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Effect of Supportive Supervision Training Intervention for Community Health Assistants on Performance of Community Health Promoters in Tuberculosis Services in Mombasa County, Kenya: A Quasi-Experimental Study

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Abstract

Purpose: This study examined the effect of supportive supervision training intervention for Community Health Assistants (CHAs) on Community Health Promoters' (CHPs) performance in Tuberculosis services in Mombasa County. Tuberculosis is still a global health concern, with treatment outcomes often constrained by below par performance on community indicators. Community Health Promoters are critical in primary healthcare delivery but face challenges that limit their effectiveness.

Methodology: This was a before and after quasi-experimental design conducted in Kisauni Sub-County, Mombasa County. A sample of 210 CHPs was selected from a population of 443 using proportionate stratified random sampling, while 17 CHAs and 6 Sub-County Community Health Services Coordinators (SCCHSCs) were included through census. CHAs and CHPs participated at both baseline and endline. The intervention involved a structured two-day CHA training based on national guidelines and baseline findings, followed by six months of monthly supportive supervision using a standardized checklist integrated with a modified Behaviourally Anchored Rating Scale. Data were collected through questionnaires, supervision checklists, and Key Informant Interviews. Quantitative data were analysed using descriptive and inferential statistics. Both predictors and CHP performance were operationalised from self-reported questionnaire data, with CHP performance independently corroborated using CHAs' supportive supervision checklists. Bivariate and multivariate analyses used the questionnaire-derived dataset, with study period (baseline vs endline) included as a predictor to assess the effect of the intervention on CHP performance. Qualitative data were analysed thematically.

Findings: Significant improvements were observed post-intervention. CHA knowledge increased ($p < 0.001$; Cohen's $d = 1.84$). CHP performance improved across all TB service delivery indicators based on supportive supervision checklist (Wilcoxon $p < 0.001$; Friedman $p < 0.001$), and self-reported questionnaire responses (χ^2 $p < 0.001$), suggesting a strong effect of the intervention (Wilcoxon $r = 0.76–0.86$; Cramer's $V = 0.44–0.67$). The Chi-square test showed significant associations between independent variables and CHP performance ($p < 0.05$), with moderate to strong effect sizes (Cramer's $V = 0.332–0.66$, $p < 0.001$). All factors were significant predictors of CHP performance in the crude analysis (cOR = 8.11–20.30, $p < 0.001$). The logistic regression model was statistically significant (Omnibus $\chi^2 = 299.529$, $df = 9$, $p < 0.001$), with good fit (Hosmer–Lemeshow $p = 0.195$), high predictive accuracy (84.2%), and no multicollinearity (Tolerance = 0.291–0.689; VIF = 1.45–3.44). Significant predictors included CHP training (aOR = 2.23, $p = 0.023$), availability of tools and materials (aOR = 3.34, $p = 0.001$), frequent feedback (aOR = 2.34, $p = 0.038$), timely feedback (aOR = 4.72, $p < 0.001$), standardized M&E framework (aOR = 2.40, $p = 0.009$), and performance review meetings (aOR = 2.63, $p = 0.005$). The intervention was a strong independent predictor of CHP performance, with significantly higher odds of high CHP performance observed at endline compared to baseline (aOR = 6.01, 95% CI: 2.30–15.70, $p < 0.001$), indicating a positive effect after controlling for other factors.

Unique Contribution to Theory, Practice and Policy: Attachment Theory informed the study since it puts emphasis on the importance of supportive relationships in boosting confidence, motivation, and optimal functioning. In this study, the supportive supervision and structured engagement between CHAs and CHPs may have created a secure attachment that enhanced CHPs' sense of trust, guidance, and psychological safety. The study recommends institutionalizing supportive supervision, strengthening CHA training, and ensuring adequate resources and standardized monitoring systems to sustain performance improvements.

Keywords: *Tuberculosis Control, Supportive Supervision, Community Health Promoters, Performance Determinants, Mombasa County*

JEL Classification: *I12, I18, J24*

INTRODUCTION

Supportive Supervision is a fundamental oversight task applicable at all levels of healthcare system. It is a process where supervisors aid supervisees to enhance their knowledge, skills, and performance in an organization (World Health Organization [WHO], 2020). According to WHO (2020), supportive supervision should inspire free, two-way conversation, and initiate teams' ways that promote problem-solving. Human Resources for Health (HRH) system requires sufficient numbers and variety of cadres who are equally and equitably distributed; are competent, responsive and productive (WHO, 2007). The global shortage of HRH, in countries with depressed economies signifies inequity in access to health services. Strategies that nations pursue to respond to this involve task shifting to other personnel like Community Health Promoters (CHPs) (WU et al., 2018). Although not professionally trained as healthcare professionals, CHPs receive training to deliver specific health interventions. CHPs play a key role and are the backbone of health Primary Healthcare (PHC) service delivery at community level. They sensitize community on various diseases at household level and through outreaches, refer patients to their link health facilities, make follow up and provide Directly Observed Treatment services (DOTs) to ensure treatment adherence, tracing contacts of patients with infectious diseases like TB, and at the end of the month prepare and submit reports of the activities done. They are supervised by Community Health Assistants (CHAs).

TB remains a significant global health threat. Despite being preventable and curable, it has re-emerged as a leading cause of death, surpassing even HIV/AIDS (WHO, 2024). The global incidence remains high, with over 10 million people contracting the disease each year. This alarming trend underscores the urgent need for concerted global action to achieve the 2035 End TB Strategy, a goal endorsed by all United Nations (UN) Member States and WHO (Hershkovitz et al., 2015). The strategy identified three key pillars: Strengthening TB services, addressing societal determinants, and enhancing innovation that requires technological improvements. It also takes into account the concerns of affected households by ensuring that none faces catastrophic costs (WHO, 2022). In the strategy, WHO targets 90% TB treatment coverage by 2027 but in 2023 the treatment coverage was 75% (WHO, 2024). The TB preventive treatment (TPT) coverage target is 90% by the year 2027, 100% coverage of rapid diagnostic testing, 95% reduction in the number of deaths from TB by 2035 and a reduction by 75% by 2025. However, the number of deaths reduced by 23% in the year 2023 (WHO, 2024). The target for reduction in TB incidence is 90% by the year 2035 and 50% reduction by 2025. However, in 2023, there was 8.3% reduction (WHO, 2024). These findings suggest a global challenge in attaining the End TB targets.

Kenya is among the 30 republics strained by TB infection globally, and in Africa the nation is among the leading 5 (WHO, 2021). TB has re-emerged as the biggest disease killers post COVID-19 pandemic (WHO, 2024). Despite the significant investment by state and other partners in preceding 20 years, the infection is the 4th dominant cause of mortality (KNBS, 2019). In 2022, Kenya's National TB, Leprosy and Lung Diseases Program (NTLP) reported that the country did not meet its case finding and treatment outcomes targets (NTLP, 2023). The poor outcomes were as a result of high Death Rate, high LTFU and patients who were not evaluated. The high LTFU cases signifies a gap in CHPs' performance since one of their responsibilities is to trace all treatment interrupters and bring them back to care.

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Statement of the Problem

Mombasa ranks among the top five counties in Kenya with high TB burden. According to the county's TB Annual performance report 2025, TB case-finding in 2024 was 3,989, which was approximately 78% of the county 's target. Out of this, CHPs referrals were 495 (12.4%) against a target of 30%. Treatment outcome for DS TB cases initiated on treatment in 2024 indicates a Treatment Success Rate (TSR) of 90% against a target of 95%, Cure Rate of 79% against a target of 92%, Death Rate of 4% with a target of less than 5%, Treatment Failure of 1% against a target of 0%, and loss to follow up (LTFU) of 5% against a target of less than 2%. The high loss to follow up implies that the CHPs did not achieve their targets in tracing treatment interrupters and bringing them back to care.

While supportive supervision is widely recognized as a key strategy for enhancing health worker performance and strengthening primary healthcare systems (Crigler et al., 2014), there is limited empirical evidence on its effectiveness in improving CHP performance in community TB indicators. This is especially in high-burden, resource-constrained settings such as Mombasa County. However, CHAs are not adequately trained on supportive supervision for CHPs and more so on TB (Otieno et al., 2026). It remains unclear whether or not structured training of CHAs in supportive supervision translates into measurable improvements in CHP performance over time. This study, therefore, seeks to address this gap by examining the effect of training CHAs on supportive supervision on performance of CHPs in community TB service delivery in Mombasa County.

Theoretical Framework

Attachment Theory

The study is anchored on Attachment Theory by John Bowlby. The theory's focal point is on connections and long-term relations among people that encompasses the relation among parents and children as well as among sentimental parties (Cherry, 2023). As pointed out by Assegaai and Schneider (2021), Supportive Supervision is an experience that is basically a mechanism of relationships. Bowlby proclaimed attachment as a long-term cognitive connectivity among individuals. Bowlby was engrossed in recognizing the fear and agony that children encounter when detached from their elementary custodians.The principal idea of attachment theory is that elementary custodians that are accessible and compassionate with children's necessities grant the children opportunities to acquire a feeling of being safe. Such children discover that the caregivers are reliable and this develops a safe foundation for the children to traverse the universe. This is illustrated in Figure 1. The same can be said of a supportive supervisor who enables a supervisee to develop confidence and a sense of security in their work.

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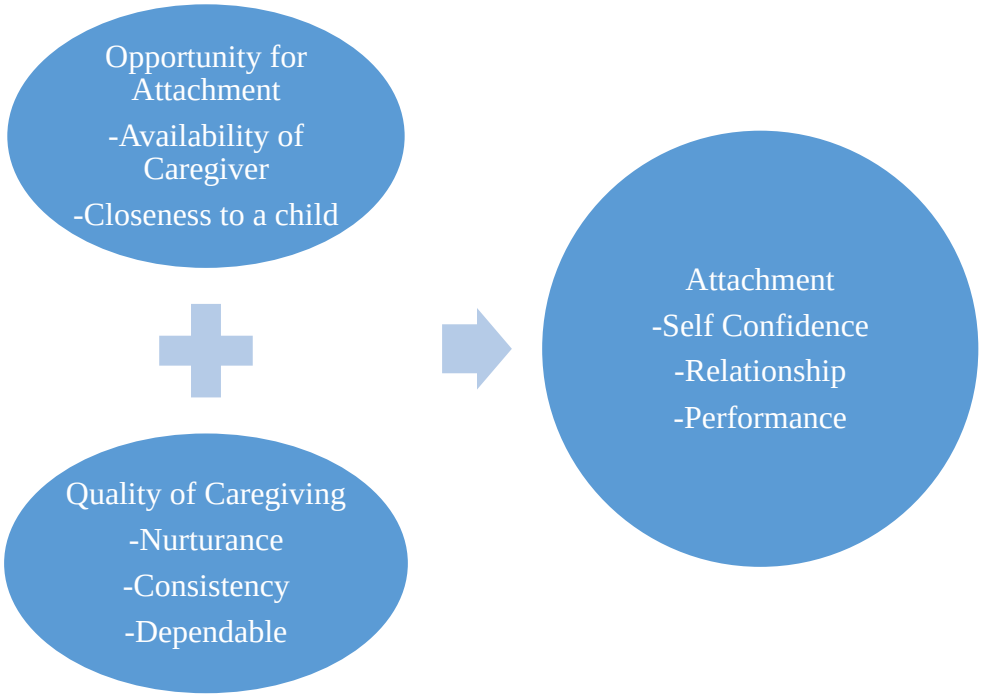

Figure 1: Attachment Theory Framework

Conceptual Framework

The study had four Independent Variables, a Moderating Variable, and Dependent Variable. These were informed by the study topic, research objectives and the literature that were reviewed by the researcher.

The first Independent Variable based on the first study objective is building capacities of CHPs. The indicators that were tracked under this variable included trained CHPs in community TB services, and refresher training and mentorship sessions for CHPs on community TB services. The second Independent Variable based on the second objective is resource availability for CHPs. Under this variable the indicators included availability of functional tools and materials for CHPs, and incentives provided to CHPs for TB-related activities. The third Independent Variable based on the third objective is availability of feedback mechanism for CHPs. The indicators included frequency of feedback to CHPs, and timeliness of feedback to CHPs on their performance. The fourth Independent Variable based on the fourth objective is performance monitoring and evaluation system for CHPs. The indicators for this variable included availability of standardized performance monitoring and evaluation framework for CHPs, and review meetings focusing on CHPs' performance in community TB services.

The study had a Moderating Variable based on the fifth objective. It involved a two-days training of CHAs on supportive supervision using a training guide that was developed and validated by experts. After the training, CHAs carried out monthly supportive supervision of CHPs for six months utilizing a supportive supervision checklist that the researcher developed and also validated by the experts. The Dependent Variable was performance of CHPs in community TB services. The indicators here included sensitization of community on TB, referral of TB presumptive cases from community, contact tracing, treatment interrupters tracing, and quality of reports submitted by the CHPs.

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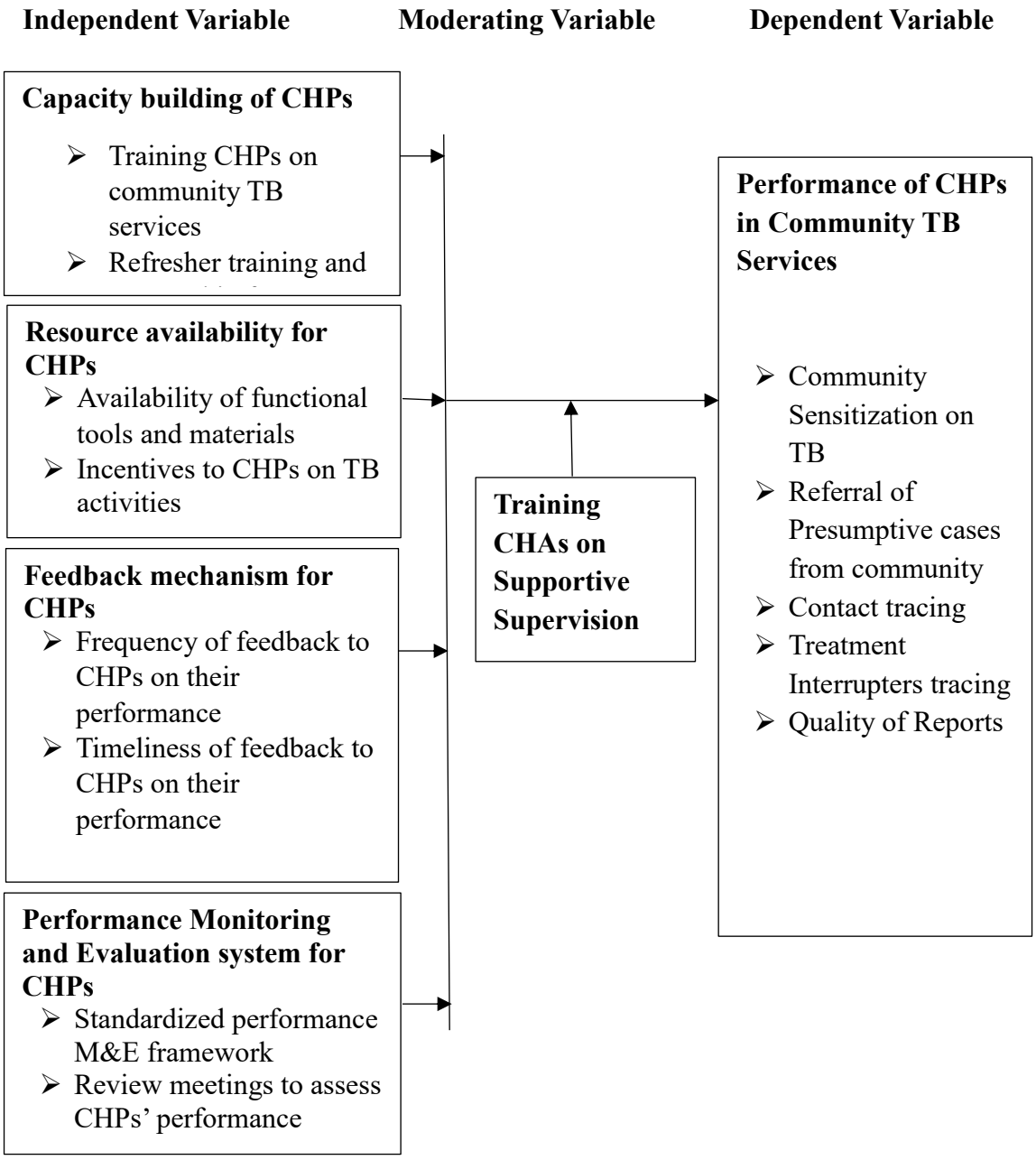

Figure 2: Conceptual Framework

METHODOLOGY

Study Design and Site

This study adopted a quasi-experimental research design of before and after, to examine the effect of training intervention on performance of CHPs in community TB indicators. The study also utilized a mixed-method approach in data collection. It was conducted in Kisauni Sub-County, located in the northern part of Mombasa County. Kisauni was purposively selected due to its comparatively lower performance in community TB indicators.

Sample Size Determination

The study targeted all 443 CHPs, all 17 CHAs in Kisauni Sub-County, and all 6 Sub-County Community Health Services Coordinators (SCCHSCs). CHPs' sample size was determined using Yamane's formula (1967). This approach ensured that the selected CHPs were adequately representative of the total population of 443 CHPs in Kisauni Sub-County. Therefore, 210 CHPs were sampled.

Sampling Procedure

The study adopted a multi-stage sampling approach. At national and sub-county levels, purposive sampling was used to select Mombasa County and Kisauni Sub-County, respectively, due to their strategic relevance to the study objectives and the need to examine supportive supervision within a high-burden yet under-performing context. At Community Health Unit (CHU) level, census sampling was employed to include all 50 CHUs. For CHPs, proportionate stratified sampling was used to determine the number of respondents from each CHU based on the size of the CHU relative to the total CHP population. Within each stratum (CHU), simple random sampling was then applied to select individual CHPs. All 17 CHAs were included through census sampling since they directly supervise CHPs. Similarly, all 6 SCCHSCs were included using census sampling at baseline because of their strategic oversight role and sub-county representation at county level.

Intervention

The study intervention was implemented at two levels: at the CHA level through training conducted by the researcher; and at the CHP level through six months of supportive supervision conducted by CHAs, with regular follow-up by the researcher to support implementation. Outcomes were assessed among CHPs.

First a baseline assessment was conducted using routine program data, and insights from SCCHSCs to establish CHP performance and CHA supportive supervision practices. The intervention was then designed by developing a TB supportive supervision training guide for CHAs and a standardized supervision checklist based national guidelines and gaps identified during the baseline assessment. Both tools were reviewed by experts for relevance and quality. Intercoder reliability testing for the checklist showed high agreement among raters ($\kappa = 0.82$), confirming strong consistency in its application.

The intervention was then designed by developing a TB supportive supervision training guide for CHAs and a standardized supervision checklist based national guidelines and gaps identified during the baseline assessment. Both tools were reviewed by experts for relevance and quality.

CHAs then received a two-day training delivered in modules, with pre- and post-tests used to assess knowledge improvement. The training was designed to strengthen supervisory competencies, including mentorship, performance monitoring, feedback provision, and the use of supervision tools.

Following training, CHAs conducted monthly supportive supervision of CHPs for six months using the checklist to guide supervision, monitor performance, and provide structured feedback. CHPs performance was assessed each month using a modified six-point Behaviourally Anchored Rating Scale (BARS). The researcher conducted regular follow-up with CHAs to monitor adherence to the intervention and address implementation gaps as needed.

Finally, the effectiveness of the intervention was assessed by comparing CHP performance at baseline and after six months using key TB service indicators.

Data Collection

Questionnaires were administered to CHPs and CHAs at baseline and endline, and pre-tested in Kilifi County to assess clarity and consistency. Internal consistency was evaluated using Cronbach's alpha, with all constructs exceeding 0.70, indicating acceptable scale reliability. Separate questionnaires were designed for each category of participants to reflect their distinct roles and responsibilities within community health system. The developed Supportive Supervision Checklist was also utilized to assess CHP performance and guide CHAs' monthly supervision. Intercoder reliability testing for the checklist showed high agreement among raters ($\kappa = 0.82$), confirming strong consistency in its application.

Data Analysis

Quantitative data were analysed using Statistical Package for Social Sciences (SPSS) version 28.0, while qualitative data were analysed thematically. The same CHAs and CHPs participated at both baseline and endline; however, individual responses were not linked across the two time points, and the data were analysed as unpaired observations. Quantitative analysis used a pooled baseline and endline dataset created by combining standardized composite scores from CHAs and CHPs across both study periods. Composite scoring was used because TB service delivery indicators and supportive supervision constructs were multidimensional, improving measurement reliability and construct validity while reducing variability from single-item measures.

Both predictors and the CHP performance outcome were operationalised from aggregated self-reported questionnaire data, with the performance measure independently corroborated using CHAs' supportive supervision checklist assessments. Bivariate and multivariate analyses were conducted using the questionnaire-derived dataset to examine associations between predictors and CHP performance.

The primary outcome variable was CHP performance, derived from aggregated composite indicators of TB service delivery. The unit of analysis was the CHP, with unpaired baseline and endline observations included in the pooled dataset. Study period (baseline vs endline) was included as a predictor to assess the effect of the intervention on the primary outcome. Binary logistic regression was performed at a 95% confidence level to determine the independent effects of the intervention and other predictors on CHP performance, while multicollinearity was assessed using tolerance values and Variance Inflation Factor (VIF).

Techniques applied to minimise bias/errors

Random selection ensured equal probability of inclusion and same participants were used at pre- and post-intervention. The same CHAs and CHPs participated at both baseline and endline, enhancing comparability between study periods and minimizing variability arising from differences in participant characteristics. The study utilised standardised data collection tools that were pre-tested in a different county. Supportive supervision and TB service delivery constructs were operationalised using standardized composite scores to improve measurement reliability and reduce random error associated with single-item indicators. Quantitative analyses were conducted using a pooled baseline–endline dataset, enabling consistent measurement of outcomes and predictors across study periods. In addition, supportive supervision checklist assessments by CHAs were used to independently corroborate self-

reported questionnaire responses on CHP performance, strengthening the validity of the findings through data triangulation.

Ethical Considerations

Ethical clearance was secured from the Science and Ethical Review Committee of Kenya Methodist University, (KEMU/ISERC/HSM/03/2025). Additional authorization was obtained from the National Commission for Science, Technology and Innovation (NACOSTI) (NACOSTI/P/25/417115). Further permissions were sought from the Departments of Health, Mombasa County Government (MSA/CH/ADM.37/VOL.111/59), and Kilifi County Government (KLF/DOH/RESEARCH/VOL.1/283) for Pre-test. All participants were given relevant information regarding the study prior to participation. Participation was entirely voluntary, and respondents provided written informed consent.

RESULTS

Characteristics of Study Respondents

In the pre-intervention phase, the largest number, 79(35.3%), of respondents were aged 41–50 years, followed by 62(27.7%) aged 31–40 years. A similar pattern was observed in the post-intervention phase.

At pre-intervention, 186(83.0%) of the respondents were female, while 38(17.0%) were male. In the post-intervention phase, where 187(83.1%) were female and 38(16.9%) were male. Concerning marital status, at pre-intervention, 167(74.6%) of respondents were married, 49(21.9%) were single. 6(2.7%) were separated while 2(0.9%) were divorced.

At baseline, 8(50.0%) of CHAs were responsible for 1–3 units, while 7(43.8%) supervised 3–6 units, and 1(6.3%) managed more than 6 units. At post-intervention, 9(52.9%) CHAs oversaw 1–3 units, 7(41.2%) supervised 3–6 units, and 1(5.9%) managed above 6 units. At baseline, 7(43.8%) supervised 1–25 CHPs, 5(31.3%) supervised 26–50 CHPs, 3(18.8%) supervised 51–75 CHPs, and 1(6.3%) supervised more than 75 CHPs. At post-intervention, the proportions were 8(47.1%), 5(29.4%), 3(17.6%), and 1(5.9%), respectively.

Among CHPs, at baseline, majority 95(45.7%) of CHPs served 51–100 households, and 101–150 households 96(46.2%), while only 14(6.7%) served 50 households and below. At endline, the number serving 101–150 households increased to 125(60.1%), while those serving 51–100 households decreased to 72(34.6%). The proportion serving 50 households and below reduced from 14(6.7%) to 8(3.8%), and 1(0.5%) served above 200 households at endline. The respondents' characteristics are presented in Table 1.

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Table 1: Respondent characteristics

			Pre-intervention (%)	Post-intervention (%)
Age Distribution (years)		≤30	14.7	12.4
		31 – 40	27.7	26.2
		41 – 50	35.3	36.4
		51 - 60	18.3	20.0
		>60	4.0	
Gender Distribution		Male	17.0	16.9
		Female	83.0	83.1
Workload Distribution	Number of Household per CHP	≤50	6.7	3.8
		51 – 100	45.7	34.6
		101 – 150	46.2	60.1
		151 – 200	1.4	1.0
		>200	0	0.5
	Number of CHPs per CHA	1 – 25	43.7	47.1
		26 – 50	31.2	29. 4
		51 – 75	18.8	17.6
		>75	6.3	5.9
	Number of CHUs per CHA	1 – 3	50	52.9
		3 – 6	43.7	41.2
		>6	6.3	5.9

Effect of the Training Intervention on CHAs Knowledge

At baseline assessment, the SCCHSCs revealed that CHAs training on supportive supervision remained inconsistent and fragmented. While some CHAs underwent On-the-Job Training (OJT), this approach was not systematic, and pre-service exposure to supportive supervision was often superficial or absent.

"At the moment we do On-Job-Trainings – no persons to train them. But there are those who are already trained." – KII 1

"The pre-service training is superficial. No one is trained on supportive supervision as a course." – KII 5

"It's not in the CHAs curriculum." – KII 2

It is based on the baseline assessment results that the researcher developed a CHAs' Supportive Supervision Training Manual and Checklist.

Before the CHAs participated in the supportive supervision training using the developed training guide, a pre-test was conducted to assess their baseline knowledge on the subject and a post-test was administered to determine the extent of knowledge gained and to evaluate the effectiveness of the training intervention. Results are presented in Table 2.

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Table 2: Effect of CHAs training on knowledge scores

Assessment	$\bar{X}$ (Mean)	σ (SD)	t-test	p-value	Cohen's d
Pre-test	43.53%	7.60	7.57	<0.001	1.84
Post-test	60.71%	6.67			

Results indicated that CHAs' mean performance score increased from 43.53% (SD = 7.60) in the pre-test to 60.71% (SD = 6.67) in the post-test, representing an average improvement of 17.18 percentage points, equivalent to a 39.5% increase in knowledge scores. A paired samples t-test revealed that the improvement in scores was statistically significant ($t(16) = 7.57$, $p < 0.001$), indicating a substantial difference between the pre-test and post-test scores. The calculated effect size (Cohen's $d = 1.84$) indicates a very large effect size suggesting that the training intervention had a strong impact on CHAs' knowledge supportive supervision.

Changes in CHPs Performance in TB Service Indicators

CHPs' performance in the five indicators was assessed on a monthly basis between April and October 2025 using the supportive supervision checklist. Table 3 shows the results.

Table 3: CHP Performance Scores in TB Service Indicators Based on Chas' Supportive Supervision Checklist Assessments

TB service indicators	N	Baseline BARS $\bar{X}$	Endline BARS $\bar{X}$	Friedman χ^2 (df=6)	p-value	Wilcoxon Z (df=1)	p-value	r
Sensitization	208	2.91	5.33	545.27	<0.001	12.05	<0.001	0.84
Presumptive referral	208	3.52	5.67	716.74	<0.001	12.36	<0.001	0.86
Contact tracing	208	2.16	5.29	511.74	<0.001	11.95	<0.001	0.83
Interrupter tracing	208	2.53	5.23	522.03	<0.001	11.55	<0.001	0.80
Quality reports	208	4.03	5.84	310.97	<0.001	10.97	<0.001	0.76
Composite CHP performance score	208	3.03	5.47	702.73	<0.001	12.41	<0.001	0.86

Note: BARS interpretation: 6 = Excellent, 5 = Above Average, 4 = Average, 3 = Below Average, 2 = Poor, and 1 = Unacceptable

All TB service indicators showed clear improvement from baseline to endline. Sensitization increased from a mean BARS score of 2.91 to 5.33, presumptive referral from 3.52 to 5.67, contact tracing from 2.16 to 5.29, interrupter tracing from 2.53 to 5.23, and quality of reports from 4.03 to 5.84. The Friedman test showed a statistically significant difference in CHP performance across the six months of intervention ($p<0.001$), indicating that performance changed significantly over time across all indicators following the intervention. The Wilcoxon signed-rank test also confirmed a significant improvement between baseline and endline measurements across all indicators ($p<0.001$), showing that the observed improvements were consistent and not due to chance. In addition, effect sizes were large across all indicators ($r=0.76–0.86$), indicating a strong practical impact of the intervention on CHP performance in

TB service delivery. The composite CHP performance score further showed a significant improvement, increasing from a mean baseline score of 3.03 to 5.47 at endline ($\chi^2 = 702.73$, $p < 0.001$; $Z = 12.41$, $p < 0.001$; $r = 0.86$).

The CHAs' supportive supervision checklist assessments were consistent with self-reported CHPs and CHAs questionnaire responses, showing a similar pattern of improvement across all TB service indicators. Table 4 shows the results.

Table 4: CHP Performance Scores in TB Service Indicators Based on CHAs' Self-Reported CHPs and CHAs Questionnaire Responses

TB Service Indicator	Study Period	Low Performance n (%)	High Performance n (%)	χ^2 (df=1)	p-value	Cramer's V
TB sensitization	Baseline	152 (67.9)	72 (32.1)	87.64	<0.001	0.44
	Endline	51 (22.7)	174 (77.3)			
Referral of presumptive TB cases	Baseline	176 (78.6)	48 (21.4)	143.21	<0.001	0.56
	Endline	85 (37.8)	140 (62.2)			
TB contact tracing	Baseline	133 (59.4)	91 (40.6)	201.88	<0.001	0.67
	Endline	11 (4.9)	214 (95.1)			
Tracing TB interrupters	Baseline	123 (54.9)	101 (45.1)	176.52	<0.001	0.63
	Endline	21 (9.3)	204 (90.7)			
Quality of reports	Baseline	123 (54.9)	101 (45.1)	179.84	<0.001	0.63
	Endline	19 (8.4)	206 (91.6)			
Composite CHP performance score	Baseline	154 (68.8)	70 (31.2)	197.66	<0.001	0.66
	Endline	22 (9.8)	203 (90.2)			

All TB service indicators showed clear improvement from baseline to endline based on reported questionnaire responses. TB sensitization increased from 32.1% high performance at baseline to 77.3% at endline ($\chi^2 = 87.64$, $p < 0.001$; Cramer's $V = 0.44$). Presumptive TB case referral improved from 21.4% to 62.2% ($\chi^2 = 143.21$, $p < 0.001$; $V = 0.56$), while TB contact tracing increased substantially from 40.6% to 95.1% ($\chi^2 = 201.88$, $p < 0.001$; $V = 0.67$). Tracing of TB treatment interrupters improved from 45.1% to 90.7% ($\chi^2 = 176.52$, $p < 0.001$; $V = 0.63$), and quality of reports increased from 45.1% to 91.6% ($\chi^2 = 179.84$, $p < 0.001$; $V = 0.63$). The composite CHP performance score similarly improved from 31.2% at baseline to 90.2% at endline ($\chi^2 = 197.66$, $p < 0.001$; Cramer's $V = 0.66$), indicating a strong and consistent improvement in self-reported CHP performance across all TB service delivery domains.

Bivariate Associations between Supportive Supervision and CHPs Performance

Table 5 presents the association between supportive supervision factors, study period, and CHP performance.

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Table 5: Bivariate Association between Supportive Supervision Factors and Chps' Performance Based on Self-Reported Questionnaire Responses

Factor	Category	Low performance n (%)	High performance n (%)	χ^2 (df=1)	p-value	Cramer's V	cOR (95% CI)	p-value
Pre-service Training	Inadequate	134 (74.0)	47 (26.0)	117.06	<0.001	0.51	15.34	<0.001
	Adequate	42 (15.7)	226 (84.3)					
Refresher Training & Mentorship	Inadequate	142 (67.6)	68 (32.4)	105.67	<0.001	0.49	12.59	<0.001
	Adequate	34 (14.2)	205 (85.8)					
Functional Tools & Materials	No	153 (55.4)	123 (44.6)	60.91	<0.001	0.37	8.11	<0.001
	Yes	23 (13.3)	150 (86.7)					
Incentives	No	172 (46.9)	195 (53.1)	41.33	<0.001	0.30	17.20	<0.001
	Yes	4 (4.9)	78 (95.1)					
Feedback Frequency	Infrequent	125 (70.2)	53 (29.8)	96.12	<0.001	0.46	10.17	<0.001
	Frequent	51 (18.8)	220 (81.2)					
Feedback Timeliness	Untimely	128 (78.5)	35 (21.5)	133.94	<0.001	0.55	18.13	<0.001
	Timely	48 (16.8)	238 (83.2)					
Standardized M&E Framework	No	124 (75.2)	41 (24.8)	120.66	<0.001	0.52	13.49	<0.001
	Yes	52 (18.3)	232 (81.7)					
Review Meetings	Irregular	108 (78.3)	30 (21.7)	123.68	<0.001	0.53	12.86	<0.001
	Regular	68 (21.9)	243 (78.1)					
Study Period	Baseline	154 (68.8)	70 (31.2)	197.66	<0.001	0.66	20.30	<0.001
	Endline	22 (9.8)	203 (90.2)					

All supportive supervision factors were significantly associated with CHP performance ($p < 0.001$). Higher proportions of high performance were observed among CHPs with adequate pre-service training (84.3%), refresher training and mentorship (85.8%), functional tools and materials (86.7%), incentives (95.1%), frequent feedback (81.2%), timely feedback (83.2%), a standardized M&E framework (81.7%), and regular review meetings (78.1%) compared to their counterparts. The strength of associations ranged from moderate to strong (Cramer's V = 0.30–0.55), with the strongest associations observed for feedback timeliness (V = 0.55), standardized M&E framework (V = 0.52), review meetings (V = 0.53), and pre-service training (V = 0.51) and refresher training and mentorship (V = 0.49). All factors were significant predictors of CHP performance in the crude analysis ($p < 0.001$), with the highest crude odds ratios observed for feedback timeliness (cOR = 18.13), incentives (cOR = 17.20), pre-service training (cOR = 15.34), standardized M&E framework (cOR = 13.49), and refresher training and mentorship (cOR = 12.59).

The study period, representing the intervention effect, demonstrated a significant improvement in CHP performance. High performance increased from 31.2% at baseline (n = 70) to 90.2% at endline (n = 203), a difference that was statistically significant ($\chi^2 = 197.66$, $p < 0.001$) with a strong effect size (Cramer's V = 0.66). The study period was also a significant predictor of CHP performance, with CHPs exhibiting higher odds of high performance at endline compared to baseline (cOR = 20.30, $p < 0.001$), suggesting a strong intervention effect.

Multivariate Predictors of CHP Performance

Multivariate analysis was performed to determine predictors of high CHPs performance. Results are presented in Table 6.

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Table 6: Multivariable Logistic Regression Analysis of Factors Associated with CHPs' Performance

Predictor	β	SE	Wald χ^2	aOR	95% CI	p-value
Pre-service training (Adequate vs inadequate)	0.803	0.354	5.144	2.23	1.12 – 4.47	0.023
Refresher training & mentorship (Adequate vs inadequate)	0.104	0.436	0.057	1.11	0.47 – 2.61	0.812
Functional tools and materials (Yes vs no)	1.207	0.377	10.238	3.34	1.60 – 7.00	0.001
Incentives (Yes vs no)	0.429	0.64	0.45	1.54	0.44 – 5.39	0.502
Feedback frequency (Frequent vs infrequent)	0.852	0.41	4.315	2.34	1.05 – 5.23	0.038
Timeliness of feedback (Timely vs untimely)	1.552	0.347	20.032	4.72	2.39 – 9.31	<0.001
Standardized M&E framework (Yes vs no)	0.873	0.334	6.839	2.4	1.25 – 4.61	0.009
Review meetings (Regular vs irregular)	0.968	0.346	7.813	2.63	1.34 – 5.19	0.005
Study period (Endline vs baseline)	1.794	0.49	13.429	6.01	2.30 – 15.70	<0.001

The binary logistic regression model was statistically significant (Omnibus $\chi^2 = 299.529$, df = 9, $p < .001$), indicating that the predictors collectively explained variation in CHPs' performance in TB services. The model explained between 48.7% (Cox & Snell R^2) and 66.0% (Nagelkerke R^2) of the variance. The Hosmer–Lemeshow test was not significant ($\chi^2 = 9.897$, $p = .195$), suggesting good model fit. Overall classification accuracy was 84.2%, with 80.1% accuracy for low performance and 86.8% for high performance.

Multicollinearity diagnostics indicated no concern, with tolerance values ranging from 0.291 to 0.689 and VIF values from 1.45 to 3.44.

Pre-service training was a significant predictor, where CHPs with adequate training had higher odds of good performance compared to those with inadequate training (aOR = 2.23, 95% CI: 1.12–4.47, p = 0.023). Availability of functional tools and materials was also a strong independent predictor, with CHPs having access showing higher odds of good performance (aOR = 3.34, 95% CI: 1.60–7.00, p = 0.001).

Frequent feedback was associated with increased odds of high performance compared to infrequent feedback (aOR = 2.34, 95% CI: 1.05–5.23, p = 0.038), while timely feedback showed the strongest effect among supervision-related factors, with CHPs receiving timely feedback having higher odds of good performance than those receiving untimely feedback (aOR = 4.72, 95% CI: 2.39–9.31, p < 0.001).

The presence of a standardized M&E framework was also associated with higher odds of performance (aOR = 2.40, 95% CI: 1.25–4.61, p = 0.009), and regular review meetings similarly increased the odds of high performance compared to irregular meetings (aOR = 2.63, 95% CI: 1.34–5.19, p = 0.005).

Refresher training and mentorship (aOR = 1.11, 95% CI: 0.47–2.61, p = 0.812) and incentives (aOR = 1.54, 95% CI: 0.44–5.39, p = 0.502) were not significantly associated with CHP performance after adjustment.

The study period, representing the intervention effect, remained a strong independent predictor, with CHPs having higher odds of good performance at endline compared to baseline (aOR = 6.01, 95% CI: 2.30–15.70, $p < 0.001$), indicating a significant positive effect of the intervention after controlling for other factors.

Discussion

The respondents were predominantly middle-aged (31–50 years), with minimal variation between baseline and endline, indicating that comparisons before and after the intervention were conducted within a consistent participant group. This strengthens the validity of the observed changes in CHPs' performance. Most CHAs were below 40 years, suggesting a relatively younger supervisory cadre overseeing older CHPs, a dynamic previously associated with supervisory tension and reduced influence (Ogutu et al., 2023).

The gender distribution reflects the typical composition of the healthcare workforce, where women form the majority, consistent with the increasing feminization of frontline and primary healthcare cadres (Alobaid et al., 2020). The predominance of married respondents suggests competing family responsibilities, which may contribute to burnout and reduced service quality (Ndu et al., 2022). Supervisory caseloads remained relatively stable across the study period; however, household coverage per CHP increased during the intervention. This exceeded Community Health Strategy (CHS) recommendations of a maximum of 100 households per CHP and approximately 10 CHPs per CHA (Ministry of Health [MOH] Kenya, 2021a), indicating an overstretched workforce that may compromise the quality and consistency of supportive supervision and TB service delivery.

The improvement in CHAs' pre- and post-training test scores demonstrates that the training component effectively strengthened supervisory capacity, equipping CHAs with the knowledge and skills necessary to support CHPs. Enhanced supervisory competence is likely to improve guidance, mentorship, and monitoring, thereby strengthening community TB service delivery. This aligns with evidence that effective supervision plays a critical role in supporting CHPs, addressing challenges, and improving service delivery (Cuvelier, 2024). The large effect size (Cohen's $d = 1.84$) further confirms the substantial impact of the training intervention.

Significant improvements were observed across key CHP performance indicators. Community sensitization on TB increased by 83.2%, suggesting enhanced knowledge dissemination at community level (Feldman et al., 2021). Referral of presumptive TB cases improved by 61.1%, underscoring the critical role of CHPs in case detection and linkage to care (Querri et al., 2017). TB contact tracing increased by 133.9%, highlighting its contribution to reducing transmission and improving case notification (Abongo et al., 2020). Tracing of treatment interrupters improved by 106.7%, supporting evidence that CHPs play a key role in monitoring adherence and addressing barriers to treatment completion (MOH Kenya, 2021b). Additionally, the quality of reports improved by 44.9%, reinforcing the importance of high-quality community-level data in strengthening service delivery (Regeru et al., 2020).

Multivariate analysis showed that refresher training and availability of incentives were not statistically significant predictors of performance. This contrasts with evidence suggesting that ongoing mentorship and incentives enhance employee performance (Altaras et al., 2024; Mwanyoha et al., 2025; Chiguzo et al., 2022). One possible explanation is that refresher training opportunities may be perceived as inequitable (Mutegi, 2020), while the voluntary nature of CHP work suggests motivation may be driven more by community health outcomes than material incentives.

Overall, both the intervention and key supportive supervision components, including timely and frequent feedback, availability of functional tools, structured monitoring and evaluation systems, regular review meetings, and adequate training, were significant predictors of improved CHPs' performance. These findings highlight the importance of strengthening supportive supervision systems to enhance the effectiveness of CHPs in community TB service delivery. This is consistent with evidence that supportive supervision improves staff competence, knowledge, and overall performance (Raven et al., 2020), and reinforces its role as a critical mechanism for sustaining motivation, role clarity, and effectiveness among CHPs (Gopalakrishnan et al., 2021; Cometto et al., 2018; Ludwick et al., 2018).

Study Limitations

Contact tracing efforts were limited by gated communities who denied access to CHPs. Cross border TB treatment interrupters and patients transferred out to other counties limited CHPs' tracing efforts. The other limitation was the timing and duration of the study intervention of May to October where the effect of CHPs performance could not be assessed on the treatment outcomes among 2025 TB patients.

SUMMARY, CONCLUSION AND RECOMMENDATIONS

Summary

The performance of CHPs improved substantially following the intervention across all key indicators, including community TB sensitization, referral of presumptive cases, contact tracing, tracing of treatment interrupters, and quality of reporting. Baseline assessments indicated moderate but sub-optimal performance characterized by inconsistent supervision, limited tools, and gaps in feedback systems. Post-intervention findings demonstrated marked improvements in service delivery outcomes, supported by strengthened supervision practices, regular performance reviews, improved documentation, and enhanced accountability mechanisms. Monthly supervision records confirmed steady progress throughout the intervention period.

The study found that supportive supervision significantly improved CHPs' performance in community TB services through four key components: capacity building, resource availability, feedback mechanisms, and monitoring and evaluation (M&E) systems. Capacity building enhanced CHAs' supervisory competencies, with pre-service training emerging as the strongest and most consistent predictor of improved performance. Resource availability also played a critical role, as access to functional tools, standardized reporting instruments, and supervision checklists significantly strengthened service delivery. Structured feedback mechanisms improved the frequency, timeliness, and documentation of supervisory feedback, fostering accountability, corrective guidance, and continuous performance improvement. In addition, strengthened M&E systems, characterized by standardized supervision frameworks, routine use of checklists, and regular performance review meetings, enhanced data utilization and accountability.

The findings indicate that CHA training played a moderating role in strengthening the relationship between supportive supervision and CHPs' performance. The structured training improved CHAs' supervisory competencies, including mentoring, monitoring, documentation, and feedback provision. Enhanced CHA capacity amplified the effectiveness of other supportive supervision components, thereby reinforcing improvements in CHPs' performance. This confirms that well-trained supervisory personnel are central to translating supportive supervision systems into measurable service delivery outcomes.

Conclusion

This study contributes to the growing evidence on supportive supervision by demonstrating that its effectiveness arises from the integration and interaction of multiple components rather than from individual elements operating independently. The findings show that capacity building, resource availability, structured feedback, monitoring and evaluation, and quality reporting function synergistically within a coordinated performance management framework to enhance CHPs' performance in community TB services. The study further establishes that training Community Health Assistants on supportive supervision plays a critical moderating role by strengthening supervisory competence and enabling the effective implementation of supervision tools, standards, and practices. The findings also extend Attachment Theory which puts emphasis on the importance of supportive relationships in boosting confidence, motivation, and optimal functioning. In this study, the supportive supervision and structured engagement between CHAs and CHPs may have created a secure attachment that enhanced CHPs' sense of trust, guidance, and psychological safety. This relational support likely enabled CHPs to perform their roles more effectively across community TB service domains. The consistent improvements observed suggest that when CHPs perceive their supervisors as accessible and supportive, their commitment and performance are enhanced. Overall, the study presents a multidimensional, theory-driven model of supportive supervision that emphasizes integration, strengthened supervisory capacity, and system-level approaches as key drivers of improved community health service delivery.

Recommendations

Based on the findings, the study recommends that the Ministry of Health and County Governments institutionalize structured supportive supervision through standardized policy frameworks and integrate it into national and county health strategies, including TB-specific supervision guidelines where appropriate. It further recommends sustained funding for supervisory activities such as training, transport facilitation, monitoring tools, and operational resources to ensure effective and consistent implementation. Additionally, County Governments should address human resource shortages by ensuring adequate numbers of Community Health Assistants relative to Community Health Promoters and population needs. Adequate staffing and balanced workload distribution are critical for maintaining regular supervision, enhancing service quality, and sustaining the effectiveness of supportive supervision interventions. Without sufficient human resources for health, the impact and sustainability of supportive supervision systems may be significantly compromised.

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