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Original Article

Five-year retention of volunteer community health workers in rural Uganda: a population-based retrospective cohort

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Abstract

Community health workers (CHWs) effectively improve maternal, newborn and child health (MNCH) outcomes in low-to-middle-income countries. However, CHW retention remains a challenge. This retrospective registry analysis evaluated medium-term retention of volunteer CHWs in two rural Ugandan districts, trained during a district-wide MNCH initiative. From 2012 to 2014, the Healthy Child Uganda partnership facilitated district-led CHW programme scale-up. CHW retention was tracked prospectively from the start of the intervention up to 2 years. Additional follow-up occurred at 5 years to confirm retention status. Database analysis assessed CHW demographic characteristics, retention rates and exit reasons 5 years post-intervention. A multivariable logistic regression model examined 5-year retention-associated characteristics. Of the original cohort of 2317 CHWs, 70% were female. The mean age was 38.8 years (standard deviation, SD: 10.0). Sixty months (5 years) after the start of the intervention, 84% of CHWs remained active. Of those exiting ($n = 377$), 63% reported a 'logistical' reason, such as relocation ($n = 96$), new job ($n = 51$) or death ($n = 30$). Sex [male, female; odds ratio (OR) = 1.53; 95% confidence interval (CI): 1 · 20–1 · 96] and age group (<25 years, 30–59; OR = 0.40; 95% CI: 0.25–0.62) were significantly associated with 5-year retention in multivariable modelling. Education completion (secondary school, primary) was not significantly associated with retention in adjusted analyses. CHWs in this relatively large cohort, trained and supervised within a national CHW programme and district-wide MNCH initiative, were retained over the medium term. Importantly, high 5-year retention in this intervention counters findings from other studies suggesting low retention in government-led and volunteer CHW programmes. Encouragingly, findings from our study suggest that retention was high, not significantly associated with timing of external partner support and largely not attributed to the CHW role i.e. workload and programme factors. Our study showcases the potential for sustainable volunteer CHW programming at scale and can inform planners and policymakers considering programme design, including selection and replacement planning for CHW networks.

Keywords: Community health worker, retention, motivation, volunteer, Uganda, health promotion, health workforce

Introduction

Improving maternal, newborn and child health (MNCH) and survival is a global priority (World Health Organization, 2015). In Uganda and other low-to-middle-income countries (LMICs), integrating community health worker (CHW) programmes into government health systems has become a cornerstone of health policy and practice and a critical strategy towards meeting sustainable development goals (Ballard and Montgomery, 2017; Agarwal *et al.*, 2019). The CHW role in reducing morbidity and mortality is essential, particularly in communities facing resource and health provider shortages (World Health Organization, 2015; Lassi *et al.*, 2016).

Evidence of CHW effectiveness in improving health outcomes has increased global CHW programme scale-up (Ballard and Montgomery, 2017). CHWs can be an integral part of health systems, particularly within MNCH programmes where they extend health promotion and referral support to vulnerable and remote populations (Christopher *et al.*, 2011). Interest in national CHW programme scale-up is widespread, including in Uganda, where the Ministry of Health initiated the Village Health Team (VHT) Strategy

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Key messages

- In a rural Ugandan setting, high 5-year retention was observed among volunteer community health workers (CHWs) in a government-led program.
- Our study showcases the potential for sustainable volunteer CHW programming at scale and can inform planners and policymakers considering programme design, including selection and replacement planning for CHW networks.

in 2001 (World Health Organization, 2017). However, in Uganda and globally, CHW programme scale-up is challenged by programme implementation barriers, including the potential for high CHW retention in volunteers as previously reported (Republic of Uganda, 2015; Uganda Ministry of Health, 2020; de Vries and Pool, 2017). Retention has implications for programme effectiveness and sustainability with the potential to undermine costly investments.

Studies have reported that higher CHW attrition is associated with volunteering (Agarwal *et al.*, 2019; Ngugi *et al.*, 2018), suggesting that financial incentives are important for motivation (Pallas *et al.*, 2013). Other literature reports associations between attrition and education; CHWs with higher education may seek other economic opportunities (Abbey *et al.*, 2014; Haines *et al.*, 2007). Commonly, government-run CHW programmes have reported higher attrition compared with non-government initiatives (Abbey *et al.*, 2014). Some notable gaps in the CHW retention literature exist for scale-up in Africa; most published CHW retention studies are from Asia, and studies from sub-national or larger scale-up programmes are limited (de Vries and Pool, 2017).

Based on our experience, 'Healthy Child Uganda' (the partnership between the authors' institutes) previously reported very high (>85%) medium-term (5-year) volunteer CHW retention from a small rural Ugandan pilot study ($n = 404$) nearly a decade ago (Ludwick *et al.*, 2014). However, replicating high volunteer CHW retention at scale is debated, especially with other authors reporting attrition in groups with similar characteristics as high as 50% over the medium term (de Vries and Pool, 2017; Nkonki *et al.*, 2011).

To assess medium-term CHW retention, we conducted a population-based retrospective analysis of an operational database designed a priori to assess retention rates, based on CHW characteristics, following a comprehensive MNCH programme's district-wide scale-up involving volunteer CHWs in rural Uganda. This study aimed to assess CHW retention rates at 5 years post-training and examine demographic characteristics associated with retention and reasons for exiting, comparing retained CHWs vs those who exited.

Materials and methods

Study design

We conducted a retrospective operational review of an existing population-based database comprising all CHWs in two districts (Bushenyi and Rubirizi) in rural southwest Uganda, prospectively designed to track CHW characteristics, retention rates and characteristics associated with retention during and following an MNCH project intervention.

Setting

The Ugandan health system consists of two levels of administration—the national (central government) level and the district level (local government) (World Health Organization, 2017). Below the district level, health subdistricts are responsible for primary healthcare services, including the coordination, delivery and monitoring of health services for the local population at health centres and through CHWs (World Health Organization, 2017). In Uganda, CHWs provide health facility outreach at the village and household levels to support health promotion activities and facilitate referrals to the health facility (World Health Organization, 2017). Bushenyi district (projected population 250 400 in 2021) includes 563 villages clustered into 64 parishes, and Rubirizi district (projected population 146 600 in 2021) consists of 294 villages and 53 parishes (Uganda Bureau of Statistics, 2016). In both districts, most (80%) families are rural, mainly subsistence farmers with limited access to essential health services (Uganda Bureau of Statistics, 2016). Moreover, the terrain is hilly, tarmac roads are few, and many families must walk long distances to access primary healthcare services.

CHW intervention

In 2012, MNCH promotion-focused volunteer CHWs were recruited, trained and supervised from all villages in Bushenyi and Rubirizi districts. Operationalizing CHW networks (i.e. Village Health Team National Strategy) was one component of a comprehensive MNCH initiative locally known as 'MamaToto' (Swahili for mother-baby), implemented by District Health Teams in collaboration with 'Healthy Child Uganda'. As a government-embedded package, the CHW component was designed for sustainability, where CHWs were expected to continue in their roles beyond the externally funded 'MamaToto' intervention period.

Between July 2012 and August 2014, the 'MamaToto' package was implemented, first in Bushenyi District (2012–13) and then in Rubirizi district (2013–14). Selected and trained CHWs within the 'MamaToto' cohort were followed prospectively for 2 years until project end (September 2014). The 'active status' of the CHWs was then assessed again at 5 years post-intervention (2017–18).

Selection

In 2012, initial sensitization meetings in each parish involved orientating community members and local leaders to the national CHW programme and describing expected CHW roles and conditions. Participants selected CHWs in each village according to government CHW recruitment guidelines and each community's process and criteria. Community-informed selection criteria included characteristics such as being a parent, active community involvement, demonstrating voluntary spirit and being a trusted and respected community member.

Training and supervision

Selected CHWs attended a 5-day initial training workshop conducted by government health facility-based trainers, using a participatory training approach to emphasize core skills and knowledge related to MNCH promotion, leadership, communication and role-specific expectations. CHWs within

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each parish were organized into parish teams who were, in turn, assigned to a designated health facility-based supervisor who supported the team during quarterly meetings. One 2-day refresher workshop occurred in the second year of intervention.

Incentives

CHWs did not receive monetary remuneration for their role. Financial and non-financial incentives included:

(1) Financial: Daily transport reimbursement to attend initial (5-day) and refresher (2-day) workshop (~$1.00USD/day);
(2) Logistical: Lunch on each workshop day;
(3) Material: One t-shirt, pen, folder and training manual;
(4) Recognition: Certificates upon completion of each workshop.

Within their first year together, almost all CHW teams self-initiated some form of income-generating activity. While such initiatives were not directly supported by the intervention, self-dependency, problem-solving and teamwork were reinforced and practised during training, and group-driven initiatives were encouraged as sustainability strategies. CHW team income-generating activities included saving and loan groups by most groups and small businesses by some groups (e.g. catering, animal husbandry and handicrafts).

Role

CHWs supported health promotion within their communities, especially related to MNCH. Specific tasks included home visits, health talks, mobilizing peers for health outreach, reporting, and assessing/referring ill patients to nearby health facilities. CHW did not provide medications or supplies unless they were part of a small percentage of CHWs supporting integrated community case management programming (Year 4–5 post-training, initiated by the district and partners outside of 'Healthy Child Uganda' programming).

Additional details of the 'MamaToto' intervention, CHW programming and CHW training package are available online: http://www.healthychilduganda.org/resources/.

Participants

Study participants were all CHWs who completed an initial 'MamaToto' training workshop in target districts in 2012 or 2013. CHW demographics were collected upon initial workshop completion, and CHW retention was reported prospectively for 2 years (after which the funded and partner-supported intervention ended). Retention was evaluated at 5 years post-intervention by follow-up of CHWs and CHW Supervisors by project staff.

Variables

The primary study outcome was retention. Analyses were done for retention at 5 years for the initial CHW cohort. The CHW 'Start date' was defined as the last day of initial 'MamaToto' training. 'Exit date' was estimated according to when their supervisor deemed a CHW to have 'exited' and required replacement. In cases where no formal 'exit date' was prospectively recorded, the exit date corresponded to the CHW replacement date. If no replacement date was available, we used the date of the last formal activity attended. 'Time to exit' for those who left by 5 years (60 months) was calculated in days between 'start date' and 'exit date'. All initial CHWs had the potential for 60-month participation (i.e. 5 years) and thus contributed to the denominator for 60-month retention proportion calculations.

An 'exit reason' was recorded based on CHW self-report or via the peer/supervisor. During data cleaning (starting at 2 years), categories were created. 'Exit reason' responses were clustered into categories according to the most common reasons provided. From then onward, database entries were either recorded as one of the categories noted or 'other' with details specified. Categories included 'logistical' reasons, which were not directly related to the CHW role (i.e. death, moves, new job/workload change, poor personal health, family duties/family health, divorce/separation and further study) or 'non-logistical' where a potential direct link to the CHW role was considered more likely (i.e. too busy, too much work/difficult, no longer interested, community rejection, peer/supervisor rejection and spouse opposed).

CHW database (data sources/measurement)

All CHWs were prospectively registered in an operational Microsoft Excel database during the intervention, recording characteristics and retention details. Demographic data, including date of birth, sex, highest formal education completed and village location, were collected during initial training workshop registration and transcribed into the database by a trained records clerk upon workshop completion. Quarterly, CHW supervisors reported details of any retention, including exit date and reason. At 24 and 60 months, a researcher visited CHW teams to confirm their status and clarify any missing/conflicting data. Database cleaning verified outlier values, duplicates, and identified missing data through phone calls, report reviews and field visits.

Statistical analysis

The analysis used STATA® version 13 (StataCorp LP., 2013; College Station, TX, USA). Descriptive statistics [means, SD, median, interquartile range, frequencies and percentages] summarized the sample and described retention variables. Multivariable logistic regression was used to assess the characteristics that were associated with retention.

Quantitative variables

As part of checking linearity assumptions with age with the log of odds, age was binned in 5-year increments/group and plotted against the observed log of odds. These showed non-linear behaviour and suggested the age (in years) categorizations used in the logistic regression, which are <25, 25–29, 30–59 and >60.

Multivariable logistic regression examined associations of factors with CHW retention using Hosmer and Lemeshow's purposeful selection of variables (Bursac *et al.*, 2008). The most complex model was fitted based on a priori literature and experience-based selection of variables and plausible interaction terms were included. Interaction terms were tested and removed if not significant, coefficients were checked for changes greater than 10% when removing non-significant variables, and a final reduced model was compared with the fuller model with use of the

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Table 1. CHW demographic characteristics according to retention status after 5 years in Bushenyi and Rubirizi, Uganda

		Bushenyi ($n = 1669$)		Rubirizi ($n = 648$)	
	Full sample ($N = 2317$)	Exited	Retained	Exited	Retained
Characteristic	*n* (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)
Age, years					
Mean (SD)	38.8 (10.0)	37.4 (11.7)	38.2 (9.3)	40.8 (12.3)	40.5 (9.9)
Age					
<25 years	115 (5.0)	24 (9.7)	67 (4.7)	6 (4.7)	18 (3.5)
25–29 years	322 (13.9)	53 (21.4)	200 (14.1)	19 (14.7)	50 (9.6)
30–59 years	1783 (77.0)	149 (60.1)	1117 (78.6)	88 (62.2)	429 (82.7)
60 years or older	82 (3.5)	14 (5.7)	35 (2.5)	11 (8.5)	22 (4.2)
Missing	15 (0.7)	8 (3.2)	2 (0.1)	5 (3.9)	0 (0.0)
Sex					
Male	694 (30.0)	78 (31.8)	333 (23.4)	72 (55.8)	211 (40.7)
Female	1623 (70.1)	170 (68.6)	1088 (76.6)	57 (44.2)	308 (59.3)
Highest completed education level					
<Primary (1–7)	385 (16.6)	41 (16.7)	194 (13.7)	37 (29.1)	113 (21.8)
Primary 7–Secondary 4 (ordinary level, Senior 1–4)	1472 (63.5)	139 (56.5)	925 (65.2)	75 (59.1)	333 (64.2)
≥Secondary 4 (advanced level, Senior 5–6)	453 (19.6)	66 (26.83)	299 (21.1)	15 (11.8)	73 (14.1)
Unknown	7 (0.3)	2 (0.8)	3 (0.2)	2 (1.6)	0 (0.0)
Community type					
Mixed (peri-urban)	210 (9.1)	31 (12.5)	138 (9.7)	4 (3.1)	37 (7.1)
Rural	1774 (76.6)	182 (73.4)	1067 (75.1)	113 (87.6)	412 (79.4)
Urban	333 (14.4)	35 (14.1)	216 (15.2)	12 (9.3)	70 (13.5)

likelihood ratio test for assessing removal of variables. The final adjusted model retained variables with a *P*-value of <0.05 and any potential confounder as per the 10% change criteria. Potential independent confounders included in the multivariable model were: sex (male or female), enrolment age (<25 years, 25–29 years, 30–59 years or >60 years), education (secondary school completion vs. non-completion), community type (rural or urban/mixed), and the interaction between community type with district (Bushenyi or Rubirizi).

Apart from the logistic regression, as an exploratory exercise, the Kaplan–Meier method (Kaplan and Meier, 1958) was used to graphically explore the exiting patterns from start date. Where CHWs did not experience an event (exiting the programme) or for which follow-up was lost, we could not observe if the event happened within the 5 years as the initial training dates were right censored (exit status is greater than or equal to the last available follow-up status).

Results

CHW characteristics and district coverage

Table 1 summarizes initial CHW cohort demographic characteristics ($n = 2317$). Most CHWs were female (70%) and had completed primary education or higher (83%). Mean CHW age was 38.8 years (SD: 10.0). CHWs represented all community types, including 77% rural, 14% urban and 9% mixed.

Five years (60 months) after the programme started, all Bushenyi and Rubirizi district parishes and villages had at least one CHW. At 60 months, villages had between one and seven currently active CHWs [mean = 2.70 CHW per village (SD: 1.15)]. The few villages ($n = 3$) reporting only one CHW stated they were either not replacing 'exited' CHW (due to small community size) or were actively seeking replacement(s). On average, each CHW parish team had 19.80 CHW (SD: 12.45 CHW).

Retention

After 5 years, 84% ($n = 1940$) of CHWs remained active in their role; 377 CHW had exited. Figure 1 displays retention rates for the full sample of CHW (both districts). The probability of retention at 5 years was 86.01% (95% CI: 84.24–87.57) based on a Kaplan–Meier estimate taking into account censoring (Kaplan and Meier, 1958) (Figure 2).

When considering only one variable at a time in unadjusted chi-square tests, we found significant associations comparing 'exited' vs retained CHWs across each age groups ($P < 0.001$), sex ($P < 0.001$) and education ($P = 0.013$) separately. A higher proportion of CHWs aged 30–59 years was retained (87%) than other age groups. More males 'exited' (22%) compared with females (14%). A higher proportion of 'exited' CHWs had completed Secondary School Advanced Level (senior level 5–6) or higher (18%), compared with Primary (levels 1–7) and Secondary School Ordinary Level (senior levels 1–4) finishers (15%). 'Exited CHW' distribution was similar across community types (rural or urban/mixed).

Table 2 shows reasons reported for exiting the CHW programme before 5 years. 'Exit reasons' were mainly deemed unrelated to the CHW role i.e. 'logistical' (63%), including relocation ($n = 107$), new job ($n = 42$), health problems ($n = 15$), divorce/separation ($n = 26$) and death ($n = 29$). 'Non-logistical' exit cases which we determined might be role-related occurred in 34% of those exiting for reasons which included 'too much work/too difficult' or 'too busy' ($n = 55$), 'community/peer/supervisor rejection' ($n = 14$), 'loss of interest' ($n = 41$) and 'spousal opposition' ($n = 7$).

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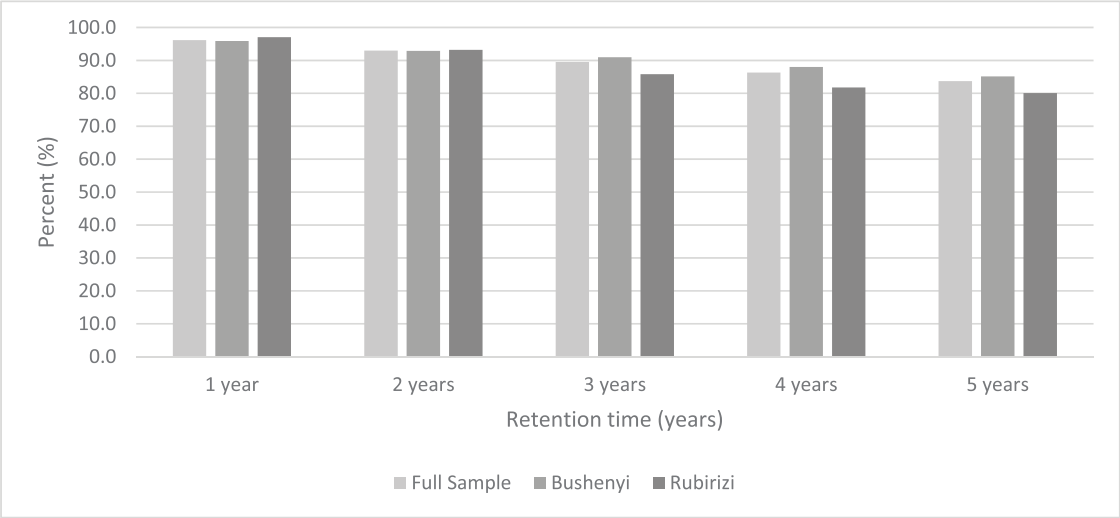

Figure 1. CHW retention at 1, 2, 3, 4 and 5 years in Bushenyi and Rubirizi districts, Uganda

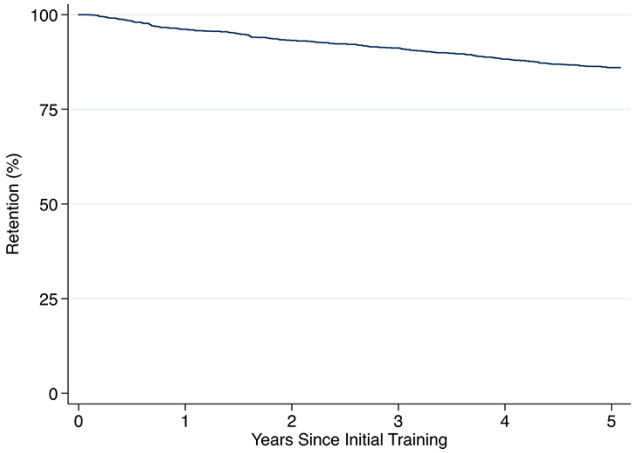

Figure 2. The Kaplan–Meier estimated 5-year retention of CHW from the start of their initial training date to 5 years in Bushenyi and Rubirizi, Uganda

Table 2. Reported CHW 'exit reason'

Reason for exit, *n* (%)	CHW (all) (*N* = 377)	Male (*n* = 150)	Female (*n* = 227)
Logistical reason (i.e. role unrelated)			
Death	29 (7.7)	18 (12.0)	11 (4.9)
Divorce/Separation	26 (6.9)	2 (1.3)	24 (10.6)
Family duties/Family health	8 (2.1)	3 (1.3)	6 (2.6)
Move—Family/School/Other	107 (28.7)	36 (24.0)	71 (27.8)
New job/Workload change	42 (11.1)	16 (10.7)	26 (11.5)
Poor personal health	15 (4.0)	6 (4.0)	9 (4.0)
Retired	9 (2.4)	5 (3.3)	4 (1.8)
Total logistical	236 (62.6)	85 (56.7)	151 (66.5)
Non-logistical reasons (i.e. role-related)			
Community rejection	14 (3.71)	6 (4.0)	8 (3.5)
No longer interested	41 (10.9)	20 (13.3)	21 (9.3)
Peer/Supervisor rejection	10 (2.7)	9 (6.0)	1 (0.4)
Spouse opposed	7 (1.9)	1 (0.7)	6 (2.6)
Too busy—personal	40 (10.6)	19 (12.7)	21 (9.3)
Too much work/Too difficult	15 (4.0)	4 (2.7)	11 (4.9)
Total non-logistical	127 (33.7)	59 (39.3)	68 (30.0)
Other/Unknown	14 (3.7)	6 (4.0)	8 (3.5)

Retention-associated factors

From our analysis (Table 3), everything else being held constant, males were more likely to exit before 5 years (OR = 1.53, 95% CI: 1.20–1.96, $P = 0.001$), compared with females. Compared with CHWs <25 years old, 30–59 years old were less likely to exit (OR = 0.40; 95% CI: 0.25–0.62). Education was not found to be significantly associated with odds of exiting. We also found an interaction between district location (Rubirizi vs Bushenyi) and community type (rural or urban); CHWs living in rural areas in Rubirizi were more likely to exit (OR: 1.52; 95% CI: 1.15–2.00), compared with CHWs in rural areas of Bushenyi.

Discussion

Key findings

In LMICs, CHWs play a critical role in community MNCH promotion, providing a means to narrowing health equality gaps. Across two rural districts in Southwestern Uganda, the probability of being retained to 5 years post initial training was 86.01% (95% CI: 84.24–87.57), including during 3 years when the CHW programme was fully government-run with no active support by external development partners. Our study findings suggest that at scale, and in a relatively large cohort, high CHW retention over the medium term can be attained within a volunteer district-led network. Importantly, retention, which did occur, followed a slow and linear decline, without a change in a pattern when external support for the initiative ended. The analysis revealed fewer than expected significant retention predictors based on the current evidence, and those CHWs who exited primarily did so for 'logistical' (non-role-related) reasons. Our study showcases the potential for sustainable volunteer CHW programming at scale and can inform planners considering programme design,

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Table 3. CHW characteristics and 5-year retention: Adjusted logistic regression

Independent variable	Multivariable analysis	
	OR (95% CI)	*P*-value
District (Rubirizi vs Bushenyi) within urban/mixed (peri-urban)	0.76 (0.41, 1.39)	0.368
District (Rubirizi vs Bushenyi) in rural	1.52 (1.15, 2.00)	0.003
Classification (rural vs urban/mixed) in Bushenyi	0.90 (0.66, 1.24)	0.531
Classification (rural vs urban/mixed) in Rubirizi	1.817 (1.007, 3.279)	0.047
Age (reference: <25 years old)		
25–29 years	0.803 (0.488, 1.319)	0.386
30–59 years	0.395 (0.253, 0.615)	<0.001
60 years or older	0.955 (0.499, 1.823)	0.888
Sex (male vs female)	1.532 (1.20, 1.963)	0.001

Significant levels used was $\propto = 0.05$; Mixed is also known as 'Peri-Urban'.

including selection and replacement planning for CHW networks.

We cautiously compare these retention data to those reported elsewhere, recognizing differences in context, role characteristics, incentives, programme structure and selection criteria. Compared with other published Ugandan CHW cohort data, our trends are consistent with three previously reported, albeit smaller studies, including (1) a cohort of 404 similar volunteer health promotion-focused CHWs initiated together with the government and reported by our partnership nearly a decade ago (91% and 86% of CHWs retained at 2 and 5 years, respectively) (Ludwick *et al.*, 2014; Brenner *et al.*, 2011); (2) a group of 81 CHWs in Eastern Uganda where 95% remained active at 12 months (Singh *et al.*, 2016); (3) CHWs tracked in nine districts in mid-Western Uganda ($n = 132$) found to have 93% retention at 24 months (Malaria Consortium, 2013).

In contrast to these Ugandan examples, a systematic review of short-term (i.e. 2–3 years) CHW attrition included eight studies; only three reported attrition ≤15%, with the remaining studies reporting 20–50% short-term attrition (de Vries and Pool, 2017). Amongst other limited available published global reports of CHW attrition, there is significant variability; even so, our over 80% documented medium-term retention from this study exceeds that reported by most other cohorts even over the short term. We emphasize that with so much programme design variability and inconsistent assessment/definition of 'retention', comparison remains challenging.

Most CHWs in our cohort were female (70%), having completed primary education, a similar demographic to other Ugandan studies (Ludwick *et al.*, 2014; Brenner *et al.*, 2011; Christopher *et al.*, 2011); however, substantial demographic heterogeneity complicates comparability between and within countries. A study by Ngugi *et al.* (2018) in Kwale County, Kenya ($n = 1005$), found, as we did, male CHW to be more likely to exit than females (Ngugi *et al.*, 2018). Similarly, a separate small Kenyan study followed a group ($n = 30$) of human immunodeficiency virus/Acquired Immune Deficiency Syndrome-focused CHWs and observed higher male dropouts; a finding attributed by study participants to attitudes that nurturing was more of a 'women's domain' (Christopher *et al.*, 2011). Elsewhere in Sub-Saharan Africa, Abbey *et al.* (2014) found no association between retention and sex within their Ghanaian MNCH-focused volunteer CHW cohort ($n = 660$) (Abbey *et al.*, 2014) . In terms of age, the tendency we saw in our cohort for younger CHWs (<25 years old) to exit compared with older counterparts (30–59 years old) may be related to age-related performance, as reported from Kenya by Crispin *et al.* (2012). The authors noted better role performance in CHWs aged 30–50 years compared with younger and older peers and attributed this to maturity and community social integration (Mays *et al.*, 2017). We speculate that the 'exiting' we observed by younger CHWs in our cohort may have been influenced by mobility, marriage and career changes common during younger years.

The large majority (67%) of CHWs who exited due to reportedly non-program-related reasons in our study is important as it suggests most CHWs remain satisfied in their position. While an 'exiting CHW' may be perceived negatively, we recognize that many CHWs in our cohort cited positive reasons for leaving their roles, including opportunities for further education, a new job, leaving an abusive relationship or entering local politics. With regard to lower retention amongst rural CHWs from Rubirizi district compared with Bushenyi counterparts, we hypothesize that general differences in characteristics between district populations may play a role such as a higher migrant (non-Indigenous) population, industry type (fishing in Rubirizi is common yet its seasonal nature encourages greater population transience for family and work reasons), as well as higher poverty levels in more rural areas (resulting in more opportunity-seeking outside the district). Additionally, higher CHW supervisor turnover has occurred in Rubirizi. Based on our previous research, stable CHW supervision is associated with CHW group performance (Ludwick *et al.*, 2018); higher stability amongst Bushenyi CHW supervisors may have contributed to higher retention by fostering relationships between CHWs and the health facility (a motivating factor).

Although studies have found financial remuneration linked with job motivation (Christopher *et al.*, 2011; Olang'o *et al.*, 2010), none of our CHW explicitly cited financial reasons for exiting, and few ($n = 15$, 4.0%) cited workload-related reasons (which could indirectly signify dissatisfaction with lacking incentives as a reason for exit). In contrast, Mays *et al.* (2017) speculate payment as an important driver of retention since 62% of the CHWs they interviewed from central Uganda reported being more likely to continue their role ten years from now if financial remuneration was involved (Mays *et al.*, 2017). As the debate over CHW financial incentives continues (Pallas *et al.*, 2013), our study adds to the literature supporting the importance of non-monetary motivation

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factors (Abbey *et al.*, 2014; Ludwick *et al.*, 2014). It is consistent with findings from our earlier published study on a smaller cohort where financial incentives factored as a low-priority motivator based on CHW self-report compared with other non-financial incentives (Ludwick *et al.*, 2014).

Programme differences in managing financial and incentive expectations may be essential; over the years and out of necessity, our 'Healthy Child Uganda' team has refined what we believe are best practices promoting voluntarism, motivation and sustainability through non-financial means. Specific strategies include ensuring sufficient time and consideration of important factors for selection (e.g. community-led, considering local processes); clear and early communication and repeated reinforcement of expectations for voluntarism; integration of past demonstrated 'voluntarism' as a 'soft' criteria during CHW selection; proactive orientation of CHW supervisors to manage requests for material incentives; and encouragement of income-generating projects.

In general and although unverified in this study, we postulate that early high retention amongst our study cohort may also be attributed to CHW programme factors cited previously by our study team and others, including engagement and leadership by the district, supportive supervision by carefully oriented health providers attached to primary care facilities, organization of CHWs into 'teams' for peer support, and CHW selection by community members (Pallas *et al.*, 2013; Malaria Consortium, 2013; Crispin *et al.*, 2012).

Strengths and limitations

This population-based study had a solid design enabling prospective enrolment (minimizing selection bias); consistent, pre-defined and mainly self-reported exit criteria; and quality data management (regular reporting, ongoing data cleaning and interval data checks). Follow-up over the medium term (5 years) and CHW tracking beyond funding from external donors and partner support adds insight. Another strength was tracking 'all' enrolled CHWs ($n = 2317$) in each district, serving a significant population catchment (~350 000) enabling improved understanding of retention potential at scale. Additionally, tracking CHWs from two non-homogeneous districts (Bushenyi was ranked in 2019–20 as the national Annual Health Performance Reporting top performer while Rubirizi ranked close to the national average) (Uganda Ministry of Health, 2020) increases the generalizability to other parts of Uganda and beyond. Additionally, embedding CHW programming within a district's existing management, and aligning with national programme guidelines and policy context increases scale-up feasibility and sustainability (Mehra *et al.*, 2020).

This study has limitations. First, we recorded all CHWs as 'active' according to supervisor reports at each interval assessed. Our 'active' definition did not specify quality or quantity of CHW work nor did we inquire with community or self-input about activity/performance level. Rather, 'active' definition was based on meeting minimal government CHW programme expectations (engaging with supervisors; being identified by local leadership) and the established process and expectations that village governments are empowered and will 'replace' any CHW seen as not meeting their expectations. Supervisors remained hands-on in supporting CHW teams and expected each registered CHW to submit reports and attend monthly meetings. Second, 'exit reason' reporting had subjectivity involved. Although direct communication with an 'exiting CHW' was sought, in some cases, explanations from a supervisor or peers were the only available information source, where exited CHWs could not be tracked. In future, with increased mobile phone availability, direct follow-up with 'exiting CHWs' may increase objectivity.

Our findings indicate that maintaining high retention of health-promotion-focused CHWs in a volunteer, district-led CHW programme is feasible. The 'MamaToto' programme was operationalized by the district using national health policies, guidelines and infrastructure with a high level of ongoing district engagement. While some other studies have found lower retention of CHWs in government-led programmes than those initiated by non-government partners, there is a growing consensus that CHW integration within existing health systems is important for coordination and relevance, CHW motivation and long-term sustainability.

Further related research is warranted. Continued retention tracking for this and other CHW cohorts will shed light on important longer-term programme issues and opportunities, including re-training, community re-confirmation, age representation and retirement/phase-out. Consideration of CHW activity level and workload factors could add valuable insights (Kok *et al.*, 2015). Importantly, since CHW programme factors are major determinants of long-term retention and sustainability (Kok *et al.*, 2015) with CHW selection, training, supervision and motivation directly related to retention, performance and sustainability (Ludwick *et al.*, 2018), continued identification and documentation of best practices are critical.

Conclusions

CHWs play an important role in linking rural and hard-to-reach communities in low-resource settings with health systems and providing critical promotion and referral services. As CHW programmes scale-up globally, predicting and understanding CHW retention and characteristics are critical to programme development, planning and sustainability. Our study found that large cohorts of trained and supervised CHWs, embedded within a district-wide MNCH initiative could be retained over the medium term. Most attrition was unrelated to the CHW role, such as workload or programme factors. If CHW programmes were scaled up in Uganda and more widely in Sub-Saharan African, we believe their potential to reduce maternal and child morbidity is significant. Understanding who CHWs are and how they can best be retained will create more robust CHW networks to serve the most vulnerable.

Data availability

The data sets analysed during the current study are available from the corresponding author on reasonable request.

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Conflict of interest statement. The authors declare that they have no conflicts of interest.

Authors' contributions

AJH, ET, TK, JK, ANA and JLB were responsible for the initial study conception and design. PR, KM and CK collected and managed data during the study. AJH and ANA performed the statistical analysis. AJH and KM drafted the manuscript with main revisions by JLB and ANA. All authors contributed to data interpretation, manuscript revision and approval of the final manuscript.

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