Malawi Recommendations Report
Impact Survey 2016

Schistosomiasis Control Initiative

Imperial College London

1 Programmatic recommendations

This reports reviews the 3rd year of follow-up (FU3) impact survey which was conducted in 10 districts in March 2016 following three rounds of mass preventive chemotherapy for schistosomiasis (SCH) and soil-transmitted helminths (STH). As discussed and agreed between the Malawian Ministry of Health (MoH) and SCI, the following programmatic actions are:

Finding or observation	Interpretation	Programmatic action
Prevalence of heavy-intensity infection <2% across sentinel sites	Treatment is reaching the schools and having an impact on morbidity.	- It has been decided by the MoH to begin re-assessing all the districts with Malawi. - The reassessment will determine if impact has been replicated elsewhere in Malawi and to review treatment strategies to ensure effective allocation of resources.
Increase in prevalence of *S. haematobium* and heavy intensity infection in a number of schools from 2015 despite overall reduction in both.	Spikes in results from school level information due to low treatment coverage in particular schools, poor sanitation or other environmental factors.	- Review the coverage in all the sentinel site schools and monitor those that are persisting with higher prevalence. - Continue to monitor changes in infection, particularly any increase in heavy intensity in all age groups.
Higher prevalence of heavy intensity infections in the 11-12 year olds compared to 6-8 year olds.	- Treatment coverage in older age groups is lower. - Risk behaviour in older age groups is more prevalent.	- Review coverage and attendance data for schools – Ensure the MoH program is conducting sensitisation and health education so that the higher risk 10-14 year olds are being educated as well as treated.
No significant difference in prevalence or intensity of infection between males and females	- Males and females are being treated equally. - Efficacy of praziquantel is equitable in males and females	None to be taken the program is having an impact on boys and girls equally.

Due to the decrease of prevalence and intensity seen within the sentinel site schools, the Malawian MoH has taken the decision to re-assess 13 districts which were mapped pre-2012 and have received five rounds of treatments. The remaining 15 districts will be re-assessed in 2017 and 2018.

Associated protocol:
https://share.imperial.ac.uk/fom/IDE/SCI/The%20Hub/MWI_IMPACT_Year%203%20Follow%20up%20ProtocolTechnician_EN_JW.docxl

Associated dashboard:
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Associated in-depth results:
R:\Countries\Malawi\Impact\2016_ICOSA_FU3\5_Results\ Malawi_FU3_Impact_results_2016-08-22

2 Background

Malawi has been implementing Mass Drug Administration (MDA) since 2009 with national treatments beginning in 2012. To date there has been 4 national MDA's with the 5th due to taking place between April and June 2017. The current aim of the program is to eliminate schistosomiasis as a public health problem within Malawi which is currently defined by WHO as reducing prevalence to below 1%.

Schistosoma mansoni, *S. haematobium* and the STH are endemic in all 28 districts in Malawi. A baseline impact survey was carried out prior to the first national MDA in March 2012 in 22 sentinel schools sampling 2,642 children. In March 2014, the first follow up occurred preceding the second national MDA campaign (April – June 2014) in the same 22 schools with 1,458 children followed up longitudinally and 846 new students as a cross-section sample in line with the original protocol. Following 2014, internal team discussions at SCI and with in-country partners led to the adaption of the original protocol. FU2 was the first round of data collection using this modified cross-sectional design. The report which outlines the details and reason for change can be found here:

https://share.imperial.ac.uk/fom/IDE/SCI/The%20Hub/MWI%20ICOSA%20ME%20report%20baseline%20FU1%20and%20FU2_Final.pdf.

FU3 followed the same protocol as FU2, sampling children from the same schools in a cross sectional manner. The protocol for this survey is referenced above.

Results from previous impact surveys have shown a decrease in prevalence and intensity for both *S. haematobium* and *S. mansoni* from baseline. Initial baseline prevalence was very low and therefore measuring impact has been difficult. The FU2 impact report provides additional information on this. Despite the difficulties in measuring the impact from the initial low prevalence the program is still reporting a significant reduction in prevalence and intensity of infection from baseline.
This impact seen within Malawi can be attributed to the successful treatment campaigns. Prior to this 2016 (FU3) data collection, treatment had been implemented in April 2015, reaching 6.18 million individuals nationwide both adults and SAC. Table 1 outlines the timing of each round of data collection and treatment since baseline in 2012.

Previous coverage surveys as well as the most recent one, conducted in September 2016, have reported high coverage in SAC who attend school, with the majority of districts reaching well above the WHO threshold of 75% coverage in SAC. Coverage for SAC who do not attend school has shown to be much lower than those who do attend school.

Table 1. Timeline of data collection and treatment since baseline in 2012.

	2012 - Baseline	2013	2014 – FU1	2015 – FU2	2016 – FU3
Data Collection	Feb - March	None	Feb - March	Feb – March	March – April
Treatment	May	None	April – May	April - May	May - June

3 Aim and Objectives

The objectives of the impact survey are:

- **Survey Objective 1. To measure the reduction in the mean intensity of infection of SCH in children**
- **SO. 2 To measure the reduction in the percentage of infected children with SCH**
- **SO. 3 To measure the reduction in the percentage of heavily infected children with SCH**

  S. mansoni: Number of children with ≥400 eggs per gram in their stool / total number of children tested

  S. haematobium: Number of children with more than ≥50 eggs per 10ml in their urine / total number of children tested
- **SO. 4 To measure the reduction in the mean intensity of infection of STH**
- **SO. 5 To measure the reduction in the percentage of heavily infected children with STH**

  A. lumbricoides: Number of SAC with ≥50,000 eggs per gram in their stool / total number of SAC tested

  T. trichiura: Number of SAC with ≥10,000 eggs per gram in their stool / total number of SAC tested

  Hookworm: Number of SAC with ≥4,000 eggs per gram in their stool / total number of SAC tested
- **SO. 6 To measure the reduction of macro haematuria in children with *S. haematobium* infection**

  Number of children with visible blood in urine i.e. direct observation of a urine specimen which appears reddish in colour
- **SO. 7 To measure the reduction of micro haematuria in children with *S. haematobium* infection**

  Number of children with micro haematuria as detected with a reagent dipstick

4 Methods

This FU 3 follow up evaluation used a 'cross-sectional' design where the same individuals were *not* followed up and sampling took place in the same sentinel schools as previously reported at baseline and subsequent annual follow-ups. In summary, 22 schools and 2,640 pupils were targeted for sampling. Nine schools were monitored for *S. haematobium*, *S. mansoni* and STH with the other 13 monitored for only *S. haematobium*. The cross-sectional method randomly samples 6, 7, 8 year olds to allow direct comparison to baseline as well as a selection of 11 year-olds who are generally more at-risk of infection (Table 2). In each school, 15 girls and 15 boys are randomly sampled from each age group to total 120 per school. A summary of the number of children sampled from each age group from baseline to FU3 can be found in Table 3.

Table 2. Age group of children to be sampled during follow up surveys.

Year	Age in cross sectional study			
Follow-up 2	6	7	8	11-12
Follow-up 3	**6**	**7**	**8**	**11-12**

All of the technicians involved in this FU3 survey were involved in FU2 data collection. For this reason, training was focussed on changes to protocol and previous errors on data recording in the field and,

in particular, how to record the volume of urine. The protocol with technicians' guide can be found here:

https://share.imperial.ac.uk/fom/IDE/SCI/The%20Hub/MWI_IMPACT_Year%203%20Follow%20up%20ProtocolTechnician_EN_JW.docxl

There were two teams made up of five technicians: one team focussed on the schools that collect stool samples with the other team travelling to the urine only sample collection. The stool collection team spends two days at each school, this, along with the large sample numbers at schools, means the teams are in the field for four weeks. The technician manual has more detail on the schedule of activity team roles and responsibility. No deviations to the protocol were reported this year during data collection.

5 Results

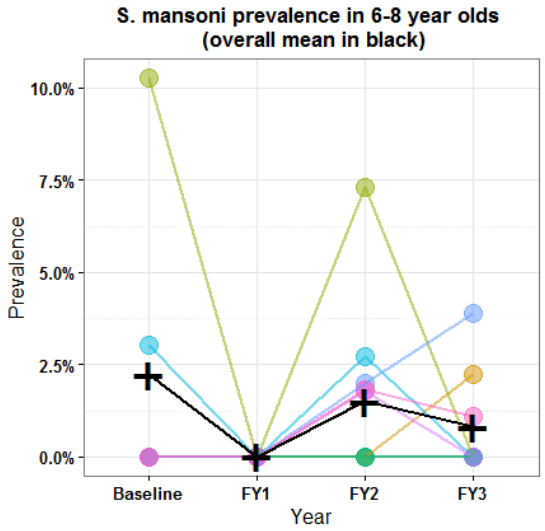
There were no significant deviations in terms of the age range of pupils sampled;

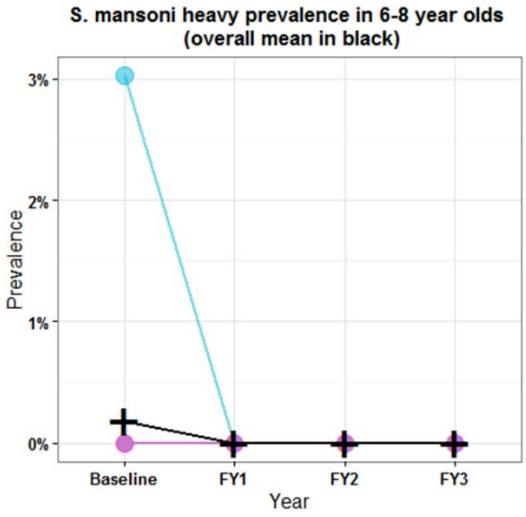
- Two of the schools, Kanyerere JP and Young Ambassadors tested less than 75% of the 120 pupils required by the protocol.
- The proportion of girls sampled ranged from 45% to 60% - an acceptable range for the protocol requirement of 50% with the exception of Likuni Boys, a single sex school with no female pupils.

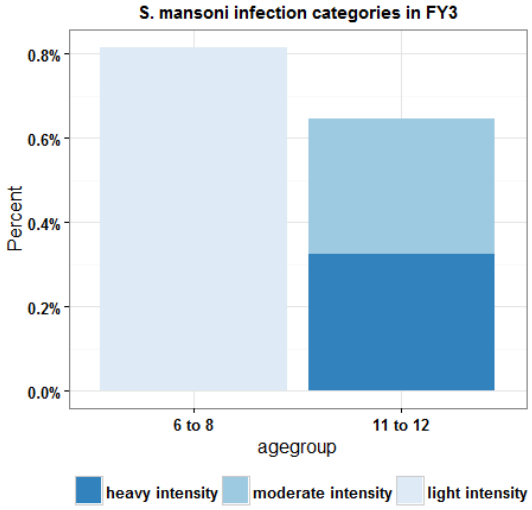
Table 3. Summary of total number of children sampled by age during each round of data collection.

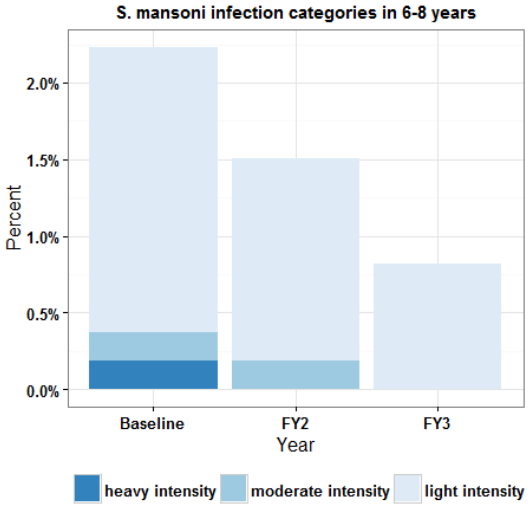
Age	Baseline		FY1		FY2		FY3	
	N	%	N	%	N	%	N	%
4	0	0%	10	0%	0	0%	0	0%
5	20	1%	110	5%	0	0%	0	0%
6	400	15%	279	12%	606	27%	612	25%
7	472	18%	252	11%	519	23%	567	23%
8	1193	45%	357	15%	491	22%	616	25%
9	360	14%	283	12%	1	0%	0	0%
10	146	6%	713	30%	3	0%	0	0%
11	14	1%	198	8%	554	24%	595	24%
12	4	0%	84	4%	81	4%	91	4%
13	0	0%	33	1%	0	0%	0	0%
14	0	0%	17	1%	0	0%	0	0%
15	0	0%	3	0%	0	0%	0	0%
NA	25	1%	14	1%	24	1%	1	0%

5.1 *S. mansoni*



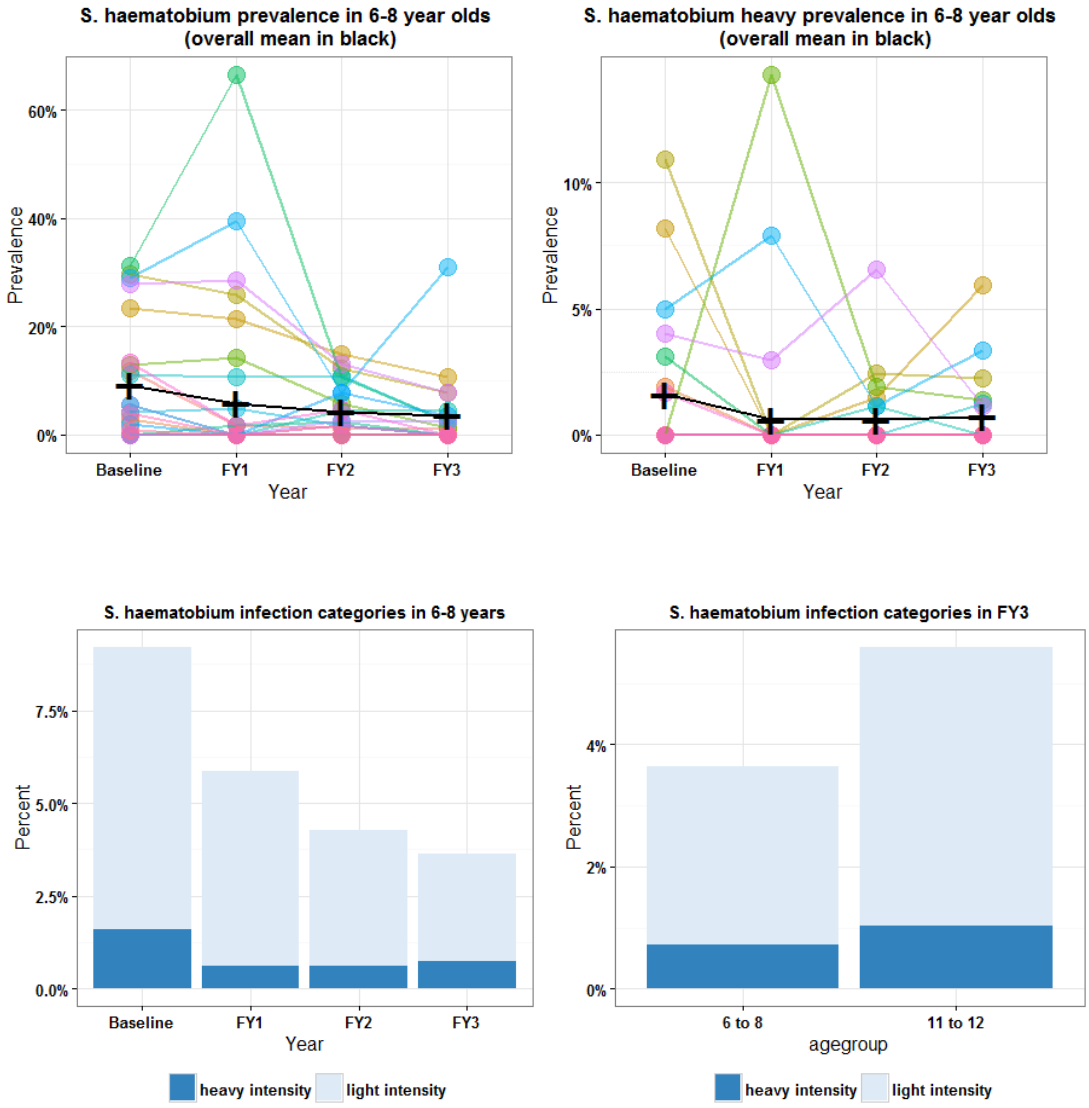






The mean prevalence of *S. mansoni* has reduced from 2.23% at baseline to 0.82% at FU3. Prevalence of heavy infection has reduced from 0.19% to 0%. Due to the low initial prevalence for *S. mansoni* our sample size is not large enough to detect if this reduction is statistically significant. Mean intensity (eggs per gram) has reduced from 2.09 at baseline to 0.19 at FU3.

5.2 *S. haematobium*

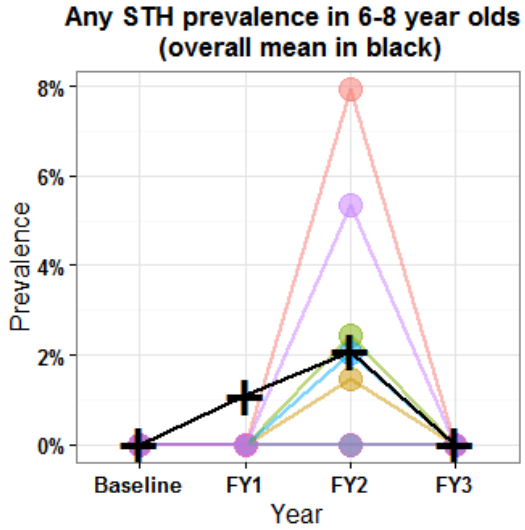


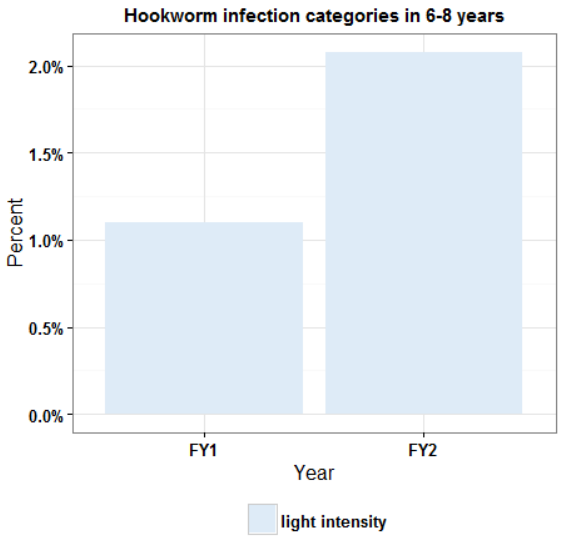
The prevalence of *S. haematobium* has reduced from 9.21% at baseline to 3.64% at FU3. Prevalence of heavy infection has reduced from 1.60% at baseline to 0.73% at baseline and mean intensity of infection (eggs per cl) has reduced from 3.59 to 1.12.

The significance of the reduction was tested by binomial generalised linear mixed models. The reduction of prevalence was found to be significant ($p < 0.05$) while the reduction of heavy prevalence was found to be weakly significant ($p = 0.02$)

Additionally, *for S. haematobium* at baseline there was a small but significant effect for gender with girls being less infected than boys ($p = 0.0001$).

5.3 STH

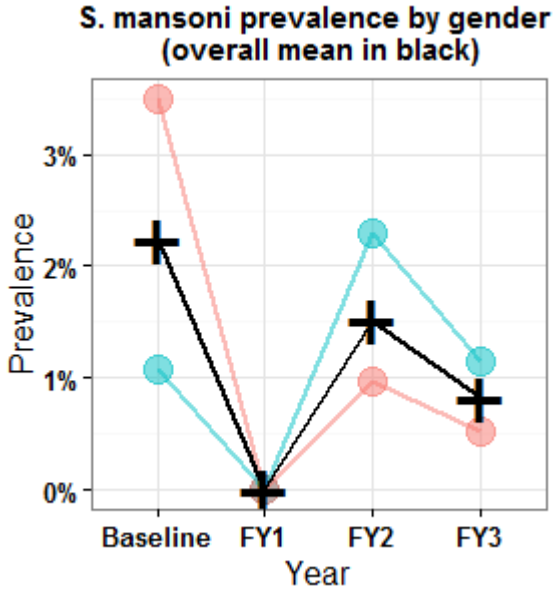


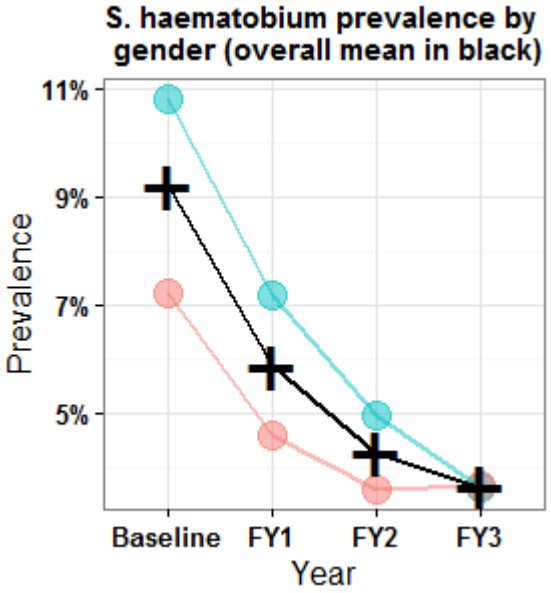


There were no positive cases of STH reported in FU3 so they are not included in the figure. Hookworm infections were observed in FU1 and FU2. The overall level of STH infection is sufficiently low that the variation observed is within the margin of error for a study of this size. Only light infections were observed for Hookworm.

(**NB** The results for one school (006 021) from FU1 have been excluded from the plot above. The infection status for only 2 students, both positive, were recorded and this resulted in a misleading value of 100% prevalence for that school and made the plot difficult to interpret.)

5.4 Gender





As stated above girls are significantly less infected with *S. haematobium* than boys, however there are no gender differences in the overall impact on S. *haematobium* since baseline.

Although *S. mansoni* appears to show a difference for the genders, in fact this represents a difference of only 2.43% at baseline and 0.62% at FU3. This difference was not significant.

Key Outputs	S. mansoni	S. haematobium	Any STH
Prevalence (%)	-1.41	-5.57	0
Prev. heavy inf. (%)	-0.19	-0.87	NA
Mean epg/epcl	-1.90	-2.47	0