

Mulanje Mission Hospital

Malaria Vector Control Report

(IRS & LSM)

2021-2022

Reported by

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A. Background information

This report describes malaria vector control at Mulanje Mission Hospital (MMH) for the 2021-2022 malaria seasons. MMH is a mission hospital under CHAM (Christian Health Association of Malawi) with 72 villages in its catchment area. The population in this catchment area is estimated at 91 941. From the year 2012 MMH started to implement malaria vector control using Indoor Residual Spraying (IRS) in its catchment area. In the year 2017, Larval source management (LSM) was added. In 2021-2022 the project was funded by the Good Little Company (GLC).

Indoor Residual Spraying involves spraying insecticide onto interior walls of houses so as to kill anopheles mosquitoes which cause malaria. A long-acting formulation proven to work for at least 3 months is used, when the mosquitoes land on the walls they are killed by active ingredient of the chemical.

Larval Source Management involves modifying breeding sites of mosquitoes so that either mosquitoes are unable to breed or larval are killed before they become adults. A chemical proven to be only killing mosquito larvae is used.

On occupation health and safety, all IRS workers at MMH use standard Personal Protective Equipment (PPE), such equipment include helmet with a face shield, mask, overall, heavy duty gloves, and gumboots. A standard store room and wash area with showers is also available. MMH also checks that all used and un-used bottles/sachets of insecticides are returned to stores.

B. 2021/22 IRS and LSM implementation

Since the establishment of IRS at MMH, MMH has continued with the use of well-trained villagers as spray operators. In 2021/22 spray operators formed 5 teams of 5 people who are supervised by team leaders (Health Surveillance Assistants). In turn these team leaders are supervised by Environmental Health Officers.

During the spraying period, spray operators completed daily record forms which were submitted to their team leaders for daily summaries.

During 2021/22, MMH used Sumishield in its IRS project. Sumishield will be used interchangeably with other compounds, notable organophosphate based products like Actellic 300CS. (This interchangeable way of using chemicals helps in managing chemical resistance of mosquitoes.

Malawi's Ministry of Health Insecticide resistant management plan stipulates that insecticides should be changed yearly. This strategy was introduced from the beginning of IRS period of the year 2019.



Figure 1: spray operator adding water to the tank for mixing with sumishield

MMH has a long track record in IRS. From 2012 to 2015, alpha-cypermethrin (Fendona) which is in the group of Pyrethroids was being used. In 2015 MMH also sprayed one part with Terminator (Fenitrothion) which is in the group of organophosphates. From 2016 to 2018, MMH was using

Actellic 300CS which is in the group of organophosphate as well. From 2019 onward Actellic 300CS is used interchangeably with Sumishield, a clothianidin based compound.

Chemicals used in IRS are subjected to sensitivity testing conducted in two months before IRS begins. During sensitivity testing different chemicals that kill mosquitoes are tested to determine fatality rates. Chemicals tested include alphacypermethrin, permethrin, fenitrothion.



Figure 2: a spray operator spraying the interior wall of a house



Figure 3: Spray operator interviewing a house owner to capture data.

LSM started in October 2021 in order to manage a small number of mosquito breeding sites before the start of rainy season where breeding sites increase because of rainfall. The chemical that was used in LSM was Dimilin, which is a powdered Insect Growth Regulator. In 2021/22, 12 villages benefited from LSM. Each village had 2 people trained to spray mosquito breeding sites.

Community awareness

Radio talks were organized to ensure community awareness of vector control activities. Village meetings were also done to help people prepare for the actual spraying - as a result a lot of people took part.

Monitoring

During IRS and LSM, MMH staff from PHC department conducted malaria monitoring by testing individuals for the presence of malaria parasites in their blood. The project also compares previous years and current malaria cases by checking registers at the hospital and neighbouring hospitals.

This year's monitoring programme used data from intervention (IRS +/- LSM) and non-intervention areas. The intervention area is the MMH catchment area, and the non-intervention area three villages in the neighbouring Chambe area. The project also compared hospital registry data from MMH and Holy Family Mission Hospital Phalombe district, which has no vector control programme.

The main indicators tracked are the following:

1. Number of under-five malaria deaths, with comparisons with non-intervention areas (table C1.1)
2. Parasitaemia levels (table C2.1)
3. Mosquito population density in intervention and non-intervention villages (table C3.1)
4. Numbers and rates of malaria and non-malaria in-patient admissions at MMH for different age groups (table C4.1.-C4.3)



Figure 2: A health worker conducting malaria testing.

C. Result

The number of villages covered in 2021/22 was 35, 23 villages were covered with IRS only, 6 LSM only and 3 both IRS and LSM.

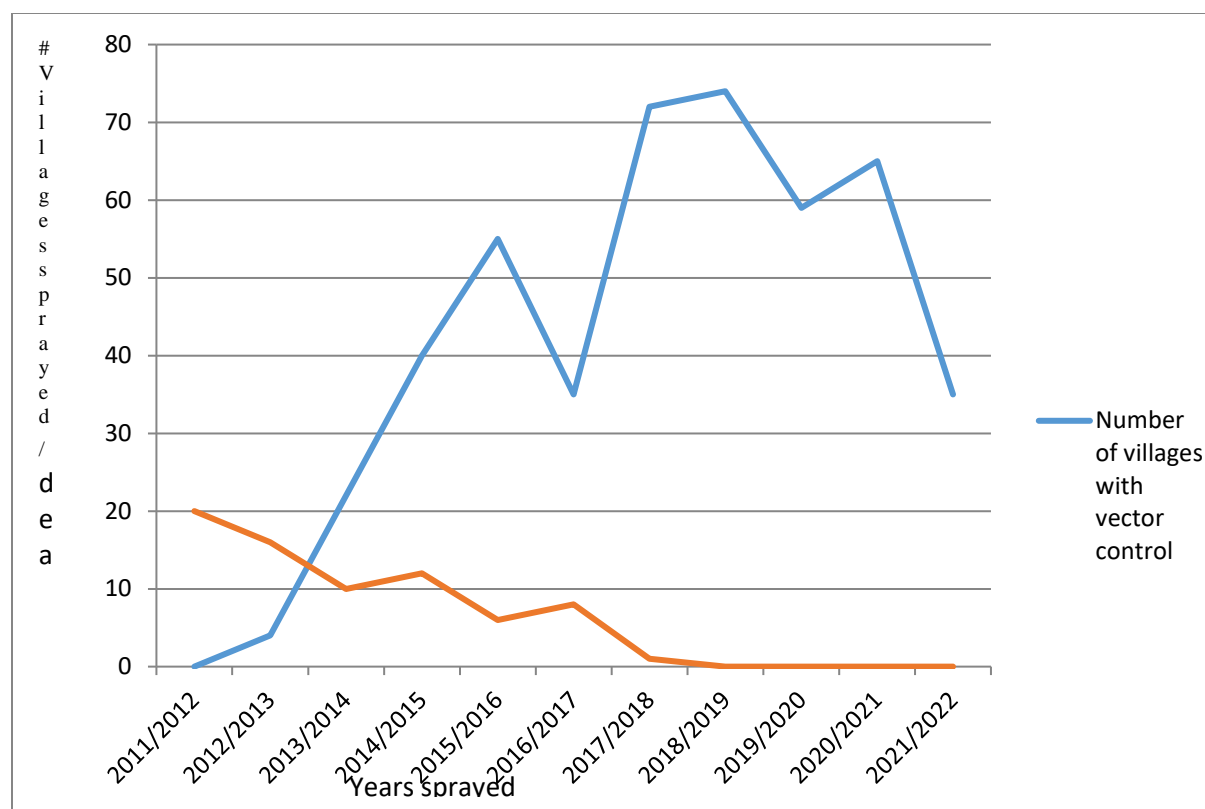
Table C.1.1 and Graph C 1.1. summarize the main outcome: under-five malaria deaths.

Table C.1.1: Vector control interventions and under five malaria deaths at MMH since 2011

Year	No. villages IRS only	No. of villages LSM only	No. of villages LSM&IRS	Total no. of villages with vector control	% of villages with vector control	Total population protected (est).	Total no of <5 yrs deaths
2011/12	0	0	0	0	0	0	20
2012/13	4	0	0	4	5.4	5246	16
2013/14	22	0	0	22	30	16,136	10
2014/15	40	0	0	40	56	37,985	12
2015/16	55	0	0	55	76	47,121	6
2016/17	35	0	0	35	49	29,986	8
2017/18	46	20	6	72	97	82,702	1
2018/19	32	32	10	74	100	85,000	0
2019/20	46	3	7	59	80	72,500	0
2020/21	48	13	4	65	90	79,872	0
2021/22	23	6	6	35	49	56,840	0

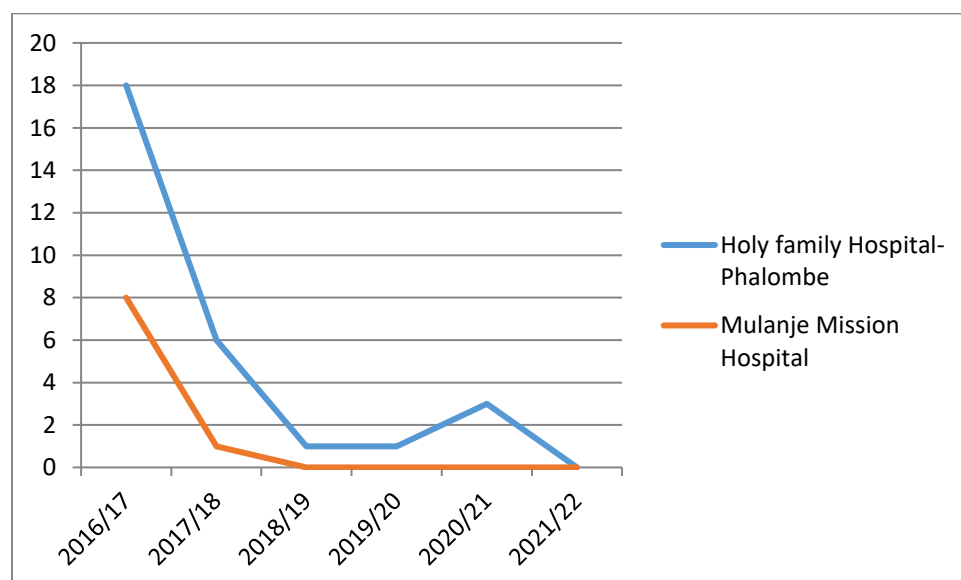
This is the fourth year in a row MMH has experienced zero under five malaria related deaths in the malaria peak season – exceptionally positive results.

Graph C 1.1. Number of villages sprayed versus under-5 malaria deaths at MMH



The gains that have been realized through vector control over the years continue to bear fruits even after reducing number of villages sprayed. This is the fourth year MMH has been registering zero malaria death in under-fives during malaria peak season.

Graph. C.1.2 Under-5 deaths in intervention area (MM Hospital) versus non-intervention area (Phalombe Hospital) based on hospital registries



This graphs shows a downward trend in under-5 mortality in a non-intervention area too. Both MMH and Phalombe have registered zero under-five malaria deaths in under five years during malaria peak season.

Table C 1.2. Number of under-5 malaria deaths and mortality rates in intervention and non-intervention area

	MMH (intervention)		Holy Family Hospital (non-intervention)	
	No of deaths	Mortality rate	No of deaths	Mortality rate
2016/17	8	0.45	18	11
2017/18	1	0.16	6	2.7
2018/19	0	0	1	0.75
2019/20	0	0	1	1.4
2020/21	0	0	3	0.02
2021/22	0	0	0	0
<i>Average/yr</i>	<i>1.5</i>	<i>0,1</i>	<i>4.8</i>	<i>2,65</i>

C2. Malaria parasitaemia

Parasitemia is the presence of parasites in the blood. This data was collected in targeted community by conveniently sampling participants and test their blood using malaria rapid diagnostic test (MRDT) kits. Participants found to be malaria positive were given malaria drugs by a clinician at the same time. 450 people were tested; 3 villages in intervention and non-intervention area (Chambe) respectively.

Table C2.1: Parasitaemia results

Village (with vector control)	Intervention	% mRDT positive	Village (no vector control)	% mRDT positive
Kangoma	IRS	3	Chilela	9
Demula	IRS	0	Mussa	5
Bwanali/Chikumbu	LSM	7	Kazembe	9
Mwamadi	IRS	2	Livetele	6
<i>Overall average</i>		<i>3%</i>		<i>7.25%</i>

Malaria remains lower in intervention areas compared to nonintervention areas. The positive thing is that in both areas malaria has reduced from previous year. This could be because of use of mosquito nets which the Malawi government distributed to the whole population.

Table C.2.2 Parasitaemia in Mwamadi village from 2013 to 2022.

Year	malaria positive%
2013	53
2014	38.8
2015	20
2018	16
2019	9.5
2020	8
2021	5
2022	2

Data sourced from blood tests using MRDT at Mwamadi village, has been showing a continuous decrease in malaria parasitaemia over the years. It was 53% in 2013 and in 2022 it is at 2% only. This is a great achievement in vector control.

C3. Mosquito population density testing

Mosquito population density involves counting number of mosquitoes present in dwelling houses using the pyrethroid knock-down test. This was done in 4 villages in the MMH intervention area and 4 villages at the neighboring Chambe non-intervention area

Table C.3.1 Mosquito population density in intervention and non-intervention area.

Village (with vector control)	Intervention	No of mosquitoes	Village (no vector control)	No of mosquitoes
Kangoma	IRS	6	Chilela	4
Demula	IRS	4	Mussa	10
Bwanali/Chikumbu	LSM	5	Kazembe	11

Mwamadi	IRS	4	Livetele	9
<i>Mean</i>		<i>4.8</i>		<i>8.5</i>

IRS intervention areas showed a reduced number of mosquitoes compared to non- intervention area.

C4. Malaria cases admitted to MMH between November & March from 2016 to 2021

This section presents the number of admissions of under-five children and in those five and older years from sampled villages since 2016, before and after IRS with or without LSM was introduced.

Table C4.1: number of under-five admissions due to malaria from sampled villages 2016-2022.

Year	2016/17	2017/18	2018/19	2019/20	2020/2021	2021/22
Village	IRS only					
Kang'oma	3	2	1	1	0	1
Zipangani	1	2	0	3	0	0
Ngolowera	5	9	1	5	0	
Mwamadi			1			0
Demula				3	4	
Total	9	13	3	12	4	1
Total cases per 1000 under 5s	11.5	16.56	0.7	1.3	0.7	0.3
	IRS only	IRS & LSM				
Bwanali/ Mabuka	2	3	2	1	0	
Nankhumwa	4	0	0	2	0	1
Lidaya	0	3	1	0	0	
Bokosi			0			0
Nkhonya				3	2	0
Total	6	6	3	6	2	1
Total cases per 1000 under 5s	8.82	8.82	0.45	0.6	0.2	0.15
	IRS only	LSM only				
Sikoya	2	1	1	3	0	0
Tambala/Chikumb	6	7	5	18	0	
Bwanali/Chikumb	11	1	2	3	0	
Gilbert			0			0
Chitambi				4	3	0
Total	19	9	8	28	3	0

Total cases per 1000 under 5s	25.03	11.86	1.6	2.8	0.3	0
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Table C4.2: number of over-five admissions due to malaria from sampled villages 2016-2022

Year	2016/17	2017/18	2018/19	2019/20	2020/2021	2021/22
Village	IRS only					
Kang'oma	1	0	1	1	1	0
Zipangani	1	0	0	1	0	0
Ngolowera	6	2				
Mwamadi			0	2	2	0
Demula			0	1	1	
Total	8	2	1	5	4	0
Total cases per 1000 over 5s	2.09	0.52	0.2	1.2	1.1	0
	IRS only	IRS &LSM				
Bwanali/ Mabuka	2	0	0	0	1	
Nankhumwa	1	0	0	3	2	0
Liwaya	2		0	0	0	0
Bokosi			0	1	2	
Nkhonya		0				0
Total	5	0	0	4	5	0
Total cases per 1000 over 5s	1.51	0	0	0.5	1.2	0
	IRS only	LSM only				
Sikoya	2	2	1	3	4	0
Tambala/Chikumb	1	0	1	6	4	
Bwanali/Chikumb			0	2	1	
Gilbert				4		0
Chitambi	1	1	0	2	2	0
Total	4	3	2	13	11	0
Total cases per 1000 over 5s	1.56	0.46	0.2	1.6	1.9	0

IRS, IRS+LSM and LSM have reduced malaria in under-5s and over-5 significantly in the community. There was no malaria admission of individuals above 5 years from the villages with vector control interventions, but from table C4.3 we see that there were **72** malaria admissions, this means they came from other villages which do not have malaria vector control. .

Below is a summary of the proportion of admissions due to malaria at MMH, relative to all admission in three different age groups.

Table C4.3: Total number of admissions at MMH, in all age groups, relative to the number of admission due to malaria 2018-2022

Year	Month	Total <5 years	Malaria	%	Total 5-11 years	Malaria	%	Total =>12 years	Malaria	%
2018-19	November	185	35	19%	20	3	15%	458	8	2%
	December	157	40	25%	28	3	11%	444	15	3%
	January	179	34	19%	35	4	11%	488	31	6%
	February	185	27	15%	23	3	13%	543	11	2%
	March	211	30	14%	33	9	27%	498	18	4%
	Total	917	166	18%	139	22	16%	2431	83	3%
2019-20	November	175	34	19%	26	3	12%	361	4	1%
	December	261	67	26%	33	12	36%	441	25	6%
	January	253	80	32%	29	10	34%	415	20	5%
	February	283	82	29%	30	8	27%	434	17	4%
	March	243	89	37%	30	8	27%	413	29	7%
	Total	1215	352	29%	148	41	28%	2064	95	5%
2020-21	November	182	39	21%	128	1	1%	354	12	3%
	December	180	36	20%	111	5	5%	364	17	5%
	January	208	89	43%	149	11	7%	387	41	11%
	February	141	42	30%	83	5	6%	258	18	7%
	March	139	34	24%	73	4	5%	337	20	6%
	Total	850	240	28%	544	26	5%	1700	108	6%
2021-22	November	80	8	10%	9	3	33%	175	11	6%
	December	78	15	19%	17	2	12%	169	25	15%
	January	117	10	9%	30	5	17%	203	6	3%
	February	84	21	25%	15	1	7%	183	5	3%
	March	139	14	10%	5	1	20%	191	13	7%
	Total	498	68	14%	76	12	16%	921	60	7%

This table shows that the proportion of malaria to all admissions was relatively stable in the past year compared to previous years, with a marked reduction in the 6-11 year old age group alone.

D. Conclusions

The above data demonstrates that the vector control project implemented at MMH has successfully reduced mortality and morbidity from malaria in all age groups. This project shows that it is possible to significantly reduce the burden of malaria through vector control even in a relatively small programme.

It is also encouraging to see that MMH has maintained 0 under-five deaths caused by malaria for the fourth consecutive year. Data from the number of cases per 1000 in both under and above five years suggest better malaria control than in the previous season, it is even 0 admission in above five years. The difference in mosquito population density is another indicator that shows proof that IRS and LSM have a strong impact.

A downward trend is seen in the catchment area of Holy Family Hospital in Phalombe, too. This can probably be attributed to better diagnosis and treatment of childhood malaria, improved housing and possibly better uptake of long-acting insecticidal bednets. Other malaria prevention measures contributing to malaria reduction are malaria case management and health.

Although this is the case, there are significant additional effects of IRS and LSM.

The community around MMH, poor rural families, strongly urge the hospital and its' partners to continue doing vector control. They cite less disease, but also the killing of other insects of medical importance like fleas, bedbugs and cockroaches, leading to peaceful nights.

E. Future Vector control efforts

MMH is committed to optimal use of every available dollar. We therefore critically look at the vector control programme on a yearly basis. The government of Malawi has rolled out third-generation bednets in selected districts, with Mulanje receiving piperonyl-butoxide nets at the end of 2021. Evidence suggests that in the presence of PBO nets it may not always be needed to continue performing IRS at the same intensity. In the coming season MMH will concentrate on high burden areas, to make optimum use of the available funding. We are performing a review of malaria burden in all 72 villages in June 2022 to make a good selection of areas to be sprayed. LSM will be continued pending on availability of funding – though likely effective, this is hard to prove statistically in our area.

In future, the vector control programme should increasingly focus on optimal availability and use of third-generation bednets including retreatment of nets if new nets are not supplied regularly.

MMH, 10th May 2022