

Characteristics and working conditions of community health workers managing childhood illness in the Democratic Republic of the Congo, Nigeria, and Uganda: a cross-sectional survey study

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Abstract

Background: Integrated community case management (iCCM) is a strategy designed to provide children in remote areas of low- and middle-income countries with access to life-saving care directly in their communities. However, in sub-Saharan Africa, community-based triaging and management of ill children remains inadequate, undermining the full potential of iCCM to reduce child mortality.

Under iCCM, Community Health Workers (CHWs) triage and treat children for common illnesses such as malaria, diarrhea and pneumonia, yet the effectiveness of their work in delivering timely and appropriate care depends on critical determinants.

This work drew on baseline survey data from the CARAMAL project to describe CHW programme characteristics, CHW support and motivation, and contextual factors relevant for triage and management of severely ill children under five.

Methods: Structured interviews were conducted with 108 CHWs in the Democratic Republic of the Congo (DRC), Nigeria, and Uganda to assess their recruitment and training pathways, working conditions, knowledge, and preferences for providing pre-referral malaria care.

Results: Most CHWs had been trained more than a year prior to the survey (80/108, 74%), received refresher iCCM training once or twice yearly (67/108, 62%), and were supervised monthly (DRC 26/28, 93%; Nigeria 37/40, 93%) or quarterly (Uganda 23/40, 56%). Diagnosis and treatment were the most requested training topic (DRC 18/28, 64%, Uganda 29/40, 73%, Nigeria 25/40, 62%). Overall, 93% (100/108) of CHWs referred sick children to another healthcare provider, most commonly due to danger signs (78%), lack of supplies (36%), or insufficient knowledge to manage the condition (30%). Drug supply reached CHWs mostly through a push system (84/108, 78%) rather than a needs-based pull system (41/108, 38%). Overall, 58% (63/108) of CHWs were satisfied with their work; suggested improvements included better payment (45%), provision of working tools (45%), consistent drug supply (43%), further training (42%), and increased supervision (7%).

Conclusions: The study identified common factors that could impact CHWs' ability to make effective decisions regarding the assessment, treatment, and referral of ill children in resource-constrained settings. iCCM programmes should address these gaps so CHWs can deliver timely, quality pre-referral care for children in their communities.

Study registration: Clinical trial number: NCT03568344. Registered 26 June 2018, <https://clinicaltrials.gov/study/NCT03568344>.

Background

Under-five mortality remains a critical health issue in several global regions. In 2023, an estimated 4.5 million children died before reaching five years of age in low- and middle-income countries (LMICs)

(1). The sub-Saharan African (SSA) region alone accounted for about 58 percent of all under-five deaths (2).

Child deaths in this age group are predominantly due to preventable and treatable conditions such as malaria, pneumonia, and diarrhoea, which are the most common child illnesses in SSA (3, 4). For instance, in 2024, children under five years represented around 75% of all 579,000 malaria deaths in the African region (5). Current persistent challenges that contribute to the high childhood mortality rates in SSA include poor recognition of severity signs and symptoms of childhood illness by caregivers, lack of access to timely and quality healthcare, and inadequate management of the highly prevalent childhood diseases (6–9). Other factors stemming from multiple socio-economic challenges in underserved communities, including poverty, low caregiver education, and inadequate prenatal care, contribute to the observed under-five mortality in hard-to-reach areas of the SSA region (10–12). Preexisting health system access barriers are exacerbated by shortages of healthcare providers (13). It is estimated that by the year 2030 LMICs will face increasing shortages of health workforce, resulting in a progressive deficit of healthcare providers in the most resource limited regions (14).

Since 2012, in efforts to respond to these healthcare access and system challenges, the World Health Organization (WHO) and United Nations Children's Fund (UNICEF) implemented the integrated community case management (iCCM) guideline as a crucial strategy for improving the survival of children (15). Many SSA countries have since adopted the iCCM strategy to improve access to early diagnosis and management of common childhood diseases at the community level in resource constraint settings (16).

According to the WHO, CHWs are members of the communities in which they reside, are elected to serve those communities, should receive support from the formal health system institutions and undergo shorter training compared to other healthcare professionals (17). They are often the first point of contact for caregivers of a sick child (7, 15). Because of the potential multifactorial health issues in children, CHWs are trained to triage and manage more than one common childhood illness.

Training of the elected community-based workers includes both initial and on-going sessions to reinforce CHWs' skills (18, 19). Though there is a variation in the duration of iCCM training for CHWs and supervisory frequency also differs across LMICs (20), a WHO training guidance package was produced (21). A further guideline emphasizes standardized regular and supportive supervision specific to CHW roles and responsibilities (19).

Although CHWs are recognised as cadres of the healthcare workforce, there are reports that CHWs from resource-constrained contexts in LMICs are persistently faced with challenges in carrying out their responsibilities (22–24). Previous reviews reported that many CHWs in SSA are not equitably salaried, skilled, supervised or properly supplied (25, 26). This makes their work less effective and reduces the quality of care to the communities they serve, including ill children. Therefore, more resources and efforts are encouraged for supporting the roles of CHWs working in underserved communities (27).

The suboptimal assessment, treatment, and referral of sick children in resource-constrained settings was also evidenced by the Community Access to Rectal Artesunate for Malaria (CARAMAL) project, which was implemented through existing iCCM schemes to contribute to the reduction of malaria deaths among children in SSA (28). The project was conducted in the Democratic Republic of the Congo (DRC), Nigeria, and Uganda (28) as part of the large-scale implementation of pre-referral treatment with rectal artesunate (RAS) for suspected severe malaria into routine health systems. The CARAMAL project was designed as a before-and-after observational study and ran between 2018 and 2020. The goal of CARAMAL was to assess the effectiveness, feasibility, acceptability and safety of introducing RAS at the community level.

Key findings of the CARAMAL project have been published elsewhere (29–33). Briefly, the study noted that large-scale implementation of RAS was not associated with improved survival among children under five with suspected severe malaria (31), and referral and post-referral treatment were both often inadequate (29, 34).

Despite the significant responsibility CHWs bear, the contextual factors shaping the triage and management of severely ill children under five by this workforce remain poorly described. Using data from CARAMAL collected before RAS roll-out, this study sought to examine CHW work characteristics, availability of essential tools, and other factors relevant to iCCM service provision in remote areas contexts.

Methods

Setting

The study was conducted in the DRC (Kenge health zone in Kwango Province, Kingandu and Ipamu health zones in Kwilu Province), Nigeria (Fufure, Mayo Belwa, Song Local Government Areas in Adamawa State), and Uganda (Apac, Kole and Oyam Districts) (28). Study sites were located in remote, hard-to-reach areas to reflect typical settings for RAS implementation as suggested in previous studies (35). There was variability between sites in terms of the number of CHWs serving the population: while in the DRC, at the start of the CARAMAL project, 42 CHWs served the study population of 785,967 in the DRC (0.5/10,000 population), in Nigeria 500 CHWs were responsible for 746,949 people (7/10,000), while in Uganda 5,100 CHWs were serving a study population of 995,986 (51/10,000) (28).

Sampling and Participants

A sample of 108 CHWs was included in this analysis. The study involved CHWs enrolled in the iCCM system who treat children under five years in the study area since not less than a month. All three study countries have implemented an iCCM system that is based on volunteer community representatives that receive no or only a minimal salary. In the DRC, 28 CHWs within the study area were enrolled in the study and in Nigeria and Uganda, a random sample of 40 CHWs per country (28).

Study design and Data sources

A secondary analysis of the CHW dataset collected before RAS roll-out was conducted. Primary data was collected through face-to-face interviews. Interviews were conducted in French in the DRC, in English in Nigeria and in Lango or English in Uganda. Data were collected using the CARAMAL health care provider survey instruments, described previously by Lengeler et al. (28). The surveys covered a range of themes, including CHW demographics, CHW selection and appointment, training and supervision and overall job satisfaction. In addition, a structured checklist was completed with the CHW to assess the availability of essential medical supplies and equipment, human resource and infrastructure capacity.

Data analysis

We developed a data analysis plan to select a list of variables of interest from the CHW dataset before RAS roll-out. The list included the variable name, description, type and value as entered in Open Data Kit forms. For analysis, descriptive statistics was used and statistical tests were applied to compare differences in distributions across countries. All analyses were conducted in statistical software (Stata/BE 18).

Results

Selection and characteristics of surveyed CHWs

Most CHWs in the DRC (21/28, 75%) and in Uganda (33/40, 83%), were elected by the community. In contrast, in Nigeria, the majority of CHWs (27/40, 68%) were appointed by local health authorities.

Overall, the median age of CHWs was 37 years (Interquartile Range: 30–45 years) and the majority were male (77%). Details are presented in Table 1. Across all three countries, 83% of CHWs reported that gardening/farming/fishing for money was their primary work. In terms of educational level, 77% of all CHWs had attained a secondary level education. Years of experience as CHWs varied across countries, but all interviewed CHWs had worked for more than two years in their current role. CHWs tended to have worked longer in DRC and Uganda, compared to Nigeria where none of the interviewed CHW had more than five years of experience ($p < 0.001$).

Table 1
Characteristics of surveyed CHWs

Characteristic	DRC N = 28	Nigeria N = 40	Uganda N = 40	Total N = 108	p-value [§]
Total	n (%)	n (%)	n (%)	n (%)	
Age group					< 0.001
< 30	1 (4)	16 (40)	5 (13)	22 (20)	
30–39	8 (29)	17 (43)	15 (38)	40 (37)	
40–49	12 (43)	6 (15)	13 (33)	31 (29)	
50–59	5 (18)	1 (3)	3 (8)	9 (8)	
≥ 60	2 (7)	0 (0)	4 (10)	6 (6)	
Gender					0.110
male	25 (89)	31 (78)	27 (68)	83 (77)	
female	3 (11)	9 (23)	13 (33)	25 (23)	
Main occupation					0.016
Gardening/farming/fishing for money	20 (71)	34 (85)	38 (95)	92 (85)	
Working in house/domestic duties	0 (0)	0 (0)	1 (3)	1 (1)	
Marketing/street seller	0 (0)	1 (3)	0 (0)	1 (1)	
Self-employed/family business	2 (7)	4 (10)	1 (3)	7 (7)	
Wage job public sector	5 (18)	0 (0)	0 (0)	5 (5)	
Other (Specify)*	1 (4)*	1 (3)*	0 (0)	2 (2)	
Highest education					0.188
Primary	1 (4)	6 (15)	9 (22.5)	16 (15)	
Secondary	25 (89)	29 (73)	29 (73)	83 (77)	
Some college/university	2 (7)	5 (13)	2 (5)	9 (8)	
Years as CHW					< 0.001
1–2 years	1 (4)	11 (28)	7 (18)	19 (18)	
3–5 years	13 (46)	29 (73)	6 (15)	48 (44)	
> 5 years	14 (50)	0 (0)	27 (66)	41 (38)	

Characteristic	DRC N = 28	Nigeria N = 40	Uganda N = 40	Total N = 108	p-value [§]
Total	n (%)	n (%)	n (%)	n (%)	
[§] p-values compare the distribution of each characteristic across the Democratic Republic of the Congo (DRC), Nigeria, and Uganda using Pearson's chi-square test * Other occupation: DRC: Pastor; Nigeria: Student CHW, community health worker.					

Training status and supervision support

Almost all surveyed CHWs in the three countries had undergone an initial training (Table 2). The majority of CHWs (80/108, 74%) underwent initial trainings one year or more ago since their recruitment and 93% (100/108) had received at least one supervisory visit in the past six months.

In the DRC, local health authorities were the main providers for almost half of the CHWs' training (46%) and supervision (43%). Other providers included bilateral development agencies and NGOs (GIZ, KOICA, JHPIEGO) (36%) and affiliated health centres (11%). In Nigeria, UNICEF was the primary provider of initial training (88%) and supervisory visits (55%). In Uganda, all surveyed CHWs had received initial training, predominantly led by local health centres (19/40, 48%); other providers of initial training were the National Malaria Control Programme (NMCP) within the ministry of health (MoH) (18%). Refresher trainings had happened mostly within the past six months in the DRC and Nigeria as compared to Uganda where 40% CHWs had the last refresher training more than a year ago ($p < 0.001$).

Most topics covered during refresher trainings were malaria (76/108, 70%), diarrhoea (37/108, 34%) and iCCM, i.e. the integrated management of various childhood illnesses that may include malaria and diarrhoea (37/108, 34%). In the DRC, Nigeria and Uganda, 62% of CHWs were trained in iCCM once or twice in the past 12 months. These iCCM trainings lasted between one and seven days across the three countries. In the DRC and Nigeria, CHWs reported that the recent iCCM training lasted one day (11/22 or 50% and 11/32 or 34%, respectively). In contrast, Uganda's highest proportion of CHWs (14/40, 44%) received trainings for five to seven days. CHWs in the DRC and Nigeria predominantly received monthly supervision visits (93% and 93%, respectively), whereas in Uganda, quarterly supervision was most common (58% of the CHWs) ($p < 0.001$). Supervision was usually conducted by the organisation providing the initial training, i.e. local health authorities and health centres in DRC and Uganda, and UNICEF in Nigeria.

Table 2
CHW training and supervision

Characteristic	DRC N = 28	Nigeria N = 40	Uganda N = 40	Total N = 108	p-value [§]
Total	n (%)	n (%)	n (%)	n (%)	
How long ago was initial training to be a CHW?					< 0.001
< 3 months	2 (7)	13 (33)	0 (0)	15 (14)	
3–6 months	1 (4)	6 (15)	1 (3)	8 (7)	
7–11 months	0 (0)	2 (5)	2 (5)	4 (4)	
1 year or more	25 (89)	18 (45)	37 (92)	80 (74)	
Missing data	0 (0)	1 (3)	0 (0)	1 (1)	
Provider of initial training to become a CHW					< 0.001
UNICEF	0 (0)	35 (88)	5 (12)	40 (37)	
NMCP / MoH°	1 (4)	1 (3)	7 (18)	9 (8)	
Local Health Authority	13 (46)	0 (0)	8 (20)	21 (19)	
Health Centre	3 (11)	3 (8)	19 (48)	25 (23)	
Bilateral Development Agencies	10 (36)	0 (0)	0 (0)	10 (9)	
Not trained	0 (0)	1 (3)	0 (0)	1 (1)	
Don't know	1 (4)	0 (0)	1 (3)	2 (2)	
How long ago was the last CHW refresher training?					< 0.001
< 3 months	9 (32)	19 (48)	4 (10)	32 (30)	
3–6 months	14 (50)	9 (23)	13 (33)	36 (33)	
7–11 months	3 (11)	4 (10)	6 (15)	13 (12)	
1 year or more	2 (7)	6 (15)	16 (40)	24 (22)	
Don't know	0 (0)	0 (0)	0 (0)	1 (1)	
Not trained	0 (0)	0 (0)	1 (3)	1 (1)	
Missing data	0 (0)	1 (3)	0 (0)	1 (1)	
Topics covered during last training*					

Characteristic	DRC N = 28	Nigeria N = 40	Uganda N = 40	Total N = 108	p-value [§]
Total	n (%)	n (%)	n (%)	n (%)	
Malaria	19 (68)	28 (70)	29 (73)	76 (70)	
iCCM	1 (4)	17 (43)	19 (48)	37 (34)	
Diarrhoea	0 (0)	18 (45)	19 (48)	37 (34)	
RAS	15 (54)	1 (3)	9 (23)	25 (23)	
Malaria Rapid Diagnostic Test use	7 (25)	16 (40)	1 (3)	24 (22)	
Pneumonia	0 (0)	7 (18)	13 (33)	20 (19)	
Health promotion	5 (18)	5 (13)	4 (10)	14 (13)	
Childhood illnesses	1 (4)	7 (18)	4 (10)	12 (11)	
Treating children	1 (4)	5 (13)	6 (15)	12 (11)	
Assessing children	1 (4)	7 (18)	3 (8)	11 (10)	
Trained in iCCM in the past 12 months					0.023
No training	5 (18)	6 (15)	2 (5)	13 (12)	
Once or twice	21 (75)	21 (53)	25 (63)	67 (62)	
More than 3 times	1 (4)	11 (28)	7 (18)	19 (18)	
Don't know	1 (4)	0 (0)	0 (0)	1 (1)	
Missing data	0 (0)	2 (5)	6 (15)	8 (7)	
Length of iCCM training in the past 12 months (days)	N = 22	N = 32	N = 32	N = 86	< 0.001
1	11 (50)	11 (34)	5 (16)	27 (31)	
2–4	7 (32)	16 (50)	7 (23)	30 (35)	
5–7	4 (18)	4 (13)	14 (44)	22 (26)	
Missing data	0 (0)	1 (3)	6 (19)	7 (8)	
Work supervisor					< 0.001
UNICEF	0 (0)	22 (55)	2 (5)	24 (22)	
NMCP /MoH°	0 (0)	2 (5)	0 (0)	2 (2)	
Local Health Authority	12 (43)	10 (25)	7 (18)	29 (27)	

Characteristic	DRC N = 28	Nigeria N = 40	Uganda N = 40	Total N = 108	p-value [⊠]
Total	n (%)	n (%)	n (%)	n (%)	
Health Centre	13 (46)	7(18)	26 (65)	46 (43)	
Local NGOs	3 (11)	4 (10)	3 (8)	10 (9)	
Not supervised	0 (0)	0 (0)	1 (3)	1 (1)	
Don't know	0 (0)	0 (0)	1(3)	1 (1)	
Supervision frequency					< 0.001
Monthly	26 (93)	37 (93)	13 (33)	76 (70)	
Quarterly	1 (4)	2 (5)	23 (56)	26 (24)	
Twice a year	0 (0)	1 (3)	1 (3)	2 (2)	
Yearly	1(4)	0 (0)	0 (0)	1 (1)	
Don't know	0 (0)	0 (0)	1 (3)	1 (1)	
Missing data	0 (0)	0 (0)	1 (3)	1 (1)	
Received supervisory visits in last 6 months?					0.070
Yes	26 (93)	40 (100)	34 (85)	100 (93)	
Missing data	0 (0)	0 (0)	1 (3)	1 (1)	
[⊠] p-values compare the distribution of each characteristic across the Democratic Republic of the Congo (DRC), Nigeria, and Uganda using Pearson's chi-square test * Multiple answers were possible ° the National Malaria Control Programme within the ministry of health CHW, community health worker; iCCM, integrated community case management; NGO, non-governmental organization; RAS, rectal artesunate.					

Most of surveyed CHWs independent of their country of origin expressed a need for training improvement. Overall, the most common requested training topic was on treatment and diagnosis of patients (Fig. 1). Management of medicines was more requested in Nigeria (63%) and Uganda (53%) but less in DRC (25%). None of the CHWs in the DRC requested training in record keeping and referral practices, compared to some CHWs expressing a need in Nigeria (30% and 33%, respectively) and in Uganda (15% and 5%, respectively).

Working conditions of CHWs

Most CHWs reported not receiving a fixed salary for their work. Table 3 shows that only four out of 108 CHWs (4%) reported having a fixed salary. Instead, some CHWs reported getting an incentive. Regular incentives were more common in Uganda (25/40, 63%) compared to DRC (17/28, 61%) and Nigeria (6/40, 15%). While most CHWs in DRC and Uganda received monthly or quarterly incentives (94% and 77%, respectively), CHWs in Nigeria received an incentive during trainings or meetings (100%). In DRC and Uganda, 61% and 60% of CHWs, respectively, who were paid an incentive, reported that payments were not always made.

Table 3
CHWs' working conditions

Characteristic	DRC N = 28	Nigeria N = 40	Uganda N = 40	Total N = 108	p-value [¶]
Total	n (%)	n (%)	n (%)	n (%)	
Does the CHW have a fixed salary?					0.368
Yes	2 (7)	0 (0)	2 (5)	4 (6)	
Does the CHW receive an incentive?					< 0.001
Yes	17 (61)	6 (15)	25 (63)	48 (44)	
How frequently is incentive paid?	N = 17	N = 6	N = 25	N = 48	< 0.001
Monthly	12 (71)	0 (0)	0 (0)	12 (25)	
Quarterly	4 (24)	0 (0)	21 (84)	25 (52)	
Twice a year	0 (0)	0 (0)	1 (4)	1 (2)	
During trainings/meetings	1 (6)	6 (100)	3 (12)	10 (21)	
Does it happen that payments are outstanding?	N = 17	N = 6	N = 25	N = 48	
Yes	17 (61)	0 (0)	24 (60)	41 (38)	
# days per month they operate as CHW					0.004
0	0 (0)	2 (5)	0 (0)	2 (2)	
1–7	1 (4)	7 (18)	4 (10)	12 (11)	
8–15	10 (36)	4 (10)	5 (13)	19 (18)	
16–22	1 (4)	3 (8)	7 (18)	11 (10)	
≥ 23	16 (57)	24 (60)	24 (60)	64 (59)	
# hours per day they operate as CHW					0.002
0–2	2 (7)	7 (18)	3 (8)	12 (11)	
3–4	8 (29)	1 (3)	9 (23)	18 (17)	
5–7	6 (21)	9 (22)	8 (20)	23 (21)	
8–12	11 (39)	8 (20)	15 (38)	34 (32)	
13–24	1 (4)	15 (38)	5 (13)	21 (19)	

¶ p-values compare the distribution of each characteristic across the Democratic Republic of the Congo (DRC), Nigeria, and Uganda using Pearson's chi-square test

Characteristic	DRC	Nigeria	Uganda	Total	p-value [§]
	N = 28	N = 40	N = 40	N = 108	
Total	n (%)	n (%)	n (%)	n (%)	
CHW, community health worker.					

Table 3 also shows that in the three countries, more than half of respondents (64/108, 59%) work more than 23 days per month as a CHW. Most of the CHWs in DRC and Uganda worked between three and 12 hours a day as a CHW (89% and 80%, respectively), while CHWs tended to work longer hours in Nigeria (38% working between 13 and 24 hours per day).

Service provision and patient referral

CHWs primarily attended to children (104/108; 96%) and infants (82/108; 76%) (Table 4). Consultation to infants were less frequent in Uganda compared to DRC and Nigeria. Contrary to Uganda and Nigeria, many CHWs in the DRC also offer services to adolescents (24/28, 86%) and adults (24/28, 86%). The median length of consultations was 15 minutes in the DRC and Nigeria, and 20 minutes in Uganda. All surveyed CHWs confirmed that patients do not pay fees for consultation and drugs. In all three countries, the CHWs reported conducting home visits to follow up on patients (89%, 80% and 68% in DRC, Nigeria and Uganda, respectively).

Overall, 93% (100/108) of CHWs refer sick children to another healthcare provider. The most reported reasons for referring sick children were presence of danger signs (78%), lack of supplies such as diagnostics and drugs (36%), or CHWs not knowing how to treat the condition (30%). Some CHWs affirmed that they offer referral support to their patients, which was more frequent in Uganda (17/40, 43%) compared to the DRC (8/28, 29%) and Nigeria (6/40, 15%). The main referral destination were primary care facilities (25/28 [89%] in the DRC, 31/34 [91%] in Nigeria, and 30/38 [79%] in Uganda), while the remaining referrals were to tertiary referral hospitals. The type of support provided to referred patients was mainly facilitation of transport, but in Nigeria, sometimes also involved monetary support.

Table 4
Service provision and patient referral

Characteristic	DRC N = 28	Nigeria N = 40	Uganda N = 40	Total N = 108	p-value [¶]
Total	n (%)	n (%)	n (%)	n (%)	
Consultation/ types of patients seen by a CHW*					
Infants	27 (96)	29 (73)	26 (65)	82 (76)	0.010
Children	28 (100)	39 (98)	37 (93)	104 (96)	0.240
Adolescents	24 (86)	2 (5)	2 (5)	28 (26)	< 0.001
Adults	24 (86)	0 (0)	2 (5)	26 (24)	< 0.001
Duration of consultation (minutes)					
median (Interquartile Range)	15 (13–20)	15 (10–25)	20 (9–30)	18 (10–30)	
Do patients pay for consultation?					
No	28 (100)	40 (100)	40 (100)	108 (100)	
Do patients pay for drugs?					
No	28 (100)	40 (100)	40 (100)	108 (100)	
Home visits to follow-up on patients?					0.095
Yes	25 (89)	32 (80)	27 (66)	84 (78)	
Do you ever refer sick children to another healthcare provider?					0.891
Yes	28 (100)	34 (85)	38 (95)	100 (93)	
Type of healthcare provider referred to?					0.276
Primary care facility	25 (89)	31 (91)	30 (79)	86 (86)	

Characteristic	DRC N = 28	Nigeria N = 40	Uganda N = 40	Total N = 108	p-value [‡]
Total	n (%)	n (%)	n (%)	n (%)	
Consultation/ types of patients seen by a CHW*					
Referral facility/Cottage hospital	3 (11)	3 (9)	8 (21)	14 (14)	
What are the reasons for referring sick children to another healthcare provider?*					
Child has a danger sign	25 (89)	31 (76)	28 (70)	84 (78)	0.001
Lack of supplies (diagnostics, drugs)	10 (36)	13 (33)	16 (40)	39 (36)	0.027
Child has non-iCCM condition / Don't know how to treat them	11 (39)	13 (33)	8 (20)	32 (30)	0.005
Lack of time / High caseload	1 (4)	0 (0)	0 (0)	1 (1)	0.009
Does CHW facilitate referral aids (transport, money)?					0.068
Yes	8 (29)	6 (15)	17 (43)	31 (29)	
Type of referral aid facilitated by CHW	N = 8	N = 6	N = 17	N = 31	
Money	0 (0)	2 (33)	0 (0)	2 (7)	0.012
Transport	8 (100)	4 (67)	12 (71)	24 (77)	0.204
[‡] p-values compare the distribution of each characteristic across the Democratic Republic of the Congo (DRC), Nigeria, and Uganda using Pearson's chi-square test * Multiple answers were possible CHW, community health worker; iCCM, integrated community case management.					

Availability of tools and commodities

Study findings from the structured checklist that assessed the availability of essential supplies and commodities are detailed in supplementary material (**Table S1**). We noted that 77% of CHWs (83/108) received resources to a certain extent other than diagnostics. Among these, 74% of CHWs (61/83) had received handbooks, 84% of CHWs in Uganda received job aids, unlike in the DRC (11%) and in Nigeria (44%), while 27% of CHWs (22/83) received back packs. CHWs registers were more reported by CHWs in Nigeria (50%, 17/34) compared to only 17% (3/18) in the DRC and 3% of CHWs (1/31) in Uganda. In Nigeria, 53% of CHWs (18/34) received referral forms compared to only 6% of CHWs (1/18) in the DRC

and 3% of CHWs (1/31) in Uganda. Also, medicine boxes were more frequently reported in Nigeria (41%, 14/34) compared to 11% of CHWs (2/18) in the DRC while none of CHWs in Uganda had received any medicine box ($p < 0.001$).

CHWs in Uganda reported higher availability of job aids for performing diagnostic tests, assessment of danger signs and treatment administration (38/40, 90%) than in Nigeria and DRC (27/40, 68% and 17/28, 61%, respectively). Medical supplies such as functional thermometers, weight scales and disinfectants were not generally available to CHWs in the three countries. In Uganda, 60% of CHWs (24/40) reported ownership of some means of transport including bicycles (18/24, 75%) and motorbikes (2/24, 8%). In the DRC, 46% of CHWs (13/28) owned bicycles while in Nigeria, only 10% of CHWs (4/40) had any form of transport ($p < 0.001$).

UNICEF was reported as the main supplier of drugs in Nigeria (95%), this was different in Uganda (5%) and the DRC (0%) ($p < 0.001$). CHWs in the latter two countries reported to have received drug supplies mostly from health centres to which they are associated (79% and 95%, respectively). CHWs reported different systems of drug supply, with 78% (84/108) being supplied through a push system (receiving supplies based on standard allocation) while 38% (41/108) of CHWs received supplies through a pull system (drug supply upon request based on actual need). A significantly higher proportion of CHWs in Uganda (80%) and DRC (68%) had a lockable storage space compared to Nigeria (40%) ($p = 0.001$). Temperature monitoring measures and fridge availabilities were generally low across all countries (4/108, 4% and 2/108, 2%, respectively).

CHWs' work satisfaction

Overall, 58% (63/108) of CHWs were satisfied with their work. None of the CHWs in any of the study countries reported being dissatisfied (Table 5). Only one (4%) CHW in the DRC and two (5%) in Nigeria reported their satisfaction as "neutral". In terms of work improvement suggestions, CHWs in Nigeria notably suggested improving payment/salary (80%) and further trainings (85%). Both areas of improvement were less mentioned in the DRC (21% and 4%, respectively) and Uganda (28% and 25%, respectively) ($P < 0.001$). Other areas of work improvements mentioned by almost half of all surveyed CHWs were provision of working tools (45%), consistent supply of drugs (43%) and more supervision (7%).

Table 5
Satisfaction (roles and work perception)

Characteristic	DRC N = 28	Nigeria N = 40	Uganda N = 40	Total N = 108	p-value [⊠]
Total	n (%)	n (%)	n (%)	n (%)	
How satisfied are you with your work?					0.392
Very satisfied	8 (29)	15 (38)	19 (48)	42 (39)	
Satisfied	19 (68)	23 (58)	21 (53)	63 (58)	
Neutral	1 (4)	2 (5)	0 (0)	3 (3)	
Rather not satisfied	0 (0)	0 (0)	0 (0)	0 (0)	
Not satisfied at all	0 (0)	0 (0)	0 (0)	0 (0)	
How could it be improved?*					
Payment / salary	6 (21)	32 (80)	11 (28)	49 (45)	< 0.001
Provision of working tools (e.g. bicycles, boots, umbrella)	12 (43)	24 (60)	13 (33)	49 (45)	0.045
Consistent drug and medical supply	17 (61)	15 (38)	14 (35)	46 (43)	0.077
Further training	1 (4)	34 (85)	10 (25)	45 (42)	< 0.001
Recognition by community	4 (14)	6 (15)	2 (5)	12 (11)	0.300
More supervision	3 (11)	3 (8)	2 (5)	8 (7)	0.675
[⊠] p-values compare the distribution of each characteristic across the Democratic Republic of Congo (DRC), Nigeria, and Uganda using Pearson's chi-square test * Multiple answers were possible					

Discussion

This study drew on real-world evidence from the CARAMAL project to gain a deeper understanding of CHW profiles in the DRC, Nigeria, and Uganda, and their needs in providing community-based health services to sick children. Our findings highlight on possible enabling factors and critical gaps affecting CHWs recruited to work within these resource-limited settings.

While none of the CHWs from the DRC, Nigeria and Uganda reported being completely dissatisfied, over 40% did not report high job satisfaction. This could suggest that a significant number of health workers

still face unmet support needs (36). Often, CHWs find their work meaningful and are motivated by the impact they have on children and underserved communities (26, 37).

In hard-to-reach settings of SSA, providing prompt and appropriate referral of severely sick children remains critical to preventing early childhood deaths (32). The most reported reasons for CHWs to refer children to a higher-level facility were the presence of iCCM danger signs. On one hand, this indicates that CHW have an awareness of critical situations as they should have. In support of this, studies conducted in the SSA region noted that danger sign recognition is the most retained and improved skills among CHWs after receiving recent iCCM training (38). On the other hand, although CHWs may recognize danger signs that require referral, lack of pre-referral medicines, or limited treatment skills may hamper immediate life-saving care. This could also lead to adverse referral outcomes (22, 34). In fact, a significant proportion of the surveyed CHWs (30%) indicated that limited knowledge in treating sick children contributed to their decision to refer patients to the nearest primary care facilities. Though urgent referral is routinely advised for severely ill children, its completion is far from guaranteed due to a combination of different factors (32).

A lack of diagnostic and essential medicines was another major reason CHWs referred children to higher healthcare providers in this study. These structural logistical barriers may affect not only the ability of CHWs to carry out case management, and treat or refer sick children, but also influence their morale (39). The combination of these major barriers cited by CHWs are consistent with previous findings that highlighted both health system and training-related challenges (7, 40).

A study from Nigeria reported that severely ill children presenting to a primary health centre arrive on average with more than four danger signs (9). The authors of that publication noted that among these severely sick children, almost half had received initial medical care from a CHW. Hence, current efforts to improve access to essential health services for children and subsequently reduce childhood mortality significantly rely on CHWs. They need frequent and sufficient training and supervision to ensure an adequate level of competency (41).

CHWs did not receive a fixed salary in any of the study countries. Instead, CHWs were only paid either monthly or quarterly incentives, if at all. In 2018, the WHO published the guidelines for defining the characteristics of CHWs before recruiting them, a major recommendation to remunerating CHWs through salaries or incentives (19). However, there are still gaps in how these WHO guidelines are being implemented by different CHW programmes in LMICs (42, 43).

CHWs mentioned a double push-pull system for the provision of supplies from suppliers such as UNICEF, local health authorities, and health centres, with significant differences between countries. However, a prior study conducted in Uganda to examine the adoption of dual push-pull hybrid models documented high frequencies of stock-outs of essential medicines and other supplies in health facilities (44). This challenge adds to the many other challenges that are related to CHWs' tasks, which makes healthcare service delivery by CHWs even more complex. Mitigating the common challenge of shortages of essential drugs and supplies necessitates establishing robust supply chain management systems (45).

Evidence from Rwanda and Malawi has shown that addressing this barrier is possible when supply-side facilitators are systematically prioritized and implemented (46).

A study conducted in the WHO African region found that the region continues to face a severe shortage of healthcare providers, with CHWs comprising only fourteen percent of the total workforce (13). To accelerate progress towards universal health coverage, regional projections estimate a need of 25.2 CHWs per 10,000 population (47). At the time of the study, both DRC and Nigeria fell well short of this benchmark, with coverage of 0.5 and 7 CHWs per 10,000 population, respectively, while Uganda had a comparatively large CHW workforce, at 51 per 10,000 population (28).

This study provides valuable insights into the potential barriers and enablers that CHWs face in delivering essential iCCM services to communities in high disease-burden, low-resource settings. However, there are limitations to consider in our study. The study design only captures a snapshot of CHWs' needs from selected areas in the study countries. We acknowledge that the survey was not designed to assess determinants of provision of curative services by CHWs, and this may have led to missed details in the data collected (e.g. factors related to CHWs' roles and scope of work such as exact curative activities done during working time could not be explored as wished). Hence, all interpretations were undertaken with caution. Additionally, the survey data were self-reported by CHWs, which may introduce recall and social desirability biases. And while the study areas represent different contexts within SSA, the findings may not be generalizable to all settings.

Conclusions

High case fatality rates among severely sick children, as evidenced by the CARAMAL observational study, reflect inadequacies in case detection and management within existing community health systems. CHWs as frontline health workforce need sufficient support and training to ensure adequate service provision. Persistent structural barriers in the health system need to be addressed to ensure CHWs receive the support, supplies, and incentives required to maintain high quality case-management within the frame of iCCM. Addressing the barriers and leveraging the facilitating factors for community-based triaging and management is crucial for improving access to life-saving care, particularly in hard-to-reach settings. The findings of this study serve as a reminder to urgently strengthen the support of iCCM programs to ensure that CHWs can continue to play a pivotal role in saving the lives of children in their communities.

Abbreviations

CARAMAL

Community Access to Rectal Artesunate for MALARia

CHW

Community Health Worker

DRC

The Democratic Republic of the Congo
iCCM
Integrated Community Case Management
LMICs
Low- and Middle-Income Countries
NGOs
Non-Governmental Organizations
RAS
Rectal Artesunate
SSA
sub-Saharan Africa
UNICEF
United Nations Children's Fund
WHO
World Health Organization

Declarations

Ethics approval and consent to participate: This study involved an analysis of de-identified secondary data. Ethical approvals were obtained prior to the implementation of the CARAMAL project. These approvals included the Research Ethics Review Committee of WHO (ERC.0003008), the Ethics Committee of the University of Kinshasa School of Public Health (012/2018), the Health Research Ethics Committee of the Adamawa State Ministry of Health (S/MoH/1131/I), the National Health Research Ethics Committee of Nigeria (NHREC/01/01/2007-05/05/2018), the Higher Degrees, Research and Ethics Committee of the Makerere University School of Public Health (548), the Uganda National Council for Science and Technology (SS 4534), and the Scientific and Ethical Review Committee of the Clinton Health Access Initiative (112; date Nov 21, 2017). All methods were carried out in accordance with the relevant guidelines and regulations. Written informed consent was obtained from all study participants prior to enrolment. The CARAMAL project was prospectively registered on ClinicalTrials.gov (NCT03568344) on 26 June 2018.

Consent for publication: Not applicable

Availability of data and materials: All data generated or analysed during this study are included in this published article [and its supplementary information files].

Competing interests: The authors declare that they have no competing interests

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Authors' contributions: AS and CB conceptualised the study design and provided access to the CARAMAL dataset. SM and AS conducted formal data cleaning, analysis, management and reporting. SM wrote the first draft of the manuscript. AS, CB, GD, MWH, EO, KA, CO, OY, JO,AT, JCK,PA, JK reviewed and edited the interpretation of the findings. All authors read and approved the final manuscript.

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Figures

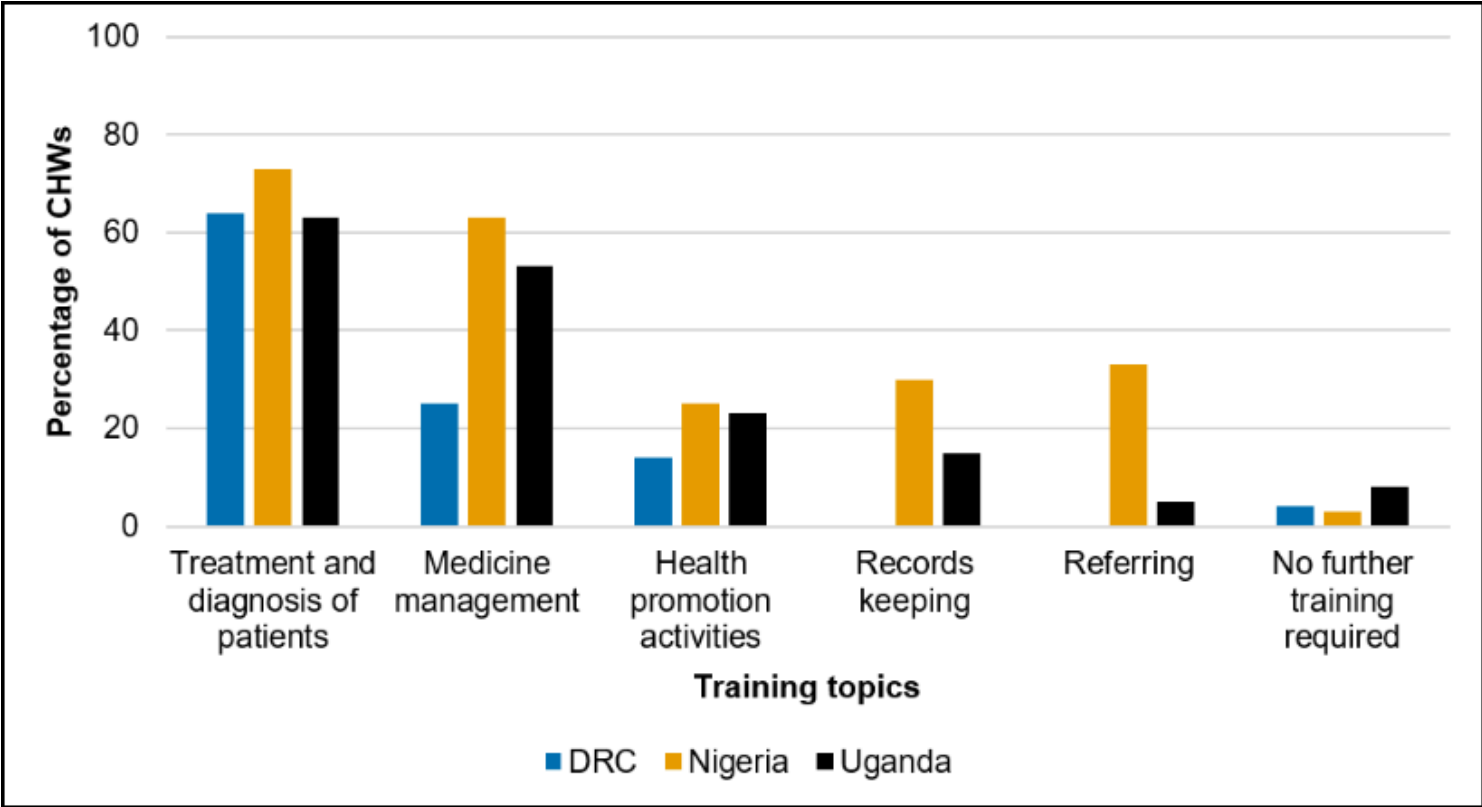


Figure 1

Areas for which community health workers request further training. CHW, community health worker.

Supplementary Files

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