drug stock outs [25, 30]. In a study on community medicine distributors (CMDs) in Uganda, low coverage of CMD use was explained by caregiver preference for private clinics, low and non-continued sensitization activities and periodic shortages [25]. Low sensitization of CHW the program may have also affected the study results. Though sensitization activities were done at the start of the intervention, it is not clear how often or whether these activities were sustained over time. The nationwide stock out of ACT may also have affected utilization; however the stockout also affected health facilities and should not have had that major an impact on CHW utilization. CHW availability and intervention drug stockouts may have also played a significant role in the low utilization observed in the study. Unavailability of expected services or drugs was the most frequent problem raised from focus group discussions of caregiver experiences with CHW services [34]. CHWs' volunteer status with limited incentives (other than community appreciation and help with household tasks) meant that they had to earn a living through farming or other tasks; making their availability at all times a challenge. However, other studies in Sub-Saharan Africa with volunteer CHW programs show variability in CHW utilization from a low of 27% in Uganda to a high of 75% in Ghana [28, 29]. CHW volunteer programs with higher utilization in Ghana (75%) and Uganda (57%) had

tangible incentives such as raincoats, bicycles, boots and T-shirts; CHWs in a Nigerian volunteer program (with 52% utilization) received commission on treatments dispensed [28]. In addition, the CHW selection process may have also resulted in the low CHW utilization. Though the community was involved in the selection process, elders in the community along with members from the DHMTs and CSOs did the primary selection of CHWs. The limited role of other members of the community may have led to the community taking less ownership of the CHW program and therefore less likely to support the CHW volunteers.

Limitations

The study results come with some limitations. Due to the low sample size of children who received treatments from CHWs (111 out of 777 U5 for whom treatment was sought), all significant associations should be taken with caution. Data on care seeking and treatment was based on the recollection of caregivers and may be subject to recall bias. A review of CHW monthly reports with the number of treatments given per U5 population per catchment area might be a better measure of utilization.

The FHCI likely had an effect on the low utilization of CHWs in the community, with caregivers preferring to seek care from health facilities. The study showed that CHW use was low even for children whose caregivers reported some common barriers to accessing health facilities (distance, cost, going alone, etc.). For instance, children whose caregivers reported going alone to a health facility as a barrier to accessing facility treatment were less likely (OR=0.17) to receive treatment from a CHW. Also, reported CHW use may have been underestimated due to some caregivers confusing CHWs with community health officers (CHOs) who are paid facility health personnel or confusing

CHWs with health facility staff at PHUs. The implementation of the intervention by different CSOs in the two districts might have also affected the study results. However, efforts were made to ensure that the CSOs worked as a consortium using the same criteria for CHW selection, training and program monitoring. The study results also showed no difference in CHW utilization by district. The multivariable logistic regression analyses adjusted for district differences in study characteristics and program duration, and still showed some significant association for CHW utilization.

Conclusion

Though utilization was low, CHW use was greater in children from disadvantaged backgrounds (poorest, female-headed) and whose caregivers reported poor quality of care as a barrier to accessing health facilities. However, a more in-depth investigation is needed to better understand caregiver's access, acceptability and utilization of CHW services as well CHWs' experiences providing care in the community.

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Figure 15 Paper 2 Figures

Figure 1 – Intervention districts

Figure 1 shows a map of Sierra Leone showing the two intervention districts (Kambia and Pujehun) in blue.

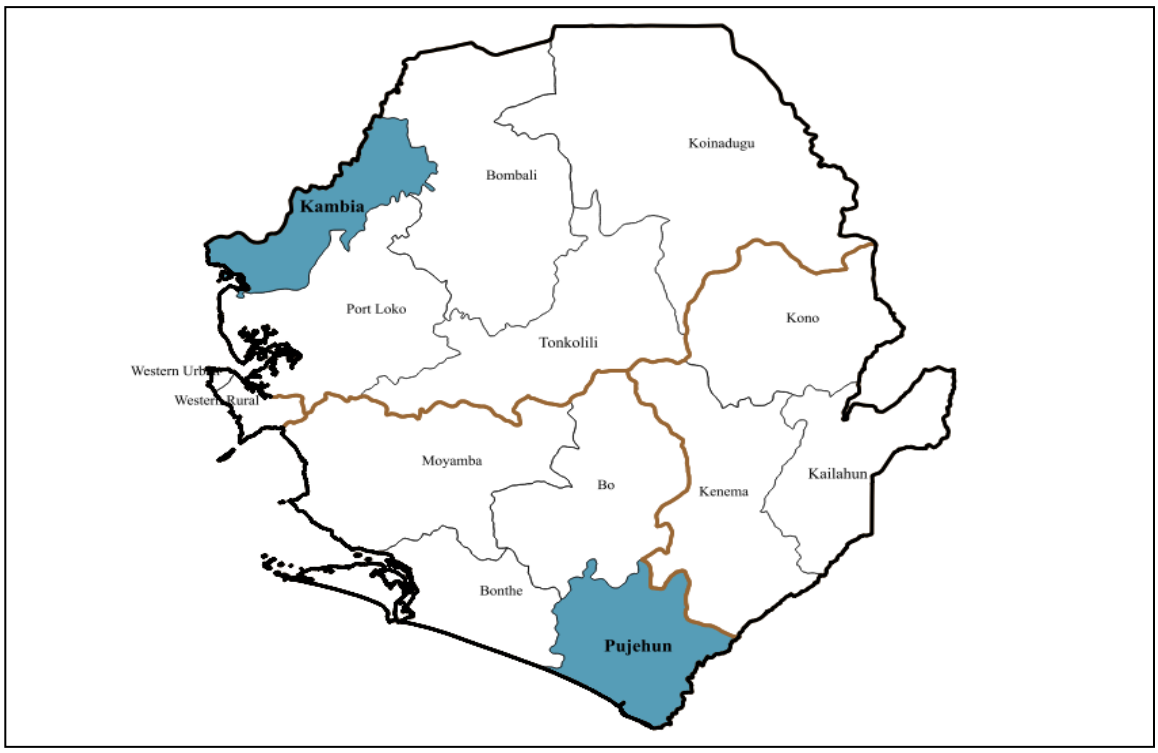
Figure 2 – Reported barriers to seeking care

Figure 2 shows a bar graph comparing reported barriers to health facility utilization by district; blue bars represent Kambia and red bars represent Pujehun.

Figure 3 – Source of appropriate treatment

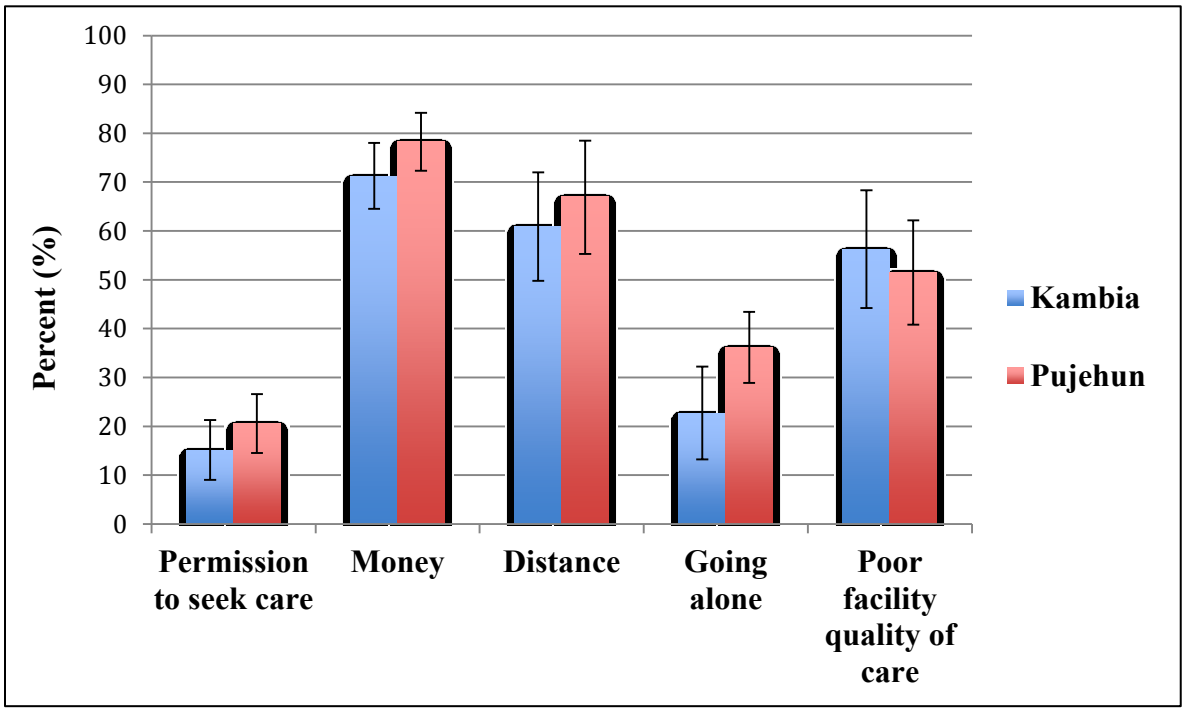
Figure 3 shows a bar graph comparing providers of appropriate treatment by district; blue bars represent Kambia and red bars represent Pujehun.

Figure 1: Map of Intervention Districts



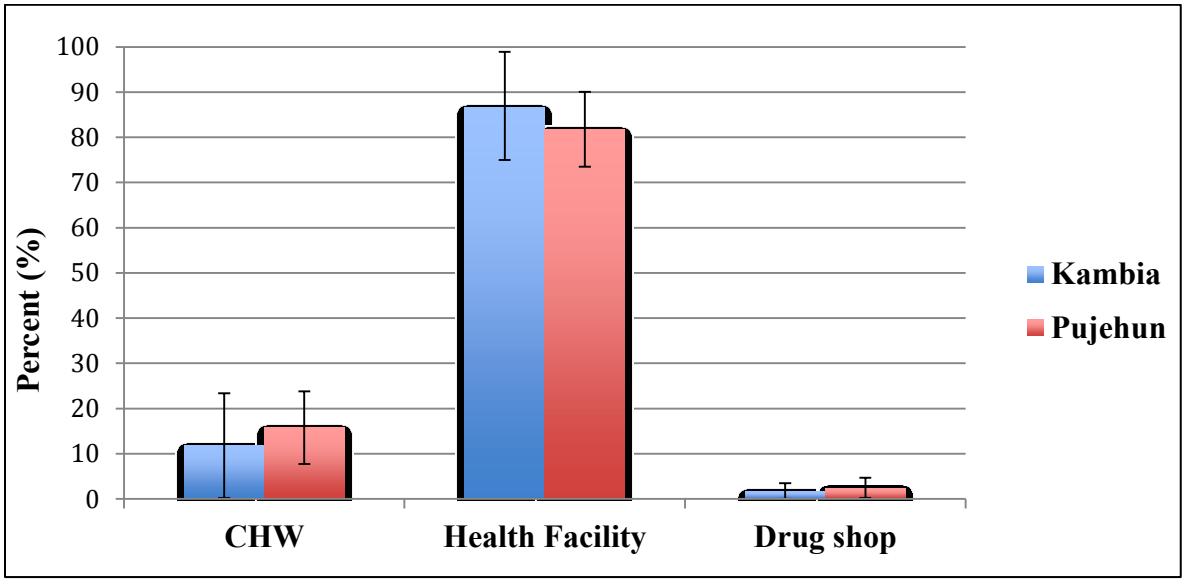
Reference: QGIS, 2014

Figure 2: Reported barriers to health facility utilization by district, Sierra Leone 2012



Bars represent 95% confidence intervals

Figure 3: Source of Appropriate Treatment by District, Sierra Leone 2012



Bars represent 95% confidence intervals

Table 6 Paper 2 Tables

Table 1 – Distribution of child, caregiver and household characteristics

Table 1 shows the total and district-level distribution of child, caregiver and household characteristics

Table 2 - Disease prevalence, care seeking, and treatment

Table 2 shows a comparison of disease prevalence, care seeking and treatment coverage by district.

Table 3 – Comparison of CHW and health facility utilization

Table 3 compares CHW and health facility utilization by child, caregiver and household characteristics.

Table 4 – CHW use vs. Other Provider (bivariate logistic regression)

Table 4 shows the estimated odds ratios derived from bivariate logistics regression of CHW use vs. other provider on child, caregiver, household, and district-level factors.

Table 5 – CHW use vs. Other Provider (multivariable logistic regression)

Table 5 shows the estimated odds ratios derived from multivariable logistic regression of CHW use vs. other provider on child, caregiver, household and district-level factors.

Table 1: Distribution of selected child, caregiver, and household characteristics by district, Sierra Leone, 2012

Characteristic	Kambia (N=838) % (95%CI)	Pujehun (N=1,441) % (95%CI)	P-value	Total (N=2,279)
Age of child (months)			0.108	
0-11	18.3 (14.2-22.5)	21.6 (17.4-25.8)		20.4 (17.3-23.4)
12-35	32.0 (14.2-22.5)	37.1 (32.4-41.9)		35.2 (31.4-39.0)
36-59	49.6 (43.0-56.3)	41.3 (36.2-46.3)		44.5 (40.3-48.7)
Sex of child			0.002	
Male	60.7 (55.0- 66.4)	48.4 (36.2-46.3)		53.1 (49.0-57.2)
Female	39.3 (33.6-45.0)	51.6 (46.6-56.7)		46.9 (43.0-50.8)
Caregiver's age (years)			0.148	
15-29	43.1 (37.8-48.4)	43.1 (37.8-48.4)		46.0 (41.7-50.3)
30-49	50.5(43.3-57.4)	51.6 (53.3-62.2)		54.0 (49.7-58.3)
% Caregivers ever attended school	16.9 (11.0-22.7)	24.0 (18.1-30.0)	0.095	20.8 (16.5-25.1)
Household size			0.329	
≤6 people	54.4 (44.2-64.5)	61.6 (50.8-72.4)		58.8 (51.0-66.5)
>6 people	45.6 (35.5-55.8)	38.4 (27.6-49.2)		41.2 (33.5-49.0)
Household Religion			0.969	
Christian	4.9 (0.9-8.9)	5.0 (1.5-9.1)		5.0 (2.1-7.8)
Muslim	95.1 (91.1-99.1)	95.0 (91.0-99.0)		95.0 (92.2-97.9)
Household Ethnicity			<0.001	
Mende	0.2 (-0.2-0.6)	97.7 (96.1-99.3)		60.0 (48.2-71.7)
Temne	65.3 (49.5-81.0)	0.5 (-0.1-1.0)		25.6 (15.2-36.0)
Other	34.5 (18.8-50.3)	1.8 (0.3-3.3)		14.5 (7.7-21.3)
% Polygamous Household	41.4 (32.1-50.7)	25.3 (19.6-30.9)	0.003	31.5 (26.3-36.8)
% Female-Headed Household	31.6 (24.0-39.2)	46.4 (39.6-53.3)	0.005	40.8 (35.6-45.9)
HH Wealth rank			0.786	
Poorest	11.3 (5.7-17.0)	12.5 (7.6-17.4)		12.1 (8.4-15.7)
Poor	63.4 (53.9-72.9)	59.3 (51.3-67.3)		60.9 (54.8-67.0)
Least Poor	25.3 (17.4-33.2)	28.2 (20.1-36.2)		27.1 (21.3-32.8)
Program duration			0.0216	
% U5 in clusters with <12 months	27.2 (12.6-41.9)	54.2 (37.2-71.2)		43.8 (31.6-60.0)
% U5 in clusters with ≥ 12 months	72.8 (58.1-87.4)	45.8 (28.2-62.2)		56.2 (44.0-68.4)

Table 2: Disease prevalence, care seeking and treatment by district, Sierra Leone 2012

Characteristic	Kambia % (95%CI)	Pujehun % (95%CI)	P-value	Total % (95%CI)
Disease Prevalence	**(N=838)**	**(N=1,441)**		
% Any symptom	78.8 (72.6-85.2)	70.0 (65.1-74.4)	0.028	73.6 (69.5-77.0)
% Diarrhea	39.8 (32.2-47.3)	21.0 (16.2-25.8)	<0.001	28.2 (23.7-32.6)
% Malaria	62.2 (55.3-69.1)	61.9 (57.2-66.7)	0.955	62.0 (58.1-65.9)
% Pneumonia	30.6 (22.6-38.7)	18.5 (14.4-22.6)	0.005	23.2 (19.1-27.3)
Care seeking from appropriate Provider	N=509 65.9 (55.9-75.9)	N=847 51.2 (41.2-61.2)	0.042	N=1,356 57.1 (50.0-64.2)
Prompt Care seeking				
All Symptoms	N=509 15.7 (8.5-22.9)	N=847 37.8 (28.8-46.8)	<0.001	N=1,356 29.0 (22.7-35.1)
Diarrhea	N=225 18.7 (7.2-30.0)	N=285 49.2 (35.9-61.9)	0.002	N=510 34.1 (25.9-42.3)
Malaria	N=394 11.6 (5.3-17.8)	N=710 32.9 (23.2-42.6)	0.001	N=1104 25.0 (18.4-31.6)
Pneumonia	N=210 6.2 (0.9-11.5)	N=219 32.9 (20.0-45.7)	0.004	N=429 19.6 (11.3-28.0)
Treatment Coverage				
ORS and zinc	N= 225 68.1 (51.6-84.5)	N=285 58.9 (44.8-73.1)	0.406	N=510 63.4 (52.5-74.3)
ACT	N=394 23.4 (13.8-33.0)	N=710 45.2 (34.5-55.8)	0.004	N=1104 37.1 (28.9-45.3)
Cotrimoxazole	N=210 62.2 (47.2-77.2)	N=219 19.8 (8.1-31.4)	<0.001	N=429 40.8 (29.6-52.1)

Appropriate provider-trained care provider (health care professional or CHW)
Prompt Care seeking – seeking care within 24 hours of symptom onset
*Treatment coverage based on those for whom treatment was sought

Table 3: Comparison of CHW and Health Facility Use by Child, Caregiver, and Household Socio-demographic Characteristics in 2 intervention districts, Sierra Leone, 2012

Variable	Number of U5	CHW % (95%CI)	Health Facility provider % (95%CI)
Overall	777	14.0 (7.1-20.7)	84.6 (77.0-92.1)
Child lives in **Kambia**	311	18.3 (3.3-33.2)	81.7 (66.8-96.7)
Child lives in **Pujehun**	443	13.2 (6.4-20.1)	86.8 (80.0-93.6)
Child's age			
<12months	91	8.9 (-0.6-18.5)	91.1 (81.5-100)
12-23 months	163	17.2 (5.2-29.1)	82.8 (70.9-97.8)
24-59 months	500	16.1 (6.2-26.1)	83.9 (74.0-93.8)
Child had Diarrhea	353	16.3 (5.2-27.4)	83.7 (72.6-94.8)
Child had Malaria	635	13.4 (6.8-20.3)	86.6 (80.0-93.2)
Child had Pneumonia Symptoms	354	17.9 (6.0-29.9)	82.1 (70.1-94.0)
Treatment coverage			
ORS and zinc	270	17.7 (4.2-31.1)	82.3 (68.9-95.8)
ACT	385	12.0 (4.6-19.3)	88.0 (80.7-95.4)
Cotrimoxazole	261	20.0 (4.9-35.1)	80.0 (64.9-95.1)
Caregiver age			
<30 years	314	11.2 (4.4-18.1)	88.8 (81.9-95.6)
30+ years	440	18.6 (7.6-29.6)	81.4 (70.4-92.4)
Caregiver education			
No education	571	18.4 (8.8-28.0)	81.6 (72.0-91.2)
Some education	180	6.9 (-1.6-15.3)	92.1 (84.7-100)
Caregiver Reported barrier seeking Health Facility care			
Permission to see doctor	126	5.8 (-4.2-15.7)	94.2 (84.3-100)
Money for treatment	505	12.7 (5.8-20.2)	87.3 (80.0-94.7)
Distance to health facility	415	12.3 (5.8-18.0)	87.7 (81.3-94.1)
Not wanting to go alone	237	4.0 (-0.5-8.6)	96.0 (91.4-100)
QoC/Staff Friendliness	357	19.7 (9.2-30.1)	80.3 (69.9-90.8)
Household Ethnic group			
Mende (only in Pujehun)	431	12.5 (---)	87.5 (---)
Temne	186	18.3 (1.9-34.8)	81.7 (65.2-98.1)
Other	137	20.0 (-2.4-42.5)	80.0 (57.5-100)
Female-Headed Household			
No	431	10.5 (3.7-17.3)	89.5 (82.7-96.2)
Yes	323	21.9 (8.9-35.0)	78.1 (65.1-91.1)
Household wealth			
Poorest	80	15.4 (-4.2-35.4)	84.6 (65.0-100)
Poor	442	20.6 (10.5-30.8)	79.4 (69.2-89.5)
Least Poor	218	5.9 (0.8-11.1)	94.1 (88.9-99.2)

# of sick children for whom care was sought; Health facility provider = doctor, nurse, midwife, community health officer

Table 4: Estimated odds ratios from bivariate logistic regression of CHW use vs. other provider on selected child, caregiver, household-level, and district-level factors

Variable	N	Odds Ratio	95% CI	P-value
District				
Kambia	344	1.00		
Pujehun	433	1.40	(0.40-4.87)	0.596
Program Duration				
Cluster with < 12 months	328	1.00		
Cluster with ≥ 12 months	449	0.40	(0.14-1.16)	0.092*
Child's age				
0-11 months	115	1.00	--	--
12-23 months	156	2.85	(0.79-10.37)	0.110
24-59 months	506	1.89	(0.54-6.64)	0.316
Sex				
Male	452	1.00	--	--
Female	325	0.61	(0.27-1.40)	0.239
Child had Diarrhea	354	2.18	(0.88-5.39)	0.091*
Child had Malaria	659	1.42	(0.58-3.50)	0.436
Child had Pneumonia	265	1.44	(0.56-3.68)	0.448
Caregiver age				
< 30 years	341	1.00	--	
≥ 30 years	436	1.52	(0.71-3.26)	0.283
Caregiver ever attended school				
No	580	1.00	--	
Yes	192	0.36	(0.08-1.53)	0.164
Caregiver reported difficulty seeking care at HF				
Permission	113	0.43	(0.10-2.84)	0.376
Money	523	1.12	(0.46-2.71)	0.808
Going alone	213	0.29	(0.11-0.81)	0.018**
Distance	440	0.96	(0.34-2.75)	0.943
Poor quality of care (QOC)	378	4.56	(2.10-9.93)	<0.001**
Household size				
≤ 6 people	453	1.00	--	
> 6 people	324	0.65	(0.29-1.47)	0.298
Female-Headed Household				
No	452	1.00	--	
Yes	325	2.19	(0.87-5.46)	0.093*
Ethnic group				
Mende	421	1.00	--	
Temne	214	0.61	(0.20-1.90)	0.393
Other	142	1.32	(0.29-6.02)	0.716
Polygamous Household				
No	564	1.00	--	

Yes	213	1.08	(0.39-2.98)	0.882
Household wealth rank				
Poorest	77	1.00	--	
Poor	448	0.72	(0.19-2.67)	0.618
Least Poor	237	0.20	(0.05-0.81)	0.025**

***P-value < 0.10; **P-value < 0.05**
N= # of sick children in past 2 weeks for whom care was sought (777);
Cluster=town/village with 55+ households;

Table 5: Estimated odds ratios from multivariable logistic regression of CHW Use vs. Other Provider on selected child, caregiver, household-level, and district-level factors

Variable	**Adjusted Odds Ratio**	**95% CI**	**P-value**
Child had Diarrhea	3.04	(1.10-8.42)	0.032*
Going alone to facility is a barrier	0.17	(0.07-0.44)	<0.001*
Poor health facility QOC is a barrier to seeking care	6.10	(2.52-14.72)	<0.001*
Female-Headed Household	5.13	(1.94-13.55)	0.001*
Household Wealth rank			
Poorest	1.00	---	---
Poor	0.62	(0.18-2.10)	0.438
Least Poor	0.17	(0.03-0.84)	0.030*
Program Duration			
< 12 months	1.00	---	---
≥ 12 months	0.34	(0.10-1.19)	0.090
Number of observations	777		

*P-value<0.05

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Chapter 8: Paper 3

Ethnic and Socioeconomic Inequalities in Care Seeking and Treatment of Childhood Illnesses in Rural Sierra Leone: Findings from an Evaluation of Integrated Community Case Management

Abstract

Background

In 2010, trained community health workers (CHWs) were deployed to provide integrated and community case management (ICCM) of diarrhea, malaria and pneumonia to children U5 in two underserved districts of Sierra Leone, six months after launch of the national Free Health Care Initiative.

Methods

A quasi-experimental study design with intervention and comparison districts was used to examine ICCM effect on inequalities in care seeking and treatment by ethnicity and socioeconomic status for ill children U5 in two intervention districts (with ICCM) and two comparison districts (with no ICCM), two years post intervention. A household cluster survey was conducted among caregivers of 5,643 and 5,259 children U5 in 2010 and 2012, respectively.

Results

Overall, no wealth inequalities were observed for care seeking and treatment, with equitable coverage across wealth ranks in both groups and survey periods. The intervention districts showed decreased ethnic inequalities and increased inequalities by caregiver education for care seeking and treatment. The comparison districts, which

seemed to have more equitable coverage for appropriate care seeking and treatment at both survey periods, showed decreased inequalities by wealth for traditional treatment and increased ethnic inequality for health facility use at endline.

There was no intervention effect on changes in care seeking and appropriate treatment for both wealth groups; however, the intervention was associated with a 53% decrease in traditional treatments for children in the poorest wealth group (OR=0.47, 95%CI: 0.23-0.97, p=0.043). The intervention was also associated with a 3-fold increase in care seeking from an appropriate provider (OR=2.98, 95%CI: 1.60-5.54); 2.2 fold increase in appropriate treatment (OR=2.15, 95%CI: 1.12-4.41) and a 66% decrease in traditional treatment (OR=0.34, 95%CI: 0.14-0.87, p=0.025) among children from households other than Mende. Per caregiver education, the intervention was associated with a 2.2 fold increase in care seeking from an appropriate provider (OR=2.17, 95%CI: 1.03-4.57) and a 2.6 fold increase in appropriate treatment (OR=2.55, 95%CI: 1.24-5.27) for children whose caregivers reported some education. The intervention was also associated with a 52% decrease in traditional treatments for children whose caregivers reported no education (OR=0.48, 95%CI: 0.23-0.99, p=0.047).

Conclusion

The ICCM intervention effect on equity in care seeking and treatment for children U5 is mixed. With significant increases in appropriate care seeking and treatment, children from ethnic groups other than Mende and whose caregivers reported some education appeared to benefit the most from the intervention. The intervention was also associated with decreased reliance on traditional treatments for children from

disadvantaged backgrounds (poorest households and whose caregivers reported no education).

Keywords: integrated community case management (ICCM), community health worker, care seeking behavior, socioeconomic status, ethnicity, equity, care seeking, Sierra Leone

Introduction

Sierra Leone has an estimated population of 6 million with 79.6% of the population living on less than 2USD a day [120]. The country has one of the highest under-five mortality rates (U5MR) in the world with 140 deaths per 1,000 live births [26]. Country health inequities exist by wealth, parental education and geographic location. The U5MR is highest amongst the poorest children compared to children from wealthier families (211 in poorest quintile vs. 144 in richest quintile); women living in urban areas are 2 times more likely to have their births attended by skilled health professionals compared to women living in rural areas; and women in the richest wealth quintiles are 2.5 times more likely to have their births attended by skilled health professionals [26].

Access to health care has been a major problem in Sierra Leone due to a weak health system consisting of an acute shortage of appropriately qualified health workers, insufficient supplies of drugs and equipment, poor coordination and management, and previously heavy fees for services [21]. In an effort to meet Millennium Development Goals (MDG) for child and maternal health, as well as address some of the equity issues in health, the government of Sierra Leone implemented the national Free Healthcare Initiative (FHCI) in April 2010. The initiative provides free basic services to pregnant and breastfeeding women and children less than 5 years of age (U5) presenting at government healthcare facilities. Prior to the FHCI, 88% of people stated that their inability to pay as the greatest barrier in accessing healthcare [25]. Government figures showed more women accessing antenatal care and delivering babies in health facilities, with a 45% increase in health facility deliveries in the first year of the initiative [29].

Most developing countries have seen continuous decline in child mortality over the past decades. However, inequities persist within and between countries, between rich and poor people and areas, public and private health sectors, provinces or districts, among rural and urban populations, and social groups [84, 85, 121]. Inequity also exists in child survival programs designed to reduce morbidity and mortality. Programs have generally been implemented without consideration of equity resulting in a clustering of interventions at the child level [17]. Previous approaches tended to reach children who can easily be reached, resulting in children from urban areas and who are at lowest risk of mortality benefiting the most from interventions. Therefore, children at greatest risk (poorest children in rural areas) are the least likely to receive interventions, the basis of which is the inverse equity hypothesis [87].

Efforts have been made in recent years to address inequities in utilization of basic health services for overall improvement of health in developing countries [14, 122]. Child health programs with high visibility and dedicated funding and which bring services to the doorstep of families (i.e. immunizations and vitamin A campaigns) are found to be more equitable than basic primary health care services at the facility level [122]. In addition, community-based interventions have been shown to be more equitable than those delivered in health facilities [97, 123]. Integrated community case management (ICCM) is one such strategy, targeting conditions that cause the most deaths for children in low-income countries, including pneumonia, diarrhea, malaria and under-nutrition. ICCM is used to deliver an integrated package of primary care services at the community level, particularly in areas with little access to facility-based services [3]. ICCM is seen as an essential strategy to foster equity by improving access to care for remote communities

and contribute to sustainable reduction in child mortality [9]. ICCM provided by CHWs is one of the measures advocated by UNICEF as part of its equity-focused approach aimed to accelerate progress, reduce disparities, and lower out-of-pocket expenditure for the poor [14].

So far, most of the evidence on inequities in child health in Sub-Saharan Africa comes from equity evaluations of IMCI programs with limited evidence on equity impact of ICCM programs. The study objective is to examine the ICCM intervention effect on equitable coverage of care seeking and treatment for children U5 with malaria, diarrhea and/or pneumonia, comparing baseline and endline differences by wealth, ethnicity and caregiver education in two ICCM districts compared to two non-ICCM comparison districts.

Methods

Intervention

The Health for the Poorest Quintile (HPQ) project, an intervention using community health volunteers (CHVs) provide ICCM to children U5, was implemented a few months after the launch of the FHCI in two districts of Sierra Leone. The intervention was implemented by civil society organizations (CSOs) in districts with the highest U5 mortality and which also represent the poorest (worst-off fifth) quintile of the country. The intervention focused on the top three causes (besides neonatal causes) of U5 mortality in Sierra Leone: diarrhea and malaria, diagnosed symptomatically and treated with low osmolarity oral rehydration solution (ORS) and zinc and artesunate-amodiaquine combined therapy (ACT) respectively; and pneumonia, diagnosed using timers to assess respiratory rate and treated with cotrimoxazole.

A total of 2,129 CHWs were recruited for the intervention, with a ratio of 2 CHWs per 100 children U5 (or per 100 households). The CHWs were non-paid volunteers, with limited or no literacy, and selected by their respective communities. They were trained for one week and provided drug kits with simplified algorithms for iCCM and a simple form for recording number of visits, treatments, and deaths. The algorithms and forms were developed in Sierra Leone for illiterate CHWs and had previously been used successfully in another district [1, 105].

The CSOs worked with District Health Management Teams (DHMTs) and peripheral health units (PHU) staff to train and equip CHWs to diagnose, treat, and as necessary, refer children to health facilities. DHMTs and CSOs worked with UNICEF to procure and ensured a continuous supply of essential drugs and commodities throughout the duration of the program in the two intervention districts. The CSOs kept monthly reports on CHW supervision, treatment and referral of children U5, and drug supply.

Before implementation, CHW services and locations were announced in religious centers and during community functions. Community members received free treatment from CHW homes or from local health posts where volunteers sometimes provided care. In lieu of payment, volunteers received recognition from the community with extra help with household tasks such as farming and exemption from community labor such as building or repair of roads and bridges. Supervision of volunteers took place on a monthly basis and included review of CHW reports and direct observations of CHWs during visits.

Study design

A quasi-experimental study design with intervention and comparison districts was used to evaluate the ICCM intervention effect on equitable coverage of care seeking and treatment of malaria, diarrhea and pneumonia in children U5. Data were collected from a two-stage household cluster survey conducted at baseline in June-July 2010 and at endline in June-August 2012 in both intervention and comparison districts, using the same clusters, sampling procedures, training, and questionnaire administration procedures were used for both surveys.

Study area and participants

The four intervention and comparison districts (figure 1) were considered to be in the lowest socioeconomic quintiles of the country using a set of criteria, each ranked from worst to best per district. The selection criteria of study districts are discussed elsewhere [105]. In addition to the scores from the selection criteria, the presence of CSOs was mapped to determine districts that were least likely to have ongoing interventions. Kambia, from the Northern province and Pujehun, from the Southern province had the least number of CSOs and were therefore selected as the intervention districts. Kailahun (Eastern province) and Tonkolili (Northern province), among the lowest scoring districts were chosen to be the comparison districts, after disqualifying other low scoring districts that already had CCM [105]. The four study areas had a projected population of 300,000 - 400,000, of which 19% were children U5 [18].

The study population consisted of caregivers of children U5 residing in selected households with at least one U5 child. Caregivers provided information on disease prevalence, care seeking and treatment for children U5 in the two weeks prior to the surveys.

Survey Sampling and Data collection

Eligible households were selected using two-stage cluster sampling. Details of the survey sampling and data collection are described elsewhere [105]. Briefly, stage one included the selection of 50 clusters per district based on population proportionate to size (PPS) sampling for a total of 200 clusters. At stage two, 30 households were randomly selected in each selected cluster, for a total sample size of 6,000 households. Thirteen teams of three interviewers and one supervisor conducted the household enumeration and subsequent interviews during a four-week duration in the four study districts. Interviewers with previous survey experience and appropriate linguistic skills similar to the districts' populations were recruited for data collection. Questionnaires were written in English and verbally translated by interviewers into local languages preferred by the respondents, using standardized, pre-tested key words and/or information obtained on terminology from the baseline qualitative study [1, 105, 107]. To ensure high quality data, the PDAs were preloaded with the questionnaires using Visual CE profession version 11 and included automated skip patterns and range and consistency checks.

Analysis

The study outcomes of interest include:

- *Care seeking from an appropriate provider*: proportion of children ill in the past 2 weeks for whom care was sought from a health facility professional (i.e. doctor or nurse) or a trained CHW
- *Appropriate treatment:* proportion of ill children who received appropriate treatment for their symptom (anti-malarials including ACT for malaria, antibiotics including cotrimoxazole for pneumonia, and ORS and zinc for diarrhea) per

Ministry of Health and Sanitation (MOHS) of Sierra Leone, UNICEF and WHO guidelines; and

- *Traditional treatment*: having treatment besides syrups and pills provided by allopathic healthcare workers [1].

Factors examined to explain potential inequalities for care seeking and treatment for children U5 included: household wealth quintile, ethnicity and educational attainment of direct caregivers of children U5. Baseline and endline proportions of care seeking and treatment (appropriate and traditional) per household wealth quintile, ethnicity, and caregiver education were compared for each study group. Principal component analysis (PCA) of household assets was used to classify households into quintiles of *poorest, very poor, poor, less poor and least poor*. Households were then ranked into "poorest" (lowest three quintiles) and "least poor" (highest two quintiles). Comparisons by ethnic group were made between Mende and Other ethnic groups. In the southern districts (Kailahun and Pujehun), the Mende ethnic group is the predominant group; however the northern districts (Kambia and Tonkolili) though predominantly Temne is more diverse with other ethnic groups (Susu, Limba, etc.). Since the vast majority of caregivers reported no education (76% at baseline and 79% at endline), educational status was divided into no education and some education (for those who reported primary, secondary or more).

Equity ratio analyses were conducted to determine the level of inequity in our study outcomes at baseline and whether they decreased at endline using odds ratios (ORs) obtained from weighted bivariate logistic regression comparing wealth rank (least poor vs. poorest), ethnicity (Mende vs. Other), and educational status (some education vs. no education). OR of 1 indicates equity, while OR≠1 indicates some level of inequality

between groups being compared. In addition, a difference-in-differences (DID) analysis was conducted per equity variable (wealth rank, ethnicity, and caregiver education) using a multivariable logistic regression model to determine: (1) whether the intervention significantly affected changes in care seeking and treatment and (2) whether the outcomes were significantly different between the intervention and comparison groups over time, as measured by an interaction term.

Proportions, odds ratios (ORs) and 95% confidence intervals (CI) were obtained in STATA 12 from bivariate and multivariable analyses weighted to account for the complex survey design and non-response [100]. A two-sided p-value <0.05 was considered to be significant for all tests.

Ethical Considerations

Permission was asked of head of households to interview others in the household including girls 15 to 17 years of age. In addition, verbal consent was obtained from caregivers of children U5 who were 18 years of age and girls under 18 who were married or had children. Interviewers attempted to find a private area within the household to conduct interviews. Respondents were given a name and contact information of someone they can contact should they have any questions or concerns regarding the survey. Names or other individual identifying information collected as part of the interview were only used to determine which persons needed to be interviewed. Once those interviews were conducted and the data downloaded, all identifying information (e.g. names, GPS coordinates of households) was removed from the database.

The Ethics and Scientific Review Committee of the Ministry of Health and Sanitation of Sierra Leone reviewed and approved the study protocol.

Results

Study characteristics

Table 1 shows the distribution of the study population by study group at baseline to endline. There were no significant differences in child and caregiver characteristics across study groups and survey periods. Twenty-six percent (26%) and 23% of caregivers reported ever attending school at baseline and endline respectively. The Mende ethnic group was the majority in intervention areas (51%), and the Temne ethnic group was the majority in the comparison areas (>40%). A higher proportion of intervention households were larger in size (58.1% vs. 40.8%, p=0.001) and polygamous (40.0% vs. 25.8%, p<0.003 at baseline, and 31.5% vs. 24.2%, p=0.042 at endline) for both surveys. The intervention group showed a 6% decrease in the proportion of poorest households between study periods (p=0.026), whereas the comparison group showed no change in wealth rank between surveys.

Care seeking and treatment by wealth, ethnicity and caregiver education

Table 2 (care seeking and treatment by wealth) shows no significant wealth difference in care seeking and treatment for both study groups and survey periods, except for the comparison group at baseline with 43% less odds of traditional treatment among children from least poor vs. poorest households (OR=0.38, p=0.030).

Table 3 (care seeking and treatment by ethnicity) shows lower coverage for care seeking and appropriate treatment and higher traditional treatment among children from other ethnic households compared to those from Mende households. In the intervention group, children from ethnic households other than Mende had lower odds of care seeking from an appropriate provider (OR=0.40, p<0.001) and appropriate treatment (OR=0.49,

p<0.001); there was no significant difference between ethnic groups at endline. In the comparison group, there were no significant ethnic differences in appropriate care seeking and treatment at both survey periods. Traditional treatments were higher among children from other ethnic groups for both study groups (OR=5.4.86, p<0.001 in intervention group; OR=4.78, p<0.001 in comparison group) at baseline; with no significant difference between ethnic groups at endline for both study groups.

Table 4 (care seeking and treatment by caregiver education) shows no significant difference in care seeking and appropriate treatment by caregiver education at baseline. Inequality was observed at endline in intervention group with higher odds of appropriate care seeking (OR=1.81, p=0.003) and appropriate treatment (OR=2.02, p=0.006) among children whose caregivers reported some education compared to those whose caregivers reported no education. The comparison group showed no difference in appropriate care seeking and treatment by caregiver education for both survey periods. In the intervention group, traditional treatment was lower for children whose caregivers reported some education at both survey periods (OR=0.65; p=0.042 baseline; OR=0.47, p=0.044 endline). In the comparison group, there was no significant difference in traditional treatment by caregiver education at baseline; with lower odds of traditional treatment (OR=0.31, p=0.002) among children whose caregivers reported some education compared to those whose caregivers reported no education at endline.

Treatment provider type by wealth, ethnicity and caregiver education

Figures 2-4 show ethnic and socioeconomic inequalities in type of provider used for appropriate treatment of diarrhea, malaria and/or pneumonia in children U5 in both study groups and survey periods. Overall, 55.1% of ill children for whom treatment was

sought, received appropriate treatment; 51% at baseline and 60% at endline, with no significant difference by study group (baseline: 51.6% intervention vs. 50.5% comparison; endline: 65.4% intervention vs. 58.2% comparison). Of the children who received appropriate treatment, the majority of children (89%) received appropriate treatment at a health facility, and 9% of children from drug shops and/or peddlers for both groups and survey periods though differences exist by ethnic and socioeconomic status. Fourteen percent (14%) of children received appropriate treatment from a CHW in the intervention districts at endline.

There were no significant wealth inequalities in health facility use across study groups and survey periods. Children from other ethnic households had 61% less odds of receiving treatment from a health facility (OR=0.39, 95%CI: 0.21-0.72, p=0.003) compared to children from Mende households in the intervention group at baseline; no significant difference between ethnic groups at endline. Though no ethnic inequalities in health facility use in the comparison group at baseline, children from other ethnic households had 89% less odds of receiving treatment from a health facility compared to children from Mende households (OR=0.11, 95%CI: 0.02-0.62, p=0.012) at endline. Health facility use was higher among children whose caregivers reported some education compared to those whose caregivers reported no education for both study groups and survey periods, though not statistically significant.

The data on CHW use is restricted to intervention districts at endline (no CHWs in intervention at baseline and none in comparison areas at both survey periods). There were no significant differences in CHW use by wealth, ethnicity or caregiver educational

status, though generally higher among children from poorest and Mende households and those whose caregivers reported no education.

There was no significant drug shop and peddler use by wealth rank and caregiver educational attainment in both study groups and survey periods. In the intervention group, children from other ethnic households had almost 3 times the odds of receiving treatment from a drug shop/peddler compared to children from Mende households at baseline (OR=2.78, 95%CI: 1.48-5.24); but there was no significant difference at endline. In the comparison group, children from other ethnic households had greater odds of receiving treatment from a drug shop/peddler than children from Mende households at both survey periods, though not statistically significant.

Figure 5 shows the baseline to endline coverage changes source treatment by wealth rank, ethnicity and caregiver educational status for each study group. Health facility use increased significantly in the comparison group, with no differences by wealth rank, ethnicity and caregiver educational status. However, the intervention group showed no significant change in health facility use for all three equity factors. Drug shop and peddler use decreased significantly for both study groups, with no differences by wealth, ethnicity and caregiver educational status. CHW use increased significantly in the intervention group at endline, though no significant difference by wealth, ethnicity and caregiver educational status.

ICCM Intervention Effect on Changes in Care Seeking and Treatment

Table 5 shows the ICCM effect on baseline to endline changes in care seeking and treatment by wealth, ethnicity and caregiver education through difference-in-differences (DID) analysis. There was no intervention effect on changes in care seeking and

appropriate treatment for both wealth groups; however, the intervention was associated with a 53% decrease in traditional treatments for children in the poorest wealth group (OR=0.47, 95%CI: 0.23-0.97, p=0.043). The intervention was associated with a 55% decrease in care seeking from an appropriate provider for children from Mende households (OR=0.45, 95%CI: 0.22-0.93, p=0.031) and a 3-fold increase in care seeking from an appropriate provider for children from other ethnic groups (OR=2.98, 95%CI: 1.60-5.54, p=0.001). The intervention was also associated with 2.2 fold increase in appropriate treatment (OR=2.15, 95%CI: 1.12-4.41, p=0.020) and a 66% decrease in traditional treatment (OR=0.34, 95%CI: 0.14-0.87, p=0.025) among children from households other than Mende. As for caregiver education, the intervention was associated with a 2.2 times increase in care seeking from an appropriate provider (OR=2.17, 95%CI: 1.03-4.57, p=0.042) and a 2.6 fold increase in appropriate treatment (OR=1.24-5.27, p=0.012) for children whose caregivers reported some education. The intervention was also associated with a 52% decrease in traditional treatments for children whose caregivers reported no education (OR=0.48, 95%CI: 0.23-0.99, p=0.047).

Discussion

The study examined ethnic and socioeconomic inequalities in care seeking and treatment for children U5 in two intervention districts versus two comparison districts, two years after the implementation of an ICCM intervention. In both study groups, no significant baseline to endline difference existed in prevalence for the 3 ICCM conditions, though prevalence was generally higher in children from poorest and Temne households and whose caregivers reported no education (data not shown). Though no significant difference in care seeking and treatment by household wealth and caregiver

education was observed, children from ethnic groups other than Mende had lower coverage for care seeking and appropriate treatment and higher traditional treatment.

The ethnic differences in care seeking can be explained by some historic differences between the Temne-dominated north and the Mende-dominated south and east of Sierra Leone. There have been historic perceptions of disadvantage among northern Temne areas compared to Mende-dominated southern and eastern regions in Sierra Leone. This was due to early Christian missionaries and colonial authorities that favored outreach to Mende areas over that of majority Muslim Temne areas in the north [124]. As a result, there is higher reliance on allopathic medicine among the Mende compared to the Temnes and other ethnic groups in the north.

Due in part to the purposive selection of poorest districts for the intervention, no wealth inequalities were observed for appropriate care seeking and treatment and treatment provider, with equitable coverage by wealth rank in both study groups and survey periods. In the intervention group, decreased inequalities by ethnicity and increased inequalities by caregiver education were observed for care seeking, treatment, and provider type. In the comparison group, decreased wealth and ethnic inequalities for traditional treatment and increased inequality for traditional treatments by caregiver education were observed. The ICCM intervention was associated with significant increases in appropriate care seeking and treatment for children from ethnic groups other than Mende and whose caregivers reported some education. The intervention was also associated with significant decreases in traditional treatments for children from poorest households and whose caregivers reported no education.

The study results, along with other studies in similar settings show that inequalities in care seeking and treatment exist in rural settings that are assumed to be homogenous and uniformly poor. A study on sex and socioeconomic differentials in child health in rural Bangladesh found no evidence of gender or socioeconomic inequities in prevalence or care seeking patterns; however, poorer children were less likely to be taken to an appropriate healthcare provider than less poor children [15]. A study from rural Tanzania found that care seeking from an appropriate provider, presenting to a health facility, receiving antimalarial and antibiotics for pneumonia were more likely in children from wealthier families compared to those from poorer families [121].

Other studies corroborate this study's mixed results on child health program effects on changes in equity. A study on country experiences with IMCI showed that inequity was increased in countries which implemented IMCI in better developed urban areas (i.e. Brazil) and decreased in countries that implemented the program in the highest mortality areas first (i.e. Peru) [17]. Results from an evaluation of IMCI impact on the equality of health outcomes and access across socio-economic gradients in rural Tanzania after 3 years of implementation showed that IMCI was associated with observed improved equity for measles vaccine coverage and decreased equity for DPT coverage [121]. A study examining inequities in CHW use for timely and appropriate treatment of malaria showed that CHWs improved geographic access to treatment but did not improve socioeconomic access to high quality drugs [125]. An evaluation of a one-year malaria and diarrhea ICCM program implemented is the sole study thus far that has shown improved equity with high levels of effective treatment equitable across socioeconomic status in the intervention areas, while disparities were observed in comparison areas [97].

In recognition of the importance of public health programs' impact on inequity in child health, countries and organizations are now including equity assessments as part of program monitoring. Studies have shown that equity assessments can be incorporated in impact evaluations at relatively low cost and may point to specific interventions that need to be reinforced [16]. Assessment of inequities in maternal and child health is part of the Countdown to 2015 objective in measuring progress in MDG 4 and 5 goals [126]. Evaluation of equity impact of health programs and interventions in Sub-Saharan Africa is growing, but limited mainly on morbidity and mortality impact by wealth. Better evidence is needed on how well public health programs are reaching not only poor children, but also different geographic and socio-demographic backgrounds.

Limitations

Due to the quasi-experimental design of the study, there could be substantial confounding associated with other district-level characteristics. The use of a comparison group however allowed us to measure care seeking and treatment coverage likely to be achieved in the absence of the intervention. The introduction of free health care for children resulted in increased health care utilization for both study groups, which may have affected the lack of difference in the study results. In addition, the intervention likely accounted for inequity by wealth by targeting the poorest districts, possibly explaining the lack of observed inequalities by wealth in the study outcomes across study groups.

Conclusion

The ICCM intervention effect on equity in care seeking and treatment for children U5 is mixed. The intervention group showed improved equity by ethnicity and increased

inequities by caregiver education for appropriate care seeking and treatment. The comparison group, which had fewer inequities at baseline, showed improved equity by wealth and ethnicity and increased inequity by caregiver education for traditional treatments. With significant increases in appropriate care seeking and treatment, children from ethnic groups other than Mende and whose caregivers reported some education appeared to benefit the most from the intervention. The intervention was also associated with decreased reliance on traditional treatments for children from disadvantaged backgrounds (poorest households and whose caregivers reported no education).

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Figure 16 Paper 3 Figures

Figure 1 – Study districts

Figure 1 shows the study districts, intervention districts in blue and comparison districts in green.

Figure 2 – Treatment provider by wealth rank and ICCM status

Figure 2 shows a bar graph comparing treatment provider type by household wealth rank and ICCM status at baseline and endline; poorest households represented by blue bars and least poor households represented by red bars.

Figure 3 – Treatment provider by ethnicity and ICCM status

Figure 3 shows a bar graph comparing treatment provider type by household ethnicity and ICCM status at baseline and endline; Mende ethnic group represented by blue bars and Other ethnic groups represented by red bars.

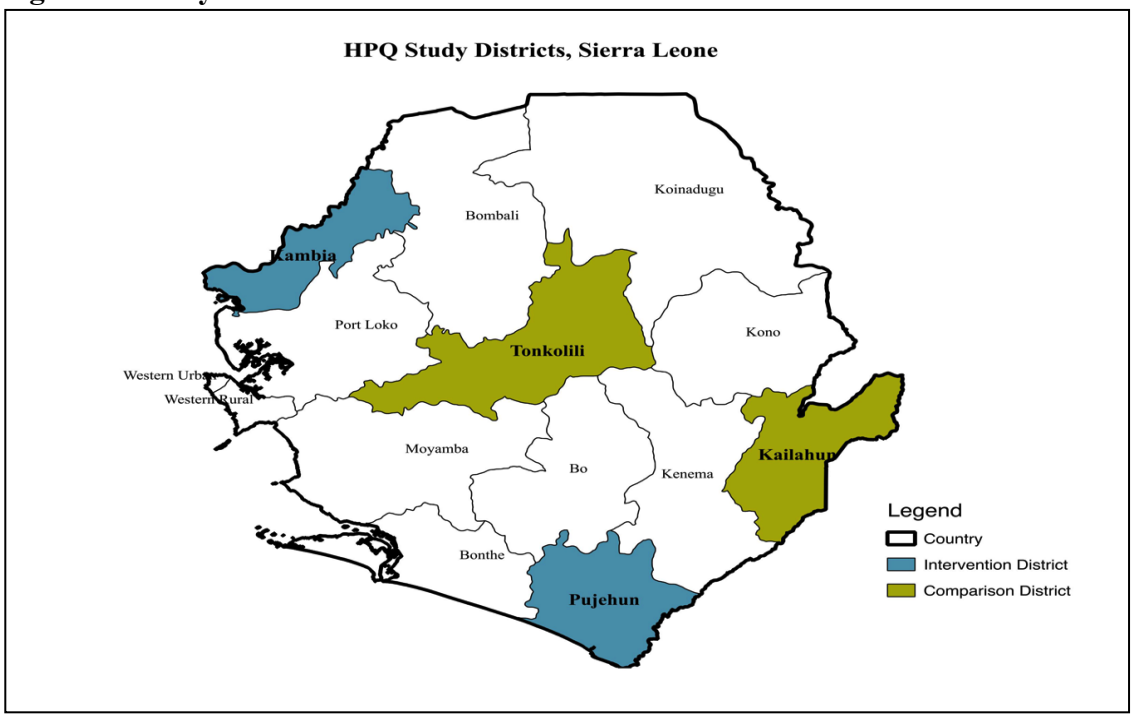
Figure 4 – Treatment provider by caregiver educational status and ICCM status

Figure 4 shows a bar graph comparing treatment provider type by caregiver education and ICCM status at baseline and endline; 'no education' group represented by blue bars and 'some education' group represented by red bars.

Figure 5 – Baseline to endline coverage changes in source of treatment by ethnic and socioeconomic status, Intervention and Comparison districts

Figure 5 shows baseline to endline changes in source of treatment by the three measures of inequity (wealth, ethnicity, and caregiver education status).

Figure 1: Study districts



Reference: QGIS

Figure 2: Treatment Provider Type by Wealth Rank and ICCM Status, Sierra Leone, 2010 and 2012

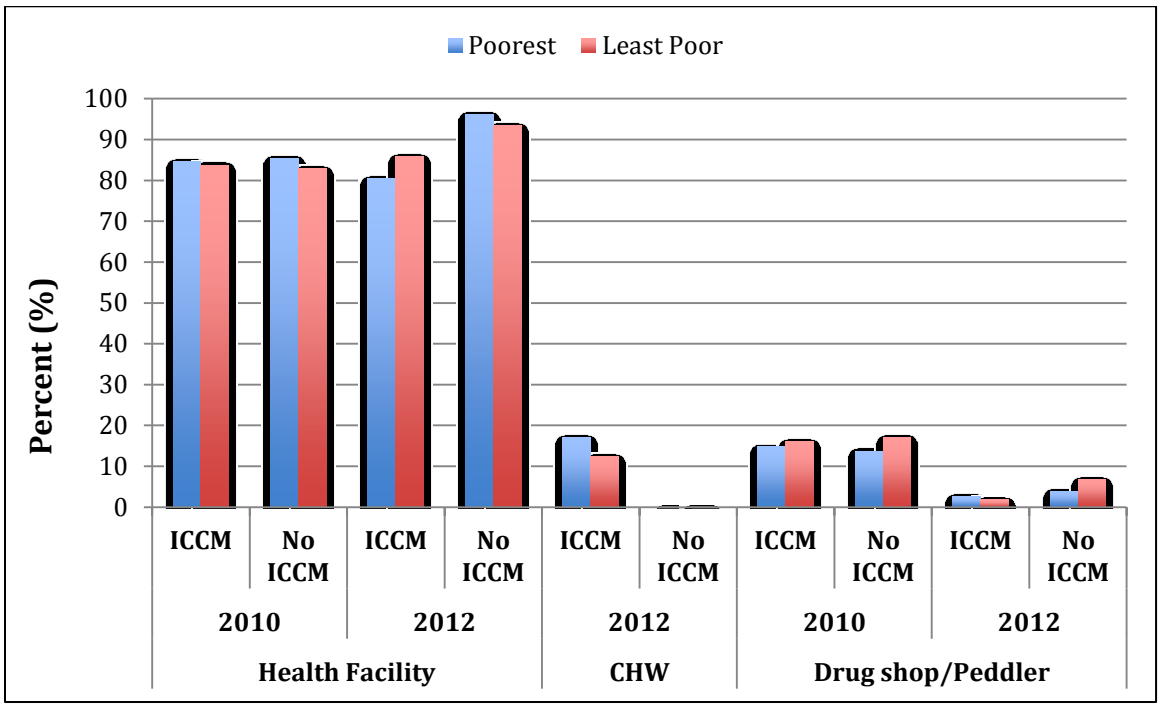


Figure 3: Treatment Provider Type by Ethnicity and ICCM Status, Sierra Leone, 2010 and 2012

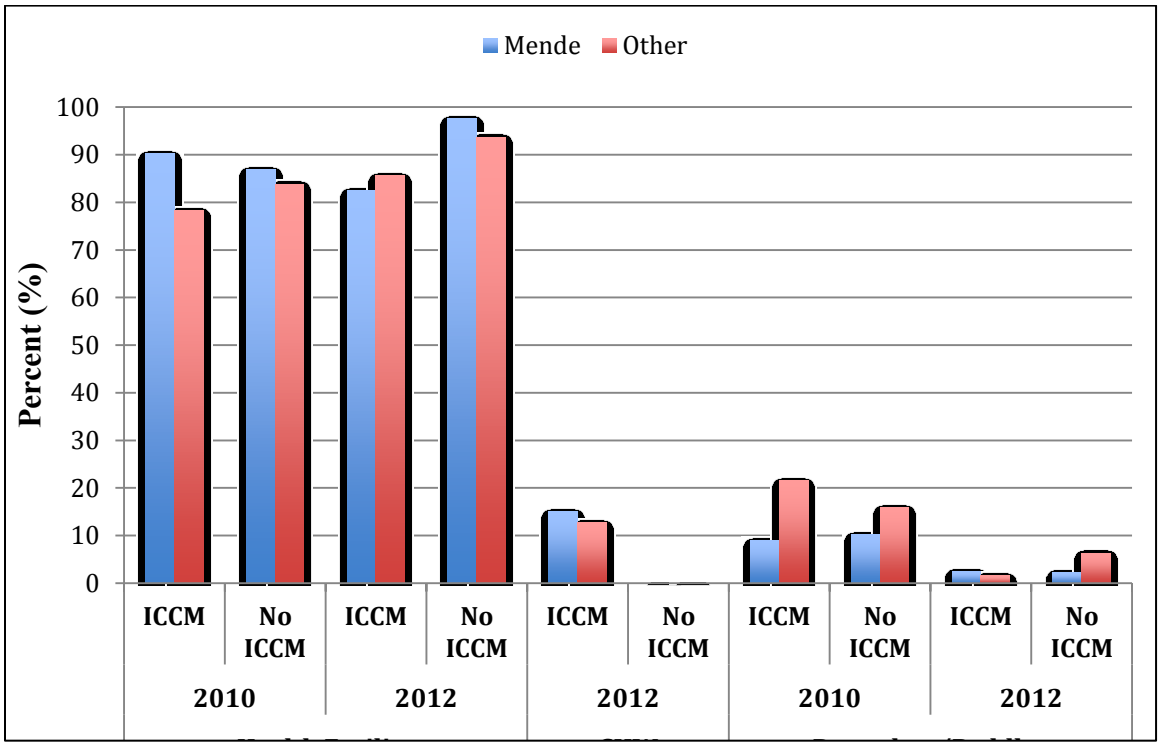


Figure 4: Treatment Provider Type by Caregiver Education and ICCM Status, Sierra Leone, 2010 and 2012

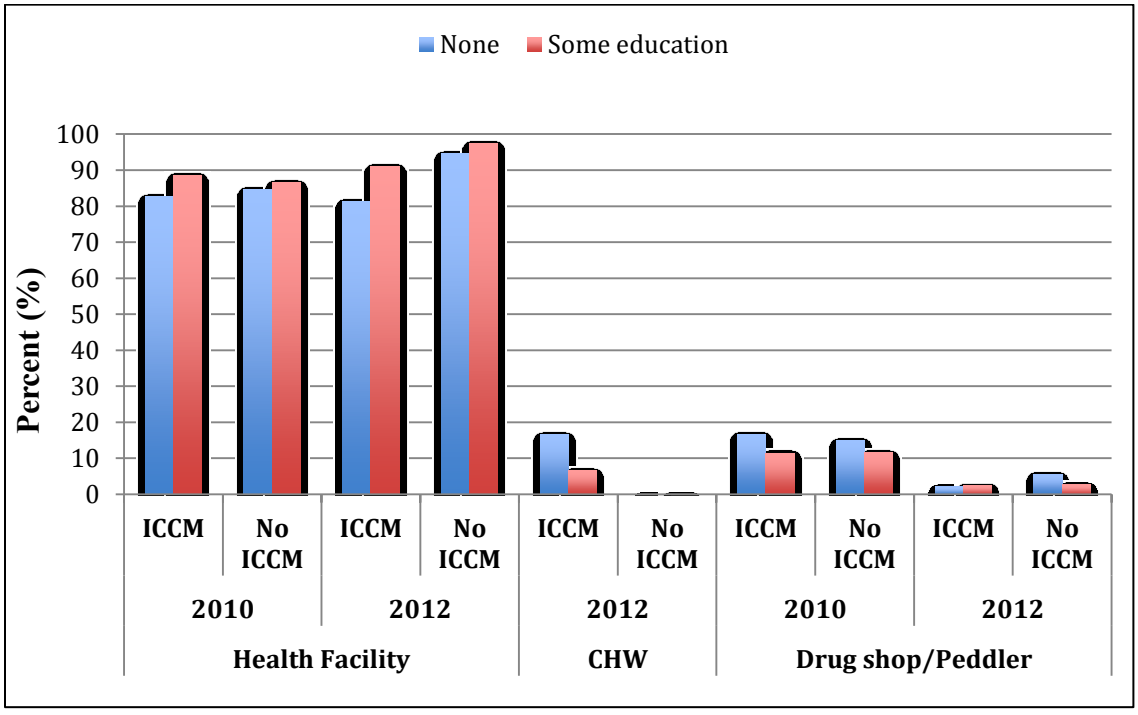
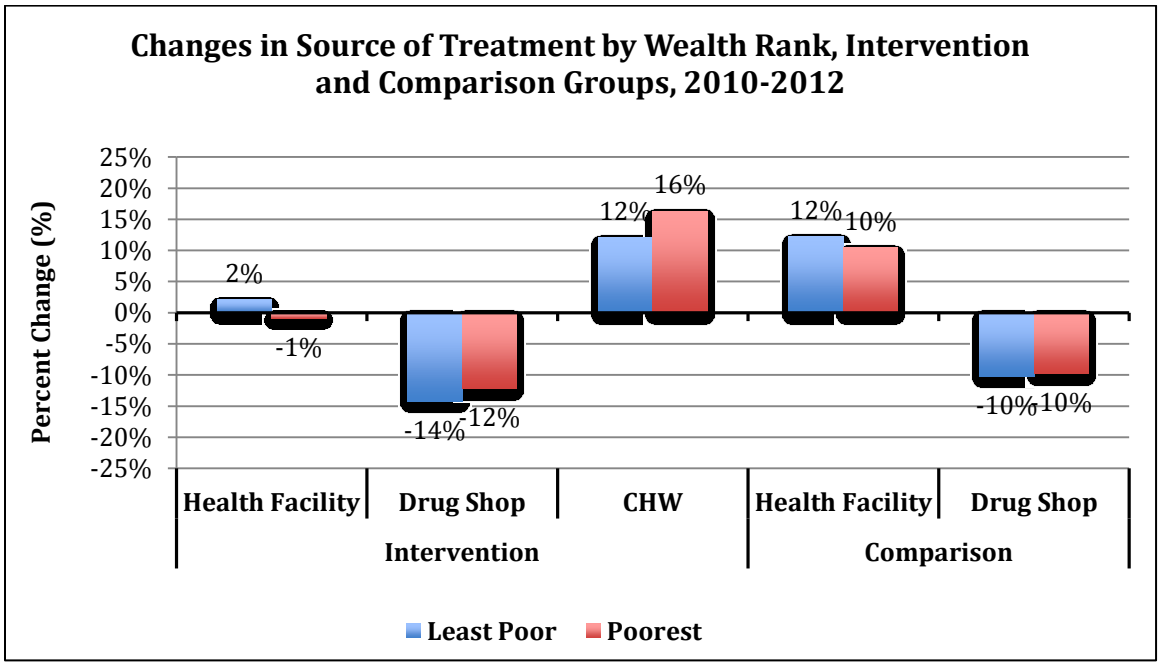
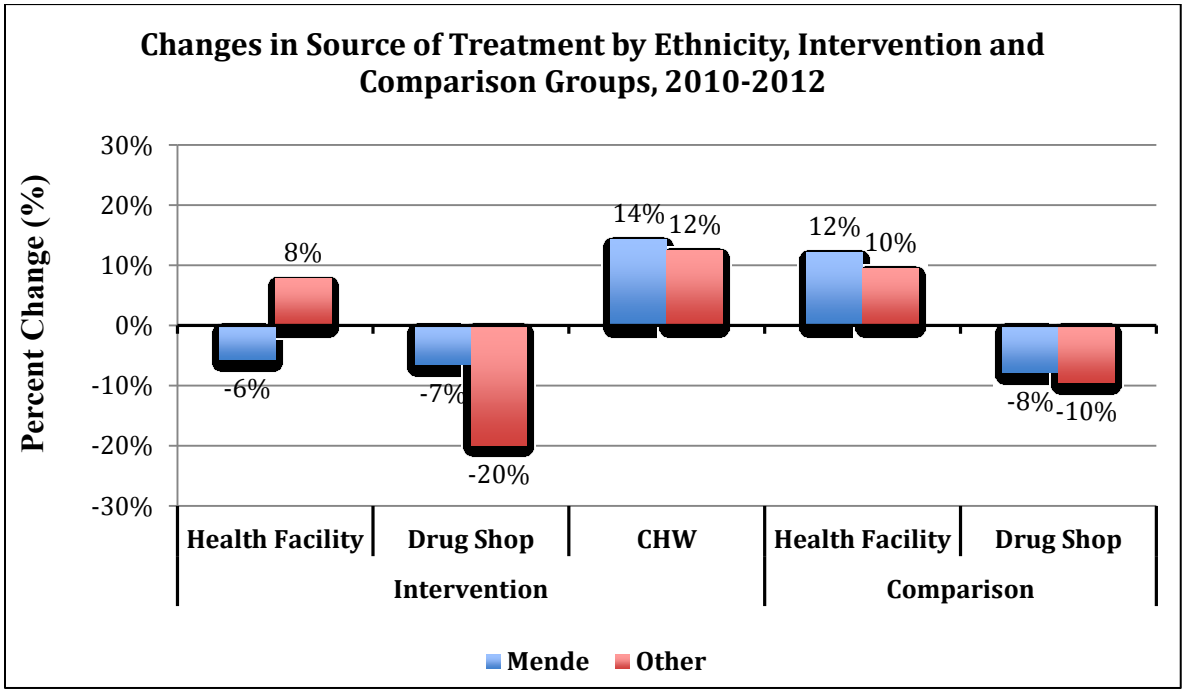


Figure 5: Baseline to Endline Coverage Changes in Source of Treatment by Ethnic and Socioeconomic Status, Intervention and Comparison Groups, 2010-2012





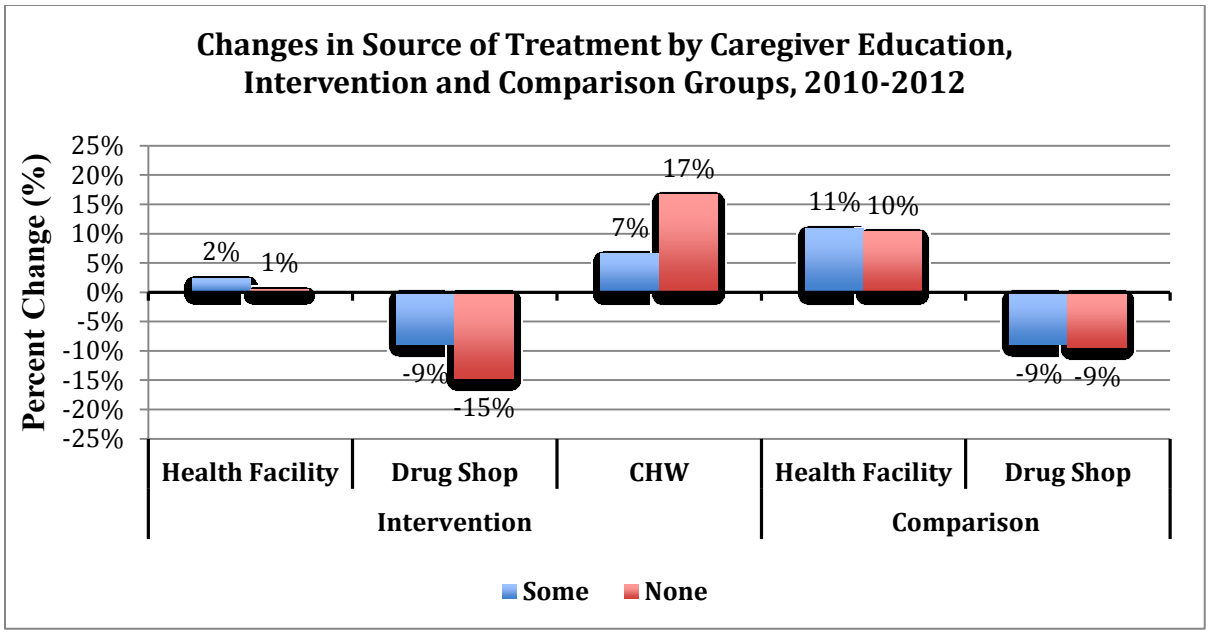

Changes in Source of Treatment by Caregiver Education, Intervention and Comparison Groups, 2010-2012
Percent Change (%)
25%
20%
15%
10%
5%
0%
-5%
-10%
-15%
-20%
-25%
2%
1%
-9%
-15%
7%
17%
11%
10%
-9%
-9%
Health Facility
Drug Shop
CHW
Health Facility
Drug Shop
Intervention
Comparison
Some
None

Table 7 Paper 3 Tables

Table 1 – Study characteristics

Table 1 shows the distribution of child, caregiver, and household characteristics by ICCM status at baseline and endline.

Table 2 – Care seeking and treatment coverage by wealth rank and ICCM status

Table 2 shows care seeking and treatment (appropriate and traditional) coverage by household wealth rank and ratios comparing least poor to poorest, by ICCM status at baseline and endline.

Table 3 – Care seeking and treatment coverage by ethnicity and ICCM status

Table 3 shows care seeking and treatment (appropriate and traditional) coverage by household ethnicity and ratios comparing 'Other' ethnic groups to Mende ethnic group, by ICCM status at baseline and endline.

Table 4 – Care seeking and treatment coverage by caregiver education and ICCM status

Table 4 shows care seeking and treatment (appropriate and traditional) coverage by caregiver educational status and ratios comparing 'some education' group to 'no education' group, by ICCM status at baseline and endline.

Table 5 – Results of ICCM effect on changes in care seeking and treatment by wealth, ethnicity and caregiver educational status

Table 5 shows the results from DID analysis to estimate the effect of the ICCM intervention on changes in care seeking and treatment by wealth, ethnicity, and caregiver educational status.

Table 1: Distribution of child, caregiver, and household characteristics by study group, Sierra Leone, 2010 and 2012

Characteristic	Baseline (2010)			Endline (2012)		
	ICCM (N=2,912)	No ICCM (N=2,731)	p-value[1]	ICCM (N=2,279)	No ICCM (N=2,980)	p-value[1]
	% (95%CI*)	% (95%CI*)		% (95%CI*)	% (95%CI*)	
Child's age (months)			0.416			0.950
0-11	24.9 (22.2-27.6)	23.5 (21.5-25.5)		20.4 (17.3-23.4)	19.7 (16.1-23.3)	
12-23	19.7 (18.4-21.0)	18.9 (17.2-20.6)		17.2 (13.8-20.6)	17.1 (14.5-19.7)	
24-59	55.4 (52.5-58.2)	57.6 (55.1-60.1)		62.4 (58.0-66.9)	63.2 (59.7-66.7)	
Child's gender			0.0601			0.206
Male	51.6 (48.7-54.6)	48.1 (45.9-50.4)		53.1 (49.0-57.2)	49.5 (45.8-53.3)	
Female	48.4 (45.4-51.3)	51.8 (49.6-54.1)		46.9 (42.8-51.0)	50.5 (46.7-54.2)	
Caregiver's age (years)			0.926			0.004
15-29	53.0 (49.8-56.3)	53.3 (48.6-58.0)		45.9 (41.6-50.3)	54.9 (50.6-59.2)	
>30	47.0 (43.7–50.2)	46.7 (42.0-51.4)		54.0 (49.7-58.4)	45.1 (40.9-49.4)	
Caregiver education level			0.363			0.878
None	74.5 (69.5-79.4)	76.5 (72.3-80.8)		79.2 (74.9-83.5)	77.6 (73.2-81.4)	
Primary	17.4 (13.2-21.4)	14.0 (10.7-17.2)		10.9 (8.0-13.7)	12.1 (8.8-15.4)	
Secondary	8.1 (5.7-10.7)	9.5 (6.4-12.5)		10.0 (7.1-12.8)	10.3 (7.5-13.1)	
Household size			0.001			0.119
≤6 people	41.9 (36.9-46.8)	59.2 (52.2-66.1)		58.8 (51.0-66.5)	65.9 (61.0-70.8)	
>6 people	58.1 (53.2-63.1)	40.8 (33.9-47.8)		41.2 (33.5-49.0)	34.1 (29.2-39.0)	
Polygamous Households	40.0 (35.0-44.3)	25.8(18.7-32.9)	0.003	31.5 (26.3-36.8)	24.2 (19.5-29.0)	0.042
Household Religion			0.000			0.000
Christian	5.8 (3.5-8.1)	23.0 (16.6-29.3)		5.0 (2.1-7.8)	19.6 (14.6-24.5)	
Muslim	94.2 (91.9-96.5)	77.0 (70.7-83.4)		95.0 (92.2-97.9)	80.4 (75.5-85.4)	
Household Ethnicity			0.020			0.011
Mende	42.1 (30.6-53.6)	27.9 (17.2-38.6)		60.0 (48.2-71.7)	39.4 (26.9-52.0)	
Temne	35.1 (25.3-44.8)	56.5 (44.2-68.8)		25.6 (15.2-36.0)	48.6 (36.3-61.0)	
Other**	22.8 (15.3-30.3)	15.6 (9.0-22.2)		14.5 (7.7-21.3)	12.0 (8.8-16.9)	
Household wealth rank***			0.060			0.004
Poorest	17.7 (13.2-22.2)	24.9 (19.8-30.0)		12.1 (8.4-15.7)	22.2 (16.9-27.5)	
Poor	61.9 (57.1-66.7)	59.3 (54.7-64.0)		60.9 (54.8-67.0)	58.7 (53.1-64.4)	
Least Poor	20.4 (15.8-25.0)	15.8 (11.7-19.9)		27.1 (21.3-32.8)	19.1 (13.9-24.3)	

ICCM= Integrated community case management

[1]Based on two-sided chi-square test for general association *Confidence Interval **Other = Susu, Limba, Kissi, Koronko and other. ***'Poorest' and 'Least Poor' defined by lowest and highest wealth quintiles based on principal components analysis (PCA) of household assets

Table 2: Care seeking and treatment coverage for children ill in previous two weeks by household wealth rank and ICCM status, Sierra Leone 2010 and 2012

CCM	Year	% Children by socioeconomic quintiles			
		Least Poor (Q4-5) % (95%CI)	Poorest (Q1-3) % (95%CI)	OR (95%CI) (Least Poor/Poorest)	P-value
Appropriate Care sought (all symptoms combined)					
	2010	(N=801)	(N=1,117)	0.84	0.209
ICCM		28.2 (22.4-34.0)	31.8 (25.8-37.9)	(0.64-1.10)	
	2012	(N=906)	(N=705)	1.10	0.717
		48.6 (40.4-56.8)	46.2 (35.9-56.5)	(0.65-1.86)	
	2010	(N=575)	(N=1,353)	0.95	0.818
No		32.7 (25.2-40.2)	33.9 (26.0-41.8)	(0.59-1.51)	
ICCM	2012	(N=688)	(N=1,398)	0.89	0.545
		41.8 (33.3-50.3)	44.7 (35.9-53.6)	(0.60-1.31)	
Appropriate treatment received (all symptoms combined)					
	2010	(N=686)	(N=1,010)	1.06	0.681
ICCM		52.5 (46.9-58.1)	51.0 (45.3-56.7)	(0.80-1.41)	
	2012	(N=757)	(N=566)	1.28	0.428
		67.8 (58.4-77.4)	62.3 (51.6-73.1)	(0.69-2.35)	
	2010	(N=520)	(N=1,228)	1.15	0.511
No		53.2 (45.0-61.6)	49.8 (41.5-58.2)	(0.76-1.83)	
ICCM	2012	(N=618)	(N=1,269)	1.13	0.628
		59.4 (48.8-69.09	56.5 (47.0-65.9)	(0.69-1.83)	
Traditional treatment received (all symptoms combined)					
	2010	(N=686)	(N=1,010)	1.10	0.680
ICCM		26.2 (17.4-35.0)	24.4 (19.2-29.7)	(0.70-1.72)	
	2012	(N=757)	(N=566)	1.39	0.352
		14.5 (7.9-21.1)	10.9 (6.4-15.5)	(0.69-2.68)	
	2010	(N=520)	(N=1,228)	0.57	0.030
No		13.2 (8.6-17.8)	21.1 (14.7-27.4)	(0.34-0.95)	
ICCM	2012	(N=618)	(N=1,269)	0.62	0.127
		11.7 (5.7-17.8)	17.7 (12.7-22.7)	(0.33-1.15)	

ICCM = integrated community case management; 'Poorest' and 'Least Poor' defined by lowest three (Q1-3), and highest two (Q4-5) wealth quintiles based on principal components analysis (PCA) of household assets. OR= odds ratio comparing Least Poor (Q4-5) to Poorest (Q1-3) Quintiles

Table 3: Care seeking and treatment coverage for children ill in previous two weeks by ethnicity and ICCM status, Sierra Leone 2010 and 2012

CCM	Year	% Children by ethnic group			
		Other	Mende	OR (95%CI)	P-value
		% (95%CI)	% (95%CI)	(Other/Mende)	
Appropriate Care sought (all symptoms combined)					
	2010	(N=1,189)	(N=789)	0.40	<0.001
ICCM		22.8 (17.6-27.9)	42.5 (36.8-48.3)	(0.28-0.57)	
	2012	(N=672)	(N=988)	1.54	0.089
		53.4 (43.6-63.3)	42.7 (34.7-50.7)	(0.94-2.53)	
	2010	(N=1,493)	(N=469)	0.98	0.937
No		33.2 (25.7-40.7)	33.6 (24.2-43.1)	(0.58-1.66)	
ICCM	2012	(N=1,421)	(N=687)	0.57	0.129
		39.3 (31.7-47.0)	53.2 (36.5-70.0)	(0.28-1.18)	
Appropriate treatment received (all symptoms combined)					
	2010	(N=980)	(N=716)	0.49	<0.001
		44.6 (40.4-48.7)	62.3 (56.8-67.8)	(0.37-0.64)	
ICCM	2012	(N=529)	(N=828)	1.43	0.252
		70.0 (60.5-79.5)	62.0 (51.7-72.4)	(0.77-2.64)	
	2010	(N=1,350)	(N=426)	0.69	0.172
No		48.3 (40.4-56.1)	57.6 (46.5-68.6)	(0.40-1.18)	
ICCM	2012	(N=1,265)	(N=642)	0.79	0.540
		55.7 (46.8-64.7)	61.6 (44.9-78.3)	(0.36-1.71)	
Traditional treatment received (all symptoms combined)					
ICCM	2010	(N=980)	(N=714)	4.86	<0.001
		35.2 (29.1-41.3)	10.1 (6.1-14.0)	(2.96-7.98)	
	2012	(N=529)	(N=827)	0.86	0.696
		12.1 (4.8-19.3)	13.8 (8.9-18.8)	(0.39-1.89)	
No	2010	(N=1,350)	(N=426)	4.78	<0.001
ICCM		22.8 (17.0-28.7)	5.8 (2.4-9.2)	(2.40-9.48)	
	2012	(N=1,265)	(N=642)	1.74	0.094
		17.9 (12.2-23.6)	11.1 (5.6-16.6)	(0.91-3.35)	

ICCM = integrated community case management; Other = Susu, Limba, Kissi, Kono, and other.
OR= odds ratio comparing Other ethnic groups to Mende ethnic group

Table 4: Care seeking and treatment coverage for children ill in previous two weeks by caregiver education and ICCM status, Sierra Leone 2010 and 2012

ICCM	Year	% Children by mother's educational status			
		Some education % (95%CI)	No education % (95%CI)	OR (95%CI) (some/none)	P-value
Appropriate Care sought (all symptoms combined)					
	2010	(N=491)	(N=1,480)	1.14	0.524
ICCM		32.4 (23.4-41.4)	29.7 (24.3-35.1)	(0.76-1.69)	
	2012	(N=333)	(N=1,322)	1.81	0.003
		58.7 (49.0-68.5)	44.0 (37.5-50.5)	(1.24-2.65)	
	2010	(N=476)	(N=1,475)	1.17	0.427
No		36.0 (27.7-44.3)	32.5 (25.7-39.4)	(0.79-1.72)	
ICCM	2012	(N=471)	(N=1,637)	0.98	0.947
		43.5 (32.3-54.8)	43.9 (35.9-52.0)	(0.61-1.59)	
Appropriate treatment received (all symptoms combined)					
	2010	(N=428)	(N=1,264)	1.05	0.781
ICCM		52.6 (44.9-60.2)	51.4 (46.8-56.1)	(0.76-1.44)	
	2012	(N=271)	(N=1,081)	2.02	0.006
		76.8 (67.5-86.0)	62.1 (54.5-69.7)	(1.23-3.31)	
	2010	(N=423)	(N=1,343)	1.54	0.050
No		58.4 (49.2-67.5)	47.6 (39.8-55.5)	(1.00-2.38)	
ICCM	2012	(N=431)	(N=1,476)	1.27	0.281
		62.2 (52.5-71.8)	56.5 (47.7-65.2)	(0.82-1.95)	
Traditional treatment received (all symptoms combined)					
	2010	(N=427)	(N=1,263)	0.65	0.042
ICCM		19.7 (13.6-25.9)	27.3 (21.0-33.6)	(0.43-0.98)	
	2012	(N=271)	(N=1,080)	0.47	0.044
		7.4 (2.6-12.1)	14.6 (9.6-20.0)	(0.22-0.98)	
	2010	(N=423)	(N=1,343)	0.97	0.869
No		18.4 (11.5-25.3)	19.0 (13.9-24.0)	(0.64-1.46)	
ICCM	2012	(N=431)	(N=1,476)	0.31	0.002
		6.5 (2.2-10.8)	18.2 (13.3-23.0)	(0.15-0.66)	

ICCM = integrated community case management;
Some education = primary, secondary and post-secondary education
OR= odds ratio comparing Some education to No education

Table 5: Results of ICCM Effect on Changes in Care Seeking and Treatment by Wealth, Ethnicity and Caregiver Education

	OR (95%CI)	P-value	OR (95%CI)	P-value
Wealth	**Poorest**		**Least Poor**	
Care seeking from appropriate provider	1.17 (0.61-2.24)	0.644	1.63 (0.89-3.0)	0.116
Appropriate treatment	1.22 (0.65-2.28)	0.538	1.49 (0.77-2.89)	0.236
Traditional treatment	0.47 (0.23-0.97)	0.043	0.55 (0.20-1.49)	0.238
Ethnicity	**Mende**		**Other**	
Care seeking from appropriate provider	0.45 (0.22-0.93)	0.031	2.98 (1.60-5.54)	0.001
Appropriate treatment	0.84 (0.38-1.82)	0.648	2.15 (1.12-4.41)	0.020
Traditional treatment	0.71 (0.22-2.30)	0.565	0.34 (0.14-0.87)	0.025
Caregiver Education	**No Education**		**Some Education**	
Care seeking from appropriate provider	1.15 (0.67-1.96)	0.619	2.17 (1.03-4.57)	0.042
Appropriate treatment	1.08 (0.62-1.89)	0.773	2.55 (1.24-5.27)	0.012
Traditional treatment	0.48 (0.23-0.99)	0.047	1.05 (0.34-3.24)	0.940

Odds ratio (OR) based on difference-in-differences (DID) analysis obtained from interaction term from multivariable logistic regression

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Chapter 9: Discussion, Conclusions and Implications

Strengths and Limitations

Strengths

- The use of comparison districts allowed measurement of care seeking and treatment coverage likely to be achieved in the absence of the intervention
- The study questionnaire was based on standard questions used in large-scale households surveys in developing countries such as the Demographic and Health Surveys (DHS) and Multiple Indicator Cluster Surveys (MICS).
- The use of PDAs with consistency checks minimized data entry errors.
- Intervention contamination was limited due to distance between intervention and comparison districts. The mainly poor and rural study population is not very mobile.
- The same data collection methods (face-to-face interviews) with same instruments (PDAs) were used at baseline and follow up. Efforts were also made to use the same interviewers, about a third of whom who participated in both surveys.
- The multivariable logistic regression analyses adjusted for district differences in study characteristics and program duration, and still showed some significant associations with CHW utilization.
- In addition, the intervention likely accounted for inequity by wealth by targeting the poorest districts, possibly explaining the lack of observed inequities by wealth in the study outcomes across study groups.

Limitations

- Program implementation
    - Two different NGOs implemented the program in the two districts. However, NGOs received the same standardized training and were made to work as a consortium with the same monitoring and reporting guidelines.
    - The staggered rollout of the intervention may have resulted in varying levels of exposure to the intervention by cluster. In one intervention district, over half (54.2%) of children U5 lived in clusters with less than 12 months of program duration, which might not have been adequate for program saturation. However, there did not appear to make a difference in CHW utilization, which was fairly the same regardless of intervention duration.
    - CHWs were deployed throughout districts regardless of accessibility of health facilities, which may explain why both intervention and comparison areas showed similar increased treatment rates. A more strategic deployment of CHWs in hard-to-reach areas may result in a more accelerated increase in treatment.
- Study design
    - Due to the quasi-experimental design of the study (i.e. not a cluster randomized trial with only 4 districts), there could be substantial confounding associated with other district-level characteristics. The use of a comparison group however allowed us to measure care seeking and treatment coverage likely to be achieved in the absence of the intervention.

- The non-comparability of study areas likely affected study results. Though all fairly poor and underserved districts, the two poorest districts were targeted for the ICCM intervention, leaving slightly better off districts for comparison. However, the baseline differences between study areas were adjusted for in the difference-in-difference (DID) analysis, which still showed some significant results.
- A review of CHW monthly reports with the number of treatments given per U5 population per catchment area may have been a better measure of CHW utilization.

- Data collection
  - Prevalence of childhood illnesses (pneumonia, malaria, and diarrhea) was based on caregiver reports of symptoms with no clinical confirmation of illness.
  - Questions regarding caregivers seeking care for their child's illness may have resulted in inflated rates due to social desirability bias.
  - Data on care seeking and treatment was based on the recollection of caregivers and may be subject to recall bias. However, the two-week recall period is the standard for household surveys (i.e. DHS and MICS) conducted in developing countries, and has been shown to produce accurate data on child morbidity and care seeking.
  - In malaria-endemic areas such as Sierra Leone, signs and symptoms of pneumonia and malaria in children often overlap, making it difficult to get an accurate prevalence estimate for the two illnesses. The interpretation of

treatment coverage for suspected pneumonia was particularly problematic since the denominator of suspected pneumonia may have included a number of cases that were not true pneumonia due to the overlap of pneumonia and malaria symptoms [111].

    - Reported CHW use may have been underestimated due to some caregivers confusing CHWs with community health officers (CHOs) who are paid facility health personnel or confusing CHWs with health facility staff at PHUs. However, efforts were made during interviewer training and data collection to provide clear definitions of who CHWs were in order to minimize confusion with CHOs and other provider types. Interviewers clearly defined who a CHW was and provided visual aids (photos of boxes used by CHWs and the fact that they are in the communities) to respondents.

- Analysis
    - Due to the small sample size of children who received treatments from CHWs (111 out of 777 U5 for whom treatment was sought), all significant associations should be taken with caution, as the distribution of types of illnesses and treatments may not be generally representative.
- Contextual Factors
    - There were other child health interventions being implemented during the study period (see appendix F). Though information on contextual factors was collected, we could not account for these in the analysis.
    - The FHCI may have had had an effect on the low utilization of CHWs in the community, with caregivers preferring to seek care from health facilities. The

study showed that CHW use was low even for children whose caregivers reported some common barriers to accessing health facilities (distance, cost, going alone, etc.). For instance, children whose caregivers reported going alone to a health facility as a barrier to accessing facility treatment were less likely (OR=0.17) to receive treatment from a CHW.

Discussion

The study findings revealed baseline to endline changes in care seeking and treatment coverage for children U5 with diarrhea, malaria and/or pneumonia, and CHWs' influence on these changes across intervention and comparison areas. Though no major differences in U5 and caregiver characteristics between intervention and comparison groups, differences existed in household characteristics by polygamy, religion and ethnicity. Overall prevalence of the three conditions remained the same at both study periods.

Paper1 (CHW Influence on Changes in Care Seeking and Treatment):

Overall care seeking rates for the three conditions did not change over time and remained fairly high for both groups. However, care seeking from an appropriate provider increased significantly for both groups. Coverage of appropriate treatment increased and traditional treatments decreased at endline, though some group and condition-specific differences existed. The intervention was associated with increased appropriate treatment for pneumonia and decreased treatment for malaria with ACT and traditional treatments of diarrhea.

CHW presence did not appear to affect care seeking from an appropriate provider, which increased in both study groups. The small differences in care seeking between study groups may be due to the FHCI, as well as health education and promotion activities in the comparison districts. The non-strategic deployment of CHWs in the intervention districts with CHWs placed all over the districts regardless of accessibility of health facilities may also explain the similar increases in treatment coverage between the study groups. The higher coverage of malaria treatment with ACT in the comparison

districts was likely due to nationwide stockout of ACT which affected intervention districts more than comparison districts. During the course of the intervention, the National Malaria Control Program implemented community-based treatment programs for malaria in both comparison districts, while another CSO implemented a malaria project in one of the comparison districts. The findings however showed that CHW presence in the intervention districts was associated with increased use of antibiotics for pneumonia, reduced use of traditional treatment for diarrhea and reduced health facility treatments for malaria and pneumonia. CHWs did not appear to have an effect on drug shops or peddler use, which was already low (14.9%) at baseline for both study groups; the low proportion likely due to the fact that peddlers charge money for treatments, whereas CHW and government health facility treatments were provided free of charge.

Recent studies have demonstrated the effectiveness of CHW programs in Sub-Saharan Africa. CHWs influence care-seeking behavior and improve access to appropriate treatment of common childhood illnesses, particularly in hard-to-reach and poor areas [7, 72, 73, 76-79]. A pre-post evaluation of a CHW program in two villages in Nigeria showed a CHW utilization rate of 26.1%, with decreased use of patent medicine dealers (44.8% to 17.9%) and slight increase in health facility use (30.2% to 32.2%) [73]. Results from an evaluation of malaria CCM pilot program in two hard-to-reach and poor districts of Kenya supported the assertion that CHWs can be influential in changing health seeking behavior of families [73, 77]. In Zambia, CHWs' provision of ICCM showed an increase in CHW use and a decrease in health facility use for children with fever and non-severe pneumonia [78]. Volunteer CHWs were credited with reduced child

deaths and improved care-seeking practices for diarrhea and fever/malaria post intervention of a CHW program in rural Uganda [79].

Due in part to the FHCI and CHW intervention, there appeared to be a shift away from traditional remedies to allopathic treatment for childhood illnesses in Sierra Leone [1]. At baseline, there was a strong association of traditional treatment use and not seeking allopathic care [105]. Caregivers reported using traditional healers because they were nearby, had a more personal relationship with them than facility-based providers, and offered flexible payment mechanisms [1]. By endline, there was an overall increase in seeking care at governmental health facilities followed by CHWs (in intervention districts) in all study districts.

Like in Sierra Leone, some Sub-Saharan countries have removed user fees for U5 children at government health facilities, in an effort to meet MDG 4 goals [108-110]. The number of consultations for curative care at health facilities doubled after the introduction of free primary health care in South Africa [110]. In rural Niger, the 3.5 times increase in reported care seeking from health facilities for pediatric diarrhea was attributed to the abolition of user fees [108]. The situation was opposite in Uganda, where despite the removal of user fees at government health facilities, the majority (two-thirds) of children were taken to drug shops and private clinics for malaria treatment due to proximity and treatment availability on credit [109]. CHWs, who are from the communities in which they provide treatments, appeared to have similar personal relationships with caregivers as the traditional healers in the intervention districts. Findings from the endline qualitative study showed there was good understanding of the role of CHWs among

communities and they are generally perceived to provide helpful services, with respondents stating that they strongly value their work [99].

With increasing care seeking from an appropriate provider in the study districts, there is a need to ensure availability and adequacy of services at both facility and community levels in Sierra Leone. Studies have shown that the removal of user fees are not enough to address community demand for access to prompt and affordable care for children [109]. Despite free healthcare, there are still costs involved in seeking care such as transportation costs, time away from home, and facilities still charging unofficial fees [31, 109]. FHCI led to increases in seeking treatment at the health facility level, putting a burden on an already weak health care infrastructure with limited staff, inadequate drugs and supplies, and long distances to health facilities [29, 31, 102].

The use of CHWs has been identified as a strategy to address the growing shortage of health workers in low-income countries. With task shifting from health centers, CHWs can increase the number of care providers at the community level [13],[74]. Compared to health facilities, CHWs are geographically closer and available; they are from the community and therefore overcome cultural and linguistic barriers that may be present in health facilities [69].

Paper 2 (Factors Associated with CHW Utilization):

The study results show care seeking and treatment coverage as well as factors significantly associated with CHW utilization for ill children U5 in the two intervention districts. There were significant district differences in the study population by ethnicity, child gender, polygamy, type of household head, and program duration. Disease prevalence and care seeking from an appropriate provider was significantly higher among

children from Kambia compared to children from Pujehun. Coverage of appropriate treatment was similar between districts, though higher malaria treatment in Pujehun and higher pneumonia treatment in Kambia. CHW utilization increased from 0% in 2010 (no CHWs at baseline) to 14% after two years of the intervention. CHWs provided 17% of diarrhea treatment with ORS and zinc, 11% of malaria treatment with ACT, and 24% of pneumonia treatment with cotrimoxazole. Children with diarrhea symptoms, who are from female-headed and poorest households and whose caregivers reported poor facility quality of care as a barrier to accessing care at health facilities were significantly more likely to receive treatments from CHWs.

Recent studies on CHW programs in Sub-Saharan Africa show varying levels of CHW utilization, ranging from 26% to 78% [77, 103, 114-117]. Poorest household wealth quintile, increased caregiver knowledge of malaria illness and a child not having fever, were significantly associated with use of community medicine distributors for malaria and pneumonia ICCM in Uganda [104]. A study on CHW utilization in Kenya showed CHW use was significantly higher in poorest vs. least poor households, in smaller villages with less than 200 households vs. larger villages, and when prompt treatment (within 24 hours of symptom onset) [77]. The use of CHWs for the management of febrile illnesses in Eastern Uganda was associated with child being from poorest household and prompt care seeking [114]. Location, skills and recommendation from a family member were reasons for seeking care from a CHW and drug stock outs and lack of knowledge of CHW services were reasons given for not seeking care from a CHW in a study on CHW access, acceptability and utilization in Uganda [116]. Symptom recognition and severity is another factor associated with CHW use. The significant use

of CHWs for diarrhea treatment was due to the fact that diarrhea in children is easy to recognize and therefore easy to seek care. For more severe illness like pneumonia, caregivers in the HPQ baseline qualitative study described it as "hospital sickness" which needed facility-based care [1]. Provider quality of care is another important factor for caregiver's decision to seek care, including seeking care from a CHW. For this study, caregivers who reported poor quality of care in health facilities as a barrier were more likely to seek care from CHW (OR=6.10). In Kenya, caregivers gave high ratings for quality of care of services received from CHWs [103]. In Uganda, caregivers' perceived quality of care was significantly higher for services provided by CHWs compared to services provided by facility-based providers [119]. Though CHW utilization was lower in this study, the findings on factors significantly associated CHW utilization are similar to other recent CHW studies in Sub-Saharan Africa, with higher CHW use among children from rural areas and poorest households [77, 104, 114].

The low CHW utilization was likely due to the preference for health facility personnel who are likely seen to be more qualified than volunteers in the community. The study results are similar to other studies with low CHW use, with low utilization likely due to preference for health facility personnel, low sensitization of CHW services, and CHW drug stock outs [104, 116]. In a study of community medicine distributors (CMD) in Uganda, low coverage of CMD use was explained by caregiver preference for private clinics, low and non-continued sensitization activities and periodic shortages [104]. Low sensitization of the CHW program may have also affected the study results. Though sensitization activities were done at the start of the intervention, it is not clear how often or whether these activities were sustained over time. The staggered implementation of the

intervention did not appear to have an effect on utilization, which was similar for longer and shorter durations of the intervention. The higher disease prevalence (particularly for diarrhea) and care seeking from Kambia district was likely due to a cholera outbreak that occurred in the district during the survey period. However, this did not affect CHW utilization, with similar CHW use in both study districts. The nationwide stock out of ACT may also have affected utilization; however the stockout also affected health facilities and should not have had that major an effect on CHW utilization. In addition, CHW availability and intervention drug stockouts may have also played a significant role in the low utilization observed in the study. Unavailability of expected services/drugs was the most frequent problem raised from focus group discussions of caregiver experiences with CHW services [99]. CHWs' volunteer status meant that they had to earn a living through farming or other tasks, making their availability at all times a challenge.

Paper 3 (ICCM Effect on Equitable Coverage of Care Seeking and Treatment):

The study examined ethnic and socioeconomic inequalities in care seeking and treatment for children U5 in two intervention districts versus two comparison districts, two years after the implementation of an ICCM intervention. In both study groups, no significant baseline to endline difference existed in prevalence for the 3 ICCM conditions, though prevalence was generally higher in children from poorest and Temne households and whose caregivers reported no education (data not shown).

Due in part to the purposive selection of poorest districts for the intervention, no wealth inequalities were observed for appropriate care seeking and treatment and treatment provider, with equitable coverage by wealth rank in both study groups and survey periods. In the intervention group, decreased inequalities by ethnicity and

increased inequalities by caregiver education were observed for care seeking, treatment, and provider type. In the comparison group, decreased wealth and ethnic inequalities for traditional treatments and increased inequality for traditional treatments by caregiver education were observed. The ICCM intervention was associated with significant increases in appropriate care seeking and treatment for children from ethnic groups other than Mende and whose caregivers reported some education. The intervention was also associated with significant decreases in traditional treatments for children from poorest households and whose caregivers reported no education.

Other studies corroborate this study's mixed results on child health program effect on changes in equity. A study on country experiences with IMCI showed that inequity was increased in countries which implemented IMCI in better developed urban areas (i.e. Brazil) and decreased in countries that implemented the program in the highest mortality areas first (i.e. Peru) [17]. Results from an evaluation of IMCI impact on the equality of health outcomes and access across socio-economic gradients in rural Tanzania after 3 years of implementation showed that IMCI was associated with observed improved equity for measles vaccine coverage and decreased equity for DPT coverage [121]. A study examining inequities in CHW use for timely and appropriate treatment of malaria showed the CHWs improved geographic access to treatment but did not improve socioeconomic access to high quality drugs [125]. An evaluation of a one-year malaria and diarrhea ICCM program implemented is the sole study thus far that has shown improved equity with high levels of effective treatment equitable across socioeconomic status in the intervention areas, while disparities were observed in comparison areas [97].

In recognition of the importance of public health programs' impact on inequity in child health, countries and organizations are now including equity assessments as part of program monitoring. Studies have shown that equity assessments can be incorporated in impact evaluations at relatively low cost and may point to specific interventions that need to be reinforced [16]. Assessment of inequities in maternal and child health is part of the Countdown to 2015 objective in measuring progress in MDG 4 and 5 goals [126]. Evaluation of equity impact of health programs and interventions in Sub-Saharan Africa is growing, but limited mainly on morbidity and mortality impact by wealth. Better evidence is needed on how well public health programs are reaching not only poor children, but also different geographic and socio-demographic backgrounds.

Conclusions

Paper 1: The study demonstrates that availability of CHWs can influence care seeking and treatment for children U5 ill with diarrhea, malaria, and/or pneumonia. They successfully provided appropriate treatment and reduced treatment burden at health facilities and caregiver reliance on traditional treatments. Despite the FHCI presence in all districts, CHWs still accounted for a significant proportion of treatments delivered in intervention districts, showing acceptability of CHW as providers and part of the formal health sector.

Paper 2: Though utilization was low, CHW use was greater in children from disadvantaged backgrounds (poorest and female-headed) and whose caregivers reported poor quality of care as a barrier to accessing health facilities. However, a more in-depth investigation is needed to better understand caregiver's access, acceptability and utilization of CHW services as well CHWs' experiences providing care in the community.

Paper 3: The ICCM intervention effect on equity in care seeking and treatment for children U5 was mixed. With significant increases in appropriate care seeking and treatment, children from ethnic groups other than Mende and whose caregivers reported some education appeared to benefit the most from the intervention. The intervention was also associated with decreased reliance in traditional treatments for children from disadvantaged backgrounds (poorest households and whose caregivers reported no education).

The intervention increased availability of appropriate care in the community and replaced traditional healers with CHWs. Deployment of CHWs was associated with some

increase in appropriate treatment, reduced treatment burden at the facility level, and reduced reliance on traditional treatments, but no overall increase in coverage within the context of expanding free care. With the challenges currently faced by Sierra Leone's health system (limited facilities, acute shortage in healthcare personnel, long distances to health facilities in rural areas), availability of trained and supervised CHWs can be an addition to improve provision of free healthcare in the country.

Recommendations

The dissertation addresses some of the gaps in the literature and contributes towards developing the evidence base on ICCM programs in sub-Saharan Africa. The dissertation also provides evidence on the utility of ICCM by CHWs in the context of free healthcare for children in Sierra Leone. Though CHW utilization was generally low, CHW presence in communities significantly influenced some changes in care seeking and treatment of common childhood illnesses in Sierra Leone. ICCM by CHWs was associated with decreased treatment burden at health facilities and decreased reliance on traditional healers. In addition, the ICCM intervention appeared to have an equity impact by most benefiting children from disadvantaged backgrounds; children from least poor and female-headed households and ethnicities other than Mende, who have traditionally been less likely to seek allopathic care. Specifically, the results of this study provide evidence to the Sierra Leone government and other resource-poor countries currently contemplating developing and/or expanding CHW programs, particularly those that have abolished user fees at government health facilities. In November 2011, a Community Health Worker Policy and Strategic Plan 2012-2015 was developed by the Sierra Leone MOHS in collaboration with UNICEF and WHO, which recommended prioritizing deployment of CHWs in hard to reach communities to increase timely access to the treatment with ICCM interventions.

The following recommendations are specific to Sierra Leone as well other Sub-Saharan African countries with similar health systems contexts. The recommendations focus on improving process outcomes (i.e. care seeking and treatment coverage), and ultimately impact child mortality.

1. There needs to be a concerted and sustained effort on health communication and promotion of CHW services, advocating for the use of CHWs as first line of care for non-severe illnesses at the community-level (Papers 1 & 2)
2. Upon determining care seeking and treatment by common equity factors (wealth, ethnicity, caregiver education), targeted behavioral change communication is needed to reinforce care seeking from appropriate providers for traditionally disadvantaged groups (poorest, most remote, certain ethnic groups, etc.), who are less likely to seek health facility care and rely more on self-treatment and traditional healers (Paper 2 & 3).
3. Continued encouragement of health facility use for more severe cases and for referrals by CHWs. However, there is a need for improvements in quality of care (QOC) at health facilities as evidenced by the preference for CHWs for caregivers who reported poor QOC as a barrier to access care from a health facility (Paper 2)
4. Countries with non-paid volunteer CHW programs should think of ways of providing motivation to volunteers and possibly provide more education and/or training and make them a more formal cadre of the health system (Paper 2).

Future Research Directions

With Sierra Leone's new CHW policy of deploying CHWs to hard-to-reach areas, the MOHS can used the evidence provided by this dissertation to formulate a comprehensive program evaluation plan to examine CHW effectiveness in the future. The following research directions will be useful.

1. Use of a more robust study design such as cluster randomized trial expanded to the whole country, with the ICCM intervention randomly assigned at the cluster-level.
2. Power the study with a large enough sample size in order to measure not only ICCM effect on care seeking and treatment, but also ICCM impact on U5 mortality.
3. More in-depth qualitative research needed on caregivers' experiences seeking care from CHWs as well as CHWs experiences in providing care in communities.
4. Even in districts that seem uniformly poor, some socio-demographic variability in care seeking and treatment still exists. There should be more robust equity analysis to determine disadvantaged groups who may benefit the most from ICCM.

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Appendices

A. Program Implementation Data

Indicator	2010	2011	2012	2010-2012
CHW training, deployment and supervision				
CHWs trained (total)	233	1,691	205	2,129
CHWs who died or abandoned duties (total)				239
CHWs available (total)				1,890
CHWs deployed per household (ratio)		1:50	1:55	
CHWs deployed per children U5 (ratio)		1:52	1:57	
CHWs with initial drug kit (%)	100%	100%	100%	100%
CHWs with refresher training (for those working at least 1 year)	0	298	829	1,127
CHWs supervised (monthly) (%)	NA	77%	56%	68%
Drug management				
% CHWs with ACT stockout	NA	3%	48%	25%
% CHWs with ORS and zinc stockout	NA	2%	31%	16%
% CHWs with cotrimoxazole stockout	NA	1%	16%	8%
CHWs supervised assessment of skills				
Correctly count respiratory rates (%)	NA	99%	95%	97%
Correct treatment – malaria (%)	NA		76%	
Correct treatment – diarrhea (%)	NA		88%	
Correct treatment – pneumonia (%)	NA		81%	

Source: UNICEF, HPQ Final Evaluation Report: Uganda and Sierra Leone, June 2013

B. Facility and CCM Treatments, January 2010-July 2012

Condition	Year	Intervention Areas			Comparison Areas
		Facility treatments	*CCM treatments*	*Total treatments*	*Facility Treatments*
Diarrhea	2010	NA	280	NA	NA
	2011	6,932	23,066	29,998	25,408
	2012	15,598	24,558	40,156	26,328
	Total (2010-2012)	**22,530**	**47,904**	**70,154**	**51,736**
Malaria (presumptive fever diagnosis)	2010	NA	833	NA	NA
	2011	33,382	68,909	102,291	107,039
	2012	45,186	54,025	99,211	100,276
	Total (2010-2012)	**78,568**	**123,767**	**201,502**	**207,315**
Pneumonia (ARI)	2010	NA	256	NA	NA
	2011	17,824	23,447	41,271	94,107
	2012	29,965	17,611	47,576	75,045
	Total (2010-2012)	**47,789**	**41,314**	**88,847**	**169,152**
All conditions combined	2010	NA	1,369	NA	NA
	2011	58,138	115,422	173,560	226,554
	2012	90,749	96,194	186,943	201,649
	Total (2010-2012)	**148,887**	**212,985**	**360,503**	**428,203**

Source: UNICEF, HPQ Final Evaluation Report: Uganda and Sierra Leone, June 2013

Notes

- Information not collected on treatment completion or referrals from a health facility
- Diarrhea treatment – do not know if the child received ORS, zinc or both

C. CHW Reporting Form

Community Based Distributor Patient Register
Community Case Management Program
Sierra Leone Ministry of Health and IRC Sierra Leone

Name of CBD: _____
Location of CBD _____
PHU: _____Chiefdom_____

Month: _____
Year: _____
CBD No.: _____

No.	Date	Patient Name	Village	Sex		Age		Fever		Diarrhoea		Cough		Pneumonia		Breaths per minute	Referred?
1 2 3 4 ...						 2-11 months	 12-59 months										
								<24 Hrs	>24 Hrs	<24 Hrs	>24 Hrs	<24 Hrs	>24 Hrs	<24 Hrs	>24 Hrs		

D. Consent Forms

Household Survey - Consent

Read to: Head of Household or other responsible Adult

We are from Statistics Sierra Leone. We are working with UNICEF and Care, IRC, and Save the Children on a project to use Community Health Volunteers to give treatments for diseases a child might get. I would like to talk to you about this and ask you some questions about your household. Also I would like to talk to all the women between the ages of 15 and 49 years of age and all persons who take care of children less than 5 years of age in your household. Your interview will take about twenty minutes.

Your answers will be entered on a small machine that looks like a cell phone. Nobody outside the study team will be able to see your information. All information that you or anyone else gives us will remain confidential. We will not give anybody's names to anybody else.

The only risks from being in this survey are that there may be some questions that may be sensitive. You or any other persons interviewed do not have to answer any question you or they do not feel comfortable answering. There are no direct benefits to you or your household by agreeing to be interviewed. What we learn from this study will help us design better programs in the future. This may help you or someone you know.

Your participation is voluntary and refusal to participate will not affect any services you might receive. If you would like to speak to someone about the study you can contact Peter Bangura, Statistician at Statistics Sierra Leone at 22376869801.

Do you give us permission to interview you?

Can we interview others in your household?

Women Survey - Consent

Read to all women ages 18-49
Also read to girls 15 to 17 who are either married OR have children

We are from Statistics Sierra Leone. We are working with UNICEF and Care, IRC, and Save the Children on a project to use Community Health Volunteers to give treatments for diseases a child might get. I would like to talk to you about this and also talk to you about all pregnancies and births you may have had. The interview will take about twenty five minutes.

Your answers will be entered on a small machine that looks like a cell phone. Nobody outside the study team will be able to see your information. All information that you or anyone else gives us will remain confidential. We will not give anybody's names to anybody else.

The only risks from being in this survey are that there may be some questions that may be sensitive. You do not have to answer any question you do not feel comfortable answering. There are no direct benefits to you or your household by agreeing to be interviewed. What we learn from this study will help us design better programs in the future. This may help you or someone you know.

Your participation is voluntary and refusal to participate will not affect any services you might receive. If you would like to speak to someone about the study you can contact Peter Bangura, Statistician at Statistics Sierra Leone at 22376869801.

Do you give us permission to interview you?

Under 5 years of age survey - primary caretaker consent

Read to all primary caretakers of children less than 5 years of age in the household

We are from Statistics Sierra Leone. We are working with UNICEF and Care, IRC, and Save the Children on a project to use Community Health Volunteers to give treatments for diseases a child might get. I would like to talk to you about this and also talk to about the health of any child under the age of 5 that you care for. The interview will take about twenty five minutes.

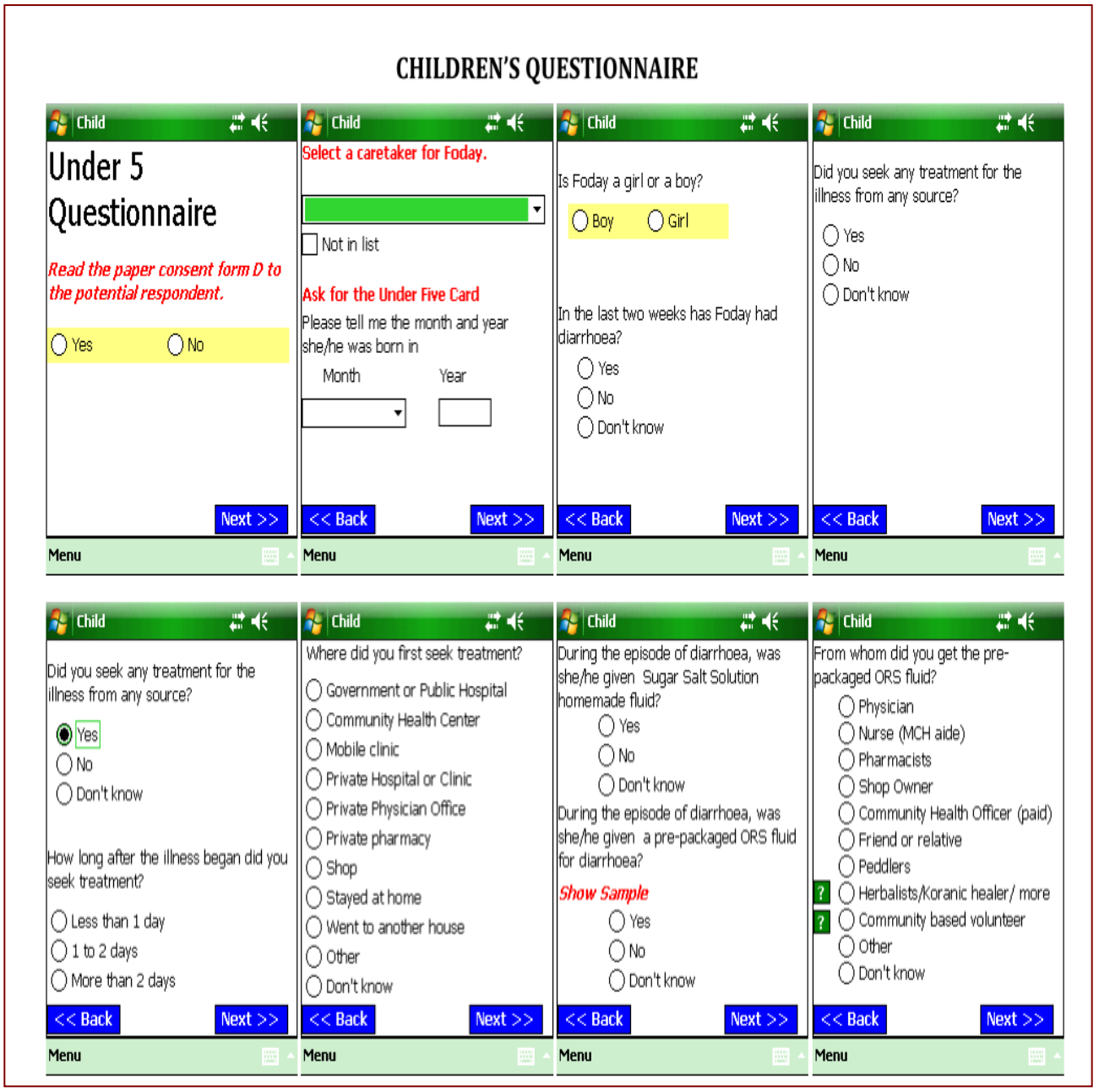
Your answers will be entered on a small machine that looks like a cell phone. Nobody outside the study team will be able to see your information. All information that you or anyone else gives us will remain confidential. We will not give anybody's names to anybody else.

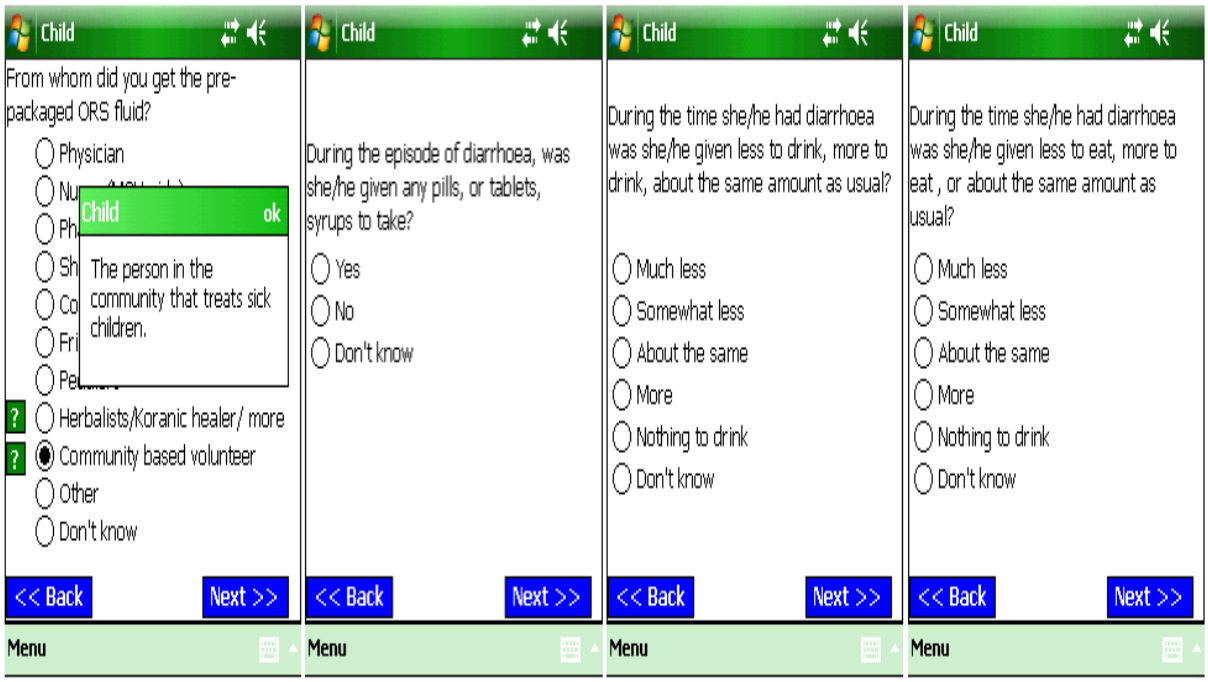
The only risks from being in this survey are that there may be some questions that may be sensitive. You do not have to answer any question you do not feel comfortable answering. There are no direct benefits to you or your household by agreeing to be interviewed. What we learn from this study will help us design better programs in the future. This may help you or someone you know.

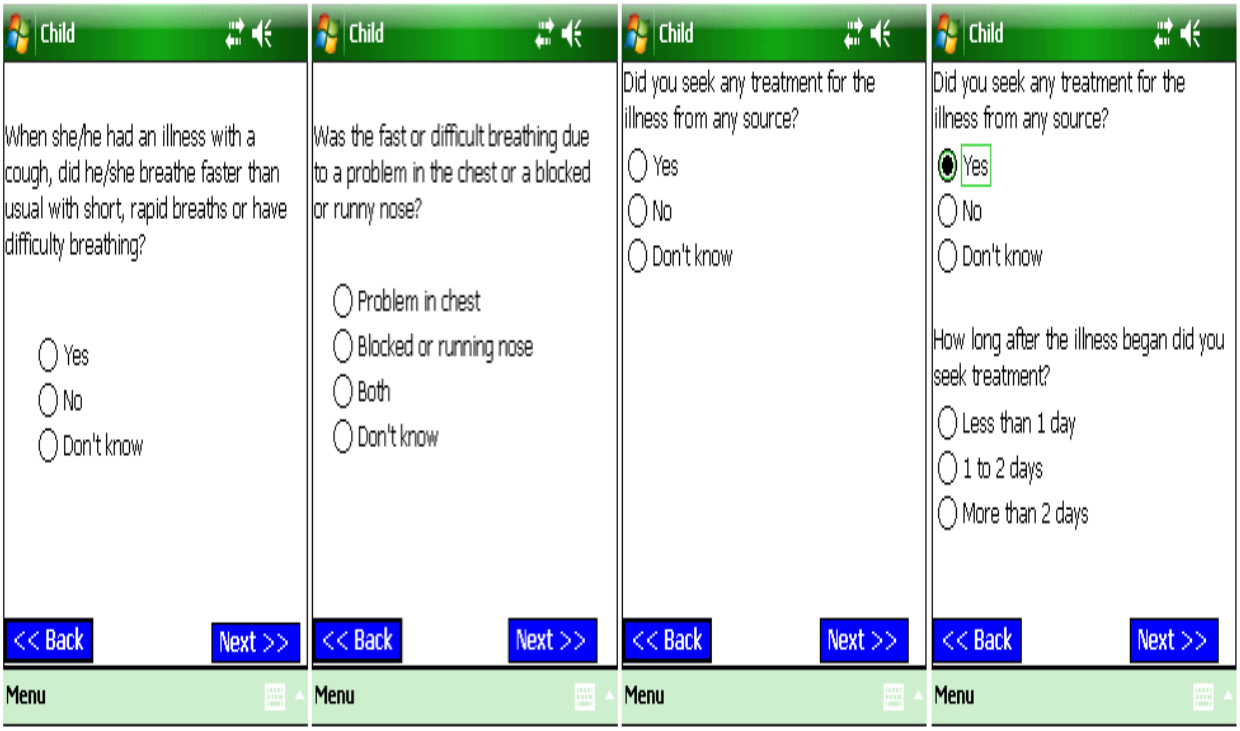
Your participation is voluntary and refusal to participate will not affect any services you might receive. If you would like to speak to someone about the study you can contact Peter Bangura, Statistician at Statistics Sierra Leone at 22376869801.

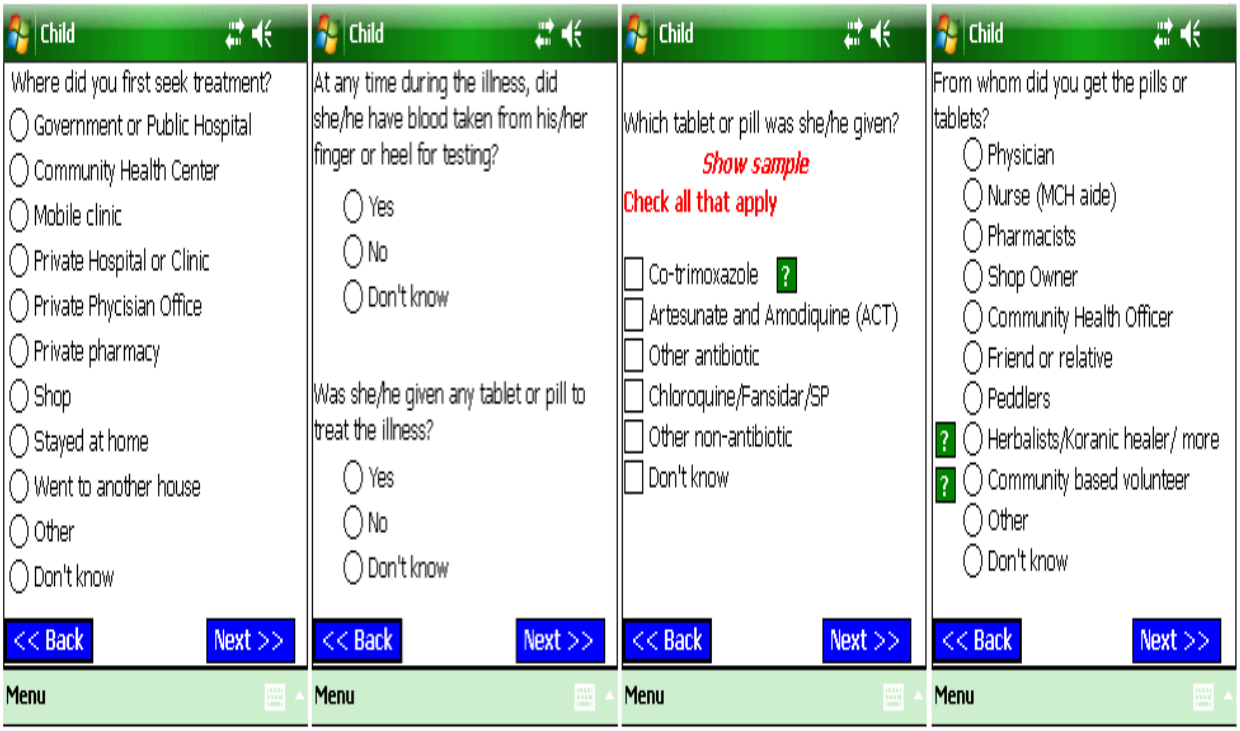
Do you give us permission to interview you?

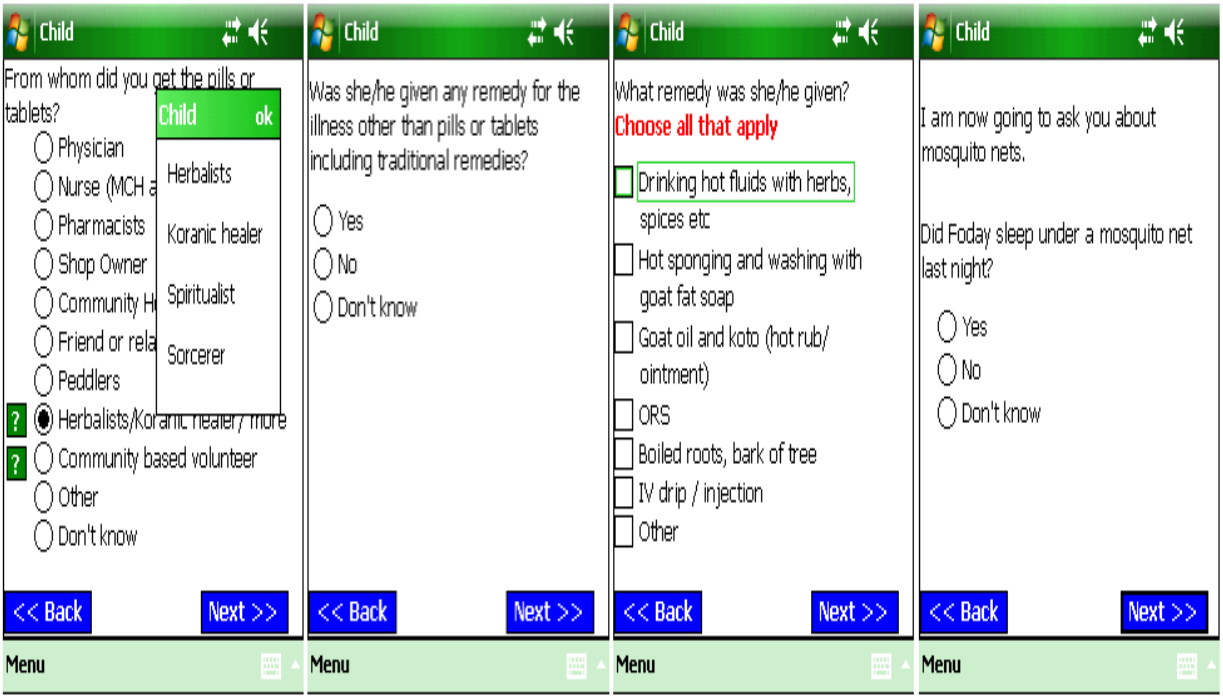
E. Study Under 5 Questionnaire

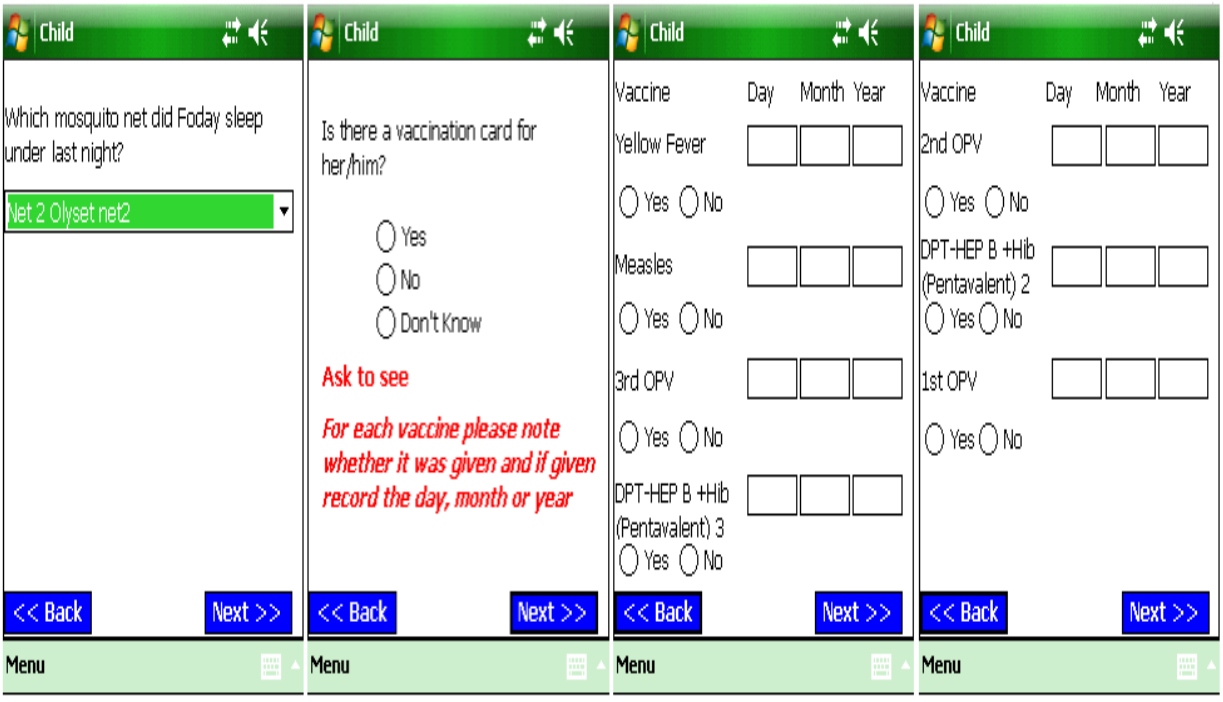


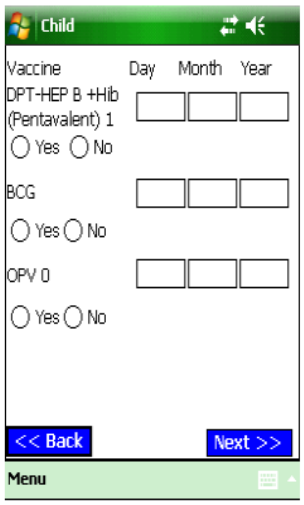

Child
From whom did you get the pre-packaged ORS fluid?
Physician
Herbalists/Koranic healer/ more
Community based volunteer
Other
Don't know
Child
ok
The person in the community that treats sick children.
<< Back
Next >>
Menu
Child
During the episode of diarrhoea, was she/he given any pills, or tablets, syrups to take?
Yes
No
Don't know
<< Back
Next >>
Menu
Child
During the time she/he had diarrhoea was she/he given less to drink, more to drink, about the same amount as usual?
Much less
Somewhat less
About the same
More
Nothing to drink
Don't know
<< Back
Next >>
Menu
Child
During the time she/he had diarrhoea was she/he given less to eat, more to eat , or about the same amount as usual?
Much less
Somewhat less
About the same
More
Nothing to drink
Don't know
<< Back
Next >>
Menu
Child
Was she/he given any other remedy, including traditional remedies, for dairrhoea other than pills, tablets, syrups, ORS, or SSS?
Yes
No
Don't know
<< Back
Next >>
Menu
Child
What other remedy was he/she given?
check all that apply
Soak pounded raw rice in water and mix with honey
Clay: hojo/hujii (white clay, salt, pepper, maggi)
Boiled herbs and roots
IV drip or injection
Other
<< Back
Next >>
Menu
Child
In the last two weeks has she/he been ill with a fever (wam bodi) at any time?
Yes
No
Don't know
<< Back
Next >>
Menu
Child
At any time in the last two weeks has she/he had an illness with a cough?
Yes
No
Don't know
<< Back
Next >>
Menu

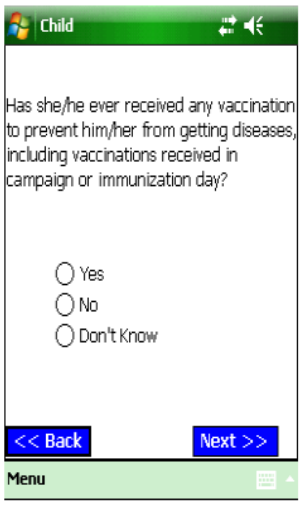

Child
When she/he had an illness with a cough, did he/she breathe faster than usual with short, rapid breaths or have difficulty breathing?
Yes
No
Don't know
<< Back
Next >>
Menu
Child
Was the fast or difficult breathing due to a problem in the chest or a blocked or runny nose?
Problem in chest
Blocked or running nose
Both
Don't know
<< Back
Next >>
Menu
Child
Did you seek any treatment for the illness from any source?
Yes
No
Don't know
<< Back
Next >>
Menu
Child
Did you seek any treatment for the illness from any source?
Yes
No
Don't know
How long after the illness began did you seek treatment?
Less than 1 day
1 to 2 days
More than 2 days
<< Back
Next >>
Menu

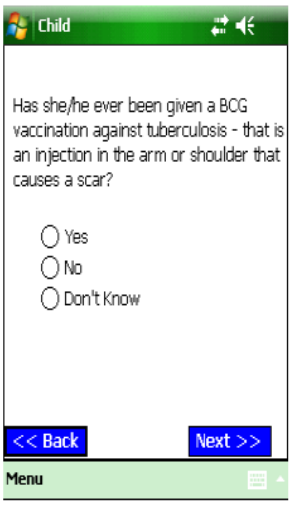

Child
Where did you first seek treatment?
Government or Public Hospital
Community Health Center
Mobile clinic
Private Hospital or Clinic
Private Phycisian Office
Private pharmacy
Shop
Stayed at home
Went to another house
Other
Don't know
<< Back
Next >>
Menu
Child
At any time during the illness, did she/he have blood taken from his/her finger or heel for testing?
Yes
No
Don't know
Was she/he given any tablet or pill to treat the illness?
Yes
No
Don't know
<< Back
Next >>
Menu
Child
Which tablet or pill was she/he given?
Show sample
Check all that apply
Co-trimoxazole
Artesunate and Amodiquine (ACT)
Other antibiotic
Chloroquine/Fansidar/SP
Other non-antibiotic
Don't know
<< Back
Next >>
Menu
Child
From whom did you get the pills or tablets?
Physician
Nurse (MCH aide)
Pharmacists
Shop Owner
Community Health Officer
Friend or relative
Peddlers
Herbalists/Koranic healer/ more
Community based volunteer
Other
Don't know
<< Back
Next >>
Menu

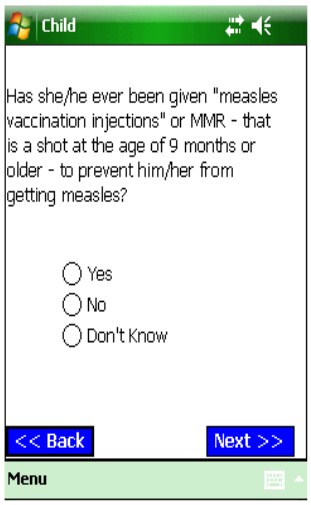

Child
From whom did you get the pills or tablets?
Physician
Nurse (MCH a
Pharmacists
Shop Owner
Community H
Friend or rela
Peddlers
Herbalists/Koranic healer/ more
Community based volunteer
Other
Don't know
Child ok
Herbalists
Koranic healer
Spiritualist
Sorcerer
<< Back
Next >>
Menu
Was she/he given any remedy for the illness other than pills or tablets including traditional remedies?
Yes
No
Don't know
What remedy was she/he given?
Choose all that apply
Drinking hot fluids with herbs, spices etc
Hot sponging and washing with goat fat soap
Goat oil and koto (hot rub/ ointment)
ORS
Boiled roots, bark of tree
IV drip / injection
Other
I am now going to ask you about mosquito nets.
Did Foday sleep under a mosquito net last night?
Yes
No
Don't know

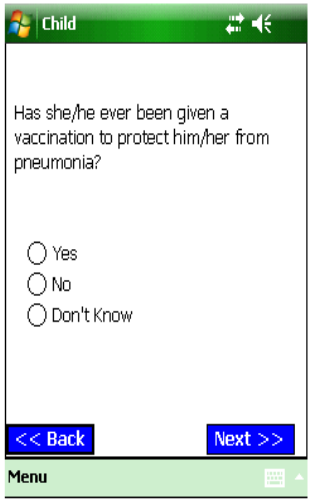

Child
Which mosquito net did Foday sleep under last night?
Net 2 Olyset net2
Is there a vaccination card for her/him?
Yes
No
Don't Know
Ask to see
For each vaccine please note whether it was given and if given record the day, month or year
Vaccine Day Month Year
Yellow Fever
Yes No
Measles
Yes No
3rd OPV
Yes No
DPT-HEP B +Hib (Pentavalent) 3
Yes No
2nd OPV
Yes No
DPT-HEP B +Hib (Pentavalent) 2
Yes No
1st OPV
Yes No
<< Back
Next >>
Menu


Child
Vaccine Day Month Year
DPT-HEP B +Hib (Pentavalent) 1
Yes No
BCG
Yes No
OPV 0
Yes No
<< Back
Next >>
Menu


Child
Has she/he ever received any vaccination to prevent him/her from getting diseases, including vaccinations received in campaign or immunization day?
Yes
No
Don't Know
<< Back
Next >>
Menu


Child
Has she/he ever been given a BCG vaccination against tuberculosis - that is an injection in the arm or shoulder that causes a scar?
Yes
No
Don't Know
<< Back
Next >>
Menu


Child
Has she/he ever been given "measles vaccination injections" or MMR - that is a shot at the age of 9 months or older - to prevent him/her from getting measles?
Yes
No
Don't Know
<< Back
Next >>
Menu


Child
Has she/he ever been given a vaccination to protect him/her from pneumonia?
Yes
No
Don't Know
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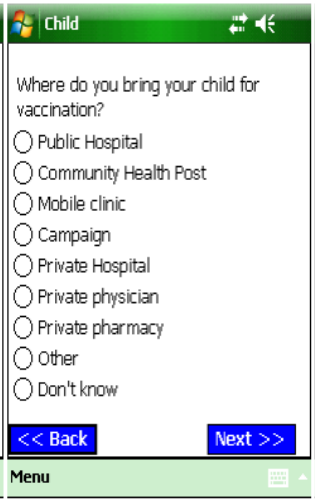
Menu


Child
Where do you bring your child for vaccination?
Public Hospital
Community Health Post
Mobile clinic
Campaign
Private Hospital
Private physician
Private pharmacy
Other
Don't know
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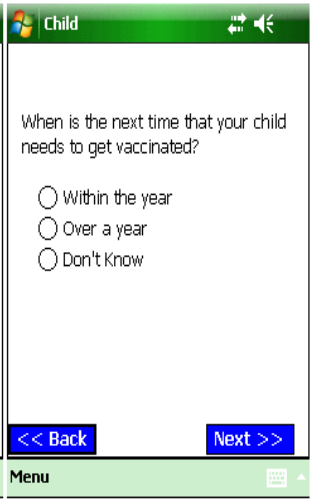
Menu


Child
When is the next time that your child needs to get vaccinated?
Within the year
Over a year
Don't Know
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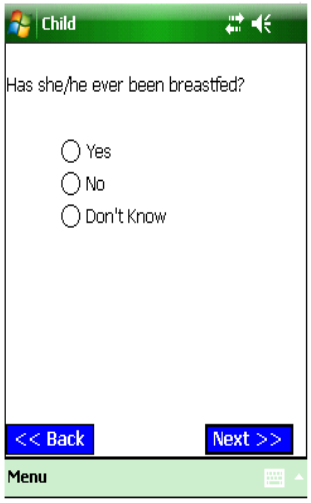
Menu


Child
Has she/he ever been breastfed?
Yes
No
Don't Know
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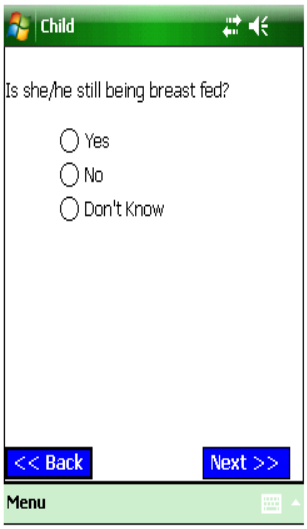
Menu


Child
Is she/he still being breast fed?
Yes
No
Don't Know
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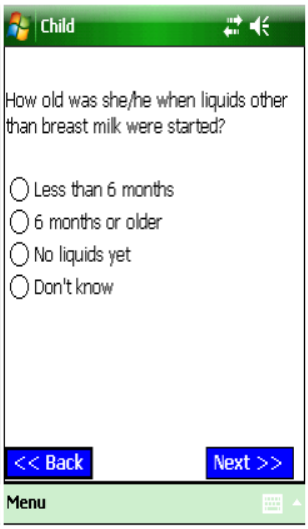
Menu


Child
How old was she/he when liquids other than breast milk were started?
Less than 6 months
6 months or older
No liquids yet
Don't know
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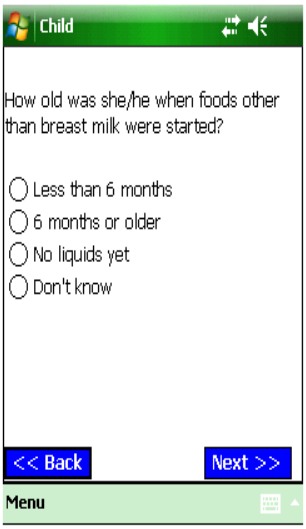
Next >>
Menu


Child
How old was she/he when foods other than breast milk were started?
Less than 6 months
6 months or older
No liquids yet
Don't know
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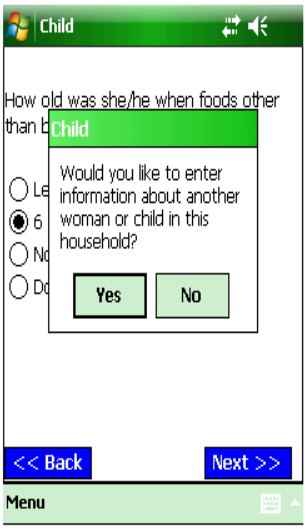
Menu


Child
How old was she/he when foods other than b
Child
Would you like to enter information about another woman or child in this household?
Yes
No
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Menu

F. Data Collection Visual Aids

Diarrhea Treatment

ORS	Zinc
	

Malaria Treatment

ACT	Chloroquine
	

Pneumonia Treatment

Cotrimoxazole	Other Antibiotic
	

G. Contextual Information

Type of Activity/Intervention	Program	List of Activities	Dates	Geography
User fees removed for pregnant women, children U5 accessing public health facilities	Free Health Care Initiative	Free basic health care to children U5 and pregnant women	April 2010 to present	Nationwide
Advocacy		Monitoring drugs at hospitals and ensuring FHCI drugs reach beneficiaries	2010 - present	Nationwide
Malaria	Community based treatment for Malaria	CCM of malaria with ACT	2010 - present	Nationwide
CHW policy including CCM drafted and validated	CHW policy		November 2011	Nationwide
ACT stockout		ACT Stock outs at government health facilities and CHWs	January 2011 to November 2011	Nationwide
Cholera epidemic		Cholera epidemic	February 2012- October 2012	Nationwide
Maternal and Newborn Health	Improving the life of newborn and maternal health	IMNCI training, EPI, newborn care and drug supply and management at BeMONC centers	2005-2010; 2011-2013	Kailahun
Health promotion	Access to quality reproductive health services	Community sensitization on essential family practice; social mobilization on EPI, NIDS, EBF	2005-2010; 2011-2014	Kailahun
Nutrition	Community management of acute malnutrition, infant and young child feeding	Screening, referrals and follow-ups of SAM cases of U5 children	Dec 2010 - present	9 chiefdoms in Kailahun (out of 14 chiefdoms)
Malaria	Behavioral change on malaria	Bed nets distribution, ACT for pregnant women, lactating mothers and under-fives; behavioral change communication	2011- present	Kailahun
Nutrition	Capacity building on nutrition, distribution of supplementary feeding	screening of severe acute malnourished children, food distribution to pregnant and lactating mothers	2011- present	5 chiefdoms in Kailahun
Health promotion		Sensitizing caregivers on child care practices; advocacy for health	2011- present	
Type of Activity/Intervention	**Program**	**List of Activities**	**Dates**	**Geography**

Nutrition	Implementation of community management of acute malnutrition infant and young child feeding	Screening, referrals and follow-ups of SAM cases of U5 children	2011-Feb 2013	8 chiefdoms in Tonkolili (out of 11 chiefdoms)
BCC/Water & Sanitation	Health Education Programme	Training community health volunteers to disseminate health messages; capacity building of HMC community-led sanitation teams	2003 - present	3 chiefdoms in 16 health facilities of Tonkolili
	Mining/private sector	Mining boom since start of 2011; residents have more income generating opportunities	2011-present	Tonkolili
Nutrition	Community management of acute malnutrition, infant and young child feeding	Screening, referrals and follow-up of SAM cases of under-five children	2007-present	Pujehun
Nutrition	Health infrastructure implementation of community management of acute malnutrition	Rehabilitation of PHUs, drugs distribution to PHUs, baby kit distribution to newborns, supplementary feeding, capacity building (IMNCI training, EPI, newborn care and drugs supply)	2009-2010	8 chiefdoms (out of 12 chiefdoms) in Pujehun
Health Systems Strengthening	Clinical services and capacity building	Improvements of clinical services in the maternity hospital and 6 BEmONCs centers; capacity building for staff in BEmONC and CEmONC	2012-present	District hospital and 6 BEmONC centers in Pujehun
Cholera	Cholera Emergency Response	Distribution of cholera kits; establishment of oral rehydration centers; hygiene promotion	February 2012	Kambia
Reproductive Health	Family planning and reproductive health outreach services	Provision of family planning services and commodities, including pills, depo, condoms; treatment of U5 children when necessary	2012-2015	Kambia
HSS/MCH	Long-term volunteer program	Teaching SRNS, SECHNS, CHOs; clinical support; hospital quality improvement projects	2012-2015	Kambia district hospital
Maternal and Child Health	MCH Program	Yearly teaching projects on management of obstetric and pediatric emergencies	2009-2012	Kambia

Type of Activity/Intervention	Program	List of Activities	Dates	Geography
Cholera Emergency Response	Emergency Response	Distribution of kits to communities (ORS, disinfectants, soap)	2012	1 chiefdom (Breiamaia)
Neglected Tropical Diseases (NTDs)	Deworming	Deworming of children	2008-present	2 chiefdoms (out of 7 chiefdoms) in Kambia
Malaria	Maternal and Child Health Weeks	Bed nets distribution during MCHW campaigns	2008-present	3 chiefdoms (out of 7 chiefdoms) in Kambia
WASH/Cholera	Health Program	Provision of chlorine for chlorination of wells; training volunteers in Cholera response; health communication on cholera prevention; rehabilitation of wells and construction of toilets	2012-present	3 chiefdoms in Kambia
Nutrition	Nutrition/C4D	Screening, referrals and follow-up of SAM cases of under-five children	2010 - present	Kambia
Community mobilization	Community empowerment	Social mobilization activities; empowering communities through community health clubs and school health clubs	2012-present	Kambia
Malaria	Communication for Malaria	Training on malaria prevention; advocacy for early treatment; community drama; environmental sanitation; promotion of proper use of bednets	2012-present	Kambia
Health Promotion	Health Promotion	Health promotion; community mobilization during NIDs and mass campaigns	2012-present	Kambia
Cholera Prevention	Cholera Prevention and Emergency Response		2012	Kambia

H. Curriculum Vitae

Aisha Yansaneh, MPH

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Email: aisha.yansaneh@gmail.com / ayansan1@jhu.edu

PROFILE

PhD candidate in International Health with eight years of work experience at domestic and international level. Research and technical assistance in health program evaluation and survey methodology in developing countries.

EDUCATION

Expected August 2014	**Doctor of Philosophy (PhD)**, Department of International Health, Program in Global Disease Epidemiology and Control, Johns Hopkins Bloomberg School of Public Health, Baltimore, MD **Dissertation**: Integrated Community Case Management of Childhood Illnesses in Rural Sierra Leone: effects on care seeking, treatment and equity
May 2003	**Master of Public Health (MPH**), Department of Quantitative Methods, School of Public Health, Rutgers University Newark, NJ
May 2000	**Bachelor of Science (BS)**, Biology, University of Maryland, College Park, MD
June– August 2011	Minority Global Health Disparities Research Training Program (MHIRT), National Center on Minority Health and Health Disparities (NCMHD) and Fogarty International Center (FIC), North West University, South Africa

WORK EXPERIENCE

April 2013 – July 2013 **Research Assistant**, Jhpiego, Baltimore MD

- Conducted literature reviews for 3 assigned articles for Jhipego's journal supplement to the *International Journal of Gynecology and Obstetrics.*
- Provided annotated bibliographies and assisted in manuscript drafts

June 2012 – April 2013 **Consultant**, UNICEF, Freetown, Sierra Leone

- Coordinated a household cluster survey evaluating the impact of integrated community case management (ICCM in two districts of Sierra Leone. Duties included: training of survey field staff and supervision of data collection, analysis of survey data and writing final report.

Dec. 2011 – Jan. 2012 **Research Assistant**, Jhpiego, Baltimore MD

- Conducted a desk review of documents and resources on Malaria in Pregnancy (MIP) implementation in Burkina Faso
- Developed draft report documenting status of malaria indicators, extent of malaria program implementation by all partners, best practices/strategies supporting malaria programming success and existing bottleneck.

Sept 2010 – May 2011 **Research Assistant,** Department of International Health, Johns Hopkins Bloomberg School of Public Health, Baltimore, MD

- Provided assistance on a systematic review synthesizing results from HIV behavioral intervention research.

Aug. 2008 – Aug. 2010 **Epidemiologist/Technical Advisor**, Northrop Grumman Corporation Inc. assigned to CDC/Global AIDS Program (GAP), Atlanta, GA

- Served as a technical expert in the area of survey design, data collection and analysis, and protocol development and assure compliance with human subjects' requirements of the US Government and other participating agencies.
- Provided technical assistance to ministries of health and other national/international collaborating partners on the design and implementation of HIV-related surveillance activities in 4 countries (Mali, Sierra Leone, Senegal, and Cameroon).

Sept. 2006–Aug. 2008 **ASPH/CDC Allan Rosenfeld Global Health Strategic Information Fellow***,* Global AIDS Program (GAP), Centers for Disease Control and Prevention (**CDC**), Atlanta, GA

- Provided HIV surveillance technical support to GAP country offices including data analysis and report writing

Mar. 2005–Aug. 2006 **Epidemiologist**, Center for Surveillance, Infection Prevention & Outbreak Response, Maryland State Department of Health and Mental Hygiene, Baltimore, MD

- Tracked selected diseases (Hepatitis A, Legionella, Malaria,) to ensure overall quality of data, adherence to CDC case definitions, rapid detection of clusters and trends, and dissemination of information about the diseases through yearly reports.

Sept. 2003- Dec. 2003 **Intern/Data Analyst**, WHO, Geneva, Switzerland

- Assisted with the World Health Survey (WHS), analyze survey data for a number of countries, prepared a codebook for the survey and training materials on the design and analysis of WHS surveys

Feb. 2003-April 2003 **Intern**, United Nations Department of Economic and Social Affairs, Statistics Division, New York, NY

- Worked on a compendium on environmental indicators, prepared chapter overviews, data tables and charts, as well as data interpretation/analysis for the compendium.

ABSTRACTS/PRESENTATIONS/PUBLICATIONS

Aisha I. Yansaneh. Evaluation of Implementation of Integrated Community Case Management in two districts in Sierra Leone in the context of the Free Health Care Initiative, 2010-2012. Presented at the 62nd Annual Meeting of the American Society of Tropical Medicine and Hygiene (ASTMH), Washington DC, November 17, 2013

Marsh K, Bolu O, Bodika S, Seipone K, Wondkongkathep S, Baryama F, **Yansaneh A**, Eure-Miller C and Garcia-Calleja J. (2010). How can PMTCT program data be used for the purposes of HIV surveillance? *Journal of HIV/AIDS Surveillance & Epidemiology*, **1**(2): 5

A. Yansaneh, R. Lobognon, et al. Assessment of Early Warning Indicators for HIV Drug Resistance Resulting from ART Programmatic Factors at Select Sites in Abidjan, Cote

d'Ivoire, 2008. Abstract presented at the 2009 HIV Implementers Meeting, Windhoek, Namibia, June 2009

SKILLS

Language Skills: French

Computer Skills: STATA, SPSS, Microsoft Office (Word, Excel, Access, PowerPoint), GIS