Malawi 4th Follow-Up Impact Survey 2017
Recommendations Report

Schistosomiasis Control Initiative

Imperial College London

1 Programmatic recommendations

This reports reviews the 4th year of follow-up (FU4) impact survey which was conducted in Malawi, in February-April 2017 following four rounds of mass preventive chemotherapy (PC) for schistosomiasis (SCH) and soil-transmitted helminths (STH). The following programmatic recommendations are:

Table 1: Observations and corrective actions from the impact survey

Finding or observation	Interpretation	Programmatic action
Schistosoma mansoni prevalence decreased from baseline.	PC is reaching target populations in these areas.	Ministry of Health (MoH) control programme works to maintain these gains.
S. haematobium prevalence decreased from baseline.	PC is reaching target populations in these areas.	MoH control programme works to maintain these gains.
Prevalence of heavy-intensity infection <1% across sentinel sites.	Treatment is reaching the schools and is having an impact on intensity of infection and consequently reducing and preventing morbidity in infected individuals.	The MoH is currently in the process of re-assessing all districts of Malawi to determine if impact has been replicated elsewhere in the country and to review treatment strategies. The reassessment will provide evidence to optimise the effective allocation of resources to where they are needed. Reassessment has been undertaken in 23 districts in 2017 and 2018, and will be completed in the remaining 5 districts in early 2019.
Statistically significant difference in prevalence of *S. haematobium* between males (2.6%) and females (2.1%).	Boys are more likely to be infected than girls i.e. are more pre-disposed to SCH due to behavioural and physiological factors. Treatment coverage may be gender equal (evidence from Malawi coverage evaluations) but frequency, coverage and compliance may need to be higher in males to have an equal effect on prevalence and intensity.	The MoH to develop strategies to ensure girls and boys are reached equally in treatment, including through social mobilisation, development of messages and training of Health Surveillance Assistants in the lead up to annual mass drug administration. Going forward, this should be incorporated into annual planning processes.

Finding or observation	Interpretation	Programmatic action
Increase in prevalence of *S. mansoni* in two schools since FU3 (2016) despite overall reduction in both since baseline (2013).	At such low prevalence this variation is within the margin of error for this survey.	MoH and SCI to review the coverage in all the sentinel site schools and monitor those that are having >2 years of increasing or higher prevalence. MoH and SCI to continue to monitor any changes, particularly any increase in heavy intensity in all age groups.

2 Methods

All methods described in associated protocol:
https://imperiallondon.sharepoint.com/:w:/r/sites/fom/schisto/mer/2_Country_M%26E/MWI/Impact/FY_1718/1_Protocol_%26_pre-survey/MWI_Impact_Protocol_FU4_EN.docx?d=w5aca5a71a14b42ac8f3a2c2f937875d9&csf=1&e=2qO1gb

2.1 Field methods

The survey schedule was interrupted by national and school holidays during data collection. Catch up days were used to finish visits to the sentinel sites.

2.2 Deviations from protocol

- At the school level there was a substantial protocol deviation: the protocol called for the collection of WASH indicators as well pupil registration data (numbers of boys and girls registered for each grade taught at the school). Only the pupil registration data was collected.
- The only significant protocol deviation at pupil level occurred in the school Amazing Grace PvT. Here only 15% of the sampled pupils participated on the second day of data collection (17 out of 114 pupils in the first day). The survey team reported that the pupils involved refused to participate on the second day and they were unable to convince them otherwise.
- The proportion of girls sampled ranged from 46% to 58% which is an acceptable range of variation (protocol called for 50%) except for one school, Likuni Boys which is a single sex school.
- On average, 93% of the sample size was achieved. Most schools managed over 95% however 4 schools, Young Ambassadors, Mphete, Kanyerere and Kambuku only sampled 75% to 78% of the required 120 pupils. This was due to the size of the schools and the numbers of pupils attending at the correct age range.

2.3 *Ethical approval*

Ethical approval was granted by Imperial College Research Committee ICREC_8_2_2. In Malawi, the National Health Sciences Research Committee has advised that evaluation activities related to existing programs of the Ministry of Health are exempt from scientific and ethical review.

3 Survey Recommendations

Table 2: Observations and corrective actions for the survey process

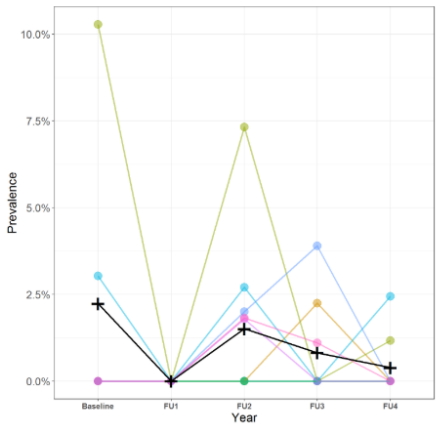
Finding or observation	Interpretation	Corrective action
There was a significant delay between the completion of the survey and receipt of survey data.	Data were collected on paper forms, which were then collated and subsequently manually entered onto excel spreadsheets.	Future surveys to be conducted on smartphones with data uploaded daily to the shared MoH-SCI server.
The data initially received contained information from the incorrect schools.	The team was conducting two surveys simultaneously, phase one of a national reassessment as well as FU4 impact survey data. This resulted in the survey supervision team being overburdened and unable to adequately organise and manage paper forms. Therefore, when the data were initially entered there had not been suitable separation of impact and reassessment data. These errors have now been painstakingly corrected by the MoH and SCI.	The timing of data collection activities should take into account the supervision capacity of the country team. If possible avoid running multiple surveys simultaneously. Use of smartphones will also facilitate a clear separation of survey data.
In the data initially received the pupil dataset did not contain a unique school ID which meant it could not be linked with either school data or previous years' data.	Insufficient guidance and supervision provided to data entry team.	Where paper forms are used for data collection, provide pre-formatted data entry sheets with clear data validation guidelines. Use of smartphone based data collection platform will mitigate the risk of this re-occurring.

4 Results

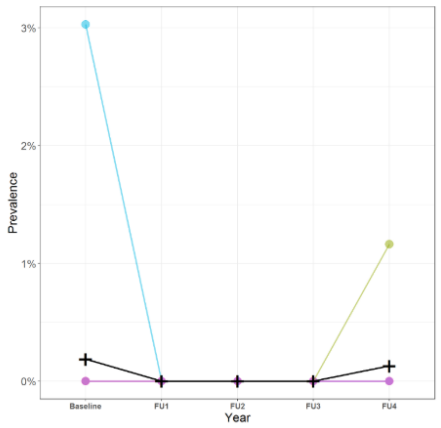
4.1 Dashboard

Malawi Impact - Baseline to FU4 | Page 1: Schistosomiasis | Page 2: Soil transmitted helminths and gender differences | SCI Schistosomiasis Control Initiative | pdf

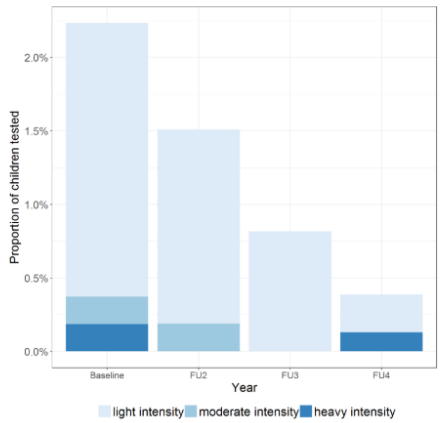
S. mansoni prevalence in 6-8 year olds by school (overall mean in black)



S. mansoni heavy prevalence in 6-8 year olds by school (overall mean in black)



S. mansoni infection categories in 6-8 year olds

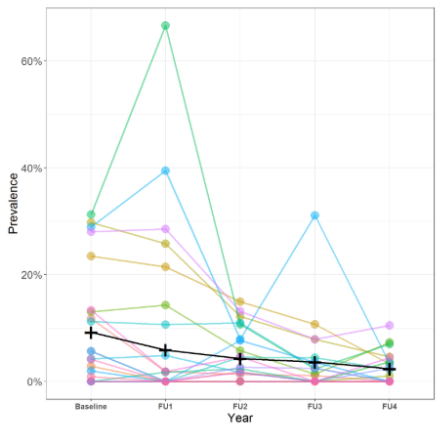


S. mansoni Commentary

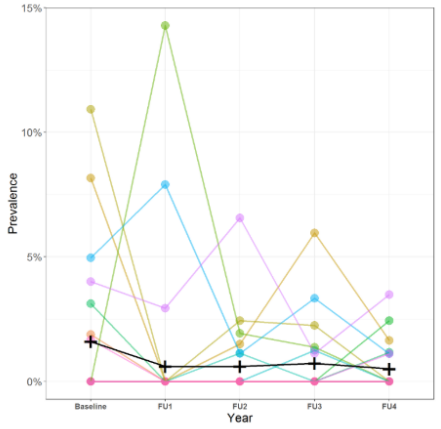
Year	Number Sampled	Number Positive	Number heavily infected
Baseline	537	12	1
FU1	182	0	0
FU2	530	8	0
FU3	735	6	0
FU4	776	3	1

Overall the prevalence of *S. mansoni* has had an 83% reduction from baseline, going from 2.2% to 0.4%. Although two schools show an increase since FU3, the prevalence for these schools is lower than at baseline. At such low prevalence this variation is within the margin of error for this survey. The increase in the prevalence of heavy infection from FU3 to FU4 is caused by one child who was found to be heavily infected from the total sample (no heavily infected children were found in FU3).

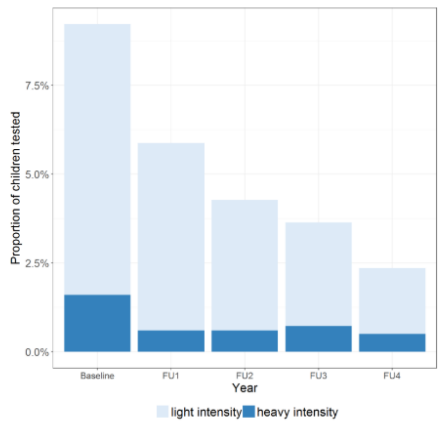
S. haematobium prevalence in 6-8 year olds by school (overall mean in black)



S. haematobium heavy prevalence in 6-8 year olds by school (overall mean in black)



S. haematobium infection categories in 6-8 year olds

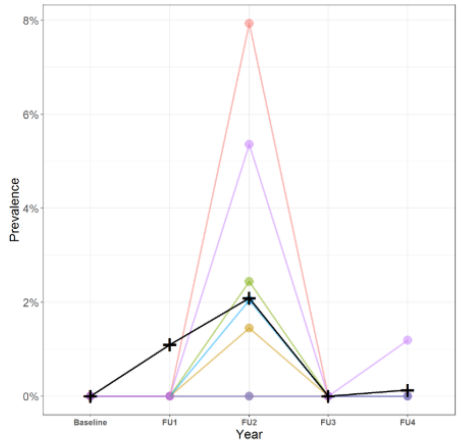


S. haematobium Commentary

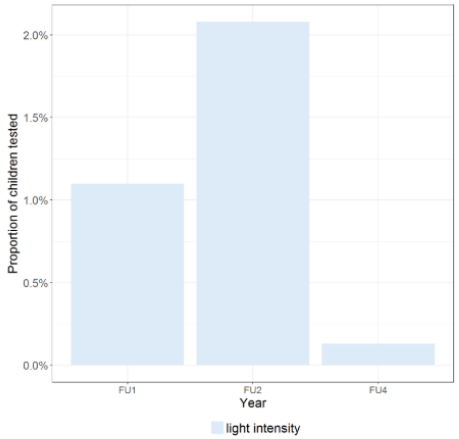
Year	Number Sampled	Number Positive	Number heavily infected
Baseline	2064	190	33
FU1	835	49	5
FU2	1499	64	9
FU3	1785	65	13
FU4	1780	42	9

The prevalence of *S. haematobium* has reduced by 74% from baseline, 9.2% to 2.4% in FU4. Prevalence of heavy infection has also reduced from 1.6% to 0.5%, a 68% reduction from baseline. While overall prevalence shows a steady decrease, year on year, the prevalence of heavy infection has remained fairly consistent since FU1 (0.6%). The mean intensity of infection has reduced by 84% from baseline, 3.6 epcl to 0.6 epcl.

Any STH prevalence in 6-8 year olds (overall mean in black)



Hookworm infection categories in 6-8 year olds



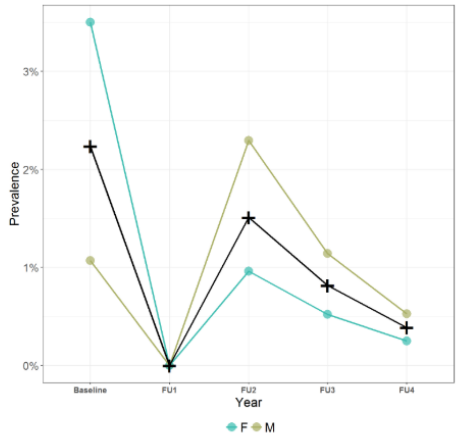
STH Commentary

Year	Number Sampled	Positive for Asc	Positive for Hkw	Positive for Tri
Baseline	537	0	0	0
FU1	182	0	2	0
FU2	527	0	11	0
FU3	735	0	0	0
FU4	776	0	1	0

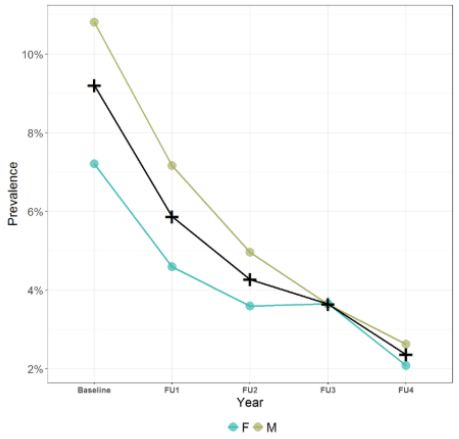
In FU4, the only STH infection observed was one case of hookworm, with light infection. The overall level of STH infection is sufficiently low that the variation observed between years is within the margin of error for a study of this size.

One of the schools (006-021) had 100% prevalence for FU1. In this situation only 2 observations were recorded, both of which tested positive for Hookworm. This school was dropped from the plot of STH prevalence as the result was misleading.

Prevalence of *S. mansoni* by gender



Prevalence of *S. haematobium* by gender



Commentary

There is a slight difference observed between the prevalence for boys and girls at FU4, 0.5% and 0.3% for *S. mansoni* and 2.6% and 2.1% for *S. haematobium* respectively. The difference in prevalence for *S. mansoni* is not significant ($p = 0.752$) however, the difference is significant for *S. haematobium*, with boys being more likely to be infected ($p < 0.001$).

The table below shows the change from baseline to FU4 for prevalence, prevalence of heavy infections and mean intensity for *S. mansoni*, *S. haematobium* and hookworms.

Key outputs	S. mansoni	S. haemtobium	Hookworm
Prevalence (%)	-1.85	-6.85	0.13
Pre. heavy inf. (%)	-0.06	-1.10	N/A
Mean epg/epcl	-1.04	-3.02	0.02

4.2 Results tables

Table 3. Impact survey results

Prev. = Prevalence; % RBF = % reduction from baseline; † = prevalence percentiles (25th, 50th (median), 75th) across all schools; p-value = p-value of difference from baseline; Mean inten. = Mean intensity (epg / ep10ml); †† = Mean intensity percentiles across all schools

	Characteristics			Prevalence				Prevalence of heavy infections				Mean Intensity (epg / ep10ml)		
Infection	**Year**	**No. Schools**	**No. Pupils**	**Prev.**	**†**	**% RBF**	**p-value**	**Prev.**	**†**	**% RBF**	**p-value**	**Mean inten.**	**††**	**% RBF**
S. mansoni	BL	9	537	2.23%	0.0% 0.0% 0.0%	n/a	n/a	0.19%	0.0% 0.0% 0.0%	n/a	n/a	2.09	0.0 0.0 0.0	n/a
	FU4	9	776	0.39%	0.0% 0.0% 0.0%	82.70%	0.034	0.13%	0.0% 0.0% 0.0%	30.80%	0.889	1.05	0.0 0.0 0.0	49.67%
S. haematobium	BL	22	2064	9.21%	0.0% 0.0% 0.0%	n/a	n/a	1.60%	0.0% 0.0% 0.0%	n/a	n/a	3.59	0.0 0.0 0.0	n/a
	FU4	22	1819	2.36%	0.0% 0.0% 0.0%	74.38%	< 0.001	0.51%	0.0% 0.0% 0.0%	68.44%	0.002	0.57	0.0 0.0 0.0	84.25%
Any STH	BL	9	537	0.0%	0.0% 0.0% 0.0%	n/a	n/a	0.0%	0.0% 0.0% 0.0%	n/a	n/a	n/a	n/a	n/a
	FU4	9	776	0.13%	0.0% 0.0% 0.0%	n/a	n/a	0.0%	0.0% 0.0% 0.0%	n/a	n/a	n/a	n/a	n/a

	Characteristics			Prevalence				Prevalence of heavy infections				Mean Intensity (epg / ep10ml)		
Infection	Year	No. Schools	No. Pupils	Prev.	†	% RBF	p-value	Prev.	†	% RBF	p-value	Mean inten.	††	% RBF
A. lumbricoides	BL	9	537	0.00%	0.0%	n/a	n/a	0.00%	0.0%	n/a	n/a	0	0.0	n/a
					0.0%				0.0%				0.0	
					0.0%				0.0%				0.0	
	FU4	9	776	0.00%	0.0%	n/a	n/a	0.00%	0.0%	n/a	n/a	0	0.0	n/a
					0.0%				0.0%				0.0	
					0.0%				0.0%				0.0	
Hookworm	BL	9	537	0.00%	0.0%	n/a	n/a	0.00%	0.0%	n/a	n/a	0.0	0.0	n/a
					0.0%				0.0%				0.0	
					0.0%				0.0%				0.0	
	FU4	9	776	0.13%	0.0%	n/a	n/a	0.00%	0.0%	n/a	n/a	0.02	0.0	n/a
					0.0%				0.0%				0.0	
					0.0%				0.0%				0.0	
T. trichiura	BL	9	537	0.00%	0.0%	n/a	n/a	0.00%	0.0%	n/a	n/a	0	0.0	n/a
					0.0%				0.0%				0.0	
					0.0%				0.0%				0.0	
	FU4	9	776	0.00%	0.0%	n/a	n/a	0.00%	0.0%	n/a	n/a	0	0.0	n/a
					0.0%				0.0%				0.0	
					0.0%				0.0%				0.0	

Table 4. Impact survey results by sex

Infection	Year	No. Schools	No. Girls	No. Boys	Prevalence	Prevalence	Prevalence of heavy infections	Prevalence of heavy infections	Mean Intensity (epg / ep10ml)	Mean Intensity (epg / ep10ml)
					Girls	Boys	Girls	Boys	Girls	Boys
S. mansoni	baseline	9	257	280	3.50%	1.07%	0.39%	0.00%	3.97	0.36
	FU4	9	398	378	0.25%	0.53%	0.00%	0.26%	0.02	2.14
S. haematobium	baseline	22	916	1148	7.21%	10.81%	1.31%	1.83%	3.00	4.06
	FU4	22	887	932	2.08%	2.62%	0.23%	0.77%	0.40	0.72
Any STH	baseline	9	257	280	0.00%	0.00%	0.00%	0.00%	n/a	n/a
	FU4	9	398	378	0.25%	0.00%	0.00%	0.00%	n/a	n/a
A. lumbricoides	baseline	9	257	280	0.00%	0.00%	0.00%	0.00%	n/a	n/a
	FU4	9	398	378	0.00%	0.00%	0.00%	0.00%	n/a	n/a
Hookworm	baseline	9	257	280	0.00%	0.00%	0.00%	0.00%	0	0
	FU4	9	398	378	0.25%	0.00%	0.00%	0.00%	0.030	0
T. trichiura	baseline	9	257	280	0.00%	0.00%	0.00%	0.00%	n/a	n/a
	FU4	9	398	378	0.00%	0.00%	0.00%	0.00%	n/a	n/a

Calculation of p-values of differences between sexes incorporated clustering at the school level. Statistical methodology is available from SCI on request.

4.3 Pdf of dashboard

MWI_Impact2017_BLtoFY4_dashboard.p