



BMJ Open Rwanda's community health workers at the front line: a mixed-method study on perceived needs and challenges for community-based healthcare delivery during COVID-19 pandemic

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ABSTRACT

Objective During the COVID-19 pandemic, community health workers (CHWs) served as front-line workers in the COVID-19 response while maintaining community health services. We aimed to understand challenges faced by Rwanda's CHWs during a nationwide COVID-19 lockdown that occurred between March and May 2020 by assessing the availability of trainings, supplies and supervision while exploring perceived needs and challenges.

Design and setting This study was a mixed-method study conducted in three Rwandan districts: Burera, Kirehe and Kayonza.

Main outcome and measure Using data collected via telephone, we assessed the availability of trainings, supplies and supervision during the first national lockdown, while exploring perceived needs and challenges of CHWs who were engaged in COVID-19 response, in addition to their existing duties of delivering health services in the community.

Results Among the 292 quantitative survey participants, CHWs were responsible for a median of 55 households (IQR: 42–79) and visited a median of 30 households (IQR: 11–52) in the month prior to the survey (July 2020). In the previous 12 months, only 164 (56.2%) CHWs reported being trained on any health topic. Gaps in supply availability, particularly for commodities, existed at the start of the lockdown and worsened over the course of the lockdown. Supervision during the lockdown was low, with nearly 10% of CHWs never receiving supervision and only 24% receiving at least three supervision visits during the 3-month lockdown. In qualitative interviews, CHWs additionally described increases in workload, lack of personal protective equipment and COVID-specific training, fear of COVID-19, and difficult working conditions.

Conclusion Many challenges faced by CHWs during the lockdown predated COVID-19 and persisted or were exacerbated during the pandemic. To promote the resilience of Rwanda's CHW system, we recommend increased access to PPE; investment in training, supervision and supply chain management; and financial compensation for CHWs.

Strengths and limitations of this study

- The study explored challenges and needs of community health workers (CHWs) who were involved in the response of COVID-19 pandemic in Rwanda.
- Using phone-based data collection, the study combined quantitative and qualitative interview data to fully understand the challenges and needs from the perspective of a CHW.
- In Rwanda, CHWs are provided with cellphones by virtue of being CHWs, and we made a great effort to reach a representative sample of CHWs in the three districts of our focus.
- This is the first study to document challenges and needs of CHWs during the COVID-19 pandemic, and we found a low level of support in terms of training, supplies, supervision; which also predated the COVID-19 pandemic.
- The scope of challenges and needs in this study is likely an underestimate of the true needs of CHWs who are solely supported by the Ministry of Health, since we interviewed CHWs who serve districts that are supported by an international non-government organisation, through training and other incentives.

INTRODUCTION

As the world lives through the COVID-19 pandemic—the most devastating health crisis of the 21st century—the pressure on the global healthcare workforce continues to intensify.¹ COVID-19 has strained healthcare personnel in high-income countries, where there were 3.7 doctors and 11.5 nurses and midwives per 1000 people in 2017.^{2,3} In low-income countries, which were already facing a healthcare workforce shortage with only 0.3 doctors and 0.9 nurses and midwives per 1000 people in 2017, COVID-19 response activities have necessitated the onboarding of non-traditional healthcare workers at the front

line of the pandemic, including individuals with no prior infectious disease expertise.^{3 4}

Establishing community health worker (CHW) systems has been one of the strategies to alleviate the shortage of formal healthcare workforce and promote access to and utilisation of health services in the communities.⁵ In countries with CHW programmes, there are approximately 3–5 CHWs per every 1000 people.⁶ CHWs have demonstrated success in many areas, including linking communities to the formal health systems, promoting immunisation uptake, improving the management of sick children and improving outcomes for acute respiratory infections and malaria.^{7–9}

During the COVID-19 pandemic, extended lockdowns, local and international travel restrictions, and increased demand on the health system have required CHWs to respond to an increased need for community-based healthcare.¹⁰ Concurrently, CHWs are challenged both to perform new pandemic related tasks. The increased workload and elevated COVID-19 infection rates among other types of healthcare workers has been linked to increased stress and anxiety, and could affect CHWs as well.^{11 12} Furthermore, CHW programmes have historically faced challenges in receiving required training, supervision and supplies.^{13–16} It has been previously observed that inadequately supported CHW programmes may struggle to provide effective services in times of crises.¹⁷ In the context of the COVID-19 pandemic, understanding the challenges faced by front-line CHWs is critical to ensuring that they have the resources needed to support their communities.

Rwanda witnessed its first COVID-19 case on 14 March 2020. As a consequence, an abrupt nationwide lockdown was imposed on 22 March 2020 through 31 May 2020, with subsequent multiple partial lockdowns across the country. During this time, incumbent CHWs were recruited for pandemic-related activities of community education and mobilisation, front-line screening, contact tracing, case identification and case referral in addition to continuing to perform their existing responsibilities.¹⁸ Furthermore, as Rwanda began shifting towards community-based treatment of COVID-19 cases in September 2020, CHWs were asked to support the monitoring of COVID-19 patients receiving home-based care. Although Rwanda has heavily engaged CHWs in the national COVID-19 response, to our knowledge, no previous research has documented the challenges faced by Rwandan CHWs, either before or during the COVID-19 pandemic. This study was conducted to understand challenges faced by CHWs during Rwanda's COVID-19 lockdown by assessing the availability of training, supervision and supplies and exploring the perceived needs and challenges of CHWs during the COVID-19 pandemic.

METHODS

Study design and settings

We applied a mixed-method cross-sectional design using a convergent parallel approach.¹⁹ It was nested in a larger study conducted in three rural Rwandan districts

of Burera, Kirehe and Southern Kayonza, to understand the effect of COVID-19 on community health indicators and CHWs' work. These three districts are supported by Partners In Health/Inshuti Mu Buzima (PIH/IMB), a Boston-based international non-governmental organisation that supports health system strengthening. Of these three districts, Kirehe is on the border of Rwanda and Tanzania and experienced substantial truck traffic from Tanzania, even during the national lockdown. This transit route resulted in larger number of imported COVID-19 cases in Kirehe district, relative to the other two districts.

Rwanda's CHW programme

Each Rwandan village, which is composed of 100–250 households, has three CHWs including one female Agent de Sante Maternelle (ASM) and a male–female pair known as Binômes. ASMs provide maternal and newborn healthcare through home visits and follow-up while Binômes provide a wider range of services, including diagnosis and treatment of childhood illness and antimalaria services for people of all ages, malnutrition screening and provision of contraceptives. Nonetheless, the roles of CHWs are not mutually exclusive based on CHW cadre. Except Binomes who are responsible for treatment and provision of medications, any CHW can perform health promotion activities, referrals to health facility, home visits and check-ins. In PIH/IMB supported regions, a fourth CHW is being added in most villages to support health promotion. Although performance-based financing is provided in some instances, CHWs currently work as volunteers and do not receive regular financial compensation.²⁰ Consequently, CHWs engage in other activities to support their family's livelihood.

CHWs are mainly supported by the Rwanda Ministry of Health through their local health centres. CHWs receive a comprehensive kit of supplies, including a prepaid cell phone which can be used to contact collaborators in local government and health sectors. CHWs are directly supervised at a cell level, which is an aggregate of approximately seven villages. A CHW cell coordinator keeps direct contact with the nearest health centre and supervises all CHWs from villages in his/her administrative cell through monthly meetings or one-on-one visits in the community. PIH/IMB provides additional support to the CHW in its catchment districts by providing them with trainings to improve their service delivery and reporting as well as financial support by funding income-generating cooperatives for CHWs.

Study participants

We used a stratified simple random sampling methodology to select participants out of 5767 CHWs from the three PIH/IMB-supported districts. We stratified the populations of CHWs into nine groups cross-classified by district and cadres (ASM, female Binome, male Binome) and sampled 5% of individuals from each of the nine groups at random. We excluded CHWs who had served their current village for less than 1 year at the start of

the COVID-19 pandemic. Our target sample size for the quantitative survey was 292, which would allow us to report 95% confidence intervals with a precision of at least $\pm 6\%$ for the overall CHW population, district-specific estimates with a precision of at least $\pm 14\%$, and cadre-specific estimates with a precision of at least $\pm 12\%$. To achieve the minimum sample size of 292, selected CHWs who were unreachable on the phone were replaced by the next CHWs on the sampling frame, which expanded the overall sample size to 349. Informants of the qualitative survey were purposely selected among CHWs who participated in the quantitative survey and the sample size for the qualitative portion was determined by thematic saturation.

Patient and public involvement

Participants had no particular involvement in the implementation of the study, other than answering to the surveys.

Data collection

Our quantitative data collection tool was developed by adapting questions from validated questionnaires previously used among healthcare workers in similar settings.^{21 22} We conducted a phone-based data collection between 30 August 2020 and 3 October 2020. CHWs were recruited via phone calls to set up an appointment for data collection, received a text message containing a shortened generic consent information and asked to consent to the study by replying yes or No to voluntary participation to the text message. Data were collected by short-term research staff who do not typically have interactions with the CHWs and who do not play a supervisory role to the CHWs. In effort to reduce non-response bias, we made three phone-call attempts on three different days; and CHWs who were not reachable directly, we contacted a peer CHW serving in that village to help us reach the CHW sampled for the study. CHWs who were not reachable at three different attempts on three different days were considered non-response. Quantitative data were collected via a 40 minutes-long phone interview and stored into a password-protected REDCap database, a data management application first developed by Vanderbilt University and hosted on a Rwanda-based server.²³ For qualitative data, we developed an interview guide comprising nondirective open-ended questions framed around challenges and needs of CHWs during COVID-19 pandemic. Probes to elicit deep responses were predetermined and included in the interview guide.²⁴ Interviews were conducted in Kinyarwanda, audiorecorded, transcribed verbatim and translated to English. Quantitative and qualitative data were collected concurrently.

Key variables

All variables were based on participants' self-reported information. We reported demographic characteristics, including age, level of education, marital status and main occupation, for quantitative and qualitative

study participants. Among demographic variables, we also collected Ubudehe categories for the participants. Ubudehe is a four-rank Rwandan home-grown categorisation of socioeconomic status, where Ubudehe 1 represents the poorest and Ubudehe 4 represents the wealthy.²⁵ We assessed whether CHWs had received any training in the past 12 months prior to COVID-19 (March 2019–March 2020) as well as whether they had received training on specific health-related topics and presented responses by CHW cadre. We assessed whether CHWs had a full kit of supplies normally provided to CHWs. Among Binomes, we assessed supply availability both at the beginning and throughout the lockdown for the following items: injectable contraceptives, oral contraceptives, condoms, reproductive cycle beads, malaria diagnostic test, malaria drugs, mosquito nets, antibiotics, deworming tablets, vitamins, registries, referral forms, timer, measuring tapes, weight-scale and other supplies. Among ASMs, who have a narrower scope of work and narrower range of required supplies, we assessed supply availability of mosquito nets, measuring tapes, weight scale, timer, registries referral forms and other supplies. We also assessed the frequency of supervision visits during a 70-day lockdown and means of supervision. Based on ideal practice of supervising CHWs at least one time per month, we categorised supervision into: no supervision, once, two, three times and more than three times.

DATA ANALYSIS

We described our data using frequencies and percents for categorical variables and medians and IQRs for continuous variable. To assess supply availability for each cadre of CHW types, we created two composite variables: one reflecting whether the CHW reported any stockouts during lockdown and another reflecting the percentage of expected items in stock throughout lockdown. We conducted χ^2 tests to assess the association between the number of supervisions a CHWs received during the lockdown and either (1) reporting any stock outs or (2) having a CHW kit. To assess the association between supervision visits and percentage of supplies in stock, we used linear regression and compared a full model that included dummy variables indicating the five supervision categories to the reduced intercept-only model using an F-statistic.²⁶

Qualitative data analysis combined inductive and deductive coding styles.²⁷ This involved two stages of open, line-by-line inductive coding and theme generation,^{28–30} and a third stage for deductive coding. At the initial stage, two coders fluent in both English and Kinyarwanda undertook parallel coding in English and Kinyarwanda on each interview, and compared the Kinyarwanda and English codes to ensure no data was lost in translation.³¹ Themes were agreed on and included in the first codebook. In the second stage, the first author (AN) and second author (IG) undertook another round of coding on English transcripts and generated a second codebook.

The two codebooks were compared and harmonised in a final master codebook. The final master codebook was used as a coding frame for the deductive coding stage,³² which involved assigning final themes to corresponding content throughout the transcripts. During analysis, trends, meaning and connection among themes in each interview were identified, different quotes were matched to different themes, and constant cross-checks of analysis were undertaken to ensure an interpretation of findings that is congruent with the data and study objectives. MAXQDA software was used to facilitate computer-based coding and analysis of the interviews.

RESULTS

Quantitative findings

Of the 349 CHWs sampled for survey participation, 292 participants consented to the study, reflecting response rates of 81%, 85% and 89% in Burera, Kirehe and Southern Kayonza, respectively. Non-response was merely due to inability to reach CHWs on the phone. Of the survey participants, 126 (43.2%) were from Kirehe district, 112 (38.4%) from Burera and 54 (18.5%) from Southern Kayonza (table 1). ASMs made up 25% of respondents while 75% were Binome. The median number of households a CHW was responsible of was 55 (IQR: 42–79) whereas median number of households a CHW visited in the month prior to the start of the survey (July 2020) was 30 (IQR: 11–52). Of 264 (90.4%) CHWs who received at least one supervision, 34.5% had in-person supervision, 35.4% had phone-based supervision, while 40.1% had a combination of in-person and phone-based supervision.

In the past 12 months, 130 (59.4%) of Binomes and 34 (46.6%) of ASMs reported receiving training on any health topic (table 2). The most common training was on nutrition for both Binomes 100 (45.7%) and ASMs 28 (38.4%). Outbreak preparedness training was received by only 45 (20.5%) of Binomes and 11 (15.1%) of ASMs. Reports of training among ASMs were consistently lower than among Binomes, even for topics that fell within ASM's area of expertise, such as caring for peripartum women (3.7% vs 2.7%), newborn care (4.1% vs 1.4%), newborn vaccination (7.8% vs 4.1%), safe home delivery (1.8% vs 0%) and referral of pregnant women to the health facility for delivery (5.5% vs 2.7%).

At the beginning of lockdown, Binomes reported that supply availability was low, particularly among consumable commodities (table 3). The commodities that were most commonly available for Binome at the beginning of the lockdown were malaria diagnostic tests (70.8%), malaria drugs (61.2%), antibiotics (47.9%), injectable contraceptives (37.9%), oral contraceptives (31.1%) and deworming tablets (24.7%). Throughout the lockdown, substantial stock-outs on all commodity items except malaria diagnostic tests were reported.

During the lockdown, 28 (9.6%) of CHWs reported not receiving any supervision visits throughout the lockdown

Table 1 Demographic characteristics of study participants

Variables	Quantitative survey N=292
District of residence	
Kirehe	126 (43.2%)
Burera	112 (38.4%)
Kayonza	54 (18.5%)
CHW cadre	
ASM	73 (25 %)
Binome	219 (75%)
Sex	
Male	108 (37.0%)
Female	184 (63.0%)
Level of education	
Incomplete primary	26 (8.9%)
Complete primary	173 (59.2%)
Enrolled in or completed secondary	93 (31.9%)
Ubudehe category	
Ubudehe 1	22 (7.6%)
Ubudehe 2	126 (43.3%)
Ubudehe 3	143 (49.1%)
Marital status	
Legally married	257 (88.0%)
Widowed	19 (6.5%)
Cohabiting	9 (3.1%)
Divorced	4 (1.4%)
Single	3 (1.0%)
Main occupation beside being CHW	
Agriculture	272 (93.1%)
Professional job or skilled worker or business	14 (4.8%)
Unemployed	6 (2.1%)
Age, median (IQR)	43.5 (38–50)
Years of being a CHW, median (IQR)	8 (5–12)
Households responsible for, median (IQR)	55 (42–79)
Households visited in July, 2020, median (IQR)	30 (11–52)
Means of supervision during COVID-19 pandemic	
In-person supervision*	91 (34.5%)
Phone-based supervision only	67 (25.4%)
In-person and phone based	106 (40.1%)

*In-person supervision includes planned one-on-one visits, informal or unplanned one-on-one visits by supervisor, and group visits in an in-person setting.

ASM, Agent de Sante Maternelle; CHW, community health worker.

and only 70 (24%) received at least three during the 3-month lockdown (table 4). Although there was no association between supervision and experiencing any stockout ($p=0.63$), CHWs who received more frequent supervision visits were more likely to have a kit of supplies at the time of data collection than those who did not ($p=0.02$). ASM who had frequent supervision visits were

Table 2 Trainings received in the past 12 months by CHW types (N=292)

Trainings received in the past 12 months	Binome N=219 (%)	ASM N=73 (%)
Any training	130 (59.4)	34 (46.6)
Nutrition	100 (45.7)	28 (38.4)
Outbreak preparedness	45 (20.5)	11 (15.1)
Data collection/management	18 (8.2)	0 (0.0)
Vaccination	17 (7.8)	3 (4.1)
Malaria	16 (7.3)	0 (0.0)
Sanitation and home hygiene	13 (5.9)	1 (1.4)
Referring women at health facility for delivery	12 (5.5)	2 (2.7)
Child health	10 (4.57)	0 (0.0)
Newborn care	9 (4.1)	1 (1.4)
Family planning	9 (4.1)	0 (0.0)
Following pregnant and postpartum women	8 (3.7)	2 (2.7)
HIV/AIDS services	6 (2.7)	1 (1.4)
Safe home delivery	4 (1.8)	0 (0.0)

ASM, Agent de Sante Maternelle.

more likely to report greater percentages of supplies in stock throughout the lockdown ($p=0.04$). However, the percentages of supply in stock throughout the lockdown was not associated with supervision frequency among Binomes.

Qualitative findings

Twenty-four CHWs participated in the qualitative interviews and their demographic characteristics were very similar to those of quantitative survey's participants. Emergent themes from the analysis were grouped into two main areas: perceived challenges and perceived needs. Under perceived challenges, two main themes emerged (1) COVID-19- specific challenges and (2) pre-existing and routine care challenges. Perceived needs encompass themes of (1) needs for COVID-19 response activities, (2) needs for care continuum during COVID-19 pandemic and (3) other needs. [Table 5](#) displays themes, subthemes and example quotes for each theme.

Perceived challenges: COVID-19-specific challenges

CHWs reported juggling many responsibilities, with most explaining that their workload has increased enormously as a result of additional responsibilities related to COVID-19 response. They shared that the overwork during the lockdown negatively affected their ability to meet household commitments, affected their livelihood and increased poverty in their households ([table 5](#), subthemes 1, 4).

Although personal protective equipment (PPE) was required for all healthcare providers during the pandemic, when the pandemic hit, CHWs did not

immediately receive facemasks and reported difficulties in accessing PPE. Some CHWs reported providing health services without wearing PPE. Lack of hand sanitisers and improved handwashing stations were also reported. While almost all CHWs reported handwashing with clean water and soap as one of the ways they protect themselves from COVID-19 infection, one CHW revealed that his village shared a well of water with three neighbouring villages and that the lack of nearby clean water challenged the message of frequent handwashing with clean water and soap. In nearly half of interviews (11 of 24), CHWs reported fear of COVID-19 infection when providing services during the lockdown. One CHW reported to have stopped all her health provision activities due to fear and the lockdown. Primarily, fear of COVID-19 was linked with lack of adequate PPE. Additionally, some CHWs highlighted lack of COVID-19 related knowledge, which impeded their ability to take an active role in the COVID-19 response activities ([table 5](#), subthemes 2, 3, 5, 7).

CHWs also mentioned that despite the efforts they made in community sensitisation and mobilisation, some community members engaged in 'discouraging' behaviour. Examples of discouraging behaviour included people who held misinformation around COVID-19, people who denied CHWs' access to their homes due to fear of letting in an outsider, and people who did not adopt the COVID-19 prevention practices taught by CHWs ([table 5](#), subtheme 6).

Perceived challenges: pre-existing and routine care challenges

Many CHWs reported long standing challenges, including challenges that preceded COVID-19 pandemic or those that occurred early in the lockdown but had not been addressed for an extended period of the time. CHWs particularly reported pre-existing poor support from their supervising entities or from the local government, delayed refills of medication and persistent lack of supplies, which were exacerbated by the pandemic and collectively made health service provision during the lockdown difficult ([table 5](#), subtheme 8).

CHWs also reported to having to provide routine care services in difficult conditions. For example, instead of gathering people in one place for care delivery, as would be the norm, they had to go house-to-house. Movement restrictions also made their work quite challenging as more patients opted to seek health services from CHWs since travelling to health facilities was difficult and expensive ([table 5](#), subthemes 9, 13).

Most (22 of 24) CHWs expressed dissatisfaction with the level of support they received from health centres or from the local government during the lockdown. The stockout of medications was among the most recounted challenge to routine services delivery. Due to lack of medications, CHWs had to transfer patients that could usually be treated in the community to the health centres. A few CHWs discussed that they had made requests of

Table 3 Y availability at the beginning and throughout the lockdown by CHW type (N=292)

Types of supplies	Binome N=219		ASM N=73	
	Items in stock at the beginning of lockdown (%)	Items in stock throughout lockdown (%)	Items in stock at the beginning of lockdown (%)	Items in stock throughout lockdown (%)
Contraception				
Injectable contraceptives	83 (37.9)	60 (27.4)	---*	---*
Oral contraceptives	68 (31.1)	38 (17.4)	---*	---*
Condoms	59 (26.9)	36 (16.4)	---*	---*
Reproductive cycle beads	13 (5.9)	12 (5.5)	---*	---*
Malaria treatment and prevention				
Malaria diagnostics test	155 (70.8)	155 (70.8)	---*	---*
Malaria drugs	134 (61.2)	78 (35.6)	---*	---*
Mosquito nets	7 (3.2)	7 (3.2)	1 (1.4)	0 (0.0)
Other medications				
Antibiotics	105 (47.9)	67 (30.6)	---*	---*
Deworming tablets	54 (24.7)	35 (16.1)	---*	---*
Vitamin A	38 (17.4)	36 (16.5)	---*	---*
Equipment				
Registries/notebook	216 (98.6)	201 (92.2)	64 (87.7)	59 (80.8)
Referral forms for Health Center transfer	213 (97.3)	204 (93.1)	71 (97.3)	70 (96)
Timer	204 (93.2)	195 (89.0)	58 (79.4)	54 (74.0)
Measuring tapes	164 (74.9)	152 (69.4)	41 (56.2)	41 (56.2)
Weight-scale	143 (65.3)		57 (78.1)	
Other supplies	57 (26.0)	54 (24.7)	19 (26.0)	12 (16.4)

The distribution of medical commodities is based on CHWs specialty. Binomes receive drugs and medications as they are responsible of treatment and provision of medication. Both CHW cadres receive same equipment they use in health promotion, reporting and referrals.

*ASMs would not be expected to have this supply based on their roles in the community.

ASM, Agent de Sante Maternelle; CHWs, community health workers.

medications at the health centre but were told that medications were not available (table 5, subthemes 10, 13).

CHWs also pointed to the suspension of the monthly CHWs meeting as a major barrier to their routine services. These meetings are portrayed as opportunities for CHWs to train and support each other on issues they face in their health delivery duties, as well as a platform for sharing their needs and challenges with supervisors and receive refresher training and support. Training during the monthly CHW meetings was perceived as the most valuable benefit of being a CHW and not having those meetings was perceived as a lost opportunity for CHWs (table 5, subtheme 11).

Perceived needs: COVID-19 activities

All interviewed CHWs reported being willing to participate in COVID-19 activities; however, they wanted their personal safety to be guaranteed and PPE to be provided. CHWs expressed that in order to be on the front-line safely, they needed supplies and equipment such as infrared thermometer, hand sanitisers, protecting coveralls, aprons and gloves. When asked how they perceived

their role in supported home-based care of COVID-19 patients, most CHWs reported that they need training to increase their knowledge on COVID-19 as well as on how to care for and treat a COVID-19 patient (table 5, subthemes 14–16)

Perceived needs: continuum of health service delivery during the pandemic

Most CHWs described a need for supplies for routine services including medications, registers or smartphones. A need for training to upgrade knowledge on key services they provide was echoed by many. They believe that their communities have evolving needs, thus consistent trainings should be provided to fill their knowledge gaps. To this end, a few CHWs also reported that they need teaching aids or training manuals to refer to when providing health services or delivering education campaigns in the community (table 5, subthemes 17, 18)

CHWs also cited a need for a dedicated office. CHWs normally provide services in patients' home or in their own homes. However, during COVID-19 pandemic, CHWs reported difficulties in adhering to social distancing

Table 4 Association of supervision frequency during lockdown and supply availability during lockdown (N=292)

	Supervision frequency during lockdown					P value*
	Never 28 (9.59%)	Once 22 (7.53%)	Twice 54 (18.49%)	Three times 118 (40.41%)	≥3 times 70 (23.97%)	
Any stockouts throughout lockdown						0.63
Yes	17 (60.7%)	10 (45.5%)	33 (61.1%)	73 (61.9%)	45 (64.3%)	
No	11 (39.3%)	12 (54.5%)	21 (38.9%)	45 (38.1%)	25 (35.7%)	
Has CHW kit						0.023
Yes	12 (42.8%)	14 (63.6%)	34 (63.0%)	64 (54.2%)	52 (74.3%)	
No	16 (57.1%)	8 (36.4%)	20 (37.0%)	54 (45.8%)	18 (25.7%)	
Percentage of supplies in stock throughout lockdown						
ASM (N=73)	33.3	42.9	52.4	43.7	54.5	0.04
Binome (N=219)	34.1	33.7	38.3	35.1	36.4	0.56

* χ^2 tests were used for categorical outcomes. For the percentage of supplies in stock outcomes, an F-test was used to compare an intercept-only model to a model with five supervision categories.²⁶

ASM, Agent de Sante Maternelle; CHW, community health worker.

measures due to an increased number of people seeking services from them at home, given a small space in their living rooms (table 5, subtheme 19)

Perceived needs: other needs

CHWs also voiced other indirect needs that affect their daily duties of delivering community health services, including transportation to facilities (bicycles), electricity and equipment for rainy season (table 5, subthemes 20, 21). Although CHWs in this cohort acknowledge their role as volunteers, a need for financial remuneration was the most repeated need for them to continue delivering routine services during the pandemic. CHWs reported that health provision duties were taking up most of their time and compromising their household commitments and livelihoods. A few CHWs who reported receiving some form of incentives complained that payment was delayed and is not provided regularly ((table 5, subtheme 22)

DISCUSSION

In this mixed-methods study, the quantitative results underscore a low level of support in terms of training, supplies, and supervision during the COVID-19 lockdown. Our qualitative results corroborate these quantitative findings and additionally highlight needs for PPE, COVID-19 related training, and financial incentives.

Our findings show that many of challenges faced during the lockdown predated the COVID-19 pandemic and either persisted or were exacerbated during the pandemic. In the past 12 months, 44% of CHWs in our sample reported to have not received any training at all, and only 19.2% of CHWs reported to have attended a training on outbreak responses and preparedness. Similarly, lack of COVID-19 knowledge and a great need for

training on COVID-19 and on other essential services have been substantiated by CHWs in the qualitative interviews. Lack of Insufficiently trained CHWs have been previously reported to underperform when providing care.³³ We also noted a substantial shortage in supplies and resources available for CHWs at the start of the COVID-19 lockdown. Similar shortages have been previously reported in Rwanda¹⁵ and point to existing gaps in the community healthcare system, the impact of which was magnified by the huge response needs due to COVID-19. Since CHW programme is one of the systems of decentralising healthcare delivery, strengthening its resilience should be prioritised to promote national outbreak preparedness in Rwanda.³⁴

Additional COVID-19-specific challenges also emerged. Although CHWs were onboarded in the response activities early in the lockdown, they felt they lacked knowledge on COVID-19 and on delivering health services during a health emergency. These finding aligns with previous reports that hospital healthcare workers deployed to the COVID-19 front line reported the lack of training and inadequate skills in Libya.³⁵ Most CHWs described a need for personal protection for them to be effective in responding to COVID-19 and continuing routine community-based service delivery. Inadequate PPE, hand sanitisers and adequate handwashing facilities came up frequently during the interviews. Shortage of PPE among front-line healthcare workers has also been reported in other low-income and middle-income countries (LMICs),^{36–38} and was associated with job dissatisfaction among healthcare workers.³⁹ Furthermore, the CHWs in our study expressed that the normal practice of providing services at the CHWs home was stressful because it placed their households at risk.

Table 5 Emerging themes and subthemes around CHWs' perceived challenges of service delivery during COVID-19 lockdown and perceived needs for them to be effective in COVID-19 response

Themes	Subthemes	Example quotes
Perceived challenges		
COVID-19 specific	1. Increased workload	'My workload increased because before COVID-19, our duty consisted of accompanying expectant mothers to the health center for safe delivery and we would use the remaining time doing our [house] work. However, when COVID-19 broke out and when the stay-at-home measures were taken, our workload increased because we were obliged to work every day.' ASM23
	2. Lack of PPEs	'The challenges were related to the lack of adequate materials for our self-protection. It was not easy' MB18
	3. Fear of COVID-19	'At some point in that time, we weren't given face masks yet... You would still provide the health care service to the patient, but you could do it fearfully, thinking like, 'What if the patient gives me the coronavirus or what if I give the virus to the patient?' FB10
	4. Increased poverty	'Now with additional task of following COVID-19 patients, there must be constant follow up for them in their homes to ensure that they don't infect other family members. So as a CHW, you are in charge of closely monitoring this so that new infections don't occur, and it is certain that our other activities we do to earn living were affected which results into poverty.' MB17
	5. Lack of COVID-19 knowledge	'Oh! It was difficult because one was worried about the lack of knowledge. It was planned for a person to volunteer to go and teach (COVID-19 mobilization campaigns). It was really hard.' MB06
	6. Discouraging behaviours	'It would take me 20 minutes to teach them how COVID-19 is contaminated and how it can be prevented but they would not be totally convinced by what I had told them. That was a challenge.' ASM02
	7. Inadequate supplies and equipment	'We do not have adequate handwashing tools. We used a jerry can, attach a rope on it and pull it down using the foot, which is inadequate' MB21
Pre-existing and routine care challenges	8. Pre-existing challenges	'We had not received medicines since before March, we got them in June' MB22 'The Ministry of Health has not made any effort to support family planning, because we are asked to take prevention measures while we don't have prevention kits like hand sanitizer; we do not get it in family planning kits. They do not give us clean water which is appropriate. We got training one time in 2017. Therefore, we do not have enough family planning training though it is a very important domain.' FB16 'Since the outbreak of COVID-19, we have not received any assistance; we haven't received anything from the health center.' ASM10
	9. Poor work conditions	'Providing health services was not easy, as we could not bring everyone together for a meeting, which required us to go and care for people door to door.' FB03
	10. Inadequate support during COVID-19 response	'Since the village leadership is the closest authority, we have been working with them but there are some things they do not care about, and they even want us to be the only ones responsible for them... sometimes they do not recognize our job' MB12
	11. No CHWs meeting	'When it comes to monthly meetings that we used to have and learn from each other, we weren't able to have the meeting. If you forgot something and you wanted someone else to remind you about it, you would use phone calls. But, sometimes you would call and you had low network or the other person's phone was unreachable' FB10
	12. Stockout of medication	'As for medications, we were told that they are not available in the pharmacy. We do not have enough medications. We are given only two doses for malaria and two for diarrhea. These medications are not enough, given that a village can have up to 500 people.' FB01
	13. Movement restriction	'The challenge was that people were not free to move from one place to another as they used to do and that it was not easy to get to the hospital We were obliged to walk there because we couldn't afford the fare.' MB22
Perceived needs		
To support COVID-19 response	14. Prevention supplies and equipment	'We do not have adequate handwashing tools. We used a jerry can, attach a rope on it and pull it down using the foot, which is inadequate.... If we have a handwashing tool and hand sanitizers, we will be able to do our job effectively and safely.' MB21
	15. PPE	'I need special clothing such as face masks and gloves to use them to protect myself from getting infected.' FB03
	16. COVID-19 training	'I can reiterate that trainings are the first support. So far, we, community health workers, haven't ever had trainings on COVID-19. That is something we critically need.' MB18

Continued

Table 5 Continued

Themes	Subthemes	Example quotes
To provide routine care during COVID-19 pandemic	17. Supplies	'We receive many patients at home.... You can see that the space of work at home and the number of clients that a CHW receives at home do not match. So, the support that you can give us so that our services can continue to be provided and at the same time by avoiding contracting COVID-19, we would appreciate if we would be given tables and chairs; this equipment would help the CHW to sit clients that come to see her/him and that would not disturb other family members. If the CHW has specific equipment and materials designed for receiving clients, that would be helpful for us, because more often you find that I am receiving 5 or 6 people at the same time at home, and I don't have a space where to sit them.' MB13
	18. Trainings	'You see..... that teaching is not a one-time thing, trainings are also a necessity for us to continue doing our job well.' ASM20
	19. Office	'We receive many patients at home, but we don't have enough protecting equipment. For that reason, you can see that the space of work at home and the number of clients that a CHW receives at home do not match. We need a space for work so as to avoid contracting COVID-19, which would help the CHW not disturb other family members.' BM13
Other needs	20. Financial Incentives	'There are times that CHW finds himself as the most poor person in the village because of much time spent in the health-related activities, ...if there were some kind of incentive for the CHW in the activities, we could work more happily and much better.' ASM20 'My need is incentive for this additional task(COVI-19 response)for combining them with other duties. I need more motivation to help me' MB11

CHW and the number after the abbreviations represents participants number

ASM., Agent de Sante Maternelle; CHWs, community health workers; FB, female Binome; MB, male Binome; PPE, personal protective equipment.

CHWs in our study also described challenges in adapting their existing roles to COVID-19 demands. CHWs reported a low level of supervision frequency during the lockdown, and qualitative interviews substantiated the effect of lockdown on straining supportive structures through the suspension of monthly CHWs meetings. A lack of supportive systems, supervision and peer-to-peer support have been previously noted as significant barriers to effective service delivery in previous health crises.^{40–43}

They also reported a tremendous increase in their workload during COVID-19 lockdown due to being recruited into community-based outbreak activities and to a rise in a number of community members who sought healthcare from a CHW. Similar experiences have been reported among CHWs who served during Ebola outbreaks in Guinea, Liberia and Sierra Leone.⁴³ Facility-based healthcare providers at the COVID-19 front line have faced long working hours and suffered burnout due to persistent stress and lack of time for recovery.^{44–46} Our qualitative findings depict COVID-19 as placing similar stress on CHWs while providing routine health services.

Unlike most other healthcare workers, CHWs in Rwanda work as volunteers and do not routinely receive financial compensation. In our interviews, CHWs perceived financial incentives as an important enabler for quality service delivery during COVID-19 pandemic. The additional demands on the time of CHWs during the pandemic cost them opportunities to engage in their personal income-generating activities and poverty was reported as a result. It is also plausible that not being compensated may have demotivated some CHWs or precluded some to fully commit to their responsibilities as they had to search for ways to support their households. Financial difficulties have previously been associated with burnout among nursing staff.⁴⁷ Maintaining motivation of front-line primary care providers through incentives has previously been recommended.⁴⁸ Providing CHWs with financial compensation may be an important way to promote well-being and prevent burn-out, particularly during periods of elevated workload, such as the COVID-19 pandemic.

A number of practical policies could be implemented to alleviate these challenges for the current COVID-19 crisis and to prepare for future crises. First, CHWs must be given access to adequate PPE. Updated national and international guidance for the continuity of essential community health services during COVID-19 advises a basic package of PPE required to protect CHWs, including medical masks, disposable gloves, reusable gowns and disposable bags.^{49 50} In order for these materials to be available for CHWs, CHWs must be included in COVID-19 PPE quantification estimates. Second, financial compensation for volunteers such as CHWs should be considered. Even if Rwanda's CHW programme remains staffed primarily by volunteers, it may be necessary to remunerate these volunteers for supplemental hours spent supporting the COVID-19 response.⁵¹ Third, increased investment should be placed in continued training and supervision of CHWs and effective supply chain management. These



actions would improve the day-to-day operations of the CHW programme and also support national preparedness to respond to future outbreaks or other emergencies.⁵²

Our findings had several of limitations. First, although nearly all Rwandan CHW have access to cellphones by virtue of their position in the CHW programme, network coverage is not perfect and our phone-based data collection methods may have missed CHWs living in more remote areas, whose needs and challenges may be specific to their location. Second, although our quantitative tools were based on pre-existing surveys conducted among facility-based healthcare workers in Rwanda, we made several adaptations to the questions to make them applicable to CHWs during the COVID-19 pandemic, and these adaptations were not piloted prior to implementing the survey. In particular, these tools may not have adequately captured commodities used by ASMs. Third, recall bias in this study is likely since data were collected 4 months after the lockdown period. Fourth, data was collected from CHWs who serve in three districts supported by PIH/IMB through training, financing CHWs' income generating cooperatives or by advocating for an additional CHW in-charge of health promotion. Their perceived and real needs may be an underestimate of the true needs of CHWs in the other 27 districts who do not receive this supplemental support. Lastly, we used convergent parallel mixed methods to collect and analyse data¹⁹; thus, we were not able to include additional questions on the qualitative interview guide to substantiate in more details the quantitative findings on supervision and types of supplies out of stock in the qualitative portion, which would have been the case if we had conducted sequential designs.

CONCLUSION

This study highlights that insufficiency of trainings, inconsistent availability of supplies and commodities, reduced supervision and increased workload challenged CHWs during COVID-19 pandemic. Many of these pre-existing gaps in the community health system were magnified by COVID-19 pandemic. To promote the resilience of Rwanda's CHW system to respond to the current and future crisis, we recommend increasing access to PPE; investment in training and supervision of CHWs; improvements in supply chain management; and financial compensation for CHWs supporting the COVID-19 response. These results hold significance to other LMIC setting where the CHW system has been established in the healthcare systems. Further research should be undertaken to outline the support systems of CHWs network in LMIC settings and to understand needs and challenges of CHWs in regions with nascent CHW programmes.

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