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Shifting care-seeking pathways for childhood illness: differential evidence from five years of integrated community case management in Busia County, Kenya

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Abstract

Background

Malaria, acute respiratory infections, and diarrhoea remain leading causes of morbidity and mortality among children under five in sub-Saharan Africa, placing a substantial burden on health facilities in low-resource settings. Integrated Community Case Management (iCCM) aims to shift the management of these illnesses to the community through trained Community Health Volunteers (CHVs), yet longitudinal evidence on whether CHVs can sustainably redistribute this burden within Kenya's community health model remains limited. This study examined the contribution of iCCM-supported CHVs to shifting care-seeking pathways for childhood illness in Busia County, Kenya, over 2017–2022.

Methods

A repeated cross-sectional design with three data points; baseline (2017), midline (2018), and endline (2022) was employed. Household surveys assessed care-seeking behaviour and treatment access for malaria, ARIs, and diarrhoea among children under five. Facility morbidity data were reviewed to examine trends in uncomplicated illness presentations. Qualitative data were collected at endline through in-depth interviews with caregivers, CHVs, and iCCM programme implementers to contextualise care-seeking practices and implementation challenges.

Results

Improvements in care-seeking were observed across all three illnesses, but gains were markedly differential. For malaria, care-seeking rose from 84.0% to 100.0% and prompt care within 24 hours increased from 38.1% to 58.9%. By 2022, CHVs conducted 54.9% of malaria tests and provided 35.4% of treatments, coinciding with declining home remedy use and fewer uncomplicated malaria cases presenting at government facilities. For ARIs, care-seeking improved but CHV treatment involvement remained limited, with pharmacies and facilities serving as primary sources due to recurrent commodity stockouts. Diarrhoea care-seeking improved, but ORS/Zinc use declined markedly from 68.2% to 24.5%, reflecting persistent supply failures. Qualitative findings revealed increasing caregiver trust in CHVs and a growing preference for community-based first-contact care, particularly for malaria.

Conclusion

The shift in care-seeking pathways associated with iCCM was disease-specific rather than uniform, being substantial for malaria but limited for ARIs and diarrhoea, where persistent commodity stockouts and uneven CHV coverage constrained gains. Strengthening supply chains, ensuring equitable CHV

deployment, and sustaining motivation mechanisms are essential to extending these gains across the full scope of childhood illness management.

Background

Despite global progress in child health, malaria, acute respiratory infections (ARI), and diarrhoea remain leading causes of morbidity and mortality among children under five years of age, particularly in sub-Saharan Africa (SSA) (1–3). These preventable illnesses significantly contribute to outpatient consultations, hospital admissions, and child deaths, disproportionately affecting low-resource settings with limited access to timely healthcare (4). In such settings, childhood illnesses place a considerable burden on both households and the healthcare system, especially in areas with constrained access to health facilities (5). Barriers such as geographic inaccessibility, cost, long waiting times, and shortages of skilled health workers further hinder access to prompt treatment (6).

To address the increased risk of severe illness and mortality among children in underserved areas (7), the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) recommended Integrated Community Case Management (iCCM) as an effective strategy to improve access to timely care (8). Under iCCM, community health volunteers (CHVs), when appropriately trained, supervised, and supported with an uninterrupted supply of medicines and equipment, can identify and effectively treat most children with pneumonia, diarrhoea, and malaria (9).

In Kenya, the National Framework and Plan of Action provides the platform for iCCM implementation (10). Within this framework, CHVs, currently referred to as community health promoters (CHPs), are trained to treat diarrhoea via oral rehydration salts (ORSs) and zinc; diagnose malaria with rapid diagnostic tests (mRDTs); treat uncomplicated cases with artemisinin-based combination therapy (ACT); and assess, classify, and treat children with fast breathing (but no danger signs) via amoxicillin dispersible tablets (DTs). They also provide prereferral treatment and refer children exhibiting danger signs or severe symptoms. This approach ensures timely treatment, reduces reliance on health facilities for uncomplicated malaria cases, and improves health outcomes, thereby strengthening primary healthcare and advancing progress toward Universal Health Coverage (UHC).

While there is substantial evidence on iCCM effectiveness in Kenya (11–14), in Uganda (15–19), Ethiopia (20–22), Zambia (23, 24) and across other sub-Saharan African (SSA) settings (25–27), most existing studies focus on short-term outcomes such as treatment coverage and case fatality rates, with fewer examining longitudinal shifts in care-seeking pathways or whether iCCM produces differential gains across disease conditions. Within Kenya specifically, evidence on the extent to which CHVs operating under the national community health strategy can sustainably shift the burden of managing uncomplicated childhood illnesses away from health facilities remains limited, particularly in the context of evolving programme models and digital health integration. Against this background, the present study aimed to examine the contribution of iCCM-supported CHVs to shifting care-seeking pathways for childhood illness in Busia County, Kenya, over the period 2017–2022. Specifically, the study: assessed

trends in care-seeking behaviour for malaria, ARI, and diarrhoea among children under five years of age across baseline (2017), midline (2018), and endline (2022); examined changes in sources of treatment and trends in the timeliness of care-seeking for each of the three illnesses across the three time points; analysed trends in facility morbidity data to assess whether community-level iCCM was associated with reduced facility utilisation over time; and explored caregivers', CHVs', and key iCCM implementation staff perspectives on care-seeking practices, CHV effectiveness, and barriers to implementation. The findings aim to inform policy decisions on CHV deployment, supply chain strengthening, and the sustainable scale-up of iCCM within Kenya's ongoing UHC reforms.

Methods

Context of the iCCM project in Busia

From 2017 to 2022, Living Goods in partnership with the Busia County Government implemented the iCCM project to improve access to essential healthcare services in Busia County, Kenya (28). The project empowered CHVs to deliver iCCM and other maternal neonatal and child health (MNCH) interventions through a digital health platform to guide CHVs through standardized protocols for assessing, diagnosing, treating, and referring children under five years of age with malaria, ARI, and diarrhoea. The intervention was based on the platform known as the DESC (Digitally enabled, Equipped, Supervised, and Compensated) approach, which ensures that CHVs are equipped with digital tools, essential medicines, diagnostic tools, necessary training, supervision for accountability, and adequate compensation to motivate and empower them. The CHVs, equipped with these resources, conducted door-to-door visits in their communities to educate, assess, and treat children under five years for malaria, diarrhoea, and pneumonia; track and refer them for lifesaving immunizations; and support women of childbearing age in pregnancy care and family planning (29).

The CHVs implementing iCCM were government-registered, selected by their communities and supported by Living Goods. Each CHV was expected to cover between 150 and 200 households. CHVs receive essential commodities, including malaria rapid diagnostic tests (mRDTs) and medicines from health facilities and medicines for pneumonia and diarrhoea from Living Goods. They were supervised by government-employed community health assistants (CHAs) and mentored by Living Goods staff, with each supervisor overseeing approximately 40 CHVs. Initially, the programme operated an entrepreneurial model whereby CHVs generated income by selling health products while providing iCCM and other health services. However, in 2019, a free medicine model was adopted. This was after realization that while the entrepreneurial model would offer a short-term solution for ensuring access to medicine, it was imposing financial barriers to caregivers through user fees and therefore was unsustainable for long-term impact (30).

Study design and setting

This study employed a repeated cross-sectional design with three data points; baseline (April 2017), midline (August 2018), and endline (December 2022) to examine trends in childhood illness care-seeking and treatment access over a five-year period. The study was initially planned as a two-point pre-post assessment, with baseline data collection in 2017 and endline data collection in 2019. A midline assessment was subsequently introduced in 2018 to capture intermediate programme outcomes, and the endline was delayed to 2022 due to disruptions caused by the COVID-19 pandemic, which also independently affected iCCM service delivery during this period.

Quantitative data were collected at all three time points through household surveys and health facility record reviews. Qualitative data were collected at endline through in-depth interviews with caregivers, CHVs, and key iCCM implementation staff. Together, these components constituted an explanatory sequential mixed-methods design (31). A mixed-methods approach was selected because understanding not only whether care-seeking patterns changed but also why they changed and why gains differed across disease conditions required both quantitative trend data and qualitative contextual insight that neither approach could provide independently. The quantitative approach was the dominant component, with qualitative used to provide explanatory depth that trend data alone could not capture, particularly regarding the mechanisms driving differential gains across disease conditions and the structural barriers limiting CHV effectiveness. Integration occurred at the interpretation stage, where qualitative themes were systematically triangulated with quantitative findings, convergent results used to strengthen conclusions, and divergent findings examined to identify explanations for discordance between the two approaches.

The study was conducted in Busia County in western Kenya, a predominantly rural county with a high burden of childhood illness and an established community health strategy operationalised through government-registered CHVs. The intervention was implemented in Nambale sub-county, which has a population of 111,636 (32). Eight community units namely Buyofu, Khwirale A, Kisoko A, Lupida, Madibo A, Malanga A, Mungatsi A, and Syekunya were selected for the study on the basis of their participation in iCCM interventions from inception.

Study population

The study targeted caregivers of children under five years of age in selected households, collecting information on illness prevalence, care-seeking, and treatment within the two weeks preceding the survey. A two-stage cluster sampling approach was used, with clusters of 100–120 households randomly selected, followed by random selection of 40–50 households within clusters. Households were excluded if no child under five years of age was resident at the time of the survey. At endline, qualitative data were collected from CHVs, caregivers and key iCCM implementation stakeholders.

The sample size was calculated to detect changes in ACT treatment coverage for malaria as the primary outcome, using a two-proportion comparison formula (95% confidence, 90% power) (33). Based on an anticipated increase in timely ACT treatment from 36.5% to 50%, and adjusting for a design effect of 2.0

and 10% non-response, the minimum required sample was 400 households at each of the three time points, baseline, midline, and endline. The study was not formally powered to detect changes in ARI or diarrhoea outcomes; findings for these conditions should therefore be considered secondary and exploratory, and observed changes interpreted with appropriate caution.

For the qualitative approach, a maximum variation purposive sampling strategy was used to ensure diversity across community units, participant roles, and levels of iCCM programme exposure.

Data collection and data sources

The primary data sources included household surveys involving structured interviews with caregivers to assess care-seeking behavior and treatment access for malaria, ARI, and diarrhoea; health facility records reviewed to examine trends in childhood illness healthcare utilization; and routine health system reports involving analysis of county health information system data on service utilization and disease trends. Facility morbidity data were extracted from health management information system records at eight linked government health facilities within the study sub-county. Complete facility data were available only from 2020 onwards, as standardised electronic reporting through the District Health Information System version 2 (DHIS2) was not consistently implemented at these facilities prior to 2020. Data for 2017–2019 were therefore unavailable and facility trend analyses are restricted to the 2020–2022 period.

The quantitative data collection used pretested structured questionnaires administered via a mobile-based Open Data Kit (ODK) data collection platform (34). The household survey questionnaire was developed for this study by the research team, drawing on standard Kenya Demographic and Health Survey household and child health modules and Living Goods' iCCM monitoring indicators. The tool was pretested and adapted to the local context prior to baseline data collection. The full questionnaire is provided in English as Supplementary File 1 (Survey tool). Trained research assistants conducted the surveys, ensuring consistency across all time points. Data quality was maintained through real-time uploads, daily quality checks, and supervision by field leads.

The primary outcomes assessed were: proportion of caregivers seeking care, source of first treatment, timeliness of care-seeking within 24 hours, and proportion receiving recommended treatment for each illness across the three time points.

Qualitative data were also collected from CHVs, caregivers, and key iCCM implementation staff to provide insights into care-seeking behaviour and implementation challenges. In-depth interviews were administered in person by two members of the research team (EE and DM), conducted in either English or Swahili depending on participant preference. Each session was captured through simultaneous audio recording and written field notes, with individual interviews typically lasting between 45 and 60 minutes. All sessions took place in private, enclosed spaces within the community to ensure confidentiality and participant comfort. The interview guide underwent field pretesting prior to data collection, with

necessary refinements incorporated before the main interviews commenced. The interview guides for caregivers, CHVs, and iCCM implementation staff are provided in English as Supplementary File 2 (Qualitative interview guides). Data collection continued across all participant groups until no new themes or codes emerged, indicating that saturation had been reached.

Data management

Data were transmitted to a secure central server in real time, with regular backups and access controls to ensure confidentiality. The data were merged and analysed via IBM SPSS version 27. Exploratory data analysis (EDA) was conducted to check for outliers and inconsistencies (35). Missing data were minimal and handled through complete case analysis. Denominators vary across survey items reflecting the number of participants to whom each question was applicable, as indicated in the tables.

Descriptive statistics were used, with all variables of interest being categorical and are presented as proportions. Given the exploratory and programme-monitoring nature of this evaluation, the analysis was primarily descriptive, focusing on trends in proportions across the three time points. Inferential statistical testing was not performed, and observed changes should therefore be interpreted with caution. No subgroup analyses or sensitivity analyses were conducted, given the descriptive evaluation design.

Audio recordings were transcribed in full and those conducted in Swahili were translated into English by a qualified professional translator, ensuring verbatim accuracy. Qualitative analysis followed an inductive thematic framework (36), allowing themes, codes, and categories to emerge organically from the data rather than being imposed a priori. Three members of the research team (EE, DM, and RO) each engaged independently with the full set of transcripts and field notes through repeated readings to develop deep familiarity with the data. Working from a random selection of transcripts, each analyst generated initial codes by identifying and labelling meaningful segments of text and foregrounding key concepts arising from participants' accounts of care-seeking practices and implementation experiences. Codes with shared characteristics were subsequently grouped into broader categories, which were then interrogated to surface overarching themes. To strengthen analytical rigour, coded segments and emergent themes were reviewed collectively, with contradictory or discrepant cases examined in detail. Where coding disagreements arose, analysts returned to the original transcripts to reach consensus. Representative excerpts from participant accounts are presented throughout the findings to illustrate key themes

This study is reported in accordance with the Good Reporting of A Mixed Methods Study (GRAMMS) (37) guidelines and the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) (38) checklist for the quantitative observational component. Completed checklists are provided as Supplementary Files 3 and 4.

Results

Study coverage and participant characteristics

In total, 348/400 (87%) at baseline, 501/500 (100%) at midline, and 382/400 (95%) of the eligible households participated in the study. Across the three survey time points, caregivers were predominantly in their mid-reproductive years, with median ages ranging from 27.0 to 30.0 years. Primary school education was the most common level of attainment at all time points. Among children, data available at midline and endline indicate that the majority were in the early childhood age category, accounting for 54.2% at both time points, with infants and toddlers comprising the remainder (Table 1).

Table 1
Demographic and socioeconomic characteristics of household survey participants

Variables	**Baseline**	**Midline**	**Endline**
	n = 348	**n = 501**	**n = 382**
Caregiver age	Median 27.0, IQR 12 (23–35)	Median 30.0, IQR 11(25–36)	Median 29.0, IQR 11(24–35)
Age category			
Early reproductive age	114 (32.8)	100 (19.9)	108 (28.3)
Mid reproductive age	140 (40.2)	257 (51.2)	182 (47.6)
Late reproductive age	94 (27.0)	145 (28.9)	92 (24.1)
Caregiver's level of education			
Never attended school	23 (6.6)	13 (2.6)	6 (1.6)
Primary school	247 (71.0)	326 (64.9)	227 (59.4)
Secondary school	73 (21.0)	131 (26.1)	129 (33.8)
Tertiary institution	5 (1.4)	32 (6.4)	20 (5.2)
Children age categories			
Infant	-	96 (25.1)	96 (25.1)
Toddler	-	79 (20.7)	79 (20.7)
Early Childhood	-	207 (54.2)	207 (54.2)

A total of 42 informants were interviewed at endline for the qualitative approach. They included 16 CHVs comprising 8 male and 8 female, aged between 40–58 years, and had between two to five years of iCCM experience; 18 caregivers (all female, reflecting the primary caregiving role in the study context); and 8 key iCCM programme implementation staff including county health officers and Living Goods programme supervisors.

Malaria care-seeking, treatment access, and facility utilisation trends

Malaria prevalence fluctuated from 21.7% at baseline to 28.1% at midline before declining to 24.9% at endline. Care-seeking improved markedly, rising from 84.0% in 2017 to 100.0% in 2022. Prompt care within 24 hours increased from 38.1% in 2018 to 58.9% in 2022, while delays beyond two days declined from 42.1% to 22.2% over the same period (Table 2).

Table 2
Distribution of malaria care-seeking behavior and access to treatment from 2017–2022

Measure	Baseline (2017) [n = 346]	Midline (2018) [n = 501]	Endline (2022) [n = 382]
Prevalence of malaria	75(21.7%)	141(28.1%)	95(24.9%)
Sought advice following symptoms	**n = 75**	**n = 141**	**n = 95**
	63(84.0%)	116(82.3%)	95(100.0%)
Source of advice	**n = 63**	**n = 116**	**n = 95***
Government facility	28 (44.4%)	49 (42.2%)	42(44.2%)
CHV	19 (30.2%)	29 (25.0%)	36(37.9%)
Private facility	1(1.6%)	6 (5.2%)	3(3.2%)
Pharmacy	14(22.2%)	29 (25.0%)	17(17.9%)
Home remedies	1(1.6%)	3 (2.6%)	1(1.1%)
Timeliness of care seeking	**n = 63**	**n = 116**	**n = 95**
Within 24 hours	37(58.7%)	21(38.1%)	56(58.9%)
Following day	7(11.1%)	23(19.8%)	18(18.9%)
2 days and more	19(30.2%)	72(42.1%)	21(22.2%)
Child tested for malaria (mRDT)	**n = 75**	**n = 78****	**n = 95**
	38 (50.7%)	68(87.2%)	71(74.7%)
Malaria testing/mRDT source	**n = 38**	**n = 78**	**n = 71***
Home by CHV	0	20 (25.6%)	39 (54.9%)
Government facility	28 (73.7%)	48 (61.5%)	32 (45.1%)
Pharmacy	0	3 (3.8%)	0_
Private facility	10 (26.3%)	7 (9.0%)	3(4.2%)
Received anti-malarial/ACT	**n = 75**	**n = 78**	**n = 95**
	64 (85.3%)	70 (89.7%)	79 (83.2%)
Antimalarial source	**n = 64**	**n = 67**	**n = 79***

* Multiple responses

**Testing denominators reflect children for whom testing was sought, not all children with reported malaria symptoms. Not all caregivers sought formal testing before treatment

Measure	Baseline (2017) [n = 346]	Midline (2018) [n = 501]	Endline (2022) [n = 382]
Public facility	14 (21.9%)	54 (80.6%)	31 (39.2%)
Private hospital	9 (14.1%)	4 (6.0%)	1 (1.3%)
Pharmacy	1 (1.6%)	0 (0.0%)	22 (27.8%)
CHV	_0	6 (9.0%)	28 (35.4%)
Other (home remedies)	40 (62.5%)	3 (4.4%)	0 (0.0%)
* Multiple responses			
**Testing denominators reflect children for whom testing was sought, not all children with reported malaria symptoms. Not all caregivers sought formal testing before treatment			

CHVs became increasingly central to malaria care over time. Their role as first source of advice grew from 30.2% in 2017 to 37.9% in 2022, while CHV-conducted malaria testing at home rose from 25.6% in 2018 to 54.9% in 2022, correspondingly reducing government facility testing from 73.7% in 2017 to 45.1% in 2022. CHV-provided antimalarial treatment increased from 9.0% in 2018 to 35.4% in 2022, while government facility treatment declined from 80.6% to 39.2% over the same period. Antimalarial treatment access remained consistently high across all time points (≥ 83%). Home remedy use fell entirely, from 62.5% in 2017 to 0% in 2022, reflecting a strong shift toward formal treatment. Government facility use remained relatively stable at approximately 44%, while pharmacy reliance rose to 27.8% in 2022, possibly reflecting episodic facility stockouts (Table 2).

Morbidity data from linked facilities show a declining trend in uncomplicated malaria presentations from 2020 to 2022 (Fig. 1), consistent with the growing role of CHVs in community-level case management.

* Data unavailable for 2017, 2018 and 2019

Caregivers consistently described CHVs as accessible, available, and trusted first-contact providers:

"CHV is important because the child may fall sick at night, and I do not have the means to take her to the hospital; the first person I run to is CHV." (Caregiver_IDI18)

"I called her, she came and tested this child… he was found with fever and malaria, that is when she treated him… she gave him AL and panadol syrup." (Caregiver_IDI13)

Key informants corroborated a reduction in facility workload attributable to CHV involvement:

"Workload at health facility is reduced. A mother just contacts a CHV and services are brought at the doorstep… you don't often see queues as they have already been attended at the community." (iCCM Staff_02)

"… it has reduced the workload in the facility *by ensuring that CHVs have commodities…the facility will only give out drugs, but they won't do follow up as CHVs do.* We have reduced cost, time and even workload at the facility". (iCCM Staff_04)

Cough/ARI care-seeking, treatment access, and facility utilisation trends, 2017–2022

ARI prevalence declined steadily from 26.0% in 2017 to 15.4% in 2022, suggesting a reduction in the community burden of respiratory illness over the study period. Care-seeking improved substantially, rising from 53.3% in 2017 to 88.1% in 2022. Prompt care within 24 hours recovered from a low of 5.2% in 2018 to 50.0% in 2022, while delays beyond two days declined from 76.3% to 30.8% over the same period. (Table 3).

Table 3
Cough/ARI care-seeking behaviour and access to treatment among children under five years of age, Busia County, Kenya, 2017–2022

Measure	Baseline (2017) [n = 346]	Midline (2018) [n = 501]	Endline (2022) [n = 382]
Prevalence of cough/ARI	90(26.0%)	113(22.6%)	59(15.4%)
Sought treatment/advice for ARI	**n = 90**	**n = 113**	**n = 59**
	48 (53.3%)	97(85.8%)	52(88.1%)
First source of advice for ARI	**n = 48**	**n = 97**	**n = 52***
Government facility	14 (29.2%)	52 (53.6%)	22 (42.3%)
Private facilities	1(2.1%)	5 (5.2%)	1(1.9%)
Pharmacy	17 (35.4%)	22(22.7%)	24 (46.2%)
CHV	11 (22.9%)	18 (18.6%)	7 (13.5%)
Other (home remedies)	5(10.4%)	0 (0.0%)	0 (0.0%)
Treatment received/yes	**n = 31**	**n = 97***	**n = 40***
Antibiotic (amoxilin)	9 (29.0%)	61 (62.9%)	25 (62.5%)
Antibiotic Injection	0	0 (0.0%)	5(12.5%)
Cough syrup	0	0 (0.0%)	13(32.5%)
Paracetamol	8(25.8%)	67(69.1%)	12(30.0%)
Other antibiotics	14(45.2%)	9(9.3%)	6(15.0%)
Source of treatment		**n = 87**	**n = 40***
Government facilities	**	41(47.1%)	16 (40.0%)
Private facilities	**	4 (4.6%)	0 (0.0%)
Pharmacy	**	26 (29.9%)	21 (52.5%)
CHV	**	15 (17.2%)	3 (7.5%)
Other (home remedies)	**	1 (1.1%)	1 (2.5%)
Care sought	**n = 48**	**n = 97**	**n = 52**
Within 24 hours	26 (54.2%)	5 (5.2%)	26(50.0%)

*Multiple responses,

 Percentages may not sum to 100% due to rounding

Measure	Baseline (2017) [n = 346]	Midline (2018) [n = 501]	Endline (2022) [n = 382]
Following day	5 (10.4%)	18 (18.6%)	10(19.2%)
2 days and more	17 (35.4%)	74 (76.3%)	16(30.8%)
*Multiple responses,			
Percentages may not sum to 100% due to rounding			

Despite these improvements, CHVs played a limited treatment role for ARIs throughout the study period. CHV use as a first source of ARI care declined from 22.9% in 2017 to 13.5% in 2022, while pharmacies emerged as the leading source of care at endline (46.2%), surpassing government facilities (42.3%). Home remedy use fell to 0% by 2022, reflecting a clear shift toward formal care. The use of amoxicillin increased from 29.0% in 2017 to 62.5% in 2022, while paracetamol use declined from 64.7% in 2018 to 30.0% in 2022, suggesting a shift toward more targeted antibiotic treatment. Facility morbidity data show a declining trend in ARI presentations over the study period (Fig. 2).

Qualitative findings indicate that CHVs functioned primarily in advisory and referral roles for ARI rather than as treatment providers, largely due to persistent commodity stockouts:

"She mostly deals with malaria; if the child is coughing a lot, she refers me to go for a checkup." (Caregiver_IDI16)

CHVs themselves confirmed recurrent shortages of pneumonia medicines:

"For those with pneumonia, we were not given drugs last month. I think there was a shortage." (CHV_IDI15)

Caregivers expressed frustration at being redirected elsewhere when CHVs lacked stock, highlighting the financial burden this created:

"There are times you can go to her, and she tells you there are no pneumonia drugs and you have to go to the hospital." (Caregiver_IDI16)

Nonetheless, caregivers valued the preventive and advisory role CHVs played, particularly around pneumonia recognition and prevention:

"She did tests and found the child did not have malaria but flu… she gave me amoxyl and panadol and advised on warm clothing." (Caregiver_IDI13)

Diarrhoea care-seeking, treatment access, and facility utilisation trends, 2017–2022

Diarrhoea prevalence rose steadily across the study period, doubling from 6.4% in 2017 to 12.8% in 2022, representing the most concerning epidemiological trend observed across the three illnesses. Care-seeking fluctuated, declining from 86.4% in 2017 to 55.3% in 2018 before recovering to 73.5% in 2022. Timeliness improved substantially, with prompt care within 24 hours rising from 11.5% in 2019 to 58.3% in 2022, and delayed care beyond two days declining from 57.7% to 25.0% over the same period. (Table 4).

Table 4
Diarrhoea care-seeking behaviour and access to treatment among children under five years of age, Busia County, Kenya, 2017–2022

Measure	**Baseline (2017)**	**Midline (2018)**	**Endline (2022)**
	[n = 346]	**[n = 501]**	**[n = 382]**
Diarrhoea prevalence	22(6.4%)	47(9.4%)	49(12.8%)
Sought advice/treatment for diarrhoea	n = 22	(n = 47)	n = 49
	19(86.4%)	26(55.3%)	36(73.5%)
Source of advice/treatment_	**n = 19**	**(n = 26)**	**n = 36***
Public Health Facilities	6(31.6%)	12(46.2%)	18(50.0%)
Private Health Facilities			2(5.6%)
CHV	5(26.3%)	7(26.9%)	9(25.0%)
Pharmacy	4(21.1%)	6(23.1%)	6(16.7%)
Others (home, traditional)	4(21.1%)	1(3.8%)	1(2.8%)
Received ORS/Zinc combination	**(n = 22)**	**(n = 47)**	**(n = 49)**
	15 (68.2%)	17(36.2%)	12(24.5%)
Source of ORS/Zinc combination	**	**(n = 27)**	**(n = 49)**
Government facilities		2(8.0%)	19 (38.8%)
Private facilities		10(40.0%)	2 (4.1%)
Pharmacy		0_	7 (14.3%)
Other (home remedies)		13 (52.0%)	11 (22.4%)
CHV		0_	10 (20.4%)
Care seeking within 24 hours	**(n = 19)**	**(n = 26)**	**(n = 36)**
within 24 hours	6(31.6%)	3(11.5%)	21(58.3%)
Following day	6(31.6%)	8(30.8%)	6(16.7%)
2 days and more	7(36.8%)	15(57.7%)	9(25.0%)

**Source of ORS/Zinc at baseline was not systematically recorded in the baseline survey instrument. This data point was introduced at midline and endline.

Government health facilities remained the primary source of diarrhoea care throughout, increasing from 31.6% in 2017 to 50.0% in 2022. CHV utilisation remained stable at approximately 25% across all time points, while pharmacy use declined modestly from 21.1% to 16.7%. Home remedy and traditional healer

use fell from 21.1% in 2017 to 2.8% in 2022, reflecting a shift toward formal care. Facility morbidity data show a declining trend in diarrhoea presentations over the study period (Fig. 3).

The most striking finding for diarrhoea was the marked decline in ORS/Zinc use, which fell from 68.2% in 2017 to 24.5% in 2022 despite ORS/Zinc remaining the WHO-recommended first-line treatment. This decline occurred against a backdrop of rising diarrhoea prevalence and improved care-seeking, suggesting that supply-side failures rather than demand-side factors drove the trend. By 2022, government facilities had become the primary source of ORS/Zinc (38.8%), while CHV provision accounted for 20.4%, indicating some community-level supply but insufficient to meet demand consistently. The source of ORS/Zinc at baseline was not captured in the survey instrument and is therefore unavailable for the 2017 time point; comparative source analysis is available for midline and endline only.

iCCM implementation challenges

Incentives and CHV motivation

Inconsistent and inadequate incentives emerged as a persistent barrier to CHV motivation and performance. CHVs and key informants drew a clear contrast between the reliable incentives provided by the implementing partner and the irregular government stipend, which was frequently delayed or insufficient:

"The funder gives an incentive that is monthly and consistent. However, the government stipend is not consistent… if one is not motivated, they stop working or drag themselves." (iCCM Staff_IDI02)

CHVs corroborated this, with some reporting months without payment from the government:

"Incentives from government, I can rate them at ten percent… it is now many months since they gave us." (CHV_IDI18)

CHV coverage and household allocation

Uneven household allocation created significant service delivery gaps across the study area. CHVs in densely populated areas managed far more households than the recommended maximum, undermining the quality and continuity of care:

"If one has 300 households, they will be able to reach all those households in a month — it is not logical." (iCCM Staff_02)

"Some CHVs have 400–500 households, which is a big burden, so you'll find some households being left out." (iCCM Staff_07)

Caregivers confirmed these coverage gaps, with some reporting never having been visited by a CHV:

"I would want the CHVs to be increased… it is because they are few that they have not gotten to me." (Caregiver_IDI15)

A further inequity arose from donor-driven CHV selection, which concentrated programme-supported CHVs in certain areas regardless of population need. This was compounded by the fact that donor-supported CHVs held medicines that government CHVs lacked, causing households to gravitate toward Living Goods-registered CHVs and inflating their caseloads:

"From the government, we have many CHVs, but in the donor programme we are few… the government CHVs do not always have drugs, so the households for Living Goods became many." (CHV_IDI17)

Commodity stockouts and availability gaps

Frequent shortages of essential medicines constrained CHVs' ability to provide timely community-level care, a challenge reported consistently by both CHVs and caregivers. CHVs described being unable to treat multiple sick children on the same day due to depleted stocks:

"You can find more than five children with fever in a day, but the medicine for fever is over." (CHV_IDI06)

Caregivers expressed frustration at being redirected to facilities when CHVs lacked medicines, highlighting the financial burden this imposed:

"She might test you and tell you she doesn't have drugs and then refers you." (Caregiver_IDI13)

Stockouts were particularly pronounced for pneumonia and diarrhoea commodities, reinforcing the quantitative finding that CHV involvement in ARI and diarrhoea treatment remained limited throughout the study period.

Discussion

This study examined trends in care-seeking behaviour, treatment access, and the redistribution of childhood illness management across health system levels over a five-year period of iCCM implementation in Busia County, Kenya. The findings reveal a disease-specific pattern of change: CHV-led iCCM was associated with a substantial and sustained shift in care-seeking pathways for malaria, where CHV testing and treatment expanded markedly and uncomplicated facility presentations declined, while gains for ARIs and diarrhoea remained limited and inconsistent throughout the study period. This differential pattern, with strong gains for malaria and constrained progress for the other two conditions, is the central finding of the study and reflects the uneven availability of commodities and the disease-specific scope of CHV practice that emerged over time.

Methodological considerations

This study has several methodological limitations that should be considered when interpreting the findings. First, the lack of a comparison group makes it impossible to attribute observed changes solely

to the iCCM intervention. Findings should therefore be interpreted as associative rather than causal, reflecting trends within the intervention area over time.

Second, the 2017 baseline did not represent a true pre-intervention assessment, as iCCM activities had already commenced before data collection began. Baseline values likely reflect partial intervention exposure, meaning the study may underestimate rather than overestimate true programme effects. Third, reliance on caregiver self-report introduced the possibility of recall bias, and facility morbidity data for 2017–2019 were incomplete, limiting the reliability of trend analyses across the full study period.

Fourth, the timing of assessments was uneven; baseline (April 2017), midline (August 2018), and endline (December 2022) with the extended gap partly attributable to COVID-19, which also independently affected iCCM implementation and care-seeking behaviour. In particular, COVID-19 likely suppressed facility-based care-seeking during 2020–2021 while increasing reliance on community-based providers, effects that cannot be fully disentangled from programme contributions. Additionally, the restriction of qualitative data collection to endline only, inherent in the explanatory sequential design as implemented prevents tracking of how caregiver perceptions, CHV practices, and community trust in iCCM evolved across the full study period, limiting the depth of qualitative insight for the baseline and midline time points.

Fifth, a mid-study shift from an entrepreneurial sales model to free commodity distribution represents a significant programmatic change that may have independently influenced care-seeking behaviour and caregiver perceptions of iCCM effectiveness, but was not analytically controlled for.

Sixth, uneven CHV coverage meant that some households were unreached during the survey period, introducing potential selection bias. Households with greater CHV exposure may be over-represented, meaning the findings may overestimate iCCM reach and impact at the population level, as households that never interacted with a CHV are less likely to be represented in the data.

Seventh, the study was conducted in a single sub-county within Busia County, limiting generalisability to other Kenyan counties or SSA settings with different health system configurations or CHV programme structures.

Finally, the analysis relied on descriptive statistics without inferential testing, meaning observed differences across time points should be interpreted with caution, as it is not possible to determine whether they exceeded what would be expected by chance alone. Despite these limitations, the convergence of household survey findings, facility morbidity trends, and qualitative accounts from caregivers, CHVs, and iCCM implementers provides a coherent and mutually reinforcing body of evidence that the expanding role of CHVs was associated with meaningful shifts in care-seeking pathways within this primary healthcare setting.

Care-seeking and treatment access for malaria

The growing reliance on CHVs for malaria testing and treatment, alongside declining pharmacy use and reduced facility presentations of uncomplicated cases, suggests that CHV-led malaria care became increasingly accessible and trusted over time. The complete cessation of home remedy use by 2022 reinforces this shift, reflecting a strong caregiver preference for formal community-based treatment over substandard alternatives, consistent with evidence from Zambia and Nigeria (24, 27). The relatively stable utilisation of government facilities throughout the study period suggests that CHVs complemented rather than displaced facility-based care, absorbing uncomplicated cases at the community level while facilities continued to manage more complex presentations.

The redistribution of uncomplicated malaria management from facilities to the community mirrors patterns documented across CHV-led programmes in Kenya (14), Zambia (23, 24), Uganda (16, 19), Sierra Leone (26), Nigeria (27), and Burkina Faso (39). Studies from Kenya and Uganda demonstrate that adequately supported CHVs can effectively influence care-seeking behaviour and expand treatment access for malaria (14, 19). The present findings extend this evidence by demonstrating a sustained shift in testing and treatment sources over five years, with CHV-conducted testing rising from 25.6% to 54.9% and CHV-provided treatment from 9.0% to 35.4% between 2018 and 2022. The slight decline in malaria testing rates at endline, however, warrants attention and may reflect emerging supply chain pressures that, if unaddressed, could reverse these gains.

Care-seeking and treatment access for ARIs

Improvements in ARI care-seeking and treatment access were observed across the study period, likely reflecting CHV-led health education and community sensitisation that enhanced caregivers' recognition of respiratory symptoms and prompted earlier care-seeking. Similar patterns have been documented in Sierra Leone, where CHV engagement was associated with improved pneumonia identification and reporting (26). However, CHV involvement in ARI treatment remained limited throughout, declining from 22.9% in 2017 to 13.5% in 2022, and pharmacies emerged as the dominant source of ARI care at endline (46.2%).

The limited CHV treatment role for ARIs is best understood as a supply-side failure rather than a demand-side preference. Recurrent stockouts of amoxicillin at the community level undermined caregiver confidence in CHVs' capacity to manage respiratory illness, consistent with evidence from Tanzania where frequent commodity shortages constrained iCCM effectiveness and redirected caregivers to distant facilities (40). The prominence of pharmacies as an ARI treatment source raises important concerns about inappropriate antibiotic use and self-medication. Similar patterns have been documented in Uganda, caregivers frequently bypass free public services in favour of drug shops despite their availability (41), while evidence from Eastern Uganda suggests that drug shops and private clinics serve as additional sources of antibiotics outside formal health system channels (18). These trends underscore the need for strengthened pharmaceutical regulation and supply chain investment to ensure that community-level CHV services offer a reliable and appropriately regulated alternative to informal sources of care.

Qualitative findings highlight that CHVs made a preventive contribution to ARI management that is not captured in treatment source data alone. Caregivers reported adopting CHV recommended practices such as keeping children warm to prevent pneumonia, reflecting the broader health promotion role that CHVs play beyond curative care, a contribution well documented in the global CHV literature (26).

Care-seeking and treatment access for diarrhoea

Government health facilities remained the dominant source of diarrhoea treatment throughout the study period, increasing from 31.6% in 2017 to 50.0% in 2022. CHV utilisation for diarrhoea remained stable at approximately 25% across all time points, suggesting a consistent but limited community-level treatment role. This pattern is consistent with findings from Burkina Faso, where community health workers functioned primarily as triage and referral providers for non-malaria conditions including diarrhoea, concentrating their treatment role on malaria management (39). The marked decline in home remedy and traditional healer use from 21.1% to 2.8% over the study period reflects growing caregiver confidence in formal care, consistent with Sierra Leone findings where CHV presence was associated with reduced reliance on traditional treatment (26).

The most concerning diarrhoea finding was the sharp decline in ORS/Zinc use from 68.2% in 2017 to 24.5% in 2022, occurring paradoxically alongside rising diarrhoea prevalence and improving care-seeking. Notably, the facility morbidity data showing declining diarrhoea presentations from 2020 to 2022 may partly reflect displacement of care to pharmacies and home management rather than genuine reductions in diarrhoeal burden, given the simultaneous decline in ORS/Zinc use and rise in diarrhoea prevalence observed in household survey data. This pattern strongly implicates supply-side failures rather than demand-side disengagement as the primary driver, consistent with evidence from Tanzania where persistent ORS and zinc stockouts forced caregivers to seek treatment from geographically distant sources (40). While some studies report consistently low care-seeking for diarrhoea (42), others demonstrate that adequately supported CHVs can substantially increase ORS/Zinc coverage at the community level (16, 26).The present findings suggest that this potential remains unrealised in Busia County due to structural supply chain constraints. Strengthening commodity availability across all levels of care including the community is therefore central to Kenya's iCCM framework and UHC agenda.

iCCM implementation challenges

Three structural challenges consistently limited CHV performance and programme reach across the study period.

Inconsistent and inadequate incentives undermined CHV motivation and sustained engagement. The contrast between reliable implementing partner incentives and irregular government stipends sometimes unpaid for months created dissatisfaction and occasional work stoppages. This is consistent with global evidence demonstrating that reliable remuneration, performance-based recognition, and career development pathways are essential to sustaining CHV effectiveness over time (43, 44). Kenya's ongoing transition toward a formal stipend structure for CHPs under the Community Health Strategy represents an important policy opportunity to address this challenge systematically. The

CHP model, anchored in Kenya's Community Health Policy 2020–2030 and operationalised through the Community Health Strategy, formally recognises CHPs as salaried members of the health workforce. Full implementation of this framework, including consistent stipend disbursement, structured supervision, and defined career pathways would directly address the motivational gaps documented in this study and create the conditions necessary for sustained iCCM delivery at scale.

Uneven CHV household allocation created inequitable access to iCCM services across the study area. CHVs in densely populated zones managed up to 400–500 households, far exceeding the recommended maximum of 100, undermining care quality and continuity, while donor-driven CHV selection concentrated programme-supported cadres in certain areas regardless of population need. Similar imbalances have been documented elsewhere, with evidence suggesting that needs-based CHV redistribution improves both equity and service efficiency (26, 45). Addressing allocation inequities through population-density mapping and needs-based deployment criteria would strengthen the reach and fairness of iCCM delivery in Busia County and comparable settings.

Frequent stockouts of essential medicines and diagnostics remained the most pervasive implementation constraint, directly limiting CHV treatment capacity for ARIs and diarrhoea and forcing caregivers toward pharmacies and distant facilities. Such shortages are widely reported across iCCM programmes, linked variously to weak forecasting (43), fragmented supply chains (40), and funding gaps (44, 45). Evidence from Rwanda and Malawi demonstrates that digital logistics systems, community-based stock reporting, and direct resupply mechanisms can substantially improve commodity availability and service reliability at the community level (46). Investing in these supply chain innovations within Kenya's existing digital health infrastructure including the DESC platform already operational in Busia County represents a feasible and contextually appropriate pathway to strengthening iCCM performance.

Conclusions

This study provides longitudinal observational evidence that iCCM-supported CHVs are associated with a disease-specific shift in childhood illness management toward the community level. The most substantial gains were observed for malaria, where CHV-led testing and treatment expanded markedly over five years and uncomplicated facility presentations declined. For ARIs and diarrhoea, improvements in care-seeking behaviour and treatment timeliness were documented, but CHV involvement in treatment remained limited, constrained by recurrent commodity stockouts and uneven coverage. As Kenya advances its UHC agenda through the CHP model and the Community Health Strategy 2020–2030, the differential gains documented in this study offer a clear evidence base for prioritising supply chain strengthening, needs-based CHV deployment, and sustained incentive structures as the foundational conditions for extending iCCM's proven malaria gains to the full burden of preventable childhood illness.

Abbreviations

ACT Artemisinin-based combination therapy

ARI Acute Respiratory Infections

CHA Community Health Assistant

CHP Community health promoter

CHVs Community Health Volunteers

DESC Digitally enabled, Equipped, Supervised, and Compensated

EDA Exploratory Data Analysis

iCCM Integrated Community Case Management

IDI In-depth Interviews

KEMRI Kenya Medical Research Institute

NACOSTI National Council of Science, Technology, and Innovation

MNCH Maternal Neonatal and Child Health

mRDTs Malaria Rapid Diagnostic Tests

ODK Open Data Kit

ORS Oral rehydration salt

SERU Scientific and Ethical Review Unit

SSA sub-Saharan Africa

UHC Universal Health Coverage

UNICEF United Nations Children's Fund

WHO World Health Organization

Declarations

Ethics approval and consent to participate

Ethical approval was obtained from the Kenya Medical Research Institute's Scientific and Ethical Review Unit (SERU No. 4615), and a research permit was granted by the National Council of Science, Technology, and Innovation (NACOSTI). Permissions were secured from county health authorities and research committees. Written informed consent was obtained from all participants before the interviews, ensuring

voluntary participation. Confidentiality was maintained by anonymizing the responses in all the reports and dissemination materials.

Consent for publication

Not applicable

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author upon reasonable request.

Competing interests

Anthony Kabarita was affiliated with Living Goods at the time the endline was conducted and is now affiliated with inSupply Health Kenya, which provides supply chain technical assistance to Living Goods Kenya. Emmanuel Luvai is employed by the County Government of Busia, which was a implementing partner in the iCCM programme evaluated in this study. All other authors declare no competing interests. The funder had no role in data collection, analysis, interpretation, or the decision to publish, as detailed in the funding declaration.

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Authors' contributions

EE, MM, DM, RM, RO and AK conceived the study. EE, DM and RM designed the study protocol and developed the first draft of the manuscript. EE, AM, MM, DM, RO, and RM acquired and analysed the data. EE, AM, MM, DM, and AK interpreted the data. VN, EL and AK critically revised the manuscript for intellectual content. All the authors read and approved the final manuscript.

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Reporting guidelines

This manuscript was prepared in accordance with the GRAMMS reporting guidelines for mixed-methods studies and the STROBE checklist for the observational component. Completed checklists are available as supplementary materials.

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Figures

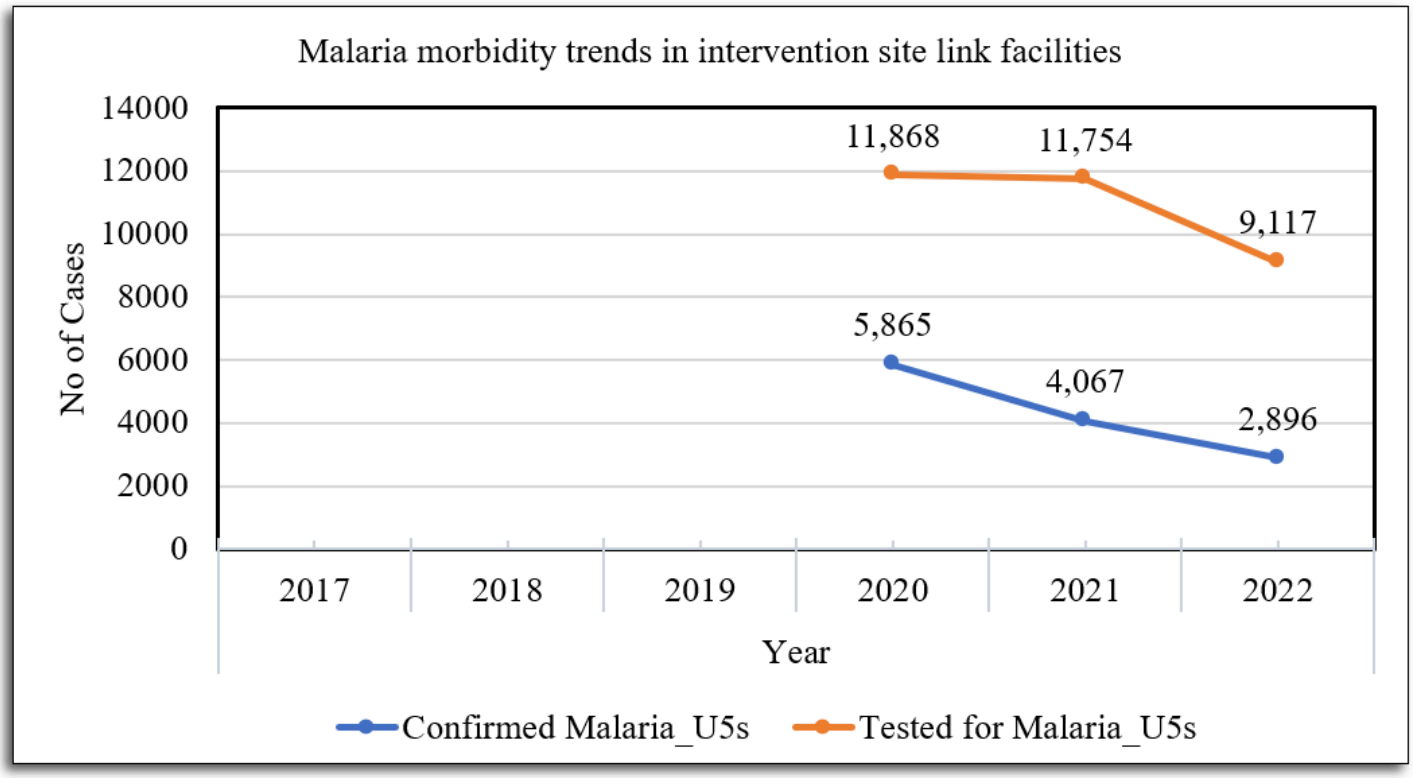
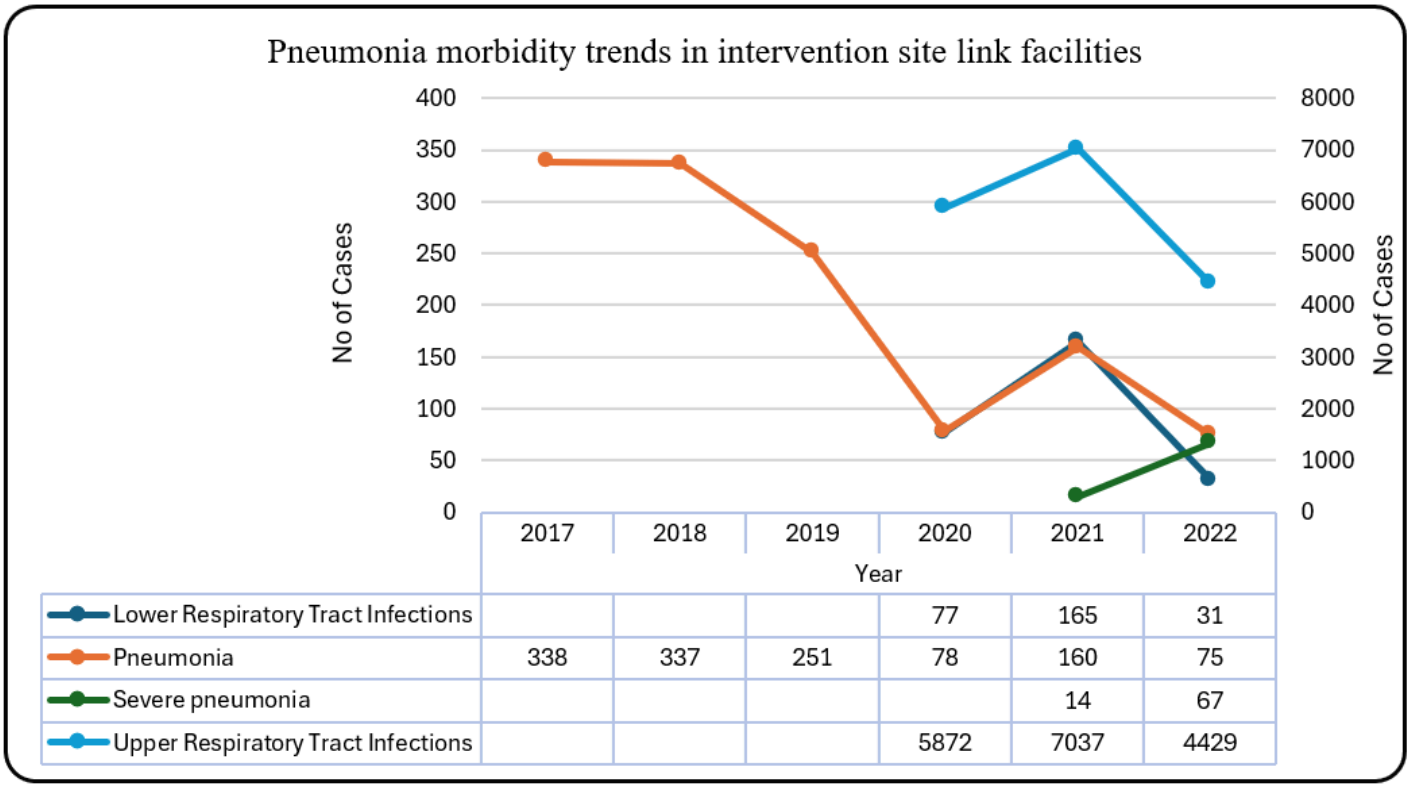


Figure 1

Malaria morbidity trends, 2017-2022.

* Data unavailable for 2017, 2018 and 2019



	2017	2018	2019	2020	2021	2022
Lower Respiratory Tract Infections				77	165	31
Pneumonia	338	337	251	78	160	75
Severe pneumonia					14	67
Upper Respiratory Tract Infections				5872	7037	4429

Figure 2

Cough/ARI morbidity trends, 2017-2022.

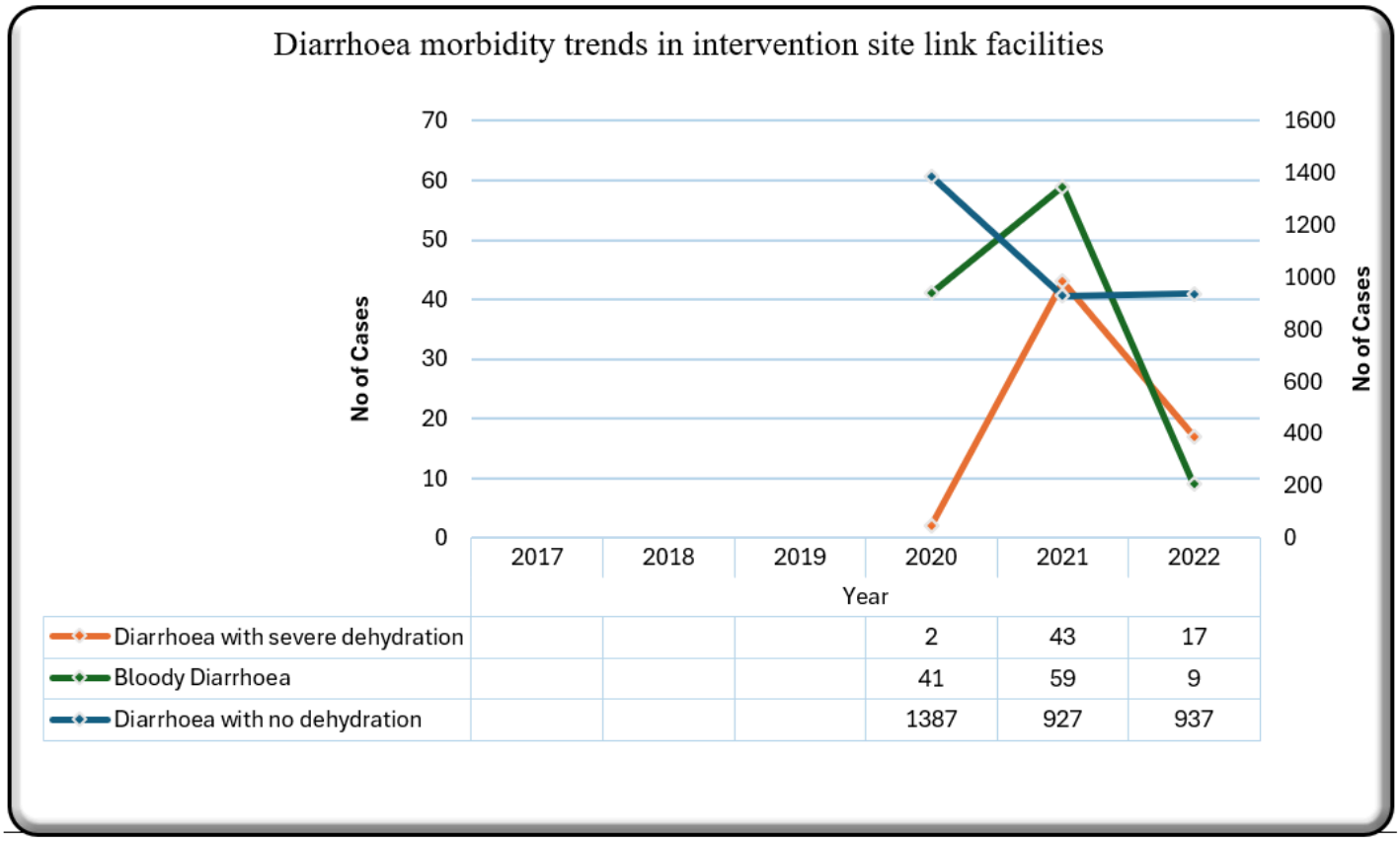


Figure 3

*Diarrhoea morbidity trends, 2017-2022. * Data unavailable for 2017, 2018, and 2019*

Supplementary Files

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