IMPROVING HEALTH CARE-SEEKING BEHAVIORS OF CARETAKERS OF CHILDREN AGED 0-59 MONTHS IN BUGIRI DISTRICT OF EASTERN UGANDA THROUGH THE IMPLEMENTATION OF THE INTEGRATED COMMUNITY CASE MANAGEMENT PROJECT: PRE AND POST IMPLEMENTATION EVALUATION.

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ABSTRACT
Introduction
Malaria, diarrhea, and pneumonia are the leading causes of death among children under five in Uganda and similar countries. The Integrated Community Case Management (iCCM) strategy aims to improve access to and use of services for these conditions at the community level. World Vision Uganda and Bugiri District, with funding from the Pfizer Foundation, implemented an 18-month iCCM project in Bugiri district. This article assesses the project's impact on health-seeking behaviors among caregivers of children aged 0-59 months for these conditions.

Methodology
453 Village Health Teams (VHTs) received a 7-day training on basic VHT skills and Integrated Community Case Management (ICCM). They were equipped with ICCM drugs, sick child job aids, and thermometers. VHTs conducted home visits to educate caretakers, and test, and treat sick children for three conditions. Severe cases were referred to health facilities. They received quarterly mentorships and used HMIS 097B to report data quarterly. Anonymized patient data were analyzed monthly using interrupted time series Poisson regression to assess intervention impact on under-five cases and mortalities.

Results
The number of under-five malaria cases tested and treated by VHTs significantly increased from 2209 to 12549 cases. at the same time, the number of cases managed at the health facilities increased from18040 to 35257 cases (P 0.000 CI 1.48-2.57). Under-five mortality due to malaria significantly reduced from 26 to 6 cases per 100000 (P 0.058 CI 0.95-12.8). Seeking treatment within 24 hours of the onset of signs (P=0.00), caregiver's ability to recognize severe condition (P =0.00), and referral of severe cases to health facilities (P=0.001) improved.

Conclusion
Implementing iCCM significantly enhances health-seeking behaviors among caregivers of children aged 0-59 months.

Recommendations
Authors recommend extending iCCM programs to more districts and communities across Uganda and similar regions to ensure broader access to essential healthcare services for children under five.

Introduction
Despite a global decline in mortality, disparities in child mortality persist between regions and sexes. In 2019, Sub-Saharan Africa accounted for 53% of under-five deaths (2.8 million), followed by Central and Southern Asia at 28% (1.5 million), with Europe at 18%. Uganda saw a 4.42%

reduction in under-five mortality from 45.3 deaths per 1,000 live births in 2019 to 43.3 deaths in 2020 (1).

Malaria, diarrhea, and pneumonia are major contributors to child mortality. In 2017, malaria caused 7% of global under-five deaths and 11% in Uganda. Diarrhea accounted for 8% of under-five deaths globally in 2017 and 5.4% in Uganda. Pneumonia affects over 1,400 children per 100,000 annually worldwide and 11.4% in Uganda (2).

Enhancing care pathways for children with malaria, pneumonia, and diarrhea involves caregivers recognizing illness, deciding to seek care, and accessing appropriate treatment. At health facilities, timely diagnosis, treatment by trained staff, and prompt referral for severe cases are essential for reducing under-five mortality (3)(4)(5). Delayed health-seeking, improper treatment, and delayed referrals contribute to higher morbidity and mortality. Interventions to improve household health-seeking behaviors, enhance childhood health services at facilities, and strengthen health systems overall are critical (4) (6) (7) (8).

A literature review of studies on childhood illness reveals poor recognition of childhood illness by caregivers (3). Caregivers' poor knowledge of the symptoms and danger signs of childhood illness greatly contributed to this. It can also contribute to delays or failure to seek care (10), while a wrong diagnosis can contribute to wrong treatment (11). Delayed referral can also contribute to delayed treatment and increased mortality (12–14). Factors affecting health-seeking behaviors include distance to health facilities, caretaker knowledge, education, social status, and alternative treatment availability. At facilities, healthcare provider knowledge, supplies, equipment, and workload impact their ability to diagnose and treat childhood illnesses effectively. Transport availability greatly influences timely referrals (7,15).

While Care and treatment can be sought from a wide variety of providers including pharmacies, private care providers, government institutions, Community Health Workers, and more informal providers such as traditional healers, Children with pneumonia need care from qualified health providers for accurate diagnosis and prompt antibiotic treatment, despite other available care options (6,16).

Bugiri district in Uganda has high childhood mortality rates, with over 60% attributed to malaria, pneumonia, and diarrhea (17). UDHS 2016 found that deaths often result from poor household health-seeking behaviors, improper treatment at health facilities, and delayed referrals between facilities(18)(19).

ICCM, a WHO strategy, uses local community health workers to provide cost-effective treatment for children under five with malaria, pneumonia, and diarrhea in remote areas, enhancing access and availability of life-saving services (9) (5).

In 2020, World Vision Uganda in collaboration with Bugiri District implemented the project entitled: "Expanding access and improving quality of community-based treatment for infectious diseases among children under 5 in Uganda", Bugiri district. The project's goal was to contribute to the reduction of mortality among children under 5 from common childhood illnesses by increasing the use of curative and preventive interventions. The project directly benefited 85,743 children under 5 years in 15 sub counties, and 72 parishes in Bugiri district. The project was phased, with an initial first phase of 18 months and the second phase lasting 24 months. As phase one ended, there was need to understand the projects' contribution to the reduction of the childhood disease burden as well as its contribution to improving caregiver-seeking behaviors. The results will inform the scale-up in the second phase. Therefore, the objective of this paper is to (i) assess the project's contribution to the reduction of common childhood disease burden (morbidity and mortality) in the district; and (ii) assess the impact of the project's interventions on the caretakers' health-seeking behaviors.

Methodology
Project area
The project is being implemented in the Bugiri district in Eastern Uganda. The district is bordered by Namutumba district and Butaleja district to the north, Tororo district to the northeast, Busia district to the east, Namayingo district to the southeast, Mayuge district to the southwest, and Bugweri district to the west. According to UBOS, Bugiri had a 2020 projection of 480,400 and 99,200 households with an average household size of 5.1. The district has one hospital, one HC IV, nine HC III, and 34 HC II with a staffing level of 59%. According to the 2019 Bugiri district report, latrine coverage was 89.6%, malaria lab-confirmed rate was 89.6%, malaria rate was 58.4%, diarrhea rate was 34.25%, and pneumonia rate was 14.6%. The immunization coverage for DPT III was 96.2%, and IPT3 was 51.5% (20).

Study Design

This study utilized the pre and post-implementation study design to assess the project's contribution to the reduction of common childhood disease burden (morbidity and mortality) and the impact of the project's interventions on the caretakers' health-seeking behaviors before and after the intervention.

Project intervention.
The Pfizer Foundation-funded project began in October 2020 with a baseline survey using IRB-approved tools. In December of the same year with support from MoH, district ICCM and IMNCI TOTs were trained. Health facility and community-based health workers received training in

IMNCI and ICCM, respectively, totaling 74 health facility workers and 425 Village Health Teams (VHTs) trained over two weeks. VHTs were equipped with medicine (coated for malaria, amoxicillin for pneumonia, ORS+ZINC tablets for diarrhea), supplies, malaria testing kits and HMIS community tool to deliver first-line testing and treatment for children under 5 at the household level, and to facilitate referrals to health facilities. Quarterly drug supplies were provided by the Ministry of Health and the Pfizer Project to prevent stockouts. Monthly support supervision by Health Workers (HW) and Health Assistants (HA), along with quarterly mentorships and refresher training, ensured the delivery of quality services. VHTs used the HMIS 097B tool to report quarterly to supervising health facilities for entry into DHIS2.

Study Participants

We included data from children under 5 years who were managed at health facilities and the community by the VHTs in the district. The data for facility management was captured through HMIS 105 and 108 while community management data was captured through HMIS 097B. The data included: the number of children tested, diagnosed, and treated for malaria, diarrhea, and pneumonia cases, as well as the under-five mortalities due to malaria, diarrhea, and pneumonia, irrespective of sex for the period January 2020 to January 2022. We chose to use January 2020 as our pre-intervention period and January 2021 as the period of intervention because it's the period when the VHTs were trained and supplied with the commodities for ICCM while Health Workers at facilities were trained on IMNCI.

To assess health-seeking behaviors, the participants were caretakers of children under 5 in the project area for the same period. They were interviewed at baseline in 2020 using approved tools and again during the midterm evaluation at the end of 2021. We also analyzed DHIS22 community data for the same period for comparative triangulation of the findings.

Eligibility Criteria

To assess health-seeking behaviors, the caretakers with children under 5 years who had been residents of the project area for at least the previous 12 months were randomly selected to participate. Caregivers who didn't consent and had stayed in the project area for less than a year were not considered.

To assess the contribution of the project to mortality and morbidity, we included data from children under 5 years who were managed at health facilities and the community by the VHTs in the district in 2020 and 2021. Incomplete data was not considered.

Sample size

The sample size for both the baseline and MTR were calculated using the cluster sample approach, and the parish was considered the cluster. The sample sizes at baseline and MTR were 549 and 524 respectively, considering a design effect of 1.5.

For outcome analysis, all health facilities in the district that reported through DHIS have considered if that population sought treatment from all the different health facilities across all levels (HCII, HCI, HCIV, districts, and referral Hospitals).

Sampling procedure

The study used the cluster approach where parishes were considered as a cluster. Within the selected clusters, the starting village was randomly selected and within every village, 10 households with at least one child under 5 years were randomly selected.

For the DHIS2 system analysis, all data reported in the system for the selected period (January 2020 to January 2022) was considered for analysis.

Outcomes

The primary outcomes were under five morbidity and mortalities due to malaria, pneumonia, and diarrhea in Bugiri district and health-seeking behaviors for caretakers of children under five in the district.

Data collection and management

Data for the analysis was extracted from the DHIS2 system. To analyze the outcomes, the project relied on the Ministry of Health's reporting structure. Child health data, including cases and mortality due to malaria, diarrhea, and pneumonia is routinely collected using the Health Management Information System (HMIS) with many primary data collection tools available at the health facilities, primarily the child registers, the outpatient register, and the inpatient register. The HMIS information flows from the lowest level (the community) to the health unit (health center two-, three-, and four-level facilities, general hospitals, and referral hospitals); the health sub-district; the district; and finally, to the National Health Databank at the Resource Centre of Ministry of Health.

This data was captured by the health Workers at the designated points of care and aggregated every month by the Health Information Assistants before it was entered into DHIS2, where it was segregated by gender and age group.

To analyze the impact on health-seeking behaviors, the data was collected through a cross-sectional study across the district during the baseline and midterm evaluations of the project. The participants were caretakers of children under 5 years in the project area who were interviewed at baseline in

October 2020; using approved tools and again at midterm at the end of 2021.

Statistical analysis

Anonymized patient-level data was analyzed and aggregated into monthly counts of under five cases and mortalities due to malaria, diarrhea, and pneumonia. During the Quantitative data analysis, we used descriptive statistics to summarize and present crude summaries of outcomes before and after the start of the ICCM in Bugiri district. We did an interrupted time series analysis of routinely collected data from fifty-seven (57) Health Facilities in Bugiri district which is 100% of all the Health Facilities in the district that reported into District Health Information System 2(DHIS2). Malaria, diarrhea, and pneumonia management services were provided free of charge at all government health facilities, subsidized for the Private, not for Profit (PNFP), and charged in the Private Profit (PFP) health facilities.

Time-series designs

They attempted to assess whether an intervention had an effect significantly greater than the underlying trend. The pre-intervention served as the control. So, when deciding to use an interrupted time series design, we essentially had a before and after design without a control group. Interrupted time series (ITS) analysis was a valuable study designed to evaluate the effectiveness of population-level health interventions that had been implemented at a clearly defined point in time.

We did interrupt time series regression analyses by fitting a Poisson regression model with Newey–West standard errors to account for autocorrelation and heteroscedasticity. This approach considered the pre and post-implementation of ICCM in the District by the project as it allowed the estimation of the effect of the intervention at various time points by centering time at that time point. We used the model to estimate the immediate effect of the ICCM intervention and the effect of ICCM by the end of the study period.

We estimated the post-ICCM intervention for each outcome by adding together the coefficients associated with time and the time of ICCM interaction. We analyzed under-five malaria mortalities, under-five malaria cases, diarrhea, and pneumonia cases by monthly counts. We constructed the trends in data on several indicators comparing pre- and post-intervention periods using the HMIS data extracted from DHIS2 for under-five malaria mortalities, under-five malaria cases, diarrhea, and pneumonia cases. Data was analyzed using stata14.

The Maximum Likelihood Time Series Analysis (Poisson and Negative Binomial Regression) Poisson regression was used to model count outcomes using a generalized estimating equation (to account for clustered observations between sites) with an autoregressive of order one (ar1)

correlation structure (to account for serial autocorrelation of error terms of outcomes of adjacent periods within-sites). Baseline and midterm evaluation survey data was analyzed using Stata version 12 for frequencies and significances then correlated with the data from DHIS2 for association.

Efforts to address potential sources of bias

The study utilized data from the District Health Information System (DHIS2), which was collected by health facilities and Village Health Teams (VHTs) to monitor malaria-related under-five mortalities and cases of malaria, diarrhea, and pneumonia. The DHIS2 is a national system overseen by the Ministry of Health (MoH), and data analysis was conducted by the District Biostatistician. World Vision (WV) did not have editing rights in the DHIS2, ensuring data accuracy and independence. Patient-level data, anonymized for privacy, were aggregated monthly to quantify under-five cases and deaths due to malaria, diarrhea, and pneumonia.

To evaluate changes in health-seeking behavior, additional data were collected during baseline and midterm assessments of the project. These cross-sectional studies were conducted in randomly selected households across the district by research assistants who were not part of the project team. The analysis of this data was led by an external consultant to ensure impartiality and rigor.

Throughout the analysis, efforts were made to account for potential confounding factors. This approach aimed to provide a thorough evaluation of how project interventions may have influenced health outcomes and health-seeking behaviors in the community.

Ethical consideration

The study and study protocols were approved by the Institutional Review Board of TASO (TASOREC/084/2020-UG-REC-009) Furthermore permission was sought from Bugiri Local Government (BLG) health department and the lower local councils. Written informed consent was sought from all participants for the primary data. The benefits and risks of participation in this study were explained to the participants before enrollment. Privacy was ensured by carrying out interviews in an area separate from where other household members were seated. Confidentiality of the data was kept by using household identification numbers rather than names. Permission to access secondary data from the district health information system (DHIS) was obtained from the BLG health department, and the data was downloaded in aggregate without identifying information.

RESULTS

At baseline, 549 caretakers with an average age of 34.2 years were interviewed while at MTR, 524 caretakers participated

across the district. Outcomes from 54 health facilities (hospital -1, HCIV -1, HCIII-10, HCII- 42 (43, government - 37 non-government- 17)) that were reported in the DHIS2 were analyzed.

The outcome was under five child morbidity and mortality due to malaria, diarrhea, and pneumonia as reported in DHIS2 describing trends of 2020 and 2021 during project intervention while the process factors were health-seeking behaviors.

Outcome

Confirmed malaria cases trend before and during the project time

Confirmed malaria cases trend 2020&2021 as reported by H/facilities

	JAN	FEB	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
2021	2169	2353	3762	2625	2247	2004	1227	1492	3416	3177	4571	6129
2020	1553	1876	1871	1117	1373	1420	1188	1440	1330	1399	1697	1729

Month of the year
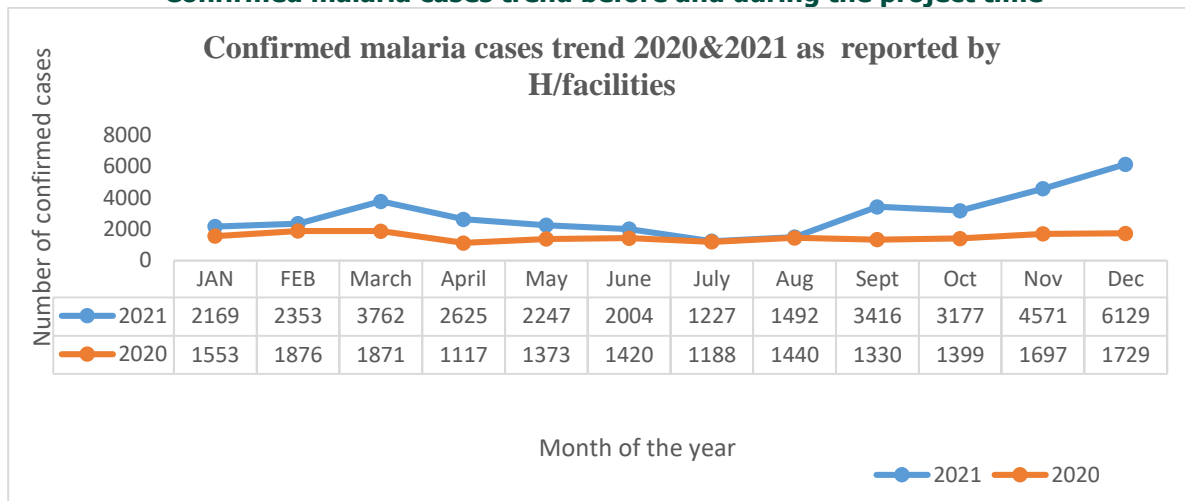
Figure 1: Trend of confirmed under-five malaria cases in under-five before and during the project as reported by the health facilities.

From Fig 1 the number of children tested and confirmed to have malaria was higher during the implementation phase compared to before. Peaks were observed during March and September. The lowest number of cases before the project was observed in April, while during the implementation, the lowest caseload was observed in July. Generally, the trend moves up from October to December before and during the project's life. The observed higher cases during the project life could be due to improved recognition of symptoms, and health-seeking behaviors by the caregivers as observed in Table 2.

In addition, the project supported the VHTs with drugs and test kits in April and November, this could explain the higher number of reported cases. Furthermore, the project, through advocacy and engagement with the MoH, facilitated the provision of drugs and supplies to the VHTs. The observed upward trend was a result of increased testing by the VHTs, and increased sensitization of caregivers to seek treatment from recognized providers and health facilities which is in line with the observed health-seeking behaviors as there was an increase in caretakers seeking treatment from health facilities and VHTs compared to baseline (fig1). This finding is consistent with the findings from studies in Tanzania Egypt and elsewhere, where supplies and drugs were critical in the successful implementation of ICCM (5)(16)(21).
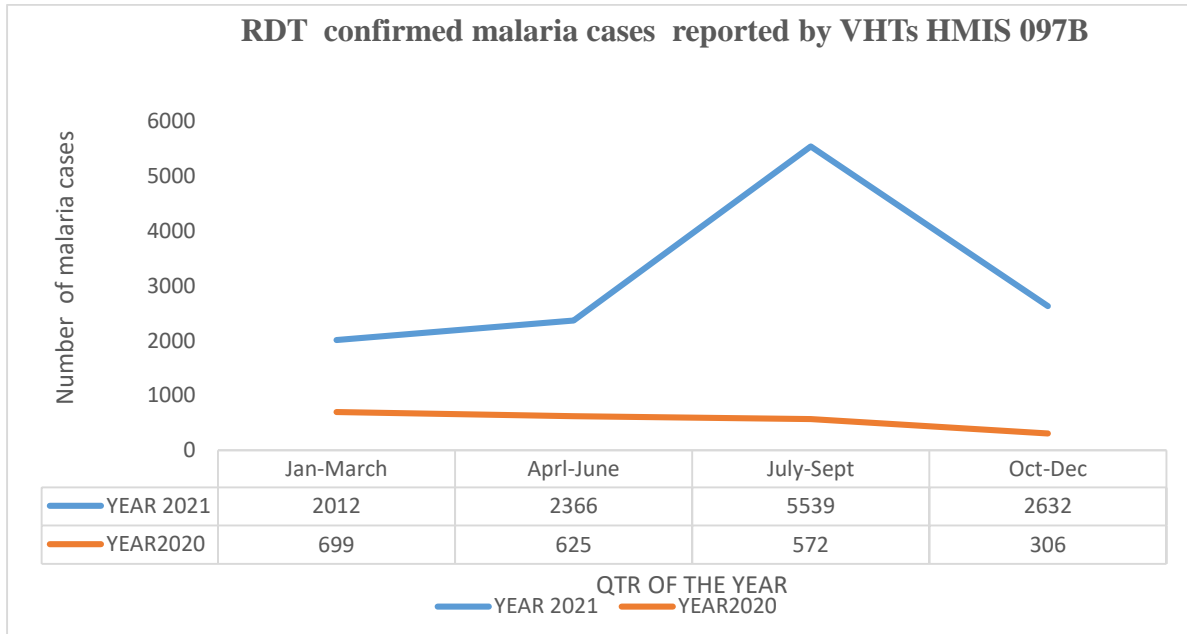
Figure 2: Trend of under-five malaria RDT confirmed malaria cases by the VHTs.

Furthermore, analysis of HMIS 097B data from the VHTs revealed an overall four-fold increase in the number of cases tested for malaria by VHTs at the community level. It was observed that during the months when health facilities received a large number of cases, fewer cases were reported by the VHTs.
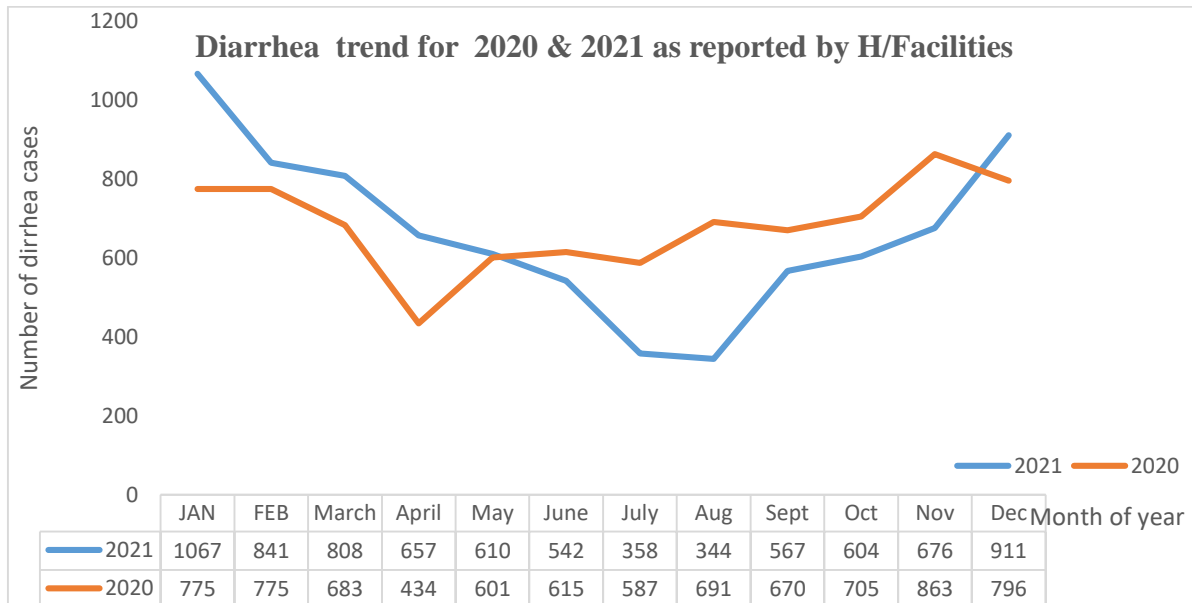

Figure 3: Under-five Diarrhea case trends as reported by the health Facilities.

There was an observed downward trend in the reported diarrhea cases at the facility level during the intervention period with the lowest levels observed in August. Overall, the total number of reported diarrhea cases reduced by 2.5%

during the intervention period. This could be attributed to the health education and prevention efforts by the VHTs; including hand hygiene as well as successful treatment by the VHTs at the community level.

However, between August and December, an upward trend was observed, although it was still lower than before the intervention period.
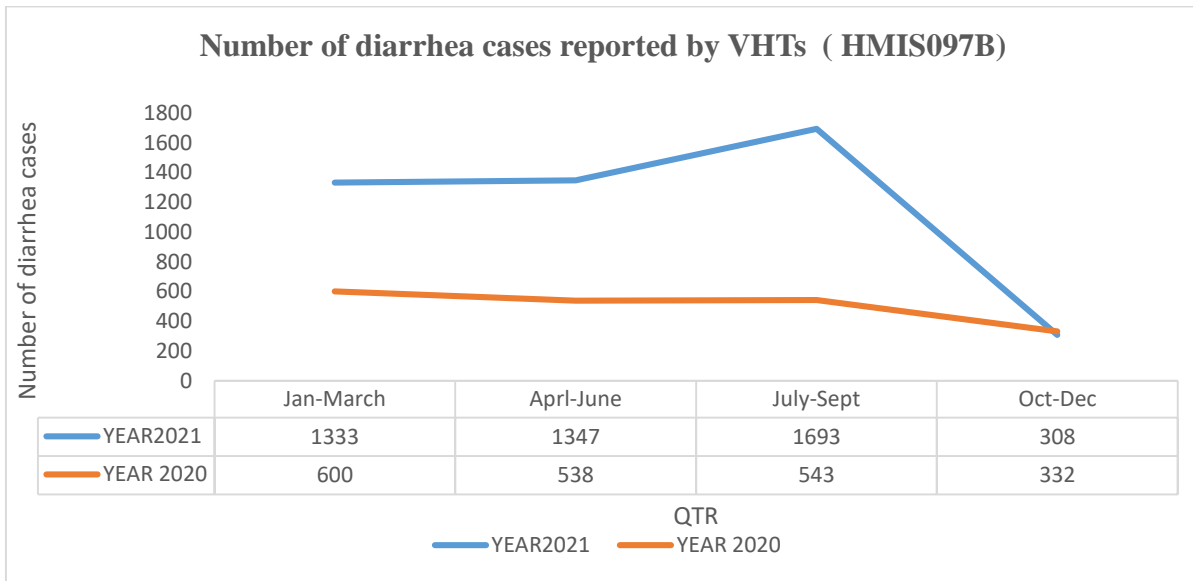
Number of diarrhea cases reported by VHTs (HMIS097B)

	Jan-March	Aprl-June	July-Sept	Oct-Dec
YEAR2021	1333	1347	1693	308
YEAR 2020	600	538	543	332

QTR

Figure 4: Trend of under-five diarrhea cases as reported by the VHTs.

In keeping with the findings at the facility level, analysis of data from HMIS 097B showed that the number of children with diarrhea attended to by VHTs increased by two. It was also observed that during months in which facilities reported high caseloads, VHTs reported lower cases.
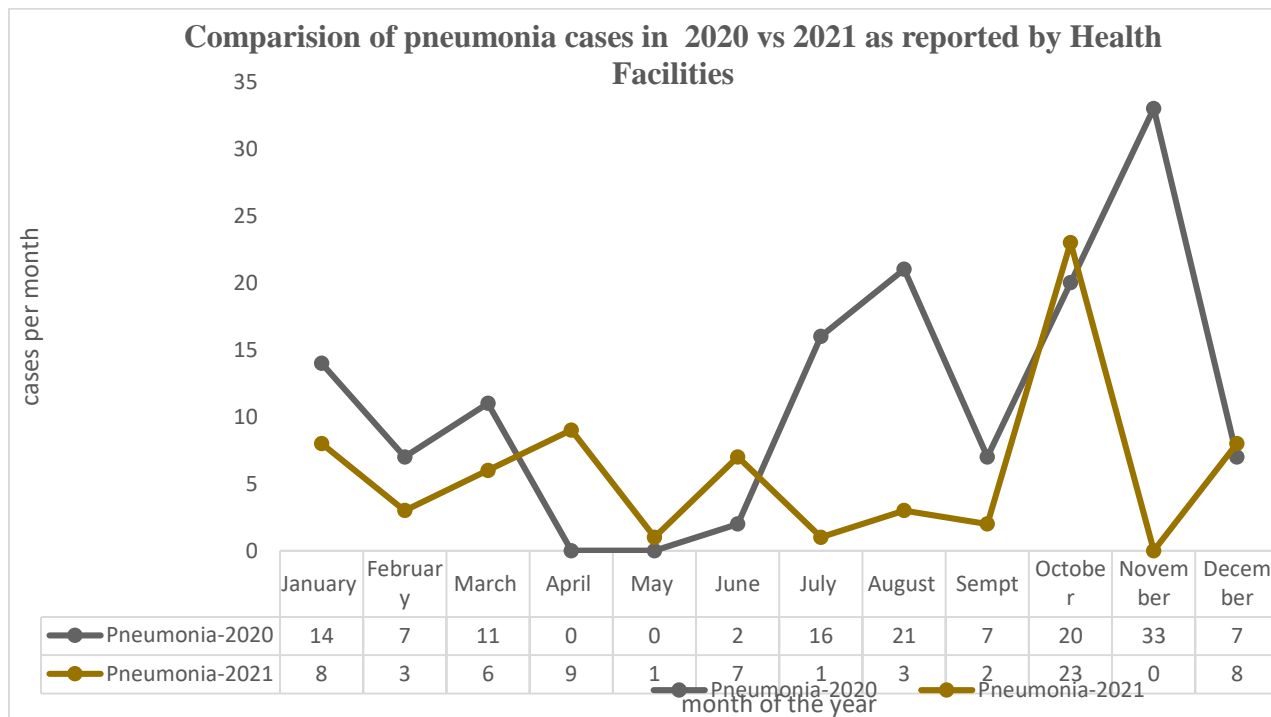
Comparision of pneumonia cases in 2020 vs 2021 as reported by Health Facilities

	January	February	March	April	May	June	July	August	Sempt	October	November	December
Pneumonia-2020	14	7	11	0	0	2	16	21	7	20	33	7
Pneumonia-2021	8	3	6	9	1	7	1	3	2	23	0	8

Figure 5: Trend of reported under five pneumonia cases as reported by the health facilities.

Table 1: Trend of under-five pneumonia cases as reported by the VHTs.

Number of pneumonia cases reported by VHTS (HMIS097B)					
QTR	Jan-March	April-June	July-Sept	Oct-Dec	TOTAL
YEAR2020	91	26	133	6	256
THE YEAR 2021	1197	1362	2571	1249	6379

From Fig 5, it was observed that the number of pneumonia cases reported by the health facilities decreased through the intervention period, except for April, June, and October when cases were observed to be higher at the facility than in the corresponding months before the intervention. Overall, pneumonia cases treated at facilities decreased by 47.82% during the project implementation period. There was a notable improvement in the recognition of the correct signs of pneumonia by the caregivers during the MTR in comparison with the baseline. However, for the pneumonia cases, the number reported by the health facilities decreased,

which is attributable to the better and more timely care provider's health-seeking behavior, and treatment of non-severe cases by VHTs in the community. Furthermore, seasonality aspects of the conditions were also observed; as shown by peak months during the baseline and MTR.

Analysis of the VHTs data (HMIS 097B)-in Table 1 revealed an increase in the number of pneumonia cases attended to by VHTs; from 256 children at baseline to 6379 children during the implementation period, with possible seasonal spikes in the third quarter of both periods.
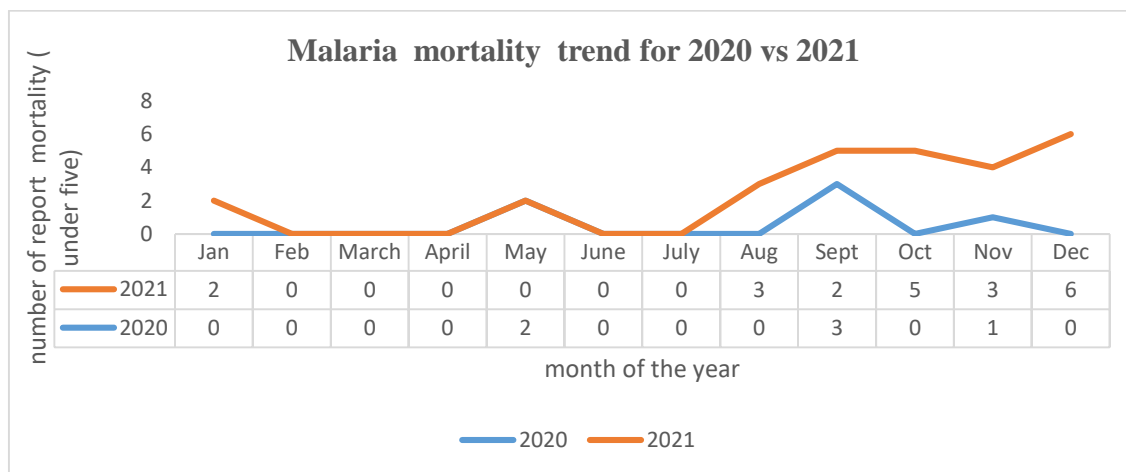
Malaria mortality trend for 2020 vs 2021

	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
2021	2	0	0	0	0	0	0	3	2	5	3	6
2020	0	0	0	0	2	0	0	0	3	0	1	0

Figure 6: Trend of under-five malaria mortality.

The trend of under-five malaria deaths (fig 6) during the project implementation period showed a sharp decline between January and April, with a rise in May followed by a decline in July and then a sharp rise towards December. There were sharp peaks in mortality in September, both before and during the intervention period. The project area experiences two rainy seasons: the first between March and June, and the second between August and November. This could explain seasonal peaks that come with increased disease burden and mortality.

Bivariate analysis

Table 2: Results from Bivariate analysis

		Cases	IRR	P-value	CI
CASES/MORBIDITY					
Malaria	2020	18040	1.95	0.000	1.48-2.57
	2021	35257			
diarrhea	2020	8195	0.97	0.80	0.97-1.19
	2021	7985			
Pneumonia	2020	138	0.51	0.083	0.24-1.09
	2021	71			
MORTALITY					
Malaria	2020	6	3.5	0.058	0.95-12.80
	2021	21			
Diarrhea	2020				
	2021				
Pneumonia	2020				
	2021				

Results in Table 2 show significant results; The risk of malaria was 95% higher in 2021 as compared to 2020, and The risk of diarrhea was 3% lower in 2021 as compared to 2020. The risk of pneumonia is 49% lower in 2021 as compared to 2021. The risk of malaria mortality is 3.5 times higher in 2021 as compared to 2020 (this could be attributed to more cases that sought treatment from facilities and more accurate documentation at the facility).

Health seeking behaviors

Table 3: Results on Health seeking behaviors   for caretakers from community surveys

		MALARIA			DIARRHEA			PNEUMONIA		
		baseline	MTR	Chi-test	Baseline	MTR	Chi-test	Baseline	MRT	Chi-test
Suspected case	No	194(85.34%)	217 (41.41%)	**0.20**	385(69.95%)	410(77.95%)	**0.03**	507(92.35%)	385(73.19%)	**0.01**
	Yes	355(64.66%)	307(58.59%)		165(30.05%)	100(19.01%)		42(7.65%)	139(26.43)	
Seeking treatments	No	70(19.72%)	20(6.47%)	**0.00**	10(6.06%)	4(3.96%)	**0.38**	6 (14.28%)	14 (9.93%)	**0.230**
	Yes	285(80.28%)	289(93.53%)		155(93.94%)	97(96.04%)		36(84.72%)	127 (90.07%)	
Place of seeking treatment	Drug shop	21(5.9%)	43(14.88%)	**0.00**		15(15.06%)	**0.00**		25(19.69%)	**0.000**
	H/F	310(87.3%)	225 (75.86%)		123(74.55%)	76(78.35%)		33(78.59%)	93(72.23%)	
	VHTs	17(4.8%)	19(6.57%)		3(1.82%)	4(4.12%)		3(7.14%)	6(4.72%)	
	Others	54(15.2%)	2(0.69%)		39(23.64%)	2 (2.06%)		6(14.28%)	3(2.32%)	
Time lag before seeking treatment	<less than 24 hrs.		213(73.7%)		130(83.87%)	62(63.92%		36(85.71%)	54(42.52%)	
	>less than 24 hrs.		76(26.29%)		25(16.13%)	36(36.08%)		6(14.29%)	71(55.91%)	
Receiving Treatment within 24 hrs.	Yes	296(83.6%)	252(87.2%)	**0.33**	130(83.87%)	86(88.66%)	**0.19**	36(85.71%)	54(42.52%)	**0.000**
	No	58(16.4%)	37(12.8%)		25(16.13%)	11(11.34%)		6(14.29%)	71(55.91%)	
severe case/condition	Yes	195(55.49%)	131(42.39%)	**0.01**	77(46.67%)	56(55.45%)	**0.08**	32(76.19%)	18(14.17%)	**0.008**
	No	158(44.51%)	178(57.61%)		88(53.33%)	44(44.55%)		10(23.81%)	109(85.83%)	
Referrals	Yes	19(9.64%)	34 (25.95%)	**0.00**	9(11.69%)	15(33.33%)	**0.00**	4(12.5%)	10(50%)	**0.613**
	No	178(90.3%)	97(94.05%)		68(88.31%)	30(66.67)		28(87.5%)	10(50%)	
Who made referral	CHW	0	15(44.12%)	**0.00**	2(22.22%)	4(26.67%)	**0.00**	0	3(30%)	**0.001**
	H/F	14(73.68%)	10(29.41%)		6(66.67%)	7(29.41%)		3(75%)	4(40%)	
	Others	5(26.32%)	9(26.3%)		1(11.11%)	9 (27.1%)		1(25%)	3(30%)	
Place of referral	H/F	16(84.21%)	28(87.5%)	**0.37**	9(100%)	13 (100%)	**1**	3(75%)	8(80%)	**0.248**
	Other	3(15.79%)	4(12.5%)		0			1(25%)	3(20%)	

Results in Table 3 show significant changes observed in the areas as stated below:

1. The number of children who reported to have had diarrhea and pneumonia in the preceding 14 days before interviews significantly reduced.
2. Seeking treatment for malaria significantly increased/improved.
3. Changes in place of seeking treatment with more caretakers seeking treatment from the VHTs and Health facilities while seeking treatment from drug shops and other places decreased.
4. Seeking treatment within 24 hours and getting treatment within 24 hours significantly improved for the three conditions.
5. The number of children with the three illnesses who developed severe disease was significantly reduced.

6. The referral system significantly improved with more children being referred by the VHTs to health facilities.

Discussion

The results demonstrate an overall increase in the number of malaria, diarrhea, and pneumonia cases reported by both the health facilities and VHTS. This increase in the number of cases can be attributed to the observed significant increase in the number of caregivers seeking timely treatment for the three conditions at the health facilities and from the VHTs in comparison with the baseline. This can also be explained by an increase in referrals from VHTs and other people in communities as observed. The significant increase in the number of caretakers seeking treatment within 24 hours could have contributed to the increased cases reported by the health facilities and VHTs. This finding is consistent with results observed in Nigeria, Egypt, and western Uganda, where implementation of ICCM resulted in more cases being identified and managed at both the community level and health facilities (15)(6)(22).

In addition, the project implementation strategy included sensitization of the caretakers on the three illnesses, including early identification done by the VHTs as well as through community dialogues and radio talk shows which increased caretakers' knowledge and awareness of the illnesses, hence improving the health-seeking behaviors. Through engagements with the government and MOH, the project team worked with the Ministry of Health, which provided the VHTs with drugs and supplies in addition to buffer drugs provided by the project. This approach minimized stockouts and ensured consistent availability of the drugs and supplies, unlike before the project when VHTs had no supplies at all. This had a positive impact on the availability and access to appropriate treatment in the community. These factors could explain the increase in cases attended to by VHTs and health facilities and hence the high numbers reported.

Before the beginning of the project, the reporting rates of VHTs were at 30%, and only 24 health facilities were reporting in DHIS2. The project built the capacity of the VHTs and Health Workers on documentation and use of HMIS. By the end of the first phase of the project, the reporting rates of VHTs had increased to 85%, and 54 health facilities were reporting in the system. The improved reporting by both the facilities and VHTs additionally explains the observed increase in the number of cases. This observation is consistent with the observation from ICCM projects in Mozambique and Tanzania where capacity building of Community Health Workers improved quality and reporting rates for community health data(23) (21).

High peaks for malaria and diarrhea were observed from July during the implementation period, and this could be attributed to several factors. The country was coming out of

the lockdown implying more clients were able to reach the health facility or visit their VHTs. It is therefore probable that the lockdown affected access to these services. August and September are also normally rainy periods, which are followed by an increase in the mosquito population, hence, more carriers of the malaria plasmodium; but also, where open defecation is practiced, running water can carry feces and increase the risks of diarrhea spreading in households. The observed inverse relationship between the cases at facilities and those reported by VHTs in the months in which the project and Ministry of Health (MoH) supplied drugs to VHTs could be due to increased testing and treatment by VHTs, thus, reducing the caseload at the facilities. The spikes/peaks coincided with rainy seasons in the project area which are often characterized by high mosquito density, hence, increased malaria cases and an increase in diarrhea cases. The observed decrease in mortality could be due to an increase in people seeking care at health facilities as well as improved reporting by the health facilities. There were also intermittent peaks observed in previous studies on malaria burden by the Ministry of Health (MoH), which observed that the spikes coincided with rainy patterns (17).

Conclusion

The project interventions in the Bugiri district led to an improvement in the health-seeking behaviors of caretakers of children aged 0-59 months during the project period. Implementation of the ICCM strategy and accompanying project activities also led to a reduction in child morbidity and mortality due to the three diseases during the project period.

Recommendations

Continued support and expansion of iCCM in Uganda could contribute significantly to the reduction in U5 deaths. Based on the success of iCCM, the Authors recommend extending the iCCM program to scale and expanding it to more districts and communities across Uganda and similar regions to ensure broader access to essential healthcare services for children under five.

Generalizability of Findings

Our study considered sample sizes at baseline and MTR of 549 and 524 respectively, considering a design effect of 1.5. For outcome analysis, all health facilities in the district that reported through DHIS have considered if that population sought treatment from all the different health facilities across all levels (HCII, HCI, HCIV, districts, and referral Hospitals). Participants were selected across all sub-counties in Bugiri District. Our findings offer insights into the benefits of integrated case management for young children in rural settings. With several similar factors in healthcare infrastructure, cultural beliefs regarding child

health and development, and socio-economic, the results could influence the implementation and outcomes of similar interventions elsewhere in similar rural settings.

Limitations
During the implementation period, there was a sporadic stock of drugs and supplies, which affected timely treatment. The impact of these sporadic stockouts on morbidity and mortality was not assessed. To add, the results in this paper did not include findings on the quality of ICCM treatment provided by the VHTs.
Moreover, during the implementation period, there were other government malaria control interventions like Indoor Residual Spraying which could have affected the observed effects

Conflicts of Interest
The authors declare that they have no competing interests.

Declaration
The content is solely the responsibility of the authors and does not necessarily represent the official views of World Vision or Funding organization

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Acknowledgment

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List of abbreviations/ acronyms

CI -Confidence Interval
Top of Form
DHIS- District Health Information System
DPT -Diphtheria, pertussis (whooping cough) and tetanus.
HC -Health Centre
HMIS- Health Management System
ICCM -Integrated Community Case Management
IMNCI -Integrated Management of Newborn and Childhood Illness
IPT -Intermittent preventive treatment
ITS- Interrupted time series
MOH -Ministry of Health
MTR -Mid-Term Review
PNFP- Private not for Profit
UBOS -Uganda Bureau of Statistics
VHT -Village Health Teams
WHO -World Health Organization

References

1) UNICEF. Levels & Trends in Child Mortality: Report 2019-Estimates developed by the UN Inter-agency Group for Child Mortality Estimation. Unicef/Who/Wb/Un. 2019;1–32.
2) UNICEF. Monitoring the situation of children and women. 2019.
3) Adedokun ST, Yaya S. Childhood morbidity and its determinants : evidence from 31 Saharan Africa countries in sub- . 2020;1–10.
4) Nhampossa T, Mandomando I, Acacio S, Nhalungo D, Sacoor C, Nhacolo A, et al. Health Care Utilization and Attitudes Survey in Cases of Moderate-to-Severe Diarrhea among Children Ages 0 – 59 Months in the District of Manhic. 2013;89(Suppl 1):41–8.
5) Morgan L, Wambua P. The Global Fund New Funding Model : Lessons from Zambia on Integrating the Integrated Community Case Management Model (iCCM). Https://WwwMcsprogramOrg/Resource/Global-Fund-New-Funding-Model-Lessons-Zambia-Addition-Integrated-Community-Case-Managed-Iccm/. 2015;(November).
6) Kirolos A, Adejumoke I, Bakare AA, Oyewole OB, Qazi A, Campbell H, et al. Care seeking behavior by caregivers and aspects of quality of care for children under five with and without pneumonia in Ibadan, Nigeria Correspondence to : 2018;
7) Kassile T, Lokina R, Mujinja P, Mmbando BP. Determinants of delay in care seeking among children under five with fever in Dodoma region, central Tanzania : a cross-sectional study. 2014;1–10.
8) Apuleni G, Jacobs C, Musonda P. Predictors of Health Seeking Behaviours for Common Childhood Illnesses in Poor Resource Settings in Zambia, A Community Cross-Sectional Study. Front Public Heal. 2021;9(May):1–9.
9) MoH. Implementation Guidelines. Stakeholder Relationship Management. Kampala; 2020.
10) Nasrin D, Wu Y, Blackwelder WC, Farag TH, Saha D, Sow SO, et al. Health care seeking for childhood diarrhea in developing countries: Evidence from seven sites in Africa and Asia. Am J Trop Med Hyg. 2013;89(SUPPL.1):3–12.
11) Miller JS, English L, Matte M, Mbusa R, Ntaro M, Bwambale S, et al. Quality of care in integrated community case management services in Bugoye, Uganda : a retrospective observational study. Malar J. 2018;1–9.
12) Ratnayake R, Ratto J, Hardy C, Blanton C, Miller L, Choi M, et al. The Effects of an Integrated Community Case Management Strategy on the Appropriate Treatment of Children and Child Mortality in Kono District, Sierra Leone : A Program Evaluation. 2017;97(3):964–73.
13) Np O, Wa O, Johansson W. Integrated community case management of childhood illness in low- and middle-income countries (Review). 2021;
14) Millar KR, McCutcheon J, Coakley EH, Brieger W, Ibrahim MA, Mohammed Z, et al. Patterns and predictors of malaria care-seeking, diagnostic testing, and artemisinin-based combination therapy for children under five with fever in Northern Nigeria : a cross-sectional study. 2014;1–12.
15) Miller JS, Mulogo EM, Wesuta AC, Mumbere N, Mbaju J, Matte M, et al. term quality of integrated community case management care for children in Bugoye Sub-county, Uganda : a retrospective observational study. 2022;1–11.
16) Riri JV, Silumbwe A, Mweemba C, Zulu JM. Facilitators and barriers to implementation of integrated community case management of childhood illness : a qualitative case study of Kapiri Mposhi District. BMC Health Serv Res. 2022;1–11.
17) MoH. Malaria Indicator Survey 2018-19. Kampala; 2018.
18) UDHS. Uganda Demographic Health Survey. 2016.
19) MoH. Annual Health Sector Performance Report 2019-2020. Available from URLhttp//www.health.go.ug/mohreports.htm. 2020;222.
20) MoH. THE UGANDA MALARIA REDUCTION STRATEGIC PLAN 2014-2020. Kampala; 2020.

21) Amouzou A, Hazel E, Shaw B, Miller NP, Tafesse M, Mekonnen Y, et al. Effects of the Integrated Community Case Management of Childhood Illness Strategy on Child Mortality in Ethiopia : A Cluster Randomized Trial. 2016;94(3):596–604.

22) Sayre D, Steinhardt LC, Irinantenaina J, Dentinger C, Rasoanaivo TF, Kapesa L, et al. Baseline malaria prevalence and care-seeking behaviors in rural Madagascar before a trial to expand malaria community case management to all ages. Malar J. 2021;1–13.

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