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Improving Access to Emergency Health Facilities in Rural Areas: Project AFCAP/GEN/060/A

Progress Report 3

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25 February 2013

developing technologies
engineering poverty relief...

This project was funded by the Africa Community Access Programme (AFCAP) which promotes safe and sustainable access to markets, healthcare, education, employment and social and political networks for rural communities in Africa.

Launched in June 2008 and managed by Crown Agents, the five year-long, UK government (DFID) funded project, supports research and knowledge sharing between participating countries to enhance the uptake of low cost, proven solutions for rural access that maximise the use of local resources.

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Executive Summary

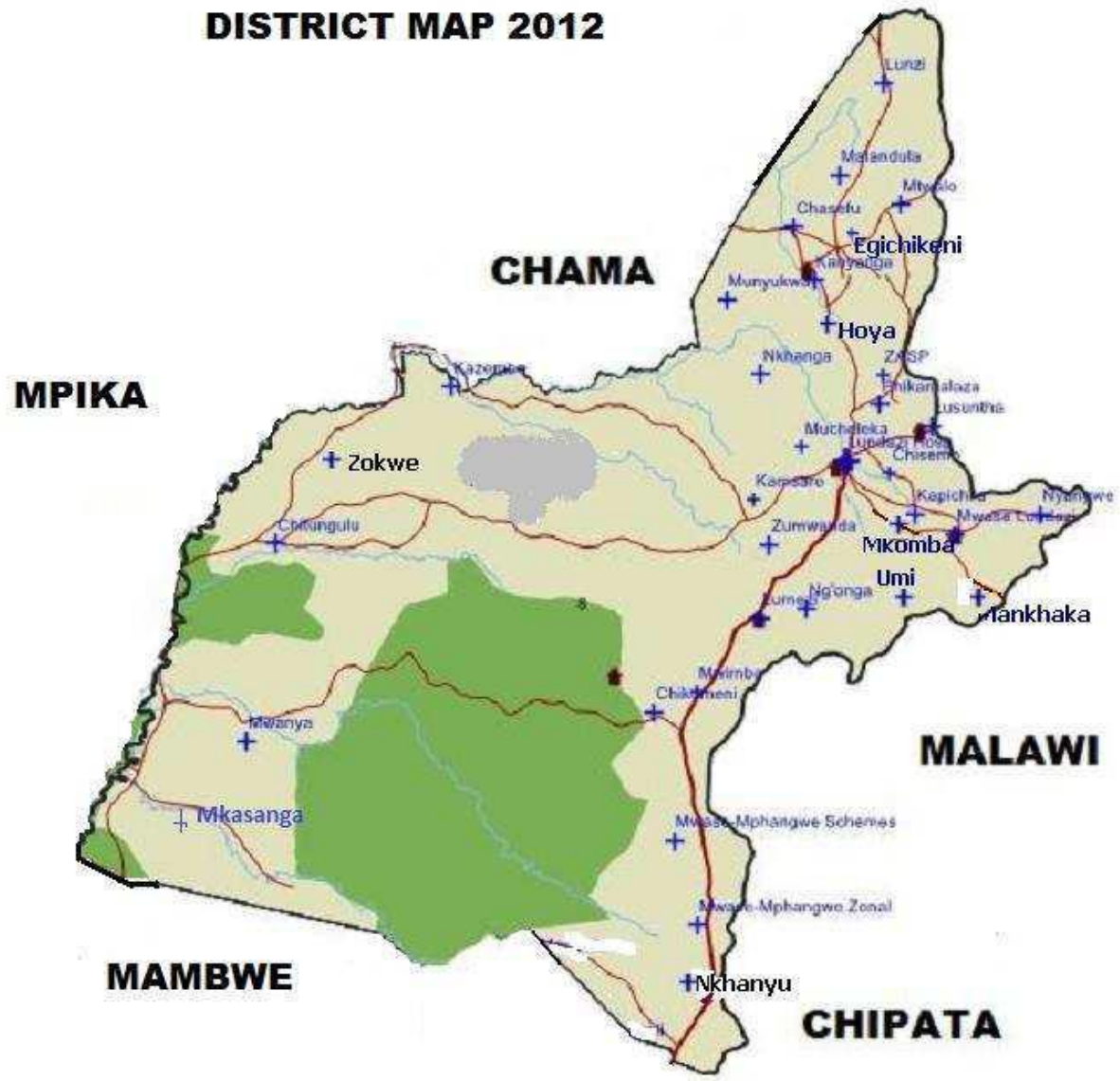
Developing Technologies (DT is implementing a project within AFCAP to promote affordable access to emergency health services in rural areas. The project is running trials of a low-cost ambulance, a motorcycle ambulance-trailer (MAT), to determine its effectiveness in providing an emergency transport service. The project is being implemented in Lundazi District in the Eastern Province of Zambia by DT's partner, the Disacare Wheelchair Centre (DWC) in collaboration with the Lundazi Health Authority (LHA) and Riders for Health, Zambia. Two MAT are being tested – MAT 1 based at Mwase-Lundazi clinic and MAT 2 based at Kanyanga clinic.

The project started in June 2011 and two progress reports have been previously submitted in August and November. This report covers activities in the period December 2012 to February 2013.These comprise:

1 On-going trials of MAT 1 which started in July 2012 and is being used to collect emergency patients, mainly maternity, from villages to clinic
2 Trials of MAT2, started in November, which is being used to transport referred patients from Health Posts to Kanyanga clinic
3 Monitoring of the trials and related emergency health activities in the Lundazi area including the use of bicycle ambulances in the district.

The MATs have completed over 120 trips yielding valuable data on their performance. Considerable monitoring data has been collected. It is considered the project is proceeding well to achieving its outputs.

Figure1: Map of Lundazi District



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1 INTRODUCTION

1.1 Background

Developing Technologies (DT), a UK registered charity based at City University, London, is implementing a project within AFCAP to promote affordable access to emergency health services in rural areas. The concept of the project is to run trials of a low-cost ambulance based on motorcycle technology, a motorcycle ambulance-trailer (MAT), to determine its effectiveness in providing an emergency transport service. The trials are to be carefully monitored to measure the effectiveness of the MAT, the improvement in access in terms of increased attendance and improved timeliness at hospital and the medical impact of the service. The project is being implemented in Zambia by DT's partner, the Disacare Wheelchair Centre (DWC) in collaboration with a Government Health Authority. DWC was supported by a DT volunteer in setting up the project.

The planned outputs for the project are:

1 Evaluation of a low-cost transport service to provide access to emergency health services, covering both operating costs and medical impact

2 Guidelines for setting up and operating the most effective service

3 Field experience needed to promote and disseminate the concept on a wide scale and to generate funding from sources such as UNICEF and the Gates Foundation to assist in setting up emergency transport services.

The project was initially planned to be carried out in three phases:

Phase 1 – preparation (3 months) to cover –

- Manufacture of 2 MAT and procurement of motorcycles
- Discussion with Health Authorities to select a district and clinics to locate the trials
- Recruitment of a Project Assistant to supervise the trials and carry out monitoring
- Recruitment of operators for the MAT
- Baseline study and sensitisation in the area covered by the trials

Phase 2 – trials and monitoring (12 months) –

- 12 months of trials of 2 MAT to cover seasonal effects
- Monitoring of the trials to measure the performance and impact of the MAT services

Phase 3 **-**

- Documentation and dissemination (2 months and on-going)

1.2 Summary of previous activities

- The project started on 10/08/11 with visit of DT volunteer to Zambia
- August to December, manufacture of MAT and discussions with local health organisations regarding best location for trials. Selection of Lundazi District in Eastern Province and two clinics, Mwase-Lundazi and Kanyanga, for location of MATs
- January to April 2012, break due to change of project personnel. Liaison with Lundazi health authority to purchase motorcycles
- May-June, 3-week visit of DT engineer to brief local assistant and finalise arrangements for trials
- June, contract set up with Riders for Health (RfH) to provide technical support for trials, fuel, repairs and maintenance. MAT 1 supplied to Mwase-Lundazi clinic
- June – July, 2-week training course for MAT operators carried out by RfH.

- 19 July, trials of MAT 1 start with opening ceremony. DT volunteer, Chris Hansford present on 2-week visit to help with final arrangements
- June-July, visit by M Sc student from Durham University to carry out social study on attitudes to attendance at health services.
- October 25, MAT 2 introduced at Kanyanga clinic after protracted process of purchase, customs clearance and registration.
- Since November, on-going trials of MAT 1 and 2 and monitoring programme

This progress report covers activities for the period mid-November 2012 to mid-February 2013.

2 MAT TRIALS

2.1 Background

Details of the clinics and Health Posts (HP) in the Lundazi district are shown in Table 1. Because of poor road conditions one HP, Umi, no longer refers to Mwasw-Lundazi and is not included in the trials. MAT 1 is located at Mwase-Lundazi clinic and MAT 2 at Kanyanga clinic. MAT 1 is towed by a Honda XLR125 motorcycle whereas MAT 2 is towed by a more powerful Yamaha AG200.

Theoretically patients first attend a HP and then if their condition cannot be dealt with are referred on to the clinic and then possibly on to the District Hospital if their condition is particularly serious. This is the situation for Kanyanga clinic but it has been found in the Mwase-Lundazi area in most cases the HPs are referring directly to the District Hospital. The reason for this is that the resources at Mwase-Lundazi clinic are little better than at the HPs so there is no point in referring patients there. Patients are therefore referred to the District Hospital and in the case of maternity cases are collected without charge by the Landcruiser ambulance based at the Hospital.

2.2 MAT 1

Trials of MAT 1 based at Mwase-Lundazi clinic started on 19 July. Initially it was intended that it would be used to collect referred patients from the HPs to the clinic. However, since most patients are being referred directly to the District Hospital for which the Hospital Landcruiser ambulance is available (see 2.1) the clinic felt it would be more useful for collecting emergency cases from the villages served by the clinic. Its use in this way will in fact complement that of MAT 2 which it appears will be used mainly to transport referred patients from HPs to Kanyanga clinic.

Details of trips for MAT 1 from November to January are summarised in Table 2. It is believed the motorcycle was used for other activities in November and was not always available for use with the MAT. However, use has increased greatly in December and January when it has been fully available. During the period patients were collected from 54 villages and 2 HPs. 3 trips were also carried out carrying referred patients from the clinic to the district hospital, a one-way distance of 31km. All trips were classified as emergency and in all cases the patient was accompanied by a carer. 67% of the trips were maternity cases and 33% for other medical conditions but surprisingly no accident cases.

The wet season started in early December with heavy rains but to date this appears to have not restricted the use of MAT 1. However, it does appear that this may have led to an increase in malaria cases.

	FACILITY NAME	POPULATION SERVED	DISTANCE IN KM
Clinics referring to Lundazi District Hospital		**3 Landcruiser ambulances available – 1 Old, 2 New**	
1	Mwase Lundazi Rural Zonal Health Centre	19,124	31
2	Kanyanga Rural Zonal Health centre	13,946	35
Details of the associated Health Posts included in the MAT trials			
Health Posts referring to Mwase-Lundazi Z.H.C		**MAT1**	
1.	Kapichila	9,976	5
2.	Mkomba	5,074	15
3.	Nyangwe	6,110	20
4.	Umi	2,037	20
5.	Mankhaka	3,797	12
Health Posts referring to Kanyanga Z.H.C		**MAT 2 ; 2 Old Landcruiser ambulances**	
6.	Hoya	4,246	15
7.	ZASP	3,728	20
8.	Chasefu	4,966	12
9.	Mthwalo	5,216	20
10.	Malandula	12,032	20
11.	Munyukwa	17803	18
12.	Egg chicken	11,105	10

Table 1: Details of Clinics and Health Posts included in the MAT trials

Month	Trips by medical condition					Total trips	Distance km
	Maternity	Malaria	Diarrhoea	Accident	Other		
November	14	1	0	0	1	16	1174(1)
December	32	0	0	0	9	41	1152
January 2013	21	10	3	0	7	41	989
Totals	***67***	***11***	***3***	***0***	***17***	***98***	***3315***

Table 2: Details of MAT 1 trips

Notes:

1 Distances are recorded from the motorcycle odometer so include all motorcycle use. It is likely that the November figure includes the use of the motorcycle for other clinic activities as the operators' own motorcycles were out of service. Patrick has regularly emphasised to the operators that the motorcycle must only be used with the MAT and it is believed that this has largely been the case since December as the distance and number of trips are more compatible. The project donated a small amount of money to the clinic in November to enable the clinic motorcycles to be repaired in order to avoid the need for the MAT motorcycle to be used for other duties. The clinic reasonably pointed out that they needed to allocate available transport to duties they considered of highest priority.

Operating cost: the operating data from December and January allow a more accurate and reliable measure of the fuel consumption of MAT 1. The results are:

December 35.4 km/l; January 33.9km/l. This gives a fuel cost of Zkw240/km (£0.03/km) compared to the Landcruiser ambulance Zkw1890/km (£0.24/l) (see Table 3 Progress Report 2).

Maintenance and repair costs will be obtained from Riders for Health at the end of the project.

2.3 MAT 2

Operating trips for MAT 2 from November to January are summarised in Table 3.

Month	Trips by medical condition					Total trips	Distance km
	Maternity	Malaria	Diarrhoea	Accident	Other		
November	1				1	2	33
December	1					1	28
January 2013	3	1			1	5	
Totals	5	1			2	8	

Table 3: Details of MAT 2 trips

The number of trips is disappointing in spite of a number of visits to Kanyanga clinic by Patrick to encourage greater usage and pointing out that monitoring of referred patients from HPs still shows the main reason for non-attendance is lack of transport. Initially the reason given was lack of money for

air-time to call the MAT operator to use the MAT . Some air-time funds were therefore diverted from the operator to the clinic in early January and this appears to have increased usage slightly. Another reason may be that the operator having had little experience with the MAT to date has not built up confidence in handling it and is easily put off by rain-affected roads. He in fact reports having set out on two trips and the returning because of the condition of the roads. Another important factor, as in the case of many innovations, may be the commitment of the persons involved. The MAT 1 operator is very committed and answers all calls. It is not yet clear if the staff and operator at Kanyanga have the same commitment.

Operating cost: initial data indicates a fuel consumption of 17.4 km/l – further data will clarify this

2.4 Initial evaluation of MAT

Operation: Initial feedback from operators has identified the following issues:

- It takes time to get used to handling the motorcycle when towing the trailer and in building up confidence. The trailer causes an oscillating pull on the bike that is tiring to the rider's arms and it is suggested that the comfortable trip length is around an hour, about 25km when loaded. However, trips of up to 35km have been carried out. It appears that the heavier Yamaha motorcycle with MAT 2 is more tiring to the operator. Some initial trials were carried out with outrider wheels each side of the rear wheel to combat this issue but it was decided that this was not necessary and it was not pursued
- The MAT bounces a lot when empty but this reduces considerably when loaded. This is probably due to an over-stiff suspension provided by the available leaf springs. It was suggested that some ballast (sand bags) should be carried but it does not appear that this has been done
- The brakes need to be improved. There is a problem with equalising the braking on each wheel which could easily be fixed in the Disacare workshop but is difficult to do in the field. However, the operators do not consider this issue constitutes a safety problem
- It is impossible to load a patient on the stretcher because of the canopy. It could only be done by a modification to allow the stretcher to be slid in from the end. On MAT 1 the stretcher has in fact been changed for a mattress on the floor of the MAT to improve comfort and ease loading of the patient. It appears that this may be a better solution and the MAT modified accordingly.

Users: The following feedback has been obtained from two users of MAT1

My name is Grace Nyirenda. I live at Zekelia village. I want to share my experience of the MAT.
When my labour pains started, there was no transport available. Lucky enough my neighbour called the MAT which came in no time. I was taken to the clinic where I delivered. I would have delivered at home had it not being for it. Were taught during anti natal home delivery is risky to both the mother and the new born baby.
" My trip to the clinic was okay, I was lied in the trailer with my mother in low who accompanied me .The space was enough to carry a few things with me.
Thank you for saving my life.'

NAME: Rhoda Nkhoma
VILLAGE: Kamsibani
"My husband went to drink beer when my labour pains started. I was helpless as I was thinking of how to get to clinic. Then one of my neighbours had the number for the operator of the MAT called it. She accompanied me.
It was a relief because previously we used to pay for transport but the MAT came at my house and is free of charge.
When asked about the experience of the trip, Rhoda said, it was good." I did not encounter any difficult and that the operator having medical experience was helpful."

There is no doubt that much more feedback of this nature could be obtained from the large number of maternity patients already transported on MAT 1 and that it is very well accepted and considered a major benefit in improving access to the clinic.

3 BICYCLE AMBULANCE-TRAILER (BAT)

10 BAT have been donated to the district by AFRICARE as part of the Motherhood Programme. A bicycle was also donated to tow the BAT and a grain mill to be used to generate funds to cover the operating costs of the BAT. The BATs have been located in villages in the Mwase area to provide transport of maternity patients to the Mwase-Lundazi clinic and are looked after by the village community health worker CHW). It also seems that the CHWs are usually the operators of the BAT.

Feedback from six of the villages where a BAT is located is summarised in Table 4.

Village	When BAT provided	Distance to clinic km	Time for trip min	Trips per month (1)	Estimated operating cost to date Zkw (2)	Is it in use (3)	How long out of use	Reason for being out of use
Chikumbi	2011	6	40	7	150	No	4 mth	Ball joint
Chilola	2010	5	30	6	200	Yes		
Chipaleni	2010	2	20	6	200	Yes		
Kambaza	2010	10	60	10	150	No	8 mth	Tyres
Swiswi	2011	10	60	10	160	Yes		
Chakwaba	2011	10	60	10	185	No	8 mth	Bike stolen

Table 4: Operating data for BAT

Notes:

1 The trips per month may be exaggerated. Monitoring of the BAT in Chikumbi and Chilola reports 1 or 2 trips per month. This is consistent with records of MAT 1 trips which show a maximum of 10 trips to any village over a 5-month period. It seems unlikely that there are as many as 10 births per month in a village

2 This is the new denomination of the Zkw with £1 approximately Zkw 8. The main problems were reported as follows:
Reported by all 6 CHW – Tyres, Zkw50; tubes, Zkw 35; ball joint for hitch, cost unknown
Reported by 1 CHW – spokes, Zkw 0,5; pedals, Zkw7.5

3 All CHWs reported the income received from the grain mills was inadequate to cover the costs of operating the MAT and that they were having to cover the costs themselves. This has resulted in two of the MAT not being used and it seems inevitable that use of others will cease when a significant repair cost is incurred. One CHW estimated that the money available from the mill was about Zkw50 per month but there was considerable competition from other mills and administering the operation of the mill was on a voluntary basis and was a problem. It also appears the income has to cover other costs in the Motherhood Programme.

Monitoring feedback: there seems to be a general lack of enthusiasm for the BAT from the CHWs in the 3 villages that are being monitored, possibly because they have to operate and look after the BAT themselves on a voluntary basis and also cover much of the costs of repairs. Asked to rate the usefulness of the BAT on the scale – Very, OK, Not much – two replied 'OK' and one 'Not much'. All said operation was 'OK' and said main problems were lack of lights and maintenance costs.

Feedback from users: Table 5 gives a summary of feedback from interviews with 5 users of the BAT

Patient	1	2	3	4	5
Gender	F	F	F	F	F
Medical Category	Maternity	Maternity	Maternity	Maternity	Maternity
Emergency (Y/N)	Y	Y	Y	Y	Y
Convenience and comfort of trip? (Good/OK/Bad)	OK	OK	Bad	Bad	OK
Problems?	No lights	Difficulty when riding up hill	Poor road system	Sometimes not available	Not spacious
Improvements?	Need to provide for lightening system	Need to provide gears for easy riding up hill	Need to improve road network to reduce time to reach the clinic	Should be made available at all times	Trailer need to be expanded to accommodate at least two people
Would the patient have travelled to the HP if the BAT was NOT available?	Yes	Yes	Yes	Yes	Yes but with difficulty

Table 5: Feedback from users of the BAT

Comments:

1 A major drawback of the BAT is its lack of carrying capacity so a carer travelling with the patient, generally a necessity for emergencies, has to find his/her own transport and if they do not have access to a bicycle they may have to walk. It has been reported that it is not uncommon for the BAT operator to walk rather than ride to allow a carer to travel with the patient therefore considerably increasing trip time.

2 The BAT is not fitted with any suspension, therefore the ride can be quite bumpy and uncomfortable as noted by two of the respondents.

4 ATTENDANCE AT CLINICS AND HEALTH POSTS

4.1 Mwase-Lundazi

The monitoring programme in the Mwase area has been revised to concentrate on MAT operations as follows:

1 Attendance at Mwase clinic to attempt to identify the impact of MAT 1
2 Attendance at 2 HPs, Kapilchila and Mankhaka for comparison with Mwase to identify any general trends in attendance such as a decrease due to the rains
3 Interviews with patients attending Mwase clinic in 3 villages at different distances from the clinic. These will cover the range of means of transport used – walk, bicycle, ox-cart and MAT1

4.1.1 Attendance and referrals at Mwase clinic

Attendance over the period May 2012 to January 2013 is summarised in Table 6. This shows attendance for all medical categories is very variable making identification of any trends difficult. Maternity cases are a very small proportion, ranging from 2 to 10% and hopefully it will be possible to identify the impact of MAT 1 on these in the next 3 months. Comparing the data for November to January with MAT 1 operations in Table 2 it is seen that the MAT has been responsible for 14/24

(58%), 32/45 (71%) and 21/50 (42%) of maternity attendance at the clinic. It is hoped that data for February to April will show a more definite trend.

Month	Attendance for various medical conditions					Total attendance
	Maternity	Malaria	Diarrhoea	Accident	Other	
May	40	1102	78	70	521	1811
June	n.a.					
July	45	951	88	13	567	1664
August	23	235	41	11	525	835
September	41	312	80	61	462	956
October	63	234	84	38	203	622
November	24	431	123	49	411	1038
December	45	393	26	37	446	947
January	50	1017	50	39	321	1477

Table 6: Attendance at Mwase-Lundazi clinic (Population 19,124)

Patients who cannot be dealt with at the clinic are referred on to Lundazi District hospital. Data for referrals from May to December is summarised in Table 7.

Month	Total referrals	Referred patients Attending				Referred patients Not-attending			
		Maternal	Malaria	Other	Total	Maternal	Malaria	Other	Total
May	18			10	10			8	8
June	23		1	7	8		1	14	15
July	13	2		8	10			3	3
August	12		1	4	5		1	6	7
Sept	19			10	10			9	9
Oct	35	2		3	5		2	28	30
Nov	19			3	3		2	14	16
Dec	14	2		3	5			9	9

Table 7: Details of referrals from Mwase-Lundazi clinic

Observations

1 The level of referrals is low, about 1 to 2% of total attendance at the clinic, suggesting the clinic is able to handle most emergency patients. This also applies to emergency maternity patients
2 From May to September the proportion of referred patients Attending the district hospital was around 50%. Since October it has dropped significantly. The reason for this is not yet clear although it could the need to complete preparation of plots ready for the onset of the rains.

Interviews with referred patients – 10 patients **A**ttending and 10 **N**on-attending have been interviewed. Details of the transport used by those attending are shown in Table 8.

Reasons for Not-attending are summarised below:

1	Purchased medicine instead	2 Malaria	Total 2
2	Used traditional medicine	1 Other	Total 1
3	Could not afford	1 Malaria, 1 Other	Total 2
4	Not ready to travel *	2 Malaria, 3 Other	Total 5

* These interviews were since November and suggest patients had other things to do.

Medical condition	Means of transport	Waiting time	Journey time	Average Speed (km/hr)	Cost (Zkw)	Level of comfort
Other	Bus	12 hr	1 hr	31	15	Good
Other	Bus	40 min	1.5 hr	21	15	Good
Maternity	LA	45 min	1 hr	31	0	Good
Maternity	LA	40 min	1 hr	31	0	Good
Maternity	LA	35 min	50 min	37	0	Good
Maternity	LA	50 min	45 min	41	0	Good
Other	LA	55 min	50 min	41	0	Good
Other	MAT 1	1hr20 min	1 hr	31	0	Good
Maternity	MAT 1	2 min	1 hr 20	23	0	Good
Maternity	MAT 1	15 min	1 hr 22	23	0	Good

Table 8: Travel of referred patients to Lundazi District Hospital

Note: LA – Landcruiser ambulance

4.1.2 Attendance at Health Posts

Attendance at Kapichila and Mankhaka HPs is summarised in Tables 9 and 10.

Month	Attendance for various medical conditions					Total attendance
	Maternity	Malaria	Diarrhoea	Accident	Other	
May	92	812	35	48	288	1275
June	101	585	79	13	540	1318
July	n.a.					
August	152	549	82	2	477	1262
September	119	463	45	23	781	1431
October	101	430	28	10	878	1447
November	120	455	17	7	446	1045
December	40	155	80	52	188	515

Table 9: Attendance at Kapichila HP. (Population 9,976)

Month	Attendance for various medical conditions					Total attendance
	Maternity	Malaria	Diarrhoea	Accident	Other	
May	0	347	21	28	219	615
June	32	256	18	11	211	528
July	37	281	12	2	321	653
August	41	234	22	11	300	608
September	41	248	35	10	221	555
October	88	325	11	0	336	760
November	76	330	176	1	257	840
December	n.a.					

Table 10: Attendance at Mankhaka H.P. (Population 3,797)

Again it is seen that attendance is very variable from month to month making trends difficult to identify. There was a large drop in attendance at Kapichila HP in December possibly due to the onset of the rains or demand of farm activities but the figure from Mankhaka is not yet available to see if this is a general trend.

Attendance of referral cases from these clinics are summarised in Table 11

Month	Referred cases Attending				Referred cases Non-attending			TOTAL Referrals
	Maternal	Other	Total		Maternal	Other	Total	
Kapichila HP (Population 9,976) referring to District Hospital – 26km								
Sept.	0	1	1		0	7	7	8
Oct.	0	1	1		0	3	3	4
Nov.	0	3	3		0	4	4	7
Dec.	0	5	3		0	6	6	9
Mankhaka HP (Population 3,797) referring to Mwase Clinic –12km								
Sept.	2	0	2		0	1	1	3
Oct.	0	1	1		0	2	2	3
Nov.	0	1	1		n.a.			
Dec.	1	1	2		n.a.			

Table 11: Attendance of referral cases from HPs

The level of referrals, particularly maternal cases, is quite low suggesting the HPs are able to deal with most patients. The referred maternal cases at Mankhaka HP have been transported by MAT 1. The results suggest the demand for ambulance transport of referral cases from the HPs is low. This should be clarified by records of births at Clinics and HPs which is to be collected over the next month.

4.1.3 Interviews with patients attending Mwase clinic

Interviews with two patients transported by MAT 1 are included in Section 2.4 above. Interviews with three patients using other forms of transport are included in the boxes below.

Ox-cart
NAME: Mervis Lukhele
VILLAGE: Matimba
MODE OF TRANSPORT: Ox-cart
"My village lies about 8 km south of Mwase clinic. I went to the clinic by means of an ox-cart I the evening to deliver. The ox-cart belonged to my father so I did not have to pay anything. It Is the mode of transport we normally use for medical emergency cases."
"The trip with an ox-cart is relatively good in the dry season but not in the rainy season because the ox-cart do not have a tent. "

Bicycle
NAME: Flyness Banda
VILLAGE: Nyoka
MODE OF TRANSPORT: Bicycle
"During ante natal lessons were advised to prepare for transport to the health facility for delivery. Since my husband had a bicycle we agreed to come and use it when I am due."
"My journey was bad because I had to sit up on the bicycles carrier instead of lying down which is more comfortable. "
Asked if she had any idea about the presence of the MAT. The woman expressed ignorant but thought was a good idea which she thought would reduce suffering among expectant mothers.

Walk
NAME: Faidah Banda
VILLAGE: Nthembwe
MODE OF TRANSPORT: Walking
I went to the clinic on foot since it is nearby. I have no problems when it comes to transport when going to the clinic.

MAT 1 has not yet visited any of these villages. In the case of the ox-cart, 8km is quite a lengthy journey of around 3 hours requiring the mother to start well in advance if she is to reach the clinic before giving birth. Allowing for a 30 minute delay in setting off, the MAT would complete the two-way trip in about 70 minutes.

More interviews are planned during the next two months.

4.2 Kanyanga Clinic and Health Posts

Because of excessive time involved in collecting data and carrying out interviews the monitoring programme has been streamlined to cover 4 HPs referring to Kanyanga clinic, 3 being serviced by MAT 2 and 1, Munyukwa, to which the road is considered too poor for the MAT to travel

Health Post	Population	Distance to clinic km	Serviced by MAT 2
Eggichikeni	11,105	10	Yes
Hoya	4,246	15	Yes
Malandula	12,032	20	Yes
Munyukwa	17,803	18	No

4.2.1 Attendance at Clinic and HPs

Attendance at Kanyanga clinic and associated HPs is summarised in Table 12

Month	Attendance for various medical conditions					Total attendance
	Maternal	Malaria	Diarrhoea	Accident	Other	
Kanyanga Clinic						
Av. May- Sept	160	490	6	71	700	1426
Oct	200	112	45	11	522	890
Nov	101	135	29	5	467	737
Dec	82	275	10	14	476	857
Jan	70	490	19	7	782	1368
Eggichikeni HP						
Av. May- Sept	n.a.					789
Oct	n.a					
Nov	n.a					
Dec	n.a					
Hoya HP						
Av. May- Sept	46	266	22	12	253	592
Oct	88	325	11	2	336	762
Nov	61	256	99	0	354	777
Dec	n.a.					
Malandula HP						
Av. May- Sept	36	366	71	42	296	811
Oct	54	267	149	9	201	680
Nov	38	296	85	0	311	730
Dec	n.a.					
Munyukwa HP						
Av. May- Sept	46	625	57	21	625	1374
Oct	38	574	105	36	664	1417
Nov	50	497	43	11	621	1222
Dec	n.a.					

Table 12: Attendance at Kanyanga Clinic and associated HPs

Some data has not yet been collected due to other priorities. The attendance at Kanyanga clinic is made up of both patients from its own catchment area and also referred patients from its associated HPs. The level and variability of maternity patients suggests it will be very difficult to identify any impact of MAT 2 on attendance. It may be necessary to compare the levels of Attending and Non-attending referrals and births at the clinic to identify any trends.

4.2.2 Details of referrals at Kanyanga Clinic and associated HPs

Attendance of referred patients is summarised in Table 13

Month	Referred cases Attending				Referred cases Non-attending			TOTAL Referrals
	Maternal	Other	Total		Maternal	Other	Total	
Kanyanga Clinic (population 13,946) referring to District Hospital – 35km								
Av. May-Sept.	4	11	15		0.2	20	20	35
Oct.	9	22	31		0	15	15	46
Nov.	18	2	20		0	18	18	38
Dec.	4	6	10		0	17	17	27
Eggichikeni HP (Population 11,105) referring to Kanyanga Clinic – distance 10 km								
Av. May-Sept.	0.4	1.4	1.8		0.6	6	6.6	8.4
Oct.	n.a.							
Nov.	n.a.							
Dec.	0	4	4		0	4	4	8
Jan.	1	6	7		1	8	9	16
Hoya HP (Population 4,246) referring to Kanyanga Clinic – distance 15 km								
Av. May-Sept.	0.2	1	1.2		1	6	7	8
Oct.	1	1	2		0	6	6	8
Nov.	0	1	1		0	6	6	7
Dec.	1	2	3		0	3	3	6
Jan.	0	5	5		0	4	4	9
Malandula HP (Population 12,032) referring to Kanyanga Clinic – distance 20 km								
Av. May-Sept.	0.5	0	0.5		0	2	2	2.5
Oct.	1	0	1		0	1	1	2
Nov.	2	0	2		0	2	2	4
Dec.	0	0	0		0	4	4	4
Jan.	0	6	6		2	13	15	21
Munyukwa HP (Population 17,803) referring to Kanyanga Clinic – distance 18 km								
Av. May-Sept.	0	2	2		0	2	2	4
Oct.	0	4	4		0	12	12	16
Nov.	0	5	5		0	7	7	12
Dec.	0	4	4		0	7	7	11
Jan.	0	9	9		2	19	21	30

Table 13: Attendance of referred patients for Kanyanga Clinic and associated HPs

Details of referrals are not recorded as standard by clinics and HPs but over the past few months has been collected at the request of the project. A small fee is paid for this. Identifying numbers that have Attended and Not-attended requires cross-checking of records from the HP or clinic where the referral was made and the clinic or hospital to which patients were referred. The data is therefore dependant on the co-operation , reliability and accuracy of two sources. It is considered that the overall figures are reasonably reliable but recording for specific medical conditions may not be as reliable. Even so the data in table 13 shows a consistent low level of referral of maternity patients, suggesting most births occur at the HP or clinic which is first visited by the patient. This needs to be checked against

records of births and this data is being collected. It is seen that all the facilities report cases of referred maternal patients who have not attended their referral. It was not possible to locate these for interviews to find the reason for non-attendance. The cases in January are puzzling since MAT 2 was available to transport referred patients.

4.3.3 Interviews with referred patients

Interviews have been carried out with patients who have been referred from Kanyanga clinic and Hoya HP, covering both those who have attended and those who did not attend. Feedback from the interviews is summarised in Table 14.

Referrals Attending					
Number Patients	**Medical condition**	**Travel details**			
		Means	**Waiting time**	**Travel time**	**Comfort level**
Kanyanga Clinic – distance 35 km					
15	Maternity	LA	Average 25 min –range 10 min to 1 hr	Average 45 min	Good
Hoya HP – distance 15 km					
2	Other	Bicycle	0	1 hr	Poor
1	Other	Bicycle	0	1 hr 20 min	Poor
1	Maternity	LA	30 min	30 min	Good
1	Maternity	LA	I hr	30 min	Good
Referrals Non-attending					
Number of patients	**Medical condition**	**Reason for non-attendance**			
Kanyanga Clinic – distance 35 km					
2	Malaria	Purchased medicine instead			
2	Other	Lack of transport			
Hoya HP – distance 15 km					
4	Other	Lack of transport			
2	Other	Purchased medicine instead			
1	Other	Nursed at home			

Table 14: Feedback from referred patients

It is seen that the Landcruiser ambulances located at Kanyanga clinic are effective in transferring referred maternity patients, all reaching their referral clinic or hospital within 1.5 hours. As indicated above, reasons for non-attendance of maternity patients are yet to be ascertained.

5 COMMUNICATION

Efficient communication is an essential component of an effective emergency transport system. Although radios are still in use, communication is increasingly by mobile phones as ownership increases rapidly in sub Saharan Africa. With this in mind the use of mobile phones in the operation of the emergency transport service is being investigated through the questionnaire included in Appendix 1. Some initial findings are listed below.

1 Cost of cheapest phone – Zkw 75 (£9.40)

2 Cost of airtime – Zkw 1/min (£0.13/min)
3 Cost of text – Zkw 0.3 (£0.04)
4 Cost of charging – Zkw 1.5 (£0.19)
5 Estimate level of ownership – 25 to 50%

6 REVIEW AND CONCLUSIONS

6.1 MAT trials

MAT 1 is being used to collect emergency patients from villages to Mwase-Lundazi as this is the priority identified by health staff and clearly confirmed by monitoring. It has now completed over 100 trips and collected patients from over 50 villages. Its performance can therefore be reliably evaluated. No safety issues have been identified and the operator is clearly confident with its operation. Some operational issues have been raised, such as bumpiness when empty, poor braking and fatigue of the arms. The first two can be solved by simple mechanical changes and it is also likely that the latter can be improved. However, a comfortable operating range of 1 hour, about 25km, has been found which will cover most of the intended use of the MAT. A number of trips up to 35km have also been carried out.

Monitoring of attendance of maternity patients at Mwase-Lundazi clinic does not yet show any impact of the MAT in increasing attendance but the monthly variation is very high and may hide any trend. Data on births will also be collected to see if any trend is shown. However, the MAT is clearly having a significant impact on improving access as identified by feedback from users. Since November the MAT has accounted for around 50 % of maternity related attendance at the clinic and since not all will be associated with births then the proportion of birth related trips will be higher. The MAT provides a more comfortable and much quicker transport to the clinic.

The use of MAT 2 has so far been limited but appears to be increasing. It was envisaged that it would be mainly used for collecting referred patients from HPs to Kanyanga clinic. However, monitoring shows that it too has been used largely for collecting emergency patients from villages. The number of referrals of maternity patients from HPs is quite low, see Table 13, and collection from the villages is the priority need in ensuring patients give birth in the presence of a skilled attendant.

6.2 Monitoring

A considerable volume of data has now been collected on attendance and referrals at the clinics and HPs involved in the project. This is summarised in Figures 2 to 4. The following observations are made:

Total attendance: the level of attendance seems to be linked to the catchment population of the clinics and HPs, with the smallest, Kapichila, Mankhaka and Hoya having the highest attendance per population. It has been suggested (see report 2) that the high attendance at Mankhaka is because it is very close with the border with Malawi and people come across the border for treatment. However, this does not particularly apply to Hoya and Kapichila. Possibly the effect of population size is related to waiting times. If lower attendance results in lower waiting times then possibly more people are encouraged to attend?

Maternity attendance: this is generally less than 10% of total attendance and does not follow the same pattern. It will involve other maternity related issues than births and needs to be supplemented by levels of births for which data is available and is being collected. The birth rate in Zambia is 4.35% and it is estimated that around 45% are in the presence of a skilled attendant, but probably less than this in rural areas. Using these figures a monthly level of births would be about 1.6 per 1,000 population. All the maternity attendance levels are above this. There is no data for Eggichikeni.

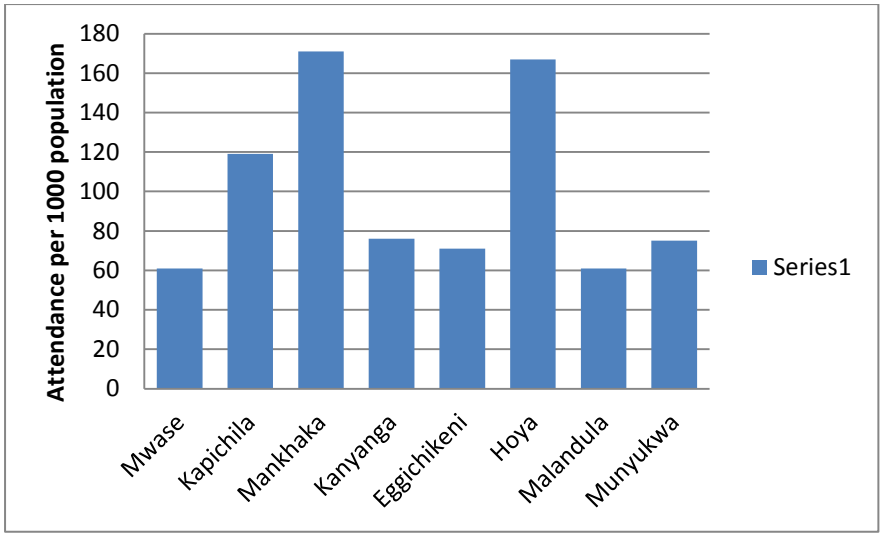

Figure 2: Monthly total attendance at clinics and HPs

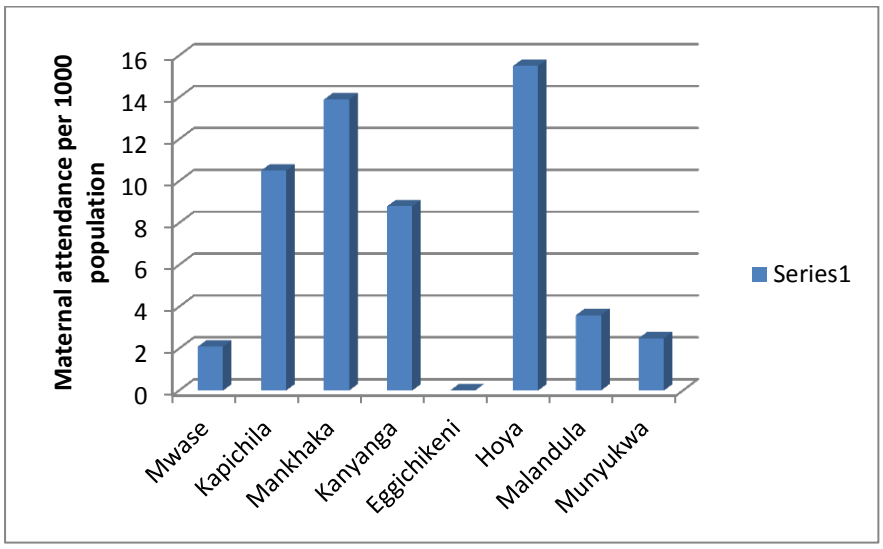

Figure 3: Monthly maternal attendance at clinics and HPs

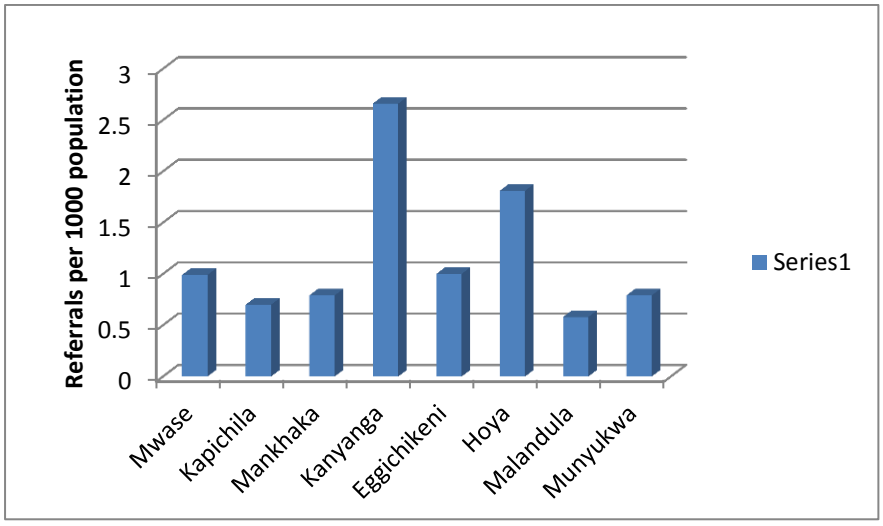

Figure 4: Monthly referrals at clinics and HPs

Referrals: these are generally only 1 to 2% of monthly attendance suggesting that the clinics and HPs are able to deal with most emergency patients. Referrals of maternity patients are also less than 2% of maternity attendance levels suggesting most births take place in the clinic or HP visited. This needs to be checked against records of births but indicates the main target in raising the level of births with skilled attendants should be in transporting patients from the villages.

6.3 Project Outputs

Conclusions on achieving the outputs of the project are presented below. It is considered that the project is proceeding well to meet its outputs

Output 1: *An evaluation of the effectiveness of low-cost ambulance services – Indicator: % of referred patients attending health facilities*

- Data collected to date shows that lack of transport is the main constraint on attendance at health facilities.
- Comparison of attendance and referral rates indicates that most cases are dealt with in the clinic or HP first visited both in the case of maternity and other cases. This needs to be checked by comparing births in the clinics and HPs. This suggests the main target in increasing the level of births attended by a skilled attendant should be in improving access from the villages to HP or clinic.
- Attempts to achieve this using bicycle ambulances in the Mwase area have had limited success due to inadequate funding. The principle of providing a source of income, grain mill, seems good but it needs to be well organised with a committed group to share the load. It appears to have been left to the community health workers who have other duties. Also the effectiveness of an ambulance placed in a village is questionable because of limited use unless it is shared between a number of villages. The MAT has so far collected patients from 54 villages, with a maximum of 10 from any village over 5 months and in most cases only 1 patient per village.
- The MAT is proving very effective in collecting emergency cases from the villages. It is very well accepted by the villagers and considerably increases comfort and speed

Output 2*: (i) Guidelines on setting up and operating an effective emergency transport service – Indicator: Guidelines distributed*

The monitoring programme covers two modes of operation in the District:

1 In the Mwase-Lundazi area patients are referred directly from HPs to the District Hospital. This generally involves longer trips involving more ambulance time and longer times before patients reach care but patients experience better resources. It also places a higher load on the hospital.

2 In the Kanyanga area patients are first referred to the clinic and then if they cannot be treated, referred onto the hospital. This provides a screening so that the hospital can concentrate on the most serious cases. All patients generally reach care more quickly but there is a delay in the most serious reaching appropriate care.

The monitoring data will be reinforced by feedback from health staff and the communities involved regarding the effectiveness of the emergency transport services and how they can be improved. The use of mobile phones in providing an emergency transport service is also being investigated

At present emergency transport services cater mainly for maternity cases. This should clearly be the priority and seems to be generally accepted even though this constitutes only a small level of attendance at health facilities. 68% of trips of MAT 1 have been for maternity cases. It is not clear how ‘other’ trips have been prioritised. One might think it might be for children but in fact all the ‘other’ trips have been for adults. It is clear that many lives could be saved by expanding the use of

emergency transport services but careful consideration needs to be given in allocating a limited resource.

(ii) Comparison of 3 forms of emergency transport – Bicycle ambulance; MAT; Landcruiser ambulance – Indicator: performance data available.

Additional data is confirming that the operating costs of the MAT may only be about 30% of the Lancruiser ambulance and average speed is around 40%. However, the MAT speed is about 2.5 x that of a bicycle and 8 to 10 x that of an oxcart and the ride is considered much more comfortable. It is therefore a major improvement in transport of maternity cases from the villages to a HP or clinic which should encourage more women to travel. These findings will be reinforced as further data is collected.

Output 3: *Field experience gained to support applications for funding to set up emergency transport services in other locations – Indicator: Applications made*

MAT 1 has already completed over 100 trips from villages to Mwase clinic and MAT 2 has just started operations and will also be used for transporting referred patients from HPs to clinic. This experience will cover the range of emergency transport operations and show the effectiveness of the MAT in carrying these out.

An application has been submitted to the Siemens Stiftung "empowering people award" for continuing development and dissemination of the MAT.

APPENDIX 1: QUESTIONNAIRE ON MOBILE PHONE USE

Communication for Emergency Transport

This is to obtain information on the availability and costs of mobile phones for use in emergency transport services and other communication methods used.

1 Other than mobile phones what means of communication are available for health services in Lundazi district and to what extent are they used?

2 How many mobile phone network providers are there for Lundazi District and how much of the district is covered

3 Which areas are NOT covered by any cell phone networks?

4 Cost

4.1 What is minimum price for a basic mobile phone
……

4.2 How much does airtime cost [minimum purchase charge for airtime units?]……

4.3 Do people usually send messages by talk …… or text ……. (please tick)

4.2 How much messaging by talk - villagers…….% ; health staff …….. %
Cost /minute …….

4.3 How much by text – villagers …… % ; health staff …… % Cost
……..

4.4 Is it possible to buy airtime in every village [in the study area]?

4.5 Where do people in villages buy airtime ……

4.6 Is it possible to charge phones in every village [in the study area]?

4.7 Where do people in villages charge their phone …….. cost
……

5 Availability and access to mobile phones

5.1 What is the level of access of people in villages to mobile phones? It will probably vary from village to village but please talk to key informants and try to give a general overview on the following scale

High, over 75% ……..; Good, 50 to 75% ……; Medium, 25 to 50 % ……;
Poor, less than 25% ……

5.2 In 3 villages served by Mwase where interviews are carried out please add the following

Name of village ……..; population ……. ;

Number of mobile phones in village ……..

For each person interviewed – did they have access to a mobile ……;

If so how ……..

General comment on access to mobile in village …….

How do people know or find out the phone number for
(i) the ambulance ……..;
(ii) the Health post or clinic ……. :
(iii) Local taxis ……..

Does anyone in the village keep a record of these phone numbers …… Y or N
If so who ……

6 Health staff

Does Government provide mobile phones for use in health service…… ; If so please give details

Does Government pay for use of mobile phones in health service ……..; If so please give details

What are attitudes of staff to use of personal mobile phones for health services ……

Any government health care information provided to health staff or patients [e.g. pregnant women] by cell phone?

7 Main constraints on use of mobile phones for emergency transport services

Please discuss with key informants and summarise opinion in the following list in order of importance

1

2

3

4

5