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

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Abstract

OBJECTIVE To examine whether community health volunteers induced significant changes in care seeking and treatment of ill children under five 2 years after their deployment in two underserved districts of Sierra Leone.

METHODS A pre-test–post-test study with intervention and comparison groups was used. A household cluster survey was conducted among caregivers of 5643 children at baseline and of 5259 children at endline.

RESULTS In the intervention districts, treatments provided by community health volunteers increased from 0 to 14.3% for all three conditions combined ($P < 0.001$). Care seeking from an appropriate provider was not statistically significant (OR = 1.50, 95% CI: 0.88–2.54) between intervention and comparison districts and coverage of appropriate treatment increased in both study groups for all three illnesses. However, the presence of community health volunteers was associated with a 105% increase in appropriate treatment for pneumonia (OR = 2.05, 95% CI: 1.22–3.42) and a 55% drop in traditional treatment for diarrhoea (OR = 0.45, 95% CI: 0.21–0.96). Community health volunteers were also associated with fewer facility treatments for malaria (OR = 0.21, 95% CI: 0.07–0.62).

CONCLUSION After implementing free care, coverage for treatment for all three illnesses in both study groups improved. Deployment of community health volunteers was associated with a reduced treatment burden at facilities and less reliance on traditional treatments.

keywords community health workers/volunteers, community case management, health care seeking

Introduction

Pneumonia, diarrhoea and malaria are major causes of mortality in children under 5 years of age (U5) in sub-Saharan Africa. Much of this mortality can be prevented with interventions effectively delivered at the community level (Christopher *et al.* 2011). Community case management (CCM) of pneumonia, malaria, and diarrhoea is effective in reducing child deaths and a feasible strategy to complement facility-based management for areas that lack access to health facilities (Core Group *et al.* 2010; Yeboah-Antwi *et al.* 2010). With task shifting from health centres 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 (Chanda *et al.* 2011; de Sousa *et al.* 2012). CCM models differ and can include integrated management of childhood illnesses given by nurses and CCM carried out by volunteer community health workers (CHWs) with limited training (Theodoratou *et al.* 2010).

Community health workers include a variety of community health personnel selected, trained and working in their own communities (Lehmann & Sanders 2007). CHWs range from salaried staff to volunteers, from simple educators to health care service providers, and from specialists in a population group or disease to generalists (Haines *et al.* 2007; Koon *et al.* 2013). There is renewed interest in CHW programmes because service needs, particularly in remote and underprivileged communities, are not fully met by existing health systems (Lehmann & Sanders 2007). Some national governments are making CHWs a cornerstone of scaling-up community health delivery as a major part of strategies to reduce child mortality (Singh & Sachs 2013).

Sierra Leone has one of the world's highest U5 mortality rates at 140 deaths per 1000 live births, most of which are due to neonatal causes (26%), malaria (27%), pneumonia (14%) and diarrhoea (12%) (Statistics Sierra Leone & ICF Macro 2009; CHERG 2013). 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% (Maxmen 2013).

Although the evidence on the effectiveness of CHWs in providing integrated CCM (ICCM) in sub-Saharan Africa is growing (Lewin *et al.* 2010; Yeboah-Antwi *et al.* 2010; Brenner *et al.* 2011; Christopher *et al.* 2011; Kalyango *et al.* 2012a,b), the evidence on CHWs' impact on healthcare seeking is limited. The study aimed to investigate CHVs' contribution to increasing appropriate treatment coverage of childhood illness in the context of free health care in Sierra Leone and specifically, to determine whether provision of ICCM by community health volunteers (CHVs) caused significant changes in care seeking and treatment of diarrhoea, malaria and pneumonia in children U5 in two intervention districts (ICCM plus free health care) *vs.* two comparison districts (free health care alone), 2 years post-intervention.

Methods

Intervention

The *Health for the Poorest Quintile* intervention was implemented a few months after the launch of the Free Health Care Initiative in late 2010 to early 2011 in two districts of Sierra Leone. The intervention was implemented by civil society organisations (CSOs) in districts with the highest U5 mortality that also represent the poorest 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: diarrhoea, 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, with timers to assess respiratory rate (for fast or difficult breathing in the chest) and treated with cotrimoxazole. The CSOs worked with District Health Management Teams and peripheral health unit staff to train and equip CHVs to diagnose, treat, and as necessary, refer children to health facilities. The CSOs, through UNICEF, procured and ensured a continuous supply of essential drugs and commodities throughout the duration of the programme in the two intervention districts. They also kept monthly reports on drug supply, CHV supervision and reports on treatment and referral of children U5.

A total of 2129 CHVs were recruited for the intervention, with a ratio of two CHVs per 100 children U5 (or per 100 households). The CHVs were non-paid volunteers, with limited or no literacy, and selected by their respective communities. They were trained for 1 week and provided drug kits with simplified algorithms for ICCM and forms for recording number of visits, treatments and deaths. CHVs were also trained to recognise severe symptoms and/or danger signs and to refer these cases to health centres. The algorithms and forms were developed in Sierra Leone for illiterate CHVs and had previously been used successfully in another district (Bakshi *et al.* 2013; Diaz *et al.* 2013). Before implementation, CHV services and locations were announced in religious centres and during community functions. Community members received free treatment from CHV 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 labour such as building or repair of roads and bridges. Supervision of volunteers took place on a monthly basis and included review of CHV reports and direct observation of CHVs during visits.

Study design

A pre-test-post-test study design with intervention and comparison groups was used to evaluate the ICCM effect on care seeking and treatment of malaria, diarrhoea 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

The intervention and comparison districts (Figure 1) were considered to be in the lowest socioeconomic quintiles of

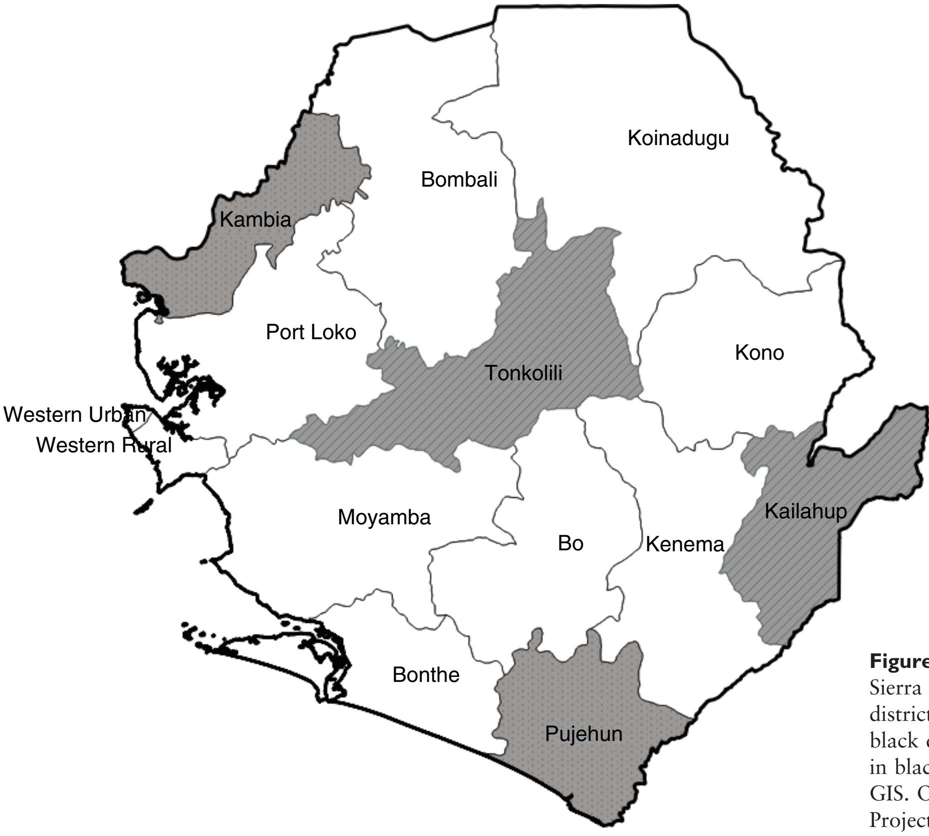

Figure 1 HPQ study districts. Map of Sierra Leone, showing the four study districts (two intervention districts in black dots and two comparison districts in black diagonal lines). Source: Quantum GIS. Open Source Geospatial Foundation Project [http://qgis.osgeo.org].

the country using a set of criteria, each ranked from worst to best per district. The selection criteria of study districts are discussed elsewhere (Diaz *et al.* 2013). Kambia and Pujehun had the fewest CSOs and were therefore selected as the intervention districts. Kailahun and Tonkolili, among the lowest-scoring districts, were chosen to be the comparison districts, after disqualifying other low-scoring districts that already had CCM (Diaz *et al.* 2013). The four study areas had a projected population of 300 000–400 000, of which 19% were children U5 (Statistics Sierra Leone 2004).

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 2 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 (Diaz *et al.* 2013). 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 of these clusters, for a total sample size of 6000 households. The census enumeration area (i.e. cluster) was used as primary sampling unit for the study. A cluster consisted of at least 55 households to ensure a sufficient number of households in each cluster to select 30 households for interview. Each selected cluster was mapped and divided into three areas, with each interviewer given a start number by which to enumerate each household. Using personal digital assistants (PDAs) with global positioning systems, 13 teams, each consisting of three 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.

Questionnaires were written in English and translated by interviewers into local languages preferred by the respondents, using standardised, pre-tested key words and/or information obtained on terminology from the baseline qualitative study (Bakshi *et al.* 2013; Diaz *et al.*

2013; Scott *et al.* 2013). To ensure high quality data, the PDAs were pre-loaded 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 were

- *Two-week period prevalence* (proportion of children with ICCM symptoms (diarrhoea, presumed malaria and/or presumed pneumonia) 2 weeks prior to the survey,
- *Care seeking* (proportion of children ill for whom care was sought),
- *Care seeking from an appropriate provider* (proportion of children ill in the previous 2 weeks for whom care was sought from healthcare professional such as a nurse, doctor or a trained CHV),
- *Appropriate treatment by symptom* (proportion of ill children who received appropriate treatment for their symptom (antimalarials including ACT for malaria, antibiotics including cotrimoxazole for pneumonia, and ORS and zinc for diarrhoea) per Ministry of Health and Sanitation of Sierra Leone, UNICEF and World Health Organization guidelines) and
- *Use of traditional treatment by symptom* (having treatment besides syrups and pills provided by allopathic healthcare workers) in the previous 2 weeks (Bakshi *et al.* 2013).

Presumed malaria is defined as having fever, which is the norm for a malaria-endemic country such as Sierra Leone. *Presumed pneumonia* is defined as having a cough with difficulty breathing due to a problem in the chest, regardless of fever.

Proportions, adjusted odds ratios (AORs) 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 (Stata Corp 2009). Proportions in the intervention and comparison groups were compared at baseline and endline using a two-sided chi-square test. A difference-in-differences (DID) analysis was conducted to study whether outcomes of interest were significantly different between groups over time with a multivariable logistic regression model that included group, time and an interaction term of group with time in the model. The model also included child sex, caregiver age, household size, religion, ethnicity and wealth. A significant coefficient of the interaction term implies that the outcomes differed by groups over time. 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 Ministry of Health and Sanitation (MOHS) of Sierra Leone approved the study protocol.

Results

The survey response rate was high with 94% (5239/5643) of caregivers of children U5 participating at baseline and 96% (5397/5632) at endline. Information was collected on 5643 children (2912 intervention, 2731 comparison) at baseline and 5259 children (2279 intervention, 2980 comparison) at endline. Distribution of the sample characteristics at baseline and endline are displayed in Table 1. No group differences existed for U5 and caregiver characteristics, but some significant group differences were noted for household religion, ethnicity and polygamy for both surveys.

Disease prevalence and care seeking

Results comparing 2-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. The DID analysis showed no change in reported diarrhoea (AOR = 1.18, 95% CI: 0.77–1.80) and presumed malaria (AOR = 0.98, 95% CI: 0.69–1.40). Reported pneumonia increased by almost 100% (AOR = 1.95, 95% CI: 1.17–3.23) 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. 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 (AOR = 1.50, 95% CI: 0.88–2.54), although 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 diarrhoea treatment with ORS and zinc (AOR = 1.10, 95% CI: 0.65–1.86), malaria traditional treatment (AOR = 0.65, 95% CI:

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

	Baseline (2010)			Endline (2012)		
Characteristic	Intervention (N = 2912) % (95% CI)	Comparison (N = 2731) % (95% CI)	P-value*	Intervention (N = 2279) % (95% CI)	Comparison (N = 2980) % (95% CI)	P-value*
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 sex			0.060			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			<0.001			<0.001
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)	

CI, confidence interval.
*Based on two-sided chi-square test for general association.
†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.

0.32–1.34) or pneumonia traditional treatment (AOR = 0.63, 95% CI: 0.30–1.32). The intervention was associated with a 38% reduction in malaria treatment with ACT (AOR = 0.62, 95% CI: 0.40–0.98), a 55% reduction in diarrhoea traditional treatment (AOR = 0.45, 95% CI: 0.21–0.96), and a 105% increase in pneumonia treatment with cotrimoxazole (AOR = 2.05, 95% CI: 1.22–3.42).

A comparison in the changes in source of appropriate treatment is shown in Figure 3. In the intervention group, treatments provided by CHVs increased from 0 to 14.3% for all three conditions combined ($P < 0.001$); 0% to 17% for diarrhoea 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 ($P = 0.046$). The DID analysis indicated that the intervention was significantly associated with reduced health facility treatments for malaria (AOR = 0.21, 95% CI: 0.07–0.62).

Discussion

The study findings revealed baseline to endline changes in care seeking and treatment coverage for children U5 with diarrhoea, malaria and/or pneumonia and CHVs' influence on those changes across intervention and comparison areas. Care seeking from an appropriate provider

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

	Intervention			Comparison			DID estimator	
Measure	Baseline % (95% CI)	Endline % (95% CI)	*P*-value*	Baseline % (95% CI)	Endline % (95% CI)	*P*-value*	AOR	*P*-value*
2-Week Disease prevalence	(*N* = 2912)	(*N* = 2279)		(*N* = 2731)	(*N* = 2980)			
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	1.18 (0.77–1.80)	0.435
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	0.98 (0.69–1.40)	0.918
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	1.95 (1.17–3.23)	0.010
Care seeking for children ill in past 2 weeks								
All conditions combined	(*N* = 1980)	(*N* = 1657)		(*N* = 1962)	(*N* = 2102)			
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	0.93 (0.50–1.70)	0.804
Care sought	(*N* = 1696)	(*N* = 1357)		(*N* = 1776)	(*N* = 1907)			
Appropriate provider†	35.3 (29.2–41.4)	57.1 (49.9–64.3)	<0.001	36.9 (30.4–43.3)	48.9 (40.9–56.8)	0.004	1.50 (0.88–2.54)	0.139
Treatment coverage for whom care was sought								
Diarrhea treatment	(*N* = 611)	(*N* = 510)		(*N* = 635)	(*N* = 645)			
Oral rehydration solution and zinc	36.9 (28.4–45.5)	63.4 (52.5–74.3)	<0.001	36.3 (30.2–42.4)	59.5 (47.8–71.3)	<0.001	1.10 (0.65–1.86)	0.717
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	0.45 (0.21–0.96)	0.040
Malaria treatment	(*N* = 1537)	(*N* = 1104)		(*N* = 1600)	(*N* = 1636)			
Amodiaquine combined therapy	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 (0.40–0.98)	0.041
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 (0.32–1.34)	0.242
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	2.05 (1.22–3.42)	0.006
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)	0.221

AOR, adjusted odds ratio; adjusted for group differences in child sex, caregiver age, household size, religion, ethnicity and wealth; CI, confidence interval; DID, difference-in-differences; (baseline and endline differences in intervention group) – (baseline and endline differences in comparison group).

*Based on two-sided chi-square tests.

†Appropriate provider – provider (health care professional or CHV) who has received training in provision of appropriate treatment of the three integrated CCM (ICCM) conditions.

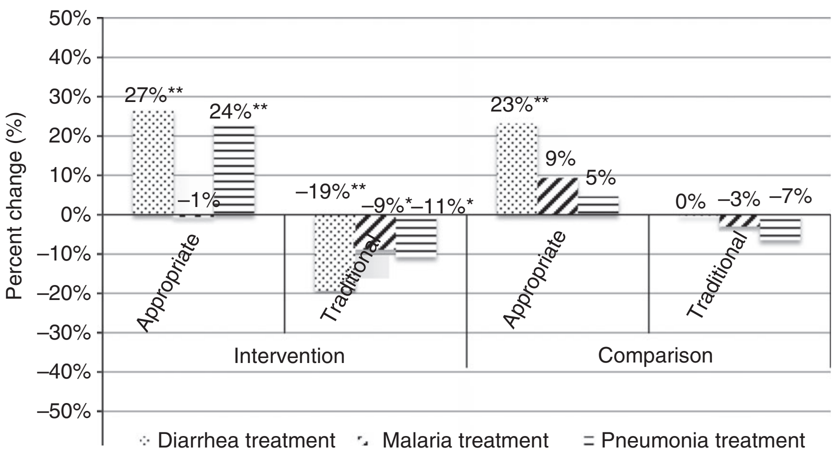

Figure 2 Changes in baseline to endline coverage of appropriate and traditional treatments. The figure shows a graph of baseline to endline percentage changes in coverage of appropriate and traditional treatments for diarrhea, malaria and pneumonia symptoms. The graph shows the changes in the intervention group (on the left) and the changes in the comparison group (on the right). *Significant change at *P*-value <0.05; **Significant change at *P*-value <0.01.

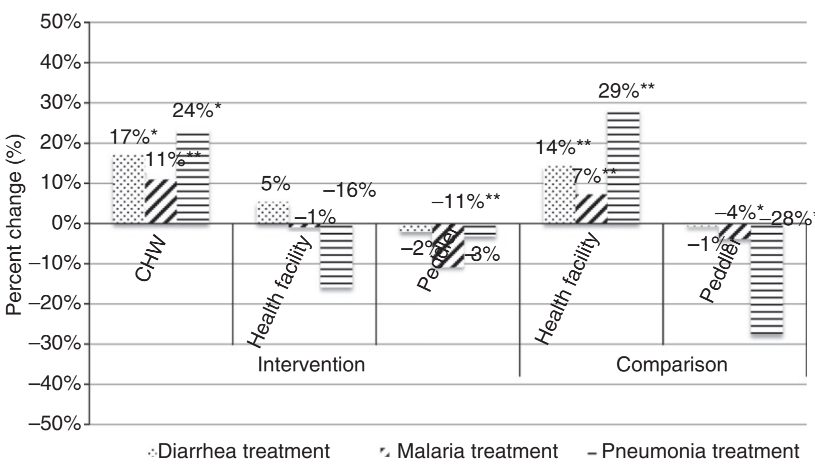

Figure 3 Changes in baseline to endline source of appropriate treatments. The figure shows baseline to endline percentage changes in source of appropriate treatment. *Significant change at *P*-value <0.05; **Significant change at *P*-value <0.01.

increased significantly for both groups. Coverage of appropriate treatment increased and traditional treatments decreased at endline, although 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 diarrhoea.

CHV 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 nationwide and district-wide health programmes implemented in both comparison and intervention areas during the study period. The non-strategic deployment of CHVs in the intervention districts with CHVs 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 lower coverage of malaria treatment with ACT in the intervention districts was likely due to a national stock-out that resulted in more children in the intervention area being brought to CHVs for fever treatments; thus CHVs had more stock outs. In fact, the routine data showed that there were more CHV malaria treatments than facility-based malaria treatments in both 2011 and 2012. CHV presence in the intervention districts was associated with increased use of antibiotics for pneumonia, reduced use of traditional treatment for diarrhoea and fewer health facility treatments for malaria and pneumonia. CHVs may have also influenced caregiver symptom recognition of pneumonia in children, as evidenced by the significant increase in reported pneumonia cases. CHVs 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.

This proportion is likely due to the fact that they charge money for treatments, whereas treatments were provided free of charge by CHVs and government health facilities.

Recent studies have demonstrated the effectiveness of CHW programmes in sub-Saharan Africa. CHWs influence care-seeking behaviour and improve access to appropriate treatment of common childhood illnesses, particularly in hard-to-reach and poor areas (Onwujekwe *et al.* 2007; Perez *et al.* 2009; Yeboah-Antwi *et al.* 2010; Brenner *et al.* 2011; Kisia *et al.* 2012; Perry & Zulliger 2012; Seidenberg *et al.* 2012). A pre–post evaluation of a CHW programme in two villages in Nigeria showed a CHW utilisation rate of 26.1%, with decreased use of drug peddlers (44.8% to 17.9%) and slight increase in health facility use (30.2% to 32.2%) (Onwujekwe *et al.* 2007). Results from an evaluation of malaria CCM pilot programme in two hard-to-reach and poor districts of Kenya supported the assertion that CHWs can be influential in changing health-seeking behaviour of families (Onwujekwe *et al.* 2007; Kisia *et al.* 2012). 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 (Seidenberg *et al.* 2012). Volunteer CHWs were credited with a reduction in the number of child deaths and improved care-seeking practices for diarrhoea and fever/malaria post-intervention of a CHW programme in rural Uganda (Brenner *et al.* 2011).

Due in part to the FHCI and CHV intervention, there appeared to be a shift away from traditional remedies to allopathic treatment for childhood illnesses in Sierra Leone (Bakshi *et al.* 2013). At baseline, there was a strong association of traditional treatment use and not seeking allopathic care (Diaz *et al.* 2013). 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 (Bakshi *et al.* 2013). By the endline, there was an overall increase in seeking care at governmental health facilities followed by CHVs (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 Millennium Development Goal 4 goals (Wilkinson *et al.* 2001; Rutebemberwa *et al.* 2009; Page *et al.* 2011). The number of consultations for curative care at health facilities doubled after the introduction of free primary health care in South Africa (Wilkinson *et al.* 2001). In rural Niger, the 3.5 times increase in reported care seeking from health facilities for paediatric diarrhoea was attributed to the abolition of user fees (Page *et al.* 2011). The opposite happened in Uganda, where despite the removal of user fees at government health facilities, two-thirds of children were taken to drug shops and private clinics for malaria treatment due to proximity and treatment availability on credit (Rutebemberwa *et al.* 2009). CHVs, 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. The endline qualitative study showed that there was good understanding of the role of CHVs among communities and that CHVs are generally perceived to provide helpful services; respondents stated that they strongly value their work (Brady & Sharkey 2013).

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. The removal of user fees is not enough to address community demand for access to prompt and affordable care for children (Rutebemberwa *et al.* 2009). 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 (Rutebemberwa *et al.* 2009; Amnesty International 2011). 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 (Amnesty International 2011; Moszynski 2011; Maxmen 2013).

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 centres, CHWs can increase the number of care providers at the community level (Lewin *et al.* 2010; de Sousa *et al.* 2012). Compared with 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 (Kelly *et al.* 2001).

Limitations

The study comes with some limitations. Due to the study not being a randomised trial, 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 are based on the recollection of caregivers and may be subject to recall bias. However, the 2-week recall period is the standard for household surveys (i.e. DHS) conducted in developing countries. CHVs were trained to treat children who presented with fever and pneumonia symptoms with both

ACT and cotrimoxazole, making the interpretation of treatment coverage for suspected pneumonia problematic as 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 (Campbell *et al.* 2013).

Reported CHV use may have been underestimated due to some caregivers confusing CHWs with community health officers (CHOs), who are paid facility health personnel or confusing CHVs with health facility staff at peripheral health units. However, efforts were made during interviewer training and data collection to provide clear definitions of who CHVs were to minimise confusion with CHOs and other provider types. The non-comparability of study areas likely affected our results. However, the baseline differences between study groups were adjusted for in the DID analysis, which still showed some CHV 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 CHV selection, training and programme 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 <12 months of programme duration, which might not have been adequate for programme saturation.

Conclusion

The study demonstrates that availability of CHVs can influence care seeking and treatment for children U5 ill with diarrhoea, 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, CHVs still accounted for a significant proportion of treatments delivered in intervention districts, showing acceptability of CHVs as providers at the community level.

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 CHVs could be an addition to improve provision of free health care in the country. Given that facility-based treatments are free, strategic deployment of CHVs to localities furthest away from facilities would likely be more effective. However, further research is needed to determine which groups would benefit the most from CHV services and how to effectively and sustainably support CHVs as an integrated part of the health system.

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