MAM@Scale Endline Evaluation

ENDLINE EVALUATION REPORT

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MAM@Scale aims to prevent 600 child deaths by training 2,000 CHVs to provide over 7,000 children with rectal artesunate for pre-referral treatment of severe malaria.

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Acronyms

CHAs	Community Health Assistants
CHAZ	Christian Health Association of Zambia
CHVs	Community Health Volunteers
CMS	Community Monitoring System
DFID	Department for International Development (UK)
DHMT	District Health Management Team
ETS	Emergency Transport System
FCDO	Foreign, Commonwealth and Development Office (UK)
GCC	Grand Challenges Canada
G-QAG	Governance Quality Assurance Group
HF	Health Facility
HMIS	Health Management Information System
Inj AS	Injectable Artesunate
MAM	MAMaZ Against Malaria
MAM@Scale	MAMaZ Against Malaria at Scale
MMV	Medicines for Malaria Venture
MOH	Ministry of Health
NMEC	National Malaria Elimination Centre
PMI	President's Malaria Initiative
QA RAS	Quality Assured Rectal Artesunate Suppository
RAS	Rectal Artesunate Suppository
RHC	Rural Health Centre
RHP	Rural Health Post
SMAGs	Safe Motherhood Action Groups
SPSS	Statistical package for social scientists
T-QAG	Technical Quality Assurance Group
TTS2	Transition to Scale Phase 2
TTS3	Transition to Scale Phase 3
WHO	World Health Organisation

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Executive Summary

Background to study

The MAM@Scale project sought to support the scale-up of an evidence-based intervention that aimed at increasing access of hard-to-reach communities to effective treatment for severe malaria in high malaria burden settings. The project was implemented in phases, i.e., Transition to Scale 2 (TTS2) which was implemented in two demonstration districts and three National Scale Up (NSU) districts and TTS3 which was implemented in the five TTS2 districts and another additional five NSU districts. The endline was carried out in selected project areas during the months of October and November 2021 to determine the contribution of the project towards increasing the access of hard-to-reach communities to effective treatment for severe malaria in high malaria burden settings. Findings were compared to those of the baseline survey (February 2019) and the midline survey (July 2020).

Methodology

The OECD-DAC criteria for evaluations was adopted for the endline. Literature review, key informant interviews (KIIs) and focus group discussions (FGDs) were used to collect data. Data was collected from Chitambo and Serenje, (demonstration districts) and three NSU districts (Chama, Kasama and Mansa). Forty (40) health facilities (HFs) were visited in the five (5) districts and 544 community health volunteers (CHVs) were interviewed during the survey.

Findings

Relevance

The project was found to be relevant at community, district, and national levels. The major concern prior to project implementation was that children were contracting malaria and were not receiving proper treatment in time. Targeting children under five years was relevant as the age group is the most susceptible to severe malaria due to a lack of immunity. The provision of rectal artesunate (RAS) to children with suspected severe malaria and availability of bicycle ambulances (BAs) helped to stabilize their condition and enabled them to reach HFs in time. The resuscitation of community structures that were inactive in most of the communities was aligned to district plans. The project was also well aligned to national plans of eliminating malaria.

Effectiveness

Improvement in knowledge level of severe malaria and confidence to administer RAS

Knowledge about severe malaria and confidence in using RAS have improved considerably. The proportion of CHVs who mentioned that they knew about the danger signs of severe malaria increased from baseline (71.1%, N=426) to endline (99.1%, N=544). The most common danger signs mentioned by RAS trained CHVs at endline were vomiting everything (93.8%), fitting (91.4%) and not able to drink or eat 90.8%. This was slightly different from what CHVs at baseline mentioned, where the most frequently mentioned was fitting (53.2%), followed by fever (36.1%) and unconscious or lethargic (32.8%). In the demonstration districts, only 8.8% CHVs knew all the five danger signs at baseline, and this significantly improved at endline to 77.2%. More than 95% of the CHVs mentioned that they were very confident when administering RAS at endline as compared to 42.7% at baseline.

Drug availability at health facilities

Drug availability also improved considerably compared to previous surveys. Out of the 40 HFs that were visited at endline, the most mentioned drug for treating complicated/severe malaria was Injectable artesunate (Inj. As) (87.5%), followed by Coartem (72.5%) and Quinine (40%). Inj AS was more commonly mentioned in demonstration districts (100%) compared to NSU districts (79.2%). SP/FANSIDAR was the least mentioned drug (5%) and was more commonly mentioned in NSU districts (8.3%). The results show that 80% of the HFs visited during the endline had at least four of the key malaria drugs SP/Fansidar, quinine [Oral/ injectables), Inj AS and Coartem (6, 12, 18 and 24 tablets)]. The most common drug that was found during the endline survey was Coartem (100%) followed by SP/Fansidar (90%) and Inj AS (87.5%).

Availability of at least one staff member trained on Injectable Artesunate

Availability of trained staff remained high. Eighty-five percent (85%, N=40) of the HFs had at least one staff member trained in Inj AS. A greater proportion (87.5%) of the HFs in the demonstration districts had at least one member of staff trained in Inj AS and this is not significantly different from midline (80.8%). For the NSU districts, 83.3% (N=24) were found to have at least one staff member trained in Inj AS. In terms of the number of staff members who lacked training or experience in dealing with severe malaria, endline results show that a total of 36 staff members from 15 HFs lacked training or experience to deal with severe malaria cases and these were in Serenje (3), Chitambo (1), Chama (4), Mansa (3)and Kasama (4).

Case management of malaria

Case management by CHVs improved over time. The proportion of CHVs who managed suspected severe malaria cases in demonstration districts increased from 79.2% at baseline to 94.1% at endline. The proportion of CHVs who referred children to a health facility was 90.4% (n=544), this improved from 89.1% at midline and the increase was more apparent in demonstration districts. At endline, 99.2% of the interviewed CHVs said that they used a referral note when referring clients. This aligns with the CMS data where 99.5% of CHVs indicated that they issued a referral form to patients transferred to the HF. In addition, 55% of the HF staff mentioned that all the referred cases came with a completed referral form/note and most of these were in the demonstration districts (56.3%). The results also show that, at endline, 77.6% of the CHVs always made follow up visits to check on the health of children with severe malaria after they return from the health facility. This is slightly higher than at baseline (66.7%).

Use of the Emergency Transport System (ETS)

The ETS was a critical part of the support system. At endline, the average distance from the central part of their community to the nearest HF was 12.4km, (minimum=6 km and maximum=39 km). ETS riders in Serenje travel a longer distance (15.6km) when compared to the other two districts, Chitambo (12.4km) and Chama (10.5km). On average at endline, ETS riders reported taking 1 hour 19 minutes (78.7 minutes) to reach a HF when carrying a patient. This is higher when compared to baseline where it took about 75 minutes to reach the nearest HF. This can be attributed to the longer distances that they are now covering. The endline survey established that all the ETS riders thought that the community agrees that BAs can be used for both maternal and child health emergencies. In general, ETS riders expressed satisfaction in their work. However, they also expressed some challenges they are facing including long distances, poor road network and lack of lights during the night.

Changes in gender empowerment

The project contributed substantially to gender empowerment. At endline, 95.3% of the female CHVs agreed that they have a stronger voice at community level because of their training. In addition, 94.6% female and 95.9% males CHVs at endline thought that female community members have more independence to make health and other decisions in their households. Furthermore, the endline results reveal a statistically significant ($p<0.05$) change in the proportion of CHVs who have visited the least supported women to discuss child health issues, from 67.9% at baseline to 89.2%. Eighty-nine percent (89.9%) also mentioned that they have taken some actions to support the least supported women in their communities. The most mentioned actions were encouragement (56%), making sure that the least-supported women have health information (53.2%) and assisting with either soap or food (45.4%).

Results show a statistically significant ($p<0.05$) increase in the proportion of CHVs who mentioned that gender-based violence (GBV) has been rising in their communities from midline (15.9%, n=782) to endline (19.3%, n=544). Eighty-four (84%) of all respondents at endline indicated that GBV had either fallen a lot or disappeared in the last couple of years. Similarly, most of the CHVs (70.5%) at endline thought that fewer children were experiencing delays in being taken to the HFs when they are suspected of having malaria. In addition, the proportion of RAS trained CHVs who felt that people are relying less on traditional medicine increased from 75% at baseline to 87.3% at endline.

Impact of COVID-19 on service provision

The COVID-19 pandemic was still having a significant impact on people's lives but the effect on service provision seems to be waning over time. The proportion of HFs which experienced disruptions due to COVID-19 decreased from 84.1% (N=44) at midline to 45% (N=40) at endline. There was a significant decrease in the proportion of HFs who suspended or scaled down community level activities from midline (61.4%, N=44) to endline (50%, N=40) due to COVID-19. The services that were mostly mentioned were immunisations, delivery, child health clinics and growth monitoring. About 60% of the HFs had adequate supplies of PPE during the pandemic and 42.5% had recorded COVID-19 cases over the past 12 months. Sixty-two percent of CHVs at endline also faced challenges due to COVID-19 including restricted movements (74.6%), reduced meetings (68.7%) and lack PPE for COVID-19 (41.5%). ETS riders also faced another challenge that was unique to them. The major challenge faced by ETS riders during the partial lockdown was the lack of availability of spare parts as it became too expensive to buy spare parts locally because travelling across districts had been restricted.

Parents revealed that COVID-19 had induced fear in many people and impacted negatively on their lifestyles and livelihoods. The food packs that were distributed by the project therefore assisted the most-needy households to bridge the gap during the difficult times. Initially people were hesitant to vaccinate due to misconceptions about the vaccines, but the education provided by the CHVs, the radio programs and posters in relevant languages, communities' knowledge improved gradually, and this improved the willingness of people to be vaccinated. ETS riders, (26.5%, N=34) mentioned that they were vaccinated. The most mentioned reason by CHVs for not vaccinating was that there are few vaccination sites (55.2%), followed by unavailability of vaccines (22%) and vaccination program had not reached their areas (10.4%).

Cases of malaria in the project districts

It is difficult to assess trends in the number of malaria cases over time as different numbers of HFs were visited in each survey. A total of 126,537 malaria cases (in both adults and children) were recorded in all the

visited districts during endline survey over a 12-month period (September 2020 – August 2021). The number of severe malaria cases identified from HFs at endline was lower that the numbers of cases recorded from CMS data. This was due to several reasons, including the following: there is no indicator in the HMIS which captures severe malaria cases, lack of proper orientation for new staff on how to capture the data, and under-reporting due to possible use of other drugs to treat cases of severe malaria when HFs do not have Inj AS in stock (number of cases of severe malaria were estimated considering the number of cases given Inj AS). The endline survey made use of data extracted from the CMS. Considering all the facilities visited during midline and endline, the results show an increase in the severe malaria cases by 35.3% (400) from midline (1,134) to endline (1,534). However, the number of HFs that were visited at baseline and endline were different. From the 6 facilities which were followed from baseline to endline, a total of 535 severe malaria cases were recorded at endline compared to 699 at baseline and 1032 at midline.

Mortality rates due to severe malaria in children

Very few deaths from severe malaria were reported in the project sites. The endline survey collected data on the number of deaths among children under 5 years attributed to severe malaria over a 12-month period (September 2020 – August 2021). During the period, a total of 4 cases of severe malaria related deaths were recorded in all districts i.e., 2 in the NSU districts and 2 in the demonstration districts (none of these deaths were verified by the DHMTs who would usually undertake a mortality audit before confirming the cause of death). The results show that, case fatality reduced from baseline (3.1%) to endline (0.5%) in demonstration districts, which is a significant improvement. The trends in the past three years have shown a decrease in mortality rates that correlates with the introduction of bicycle ambulances and CHVs that are administering RAS. All these interventions have contributed to the reduction in reported malaria-related fatality rates in the intervention districts from 8% to 0.5%.

Efficiency

All resources for the project i.e., financial, human, equipment, and vehicles, were adequate for the planned project activities. Financial resources were disbursed according to the set schedule and against specific milestones. To promote efficiency in the implementation of the project, the human, equipment, and vehicles were increased when the project was scaled up to ten districts. The project's spending decisions were guided by value for money principles. In all procurements, the underlining principle was value for money with a balance of quality. The project subjected procurement over a certain threshold to three competitive quote systems to make sure that there was a basis for price and quality as prevailing in the market.

Sustainability

This endline established that there are project activities that are highly likely to continue beyond the lifespan of the project. Similarly, the project has outcomes that are expected to last even after the conclusion of project activities. This is due to several factors but mainly due to the presence of revived and strengthened community-based structures with a strong spirit of volunteerism, institutionalization in the district health systems, provision of RAS throughout the country by the national government, and the addition of a RAS component into the national (iCCM) training manual. Furthermore, stakeholders at all levels were well engaged and there is evidence of local ownership of the activities.

Conclusions and recommendations

Conclusions

- The project remained relevant throughout the different phases of implementation. The target of eliminating malaria has not yet been achieved in the country and the project continued to contribute to this national goal. There were no emerging or topical issues either at national or community level that warranted a re-focusing of the project or rendered it irrelevant.
- The availability of at least one staff member trained on Inj AS at HFs level has been affected by attrition of trained health staff from the project districts to other districts. Health staff are routinely rotated, and this is the likely cause of the reduction in the percentage of trained staff especially in the demonstration districts that was noted at both the midline and endline.
- One of the project focal areas was the improvement of drug availability at HF level. This was achieved as most of the HFs had four of the key malaria drugs at endline and the drug situation had improved from the one that was obtaining at baseline.
- The project helped to improve knowledge about simple and severe malaria among CHVs. The knowledge has also been passed on to parents prompting them to seek assistance from CHVs early. Almost all RAS trained CHVs indicated that they were confident to administer RAS. This, together with the high severe malaria knowledge levels, is likely to have contributed to a reduction in malaria deaths in the project districts. Despite the positive changes, CHVs encountered challenges in offering their services including inadequate PPE.
- The ETS has improved accessibility of HFs for malaria and maternity cases. The time taken to reach HFs has been reduced and this is critical especially in emergency situations. The fact that some ETS riders are also CHVs has further improved the effectiveness of the system as it eliminates the need for more than one person to be consulted. Although the riders face challenges in their line of duty, they have remained passionate about their work.
- There have been significant positive changes in gender empowerment and social inclusion of disadvantaged women and their families. This is evidenced by having more female CHVs who report that they have a stronger voice in their communities. Women in general have also been empowered as they are now able to make health-related decisions at household level. At endline, just under 90% of trained CHVs indicated that they had taken steps to reach the least-supported women in their community and include them in project activities.
- COVID-19 had a negative impact on service provision at both health facility and community levels. Efforts made by the project in creating awareness at community level seem to have significantly improved knowledge levels about COVID-19. The CHVs have also led by example when it comes to being vaccinated, with over 50% vaccinated at the time of the endline survey.
- All financial decisions were made based on the value for money principles. All resources were adequate to achieve the project objectives, and these were generally availed timeously. Overall, the project was well managed with all activities in the project's action plan delivered and most delivered on time.
- There is evidence of a reduction in child mortality from severe malaria in the project sites. Although the entire change cannot wholly be attributed to the project, it is apparent that the project has contributed in this regard. Recording of severe malaria cases at HF level however needs to be improved so that this vital statistic is accurately captured.

- It is anticipated that some of the project's activities will continue beyond the lifespan of the project. The project was able to build capacity of stakeholders and community structures, ensure buy-in by key stakeholders and establish partnerships that will help ensure that there is sustainability not only of some project activities but also of the outcomes.

Recommendations

- Government to promote joint programming, coordination, and implementation with other development agencies to sustain the management of severe malaria at community level.
- The Ministry of Health should consider the incorporation of severe malaria in the DHIS2. The MAM@Scale team has been working closely with other development partners to progress this agenda. Various severe malaria indicators are currently under consideration by the MOH for inclusion in the HMIS.
- It is important for the government to continue strengthening its institutional partnership and support for CHVs while utilising their existing community-based infrastructures and services to enhance joint activities at community level to address severe malaria.
- Rural health programs should put CHVs at the center of their planning and orientation. The government should place emphasis on the work undertaken by CHVs and acknowledge their efforts, for example through the provision of ongoing supportive supervision provided by the local health facility, adequate 'tools of the trade' including safety equipment (e.g., torches, raincoats, gum boots, PPE) a form of identification (e.g., identification badge or t-shirt) and a means of transport (e.g., bicycle) and continuous training.
- The contribution to the project outcomes of the ETS cannot be overlooked. Therefore, it is worth replicating this in other districts to alleviate the challenges posed by distances to HFs and the need to timeously get children to these facilities.

Dashboard

Indicator	Project target (TTS2)[1]	Baseline (February 2019)	Midline (June / July 2020)		Project target (TTS3)[2]	Endline (November 2021)		Data sources
# Lives saved among children aged 2 months to 6 years old	636		193[3]		636	439		HMIS, Outpatient Registers at HFs
# RAS beneficiaries (children aged 2months to 6 years)	7,621	1,279	Total	3,216	10,578	Total	7,310 (69% of target)	CMS data
			Demo	2,993	-	Demo	2,732	
			NSU	619	-	NSU	4,578	
# Intervention communities using innovative product	120		Total	351	1,614	Total	1,272 (79% of target)	CMS data
			Demo	180	-	Demo	180	
			NSU	171	-	NSU	1,092	
# (%) HWs trained in SM case management who manage cases	64 (80% of 80)		Serenje -98% Chitambo – 98% Manyinga – 98% Chama -98% Vubwi – 99%		100 (80% of 125)	Demo	97%	Health facility staff records
						NSU	85%	
						Total	92%	
# (%) CHVs trained in SM case management who manage cases	1152 (80% of 1,440)	79.2%	Total	1,667 (94.4%)	925 (80% of 1,157)	Total	94.1%	Baseline, midline and, endline survey
			Demo	1,417 (93.1%)	-	Demo	94.7%	
			NSU	220 (89.2%)		NSU	93.7%	

[1] The project's Transition to Scale Phase 2 (TTS2) timeline was February 2019 to October 2021.
[2] The project's Transition to Scale Phase 3 (TTS3) timeline was October 2020 to December 2021.
[3] Proportion of cases progressing to SM was lower, hence lowering this number.

Indicator	Project target (TTS2)	Baseline (February 2019)	Midline (June / July 2020)		Project target (TTS3)	Endline (November 2021)		Data sources
# HWs trained in SM case management	100		Total	238	125	Total	392 (314% of target)	CMS data
			Demo	157	-	Demo	-	
			NSU	81	-	NSU	392	
# CHVs trained in RAS administration and referral	2,000		Total	1,810	1,157	Total	1,117 (97% of target)	CHV training report
			Demo	1,448		Demo	-	
			NSU	362		NSU	1,117	
# (%) HWs confident to deal with SM cases	80		Serenje -98% Chitambo – 98% Manyinga – 90% Chama -100% Vubwi – 98%		80%	100%		Baseline and midline Surveys
(%) CHVs confident to deal with SM in children	80%	42.7%	Total	97.4%	80%	Total	99.6%	Baseline, midline, and Endline Surveys
			Demo	98.3%	80%	Demo	100%	
			NSU	95.1%	80%	NSU	99.3%	
# full-time jobs created by project in Zambia	5	5	6		6			CMS data
# part-time jobs created by project in Zambia	4	4	13[4]		12	14[5]		Program Documents (Contracts)
# Outreach or awareness activities conducted	1		1		1	2 (severe malaria and COVID-19 campaigns)		CMS data

[4] 9 Community Facilitators, 1 Finance Officer, 1 Donor Liaison Officer, 2 District Consultants.
[5] 10 Community Facilitators, 1 Finance Officer, 1 Donor Liaison Officer, 2 District Consultants.

Indicator	Project target (TTS2)	Baseline (February 2019)	Midline (June / July 2020)		Project target (TTS3)	Endline (November 2021)		Data sources
# Beneficiaries reached via outreach or awareness (children 6 months - 6 yrs.)	39,500		67,968		183,946	188,704 (103% of target)		CMS data
# Community members reached via outreach or awareness activities	115,476		224,000		613,163	588,581 (96% of target)		CMS data
Influence / contribution to a change in policy, procedure, or legislation	YES				YES	- RAS is being procured by MOH - RAS is being scaled up nationally - MAM@Scale approach included in national iCCM Training Manual		Design Mission, Baseline, midline, and CMS
# (%) female CHVs	50%		Total	47%	Same as TTS2	Total		CHV training report
			Demo	51.8%		Demo		
			NSU	19.8%		NSU		
# (%) female ETS riders	15%		34%		15%			ETS training report
(%) female CHVs with improved severe malaria knowledge	80%	72.6%	Total	99.7%	80%	Total	99.4%	Midline and endline surveys
			Demo	99.7%		Demo	99.1%	
			NSU	100%		NSU	100%	

Indicator	Project target (TTS2)	Baseline (February 2019)	Midline (June / July 2020)		Project target (TTS3)	Endline (November 2021)		Data sources
(%) female CHVs with confidence to administer RAS	80%	43.3%	Total	95.5%	80%	Total	100%	Midline and endline surveys
			Demo	97.2%		Demo	100%	
			NSU	85.3%		NSU	100%	
(%) female CHVs reporting that they have a stronger voice at community level	70%		Total	97.8%	70%	Total	95.3%	Midline and endline surveys
			Demo	97.9%		Demo	92.5%	
			NSU	96.2%		NSU	100%	
(%) of female community members indicating that they have improved scope for decision-making within the households	70%		Total	94.4%	70%	Total	95.9%	Midline surveys
			Demo	94.2%		Demo	93.4%	
			NSU	96.2%		NSU	100%	

1 Introduction

1.1 Background to the endline

The MAM@Scale project sought to support the scale-up of an evidence-based intervention that aimed at increasing access of hard-to-reach communities to effective treatment for severe malaria in high malaria burden settings. The MAM@Scale project brought quality assured rectal artesunate (RAS) to remote regions in Zambia, providing children under-six with an immediate pre-referral intervention for severe malaria at the community level. The project also facilitated an emergency transport scheme (ETS) to transport patients to referral health centers via a system of bicycle ambulances (BAs) with trained riders. The MAM@Scale Transition to Scale 2 (TTS2) began on 1st December 2018 and was initially set to end on 30 May 2020. Due to the COVID-19 pandemic, the project applied for and was granted a no-cost extension for a maximum of six months (i.e., from June to November 2020). This phase was implemented in two core demonstration districts (Serenje and Chitambo) and three additional national scale up (NSU) districts (Manyinga, Vubwi and Chama). The project was further granted a costed extension for 12 months (TTS3) and this was implemented in the five TTS2 districts and another five NSU districts. TTS3 is set to end in November 2021 hence the endline evaluation. The consortium requested a one month no cost extension to finalise project activities and this was granted.

1.2 Purpose and objectives of the evaluation

The main objective of the endline evaluation was to determine the contribution of the project towards increasing the access of hard-to-reach communities to effective treatment for severe malaria in high malaria burden settings. The evaluation sought to assess the relevance, impact, effectiveness, efficiency, and sustainability of MAM@Scale TTS2 and 3. The outcomes of the evaluation will be used to inform future programs and provide evidence for advocating for scaling up the project to cover the entire nation. The specific objectives of the evaluation were to:

- Review the contextual relevance of the project and strategic fit in the elimination of malaria in children under 6 years.
- Determine the impact of the project on the reduction of mortality in children under 6 years due to severe malaria.
- Explore the effectiveness of the project strategies, particularly strategies to:
    - Improve the availability of trained personnel and malaria drugs at health institutions
    - Improve knowledge levels on severe malaria, confidence to deal with children and malaria case management by community health workers
    - Promote social inclusion of disadvantaged females
    - Mitigate the impact of COVID-19 on the provision of services
- Assess the efficiency of the project
- To assess the sustainability of the project and its intervention

1.3 MAM@Scale Project

1.3.1 Project Description

The MAM@Scale project sought to support the scale-up of an evidence-based intervention that aims to increase the access of hard-to-reach communities to effective treatment for severe malaria in high malaria burden settings. The intervention increased access to pre-referral RAS in the community and injectable artesunate at the health facility. It broke down the barriers and delays that prevent timely uptake of malaria treatment and services and helped to improve referrals from the community. MAM@Scale was awarded a 'transition to scale grant' by Grand Challenges Canada (GCC) in 2018. This supports innovators to "take their bold ideas to big impact in the area of global health." The innovation is an approach that increases the access of children aged two months to six years old to a pre-referral intervention for severe malaria (i.e., RAS[6]) and supports their referral to HFs that are equipped to provide quality case management of severe malaria. The innovation is suitable for hard-to-reach areas where communities commonly experience delays in reaching a health facility. The MAM@Scale project is a scale up of the pilot MAMaZ Against Malaria (MAM) project which was carried out in Serenje district, Central Province, between July 2017 and July 2018 and funded by Medicines for Malaria Venture (MMV). The pilot mobilised communities around a severe malaria agenda and connected communities to HFs ensuring that severe malaria case management was available, adequately followed-up, and that the health system was more responsive to beneficiary needs.

MAM@Scale increased access to quality-assured RAS in community-based settings in Zambia to ensure that more children with suspected severe malaria were receiving immediate antimalarial pre-referral treatment prior to referral to a health care. The partnership with MMV ensured procurement of quality assured RAS through two pharmaceutical partners, Cipla and Strides Shashun. The MAM@Scale project ensured that quality assured RAS was available at community level (through distribution partnerships with district governments), trained community health volunteers (CHVs) on the diagnosis of severe malaria in the community setting, and in the administration of RAS for suspected severe malaria cases.

The project was implemented by a consortium comprising Development Data Zambia (project lead), Transaid (UK), DAI Global Health (UK) and Disacare (Zambia). All four organisations were involved in the design and implementation of MAMaZ Against Malaria which was led by Transaid, the MORE Mobilising Access to Maternal Health Services in Zambia Project (MORE MAMaZ), led by Transaid and funded by the UK charity Comic Relief (2014-2016) and MAMaZ, led by Health Partners International (now part of DAI Global Health) and funded by the UK Department for International Development (now the UK Foreign, Commonwealth and Development Office – FCDO).

The project's core intervention districts were Serenje and Chitambo in Central Province. Both districts participated in MAMaZ and MORE MAMaZ, and Serenje District was the sole intervention district in MAM. MAM@Scale also provided light support to three additional districts namely Manyinga, Vubwi and Chama in the first phase of scaling up the innovation (TTS2) with support from other partners. In TTS3 a further five districts were added (Mwinilunga, Mansa, Petauke, Lufwanyama and Kasama), taking the total number of intervention districts to ten.

[6] The preferred name recently changed to Artesunate Rectal Capsules (ARC). However, the term used in Zambia by NMEC, health workers and CHVs is 'RAS'.

Sustainable delivery of MAM@Scale was implemented via government uptake and long-term support of the intervention through the Zambian MOH, local district governments, and the National Malaria Elimination Centre. In this regard, the project sought to leverage support from all government partners to work with the MAM@Scale team to gradually expand the project nationwide.

Through trained CHVs, children with severe symptoms who cannot take oral medication are given a rectal capsule, RAS, which ensures they are receiving an immediate pre-referral intervention with an antimalarial before they are referred to a health facility. The project also facilitated emergency transportation of patients with severe malaria from the community to referral HFs for follow-on treatment, through a system of bicycle ambulances with trained riders. At health care settings the MAM@Scale project trained health care providers in the diagnosis and case management of severe malaria in children.

MAM@Scale TTS2 was set to deliver impact by:

- Expanding project operations from one to five districts and therefore creating a substantial increase in population coverage
- Training 2,000 CHVs in severe malaria recognition and treatment
- Training over 100 front-line health providers in severe malaria case management in five districts
- Procuring adequate supplies of RAS for over 7,000 beneficiaries by the MOH, with support from the Global Fund), and ensuring NSU districts could access a reliable supply and longer-term commodity security, and
- Providing evidence as well as strategic support to the Zambian MOH to transition pre-referral RAS to scale across Zambia.

Having made significant progress towards TTS2 milestones, the TTS3 phase enabled the consortium to continue to transition to scale and strengthen the institutionalization of community-based RAS at the national and district levels. During TTS3, the target was that up to 10,578 children with severe malaria would receive RAS, of which 9,000 would receive timely transportation to a facility and receive follow-on treatment, ideally with Injectable Artesunate. Approximately 636 deaths would be averted. Under TTS3, the project sought to:

1. *Scale-up the MAM project from 5 to 10 districts and increase saturation in 5 existing districts, expanding the catchment area from 284,098 to almost 900,000.* An additional 1,157 CHVs were to be trained in severe malaria case management through a train-the-trainer model. The two demonstration districts would be strengthened, and trainers from these districts mobilised to train trainers in other districts. The plan was to train 90 ETS riders. Five new intervention districts were to be added, and coverage of RAS expanded in three existing districts (Vubwi, Chama and Manyinga) where appropriate. The team aimed to work in partnership with the MOH and local implementation partners in each district to deliver RAS training.

2. *Strengthen the capacity of the Zambian MOH and NMEC for national scale-up by*:

- Integrating key revisions to the national i-CCM training manual for administration of RAS, emphasizing community mobilisation and gender-smart strategies;
- Participating in MOH technical working groups and drug quantification exercises to ensure the routine ordering and distribution of RAS;

- Providing technical support on data management, monitoring and evaluation; and
- Contributing to Zambia's 2021-2023 Global Fund proposal to ensure RAS, RAS training and emergency transportation systems were included in the malaria proposal.

MAM@Scale was also adapted at speed to integrate an emergency response to COVID-19. FIA Foundation provided support to address COVID-19 initiatives that ran from April 2020 to March 2021.

The coverage of TTS2 and TTS3 is summarized in Table 1 below.

Table 1:Projected Total Population Coverage of MAM@Scale

Comparator	MAM@Scale TTS2 and TTS3 Districts										
	Serenje	Chitambo	Mansa	Chama	Kasama	Lufwanyama	Petauke	Mwinilunga	Manyinga	Vubwi	Total
Total District Population	148,006	61,348	253,414	151,428	306,423	150,000	306,681	129,523	58,500	55,015	**1,620,338**
Pop Coverage (demo sites)	78,181	49,917	-	-	-	-	-	-	-	-	**128,098**
Pop Coverage (Low intensity sites)	30,000	2,000	108,000	86,500	105,500	133,500	105,500	106,000	58,500	35,000	**770,500**
Total Pop Coverage	**108,181**	**51,917**	**108,000**	**86,500**	**105,500**	**133,500**	**105,500**	**106,000**	**58,500**	**35,000**	**898,598**
% Total population	74%	80%	43%	57%	34%	89%	34%	82%	100%	64%	**55%**
Intervention HFs (high intensity approach)	16	13	-	-	-	-	-	-	-	-	**29**
Intervention HFs (Low intensity approach)	9	1	37	18	28	23	22	27	11	12	**187**
Total Intervention HFs	25	14	37	18	28	23	22	27	11	12	**217**
Total HFs in district	29	14	74	29	43	23	31	28	11	12	**294**
% Total HFs	**86%**	**100%**	**50%**	**62%**	**65%**	**100%**	**71%**	**93%**	**100%**	**100%**	**74%**

1.3.2 Project Indicators

The main point of reference for this project's measurement of achievements is its Results-based Management & Accountability Framework (RMAF) summarised in Table 2 below:

Table 2: MAM@Scale Project Targets

Indicator	Indicator categories	Project targets					
		TTS2			TTS3		
		Female	Male	Total	Female	Male	Total
# Of Lives saved in target communities (in low- and middle-income countries), disaggregated by Age and Sex	New-born under 1 month						
	Children (1 month - <2 years)	76	76	152	106	106	212
	Children (2 - 4 years)	146	147	293	106	106	212
	Children (5 - 9 years)	95	96	191	106	106	212
# of beneficiaries using innovative products or services to improve their health (disaggregated by sex and age)	New-born under 1 month						
	Children (1 month - <2 years)	1,016	1,016	2,032	1,763	1,763	3,526
	Children (2 - 4 years)	1,948	1,947	3,895	1,763	1,763	3,526
	Children (5 - 9 years)	1,270	1,270	2,540	1,763	1,763	3,526

Table 3 below shows the list of main indicators for the project. A baseline study was conducted at the beginning of the project in the demonstration districts only. The initial monitoring plan did not include a midline survey since the project was scheduled to end in May 2020. Instead, an endline was supposed to be conducted at this stage. Additional funding for a COVID-19 intervention allowed the project to extend its operations to 30 November 2020. Contractually TTS3 commenced in mid-October 2020.

Table 3: MAM@Scale Project Indicators

Indicator	Project targets		Planned Data Source(s)
	TTS2	TTS3	
# lives saved among children aged 2 months to 6 years old	636	636	HMIS, Outpatient Registers at health facilities
# RAS beneficiaries (children aged 2 months to 6 years)	7,621	10,578	Community Monitoring System (CMS) Data
# intervention communities using innovative product	120	1,614	Community Monitoring System (CMS) data
# CHVs trained in RAS administration and referral	2,000	1,157	Community Monitoring System (CMS) data
# HWs trained in SM case management	100	125	Community Monitoring System (CMS) data
# (%) HWs trained in SM case management who manage cases	80	100 (80% of 125)	Health facility staff records
# (%) CHVs trained in SM case management who manage cases	1,440	925 (80% of 1,157)	Baseline and Endline Surveys

# (%) HWs confident to deal with SM cases	80	100 (80% of 125)	Baseline and Endline Surveys
# (%) CHVs confident to deal with SM in children	1,600	925 (80% of 1,157)	Baseline and Endline Surveys
# full-time jobs created by project in Zambia	5	6	Community Monitoring System (CMS)
# part-time jobs created by project in Zambia	4	12	Community Monitoring System (CMS)
# outreach or awareness activities conducted	1	1	Community Monitoring System (CMS)
# beneficiaries reached via outreach or awareness (children 6 months - 6 yrs.)	39,500	183,946	Community Monitoring System (CMS)
# community members reached via outreach or awareness activities	115,476	613,163	Community Monitoring System (CMS)
Influence / contribution to a change in policy, procedure or legislation	Yes	Yes	Design Mission, Baseline, Endline and CMS

Data for indicators in the Gender Strategy was also collected. The indicators for the Gender Strategy are outlined below (Table 4)

Table 4: Indicators for Gender Priorities

Priority	Indicators	Target	How measured
1	# (%) female CHVs	50%	CHV training report
	# (%) female ETS riders	15%	ETS training report
	# (%) female CHVs with improved severe malaria knowledge	80%	Endline survey
	# (%) female CHVs with confidence to administer RAS	80%	Endline survey
	# (%) female CHVs reporting that they have a stronger voice at community level	70%	Endline survey Qualitative gender empowerment outcomes study
	# (%) of female community members indicating that they have improved scope for decision-making within the households	70%	Qualitative gender empowerment outcomes study/ Endline survey
2	Gender empowerment outcomes study produced	By end of Q4 Y2	Report
	Endline survey incorporates additional gender indicators	By end of Q4 Y2	Endline survey report
3	National i-CCM training manual revised to incorporate MAM@Scale training approach (which includes gender-smart strategies)	By end of Q4 Y2	Review of National i-CCM Training Manual / Approach (discussions with government stakeholders)

2 Literature Review

2.1 Synopsis of malaria context in Zambia

Zambia's entire population of 17.861 million people is categorised as at high risk of contracting malaria, leading to an estimated 2.64 million cases in 2019 (WHO, 2020). Due to the concerted efforts of the National Malaria Elimination Centre (NMEC), Zambia reported a decrease in cases between 2017 and 2019 (from 2.93 million to 2.64 million). The World Malaria Report 2020 estimates that 7,793 Zambians lost their lives to malaria in 2018 and 7,914 in 2019 (WHO, 2020). In contrast, the National Health Management Information System (HMIS) reported 1,339 malaria deaths in 2019 (WHO 2020). The higher WHO figure includes an estimate of malaria deaths occurring at community level out of sight of the formal health sector. P. falciparum, the species of plasmodium parasite that causes the most lethal form of malaria, accounts for an estimated 98% of malaria cases in Zambia[7] (MOH, 2021). Central Province has a malaria parasite prevalence rate of 13.8%[8] (GOZ, 2015).

Zambia is known to be a highly endemic malaria country; the entire population is prone to contracting malaria. The risk of contracting malaria is highest in the wetter, rural, poverty-stricken provinces of Luapula, Northern, Muchinga and North-western (11–30% prevalence in 2018), and lowest in Lusaka Province (0.1% and Southern Province (<0.1%) (https://www.severemalaria.org/countries/zambia). According to the WHO's World Malaria Report published in 2017, it was stated that children under five years old are the age group most susceptible to severe malaria due to a lack of immunity and if left untreated, severe malaria can quickly become fatal.

Zambia is among the 20 countries with the highest malaria incidence and mortality globally. Zambia carries 2% of the global malaria case burden and 5.2% of the case burden in East and Southern Africa (Zambia Malaria Indicator Survey (MIS) 2018; (Health Management Information System (HMIS) 2018). Chaponda *et al* argue that pregnant women and children under 5 years of age are among the groups at high risk of malaria infection. They further state that malaria infection is associated with adverse birth outcomes that affect the mother, foetus, and infant (ibid). Chaponda *et al* also note that the prevalence and the predictors of malaria infection among pregnant women resident in the Nchelenge District of northern Zambia were investigated and high burden of malaria detected by PCR in these pregnant women suggests that past prevention efforts have had limited effect. To reduce this burden of malaria sustainably, there is clear need to strengthen existing interventions and, possibly, to change approaches so as to improve targeting of groups most affected by malaria (ibid).

Trends identified in the 2018 Zambia Malaria Indicator Survey (MIS) and Health Management Information System (HMIS) are as follows:

- The national infection rate in children under five decreased from 22% in 2006 to 9% in 2018.

[8] The malaria parasite prevalence rate is based on the percentage of children under five years old with malaria parasites read by microscopy.

- 80% of households owned at least one insecticide-treated mosquito net (ITN), an increase from 38% in 2006
- 77% of children in rural areas, where risk is greatest, slept under ITN, an increase from 42% in 2008. 81% of pregnant women received medications to prevent malaria, an increase from 59% in 2006.

The above indicates that Zambia has made significant progress in malaria control. There was a 26.8% reduction in cases between 2016 and 2019, from 202 to 148 per 1000 of the population at risk, while mortality rates fell by 5.4% from 0.47 to 0.44 per 1000 of the population at risk (https://www.severemalaria.org/countries/zambia). In the first half of 2020, however, epidemiologic trends in malaria indicators worsened. The National Malaria Elimination Centre (NMEC) recorded a 30–50% increase in malaria cases, malaria deaths, and test positivity rates nationally, as compared with 2018 and 2019.

The Government of the Republic of Zambia adopted the National Malaria Elimination Strategic Plan for the period of 2017-2021[9] in 2017. The plan aims to 'move from accelerated burden reduction to malaria elimination in Zambia.' This strategy has a vision of a malaria-free Zambia. It seeks to achieve this by eliminating local malaria infection and disease in Zambia by 2021, maintaining malaria-free status, and preventing the reintroduction and importation of malaria into areas where the disease has been eliminated. An important element in the country's approach to eliminating malaria includes effective case management strategies that focus on treating detected cases. Timely diagnosis and effective treatment are regarded as a first step in reducing the country's malaria burden.

2.2 Epidemiology

According to the World Health Report (2020), sustainability is the core of a successful health-related intervention program, and this has played a pivotal role in malaria contraction. However, drug and insecticide resistance, social, demographic, cultural and behavioural beliefs and practices, and various health systems challenges could set back the progress attained so far. Ignoring such impeding factors coupled with certain region-specific factors may jeopardize Zambia's ability to stay on track to achieve global elimination of the malaria parasite. Steketee et al (2019) report that the predominant malaria parasite in Zambia is Plasmodium falciparum which accounts for 98% of all reported malaria cases. Plasmodium ovale, P vivax and P. malariae account for the remaining 2%. The primary vector is Anopheles arabiensis and it is widely distributed in the eight rural provinces of Zambia. Anopheles funestus is resistant to two groups of insecticides - pyrethroid and carbamates. Currently, the country is conducting entomological surveillance to determine its distribution. The country received a lot of rain during the 2019 malaria season which increased the mosquito breeding places resulting in an increased mosquito population density. This led to an increased malaria outbreak experienced in the provinces (Report on the Zambia Roll Back Malaria baseline study 2019).

WHO (2020) noted, *"We are extremely concerned about the spike in malaria and cholera cases amidst the COVID-19 pandemic. The COVID-19 pandemic has caused more strain on the existing health system for those most vulnerable, and now these other disease outbreaks are worsening the situation amidst a scarcity in health personnel and supplies. The IRC [International Rescue Committee] has been training*

[9] https://www.nmec.org.zm/malaria-elimination-strategic-plan

our health care workers to recognize symptoms and safely support patients suffering from malaria, cholera and COVID-19. Still, health services in many countries are not fit to handle coinciding outbreaks of these diseases, and we need urgent support to scale up our response now (United Nations 2020)."

For those displaced, these diseases are especially dangerous due to cramped living spaces and poor access to water and sanitation facilities and shelter (Roll Back Malaria, 2019). Apart from the strain on HFs during the pandemic, in some provinces, it was reported that a fear of exposure to COVID-19 has prevented parents from taking their children to hospital, delaying diagnosis and treatment of malaria and increasing preventable deaths.

In rural areas of stable malaria transmission, very young children and pregnant women are the population groups at highest risk for malaria morbidity and mortality (Molineaux, 2020). Most children experience their first malaria infections during the first year or two of life, when they have not yet acquired adequate clinical immunity – which makes these early years particularly dangerous. Eighty percent of all malaria deaths in Africa are estimated to occur in young children (WHO 2021).

2.3 Mortality

According to the World Health Report (2020), there are three principal ways in which malaria can contribute to death in young children. First, an overwhelming acute infection, which frequently presents as seizures or coma (cerebral malaria), may kill a child directly and quickly. Second, repeated malaria infections contribute to the development of severe anaemia, which substantially increases the risk of death. Third, low birth weight – frequently the consequence of malaria infection in pregnant women – is the major risk factor for death in the first month of life. In addition, repeated malaria infections make young children more susceptible to other common childhood illnesses, such as diarrhoea and respiratory infections, and thus contribute indirectly to mortality.

2.4 Routine case detection and reporting

Data from HFs are potentially useful for monitoring time trends in the number of malaria cases and deaths but have severe limitations. United Nations (2020) claimed that, in rural Zambia, most cases of malaria are diagnosed on the basis of clinical symptoms and treatment is presumptive, rather than based on laboratory confirmation. The main clinical symptoms of malaria – fever and general weakness – are nonspecific and may well be due to other common infections.

2.5 Malaria eradication

Malaria elimination is possible, but doubts have been raised on Zambia's ability to achieve its complete eradication. Many provinces in Zambia that are endemic today were at the verge of elimination a few decades ago. Malaria surveillance data indicate that the situation can regress quickly (Molineaux, 2020). However, recently encouraged by the progress achieved, once again elimination has gained momentum with the aim of complete eradication. Yet there are multiple challenges which may keep on increasing as the country moves ahead towards complete elimination. At present, there is a pressing need to contain developing antimalarial and insecticide resistance, increase surveillance including detection of asymptomatic carriers. In addition, the country needs to improve testing and treatment methods and show courageous leadership at national level to remain committed to elimination programs and assure continuous and long-term investment. The elimination activities are primarily skewed to target Plasmodium

falciparum and do not take into account P. vivax which poses a potential challenge when clearing malaria epicentres in endemic settings (MARA/ARMA collaboration, 2020).

Challenges in achieving malaria elimination

Steketee et al (2019) note that Zambia remains endemic for malaria and has the ambition to eliminate malaria. There are however challenges to confront in order to make the desired progress. Drug resistance, treatment failure, insecticide resistance, global warming and change in climate, and internally displaced persons, migration, lack of political will, inadequate malaria leadership, funding, and adequate local research constitute the challenges. Addressing these challenges is central to achieving malaria elimination in Zambia.

Socio-cultural hindrance in malaria elimination

Serious malaria control efforts cannot afford to disregard the human context and recognise that there are different perceptions and beliefs of malaria, malaria vectors and their management at community level. The United Nations (2020) emphasized that community behaviour including delays in seeking medical attention, staying outdoors until late and maintaining stagnant water are not supportive to the national malaria elimination program. The UN also found that the disease was more prevalent among those who have low income, poor knowledge of basic malaria facts, inhabit remote areas and hesitate to use bed nets. These communities are probably marginalised by the health system and have less access to ongoing control and prevention measures. Such people are not able to afford personal protection measures all the time and are vulnerable to ineffective treatment due to various cultural and financial limitations (Molineaux, 2020).

In Zambia, beliefs about malaria among different communities vary according to gender, education, social, cultural and religious factors. These variations influence the acceptability of malaria prevention and treatment and also activities associated with malaria control, primarily because social beliefs have no scientific and logical background, and people may have conflicting opinions. Therefore, involving communities without addressing such beliefs acquired over time and resolving seemingly misleading knowledge about malaria with accurate explanation is challenging. Lack of awareness could also lead to serious consequences that may thwart control programs. A recent review by WHO (see World Health Report 2020) has highlighted that mosquito nets distributed free of cost to people living in endemic areas may not be used for the purpose they are meant for but may rather be used for catching fish in the streams and rivers and to store food material. Steketee et al (2019) suggest that to attain effective acceptance of malaria control methods in endemic areas, the control strategy must include the following: (i) perception of malaria at local level, (ii) how people decide whether treatment or preventive measures are efficacious, (iii) treatment seeking pattern of community, and (iv) involvement of communities in overall planning and evaluation of control programs.

Zambia's malaria efforts underscore the challenges developing countries' disease control programmes face in areas with poor infrastructure, weak health systems and porous borders. It is one of eight southern African countries, known as the E8, that have set themselves the joint 2030 goal of elimination (Bull World Health Organ; 2018). Last year (2020), two of those countries (Botswana and Namibia) had outbreaks and four (Angola, Mozambique, South Africa and Zimbabwe) had localized increases of cases; Eswatini is also in the group (ibid). Dr Elizabeth Chizema, the director of the Zambia National Malaria Elimination Centre noted that Zambia's success in moving towards malaria elimination has been geographically uneven, reflecting

disparities in wealth and health system strength in different regions, uneven donor funding patterns, as well as differences in the epidemiology of the disease across the country making it easier to control malaria in some areas but less so in other areas. The north of Zambia is lagging, reflecting inequalities in investment and traditionally high levels of malaria transmission, according to Dr Chitalu Chilufya, who was Zambia's health minister (August 2016 to January 2021). The more deprived parts of the country – with poor overall health indicators, greater poverty, and weak health systems and infrastructure – present more challenging environments to operate in, according to Melanie Luick-Martins, who heads USAID's health programme, one of the few donors investing in deprived parts of Zambia.

Prequalified RAS (rectal artesunate)

Although WHO guidelines for the treatment of malaria have included recommendations for the use of the suppository form of the drug, known as rectal artesunate suppository (RAS), for over ten years, until recently there was no quality-assured RAS product on the market (https://www.scidev.net/sub-saharan-africa/multimedia/zambia-trial-cuts-severe-malaria-deaths). This forced malaria-endemic countries to choose from sources of drug supply that did not meet international standards. MMV collaborated with two Indian pharmaceutical companies, Strides and Cipla, to secure WHO prequalification of RAS as part of a project funded by the international malaria initiative UNITAID (ibid).

As part of the project, a pilot was conducted in Zambia's Serenje district in partnership with Zambia's National Malaria Elimination Centre. The pilot aimed to increase access to quality-assured artesunate at community level and to reduce deaths from severe malaria in children under six by improving case management of severe malaria in children (https://www.scidev.net/sub-saharan-africa/multimedia/zambia-trial-cuts-severe-malaria-deaths). In the pilot trained community health volunteers administered the drug to all children from six months to six years old with suspected severe malaria.

In 2017, the National Malaria Elimination Program of Zambia and its partners revised the Guidelines for the Diagnosis and Treatment of Malaria to include artesunate rectal capsules for pre-referral treatment of severe malaria in children less than six years, including at the community level. There is renewed MoH interest in scaling up the use of artesunate rectal capsules for the management of children with severe malaria at the time of referral from community settings and health posts (https://www.severemalaria.org/countries/zambia). Zambia's Guidelines for the Diagnosis and Treatment of Malaria in Zambia (Ministry of Health, 5th Edition, 2017) recommend injectable artesunate as the first line treatment for severe malaria; Intramuscular artemether or intramuscular/intravenous quinine are alternatives; Injectable artesunate is also the first line treatment for pregnant women with severe malaria. WHO recommends that this should be done starting from the 2nd trimester onwards - at peripheral HFs, pre-referral management of severe disease with artesunate rectal capsules (ARC) (for children less than 6 years old) or injectable artesunate is recommended. If these two options are not available, intramuscular quinine is recommended. For community health workers, pre-referral management of severe disease with rectal artesunate (for children less than 6 years old) is recommended (ibid).

Conclusion

The intervention tools available currently can most likely reduce transmission but clearing of malaria epicenters from where the disease can flare up any time, is not possible without involving the local

population in meaningful ways that respond to their beliefs and traditions. Nevertheless, maintaining zero malaria transmission and checks on malaria import in areas of Zambia that have been declared malaria free, and further speeding up of interventions to stop transmission in Zambia is most desirable. Strong community level collaboration backed by adequate political and financial support among the provinces with a common objective to eliminate malaria must be a top priority.

3 Review Approach and Methodology

3.1 Endline survey approach

The endline evaluation was carried out in selected MAM@Scale project intervention areas to assess the possible change that can be attributed to the project particularly with regards to management of cases of severe malaria. The OECD-DAC criteria for evaluations were adopted. Primary and secondary data collection methods were employed to gather data for the endline survey, and the results were contrasted against the midline and baseline outcomes. To triangulate findings, data were collected using complementary methodologies. Primary data were collected from HFs and CHVs including ETS riders. Quantitative data were collected using two separate tools which were adapted from the baseline: a health facility tool used to capture information on personnel, malaria case management, and preparedness for severe malaria; and a structured interview tool for CHVs and ETS riders (see Annex 2).

Qualitative data were collected using three separate tools, two focus group discussion guides and one key informant guide as follows:

(1) Focus group guide for the use with parents of children who benefitted from the project
(2) Focus group guide for the ordinary CHVs and
(3) Key informant guide for the use with selected key informants at district and community levels.

Secondary data were collected from the review of HMIS data, project reports, Community Monitoring System (CMS) and relevant national reports.

3.2 Survey design

The MaM@Scale endline evaluation was designed to make comparisons between baseline and midline reviews. In addition, it was also designed to mirror the baseline survey which was carried out in Chitambo and Serenje. It was also undertaken to show progress against key project targets in TTS3. The sampling included a total of five districts: Serenje, Chitambo, Chama, Mansa and Kasama. It is worth noting that the survey was also designed to make a comparison between TTS2 and TTS3 supported districts, hence the inclusion of Mansa and Kasama districts, both of which came on stream as intervention districts during TTS3. Sample sizes for respondents were allocated to facilities in two stages: 1) by first selecting HFs randomly then 2) equal numbers of CHVs were allocated in each of the targeted districts. Below is the map with some of the facilities visited during endline.

Table 5: List of health facilities that were visited at endline

#	Serenje	Chitambo	Chama	Mansa	Kasama
1	Chibobo	Chalilo	Chibale	Chisunka	Chanda Mukulu
2	Kabamba	Chipundu	Kambombo	Katangwe	Chiombo
3	Kamena	Kafinda	Lundu	Mano	Kasakula
4	Kaseba	Mapepala	Manthepa	Matelo	Lukasha
5	Lumpampa	Mateokakumbi	Mwalala	Musaila	Lwabwe
6	Mulilima	Mpelembe	Sitwe	Ndoba	Misengo
7	Musamani	Nakatambo	Tembwe		Mwamba
8	Nchimishi	Yoram			Mwasha
9					Ngoma
10					Nkolemfumu
11					Ntumpa

3.3 Sample size determination and achievements

The sample size for the endline survey was statistically calculated to provide a robust sample to measure the indicators. A total of 504 CHVs were targeted. Equal allocation of the sample size was applied to allocate the sample to the five target districts, thus a minimum of 100 CHVs were targeted in each of the districts. In each district, an additional 10% of the sample was added to include ETS riders. However, there are no ETS riders in Kasama and Mansa, hence ETS riders were drawn from only three districts, Serenje, Chitambo and Chama, i.e., 10 ETS riders were targeted in each of those districts giving a total of 30 ETS riders. Therefore, the endline survey targeted a total of 534 volunteers. However, the survey achieved a 101.9% coverage as 544 volunteers were interviewed. The targets set for both the demonstration and NSU districts were achieved as is shown on Table 6 below.

Table 6: The targets and achievements for the endline survey

District	Target sample			Achieved sample			% Reach
	CHVs	ETS Riders	Total	CHVs	ETS Riders	Total	
Chama	104	10	114	108	11	119	104.4%
Chitambo	100	10	110	100	10	110	100.0%
Serenje	100	10	110	102	13	115	104.5%
Kasama	100	-	100	100	-	100	100.0%
Mansa	100	-	100	100	-	100	100.0%
Total	**504**	**30**	**534**	**510**	**34**	**544**	**101.9%**

Table 7 below shows how the total pool of trained CHVs were represented by the sample drawn from them, moreover, it also shows the population coverage in each of the visited districts. CHVs representation in all the visited districts were above 10%, which is a desired representation.

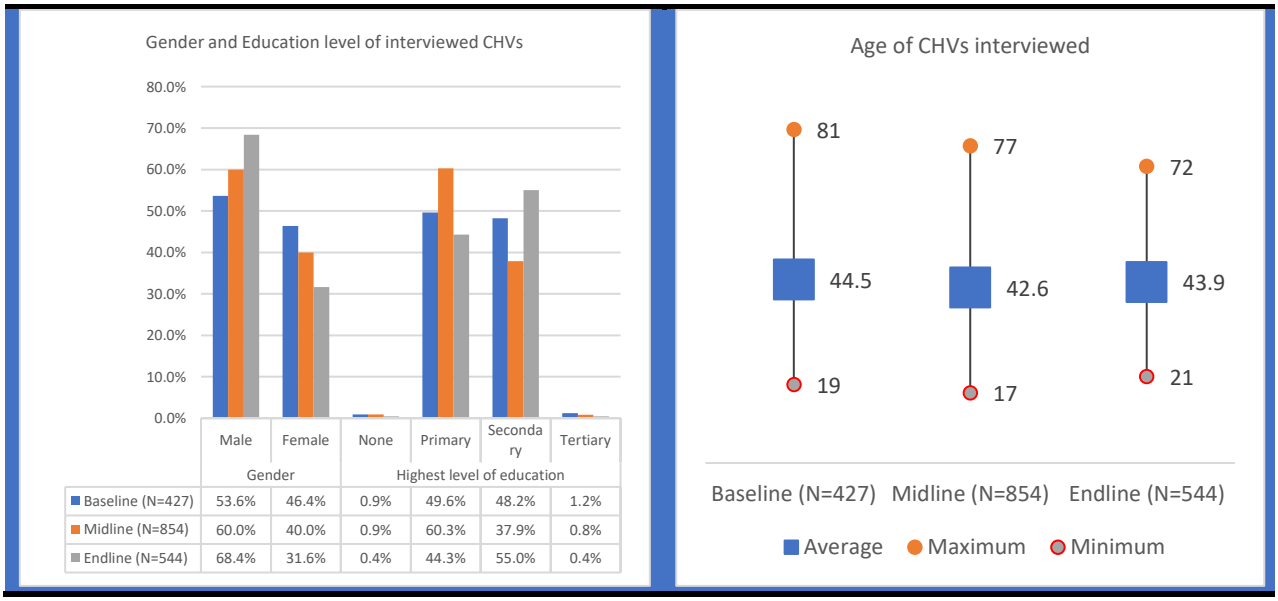
Table 7: Sample population representation

District	Population coverage	Total CHVs trained (all project phases)	Sample size at endline	Proportion representation
Chama	86,500	173	119	69%
Chitambo	51,917	815	110	13.5%
Serenje	108,181	959	115	12%
Kasama	105,500	216	100	46.3%
Mansa	108,000	216	100	46.3%
Total	460,098		544	

CHVs demographic data

Out of the sampled 544 CHVs, the majority were males (68.4%) and female CHVs comprised 31.6%. More The average age of interviewed CHVs was 43.9 years. The difference between the age of CHVs interviewed at baseline and endline was not significant. However, CHVs interviewed at midline were significantly younger when compared to those interviewed at baseline, ($p<0.05$). In terms of the highest level of education achieved, endline results show that 55% of the CHVs had completed secondary, followed by 44.3% who had completed primary and 0.4% who had completed tertiary education (Figure 1).

Figure 1: Interviewed CHVs demographic information



Eight HFs were targeted for data collection in each of the following districts: Serenje, Chitambo, Mansa, Kasama, and six in Chama, giving a total of 38 HFs. In Chama, some of the facilities were new having been added to the program late in the TTS2 phase. These 'new' intervention sites were excluded from the endline survey. This meant that only the early-TTS2 supported HFs were sampled for the survey in Chama. Out of a

total of 38 HFs targeted for the facility level data collection, the endline survey reached a total of 40. The plan was to interview CHVs at their respective HFs, but this had to be changed in realisation that some HFs had few volunteers (i.e., less than five). Volunteers from such facilities were requested to go to another nearby facility with a considerable number of volunteers for interviews. In two (2) separate instances, volunteers had to meet at HFs that had not been initially selected for the HF survey. The HFs were eventually included in the survey and thus increasing the number of HFs reached from 38 to 40.

3.4 Challenges encountered during data collection

The data collection exercise was conducted by a team of well-trained enumerators and supervisors. The exercise was conducted over a period of nine days. There were no significant limitations to the study. However, there were a few challenges that were encountered during data collection. One of the challenges that was encountered was that malaria case records were not available in some of the HFs. The data collection teams had to make follow-ups by telephone. The other challenge was the inability to meet CHV targets in some districts during the time in the field. Telephone interviews were conducted, and targets were eventually achieved.

Figure 2: A picture showing an interview in progress

3.5 Data analysis

All qualitative data were recorded and transcribed before analysis using Nvivo software. Qualitative data submitted to the survey server were downloaded as csv files and analysed using SPSS version 25 software. All statistical significance was assessed at $p<0.05$ (2 sided).

NOTE: In this report, some percentages are presented in the format x% (n), (where n is the absolute value) and X% (N), (where N refers to the total number of HFs that constituted the denominator for the calculation). This denominator (N) may vary from one analysis to the next due to missing values on the variable under consideration. In all instances, the denominator will be all facilities that provided a response to the variable under consideration

4 Findings

The major findings of the endline are presented in this section of the report.

4.1 Relevance

4.1.1 Relevance to community needs

The project's focus on malaria was found to be relevant as it addressed a major health challenge at community level. A key informant from the DHMT in Kasama mentioned that as a ministry, they had recorded many malaria deaths especially in the rural areas prior to project implementation. The major concern prior to project implementation was that children were contracting malaria and were not receiving proper treatment in time. This increased the likelihood of simple malaria progressing to severe malaria and ultimately resulting in complications and/or death. In a discussion with parents in Kasama district, it was

stated that although both adults and children were prone to getting malaria, children were more vulnerable than adults. This was also confirmed by parents at Ndoba Health Post in Mansa district who said that children were prone to contracting malaria as they tended to play outdoors even during the rainy season and thus exposing themselves to mosquitos. Parents in Serenje were also in agreement and reiterated that children are most affected because their bodies lacked immunity, unlike adults who have suffered from malaria at least once in their lifetime. It was further noted that several families do not have mosquito nets because these are old and worn out. Some households just do not see the need to use mosquito nets. Targeting children was thus relevant and appropriate considering their vulnerability.

Knowledge of signs and symptoms of severe malaria had been limited at community level prior to the start of the project. According to the Project Support Officer of the Mam@Scale project, one of the key issues that led to children dying of severe malaria was the delay in seeking early treatment. Factors that contributed to the delay were lack of knowledge on severe malaria, poverty, and distance to the health facility. The project came in and addressed these components. The focus group discussions indicated that community members can now easily identify signs and symptoms of severe malaria and seek treatment early. The provision of RAS, a pre-referral treatment, to children with suspected severe malaria helps to stabilize their condition therefore affording them more time to reach HFs. The project was aligned with local needs in the sense that it managed to link the communities to the HFs through continuous health education that helped in improving people's health-seeking behavior. Bicycle ambulances were distributed in some of the intervention communities to reduce physical access barriers. The project helped to increase accessibility to the health services by ensuring that everyone understood the need for prompt referrals in times of emergency. The issue of distance as a contributory factor to mortality rates was confirmed by Ministry of Health officials at district level.

The project was relevant as it addressed harmful social behaviors that limited the seeking of conventional medical treatment for malaria. The project held community discussions which were led by CHVs to stop people from continuing with their old harmful beliefs and promote seeking of treatment from HFs. Some of the harmful beliefs emanated from people associating malaria with witchcraft. Essentially, malaria was viewed with a traditional beliefs lens and thus addressed from that perspective.

In addition, it was reported by parents from the FGDs conducted in Serenje that men were the major decision makers when it came to seeking medical treatment. There was a perception that this contributed to loss of time and thus endangering the lives of children. The project empowered women to make decisions on health issues. The project also played a critical role in empowering women in the community. The fact that both women and men were involved in the project as CHVs is an indication of the gender-sensitivity of the approaches used to implement the project. There were equal opportunities for both men and women to be engaged as CHVs and administer RAS, to be ETS riders and community mobilisers. Therefore, the qualitative findings suggest that the project was relevant from the pilot stage to TTS3 as it addressed real and priority issues at community level.

4.1.2 Relevance to district and national plans

The project was also found to be aligned to district and national plans. According to an official in Kasama district, the project also played a pivotal role in making RAS available at district level. He further said, *"I*

remember at one point we ran out of rectal artesunate, and the project helped us transfer the RAS from Lusaka to Kasama and the community health workers were restocked with the same commodities".

Additionally, the project played a critical role in the provision of peripheral treatment in terms of confirmed malaria. The project helped to revamp community NHC structures that were inactive in most of the communities. The Ministry of Health strives to have cost-effective health care services brought closer to the families as much as possible. The empowerment of CHVs created a connection between the HFs and the communities. The CHVs were able to provide health care services at that level and children were able to reach HFs using ETS. This helped reduce deaths in children that could have occurred because of complicated malaria. This, therefore, contributed well to existing district plans in terms of reducing the burden of malaria.

Similarly, the project was aligned to national plans of eliminating malaria. Since 2017, Zambia has been seeking to eliminate malaria. Efforts in this regard are guided by the National Malaria Elimination Strategic Plan for the period of 2017-2021 that was adopted by the Government of the Republic of Zambia. The plan has a vision of a malaria-free Zambia and aims to 'move from accelerated burden reduction to malaria elimination in Zambia.' It seeks to achieve this by eliminating local malaria infection and disease in Zambia by 2021, maintaining malaria-free status, and preventing reintroduction and importation of malaria into areas where the disease has been eliminated. An important element in the country's approach to eliminating malaria includes effective case management strategies that focus on treating detected cases. Timely diagnosis and effective treatment are regarded as a first step in reducing the country's malaria burden.

In Zambia, as in other countries with a similar malaria burden, reducing malaria-related mortality requires a stronger focus on areas where mortality is highest. This includes addressing severe malaria. An estimated 5-7% of malaria cases progress to severe malaria. The focus on severe malaria was therefore found to be in line with government efforts to eradicate malaria. In addition, the target group was also relevant. Epidemiologically, children under five years old are the age group most susceptible to severe malaria due to a lack of immunity. The strategies adopted by the project were therefore consistent with the efforts at national level. There were no major policy shifts at national level that would have rendered the project irrelevant.

4.2 Effectiveness

This section seeks to determine the effectiveness of strategies that were adopted by the project to achieve the project goal. Generally, this endline evaluation has established that the project was on track towards achieving its outcomes through the implementation of set project strategies. These are discussed in detail in the sub-sections below.

4.2.1 Objective 1: To determine the availability of trained personnel and malaria drugs at health institutions

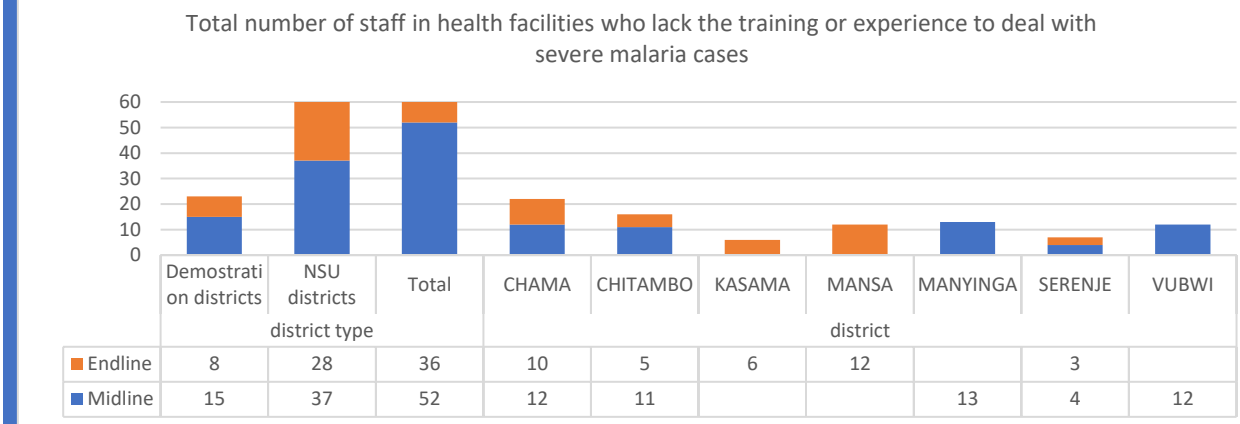
Availability of staff trained to administer Injectable Artesunate (Inj AS)

The endline survey sought to determine the availability of staff trained on Inj As at health facility level. Overall, results show that (85%, N=40) of the facilities included in the survey had at least one health

personnel trained in Inj AS. This is slightly lower than the baseline and midline (88.2% and 89.6% respectively). The prevailing situation might be a result of staff rotations that have seen staff trained on Inj AS moving to other districts. Disaggregated data by district type show that a greater proportion (87.5%) of the HFs in demonstration districts (i.e., Chitambo and Serenje) had at least one member of staff trained in Inj AS which is not significantly different from midline (80.8%). For the NSU districts, a proportion of (83.3%, N=24) were found to have at least one member of staff trained in injectable artesunate. The variation is significantly different when compared to facilities visited at midline (100%, n=22). However, facilities visited at endline were different from those visited at midline.

In terms of staff members who lacked training or experience to deal with severe malaria cases, the endline results show that a total of 36 staff members from 15 HFs lacked training or experience to deal with severe malaria i.e., Serenje (3), Chitambo(1), Chama(4), Mansa(3), Kasama (4). This is significantly lower than results from the midline where 52 staff from 20 HFs lacked training or experience. Analysis by type of district show that, at endline, demonstration districts have fewer numbers of staff lacking training, with a total of 8 when comparing to NSU districts which had a total of 28. Analysis by district shows that Mansa and Chama have high numbers of staff who lacked training or experience to deal with severe malaria cases, with a total of 10 and 12 respectively. The results are presented in Figure 3 below. It is worth noting that MAM@Scale trained 1-2 health workers in each intervention health facility. The individuals who received this training were encouraged to cascade their training down to other staff within their health facility. It is probable that the fall in number of health facility staff with no Inj AS training between midline and endline is due to the impact of the cascade training approach which took some time to implement.

Figure 3: Total number of members of staff who lacked training or experience in dealing with SM



Trained health workers who manage cases

At endline, data on the number of trained health workers who manage cases at health facility level was collected in addition to the number of trained health workers in injectable artesunate. Out of the 65 trained health workers, 60 of them manage the cases at facility level which makes a proportion of 92%. Disaggregating data by district type, the results show that, most of the trained HW workers who manage cases are found in demonstration districts (97%) when comparing with NSU districts (85%). Table 8 below shows the results in detail.

Table 8: Proportion of health workers trained in injectable artesunate

	Total number of staff trained in injectable artesunate	Number of staff trained in injectable artesunate who manage cases	Proportion of trained staff who manages cases
District type			
Overall	65	60	92%
Demonstration districts	39	38	97%
NSU districts	26	22	85%
District			
Chama	8	5	63%
Chitambo	24	24	100%
Kasama	11	10	91%
Mansa	7	7	100%
Serenje	15	14	93%

Severe malaria drug availability at health facilities

Like the baseline and midline surveys, malaria drug availability was also checked at the visited HFs during the endline survey. Interviewed health workers were asked what drugs they used when treating patients with complicated/severe malaria. Overall, out of the 40 HFs that were visited, the most mentioned drug was Injectable artesunate (87.5%), followed by Coartem (72.5%) and Quinine (40%). Injectable artesunate was more commonly mentioned in demonstration districts (100%) compared to NSU districts (79.2%). SP/FANSIDAR was the least mentioned drug (5%) and was more commonly mentioned in NSU districts (8.3%). It is worth noting that, a few facilities reported to be using RAS at facility level. Three facilities, Kasama (1) and Serenje (2), mentioned to be using RAS at facility level at some point. RAS was used on special cases when CHVs were asked to staff the HFs when trained staff were absent. Table 9 below shows the results in detail.

Table 9: Types of drugs used in health facilities to treat Malaria

Drug	District type			District				
	Demonstration districts	NSU districts	All districts	Chama	Chitambo	Kasama	Mansa	Serenje
N	16	24	40	7	8	11	6	8
SP/Fansidar	0.0%	8.3%	5.0%	0.0%	0.0%	9.1%	16.7%	0.0%
Quinine	31.3%	45.8%	40.0%	14.3%	25.0%	63.6%	50.0%	37.5%
Coartem[10]	50.0%	87.5%	72.5%	57.1%	50.0%	100%	100%	50.0%
Injectable Artesunate	100%	79.2%	87.5%	57.1%	100%	81.8%	100%	100%
RAS[11]	12.5%	4.2%	7.5%	0.0%	0.0%	9.1%	0.0%	25.0%

[10] Artemether-Lumefantrine (or any other ACT such as ASAQ, DHA-PPQ,)
[11] Excluding that given to CHVs

Drug availability was also checked to see whether the mentioned drugs were available during the time of survey. At baseline and midline, the availability of the following medicines was checked: SP/Fansidar, quinine (Oral/ injectables), Inj AS and Coartem (6, 12, 18 and 24 tablets). The results show that 80% of the facilities visited during endline had at least four of the key malaria drugs. The difference between baseline to endline was statistically significant p<0.05, where only 35.3% had at least four of the malaria drugs. Analysis of data by district shows that Kasama was the district which had the highest availability of at least four malaria drugs, 90.9%, followed by Chitambo (87.5%) and Mansa (83.3%). A key informant from Kasama shared that there was a month when they had expired commodities and it took a bit of time to replenish. Chama was the district with the lowest proportion of facilities with at least four of the malaria drugs (see Figure 4). The most common drug that was found during the endline survey was Coartem (100%) followed by SP/Fansidar (90%) and Inj AS (87.5%). Rectal artesunate was the medication with the lowest availability found during endline (57.5%) although there was a significant increase on its availability from baseline (11.8%), p<0.05. The low levels of RAS noted at HFs at endline was as a result of the fact that it had been distributed to CHVs. During the time of survey, most of the health personnel mentioned that they had just given out RAS to the CHVs. Figure 5 below shows the results in detail.

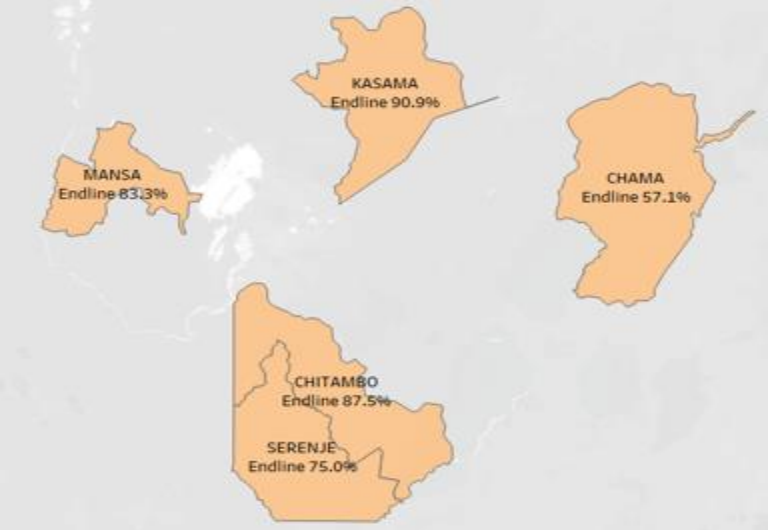
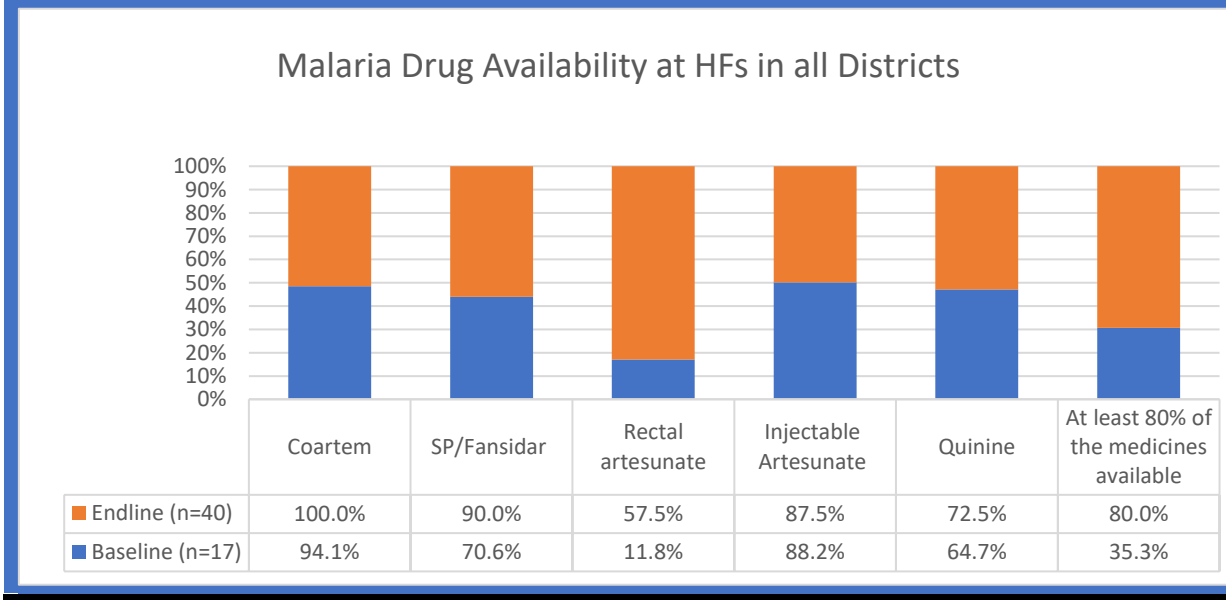


Figure 4: Availability of at least 80% of key malaria drugs

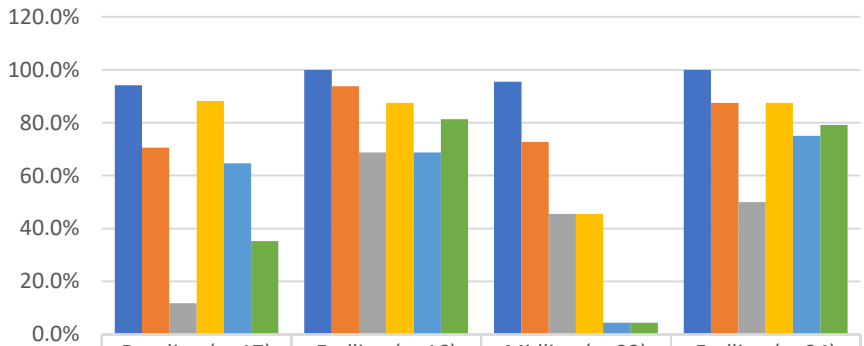
Figure 5: Malaria drug availability in all districts at baseline and endline



	Coartem	SP/Fansidar	Rectal artesunate	Injectable Artesunate	Quinine	At least 80% of the medicines available
Endline (n=40)	100.0%	90.0%	57.5%	87.5%	72.5%	80.0%
Baseline (n=17)	94.1%	70.6%	11.8%	88.2%	64.7%	35.3%

Analysis of data by district type shows that more HFs in demonstration districts than in NSU districts had at least four of the malaria drugs available in stock at the time of the survey (81.3% vs 79.2%), although the difference was not statistically significant. In the NSU districts, the availability of at least four malaria drugs increased from 4.5% to 79.2% between midline and endline, and the difference was statistically significant ($p<0.01$). Rectal artesunate was more common in the demonstration districts (68.8%) than NSU districts (50%), however the difference was not statistically significant, $p>0.05$. Quinine was more common in NSU districts (75%) than demonstration districts (68.8%). See Figure 6 for details.

Figure 6: Malaria drug availability by type of district



	Baseline (n=17)	Endline (n=16)	Midline (n=22)	Endline (n=24)
	Demostration districts		NSU districts	
Coartem	94.1%	100%	95.5%	100.0%
SP/Fansidar	70.6%	93.8%	72.7%	87.5%
Rectal artesunate	11.8%	68.8%	45.5%	50.0%
Injectable Artesunate	88.2%	87.5%	45.5%	87.5%
Quinine	64.7%	68.8%	4.5%	75.0%
At least 80% of the medicines available	35.3%	81.3%	4.5%	79.2%

Quinine and Coartem malaria drugs have different presentations and packaging and the availability of these was also assessed as was done at baseline and midline. For quinine, the availability of oral and injectable was assessed whilst for Coartem, availability of 6, 12, 18 and 24 tablets were also assessed. The availability of oral quinine decreased from baseline (64.7%) to endline (0%), whilst the availability of injectable quinine increased from baseline (5.9%) to 72.5% at endline, and the change was statistically significant ($p<0.01$). Disaggregating data by type of district, at endline, the results show that injectable quinine was found in 68.8% of HFs surveyed in the demonstration districts and 75% of HFs in the NSU districts. Considering Coartem, Coartem 6 and 24 were commonly found during endline (90%). All the Coartem tablets were more prevalent in the demonstration districts than the NSU districts. See Table 10 below for detailed results.

Table 10: Availability of different presentations and packaging's of Quinine and Coartem drugs

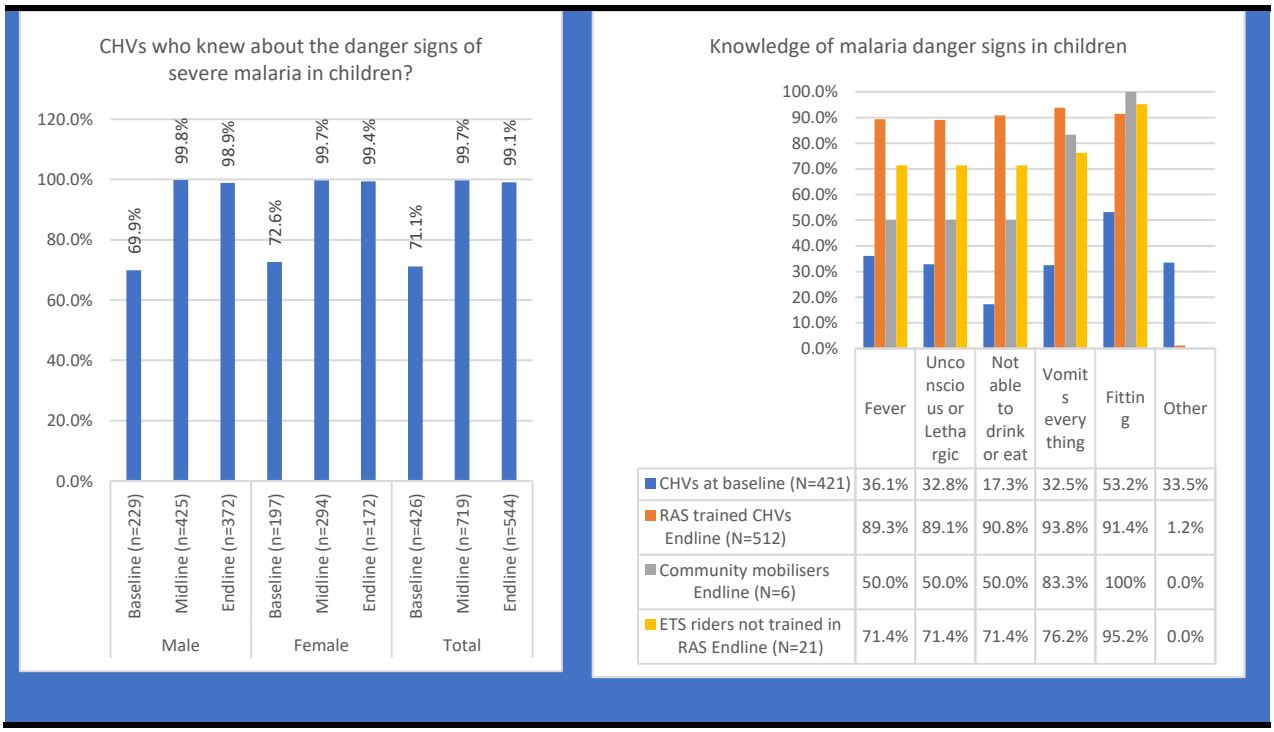
Drug	Demonstration districts			NSU districts			All districts		
	Baseline	Midline	Endline	Baseline	Midline	Endline	Baseline	Midline	Endline
COARTEM - 6	76.5%	23.1%	100%	-	50.0%	83.3%	76.5%	35.4%	90.0%
COARTEM - 12	76.5%	7.7%	68.8%	-	31.8%	62.5%	76.5%	18.8%	65.0%
COARTEM - 18	70.6%	46.2%	31.3%	-	59.1%	8.3%	70.6%	52.1%	17.5%
COARTEM - 24	52.9%	84.6%	93.8%	-	86.4%	87.5%	52.9%	85.4%	90.0%
Quinine (oral)	64.7%	0.0%	0.0%	-	4.5%	0.0%	64.7%	2.1%	0.0%
Quinine (Injectable)	5.9%	88.5%	68.8%	-	0.0%	75.0%	5.9%	47.9%	72.5%

4.2.2 Objective 2: Changes in knowledge levels on severe malaria and case management by community health worker

Community Health Workers Knowledge on Severe Malaria

During the endline survey, the total number of CHVs that were interviewed was 544. These were mostly RAS trained CHVs and ETS riders. Like the baseline and midline surveys, CHVs were asked if they knew about the danger signs of severe malaria in children. Overall, the proportion of CHVs who mentioned that they knew about the danger signs of severe malaria increased significantly from baseline (71.1%, N=426) to endline (99.1%, N=544). The difference in the proportion of males and females who knew about danger signs of severe malaria in children was not statistically significant. RAS trained CHVs were further asked about the actual danger signs they knew, and these were compared with CHVs who were interviewed at baseline. The most mentioned signs at endline were, vomiting everything (93.8%) followed by fitting (91.4%) and not able to drink or eat 90.8%. This was slightly different from what CHVs at baseline mentioned, where the most frequently mentioned was fitting (53.2%), followed by fever (36.1%) and unconscious or lethargic (32.8%). See Figure 7 below.

Figure 7: CHVs knowledge on danger signs of severe malaria in children



	Fever	Unconscious or Lethargic	Not able to drink or eat	Vomits every thing	Fitting	Other
CHVs at baseline (N=421)	36.1%	32.8%	17.3%	32.5%	53.2%	33.5%
RAS trained CHVs Endline (N=512)	89.3%	89.1%	90.8%	93.8%	91.4%	1.2%
Community mobilisers Endline (N=6)	50.0%	50.0%	50.0%	83.3%	100%	0.0%
ETS riders not trained in RAS Endline (N=21)	71.4%	71.4%	71.4%	76.2%	95.2%	0.0%

From the FGDs and key informant interviews it was obtained that the knowledge levels among CHVs had improved and this is attributed to the project. According to respondents, CHVs now know the signs and symptoms of someone that is suffering from severe malaria and that they should quickly rush the sick child to the clinic. This is likely to have helped in the reduction of malaria mortality in the intervention sites. Discussions with parents and CHVs also revealed that the training of CHVs was effective as it improved knowledge levels among these community volunteers. The community members also stated that the presence of CHVs in their communities and the awareness creation by CVHs was not limited to malaria only. Parents agreed that since the introduction of the CHVs there has been more awareness on various health-related topics including maternal health, malaria, other child health emergencies and COVID-19. Parents stated that there is a mass scale community mobilisation where the CHVs go door to door educating the community members.

"In terms of malaria, they are now able to know the signs and symptoms of someone that is suffering from malaria and quickly rush to the clinic or CHV". Parents, Mansa FGD

"Severe malaria cases which could have gone severe were treated at an early stage". ETS Rider, Chitambo district

Case study 1: **Demonstrating ability of parents and CHVs to identify danger signs in children**
One parent from Serenje narrated the following. "One night my baby's temperature was high, and she was refusing to eat, shaking and was vomiting. I remembered what we had been taught by the CHVs regarding severe malaria. My husband and I immediately took the child to the CHV who also confirmed our fears regarding severe malaria. He then administered RAS and told us to visit the health facility as a matter of urgency. I then went to the health facility without my husband because he had to remain behind and work in our fields. I went with the ETS rider to the clinic where my child received treatment. I went with a referral letter which the CHV said I should give to the nurse. I gave the nurse the letter. After a few days my baby was playing again. I thank your project for giving us community helpers whom we can go to whenever our children are sick even at night".

CHVs felt they were respected by the community and were even referred to as community doctors and this gave them a sense of pride to be serving their communities. When asked if they were happy to continue with the project regardless of a lack of remuneration respondents from all the districts argued that they volunteered willingly and were prepared and well equipped to continue serving their respective communities. CHVs in Chama were quoted saying: *"We will continue volunteering because these are our relatives, so we have to help them."* Thus, the attitude of the respondents is quite positive, and this makes the project activities sustainable. One parent from Chibale Rural Health Centre mentioned that even at night people take sick children to the CHVs - an indication of their dedication to their work.

An analysis of the knowledge of malaria danger signs in children by district was conducted to enable a comparison between CHVs at baseline and RAS trained CHVs at endline. At endline, RAS trained CHVs who knew all the five danger signs were most common in Kasama (91.8%, n=98) followed by Chitambo (86.1%, n=101) and Mansa (84%, n=100). In Chitambo and Serenje the proportion of CHVs who knew all the five danger signs significantly improved ($p<0.01$) from 12.9% and 4.7% at baseline to 86.1% and 68.5% in Chitambo and Serenje respectively. The results are presented in Table 11 below. The high knowledge levels among the CHVs in the NSU districts can be attributed to the fact that trainings were conducted during this current year (2021) and the knowledge would still be fresh in their minds.

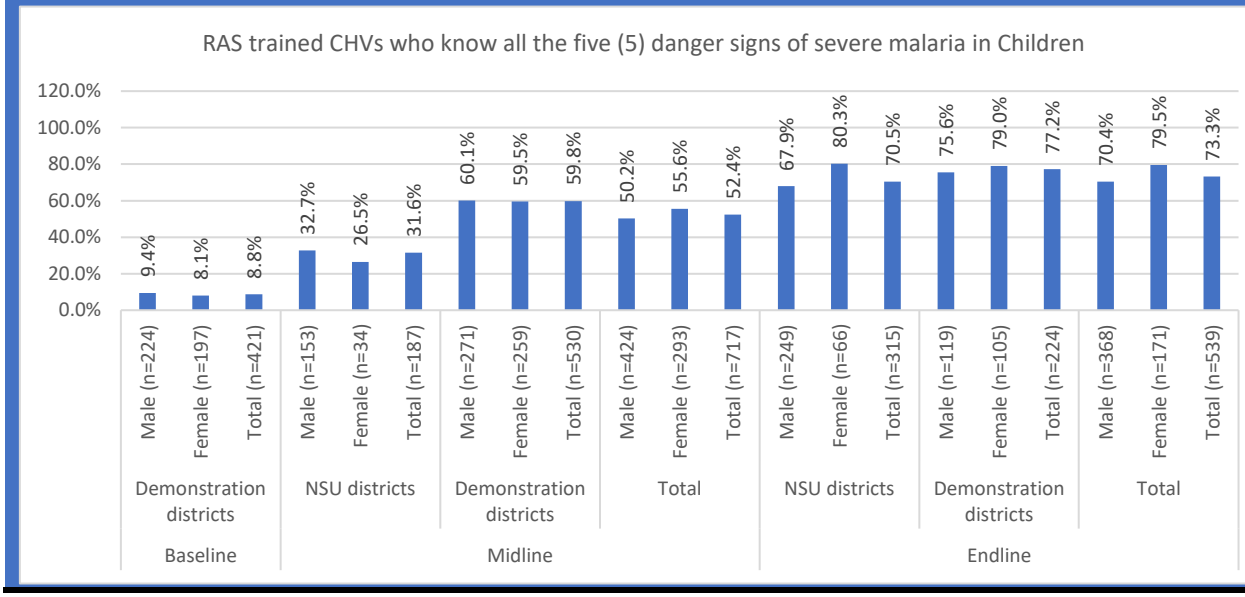
Table 11: Knowledge of malaria danger signs in children by district

	Serenje			Chitambo			Chama		Kasama	Mansa
	Baseline	Midline	Endline	Baseline	Midline	Endline	Midline	Endline	Endline	Endline
N	211	264	108	210	212	101	56	105	98	100
Fever	38.4%	98.1%	88.0%	33.8%	86.8%	100%	67.9%	71.4%	96.9%	91.0%
Unconscious or Lethargic	28.4%	77.3%	85.2%	37.1%	76.9%	89.1%	51.8%	79.0%	100%	93.0%
Not able to drink or eat	16.1%	88.3%	86.1%	18.6%	82.1%	94.1%	60.7%	81.9%	98.0%	95.0%
Vomits everything	35.5%	96.6%	94.4%	29.5%	87.7%	98.0%	80.4%	84.8%	98.0%	94.0%
Fitting	47.9%	95.5%	87.0%	58.6%	91.5%	98.0%	98.2%	88.6%	93.9%	90.0%
CHVs who Knows all the 5 danger signs	4.7%	65.2%	68.5%	12.9%	55.2%	86.1%	30.4%	44.8%	91.8%	84.0%

In addition, an analysis of the knowledge of all the five danger signs of severe malaria in children by gender of RAS trained CHVs was carried out. The results show that, there are no differences in the knowledge of all five danger signs between males and females. However, the knowledge levels improved in the demonstration districts from baseline to endline. In the demonstration districts, during baseline, only 8.8% (9.4% males, 8.1% females) of the CHVs knew all the five danger signs which significantly improved during endline where 77.2% (79% female and 75.6% males) knew the five signs.

Comparing the NSU districts at midline and endline, the results show an improvement in the knowledge levels of all the five severe malaria danger signs from midline 31.6% (32.7% males and 26.5% females) to endline 70.5% (80.3% females and 67.9% males). The results also show that females improved more than males, with an improvement of 53.8% when comparing to males with an improvement of 35.2%. Figure 9 below shows the results in detail.

Figure 8: RAS trained CHVs who know all the five (5) danger signs of severe malaria in Children



Community health volunteers' confidence to deal with children

At endline, >95% of the RAS CHVs mentioned that they were very confident when they were administering RAS, see Table 12 below for the detailed results. This was an improvement from baseline, where only 42.7% of the CHVs mentioned that they would feel very confident in RAS administration. The difference between midline and endline was significant (p>0.05). Analysis by gender shows that, at baseline and at endline it was mostly females than males who felt very confident when administering RAS. At baseline 43.3% of the females felt confident when comparing to males (41.6%). Similarly, all women (100%) were confident when comparing to male (99.4%) at endline.

Table 12: Proportion of CHVs confident in dealing with severe malaria cases

	Baseline			Midline			Endline		
	Male	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**
District type									
NSU districts	-	-	-	97.3%	85.3%	95.1%	99.2%	100.0%	99.3%
Demonstration districts	41.9%	43.3%	42.7%	99.5%	97.2%	98.3%	100%	100%	100%
All districts	41.9%	43.3%	42.7%	98.6%	95.5%	97.3%	99.4%	100.0%	99.6%
District									
Chama	-	-	-	100%	100%	100%	100%	100%	100%
Chitambo	64.0%	66.2%	65.2%	100%	98.9%	99.5%	100%	100%	100%
Manyinga	0.0%	0.0%	0.0%	94.5%	88.9%	93.8%	-	-	-
Serenje	16.3%	16.4%	16.3%	99.0%	95.9%	97.3%	100%	100%	100%
Vubwi	0.0%	0.0%	0.0%	97.6%	83.3%	92.4%	-	-	-
Kasama	-	-	-	-	-	-	100%	100%	100%
Mansa	-	-	-	-	-	-	97.1%	100.0%	98.0%

Although most of the CHVs were confident in administering RAS, they also encountered challenges during the administration of RAS. The most mentioned challenge at endline was shortage of protective equipment e.g., gloves, soap, masks etc (39.7%) followed by health conditions of the child e.g., diarrhoea (17.5%) and parents' refusal to have RAS administered to their children (14.3%). Shortage of protective equipment was more commonly mentioned in the demonstration districts (52.4%) as compared to NSU districts (30.7%). Analysis by gender shows that the latter concern was more often mentioned by female CHVs (47.1%) than males (36.3%). The health condition of the child was more commonly mentioned in demonstration districts (32%) compared to NSU districts (7.2%). About 13.8% (12.4% demonstration districts and 14.7% NSU districts) mentioned lack of lights when administering RAS during the night as another challenge. This was more commonly reported by females (16.3%) than males (12.6%). See Table 13 below for detailed results.

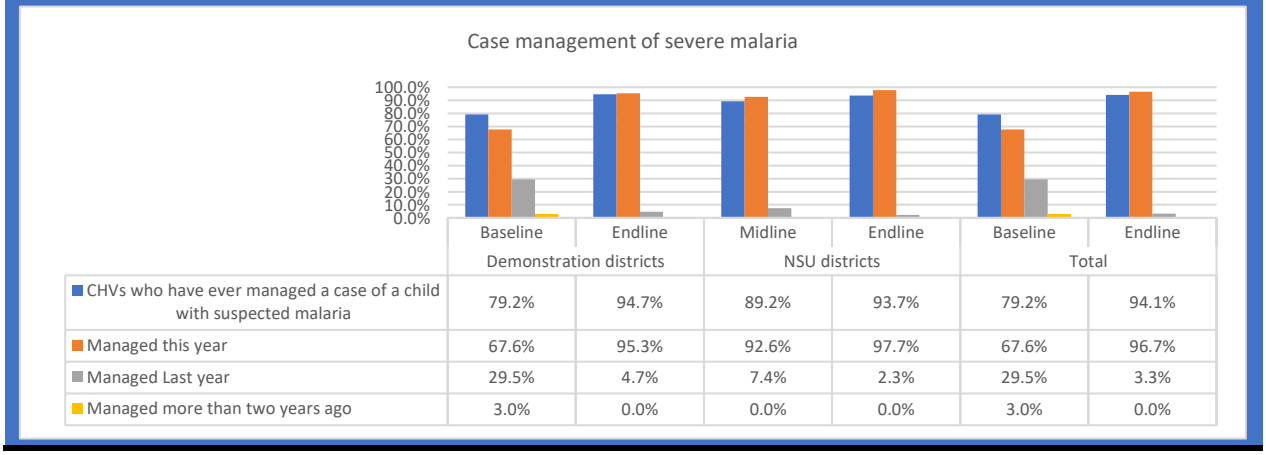
Table 13: RAS administration challenges mentioned by CHVs at endline

	All CHVs	District type		Gender		District				
		Demonstration districts	NSU districts	Male	Female	Chama	Chitambo	Serenje	Kasama	Mansa
N	544	225	319	372	172	119	110	115	100	100
Shortage of protective equipment e.g. Gloves, Soap, masks etc	39.7%	52.4%	30.7%	36.3%	47.1%	26.9%	69.1%	36.5%	36.0%	30.0%
Health conditions of the child e.g. diarrhoea	17.5%	32.0%	7.2%	14.0%	25.0%	12.6%	49.1%	15.7%	7.0%	1.0%
Parents refusal for child to have RAS	14.3%	15.6%	13.5%	11.3%	20.9%	2.5%	14.5%	16.5%	23.0%	17.0%
Lack of lights during the night	13.8%	12.4%	14.7%	12.6%	16.3%	4.2%	16.4%	8.7%	27.0%	15.0%
Other	4.6%	0.9%	7.2%	5.1%	3.5%	10.9%	0.9%	0.9%	3.0%	7.0%

Case management of severe malaria by Community Health Volunteers

CHVs where asked if they had ever managed a case of a child with suspected malaria and the results are presented in Figure 9 below. The proportion of CHVs who had managed cases significantly improved from baseline to endline (79.2% vs 94.1%). Case management improved more in demonstration districts, with an improvement of 15.5% (from 79.2% at baseline to 94.1% at endline). In the NSU districts, case management by CHVs improved by 5.5% (89.2% at midline to 93.7% at endline). Most of the cases (>90%) were managed during the year the survey was carried out, for example, 96.7% CHVs at endline had managed a case during 2021. This is therefore a positive trend in managed cases from baseline to endline which is an indication of the effectiveness of the project strategies.

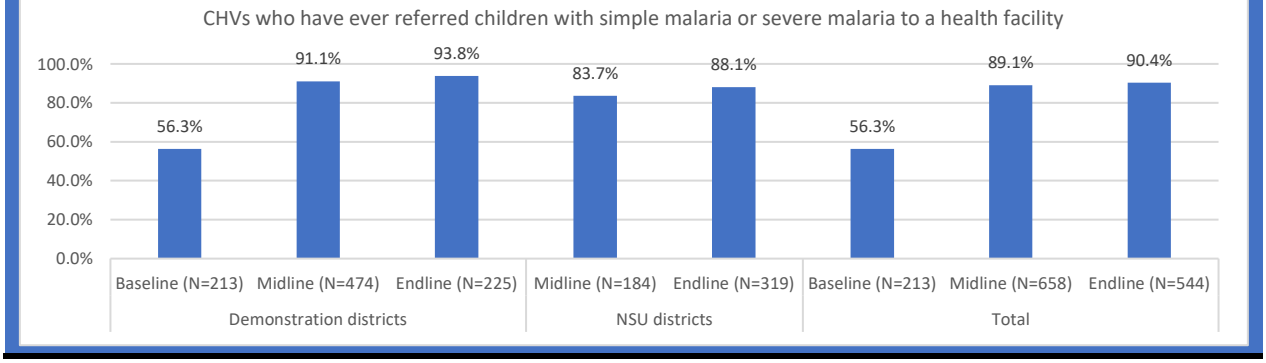
Figure 9:Case management of severe malaria in children



Referral cases of severe malaria

Saving children's lives is one of the main project objectives. This was to be achieved in part by quick referrals of children with suspected severe malaria to their nearest HFs. It is part of CHVs' role to promptly refer children with suspected severe malaria to the health facility. CHVs were asked if they have ever referred children with simple or severe malaria to a health facility. Overall, all districts combined (demonstration and NSU districts), the proportion of CHVs who referred children to a health facility improved from baseline (56.3%, n=213) to endline (90.4%, n=544). The proportion improved by 1.3 percentage points from midline (89.1%) to endline (90.4%). Between midline and endline, the proportion of CHVs who have ever referred children to the health facility increased more in demonstration districts (4.7 percentage points) as compared to NSU districts which increased by 4.4 percentage points. See Figure 10 below for detailed results.

Figure 10:CHVs who had ever made referrals to HFs for simple or severe malaria in children



CHVs were further asked if they use written materials when referring clients to the HFs. In addition, they were asked if they received any counter referral forms from the HFs after referral[12]. At endline, almost every interviewed CHV (99.2%) mentioned that they a use referral note when referring clients (an example of a referral note used by CHVs is shown in Figure 11). This ties up with the CMS where 99.5% of CHVs indicated that they issued a referral form to patients transferred to the health facility with suspected severe malaria. Around 90.9% of CHVs mentioned that they also received a counter referral form after referral. There was no difference in the use of referral materials between project phases TTS2 and TTS3. Analysis of data by two project phases (TTS2 and TTS3) shows differences between CHVs who confirmed receiving a counter referral form after referral. The proportion of CHVs who mentioned that they were provided with a counter referral form was lower among CHVs who were in the TTS2 supported facilities (88.7%) when compared to those who were in

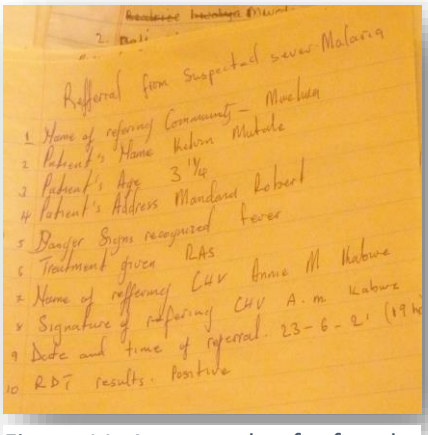
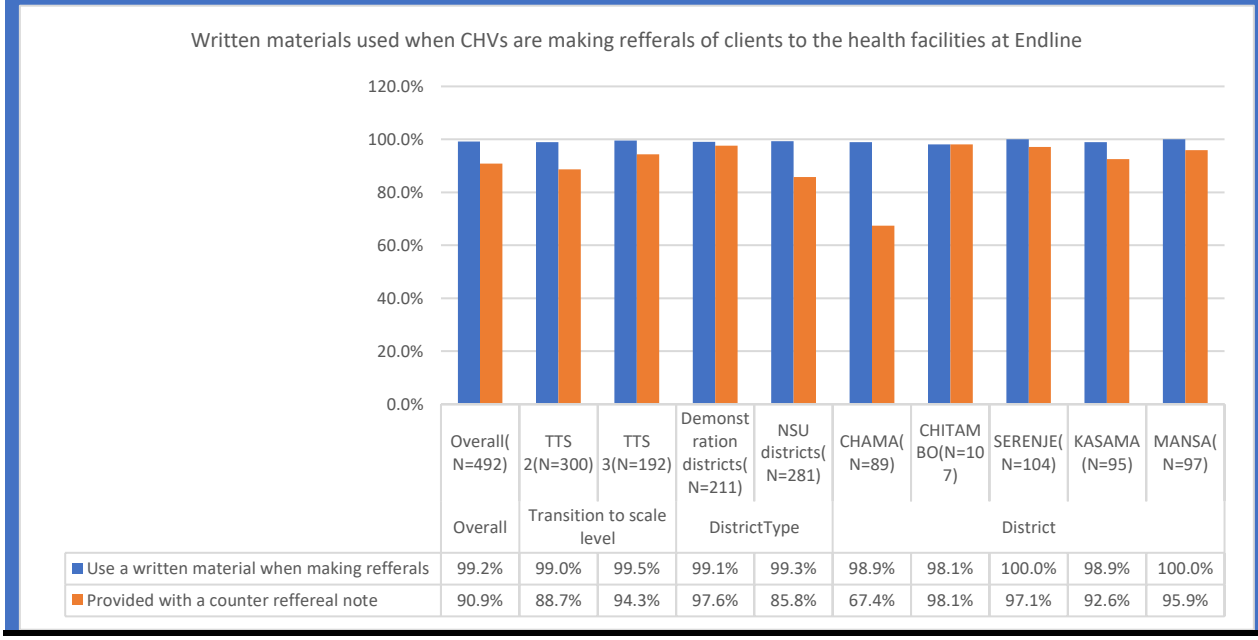


Figure 11: An example of referral note used by CHVs

[12] Questions on referral material use asked at midline was slightly different from what was asked at endline; hence comparisons are not possible.

TTS3 supported facilities. Disaggregating data by district type did not show any variation (Figure 12).

Figure 12:Written materials for referrals



Further, the endline sought to determine from the HFs whether suspected cases of severe malaria came with referral forms completed by CHVs. Out of all the 40 HFs, 55% mentioned that all the referred cases came with a completed referral form/note, 27.5% mentioned that most of the cases came with a completed referral form and 17.5% mentioned that some of the referred cases had referral forms (Table 14). It is worth noting that, there were no facilities that mentioned that referral cases arrived without a referral note.

Facilities which mentioned that all referred cases came with a referral note from the community were mostly common in demonstration districts (56.3%) as compared to NSU districts (54.2%) although the difference was not statistically different. Most of the facilities which mentioned that all the referred cases came with a completed referral note were in Chitambo (75%), followed by Kasama (63.6%) and Mansa (50%).

When asked about the number of cases which they provided with a completed counter referral form, under half of the facilities (42.5%) mentioned that all the referred cases were provided with a counter referral form, followed by 37.5% who mentioned most of the cases, whilst 17.5% mentioned some of the referred cases. It is worth noting that only 2.5% of the facilities mentioned that they do not provide a completed counter referral form, and these were all in Mansa. In comparison, data reported through the CMS indicated that 92% of RAS recipients returned to the community with a counter-referral form.

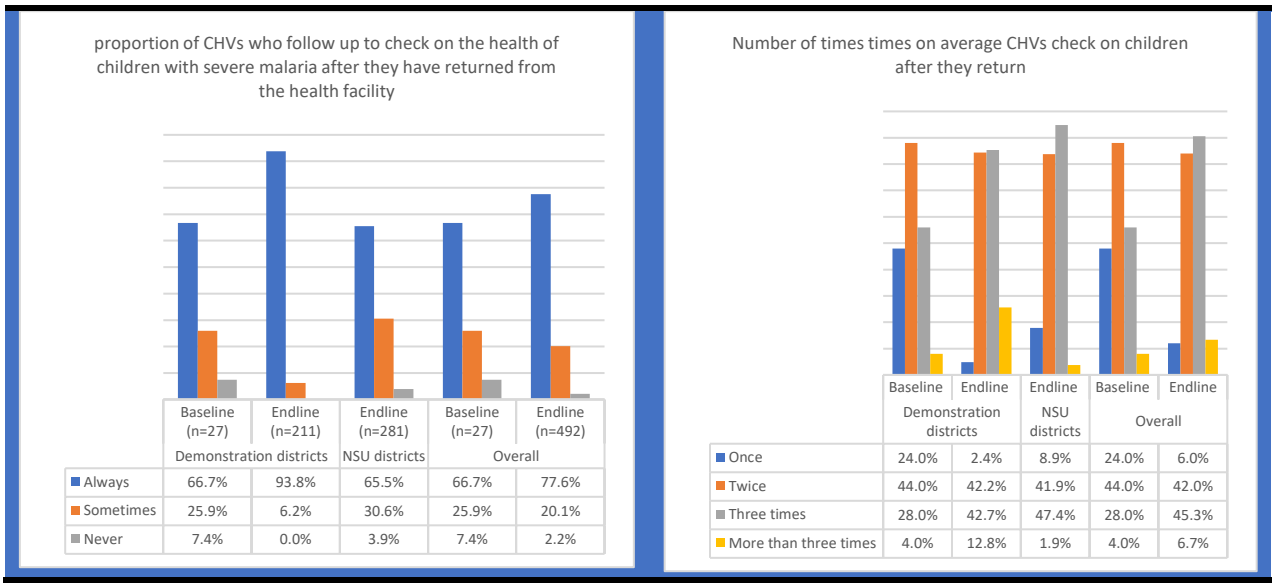
Table 14: Referral form/note at heath facility during endline

	Overall	District type		District				
		Demonstration districts	NSU districts	Chama	Chitambo	Kasama	Mansa	Serenje
N	**40**	**16**	**24**	**7**	**8**	**11**	**6**	**8**
Suspected severe malaria referrals from the community that came with a completed referral form								
All referred cases	55.0%	56.3%	54.2%	42.9%	75.0%	63.6%	50.0%	37.5%
Most referred cases	27.5%	37.5%	20.8%	0.0%	25.0%	36.4%	16.7%	50.0%
Some of the referred cases	17.5%	6.3%	25.0%	57.1%	0.0%	0.0%	33.3%	12.5%
None	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Total	100%	100%	100%	100%	100%	100%	100%	100%
Cases which were provided with a completed counter-referral form								
All referred cases	42.5%	43.8%	41.7%	28.6%	50.0%	54.5%	33.3%	37.5%
Most referred cases	37.5%	43.8%	33.3%	14.3%	37.5%	45.5%	33.3%	50.0%
Some of the referred cases	17.5%	12.5%	20.8%	57.1%	12.5%	0.0%	16.7%	12.5%
None	2.5%	0.0%	4.2%	0.0%	0.0%	0.0%	16.7%	0.0%
Total	100%	100%	100%	100%	100%	100%	100%	100%

Follow-up of severe malaria cases

After a child has been discharged from the health facility, it is the duty of the CHV to make a follow up and check on the health status of the child. The results (Figure 13) show that, at endline, 77.6% of the CHVs said that they always make follow up visits to check on the health of children with severe malaria after they return from the health facility. This is slightly higher than the baseline (66.7%) situation. Moreover, during endline, a higher proportion of CHVs who said that they always conduct follow up visits were more commonly found in demonstration districts (93.8%) compared to NSU districts (65.5%). On average, 45.3% mentioned that they make follow-ups three times, followed by 42% who mentioned that they do follow ups twice and 6.7% mentioned that they conduct follow up visits more than three times. The proportion of CHVs who make three follow up visits improved from baseline (28%) to 45.3% at endline. At endline, those who mentioned that on average, they visit three times were more common in NSU districts (47.4%) compared to demonstration districts (42.7%).

Figure 13: Follow up visits conducted by CHVs



Use of emergency transport system

Transporting an ill child or a woman in labour in difficult/challenging terrain by foot or being carried even for 5 km is a long distance. The emergency transport system (ETS) is a useful resource when supporting referrals from communities that are far away from the HFs. In Mansa parents complained that accessibility to HFs was still difficult due to the long distances that they have to travel on foot as they did not have access to ETS. A total of 34 (13 in Serenje, 10 in Chitambo and 11 in Chama) ETS riders were interviewed during endline. ETS riders were asked about the distance from the central part of their communities to their nearest health facility. At endline, the average distance from the central part of their community to the nearest health facility was 12.4km, with a minimum of 6 km and maximum of 39 km. ETS riders in Serenje travel a longer distance (15.6km) when compared to the other two districts, Chitambo (12.4km) and Chama (10.5km). The average distance travelled by ETS riders at endline (12.4 km) was slightly longer than that travelled at baseline (10.5 km). However, the difference was not statistically significant. Comparing baseline and endline data for Serenje and Chitambo, the results show that at baseline the maximum distance in Serenje was 12 km and Chitambo 18 km, these went up significantly to 26km and 39 km respectively. This could indicate of a wider coverage and a larger population accessing health care by having ETS in place.

In terms of time they need to reach a health facility when ferrying a patient using a BA, on average, ETS riders reported taking 1 hour 19 minutes (78.7 minutes) at endline. This is higher when compared to the ETS riders who were interviewed at baseline who mentioned taking about 75 minutes. This can be attributed to the longer distances that they are now covering. Furthermore, ETS riders said it took them on average 150 minutes to reach the facility on foot. This is higher than what was reported at baseline (143 minutes). The endline showed that ETS riders reported average trips to take 1h 19 minutes by bicycle ambulance, when the same journey on foot would have taken 2hr 30mins. When a child is critically unwell, or a woman has a complication during pregnancy this saving of 1 hr 11 minutes could be vital. The journey is also likely to have been more comfortable for the client by bicycle ambulance than on foot/being carried. See Table 15 below for detailed results.

Table 15: Average distance and time taken to reach the health facility by ETS riders at endline

		Serenje		Chitambo		Chama		Overall	
		Baseline	Endline	Baseline	Endline	Baseline	Endline	Baseline	Endline
Distance in (Km) from the central part of communities to the health facilities	N	3	13	3	10	-	11	6	34
	Mean	7.7	15.6	13.3	12.4	-	8.5	10.5	12.4
	Minimum	5	2	10	6	-	1	5	1
	Maximum	12	46	18	39	-	20	18	46
	Standard Deviation	3.8	13.4	4.2	9.6	-	6.4	4.7	10.6
Time in (minutes) taken to reach the health facilities when carrying a patient by bicycle ambulance	N	3	13	3	10	-	11	6	34
	Mean	78.3	93.1	73.3	83.5	-	57.2	75.8	78.7
	Minimum	45	30	10	30	-	1	10	1
	Maximum	130	190	120	300	-	180	130	300
	Standard Deviation	45.4	52.8	56.9	79.9	-	49.8	46.1	61.2
Time taken in (minutes) to reach the health facility on foot	N	3	13	3	10	-	11	6	34
	Mean	140	169.6	146.7	172	-	106.9	143.3	150.0
	Minimum	90	5	90	90	-	1	90	1
	Maximum	240	420	230	480	-	360	240	480
	Standard Deviation	86.6	124.2	73.7	116.2	-	103.6	72.0	116.0

The endline survey established that all the ETS riders thought that the community agree that bicycle ambulance can be used for both maternal and child health emergencies. This was the same result that was obtained at midline.

Case study 2: Bicycle Ambulance Saves Prudence's Life:

What looked like a normal day for Prudence Chibuye turned out to be the worst day of her life. On the 5th of April 2020 at approximately 4:00 pm, Prudence, a mother of three from Chanikila community in Serenje district who was six months pregnant, was doing her routine activities working in her beans field with her husband Elvis Nkandu. However, this day was different in her entire life as she experienced something unusual, she began to bleed while in the field. "Upon seeing this, I was overcome with fear and confusion but I managed to alert my husband about my sudden condition," Prudence narrated in a calm voice. Elvis said, "I immediately realized that Prudence and the baby's lives were in immediate danger. I knew that what happened to Prudence was a maternal complication and any delays in rushing her to the facility will cause her to bleed to death." Elvis recalls immediately

Figure 14: Picture of Prudence Chibuye with her child

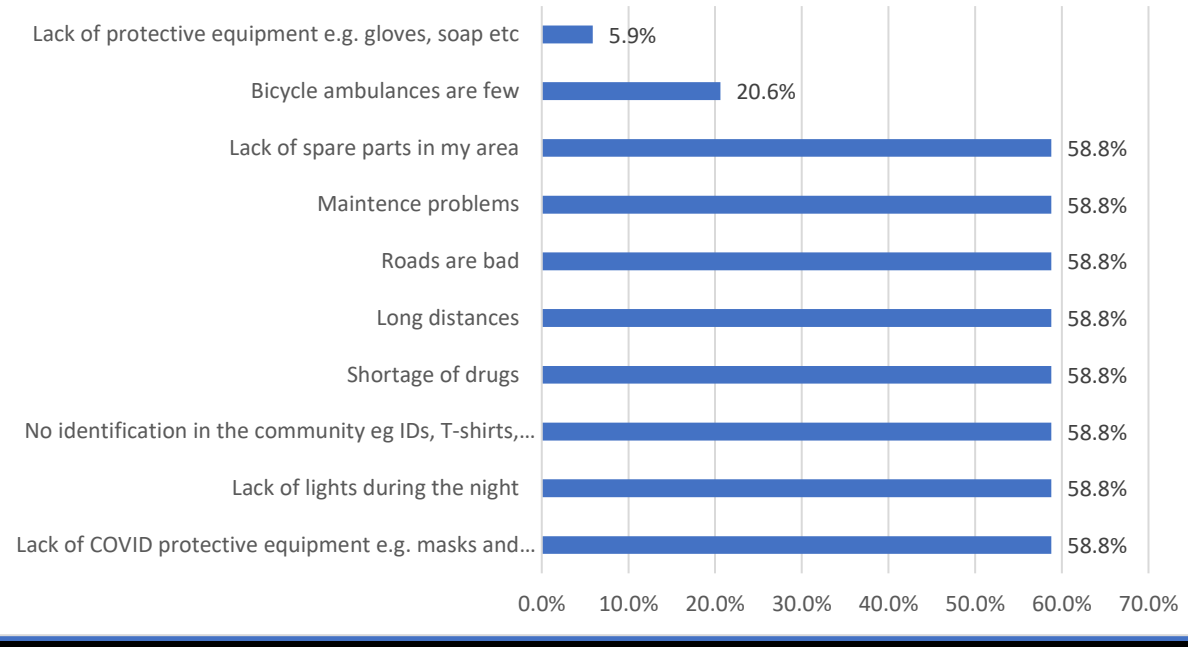
called Philemon Kalunga, an Emergency Transport Scheme Bicycle Ambulance (BA) rider, to inform him of the emergency. MAM@ Scale implemented bicycle ambulances to the programmes intervention sites to provide affordable, safe and timely transport in rural locations for children with severe malaria in accessing health services. However, the BAs can be utilised for maternal emergencies, such as in Prudence's case.

Philemon, a dedicated ETS rider, is a security officer at Feed Zambia, an organization that deals in chicken rearing and he is also a Community Health Volunteer. He was working when he was called upon for help for Prudence. "With the nature of my work it was difficult for me to leave my work premises, but I approached my manager to ask for permission," Philemon said. Philemon is well known for his work as an ETS rider, and his manager is very much aware that Philemon has assisted many in great need in the past as an ETS rider and gave him permission to rush Prudence to the health facility. It took less than an hour for Philemon to arrive with the bicycle ambulance and immediately Prudence was rushed to Kabamba health facility for treatment. Unfortunately, Prudence lost the baby, but the facility staff commended Philemon and Elvis for their quick action that led to Prudence's life being saved. Prudence was only admitted for one day and discharged the following day because of the prompt action taken by her husband and the ETS rider reduced the amount of time she bled and so the impact on her health. When Prudence was asked what she thought of Philemon's work as a rider her reply was, "he saved my life. Had it not been for the bicycle ambulance in my community and the dedicated ETS rider I would have died."

In general, ETS riders expressed satisfaction in their work; *"I will always be thankful for the opportunity of working with MAM@Scale as an ETS rider. My family is very proud of my work and encourages me to continue saving lives in my community with the bicycle ambulance. Transporting emergency cases is one of the most rewarding things I can do and I am happy with the level of transformation that has occurred in my community because of ETS"* (Baron Mupeta, ETS rider and CHV in Serenje District).

However, they also expressed some challenges they are facing. Over 50% of the ETS riders mentioned eight challenges they normally face, and these include long distances, poor road network, shortage of drugs, lack of lights during the night, no personal identification in community, lack of COVID-19 protective equipment and lack of spare parts for the ETS vehicles. Maintance problems and lack of spare parts was also mentioned by over 50% of the ETS, this was a result of COVID-19 and supply chain and cost issues. (See Figure 15).

Figure 15:Challenges faced by ETS riders at endline



4.2.3 Objective 3: Changes in gender empowerment and in social inclusion of disadvantaged families

CHVs having a stronger voice at community level

Focus group discussions with CHVs revealed that they are now well respected in the community because they are more knowledgeable about health-related issues. It further emerged that generally most women in the community are more comfortable to be attended to by fellow women than by men hence female CHVs play a critical role in addressing that gap. The female CHVs proudly mentioned that they are regarded as community nurses.

Furthermore, at endline, about 95.3% of the female CHVs agreed that they have a stronger voice at community level because of their training (Table 16). In addition, more than 90% of all the CHVs interviewed at endline (94.6% females, 95.9% males) thought that female community members have more independence to make health and other decisions in their households because of community mobilisation activities in their communities. The proportion was significantly higher in NSU districts (98.4%) in comparison to demonstration districts (90.2%). The above results were confirmed through FGDs that were held with the CHVs, e.g., in Serenje.

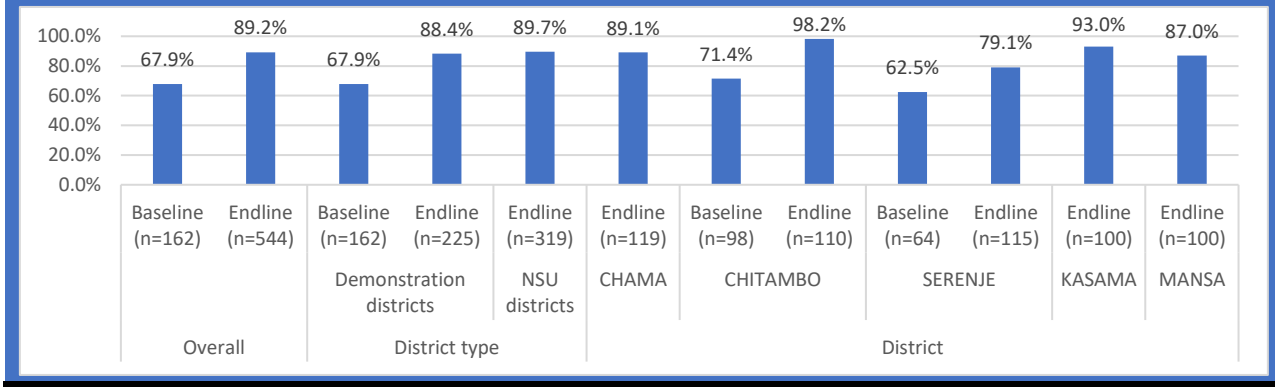
Table 16: Views of CHVs on empowerment of women in their communities

	As a female CHV, do you feel that you have a stronger voice at community level because of their MAMaZ training?		CHVs who thought that female community members have more independence to make health and other decisions within their households as a result of the community mobilisation activities in their communities					
	Midline	Endline	Midline			Endline		
	Female	Female	Male	Female	Total	Male	Female	Total
District Type								
Demonstration districts	97.9%	92.5%	95.0%	94.2%	94.6%	87.4%	93.4%	90.2%
NSU districts	96.2%	100%	81.8%	96.2%	84.0%	98.0%	100.0%	98.4%
Total	97.8%	95.3%	90.3%	94.4%	91.9%	94.6%	95.9%	95.0%
District								
Chama	100%	100%	90.9%	100%	91.1%	96.3%	100%	96.6%
Chitambo	95.9%	100.0%	92.4%	91.8%	92.1%	98.1%	98.2%	98.2%
Manyinga	88.9%	0.0%	62.5%	88.9%	66.2%	0.0%	0.0%	0.0%
Serenje	99.3%	84.0%	97.2%	95.9%	96.5%	78.5%	88.0%	82.6%
Vubwi	100%	0.0%	100%	100%	100%	0.0%	0.0%	0.0%
Kasama	0.0%	100.0%	0.0%	0.0%	0.0%	98.6%	100%	99.0%
Mansa	0.0%	100.0%	0.0%	0.0%	0.0%	100%	100%	100%
Total	97.8%	95.3%	90.3%	94.4%	91.9%	94.6%	95.9%	95.0%

CHVs supporting the least-supported women in their communities

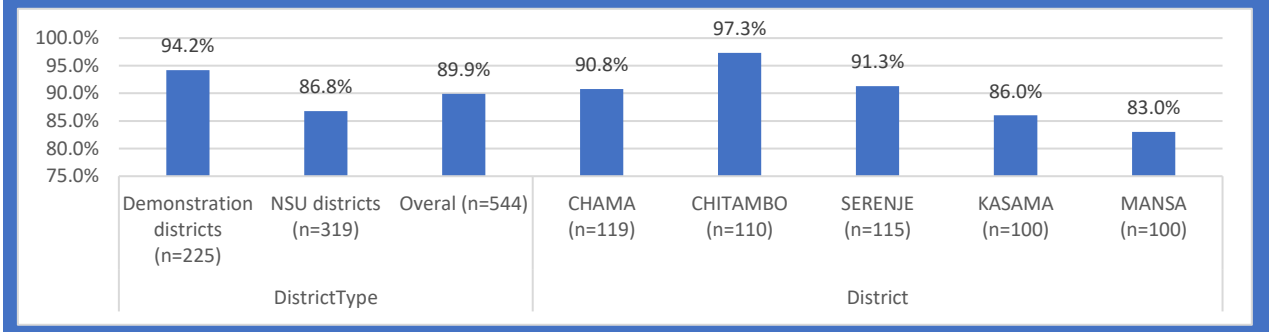
CHVs were asked if they have ever visited the least supported women from their communities in their homes to discuss child health issues. The results reveal a statistically significant ($p<0.05$) change in the proportion of CHVs who have ever visited the least supported women, from baseline to endline, i.e., 67.9% to 89.2% respectively. Analysis by district type shows that the proportion of CHVs who have ever visited the least supported women changed from baseline to endline by 20.5 percentage points in the demonstration districts. The comparison is limited to the demonstration districts since the NSU districts were not yet part of the project areas at baseline. The results show that the greatest change was in Chitambo (21 percentage points) as compared with Serenje (16.6%) between baseline and endline. At endline, the results show that the proportion of CHVs who have ever visited the least-supported women was higher in Chitambo (98.2%), followed by Kasama (93%) and Chama (89.1%). See Figure 16 below for more detailed results.

Figure 16:Percentage of CHVs who had ever visited the least supported women in their communities



The results (Figure 17) also show that 89.9% (94.2% in demonstration districts and 86.8% in NSU districts) had taken some actions to support the least-supported women in their communities. Analysis by district shows that the proportion of those who had taken some actions was higher in Chitambo (97.3%), followed by Serenje (91.3%) and Chama (90.8%).

Figure 17: Percentage of volunteers who had taken action to support least supported women in their communities (endline)



The type of actions taken to support the least-supported women in their communities are presented in Table 17 below. The results show that the most mentioned actions were encouragement (56%), making sure that the least-supported women have health information (53.2%) and, assisting with either soap or food (45.4%). CHVs who mentioned that they assisted the least-supported women with either soap or food were more prevalent in demonstration districts (52.8%) than in NSU districts (39.7%). CHVs who mentioned that they made sure that the least supported women have health information were more common in NSU districts (57%) than in demonstration districts (48.1%). Focus group discussions with CHVs also revealed that they are always ready to assist if disadvantaged women have children who need help due to illness or require any other health related information. Most often, children from disadvantaged backgrounds are assisted in the form of transport.

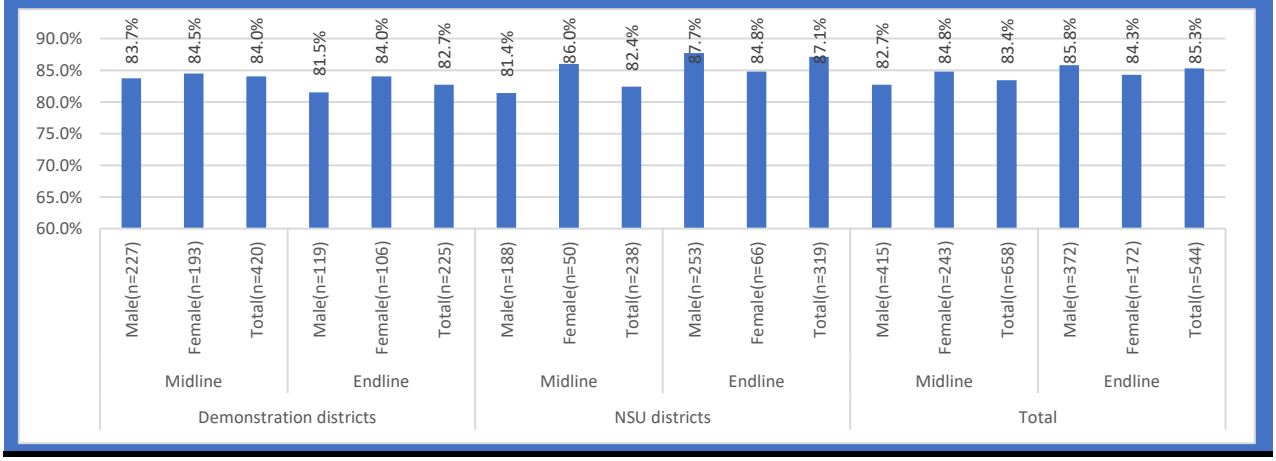
Table 17: Actions taken to assist vulnerable women (endline)

Action	District type			District				
	Demonstration districts	NSU districts	Overall	Chama	Chitambo	Serenje	Kasama	Mansa
N	225	319	544	119	110	115	100	100
Encouraged them	52.4%	58.8%	56.0%	9.30%	55.10%	49.50%	91.90%	89.2%
Made sure they have health information	48.1%	57.0%	53.2%	25.90%	54.20%	41.90%	80.20%	73.5%
Helped with childcare	27.4%	25.3%	26.2%	6.50%	33.60%	21.00%	37.20%	37.3%
Assisted with soap or food	52.8%	39.7%	45.4%	50.00%	65.40%	40.00%	30.20%	36.1%
Made friends with them	24.5%	19.9%	21.9%	0.00%	29.00%	20.00%	38.40%	26.5%
Helped with transport	34.4%	42.6%	39.1%	73.10%	45.80%	22.90%	26.70%	19.3%
Assisted with money	31.6%	28.2%	29.7%	49.10%	39.30%	23.80%	14.00%	15.7%
Other	0.0%	3.6%	2.00%	6.50%	0.00%	0.00%	2.30%	1.2%

Gender based violence (GBV)

The term gender-based violence (GBV) refers to the violence that targets individuals or groups based on their gender[13]. Just like at the midline, data on GBV was collected from the CHVs. CHVs who mentioned that GBV was not rising in their communities were further asked if GBV has fallen over the past couple of years. The results show that, over 80% of the CHVs in both surveys (midline and endline) felt that GBV was falling over the past couple of years. At endline, the proportion was (85.3%, n=544) which is slightly higher when comparing to CHVs at midline (83.4%, n=658). Analysis by gender and district type did not show any variation (Figure 18).

Figure 18:Proportion of CHVs who mentioned that GBV has fallen in their community over the past couple of years



[13] https://www.thenewhumanitarian.org/feature/2004/09/01/definitions-sexual-and-gender-based-violence#:~:text=Definitions%20of%20sexual%20and%20gender-based%20violence%201%20Gender-based,likely%20to%20result%20in%2C%20...%20More%20items...%20

The extent to which GBV has fallen was also analysed (Table 18). The results show that, at endline, the highest proportion of CHVs (65.1%) mentioned that GBV has reduced a lot, this is followed by 19.2% who mentioned that it has disappeared and 15.7% who mentioned that it has reduced a little. In addition, most of the CHVs who mentioned that GBV has reduced a lot were females (72.4%, n=145) which is significantly different to male CHVs (61.8%, n=319). Comparing the two surveys, baseline and endline, the proportion of CHVs who mentioned that GBV has reduced a lot significantly ($p<0.05$) reduced from midline (72.7%, n=549) to endline (65.1%, n=464). Disaggregation of data by district type did not show much variation. The fact that 84% of all respondents at endline indicated that GBV had either fallen a lot or disappeared in the last couple of years is very positive.

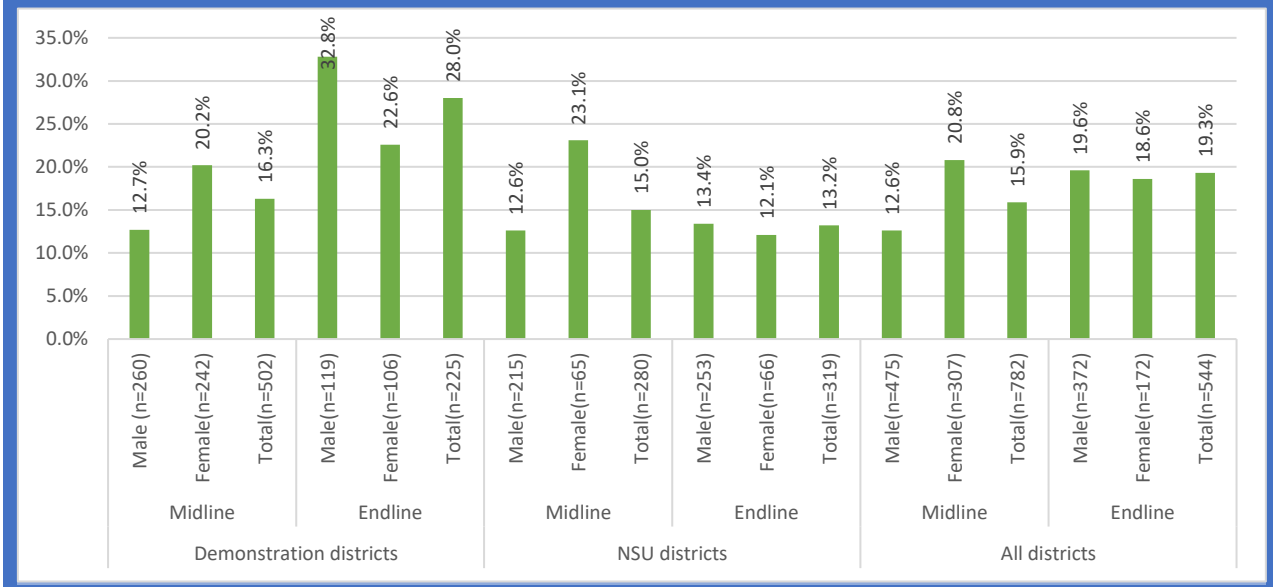
Table 18:The extent to which GBV has fallen in communities

District type	Survey point	Gender	N	It has disappeared	It has reduced a lot	It has reduced a little	Total
Demonstration districts	Midline	Male	190	7.4%	72.6%	20.0%	100%
		Female	163	6.7%	80.4%	12.9%	100%
		Total	353	7.1%	76.2%	16.7%	100%
	Endline	Male	97	11.3%	81.4%	7.2%	100%
		Female	89	7.9%	85.4%	6.7%	100%
		Total	186	9.7%	83.3%	7.0%	100%
NSU districts	Midline	Male	153	2.6%	68.6%	28.8%	100%
		Female	43	2.3%	58.1%	39.5%	100%
		Total	196	2.6%	66.3%	31.1%	100%
	Endline	Male	222	24.8%	53.2%	22.1%	100%
		Female	56	28.6%	51.8%	19.6%	100%
		Total	278	25.5%	52.9%	21.6%	100%
All districts	Midline	Male	343	5.2%	70.8%	23.9%	100%
		Female	206	5.8%	75.7%	18.4%	100%
		Total	549	5.5%	72.7%	21.9%	100%
	Endline	Male	319	20.7%	61.8%	17.6%	100%
		Female	145	15.9%	72.4%	11.7%	100%
		Total	464	19.2%	65.1%	15.7%	100%

The results show a statistically significant ($p<0.05$) increase in the proportion of CHVs who mentioned that gender-based violence has been rising in their communities from midline (15.9%, n=782) to endline (19.3%, n=544 (see Figure 19 below). At endline, mostly male CHVs (19.6%, n=372) mentioned that GBV was rising as compared to female CHVs (18.6%, n=172), the difference was statistically significant ($p<0.05$). This was slightly different when comparing to CHVs interviewed at midline, where the greater proportion of CHVs who mentioned that GBV was increasing were females (20.8%, n=307) as compared to males (12.6%, n=475). Disaggregating data by district type shows that, at endline, the rising GBV levels were more

prevalent in demonstration districts (28%, n=225) compared to NSU districts (13.2%, n=319). The difference was statistically significant (p<0.05).

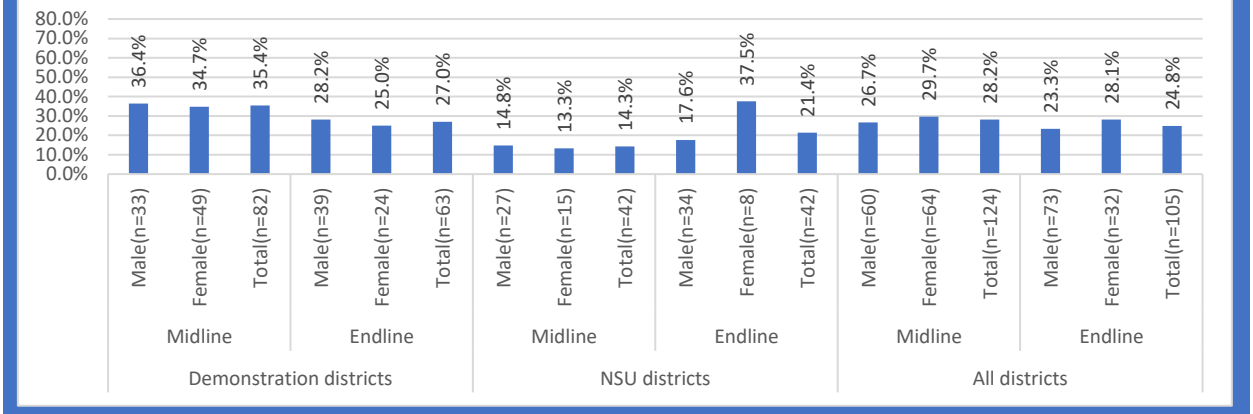
Figure 19:Proportion of CHVs who mentioned that Gender Based Violence is rising in their communities



The results show that, at endline, about (24.8%, n=105) felt that GBV was rising because of the challenges brought about by COVID-19. This is significantly lower to what was reported at midline (28.2%, n=124). This can be attributed to changes in the COVID-19 environment at midline and endline. Analysis by gender shows that, in both surveys, CHVs who felt that GBV was increasing because of COVID-19 were females. At endline, 28.1% of female CHVs compared to 23.3% of male CHVs felt that GBV was increasing because of COVID-19. At midline, 29.7% of female CHVs and 26.7% of male CHVs felt the same.

Disaggregating data by district type shows that, at endline, the greater proportion of CHVs who mentioned that GBV was rising because of changes brought about by COVID-19 was in the demonstration districts (27%, n=63) as compared to the NSU districts (21.4%, n=42). The difference was statistically significant (p<0.05). In the demonstration districts, for both surveys, CHVs who mentioned that GBV was increasing due to the challenges brought about COVID-19 were mostly males. At endline the proportions were (28.2% males vs 25% females) whilst at midline the proportions were (36.4% males vs 34.7% females). This was slightly different when compared with CHVs in NSU districts. At endline, there was a higher propotion of females (37.5%, n=8) when comparing to males (17.6%, n=34). See Figure 20 below for the detailed results.

Figure 20: Proportion of CHVs who mentioned that GBV is increasing because of the changes and challenges brought about by coronavirus (COVID-19)



Delays in taking children for treatment at the health facilities

RAS trained CHVs as endline (70.5%) thought that fewer children were experiencing delays in being taken to the HFs when they are suspected of having malaria, this proportion was lower when comparing with CHVs at baseline (75%). Analysis by district type shows that the proportion of CHVs who mentioned that fewer children are being delayed significantly increased from baseline (75%) to endline (80.4%) in the demonstration districts. NSU districts were not surveyed at baseline hence a comparison could not be made. However, 63.7% of the CHVs interviewed at endline felt that fewer children are experiencing delays. Disaggregation of data by district shows that the highest number of CHVs who believe fewer children are experiencing delays are found in Chitambo (89.1%) followed by Serenje (72.2%) and Kasama (71.4%). According to parents, health-seeking behavior has improved, and communities are now seeking early treatment for severe malaria.

"We are now more inclined to take our children to the CHV or health post once they fall sick. We have learnt from the CHVs about the importance of seeking medical attention." Mansa parents FGD.

Moreover, RAS trained CHVs were thought that families in their communities are relying less on traditional remedies to treat malaria. The results reveal a significant increase from baseline (75%) to endline (87.3%) in the proportion of CHVs who felt that people are relying less on traditional medicine. Analysis by district shows that, in the demonstration districts, the proportion significantly increased by 22.6 percentage points from baseline (75%) to endline (97.6%). Disaggregating data by district, at endline, shows that this proportion was higher in Chitambo (100%), followed by Serenje (95.4%) and Chama (93.3%).

"MAM@Scale not only gave us the bicycle ambulances to shorten the distance [time] to the health facility but has ended the cultural beliefs people had on the cause of illness in the community through the meetings and lessons that CHVs conduct." Baron Mupeta, ETS rider and CHV

On the question presented to RAS trained CHVs pertaining to least-supported women in their communities having been reached and included in the child health activities, results show that about 93.8% at endline were affirmative, and this is significantly higher when compared with 83.3% at baseline (Table 19). Analysis

of data by district shows that this proportion was higher in Chama (98.1%), followed by Chitambo (98%) and Serenje (90.9%).

Table 19: Delays of children to the health facility and rely on traditional medicine to treat malaria

	Survey point	N	RAS trained CHVs, who thought that fewer children are experiencing delays in going to the health facility when they are suspected of having malaria	RAS trained CHVS, who thought that families in this community are relying less on traditional remedies to treat malaria	RAS trained CHVs, who thought that the least-supported women in this community have been reached and included in the child health activities
District type					
Demonstration districts	Baseline	24	75.0%	75.0%	83.3%
	Endline	209	80.4%	97.6%	95.7%
NSU districts	Baseline	-	-	-	-
	Endline	303	63.7%	80.2%	92.4%
District					
Serenje	Baseline	11	72.7%	72.7%	90.9%
	Endline	108	72.2%	95.4%	93.5%
Chitambo	Baseline	13	76.9%	76.9%	76.9%
	Endline	101	89.1%	100.0%	98.0%
Chama	Endline	105	52.4%	93.3%	98.1%
Kasama	Endline	98	71.4%	72.4%	89.8%
Mansa	Endline	100	68.0%	74.0%	89.0%

4.2.4 Objective 4: The impact of COVID-19 on the provision of services

Impact on service provision by HFs

Data were collected from health facility personnel to check the impact of COVID-19 at facility level. Health facility respondents were asked if they had experienced disruptions in supplies of medicines and other essential consumables due to COVID-19 and results are presented in Table 16 below. The results show that the proportion of HFs who experienced disruptions significantly reduced by 39 percentage points from midline (84.1%, N=44) to endline (45%, N=40). Analysis by district type show that, at endline, most of the affected HFs were found in the demonstration districts (75%, N=16) when compared to the NSU districts (25%, N=24).

On whether the HFs suspended or scaled down on community level activities due to COVID-19, the results reveal a significant decrease in the proportion of HFs who suspended or scaled down community level activities from midline (61.4%, N=44) to endline (50%, N=40). Analysis of data by district type show that the proportion of HFs that had scaled down activities at endline were more common in the demonstration districts (81.3%, N=16) when compared with the NSU districts (29.2%, n=24). The situation was like what

was seen at midline, where HFs who suspended activities were more common in demonstration districts (70.8%, N=24) as compared to NSU districts (50%, N=20). See Table 20 for detailed results.

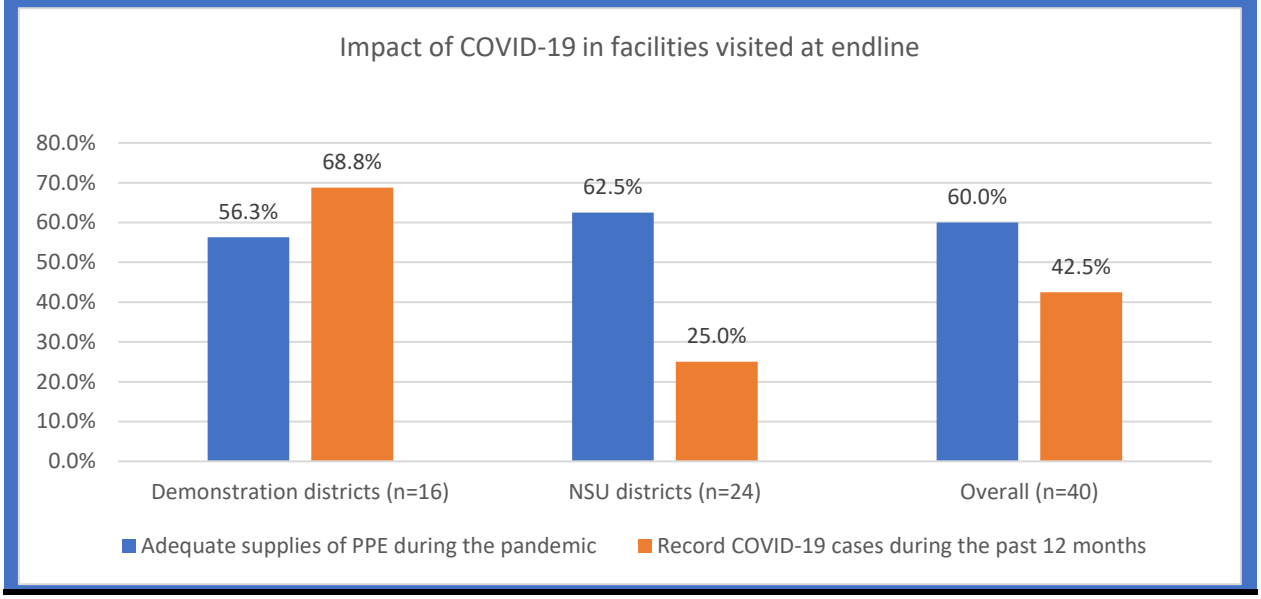
Table 20: Proportion of HFs who experienced disruptions in service provision due to COVID-19

	Demonstration districts		NSU districts		All districts	
	Midline	Endline	Midline	Endline	Midline	Endline
N	24	16	20	24	44	40
Proportion of HF who experienced disruptions in supplies of medicines and other essential consumables due to COVID-19	91.7%	75.0%	75.0%	25.0%	84.1%	45.0%
Proportion of HF who have suspended or scaled down on community level activities due to COVID-19	70.8%	81.3%	50.0%	29.2%	61.4%	50.0%
Percentage of HFs who have experience reductions in volumes of people seeking the following						
ANC services	12.5%	43.8%	15.0%	0.0%	13.6%	17.5%
Immunisations services	25.0%	43.8%	21.1%	4.2%	23.3%	20.0%
Deliveries services	4.2%	43.8%	15.0%	4.2%	9.1%	20.0%
Child Health clinics services	29.2%	43.8%	15.8%	4.2%	23.3%	20.0%
Growth monitoring services	29.2%	43.8%	20.0%	4.2%	25.0%	20.0%

Table 20 above also show the proportion of HFs who have experienced reductions in volumes of people seeking services like ANC, immunisations, delivery, child health clinics and growth monitoring. At endline, the most mentioned services were immunisations, delivery, child health clinics and growth monitoring and the proportion of HFs who mentioned these services were the same (20%). This is slightly different to what was mentioned at midline, where the most mentioned services that were disrupted were growth monitoring (25%), immunisations (23.3%) and child health clinics (23.3%).

In addition, the survey sought to determine whether the HFs had adequate supplies of PPE during the pandemic. About 60% (62.5% in the NSU districts and 56.3% in the demonstration districts) had adequate supplies of PPE during the pandemic. Furthermore, the survey collected data on HFs that had recorded any COVID-19 cases at facility level. Around, 42.5% (68.8% in demonstration districts and 25% in NSU districts) mentioned that they had recorded COVID-19 cases over the past 12 months (Figure 23).

Figure 21: Impact of COVID19 in facilities visited at endline

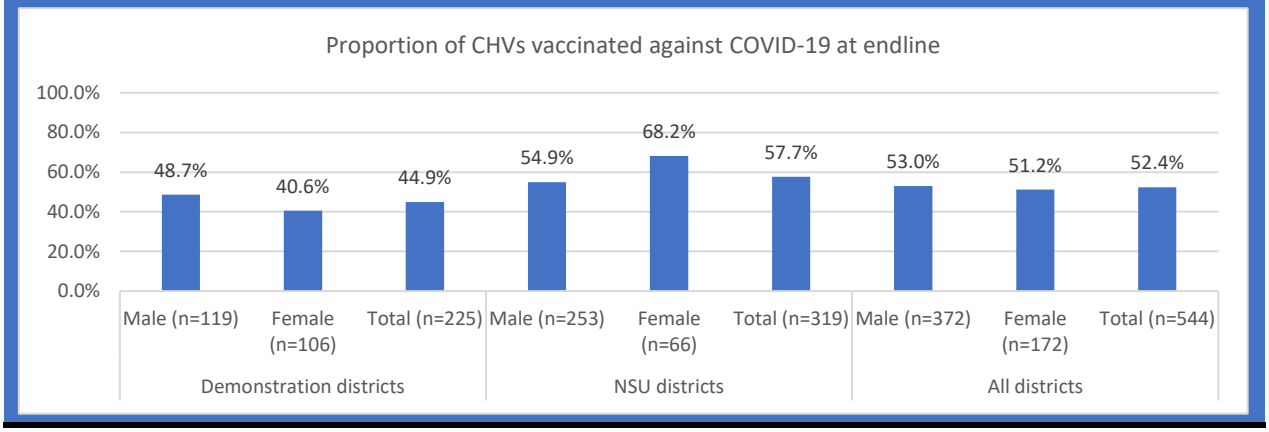


Impact of COVID-19 at community level

COVID-19 had brought fear into the lives of people as revealed by parents, not only in towns but also in the rural areas. Some people lost their friends and relatives due to the pandemic. Respondents from Kasama, Serenje and Chitambo district indicated that the COVID-19 pandemic impacted greatly on their lifestyles and livelihoods. Churches were closed and people stopped doing economically productive activities and other businesses because they could not move around to purchase stock. They could not even visit their own relatives because they were told to stay at home. The suspension of economically productive activities resulted in food shortages and hunger in homes. The food packs that were distributed by the project assisted the most-needy households to bridge the gap during the difficult times. In general, COVID-19 impacted on most aspects of life including religious activities and education. Churches were closed and people could not congregate. Schools were also closed, meaning that children were also missing out a lot on their education. Parents complained that when children go a long time without going to school, they start to misbehave. Early pregnancies and marriages were reported as children had more time with nothing to do.

Regarding the COVID-19 vaccine, the number of people who have been vaccinated was higher in the NSU districts as shown in Figure 24 below. There were more males who have been vaccinated with 53% than females with 51.2%. Considering the ETS riders, (26.5%, N=34) mentioned that they were vaccinated. It also emerged from the FGDs conducted with parents in Mansa that they were many misconceptions about COVID-19 and the vaccine. Some people in the community reportedly strongly believed that the vaccine would kill them. However, with the education provided by the CHVs, the radio programs and posters in relevant languages, communities' knowledge improved gradually, and this improved the willingness of people to be vaccinated.

Figure 22:Proportion of CHV who were vaccinated against COVID-19



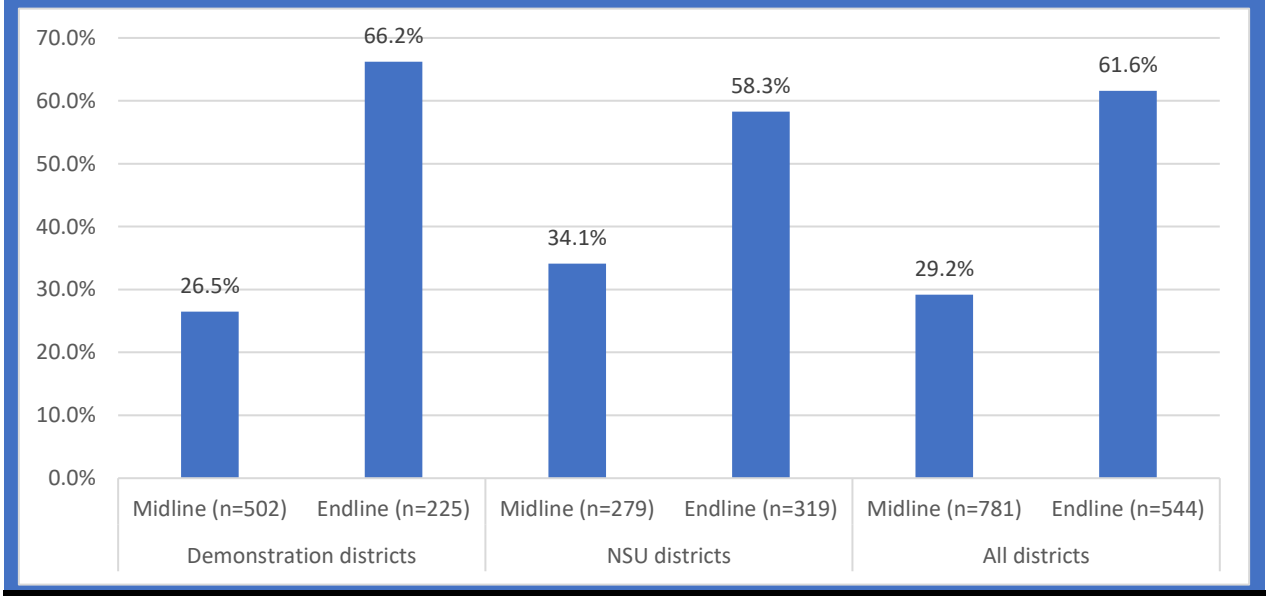
CHVs who mentioned that they were not vaccinated, were asked for the main reasons for not getting vaccinated. The most mentioned reason was that there are few vaccination sites (55.2%), followed by unavailability of vaccines (22%) and others mentioned that the vaccination program had not reached their areas (10.4%). It is worth noting that 7.3% of respondents mentioned that they just did not want to get vaccinated and 2.3% mentioned that they feared the unknown COVID-19 vaccination side effects. Analysis by gender shows that CHVs who mentioned that they do not want to get vaccinated were more commonly females (11.9%, n=84) when compared to males (5.1%, n=175). The difference was statistically significant ($p<0.05$). Analysis of data by district type did not show any great variation. See Table 21 below for results in greater detail.

Table 21: Reasons why CHVs are not vaccinated

	Demonstration districts			NSU districts			All districts		
	Male	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**
N	**61**	**63**	**124**	**114**	**21**	**135**	**175**	**84**	**259**
Few vaccination areas	78.7%	71.4%	75.0%	34.2%	52.4%	37.0%	49.7%	66.7%	55.2%
No vaccines available	11.5%	3.2%	7.3%	38.6%	19.0%	35.6%	29.1%	7.1%	22.0%
Vaccination has not reached the area	11.5%	4.8%	8.1%	12.3%	14.3%	12.6%	12.0%	7.1%	10.4%
I just don't want	1.6%	11.1%	6.5%	7.0%	14.3%	8.1%	5.1%	11.9%	7.3%
No time to go and get vaccinated	3.3%	3.2%	3.2%	10.5%	4.8%	9.6%	8.0%	3.6%	6.6%
Not informed about the vaccination availability at the health facility	1.6%	7.9%	4.8%	6.1%	4.8%	5.9%	4.6%	7.1%	5.4%
Fear of the side effects	0.0%	3.2%	1.6%	0.9%	14.3%	3.0%	0.6%	6.0%	2.3%
Most of the vaccination areas are always full	0.0%	1.6%	0.8%	0.9%	0.0%	0.7%	0.6%	1.2%	0.8%
Was not available when the vaccines came	0.0%	0.0%	0.0%	1.8%	0.0%	1.5%	1.1%	0.0%	0.8%
Religious beliefs	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

The survey also sought to determine the impact of COVID-19 on the ability of CHVs to continue with their volunteering work due to measures introduced to curb the spread of COVID-19. The results reveal a significant increase in the proportion of CHVs who mentioned that they are facing challenges from midline (29.2%, n=781) to endline (61.6%, n=544). Analysis by district type shows that CHVs who faced challenges were more often in demonstration districts (66.2%, n=225) when compared with CHVs from NSU districts (58.3%, n=319). The difference was statistically significant. See Figure 25 below.

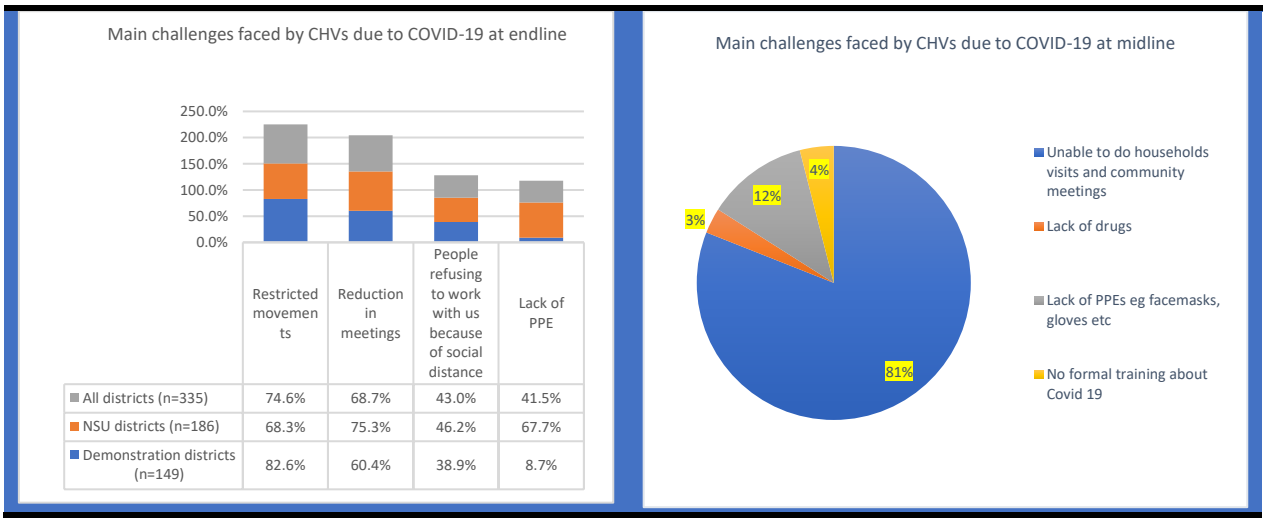
Figure 23:Proportion of CHVs who have faced challenges because of COVID-19 measures



CHVs who mentioned that they faced challenges were further asked about the specific challenges they faced. Challenges mentioned at midline were slightly different to the ones mentioned at endline, hence comparisons cannot be made. During endline, the most mentioned challenges faced by CHVs because of COVID-19 measures were restricted movements (74.6%), reduction in meetings (68.7%) and some mentioned that people are refusing to work with the CHVs because of social distancing (43%). About 41.5% of respondents mentioned that they lack PPE for COVID-19. As the frontline workers some CHVs had challenges because they did not have face masks and hand sanitizers as well as soap and gloves. They felt that they were not well protected. Restriction of movement was more common in the demonstration districts (82.6%) compared to NSU districts (68.3%). See Figure 26 below for results. It is interesting to note that only 4% of respondents mentioned that they lacked formal training on COVID-19 and that this hindered their work as CHVs.

ETS riders also faced another challenge that was unique to them. The major challenge they faced during the partial lockdown was the lack of availability of spare parts. It became too expensive to buy spare parts locally because travelling across districts had been restricted.

Figure 24: Main challenges faced by CHVs due to COVID-19



Case study 3: Chitambo District Health Office (DHO) partnering with MAM@Scale in the COVID-19 response

The collaboration between Chitambo District Health Office (DHO) and MAM@Scale has been very effective, not only in the treatment of severe malaria at community level using rectal artesunate, a pre-referral drug, but also developing strong preventative measures against COVID-19 in this transit town. According to Dr Phiri;

"Our grants [from the Zambian government] are usually inadequate to cater for all medical conditions. We are reliant on other partners such as MAM@Scale so that we could join hands and to put up measures in fighting COVID-19. MAM@Scale has not only supported Chitambo DHO staff to facilitate focus group discussions on COVID-19 in the markets and other public places, but supported the staff to do COVID-19 screenings at entry and exit points of the district. MAMaZ also organised phone in radio programs on COVID-19 and GBV (Gender Based Violence) twice a week in the district. Tip taps, facemasks, hand sanitisers, soap and COVID-19 posters translated in local language were distributed in all health facilities. CHVs (Community Health Volunteers) have also been trained to create awareness on COVID-19 within their communities. It is important to say that MAM@Scale was first to offer help to the district in putting up preventive measures against COVID-19".

In an effort to remove distance barriers in accessing health services, MAM@Scale has supplied bicycle ambulances to communities in Chitambo District for transporting malarial and maternal emergencies. "MAM@Scale has done a great service to Chitambo, in July 2020 two riders transported a maternal emergency from Kamanga Community to Reuben Health Facility, which is a very long distance of about 30 kilometres. They did that while observing all procedures in preventing any possible spread of COVID-19, such as wearing masks, keeping a social distance, wearing of gloves when carrying the patient and regular washing of hands with soap. The level of volunteerism in these communities is excellent and community ownership of these assets is so good. We could never achieve all this without the interventions from MAM@Scale," Dr Phiri said.

MAM@Scale uses a strong community engagement approach by establishing and strengthening community systems to uplift health standards at community level. It is an inclusive approach that engages people at all levels, from traditional leadership to members of the community. People who volunteer to work for the community are trained in health education and become the providers of basic health services at community level. Food banks and savings schemes are formed in the communities to fight

affordability barriers. This has not only raised demand for health services in the facilities that MAM@Scale is supporting in Chitambo district, but it made it much easier to put up preventative measures against COVID-19. Programmes such as MAM@Scale with a strong history of community engagement are able to effectively respond to pandemics such as COVID-19 using tried and tested approaches. This teaches us that collaboration is for life and not just for times of crisis.

4.2.5 Objective 5: Contribution to reduction in mortality due to severe malaria in children

Number of malaria cases

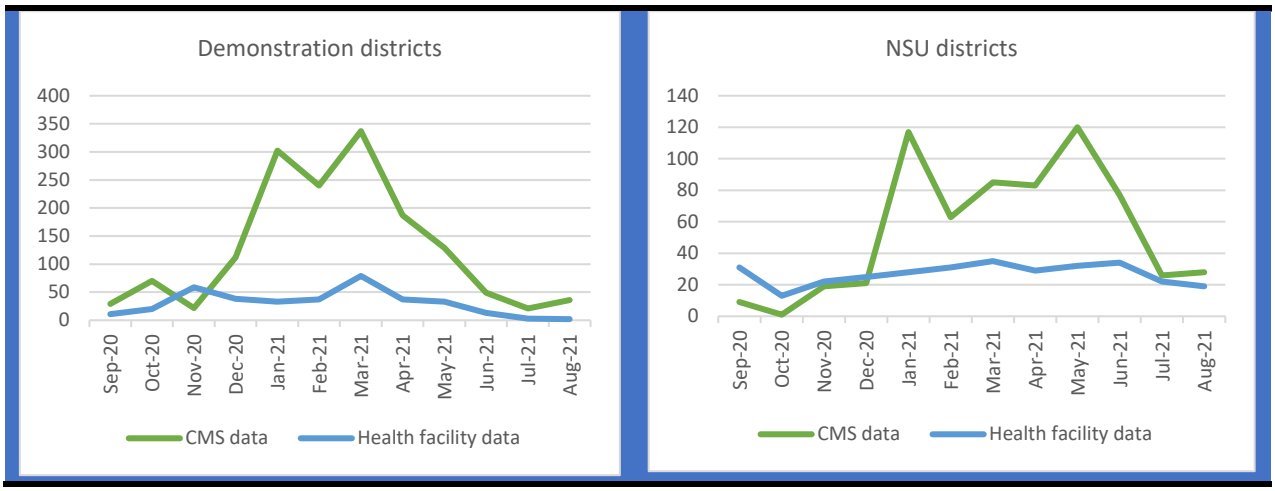
The survey checked whether they were notable changes in number of malaria cases from the onset of the project to the endline. The results show that, over a 12-month period (September 2020 – August 2021), a total of 126,537 malaria cases (in both adults and children) were recorded in all the visited districts during endline survey. Malaria cases in demonstration districts tend to peak between December and January, whilst in NSU districts malaria cases seem to peak during January. Two data sources were considered for severe malaria cases, i.e., severe cases recorded at health facility (and collected by enumerators at endline) and severe cases which were recorded by the project community monitoring system (CMS). The number of severe malaria cases identified from HFs was lower that the numbers of cases recorded from CMS data. This was due to several reasons, including the following

1 No indicator is available in the HMIS which captures severe malaria cases: To determine the number of severe malaria cases for the endline survey, enumerators had to count the number of children given Inj AS. The assumption was that Inj AS is only given to children with severe malaria.
2 Staff rotations: when new staff comes in, they are not properly oriented on how to capture the data and therefore creating room for under-reporting,
3 Possible use of other drugs to treat cases of severe malaria: When HFs do not have Inj AS in stock, they use other drugs to treat suspected cases of severe malaria. Children who were given other drugs (e.g., quinine) when they presented signs and symptoms of severe malaria were missed, and this could have resulted in lower numbers being reported.

Figure 27 below shows a comparison between the severe malaria cases reported by the CMS data [14]and those recorded by HFs from September 2020 to August 2021. It can be noted that, cases reported by CMS data are significantly higher than those which were recorded from the HFs. For the NSU districts, only Chama was recording data from September 2020, Kasama and Mansa started to record CMS data in February 2021. However, the CMS severe malaria cases are higher when compared to those reported by HFs as shown below.

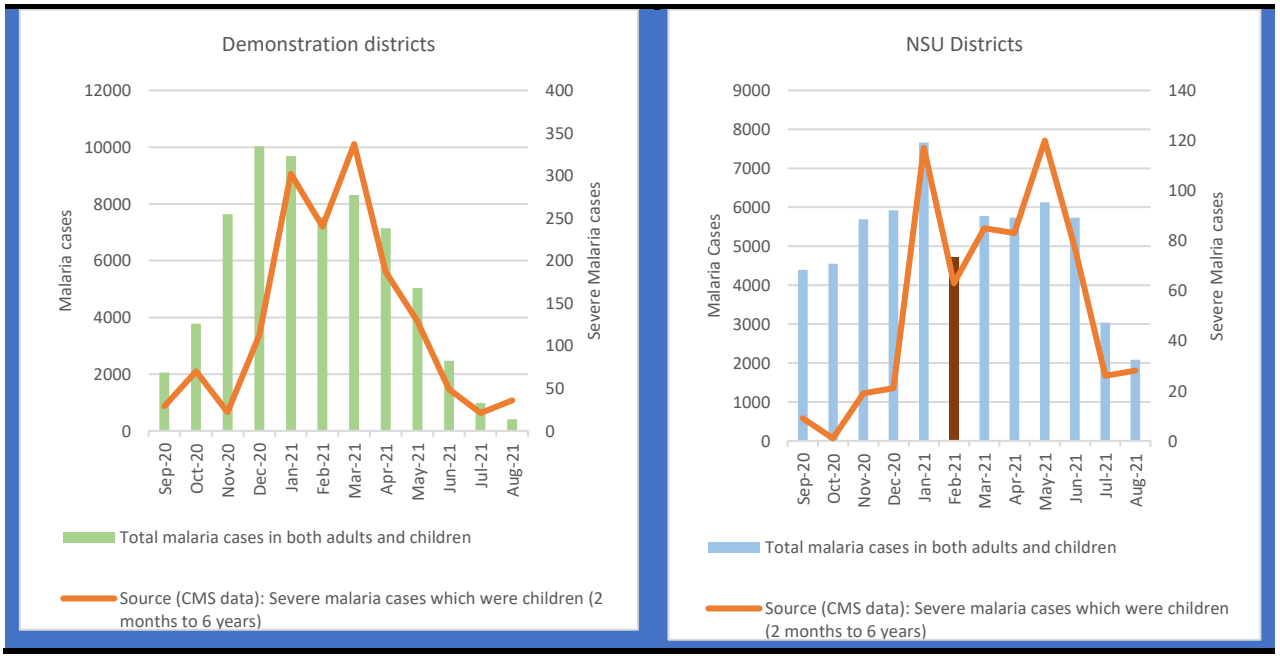
[14] Number of children between the age of 2 months to 6 years given RAS in a particular month.

Figure 25: Comparison of data sources on severe malaria cases



Based on the explanation above, the endline will use the severe cases recorded by the CMS data. Therefore, the severe cases shown in Figure 28 below are the severe malaria cases obtained from the CMS data. It can be noted that, severe cases in communities peaked in March in the demonstration districts whilst in NSU districts, they reached a peak in January and May.

Figure 26: Malaria trends in demonstration and NSU districts



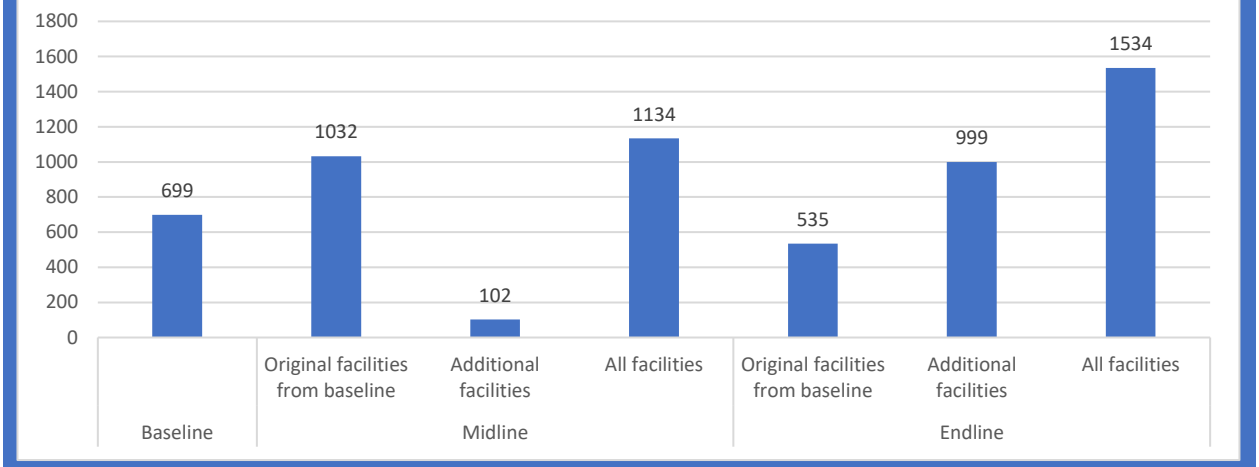
Source of severe malaria cases: CMS data[15]

Figure 29 shows the severe malaria cases which were recorded at baseline, midline and endline in the demonstration districts. At endline, the severe malaria cases shown were extracted from the CMS data as described in the sections above. In CMS data, RAS recipients is used as a proxy for severe malaria.

[15] Number of children given RAS in particular month

Considering all the facilities visited during midline and endline, the results show an increase in the severe malaria cases by 35.3% (400) from midline (1,134) to endline (1,534). At baseline, a total of 17 facilities were visited and only 6 of those facilities were visited during endline. Out of the 40 HFs visited at endline, 13 were followed from midline and from the 13, as highlighted earlier, 6 were followed from baseline which were also available in all the survey rounds. From the 6 facilities which were followed from baseline to endline, a total of 535 severe malaria cases were recorded. In NSU districts, a total of 225 severe malaria cases were recorded during midline which increased to 649 at endline.

Figure 27: Severe malaria cases in children between 2 months to 6 years in demonstration districts



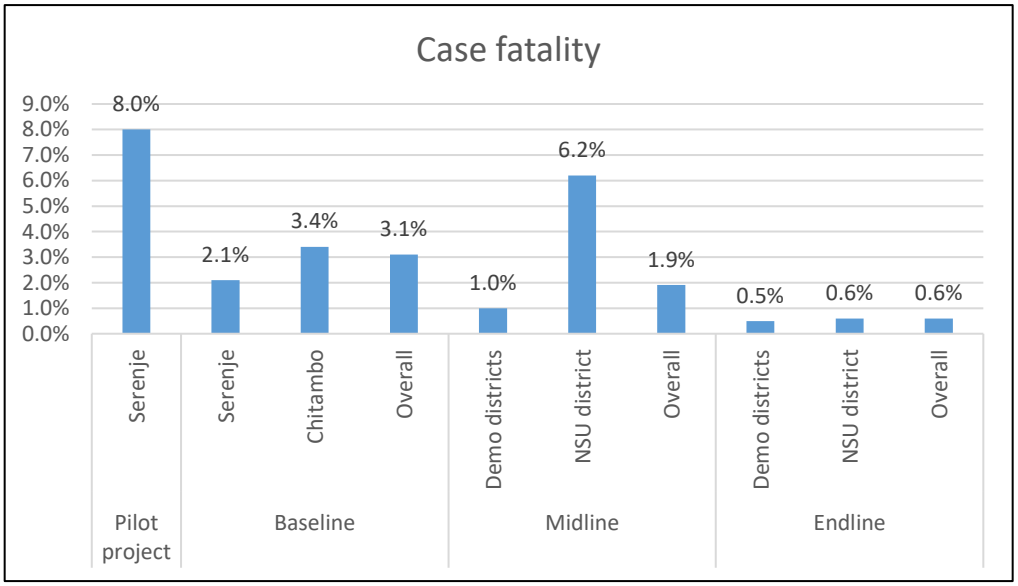
Malaria case fatality

One of the main objectives of the MAM@Scale project is to reduce deaths attributed to severe malaria. The endline survey collected data on the number of deaths among children under 5 years attributed to severe malaria over a 12-month period (September 2020 – August 2021). This was sought to determine the impact of the project (i.e., the number of lives saved among children aged 2 months to 6 years old) by reviewing the case fatality rate. During the 12-month period, a total of 4 cases of severe malaria related deaths were recorded in all districts. A total of 2 severe malaria cases deaths were reported by HFs in the NSU districts whilst 2 deaths were reported in the demonstration districts (none of these deaths were verified by the DHMTs who would usually undertake a mortality audit before confirming the cause of death). Figure 30 below shows a comparison of the case fatality rate between baseline and endline surveys. The results show that, case fatality reduced from baseline (3.1%) to endline (0.5%) in demonstration districts, which is a significant improvement. In Serenje district, case fatality rate reduced from 2.1% at baseline to 0% at endline. Case fatality rate in NSU districts improved significantly, it reduced from 6.2% at midline to 0.6% at endline.

The trends in the past three years have shown a decrease in mortality rates that correlates with the introduction of CHVs that are administering RAS and bicycle ambulances. It is likely that this is contributing to reducing the danger of children losing their lives especially in areas where health posts are far. All these

interventions have contributed to the reduction in reported malaria-related fatality rates in the intervention districts from 8% to 0.5%.

Figure 28:Reported Severe Malaria case fatality rates in surveyed facilities



4.3 Efficiency

This section will focus on adequacy of resources and application of the value for money principles in the decision-making processes.

4.3.1 Adequacy of resources

- ***Financial resources***

The financial resources for the project were adequate for the planned project activities. Resources were disbursed according to the set schedule and against specific milestones.

- ***Human Resources***

A total of six members of staff were employed on the project on a full-time basis while one was employed on a part-time basis. The members of staff that were employed on a full-time basis consisted of a Technical Co-ordinator, District Programme Co-ordinator, Project Support Officer two ETS Officers and an Operations Manager. The available human resources were adequate for the implementation and management of the project. This largely emanated from the responsiveness of the project to realised needs on the ground. When the project was scaled up to ten districts, this increased the workload on the already existing members of staff. It therefore, became necessary to employ another project officer and this was done without any challenges. Two part-time national consultants were also contracted to support the scale-up

to new districts. The field and other locally based staff were adequately supported by a Technical Quality Assurance Group (T-QAG) and Governance Quality Assurance Group (G-QAG).

- ***Equipment and vehicles***

The endline found that the available equipment (laptops, printers, and communication infrastructure (including Wi-Fi)) was adequate at the local office. The project had two vehicles that were available for project activities. Initially the project had two vehicles, but a third vehicle was procured in 2020 due to the expansion of project areas. The project vehicles were suitable for the terrain. All the equipment and vehicles were well maintained throughout the TTS2 and TTS3.

4.3.2 Value for money

The project's spending decisions were guided by value for money principles. In all the procurement, the underlining principle has been value for money with a balance of quality. The project subjected procurement of a certain threshold to three competitive quote systems to make sure that there was a basis for price and quality as prevailing in the market. However, there were a few times when procurements were done without calling for procurement meetings. The reasons are that members of the committee members would be sited in different locations with no opportunity to present samples of items for consideration. Sometimes specialized procurements were made of items which have limited suppliers such as RAS and bicycle ambulances in which case the need for three competitive quotes was waived. Other procurements related to activities were done at community level such as bulk food stuffs and in such setups, it is difficult to find many suppliers and associated supportive paper works is a challenge. In general, procedures were followed in most dealings of the project and where omissions exist explanations are there. Due to the disruption of COVID-19, most project activities were integrated and thereby significantly reducing costs and also maximizing on time.

Due to the volatility of the Zambian kwacha, the project experienced variability in actual income since the funding budget was in Canadian dollars. However, the finance team managed to work within the budget and ensured that specific resources were not being over or under-utilized. Additionally, the team would make projections that helped prepare for any changes in the value of the Kwacha.

4.4 Sustainability

This endline has established that there are project activities that are bound to continue beyond the life-span of the project. Similarly, the project has outcomes that are expected to last even after the conclusion of project activities. Some of these are listed and discussed below.

- *Revived and strengthened community structures:* The project revived community-based health structures and empowered them with skills and knowledge of diagnosing severe malaria and giving them pre-referral treatment. Despite facing challenges, the CHVs and ETS riders are committed to their work and exhibit attitudes that show that they are passionate about what they do and are not merely serving out of duty. They have the spirit of volunteerism and are expected to continue offering their services even beyond the life-span of the project.

- *Buy-in by the national government in the provision of RAS:* The Zambian government has institutionalized RAS and is now in the process of scaling up the invention throughout the country. The implication of this move is that RAS will continue to be available at community level in the project districts and beyond.
- *Addition of a RAS component into the iCCM:* The addition of a RAS component into the national (iCCM) training manual by the MOH means that all iCCM trainings delivered by government or development partners will include a RAS component.
- *Buy-in by stakeholders and other development partners:* Stakeholders at all levels were well engaged (district, provincial and national levels) and there is proof that ownership of the activities have been taken. It is encouraging to see the participation of DHMT and partner organisations in the MAM@Scale project activities including the baseline, midline and endline surveys and RAS verification exercises. The DHMT staff and facility staff attended and often led all project trainings and were fully oriented on running and sustaining the intervention. DHMT staff also supported the roll out of RAS and Inj AS trainings in other scale-up districts and participated in mentoring and coaching support visits to these districts, thereby sharing their knowledge and experience. In addition, all intervention districts nominated focal persons for the project, including ETS Focal persons in the four districts when ETS was implemented. The project partnered with PAMO who went on to supply 32 Bicycle Ambulances to Chama district in an effort to solve transport barriers at community level.

5 Conclusions and Recommendations

Conclusions

Conclusion 1: The project remained relevant throughout the different phases of implementation. The target of eliminating malaria has not yet been achieved in the country and the project continued to contribute to this national goal. There were no emerging or topical issues either at national or community level that warranted a re-focusing of the project or rendered it irrelevant. The major issue that emerged was the COVID-19 pandemic, but this did not warrant a re-focus of the project. However, a COVID-19 component was implemented to mitigate against negative impacts related to measures for curbing the spread of the virus and also create awareness considering the novelty of the disease.

Conclusion 2: The availability of at least one staff member trained on Inj AS at HF level has been affected by attrition of trained health staff from the project districts to other districts. Health staff are routinely rotated and this is the likely cause of the reduction in the percentage of trained staff especially in the demonstration districts that was noted at both the midline and endline. While this is a concern in the project districts, it is a positive move to the receiving districts and country as a whole. The presence of staff members who require training on Inj AS shows the need for staff who have been trained in severe malaria case management to cascade their training down to other members of the health facility team.

Conclusion 3: One of the project focal areas was the improvement of drug availability at HF level. This was achieved as most of the HFs had four of the key malaria drugs at endline and the drug situation had improved from the one that was obtaining at baseline. The difference between the demonstration districts

and NSU might be an indication of the impact of the project over time. RAS was mentioned to be available at HF level although the stocks were low. This was expected as the drug is distributed to CHVs and not commonly used at HF level.

Conclusion 4: The project helped to significantly improve knowledge about simple and severe malaria among CHVs. The knowledge has also been passed on to parents prompting them to seek assistance from CHVs early. Almost all RAS trained CHVs indicated that they were confident to administer RAS. This, together with the high severe malaria knowledge levels, is likely to have contributed to a reduction in malaria deaths in the project districts. Despite the positive changes, CHVs encountered challenges in offering their services. The main challenge, inadequate PPE, is of concern especially in the COVID-19 era.

Conclusion 5: The ETS has improved accessibility of HFs for malaria and maternity cases. The time taken to reach HFs has been reduced and this is critical especially in emergency situations. The fact that some ETS riders are also CHVs has further improved the effectiveness of the system as it eliminates the need for more than one person to be consulted. Although the riders face challenges in their line of duty, they have remained passionate about their work.

Conclusion 6: There have been significant positive changes in gender empowerment and social inclusion of disadvantaged women and their families. This is evidenced by having more female CHVs who report that they have a stronger voice in their communities, and they are generally respected in their communities. Women in general have also been empowered as they are now able to make health-related decisions at household level. At endline just under 90% of trained CHVs indicated that they had taken steps to reach the least-supported women in their community and include them in project activities.

Conclusion 7**:** COVID-19 had a negative impact on service provision at both health facility and community levels. The situation has however improved at both levels as compared to midline. Efforts made by the project in creating awareness at community level seem to have significantly improved knowledge levels about COVID-19. The CHVs have also led by example when it comes to being vaccinated, with over 50% vaccinated at the time of the endline survey.

Conclusion 8: All financial decisions were made based on the value for money principles. All resources were adequate to achieve the project objectives, and these were generally availed timeously. Overall, the project was well managed with all activities in the project's action plan delivered and most delivered on time.

Conclusion 9: There has been a reduction in child mortality from severe malaria in the project sites. Although the entire change cannot wholly be attributed to the project, it is apparent that the project has contributed in this regard. Recording of severe malaria cases at HF level however needs to be improved so that this vital variable is accurately captured.

Conclusion 10: It is anticipated that some of the project's activities will continue beyond the life-span of the project. The project was able to build capacity of stakeholders and community structures, ensure buy-in by

key stakeholders and establish partnerships that will help ensure that there is sustainability not only of some project activities but also of the outcomes.

Recommendations

- Government to promote joint programming, coordination, and implementation with other development agencies to sustain the management of severe malaria at community level.

- Recording of severe malaria cases is not done at health facility level and this is because it is not one of the indicators for the Ministry of Health. To address the gap in the project's model, there is a need for the ministry to consider the incorporation of severe malaria in the DHIS2. The MAM@Scale team has been working closely with other development partners to progress this agenda. Various severe malaria indicators are currently under consideration by the MOH for inclusion in the HMIS.

- It is important for the government to continue strengthening its institutional partnership with and support for CHVs while utilising their existing community-based infrastructures and services to enhance joint activities at community level to address severe malaria.

- Rural health programs should put CHVs at the centre of their planning and orientation. The government should place emphasis on the work done by CHVs and acknowledge their efforts, for example through the provision of ongoing supportive supervision provided by the local health facility, adequate 'tools of the trade' including safety equipment (e.g., torches, raincoats, gum boots, PPE) a form of identification (e.g., identification badge or t-shirt) and a means of transport (e.g., bicycle) and continuous training.

- For future monitoring and evaluation purposes, the project should invest in a database management system for the community monitoring system data. CHVs could be provided with data collection gadgets to ensure quality of data and promote real-time reporting.

- The contribution to the project outcomes of the ETS cannot be overlooked. Therefore, it is worth replicating this in other districts so as to alleviate the challenges posed by distances to HFs and the need to timeously get children to these facilities.

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7 Annexes

7.1 Annex 2: Data collection tools

Health Facility tool

CHVS and ETS Riders tool

Focus Group Discussion Guide for Parents/Primary Caregivers

Focus Group Discussion Guide for CHVs

Key Informant Interview Guide for Stakeholders

Key Informant Interview Guide for Project Staff

Attached separately