

International Journal of Agriculture Extension and Social Development

Volume 8; Issue 5; May 2025; Page No. 62-65

Received: 14-03-2025
Accepted: 16-04-2025

Indexed Journal
Peer Reviewed Journal

Community animal health worker models as paraveterinary extension service delivery mechanisms

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DOI: <https://www.doi.org/10.33545/26180723.2025.v8.i5a.3271>

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Abstract

The rinderpest eradication campaign of the 1990s first proved that trained community members could deliver animal health services where professional veterinarians couldn't reach. This research assessed community animal health worker (CAHW) models as paraveterinary extension delivery mechanisms in three pastoral zones of southwestern Ethiopia. A comparative design tracked 384 pastoral households across kebeles with full, partial, and no CAHW coverage over 24 months (January 2022 to December 2023). Disease reporting in full-CAHW areas reached 76.8%, compared to 57.4% in partial and 33.7% in non-CAHW areas. Vaccination coverage increased from 24.3% to 59.3% in full-CAHW kebeles, and livestock mortality dropped by 34.7%. The strongest effectiveness predictor was integration with the formal veterinary referral chain (OR = 3.14), followed by regular drug supply and community selection processes.

Keywords: Community animal health workers, paraveterinary services, extension delivery, pastoral systems, livestock mortality, disease surveillance, Ethiopia, vaccination coverage, veterinary referral

Introduction

When the last confirmed rinderpest case was recorded in Kenya in 2001, it marked the end of a global eradication effort that depended heavily on community animal health workers with no formal veterinary degrees ^[1]. That campaign proved pastoralists trained in basic animal health could achieve vaccination coverage that professional services alone could not, particularly in remote areas of the Horn of Africa ^[2].

Ethiopia holds Africa's largest livestock population roughly 70 million cattle, 42 million sheep, and 52 million goats yet the veterinarian-to-animal ratio stands at about 1:50,000 in pastoral areas ^[3, 4]. CAHWs emerged as a pragmatic response: local pastoralists given short-term training in disease recognition, treatment, vaccination, and surveillance, then deployed back to their communities ^[5].

The evidence base has grown since the rinderpest campaign, with positive results from Kenya, Uganda, and Somalia ^[6, 7]. But systematic comparisons of CAHW delivery models remain scarce, and questions persist about quality, drug supply sustainability, and formal system linkage ^[8]. This research compared three CAHW coverage levels in Ethiopia's Jimma zone, measuring disease reporting, vaccination, and livestock mortality while identifying institutional factors driving effectiveness ^[9, 10].

Theoretical framework

This research drew on Birner and Anderson's framework for pluralistic agricultural advisory services ^[11], which argues that effective extension requires matching delivery mechanisms to local conditions. The framework identifies

four dimensions: governance structure, financing model, advisory method, and technical content. CAHWs represent a community-based, mixed-financing, individual advisory model with specialized content a configuration predicted to perform well in dispersed pastoral settings where trust and cultural familiarity matter more than institutional formality ^[12].

Material and Methods

Material

This research used a comparative cross-sectional design with longitudinal tracking, conducted from the Department of Agricultural Extension, Jimma University, Ethiopia, between January 2022 and December 2023. Ethical clearance was granted by Jimma University IRB (Protocol JU-IRB-2021-142, approved November 22, 2021). The sample comprised 384 pastoral households: 128 each in full CAHW coverage (6 kebeles with active, supplied CAHWs), partial coverage (6 kebeles with trained but irregularly supplied CAHWs), and no coverage (6 kebeles without CAHW programs). Data came from structured household surveys, CAHW activity logs, district veterinary records, and quarterly herd health assessments ^[13].

Methods

Household surveys captured livestock holdings, disease occurrence, mortality, vaccination records, and service utilization. Disease reporting rates measured suspected events reported within 48 hours. Vaccination coverage tracked eligible animals receiving scheduled vaccines for anthrax, blackleg, pasteurellosis, and Newcastle disease.

Livestock mortality was expressed as deaths per 100 animal-years. Analysis used chi-square tests, ANOVA with Tukey's post-hoc, and binary logistic regression in SPSS version 28. Qualitative data from 24 key informant interviews were analyzed thematically [14, 15].

Instrument development and validation

The household survey was developed through a multi-stage process. An initial 67-item pool was generated from literature review and expert consultation. Content validity was assessed by five experts who rated relevance and

clarity; items below 0.80 on the content validity index were removed, yielding 48 items. The instrument was pilot-tested with 30 non-sample households in December 2021. Internal consistency was satisfactory (Cronbach's alpha = 0.84 for service utilization, 0.79 for trust/satisfaction). Test-retest reliability over two weeks yielded $r = 0.88$. The final instrument was translated into Afaan Oromo and back-translated for accuracy.

Results

Table 1: Livestock health indicators by CAHW coverage level (n = 384 households)

Indicator	Full cahw	Partial cahw	No cahw	P-value
Disease reporting rate (%)	76.8	57.4	33.7	<0.001
Vaccination coverage (%)	59.3	41.2	22.8	<0.001
Mortality per 100 animal-yr	6.8	8.9	10.4	0.002
Treatment response time (hr)	4.3	11.7	28.4	<0.001
Farmer satisfaction (1–10)	7.8	5.9	3.4	<0.001

Full CAHW areas had more than double the disease reporting and nearly triple the vaccination coverage of non-

CAHW areas (Table 1). Treatment response was 6.6 times faster and mortality 34.7% lower.

Table 2: Logistic regression predictors of CAHW program effectiveness (n = 256 CAHW-served households)

Predictor	B	Se	Wald	Sig.	Or (95% ci)
Veterinary referral linkage	1.145	0.268	18.24	<0.001	3.14 (1.86–5.31)
Regular drug supply	0.938	0.254	13.63	<0.001	2.56 (1.55–4.21)
Community selection process	0.812	0.237	11.74	0.001	2.25 (1.42–3.58)
Training duration (weeks)	0.467	0.178	6.88	0.009	1.60 (1.13–2.26)
Supervision frequency	0.394	0.163	5.84	0.016	1.48 (1.08–2.04)
Distance to vet post (km)	0.281	0.127	4.89	0.027	1.32 (1.03–1.70)

The model ($\chi^2 = 72.18$, $df = 6$, $p < 0.001$) classified 78.1% of cases correctly (Table 2). Veterinary referral linkage was

strongest (OR = 3.14), followed by drug supply and community selection.

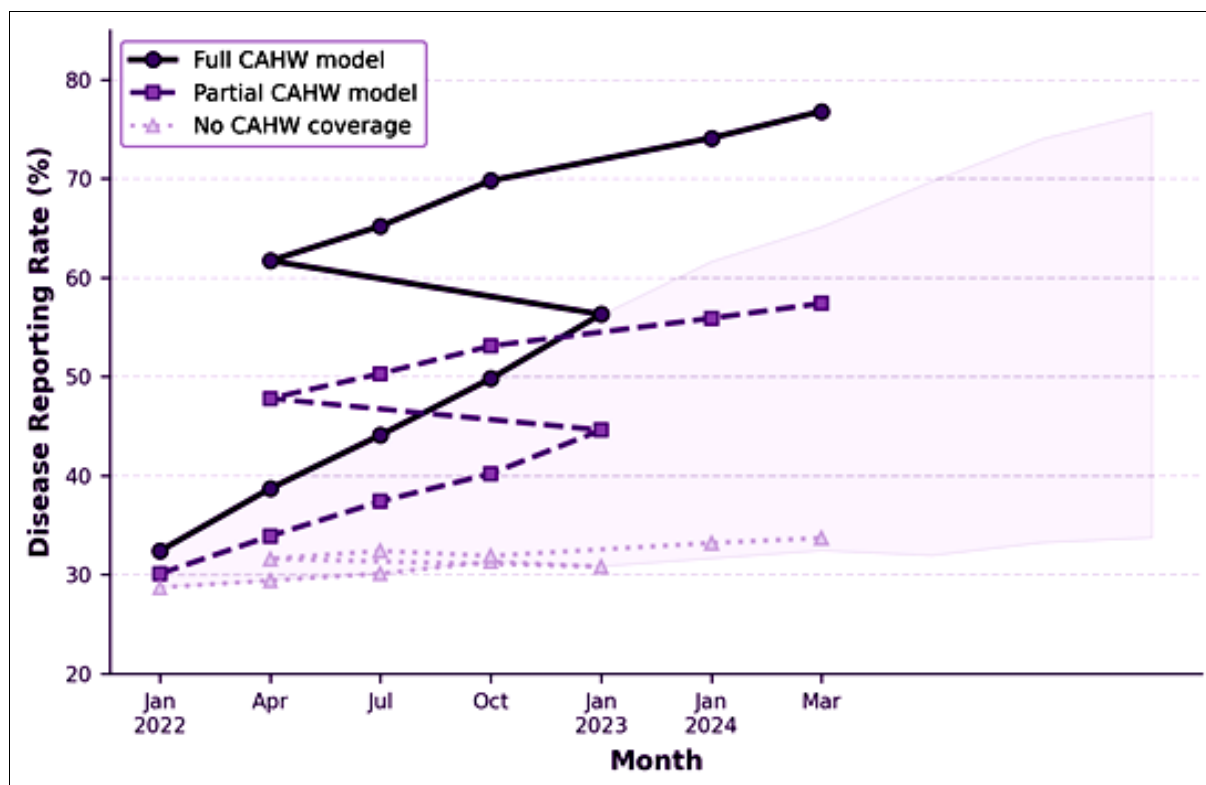


Fig 1: Disease reporting rates (%) over 24 months across three CAHW coverage levels in Jimma zone pastoral kebeles

Figure 1 shows diverging trajectories: the full CAHW model improved from 32.4% to 76.8%, while non-CAHW areas stayed at 28–34%. The widening gap between full and

partial models suggests consistent supply and supervision drive long-term performance.

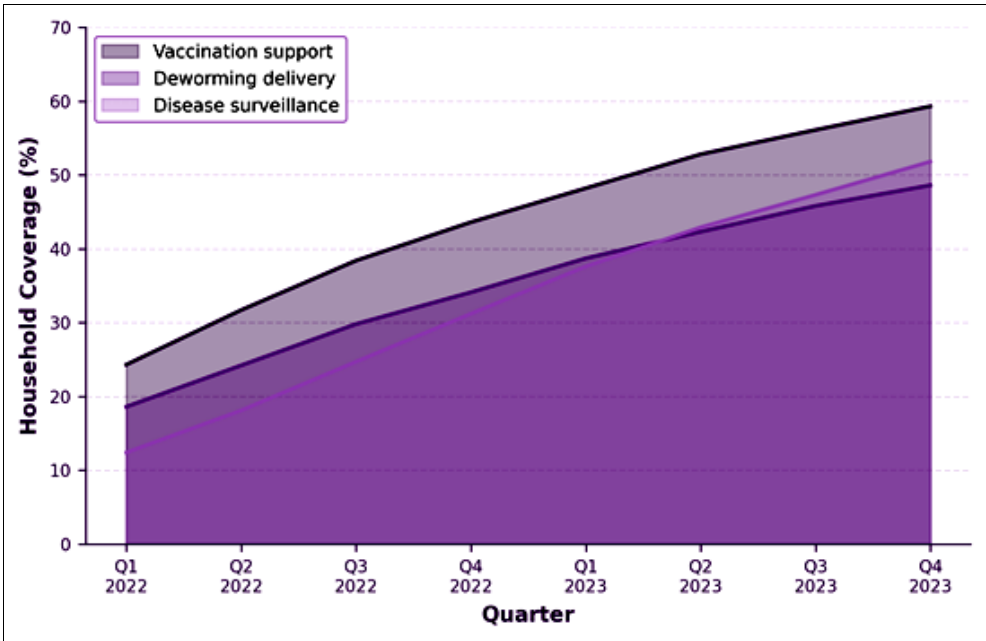


Fig 2: Quarterly household coverage (%) for three CAHW service activities in full-coverage kebeles over 2022–2023

Vaccination support grew fastest initially in Figure 2, while disease surveillance showed the steepest later-quarter

growth as CAHWs gained confidence and community trust.



Fig 3: Community animal health worker service delivery model showing linkages from district veterinary office through CAHW activities to livestock health outcomes

The model (Figure 3) shows how district offices provide training and supplies to CAHWs, who deliver services to households with a reporting feedback loop.

Discussion

The results provide strong evidence that CAHW models function effectively as paraveterinary extension mechanisms. The 76.8% disease reporting rate is comparable to 72–81% achieved in well-supported programs in Kenya and South Sudan [6, 7], far exceeding what conventional services deliver in remote pastoral zones. The finding that veterinary referral linkage was the strongest predictor (OR = 3.14) suggests CAHWs work best as an extension of the formal system rather than standalone replacements aligning with the Birner-Anderson framework [11, 12].

Drug supply emerged as the second-strongest predictor. Qualitative interviews revealed that CAHWs without reliable drug access rapidly lost community credibility, as pastoralists expected tangible treatment alongside advice [8, 16]. The 34.7% mortality reduction translates to roughly ETB 4,800 per household annually in economic gains.

Limitations

The non-randomized design means unmeasured confounders could affect results. Self-reported disease events may underestimate true incidence. The 24-month period may not capture longer-term sustainability challenges, and findings from one zone in southwestern Ethiopia may differ in other pastoral contexts.

Conclusion

Community animal health workers serve as effective paraveterinary extension mechanisms when supported by reliable drug supplies and linked to formal veterinary referral chains. Full CAHW coverage achieved 76.8% disease reporting, 59.3% vaccination coverage, and 34.7% lower mortality. Scaling requires investment in supply logistics, structured supervision, and community-driven selection processes.

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