



## **REPORT OF A RECTAL ARTESUNATE VERIFICATION EXERCISE**

### **1. BACKGROUND**

Between February 2019 and October 2020, Community Health Volunteers (CHVs) trained by the MAMaZ Against Malaria at Scale (MAM@Scale) project identified 3,916 cases of severe malaria among children aged six months to six years old in Serenje and Chitambo districts. All these children were administered artesunate rectal capsules (ARC), previously known as rectal artesunate suppositories (RAS) and were referred to the health facility for further treatment.

In December 2020 a RAS verification exercise was undertaken to check whether the children who had been administered RAS as a pre-referral intervention at community level went on to be treated at the health facility for severe malaria, and, if so, what treatment they were given. The overarching aim of the exercise was to assess whether both CHVs and health facility staff were following the correct severe malaria protocol.

A similar RAS verification exercise had been undertaken in October 2019 and, prior to that, by the MAMaZ Against Malaria pilot project in Serenje in 2017.

The remainder of this report is organised as follows:

- Section two describes the verification exercise methodology
- Section three provides a summary of the key findings of the verification exercise
- Section four discusses the findings
- Section five summarizes implications for policy and programmes

The raw data gathered during the verification exercise can be found in Annex 1. A gender breakdown of the RAS beneficiaries can be found in Annex 2.

### **2. METHODOLOGY**

The RAS verification exercise was undertaken in December 2020. In Serenje, MAM@Scale's Project Support Officer Likando Mundia worked with Serenje district's Clinical Care Officer, Mrs Lungu. In Chitambo, MAM@Scale's District Programme Officer, Ruth

Nyirenda worked with Chitambo district's Clinical Care Officer Mr Chibamba and the District Health Information Officer, Josephine Mwezani Kabezya.

Ten (26%) of the project's 39 intervention health facilities in Chitambo and Serenje districts participated in the exercise. Health facilities that were handling high numbers of suspected severe malaria cases were selected for participation. These were:

- Five health facilities in Chitambo district (Gibson; Nakatambo; Mapepala; Mpelembe; Katikulula)
- Five health facilities in Serenje district (Mulilima; Kabundi; Kaseba; Nchimishi; Kamena)

All but one of these health facilities (Kamena Rural Health Centre) was involved in the October 2019 RAS verification exercise.

Ten randomly selected cases of suspected severe malaria per health facility were examined. A total sample of 100 cases was reviewed during the exercise.

The verification team worked with health facility staff to establish the following:

- The name and age of patients with suspected severe malaria
- Whether the patient was given RAS at community level
- Time taken to get to the health facility after RAS administration
- Rapid Diagnostic Test (RDT) result
- Whether the RDT was undertaken in the community, at the health facility, or both
- Danger signs recognised by the CHV or the carer
- Whether the patient was treated at the health facility for severe malaria
- What malaria/severe malaria drugs were administered at the health facility
- Reasons why the RAS beneficiary was not treated with Inj AS at the health facility
- Whether the patient survived

Data from each health facility was compiled by the MAM@Scale team and analysed in conjunction with one of the project's Senior Technical Advisers. Patient records were anonymised using a coding system (see Appendix 1).

Since this was an internal review there is risk of bias in the data collection and interpretation. However, the fact that a mixed team comprising project staff and DHMT members undertook the verification exercise helped, to some extent, guard against any inherent bias.

### **3. FINDINGS**

The key findings of the RAS verification exercise were as follows:

- 55% of the 100 RAS beneficiaries assessed during the verification exercise were male and 45% were female (Annex 2).
- All RAS recipients included in the study received follow-on treatment at the health facility between February and November 2020.
- 11% of the RAS beneficiaries were aged one year or less; 89% were over one year old.
- 97% of CHVs correctly reported fever plus one or more other severe malaria danger signs. 3% of CHVs reported single danger signs (i.e. fever, or convulsions, or body hotness).

- 95% (n=95 of 100) of children administered RAS by trained CHVs were diagnosed with severe malaria at the health facility; 3% (n=3) of RAS beneficiaries were diagnosed with simple malaria at the health facility; and the other two cases (both with negative RDTs) were not treated for malaria at the health facility.
- 37% (n=35 of 95) of RAS beneficiaries who were diagnosed with severe malaria at the health facility were not given the first-line treatment, Injectable Artesunate (Inj AS) due to drug stock-outs or 'low stocks of Inj AS' (as reported by health facility staff). These patients were treated with second-line drugs (e.g. Quinine IV) or other drugs (e.g. Fansidar or Coartem).
- 100% of RAS beneficiaries were given a rapid diagnostic test for malaria. 64% of the RDTs were done at community level; 33% at the health facility; and in 3% of cases RDTs were done at both community and health facility levels.
- 97% of RDTs were positive. Of the other three cases, one was treated for simple malaria.
- 76% of RAS beneficiaries took three hours or less to reach the health facility; 21% took between three and six hours; 1% took 11 hours; and for 2% of cases travel times were not recorded.
- 99 out of 100 children included in the verification exercise survived malaria.

The December 2020 RAS verification results are compared with the October 2019 verification exercise in Appendix 3.

#### **4. DISCUSSION**

The RAS verification exercise examined 2.6% of suspected severe malaria cases seen and reported by CHVs in Chitambo and Serenje between February 2019 and November 2020.

The fact that 95% (95 of 100) RAS beneficiaries had their severe malaria diagnosis confirmed by the health facility is very positive. This shows that CHVs trained by MAM@Scale are closely following the severe malaria protocol that they were taught during their training.

Only 3% (n=3) RAS beneficiaries went on to receive a simple malaria diagnosis at the health facility and 2% (n=2) did not receive a malaria diagnosis on arrival at the health facility. One of the early concerns of government (during the earlier pilot project) was whether CHVs are over-prescribing RAS and administering the pre-referral intervention in situations where there is no evidence of severe malaria. This concern is not borne out by these results.

Under-diagnosing of severe malaria cases can – in theory – also be an issue. To guard against that, all health providers in Chitambo and Serenje were issued a directive by their respective DHMT in September 2019 which advised that all children given RAS by CHVs should be treated with Inj AS on arrival at the health facility. Malaria symptoms occur on a spectrum and hence diagnosis is not always clear-cut. RAS beneficiaries may have improved by the time they reach the health facility, pushing their symptoms further down the spectrum towards 'uncomplicated malaria'. However, if treated for simple malaria, some of these children can experience a recrudescence of malaria, placing them at risk of malaria-related complications or even death.

The fact that 37% of the RAS beneficiaries with confirmed severe malaria did not receive Inj AS due to stock outs of this drug (or concerns about low stocks) is a concern. This percentage is significantly higher than the October 2019 RAS exercise which found that 10% of RAS beneficiaries did not receive Inj AS. The lack of supply can be attributed to a large

extent to the impact of COVID-19. During the pandemic some Inj AS manufacturers have switched their production lines to other drugs, leading to supply shortages. General logistical challenges during COVID-19 have also had an effect on stock levels. All these children were treated with other severe malaria or malaria drugs (e.g. IV Quinine, Coartem or Fansidar).

All children included in the RAS verification exercise were tested with an RDT for malaria. This is very positive. However, the percentage of children tested for severe malaria at community level has fallen slightly since the October 2019 RAS verification exercise (from 75% to 64%). Because both verification exercises used a small sample size (i.e. 100 cases of severe malaria) it is difficult to draw firm conclusions about trends in RDT use over time. The change in RDT testing could be a consequence of several factors, or a combination of these, including changes in health-seeking behaviour or challenges with RDT supplies.

The RAS verification exercise also gathered data on the time it took for a child to reach the health facility following administration of RAS. By far the majority of children (76%) reached the health facility within three hours. Only one case (1%) took more than 10 hours to reach the health facility. This case occurred in a community with a bicycle ambulance that was not working at the time of the emergency. It is worth noting that in the October 2019 RAS verification exercise 9% of cases took over 12 hours to reach the health facility.

## **5. IMPLICATIONS FOR POLICY AND PROGRAMMES**

The RAS verification exercise undertaken by MAM@Scale and its district partners in December 2020 implies the following for policy and programmes:

- The RAS verification exercise confirmed that CHVs' training has been effective and that they are using RAS responsibly.
- Stock outs of Inj AS affected 37% of the children diagnosed with severe malaria in this exercise – much higher than in October 2019. Although this is partly due to the COVID-19 pandemic, there are wider concerns about intermittent stock-outs of this drug. As RAS is scaled up across the country, it will be vital for districts to have adequate supplies of Inj AS (or second-line drugs for severe malaria) and to monitor stocks very closely so that demand for the drug does not outstrip supply.
- The fact that 33% of RDTs were undertaken at the health facility suggests that these tests are not always readily available at community level. Ensuring a reliable supply of RDTs for use by trained CHVs at community is vital in any RAS programme.
- Only one child was very delayed in reaching the health facility following their suspected severe malaria diagnosis by CHVs. They lived in a community that had ETS, but the bicycle ambulance was not working at the time of the referral. Functional emergency transport systems make a major contribution to timely referrals in the MAM@Scale support districts. A real-time reporting system (from riders to their community, and from community to district) for bicycle ambulances that fall out of service will help to mobilise the resources and support required to ensure that these vehicles are roadworthy at all times.

## Appendix 1: Data from Health Facilities Involved in RAS Verification Exercise

District: CHITAMBO											
Name of Health Facility: GIBSON RHC											
Code and age of patient	Sex	Date of arrival at HF	RAS given in community (Y/N)	RDT Result (positive = P negative = N)	Where RDT done (community, health facility, both)	Severe malaria danger signs recognized by CHV or child's carers	Time to get to the HF after child given RAS (in minutes)	Child treated for severe malaria at HF (Y/N)	Name all severe malaria/ malaria drugs given at HF	Reason RAS beneficiary not given Inj AS	Child Survived (Y/N)
Case 1 1 yr	F	27/03/20	Y	P	Community	Fever with vomiting and convulsions	60 MIN	Y	Quinine IV,Coartem and Panadol	O/S	Y
Case 2 2 yrs 8 months	M	23/04/20	Y	P	Community	Fever with convulsions	60 MIN	Y	Quinine IV,Coartem and Panadol	O/S	Y
Case 3 2 yrs 1 month	F	29/09/20	Y	P	Community	Fever with convulsions	160 MIN	Y	Quinine IV,Coartem and Panadol	O/S	Y
Case 4 9 months	M	03/10/20	Y	P	Community	Fever with convulsions & vomiting everything	60 MIN	Y	Quinine IV,Coartem and Panadol	O/S	Y
Case 5 1 yr 5 months	F	12/10/20	Y	P	Community	Fever with Convulsions and vomiting everything	150 MIN	Y	Quinine IV,Coartem and Panadol	O/S	Y
Case 6 3 years 5 months	M	30/11/20	Y	P	Community	Fever with convulsions	60 MIN	Y	Quinine IV,Coartem and Panadol	O/S	Y
Case 7 6 months	M	30/10/20	Y	P	Community	Fever with Convulsions	130 MIN	Y	Quinine IV,Coartem and Panadol	O/S	Y
Case 8 2 yrs 3 months	M	02/12/20	Y	P	Community	Fever with Convulsions and refusing to breast feed	120 MIN	Y	Quinine IV,Coartem and Panadol	O/S	Y
Case 9 11 months	F	07/12/20	Y	P	Community	Fever with convulsions and refusing to breast feed	60 MIN	Y	Quinine IV,Coartem and Panadol	O/S	Y
Case 10 2 yrs	F	07/12/20	Y	P	Community	Fever with Convulsions	55 MIN	Y	Quinine IV,Coartem and Panadol	O/S	Y

**District: CHITAMBO**

**Name of Health Facility: KATIKULULA RHC**

Code and age of patient	Sex	Date of arrival at HF	RAS given in community (Y/N)	RDT Result (positive = P negative = N)	Where RDT done (community, health facility, both)	Severe malaria danger signs recognized by CHV or child's carers	Time to get to the HF after child given RAS (in minutes)	Child treated for severe malaria at HF (Y/N)	Name all severe malaria/ malaria drugs given at HF	Reason RAS beneficiary not given Inj AS	Child Survived (Y/N)
Case 11 1 yr 8 months	F	14/04/20	Y	P	Community	Fever with Convulsions	190 MIN	Y	Inj AS, Panadol and ACTs	N/A	Y
Case 12 1 yr 6 months	F	17/04/20	Y	P	HF	Fever with convulsions	50 MIN	N	Panadol and ACTs	Treated for simple malaria	Y
Case 13 4 yrs	M	18/04/20	Y	P	Community	Fever with convulsions	70 MIN	Y	Inj AS, Panadol and ACTs	N/A	Y
Case 14 5 yrs	M	04/05/20	Y	P	Community	Fever with convulsions	180 MIN	Y	Inj AS, Panadol and ACTs	N/A	Y
Case 15 1 yr 9 months	F	18/05/20	Y	P	Community	Fever with Convulsions and sneezing	180 MIN	N	Panadol and ACTs	Treated for simple malaria	Y
Case 16 3 yrs 7 months	M	18/05/20	Y	P	Community	Fever with vomiting and convulsions	60 MIN	Y	Inj AS, Panadol and ACTs	N/A	Y
Case 17 3 yrs	F	25/05/20	Y	P	Community	Fever with Convulsions plus refusing to eat	80 MIN	Y	Inj AS, Panadol and ACTs	N/A	Case referred to Chitambo Hospital for further managt.
Case 18 2 yrs 5 months	F	31/05/20	Y	P	Community	Fever with Convulsions	60 MIN	Y	Inj AS, Panadol and ACTs	N/A	Y
Case 19 4 yrs 5 months	M	02/06/20	Y	P	Community	Fever with convulsions and vomiting everything	180 MIN	Y	Inj AS, Panadol and ACTs	N/A	Y
Case 20 1 yr 9 months	M	08/06/20	Y	P	Community	Fever with Convulsions	180 MIN	Y	Inj AS, Panadol and ACTs	N/A	Y

**District: CHITAMBO**

**Name of Health Facility: MPELEMBE ZONAL RHC**

Code and age of patient	Sex	Date of arrival at HF	RAS given in community (Y/N)	RDT Result (positive = P negative = N)	Where RDT done (community, health facility, both)	Severe malaria danger signs recognized by CHV or child's carers	Time to get to the HF after child given RAS (in minutes)	Child treated for severe malaria at HF (Y/N)	Name all severe malaria/ malaria drugs given at HF	Reason RAS beneficiary not given Inj AS	Child Survived (Y/N)
Case 21 2 yrs 6 months	M	05/05/20	Y	P	Community	Fever with Convulsions	30 MIN	Y	Inj AS, Panadol and ACTs	N/A	Y
Case 22 3 yrs	M	07/05/20	Y	P	HF	Fever with convulsions	90 MIN	Y	Inj AS, Panadol and ACTs	N/A	Y
Case 23 4 yrs	M	07/05/20	Y	P	Community	Fever with convulsions	120 MIN	Y	Inj AS, Panadol and ACTs	N/A	Y
Case 24 2 yrs	M	12/05/20	Y	P	HF	Fever with convulsions	120 MIN	Y	Inj AS, Panadol and ACTs	N/A	Y
Case 25 3 yrs	M	25/05/20	Y	P	Community	Fever with Convulsions	60 MIN	Y	Inj AS, Panadol and ACTs	N/A	Y
Case 26 3 yrs	M	29/05/20	Y	P	HF	Fever with vomiting and convulsions	120 MIN	Y	Inj AS, Panadol and ACTs	N/A	Y
Case 27 3 yrs 4 months	M	27/08/20	Y	P	HF	Fever with Convulsions	120 MIN	Y	Inj AS, Panadol and ACTs	N/A	Y
Case 28 2 yrs	F	17/09/20	Y	P	HF	Fever with Convulsions	60 MIN	Y	Inj AS, Panadol and ACTs	N/A	Y
Case 29 2 yrs	M	26/10/20	Y	P	HF	Fever with convulsions	90 MIN	Y	Inj AS, Panadol and ACTs	N/A	Y
Case 30 2 yrs 6 months	M	02/11/20	Y	P	Community	Fever with Convulsions and refusing to eat	60 MIN	Y	Inj AS, Panadol and ACTs	N/A	Y

**District: CHITAMBO****Name of Health Facility: MAPEPALA RHC**

Code and age of patient	Sex	Date of arrival at HF	RAS given in community (Y/N)	RDT Result (positive = P negative = N)	Where RDT done (community, health facility, both)	Severe malaria danger signs recognized by CHV or child's carers	Time to get to the HF after child given RAS (in minutes)	Child treated for severe malaria at HF (Y/N)	Name all severe malaria/ malaria drugs given at HF	Reason RAS beneficiary not given Inj AS	Child Survived (Y/N)
Case 31 4yrs	M	09/10/20	Y	P	HF	Fever with Convulsions	90 MIN	Y	Inj AS, Panadol and ACTs	N/A	Y
Case 32 1yr	F	28/10/20	Y	P	HF	Fever with convulsions	10 MIN	Y	Inj AS Panadol and ACTs	N/A	Y
Case 33 3yrs	F	9/11/20	Y	P	HF	Fever with convulsions	20 MIN	Y	Quinine IV, Panadol, and ACTs	Inj AS O/S	Y
Case 34 2 yrs	M	10/11/20	Y	P	HF	Fever with convulsions	30 MIN	Y	Quinine IV Panadol and ACTs	Inj AS O/S	Y
Case 35 2 yrs	M	20/11/20	Y	P	HF	Fever with Convulsions and vomiting	10 MIN	Y	Quinine IV, Panadol, and ACTs	Inj AS O/S	Y
Case 36 8 months	F	27/11/20	Y	P	HF	Fever with convulsions	90 MIN	Y	Inj AS, Panadol and ACTs	N/A	Y
Case 37 2 yrs 9 months	M	27/11/20	Y	P	HF	Fever with Convulsions	60 MIN	Y	Inj AS, Panadol and ACTs	N/A	Y
Case 38 5 yrs	M	01/12/20	Y	P	HF	Fever with Convulsions	40 MIN	Y	Quinine IV, Panadol, and ACTs	Inj AS O/S	Y
Case 39 4 yrs	F	07/12/20	Y	P	HF	Fever with convulsions	50 MIN	Y	Quinine IV Panadol and ACTs	Inj AS O/S	Y
Case 40 2 yrs 10 months	F	08/12/20	Y	P	HF	Fever with Convulsions	10 MIN	Y	Quinine IV, Panadol, and ACTs	Inj AS O/S	Y



District: CHITAMBO											
Name of Health Facility: NAKATAMBO RHC											
Code and age of patient	Sex	Date of arrival at HF	RAS given in community (Y/N)	RDT Result (positive = P negative = N)	Where RDT done (community, health facility, both)	Severe malaria danger signs recognized by CHV or child's carers	Time to get to the HF after child given RAS (in minutes)	Child treated for severe malaria at HF (Y/N)	Name all severe malaria/ malaria drugs given at HF	Reason RAS beneficiary not given Inj AS	Child Survived (Y/N)
Case 41 5 yrs	M	21/01/20	Y	P	Community	Fever with Convulsions and abdominal pain	120 MIN	Y	Panadol and ACTs	Inj AS O/S	Y
Case 42 6 yrs	F	22/01/20	Y	P	Community	Fever with vomiting	120 MIN	Y	Panadol and ACTs	Inj AS O/S	Y
Case 43 5 yrs	M	31/01/20	Y	P	Community	Fever with vomiting	160 MIN	N	Panadol and ACTs	Diagnosed with simple malaria	Y
Case 44 2 yrs	M	31/01/20	Y	P	Community	Fever with convulsions	90 MIN	Y	Inj AS, Panadol and ACTs	N/A	Y
Case 45 3 yrs	M	06/03/20	Y	P	Community	Fever with Convulsions	60 MIN	Y	Panadol and ACTs	Inj AS O/S	Y
Case 46 2 yrs 5 months	F	15/06/20	Y	P	Community	Fever with vomiting and convulsions	240 MIN	Y	Inj AS, Panadol and ACTs	N/A	Y
Case 47 3 yrs 2 months	M	23/06/20	Y	P	Community	Fever with Convulsions	240 MIN	Y	Inj AS, Panadol and ACTs	N/A	Y
Case 48 1 yr 9 months	F	06/08/20	Y	P	Community	Fever with Convulsions	240 MIN	Y	Inj AS, Panadol and ACTs	N/A	Y
Case 49 1yr	F	14/06/20	Y	P	Community	Fever with convulsions and vomiting everything	240 MIN	Y	Inj AS, Panadol and ACTs	N/A	Y
Case 50 2 yrs	M	05/10/20	Y	P	Community	Fever with Convulsions	120 MIN	Y	Inj AS, Panadol and ACTs	N/A	Y

District: SERENJE

Name of Health Facility: MULILIMA RHC

Patient Code and Age	Sex	Date of arrival at HF	RAS given in community (Y/N)	RDT Result (positive = P negative = N)	Where RDT done (HF, Community or Both)	Severe malaria danger signs recognised by CHV or child's carers	Time to get to the HF after child given RAS (in minutes)	Child treated for severe malaria at HF (Y/N)	Name all severe malaria/ malaria drugs given at HF	Reason RAS beneficiary not given Inj AS	Child Survived (Y/N)
Case 51 1 yr 9 months	M	12/10/20	Y	P	Community Both	Convulsion fever	120 MIN	Y	Inj AS and Panadol	N/A	Y
Case 52 3 yrs 7 months	M	28/10/20	Y	P	Both	Lethargy high fever	45 MIN	Y	Inj AS and Panadol	N/A	Y
Case 53 3 yrs 1 month	F	29/10/20	Y	P	Both	Fever Convulsion	120 MIN	Y	ACTs, Inj AS and Panadol	N/A	Y
Case 54 3 yrs 4 months	F	31/10/20	Y	P	Community	Vomiting fever	90 MIN	Y	ACTs, Inj AS and Panadol	N/A	Y
Case 55 1 yr 1 month	F	02/11/20	Y	P	Community	Convulsion fever	60 MIN	Y	ACTs, Inj AS and Panadol	N/A	Y
Case 56 1 yr 4 months	F	03/11/20	Y	P	Community	Convulsion fever	90 MIN	Y	ACTs, Inj AS and Panadol	N/A	Y
Case 57 1 yr 8 months	F	10/11/20	Y	P	Community	Convulsion fever	110 MIN	Y	ACTs, Inj AS Panadol	N/A	Y
Case 58 2 yrs 11 months	F	25/11/20	Y	P	Community	Lethargy Vomiting	60 MIN	Y	ACTs, Inj AS and Panadol	N/A	Y
Case 59 2 yrs 5 months	M	25/11/20	Y	P	Community	Vomiting fever	50 MIN	Y	Acts, Inj AS and Panadol	N/A	Y
Case 60 3 yrs 4 months	M	30/11/20	Y	P	Community	Convulsion fevers	80 MIN	Y	ACTs, Inj AS and Panadol	N/A	Y

District: SERENJE											
Name of Health Facility: KAMENA RHP											
Patient code and age	Sex	Date of arrival at HF	RAS given in community (Y/N)	RDT Result (positive = P negative = N)	Where RDT done	Severe malaria danger signs recognised by CHV or child's carers	Time to get to the HF after child given RAS (in minutes)	Child treated for severe malaria at HF (Y/N)	Name all severe malaria/ malaria drugs given at HF	Reason RAS beneficiary not given Inj AS	Child Survived (Y/N)
Case 61 1 yr 10 months	M	23/11/20	Y	P	Community	Fever convulsion	120 MIN	Y	Inj AS, ACTs and panadol		Y
Case 62 3 yrs	F	16/11/20	Y	P	Community	Fever convulsion	210 MIN	Y	Coartem and Panadol	Low stock of Inj AS	Y
Case 63 3 yrs	F	05/11/20	Y	P	Community	Fever convulsion	No data	Y	Inj AS, ACTs and panadol		Y
Case 64 4 yrs	M	05/11/20	Y	P	Community	Fever vomiting	No data	Y	Inj AS, ACTs and panadol		Y
Case 65 9 months	F	08/10/20	Y	P	Community	Fever, fitting	300 MIN	Y	Coartem and Panadol	Low stock of Inj AS	Y
Case 66 3 yrs	M	23/11/20	Y	P	Community	Fever convulsion	120 MIN	Y	Inj AS, ACTs and panadol		Y
Case 67 3 yrs 6 months	F	16/05/20	Y	P	Community	Convulsion	120 MIN	Y	Inj AS, ACTs and panadol		Y
Case 68 2 yrs	M	06/06/20	Y	P	Community	Fever	300 MIN	Y	Inj AS, ACTs and panadol		Y
Case 69 4.5 yrs	M	08/06/20	Y	P	Community	Fever	25 MIN	Y	Inj AS, ACTs and panadol		Y
Case 70 1 yr 1 month	F	13/05/20	Y	P	Community	Fever diarrhoea	25 MIN	Y	Inj AS, ACTs and panadol		Y

District: SERENJE											
Name of Health Facility: KASEBA RHC											
Patient code and age	Sex	Date of arrival at HF	RAS given in community (Y/N)	RDT Result (positive = P negative = N)	Where RDT done	Severe malaria danger signs recognised by CHV or child's carers	Time to get to the HF after child given RAS (in minutes)	Child treated for severe malaria at HF (Y/N)	Name all severe malaria/ malaria drugs given at HF	Reason RAS beneficiary not given Inj AS	Child Survived (Y/N)
Case 71 6 yrs	F	24/09/20	Y	P	Community	Fever refusal to eat	72 MIN	Y	Inj AS, ACTs and panadol	N/A	Y
Case 72 5 yrs	M	13/10/20	Y	P	Community	Fever	64 MIN	Y	Inj AS, ACTs and panadol	N/A	Y
Case 73 8 months	M	14/07/20	Y	P	Community	Fever, body hotness, refusal to eat	135 MIN	Y	Quinine IV, Coartem and panadol	Inj AS O/S	Y
Case 74 5 yrs	M	11/07/20	Y	P	Community	Convulsion refusal to feed, fever	45 MIN	Y	Quinine IV, Coartem and panadol	Inj AS O/S	Y
Case 75 2 yrs	F	24/06/20	Y	N	Community	Body hotness, refusal to eat, fever	205 MIN	Y	Quinine IV Coartem and panadol	Inj AS O/S	Y
Case 76 4 yrs	F	15/06/20	Y	P	Community	Body hotness refusal to feed,	230 MIN	Y	Quinine IV Coartem and panadol	Inj AS O/S	Y
Case 77 7 months	M	15/06/20	Y	P	Community	Cough, fever refusal to feed	220 MIN	Y	Quinine IV Coartem and panadol	Inj AS O/S	Y
Case 78 2 yrs	M	05/07/20	Y	P	Community	Convulsion fever	67 MIN	Y	Quinine IV, Coartem and panadol	Inj AS O/S	N
Case 79 3 yrs	F	19/05/20	Y	P	Community	Convulsion fever	90 MIN	Y	Fansidar and panadol	Inj AS O/S	Y
Case 80 2 yrs 11 months	M	11/05/20	Y	P	Community	Fever refusal to feed	89 MIN	Y	Fansidar and panadol	Inj AS O/S	Y

District: SERENJE											
Name of Health Facility: KABUNDI RHC											
Patient code and age	Sex	Date of arrival at HF	RAS given in community (Y/N)	RDT Result (positive = P negative = N)	Where RDT done	Severe malaria danger signs recognised by CHV or child's carers	Time to get to the HF after child given RAS (in minutes)	Child treated for severe malaria at HF (Y/N)	Name all severe malaria/ malaria drugs given at HF	Reason RAS beneficiary not given Inj AS	Child Survived (Y/N)
Case 81 2 yrs	F	12/04/20	Y	P	Community	Fever convulsion	50 MIN	Y	Inj AS, ACTs and panadol	-	Y
Case 82 2 yrs 2 months	M	25/04/20	Y	P	Community	Fever, diarrhoea convulsion	60 MIN	Y	Inj AS, ACTs and panadol	-	Y
Case 83 1 yr 7 months	F	03/03/20	Y	P	HF	Convulsion and fever	240 MIN	Y	Inj AS, ACTS and panadol	-	Y
Case 84 5 yrs	F	10/04/20	Y	P	Community	Convulsion fever	270 MIN	Y	Inj AS, ACTs and panadol	-	Y
Case 85 1 yr	F	03/11/20	Y	P	HF	Fever, diarrhoea, vomit	360 MIN	Y	Inj AS, ACTs and panadol	-	Y
Case 86 1 yr 2 months	M	12/05/20	Y	P	HF	Convulsion	90 MIN	Y	Inj AS, ACTs and panadol	-	Y
Case 87 3 yrs	M	03/06/20	Y	P	HF	Fever convulsion	45 MIN	Y	Inj AS, ACTs and panadol	-	Y
Case 88 2 yrs 3 months	F	14/02/20	Y	P	HF	Convulsion fever	60 MIN	Y	Inj AS, ACTs and panadol	-	Y
Case 89 1 yr 9 months	M	15/02/20	Y	P	Community	Convulsion	60 MIN	Y	Inj AS, ACTs and panadol	-	Y
Case 90 1 yr 10 months	M	26/05/20	Y	P	HF	Convulsion fever	660 MIN	Y	Inj AS, ACTs and panadol	-	Y

Note: With case 90, the community has a bicycle ambulance, but it wasn't working at the time of the referral. This referral took 11 hours.

District: SERENJE											
Name of Health Facility: NCHIMISHI RHC											
Case and age of patient	Sex	Date of arrival at HF	RAS given in community (Y/N)	RDT Result (positive = P negative = N)	Where RDT done	Severe malaria danger signs recognised by CHV or child's carers	Time to get to the HF after child given RAS (in minutes)	Child treated for severe malaria at HF (Y/N)	Name all severe malaria/ malaria drugs given at HF	Reason RAS beneficiary not given Inj AS	Child Survived (Y/N)
Case 91 1 yr 11 months	M	06/07/20	Y	P	HF	Fever convulsion	130 MIN	Y	Quinine injectable, Coartem and Panadol	No Inj AS available	Y
Case 92 3 yrs	M	15/06/20	Y	P	HF	Fever vomiting	60 MIN	Y	Quinine injectable, Coartem and Panadol	No Inj AS available	Y
Case 93 1 yr 4 month	F	04/06/20	Y	P	HF	Fever vomiting	180 MIN	Y	Quinine injectable, Coartem and Panadol	No Inj AS available	Y
Case 94 4 yrs	M	06/04/20	Y	P	HF	Fever vomiting	1080 MIN	Y	Quinine injectable, Coartem and Panadol	NA	Y
Case 95 5 yrs 4 months	M	28/08/20	Y	N	HF	Fever convulsion	360 MIN	N	NA	RDT = N	Y
Case 96 1 yr 11 months	F	26/05/20	Y	P	HF	Refusal to eat, fever, vomiting	130 MIN	Y	Inj AS, ACTs and Panadol	NA	Y
Case 97 2 yrs 9 months	M	05/10/20	Y	P	HF	Fever, vomiting	90 MIN	Y	Quinine injectable, Coartem and Panadol	No Inj AS available	Y
Case 98 3 yrs	F	22/06/20	Y	P	HF	Fever vomiting	90 MIN	Y	Quinine injectable, Coartem and Panadol	No Inj AS available	Y
Case 99 2 yrs 7 months	F	22/06/20	Y	P	HF	Fever refusal to eat	120 MIN	Y	Inj AS, ACTs and Panadol	NA	Y
Case 100 2 yrs 4 months	F	28/05/20	Y	N	HF	Fever vomiting	130 MIN	N	NA	RDT = N	Y

Note: Case 94 came from a very remote health facility without an emergency transport system. This referral took 18 hours.

## Appendix 2: Gender Breakdown of RAS Beneficiaries

Facility	Male	Female
Gibson	5	5
Katikulula	5	5
Mapepala	5	5
Mpelembe	9	1
Nakatambo	6	4
Kabundi	5	5
Kaseba	6	4
Mulilima	4	6
Nchimishi	5	5
Kamena	5	5
<b>Total</b>	<b>55</b>	<b>45</b>

### Appendix 3: Comparison of RAS Verification Study Findings

Indicator	June 2018 MAM Pilot Project	Oct 2019 MAM@Scale	Dec 2020 MAM@Scale
No. HFs in study	8	10	10
No. RAS beneficiaries included in study	27	100	100
% CHVS correctly reporting more than one severe malaria danger sign	100%	100%	97%
% RAS beneficiaries diagnosed with severe malaria by HF staff	70%*	83%	95%
% of RAS beneficiaries diagnosed with severe malaria at the HF given Inj AS	Not measured	90%	63%**
% RAS beneficiaries given RDT	100%	100%	100%
% RAS beneficiaries with positive RDT	96%	95%	97%
% RDTs done at community level	Not measured	75%	64%
% RDTs done at both HF and community level	Not measured	0%	3%
% RAS beneficiaries who delayed for more than 12 hours before arriving at the HF	Not measured	9%	0%
% RAS beneficiaries who survived severe malaria	Not measured	99%	99%

\* *Serenje DHMT felt that all cases that were not treated as severe malaria cases at the HF were wrongly diagnosed (i.e. should have been treated as SM cases).*

\*\* *This result likely shows the effect of health systems challenges faced during the COVID-19 pandemic on the effective operation of the severe malaria programme.*