

Malawi Re-assessment Survey 2018 Recommendations Report



1 Programmatic recommendations

This report reviews the re-assessment survey which was conducted across 9 districts in Malawi, in April-June 2018 following five rounds of mass preventive chemotherapy (PC) for schistosomiasis (SCH) and soil-transmitted helminths (STH). Sampling was stratified into high-risk or low-risk of infection within each surveyed district. The classification of high-risk, or 'hotspots', were based primarily on local knowledge, which created 22 sub-districts for analysis. In this report whether an area is high-risk or low-risk is denoted by a 1 or 0 after the district name, respectively. This survey illustrates, at the district level, changes in prevalence from the pre-treatment baseline to the current situation post 5 rounds of PC. The last PC campaign that previous to this survey was in July 2017 and the next occurred in October 2018. The following programmatic recommendations are:

Table 1: Observations, interpretations and programmatic actions determined from the reassessment survey results

Finding or observation	Interpretation	Programmatic action
<p>For <i>Schistosoma mansoni</i>:</p> <ul style="list-style-type: none"> - 15 of the 22 surveyed sub-districts had an average estimated prevalence <1% - The remaining 7 had an average estimated prevalence that fell within the World Health Organisation (WHO) defined low-risk category (≥1% <10%). - Prevalence maps demonstrate that district-level WHO risk category fell between surveys from low in 2012 to no-risk in 2018 in Mzimba, Nchisi and Neno. 	<p>For <i>S. mansoni</i>, all sub-districts are low-risk or no-risk (<10% prevalence).</p> <p>Overall, prevalence of <i>S. mansoni</i> is decreasing.</p> <p>The treatment strategy will need to be reviewed for each sub-district following re-classification based on prevalence according and in line with WHO guidelines (WHO 2013, Annex 10+).</p>	<p>Ministry of Health (MoH) to complete re-assessment in remaining districts in 2019 and adjust national treatment plan accordingly.</p> <p>Treatment frequency to be determined by highest level of risk of any schistosomiasis, as per WHO guidelines.</p> <p>MoH to continue implementing measures to reduce prevalence of SCH.</p>
<p>For <i>Schistosoma haematobium</i>:</p> <ul style="list-style-type: none"> - 19 of the 22 surveyed sub-districts had an average estimated prevalence that fell within the WHO defined low risk category (1% - 10%) - The remaining 3 sub-districts had an average estimated prevalence <1%. - Prevalence maps demonstrate that <i>S. haematobium</i> district-level WHO risk category dropped between surveys 	<p>For <i>S. haematobium</i>, all sub-districts are now low-risk (<10% prevalence).</p> <p>Overall, prevalence of <i>S. mansoni</i> is decreasing.</p> <p>The treatment strategy will need to be reviewed for each sub-district following re-classification based on</p>	<p>MoH to complete re-assessment in remaining districts in 2019 and adjust national treatment plan accordingly.</p> <p>Treatment frequency to be determined by highest level of risk of any SCH, as per WHO guidelines.</p>

Finding or observation	Interpretation	Programmatic action
from moderate in 2012 in low in 2018 in Ntcheu, Balaka, Neno and Blantyre. It remained low in the remaining districts for which mapping data was available.	prevalence according and in line with WHO guidelines†.	MoH to continue implementing measures to reduce prevalence of SCH.
In all 13 district mapping areas, estimated prevalence of ‘any schistosomiasis’ decreased from district-level baseline (2012 mapping data). The decreases in prevalence observed were statistically significant in 10 of these 13 district mapping areas.	PC is reaching target population in these areas and overall, prevalence of SCH is decreasing. The pattern of change varied between district mapping areas and between species.	MoH to maintain these gains and to continue monitoring changes in level of infection.
At the school level (page 5 of the dashboard) <i>S. haematobium</i> prevalence was observed to decrease between surveys for most schools.	PC is reaching target population in these areas and overall, prevalence of both species of SCH are observed to decrease.	MoH to maintain these gains and to continue monitoring changes in level of infection.
For <i>S. mansoni</i> , school prevalence was observed to decline or remain at a similar low level between 2012 and 2018	The pattern of change varied between schools and between species.	

Finding or observation	Interpretation	Programmatic action
<p>With the exception of <i>S. haematobium</i> in Lilongwe City and Ntcheu, and <i>S. mansoni</i> in Mzimba South, there were no statistically significant differences between the results of high-risk (hotspot) and low-risk (non-hotspot) areas.</p> <p>Where differences were found, these were not consistent: In Ntcheu, <i>S. haematobium</i> prevalence was higher in the low-risk area than in the high-risk area. In Lilongwe City (for <i>S. haematobium</i>) and Mzimba South (for <i>S. mansoni</i>), the prevalence was higher in high-risk areas than low risk areas.</p>	<p>Hotspot classification of areas based on local knowledge and practices may not be related to prevalence, or may not be specific enough to inform sub-district level treatment of SCH.</p>	<p>Standardised criteria to be identified by MoH and implemented for classification of hotspot and non-hotspot areas, utilising World Health Organisation (WHO) guidelines, recommendations and evidence from other endemic settings.</p> <p>Pending results from 2019 re-assessment, district level likely to remain as the implementation unit (IU) for treatment.</p>
<p>STH is endemic in all surveyed sub-districts, with an estimated prevalence <20% (low-risk) in all cases.</p> <p>Despite this, Table 6 demonstrates that prevalence increased in all areas except for Lilongwe Rural West and Mzuzu City.</p>	<p>Based on re-assessment results, all sub-districts remain low risk according to WHO thresholds.</p> <p>Increases in prevalence of STH may be as a result of the stopping of the Programme for the Elimination of Lymphatic Filariasis, or other secular environmental changes.</p>	<p>MoH to complete re-assessment in remaining districts in 2019 to inform national treatment strategy for STH.</p> <p>MoH to investigate and implement measures to prevent recrudescence of STH prevalence</p>

† Helminth control in school age children: a guide for managers of control programmes – 2nd ed. World Health Organisation (2013)

2 Methods

All methods described in associated protocol:

https://imperiallondon.sharepoint.com/:w:/r/sites/fom/schisto/mer/2_Country_M%26E/MWI/Mapping/FY_1718/1_Protocol_%26_pre-survey/MWI_Reassessment_Protocol_2018_updated.docx?d=wdfbe5bfcc45e4a6580700ea96fd786db&csf=1&e=PZOQrN

2.1 Field methods

- The data collection was paused for one week during the survey, due to school holidays from 14-18 May 2018.

- In-country supervision was provided by the MoH. The Schistosomiasis Control Initiative (SCI) Programme Advisor also travelled to Malawi for a supervision visit.
- Remote data checks were undertaken by SCI's Monitoring, Evaluation and Research (MER) team. Data queries were passed on to the MoH who then liaised with the survey teams to address identified issues.
- During the survey, updated site selection lists were generated for Lilongwe, as a large number of selected schools were either closed or attended by students outside of the required age group.
- Due to delayed delivery of survey equipment, urine filters were washed and reused for urine filtration.

2.2 Deviations from protocol

- In total, 277 schools were visited. Five schools more than the required number defined by the protocol were included in the survey
- Thirteen reserve schools were visited in place of selected schools. The main reason given for not using the selected schools was that pupils in these schools were over or under the required age range.
- Thirteen schools that were not in the selected or reserve lists were also visited. Nine of them were in Lilongwe City, representing 75% of the schools in this sub-district (9 out of 13 schools).
- Numbers of pupils per school: only 2 schools deviated from 30 (one with 10 and the other with 20 pupils examined).
- Gender: overall, gender ratio was 50%. Exceptions to this are: the sex ratio of the school where only 10 pupils were sampled was 80%, and there were two schools of only girls and two schools of only boys.

2.3 Ethical approval

Ethical approval was requested from the National Health Sciences Research Committee in Malawi, however the application was exempted from ethical review as it was considered to be an evaluation activity of an existing MoH programme (exemption letter located here):https://imperiallondon.sharepoint.com/:i:/r/sites/fom/schisto/mer/2_Country_M%26E/MWI/Mapping/FY_1718/1_Protocol_%26_pre-survey/MWI_Reassessment2018_Ethical_Approval.jpg?csf=1&e=gPNE9g). In the UK, ethical approval was granted by Imperial College Research Committee ICREC_8_2_2.

3 Survey Recommendations

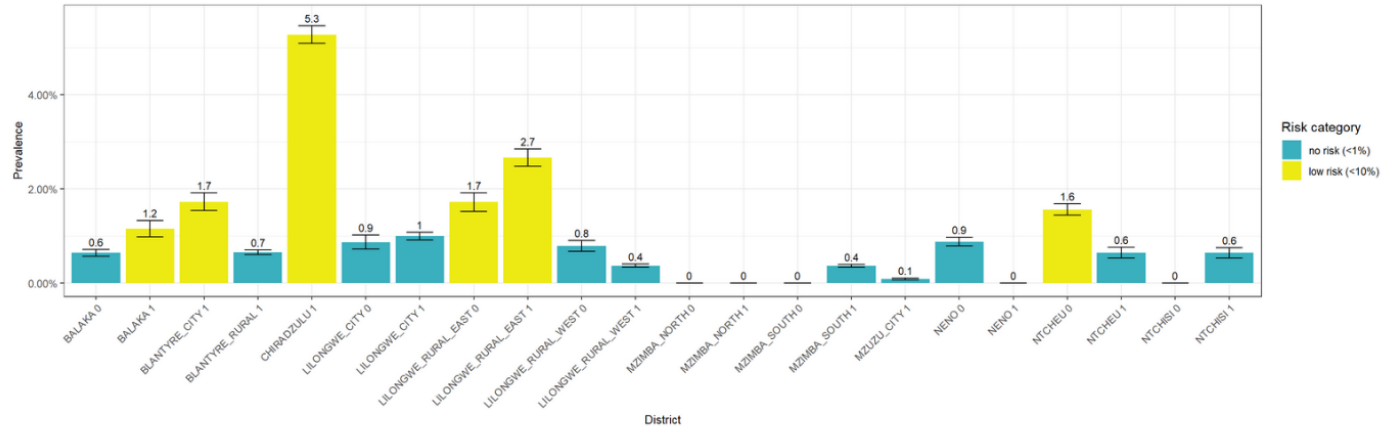
Table 2: Observations, interpretation and corrective measures for the survey process itself.

Finding or observation	Interpretation	Corrective action
<p>The number of selected schools that could not be visited is relatively large, particularly in the case of Lilongwe City (75% of the schools in this implementation unit (IU) were not in the list of schools).</p>	<p>If a large proportion of schools does not correspond to the randomised list then the representativeness of the sample can be questioned.</p> <p>School lists provided were outdated or inaccurate.</p>	<p>MoH to liaise with the Ministry of Education (MoE) obtain and supply an accurate and up to date list of eligible schools for site selection at protocol development stage.</p> <p>MoH and SCI to provide additional training to enumerators on protocol adherence and reporting of deviations.</p>
<p>Data was collected on mobile phones using the surveyCTO data collection app.</p>	<p>Use of phones for data collection prevented reoccurrence of the data entry delays and quality issues identified in the 2017 reassessment (paper-based).</p> <p>Global positioning system (GPS) coordinates were available for all schools. The data cleaning process was faster than previous years.</p>	<p>Mobile phones to be used for data collection in future surveys.</p>
<p>Survey exceeded days allocated for data collection.</p>	<p>There was a lack of clarity around the scheduling requirements to fulfil the protocol.</p> <p>Teams may not have been clear on number of schools to be visited each day in order to reach required sample size.</p>	<p>MoH and SCI to place greater emphasis on survey planning, scheduling and logistics during training. Specifically team sizes and number of days to spend at each site.</p> <p>MoH to work with district counterparts to develop schedules in advance of survey commencement.</p>
<p>Equipment shortages required substantial unplanned local procurement.</p>	<p>Delivery of internationally procured items delayed and/or equipment requirements incorrectly calculated.</p>	<p>MoH to ensure sufficient equipment and consumables available prior to commencement of survey. SCI will support with survey planning and accurate calculation of required equipment in line with survey protocol for the next financial year.</p> <p>MoH to ensure survey budget includes sufficient allocation for items procured locally.</p>

4 Results

4.1 Dashboard

Schistosoma mansoni



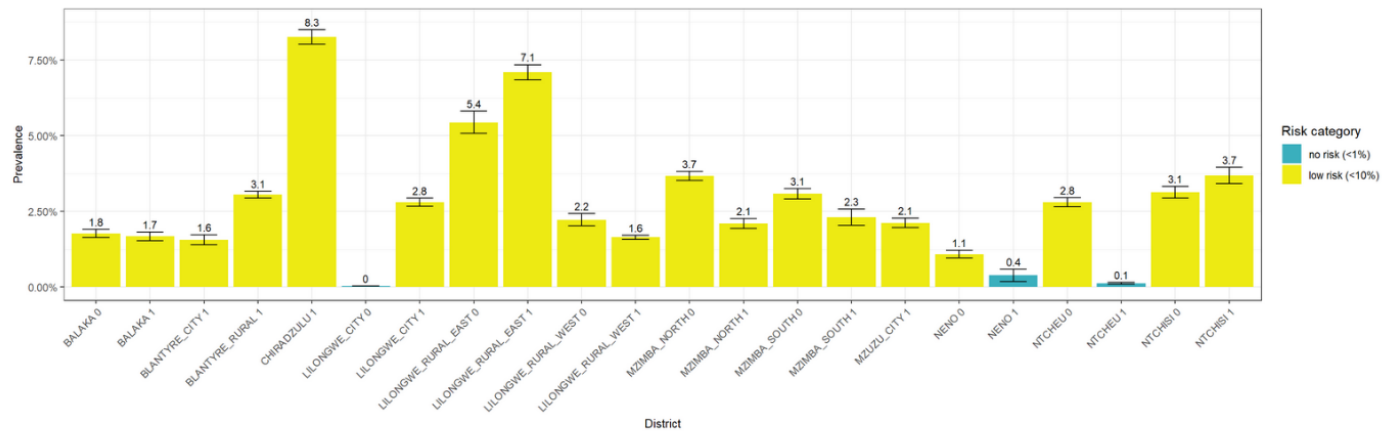
Comments: *Schistosoma mansoni*

Average prevalence estimates in all districts were below the WHO 10% threshold level for low infection. *S. mansoni* was not observed in 5 sub-districts, i.e. Mzimba North 0 and 1, Mzimba South 0, Neno 1 and Ntchisi 1, whilst it attained its highest prevalence in the district of Chiradzulu (5.3%; 95% CI: 5.1% to 5.5%). Prevalence in high-risk and non-high risk areas were not significantly different except in Mzimba South as *S. mansoni* was not observed in non-high risk areas but reached an average prevalence of 0.35% (95% CI: 0.32 to 0.38) in high risk areas.

Risk category	# Districts
no risk (<1%)	16
low risk (<10%)	6
moderate risk (<50%)	0
high risk (>= 50%)	0

Note: Index 1 at the end of the district name indicates the sub-district inclusive of hotspot schools and 0 indicates the sub-district inclusive of non-hotspot schools.

Schistosoma haematobium

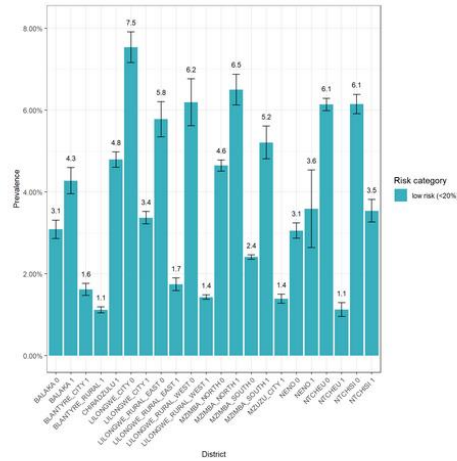


Comments: *S. haematobium*

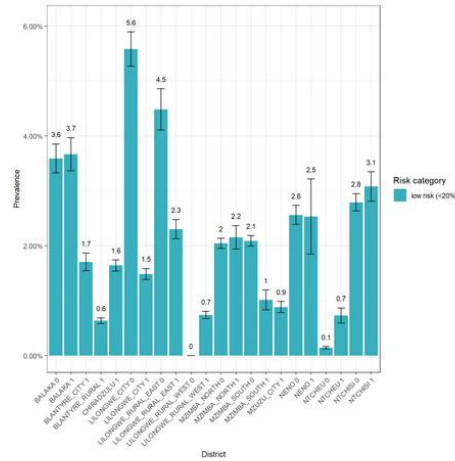
All the implementation units examined in the 2018 re-assessment survey had prevalence estimates below 10%. *S. haematobium* was not observed in Lilongwe City 0 whilst Neno 1 and Ntcheu 1 had prevalence values below 1%. Prevalence of *S. haematobium* was significantly different between non-risk and risk areas in two cases only. Firstly, and contrary to what was expected, the prevalence of *S. haematobium* in Ntcheu 0 (2.8%; 95% CI: 2.7% to 3.0%) was significantly larger than in Ntcheu 1 (0.1%; 95% CI: 0.1% to 0.2%). Secondly, the observed prevalence of 0.03% (95% CI: 0.03% to 0.04%) in Lilongwe City 0 was significantly lower than that in Lilongwe City 1 (2.81%; 95% CI: 2.67% to 2.94%).

Risk category	# Districts
no risk (<1%)	3
low risk (<10%)	19
moderate risk (<50%)	0
high risk (>= 50%)	0

Ascaris lumbricoides



Hookworm



Comments

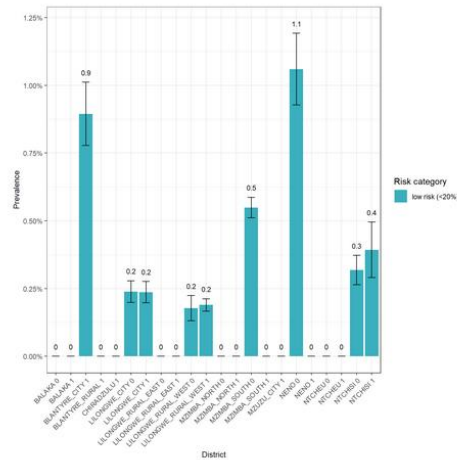
Ascaris lumbricoides was the most abundant of the three STH species identified in this survey. *A. lumbricoides* was found in all the areas and districts examined with prevalence ranging from 7.5% in Lilongwe City 0 (95% CI: 1.2% to 7.9%) to 1.1 in Ntcheu 0 (95% CI: 1.0% to 1.3%) and Blantyre rural 1 (95% CI: 1.0% to 1.2%).

Risk category	# Districts
low risk (<20%)	22
moderate risk (<50%)	0
high risk (>=50%)	0

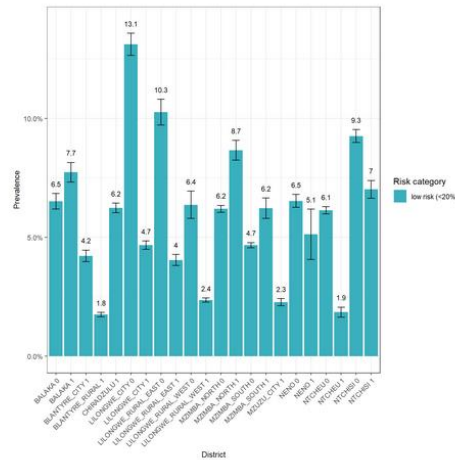
Hookworm was present in all districts except for Lilongwe Rural West 0. Prevalence in all the districts was below the WHO 20% threshold level for low risk of infection.

Risk category	# Districts
low risk (<20%)	22
moderate risk (<50%)	0
high risk (>=50%)	0

Trichuris trichiura



Any STHs



Comments

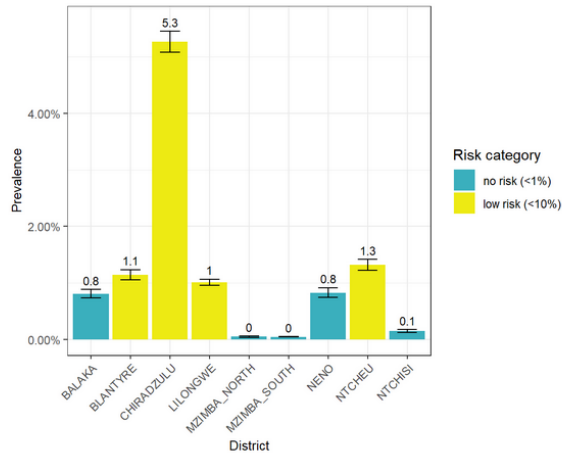
Trichuris trichiura was found in 9 out of the 22 sub-districts. Prevalence was relatively low in all cases, reaching a maximum of 1.1% in Neno 0 (95% CI: 0.9% to 1.2%).

Risk category	# Districts
low risk (<20%)	22
moderate risk (<50%)	0
high risk (>=50%)	0

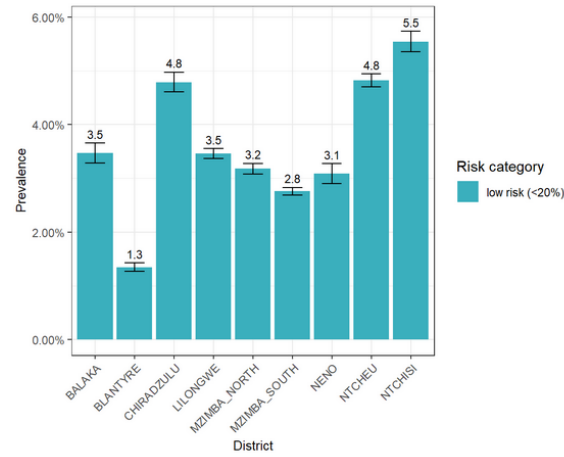
STHs were found in all of the 22 sub-districts visited with prevalence ranging from 13.1 (95% CI: 12.6% to 13.6%) in Lilongwe City 0.

Risk category	# Districts
low risk (<20%)	22
moderate risk (<50%)	0
high risk (>=50%)	0

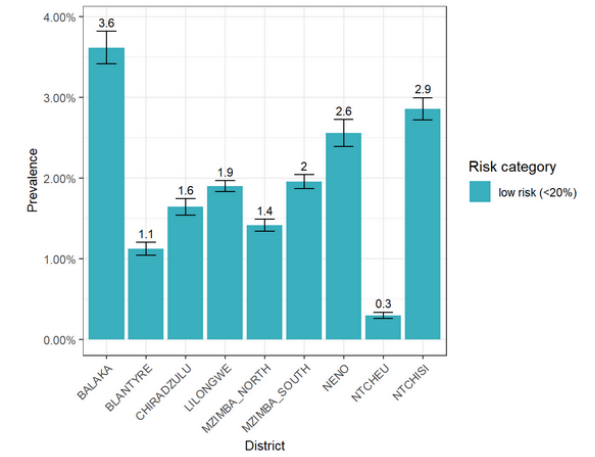
Schistosoma mansoni



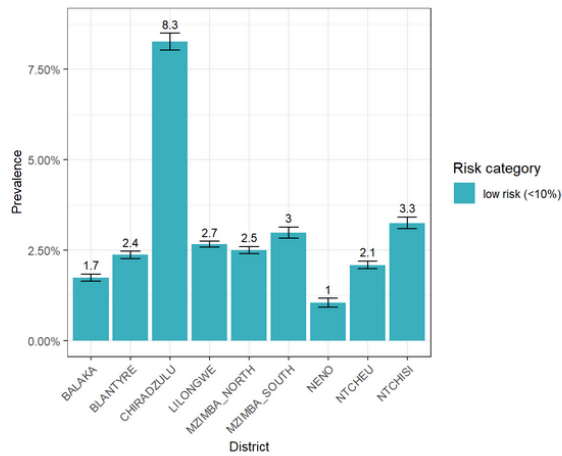
Ascaris lumbricoides



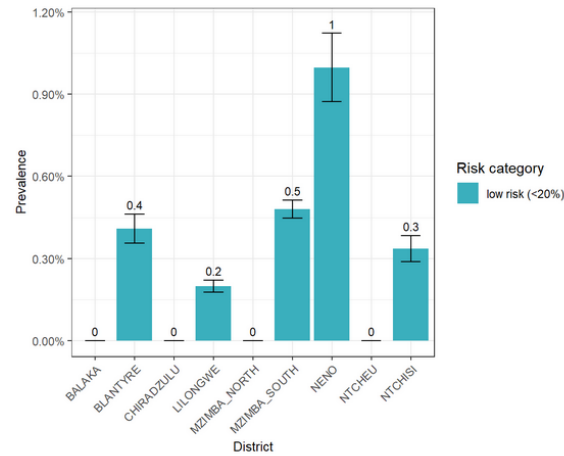
Hookworm



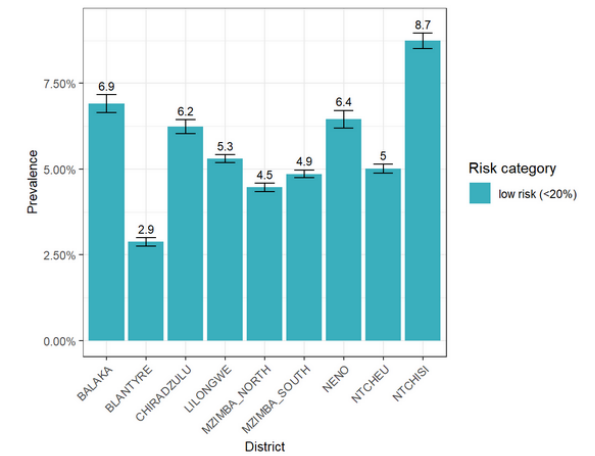
Schistosoma haematobium



Trichuris trichiura



Any STHs



Prevalence of *Schistosoma haematobium*, 2012 mapping survey

MALAWI 2012
Mapping Survey

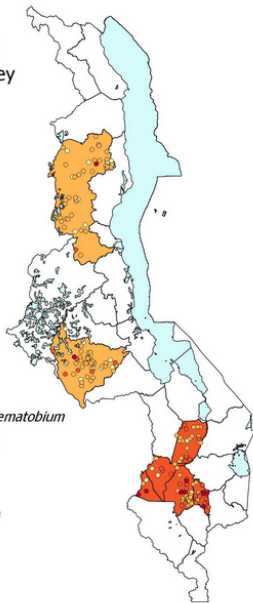
Schistosoma haematobium

School prevalence

- <1%
- 1% to 20%
- 20% to 50%
- >50%

District prevalence

- <1%
- 1% to 10%
- 10% to 50%
- >50%



Prevalence of *Schistosoma haematobium*, 2018 re-assessment survey

MALAWI 2018
Re-assessment
Survey

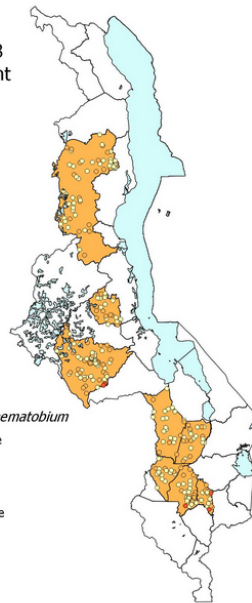
Schistosoma haematobium

School prevalence

- <1%
- 1% to 20%
- 20% to 50%
- >50%

District prevalence

- <1%
- 1% to 10%
- 10% to 50%
- >50%



Prevalence of *Schistosoma mansoni*, 2012 mapping survey

MALAWI 2012
Mapping Survey

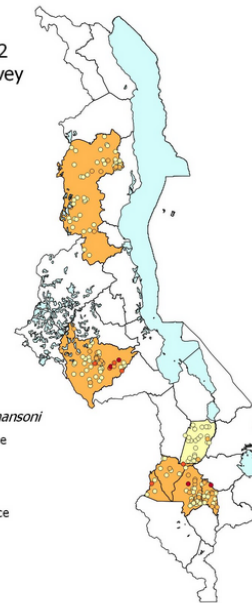
Schistosoma mansoni

School prevalence

- <1%
- 1% to 20%
- 20% to 50%
- >50%

District prevalence

- <1%
- 1% to 10%
- 10% to 50%
- >50%



Prevalence of *Schistosoma mansoni*, 2018 re-assessment survey

MALAWI 2018
Re-assessment
Survey

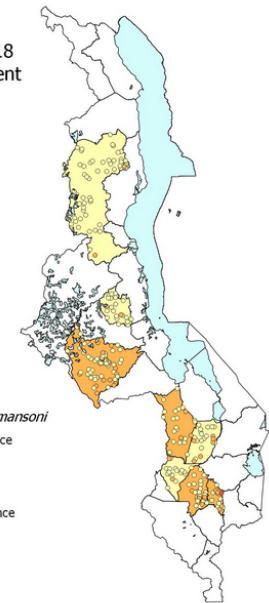
Schistosoma mansoni

School prevalence

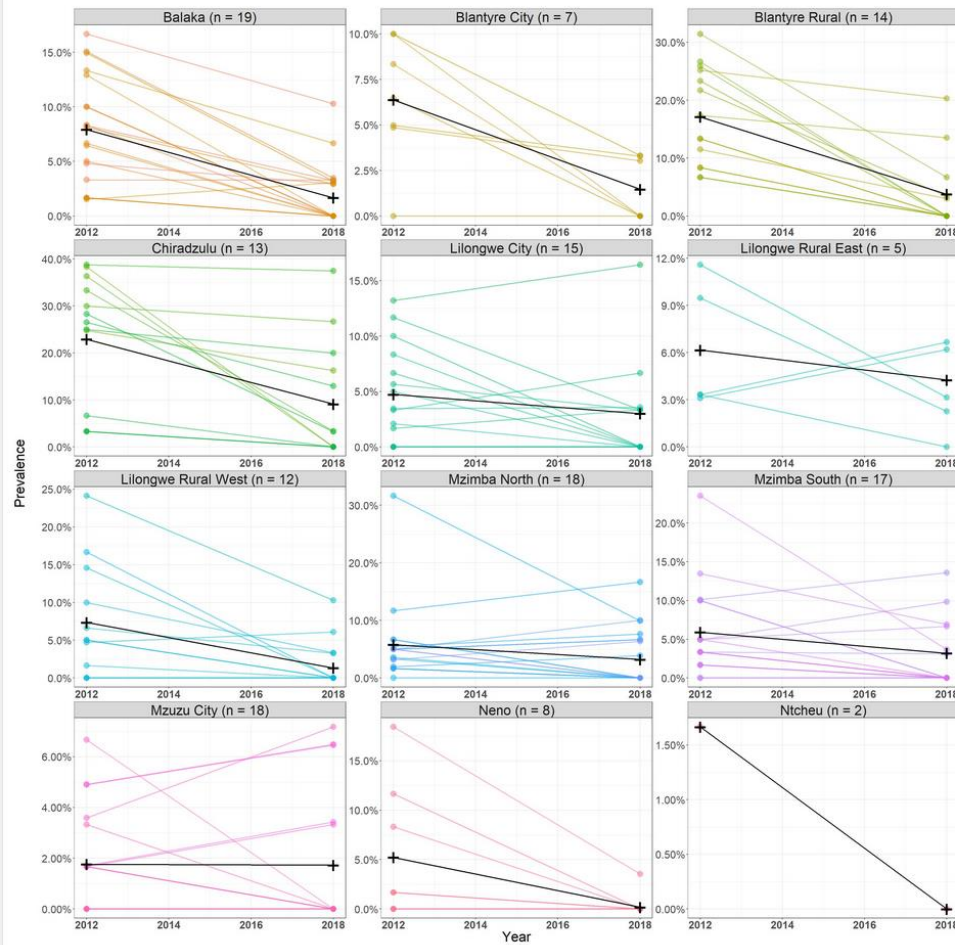
- <1%
- 1% to 20%
- 20% to 50%
- >50%

District prevalence

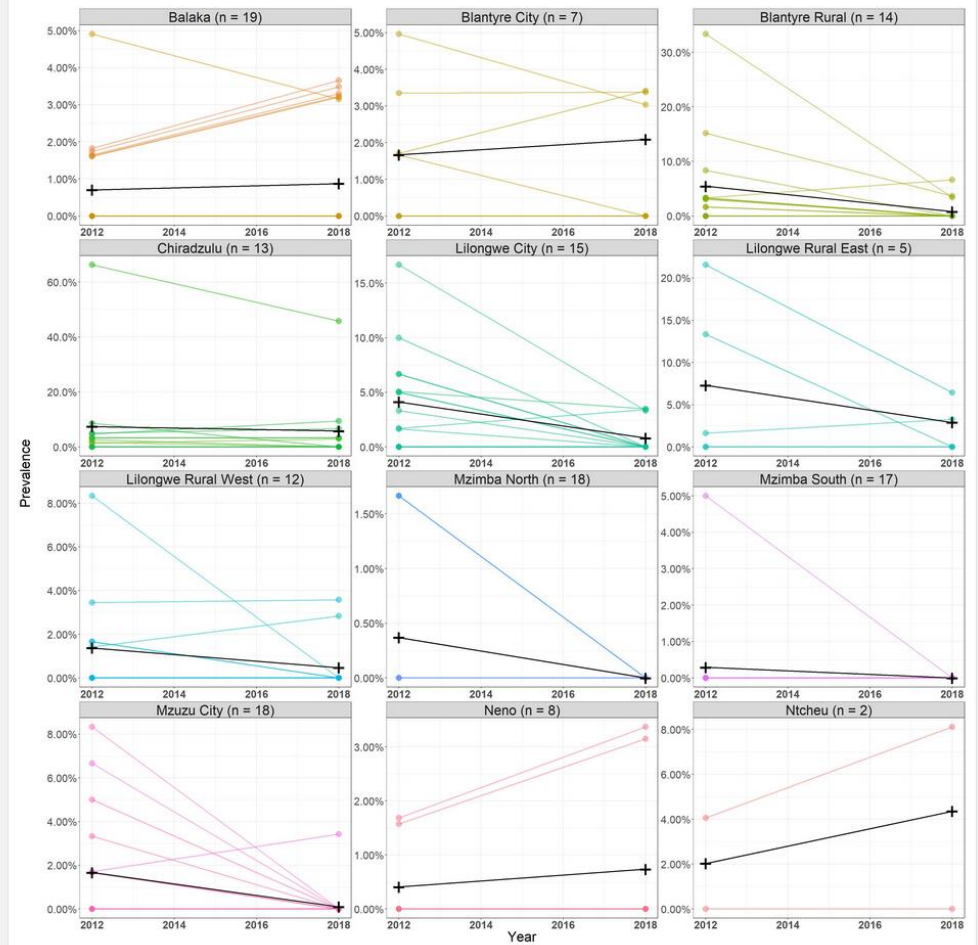
- <1%
- 1% to 10%
- 10% to 50%
- >50%



Prevalence of *Schistosoma haematobium*
(Overall mean in black; number of schools *n* in brackets)



Prevalence of *Schistosoma mansoni*
(Overall mean in black; number of schools *n* in brackets)



4.2 Results tables

Table 3. Mapping survey results by district stratified by high-risk (or 'hotspot') = 1 and low-risk = 0 and by species of SCH and STH.

Infection	Characteristics				Prevalence		Prevalence of heavy infections		Mean Intensity (epg / ep10ml)	
	District	Hotspot (0 = No, 1 = Yes)	No. Schools	No. Pupils	Prevalence	95% confidence interval	Prevalence of heavy infections	Prevalence of heavy infections percentiles† across all schools	Mean Intensity (epg / ep10ml)	Mean intensity percentiles† across all schools
<i>S. mansoni</i>	BALAKA	No	12	360	0.6%	(0.6, 0.7)	0.0%	0, 0, 0	0.2	0, 0, 0
	BALAKA	Yes	10	300	1.2%	(1.0, 1.3)	0.0%	0, 0, 0	0.3	0, 0, 0
	BLANTYRE CITY	Yes	15	450	1.7%	(1.5, 1.9)	0.0%	0, 0, 0	1.0	0, 0, 0
	BLANTYRE RURAL	Yes	16	480	0.7%	(0.6, .07)	0.0%	0, 0, 0	0.4	0, 0, 0
	CHIRADZULU	Yes	15	448	5.3%	(5.1, 5.5)	0.0%	0, 0, 0	2.4	0, 0, 0
	LILONGWE CITY	No	13	390	0.9%	(0.7, 1.0)	0.0%	0, 0, 0	0.6	0, 0, 0
	LILONGWE CITY	Yes	16	479	1.0%	(0.9, 1.1)	0.0%	0, 0, 0	0.6	0, 0, 0
	LILONGWE RURAL EAST	No	14	400	1.7%	(1.5, 1.9)	0.0%	0, 0, 0	0.7	0, 0, 0
	LILONGWE RURAL EAST	Yes	11	330	2.7%	(2.5, 2.8)	0.4%	0, 0, 0	7.8	0, 0, 0
	LILONGWE RURAL WEST	No	11	322	0.8%	(0.7, 0.9)	0.0%	0, 0, 0	0.1	0, 0, 0
	LILONGWE RURAL WEST	Yes	13	390	0.4%	(0.3, 0.4)	0.0%	0, 0, 0	0.1	0, 0, 0
	MZIMBA NORTH	No	12	360	0.0%	(0.0, 0.0)	0.0%	0, 0, 0	0.0	0, 0, 0
	MZIMBA NORTH	Yes	10	300	0.0%	(0.0, 0.0)	0.0%	0, 0, 0	0.0	0, 0, 0
	MZIMBA SOUTH	No	15	450	0.0%	(0.0, 0.0)	0.0%	0, 0, 0	0.0	0, 0, 0
	MZIMBA SOUTH	Yes	10	300	0.4%	(0.3, 0.4)	0.0%	0, 0, 0	0.5	0, 0, 0
	MZUZU CITY	Yes	20	600	0.1%	(0.1, 0.1)	0.0%	0, 0, 0	0.0	0, 0, 0
	NENO	No	12	360	0.9%	(0.8, 1.0)	0.0%	0, 0, 0	0.3	0, 0, 0
	NENO	Yes	8	240	0.0%	(0.0, 0.0)	0.0%	0, 0, 0	0.0	0, 0, 0
	NTCHEU	No	12	360	1.6%	(1.4, 1.7)	0.0%	0, 0, 0	0.6	0, 0, 0
	NTCHEU	Yes	10	300	0.6%	(0.5, 0.8)	0.0%	0, 0, 0	1.1	0, 0, 0
NTCHISI	No	11	330	0.0%	(0.0, 0.0)	0.0%	0, 0, 0	0.0	0, 0, 0	
NTCHISI	Yes	11	328	0.6%	(0.5, 0.8)	0.0%	0, 0, 0	0.2	0, 0, 0	

Infection	Characteristics				Prevalence		Prevalence of heavy infections		Mean Intensity (epg / ep10ml)	
	District	Hotspot (0 = No, 1 = Yes)	No. Schools	No. Pupils	Prevalence	95% confidence interval	Prevalence of heavy infections	Prevalence of heavy infections percentiles† across all schools	Mean Intensity (epg / ep10ml)	Mean intensity percentiles† across all schools
<i>S. haematobium</i>	BALAKA	No	12	360	1.8%	(1.6, 1.9)	0.2%	0, 0, 0	0.2	0, 0, 0
	BALAKA	Yes	10	300	1.7%	(1.5, 1.8)	0.2%	0, 0, 0	0.3	0, 0, 0
	BLANTYRE CITY	Yes	15	450	1.6%	(1.4, 1.7)	0.0%	0, 0, 0	1.0	0, 0, 0
	BLANTYRE RURAL	Yes	16	480	3.1%	(2.9, 3.2)	0.2%	0, 0, 0	0.4	0, 0, 0
	CHIRADZULU	Yes	15	448	8.3%	(8.0, 8.5)	1.1%	0, 0, 0	2.4	0, 0, 0
	LILONGWE CITY	No	13	390	0.0%	(0.0, 0.0)	0.0%	0, 0, 0	0.6	0, 0, 0
	LILONGWE CITY	Yes	16	479	2.8%	(2.7, 2.9)	0.2%	0, 0, 0	0.6	0, 0, 0
	LILONGWE RURAL EAST	No	14	400	5.4%	(5.1, 5.8)	1.8%	0, 0, 0	0.7	0, 0, 0
	LILONGWE RURAL EAST	Yes	11	330	7.1%	(6.8, 7.3)	1.5%	0, 0, 0	7.8	0, 0, 0
	LILONGWE RURAL WEST	No	11	322	2.2%	(2.0, 2.4)	0.2%	0, 0, 0	0.1	0, 0, 0
	LILONGWE RURAL WEST	Yes	13	390	1.6%	(1.6, 1.7)	0.0%	0, 0, 0	0.1	0, 0, 0
	MZIMBA NORTH	No	12	360	3.7%	(3.5, 3.8)	0.1%	0, 0, 0	0.0	0, 0, 0
	MZIMBA NORTH	Yes	10	300	2.1%	(1.9, 2.3)	0.0%	0, 0, 0	0.0	0, 0, 0
	MZIMBA SOUTH	No	15	450	3.1%	(2.9, 3.3)	0.0%	0, 0, 0	0.0	0, 0, 0
	MZIMBA SOUTH	Yes	10	300	2.3%	(2.0, 2.6)	0.1%	0, 0, 0	0.5	0, 0, 0
	MZUZU CITY	Yes	20	600	2.1%	(2.0, 2.3)	0.0%	0, 0, 0	0.0	0, 0, 0
	NENO	No	12	360	1.1%	(1.0, 1.2)	0.0%	0, 0, 0	0.3	0, 0, 0
	NENO	Yes	8	240	0.4%	(0.2, 0.6)	0.0%	0, 0, 0	0.0	0, 0, 0
	NTCHEU	No	12	360	2.8%	(2.7, 3.0)	0.4%	0, 0, 0	0.6	0, 0, 0
	NTCHEU	Yes	10	300	0.1%	(0.1, 0.2)	0.1%	0, 0, 0	1.1	0, 0, 0
NTCHISI	No	11	330	3.1%	(2.9, 3.3)	0.5%	0, 0, 0	0.0	0, 0, 0	
NTCHISI	Yes	11	328	3.7%	(3.4, 3.9)	0.9%	0, 0, 0	0.2	0, 0, 0	

Infection	Characteristics				Prevalence		Prevalence of heavy infections		Mean Intensity (epg / ep10ml)	
	District	Hotspot (0 = No, 1= Yes)	No. Schools	No. Pupils	Prevalence	95% confidence interval	Prevalence of heavy infections	Prevalence of heavy infections percentiles† across all schools	Mean Intensity (epg / ep10ml)	Mean intensity percentiles† across all schools
<i>Ascaris lumbricoides</i>	BALAKA	No	12	360	3.1%	(2.9, 3.3)	0.0%	0, 0, 0	1.9	0, 0, 0
	BALAKA	Yes	10	300	4.3%	(4.0, 4.6)	0.0%	0, 0, 0	2.0	0, 0, 0
	BLANTYRE CITY	Yes	15	450	1.6%	(1.5, 1.8)	0.0%	0, 0, 0	8.0	0, 0, 0
	BLANTYRE RURAL	Yes	16	480	1.1%	(1.0, 1.2)	0.0%	0, 0, 0	0.9	0, 0, 0
	CHIRADZULU	Yes	15	448	4.8%	(4.6, 5.0)	0.0%	0, 0, 0	3.1	0, 0, 0
	LILONGWE CITY	No	13	390	7.5%	(7.2, 7.9)	0.0%	0, 0, 0	3.5	0, 0, 0
	LILONGWE CITY	Yes	16	479	3.4%	(3.2, 3.5)	0.0%	0, 0, 0	1.7	0, 0, 0
	LILONGWE RURAL EAST	No	14	400	5.8%	(5.3, 6.2)	0.0%	0, 0, 0	2.3	0, 0, 0
	LILONGWE RURAL EAST	Yes	11	330	1.7%	(1.6, 1.9)	0.0%	0, 0, 0	0.8	0, 0, 0
	LILONGWE RURAL WEST	No	11	322	6.2%	(5.6, 6.8)	0.0%	0, 0, 0	1.9	0, 0, 0
	LILONGWE RURAL WEST	Yes	13	390	1.4%	(1.4, 1.5)	0.0%	0, 0, 0	1.3	0, 0, 0
	MZIMBA NORTH	No	12	360	4.6%	(4.5, 4.8)	0.0%	0, 0, 0	1.2	0, 0, 0
	MZIMBA NORTH	Yes	10	300	6.5%	(6.1, 6.9)	0.0%	0, 0, 0	2.0	0, 0, 0
	MZIMBA SOUTH	No	15	450	2.4%	(2.4, 2.5)	0.0%	0, 0, 0	0.8	0, 0, 0
	MZIMBA SOUTH	Yes	10	300	5.2%	(4.8, 5.6)	0.0%	0, 0, 0	2.5	0, 0, 0
	MZUZU CITY	Yes	20	600	1.4%	(1.3, 1.5)	0.0%	0, 0, 0	1.6	0, 0, 0
	NENO	No	12	360	3.1%	(2.9, 3.2)	0.0%	0, 0, 0	1.2	0, 0, 0
	NENO	Yes	8	240	3.6%	(2.6, 4.5)	0.0%	0, 0, 0	2.7	0, 0, 0
	NTCHEU	No	12	360	6.1%	(6.0, 6.3)	0.0%	0, 0, 0	3.6	0, 0, 0
	NTCHEU	Yes	10	300	1.1%	(1.0, 1.3)	0.0%	0, 0, 0	0.8	0, 0, 0
NTCHISI	No	11	330	6.1%	(5.9, 6.4)	0.0%	0, 0, 0	51.7	0, 0, 0	
NTCHISI	Yes	11	328	3.5%	(3.3, 3.8)	0.0%	0, 0, 0	3.5	0, 0, 0	

Infection	Characteristics				Prevalence		Prevalence of heavy infections		Mean Intensity (epg / ep10ml)	
	District	Hotspot (0 = No, 1= Yes)	No. Schools	No. Pupils	Prevalence	95% confidence interval	Prevalence of heavy infections	Prevalence of heavy infections percentiles† across all schools	Mean Intensity (epg / ep10ml)	Mean intensity percentiles† across all schools
Hookworm	BALAKA	No	12	360	3.6%	(3.3, 3.9)	0.0%	0, 0, 0	1.7	0, 0, 0
	BALAKA	Yes	10	300	3.7%	(3.4, 4.0)	0.0%	0, 0, 0	2.0	0, 0, 0
	BLANTYRE CITY	Yes	15	450	1.7%	(1.5, 1.9)	0.1%	0, 0, 0	5.1	0, 0, 0
	BLANTYRE RURAL	Yes	16	480	0.6%	(0.6, 0.7)	0.0%	0, 0, 0	0.1	0, 0, 0
	CHIRADZULU	Yes	15	448	1.6%	(1.5, 1.7)	0.0%	0, 0, 0	0.9	0, 0, 0
	LILONGWE CITY	No	13	390	5.6%	(5.3, 5.9)	0.0%	0, 0, 0	4.1	0, 0, 0
	LILONGWE CITY	Yes	16	479	1.5%	(1.4, 1.6)	0.0%	0, 0, 0	0.6	0, 0, 0
	LILONGWE RURAL EAST	No	14	400	4.5%	(4.1, 4.9)	0.0%	0, 0, 0	2.4	0, 0, 0
	LILONGWE RURAL EAST	Yes	11	330	2.3%	(2.1, 2.5)	0.0%	0, 0, 0	1.2	0, 0, 0
	LILONGWE RURAL WEST	No	11	322	0.0%	(0.0, 0.0)	0.0%	0, 0, 0	0.0	0, 0, 0
	LILONGWE RURAL WEST	Yes	13	390	0.7%	(0.7, 0.8)	0.0%	0, 0, 0	0.5	0, 0, 0
	MZIMBA NORTH	No	12	360	2.0%	(1.9, 2.1)	0.0%	0, 0, 0	0.5	0, 0, 0
	MZIMBA NORTH	Yes	10	300	2.2%	(1.9, 2.4)	0.0%	0, 0, 0	0.7	0, 0, 0
	MZIMBA SOUTH	No	15	450	2.1%	(2.0, 2.2)	0.0%	0, 0, 0	0.7	0, 0, 0
	MZIMBA SOUTH	Yes	10	300	1.0%	(0.8, 1.2)	0.1%	0, 0, 0	4.6	0, 0, 0
	MZUZU CITY	Yes	20	600	0.9%	(0.8, 1.0)	0.0%	0, 0, 0	5.5	0, 0, 0
	NENO	No	12	360	2.6%	(2.4, 2.7)	0.0%	0, 0, 0	1.2	0, 0, 0
	NENO	Yes	8	240	2.5%	(1.8, 3.2)	0.0%	0, 0, 0	3.5	0, 0, 0
	NTCHEU	No	12	360	0.1%	(0.1, 0.2)	0.0%	0, 0, 0	0.0	0, 0, 0
	NTCHEU	Yes	10	300	0.7%	(0.6, 0.9)	0.0%	0, 0, 0	0.3	0, 0, 0
NTCHISI	No	11	330	2.8%	(2.6, 2.9)	0.0%	0, 0, 0	2.2	0, 0, 0	
NTCHISI	Yes	11	328	3.1%	(2.8, 3.3)	0.0%	0, 0, 0	2.1	0, 0, 0	

Infection	Characteristics				Prevalence		Prevalence of heavy infections		Mean Intensity (epg / ep10ml)	
	District	Hotspot (0 = No, 1= Yes)	No. Schools	No. Pupils	Prevalence	95% confidence interval	Prevalence of heavy infections	Prevalence of heavy infections percentiles† across all schools	Mean Intensity (epg / ep10ml)	Mean intensity percentiles† across all schools
<i>Trichurus trichura</i>	BALAKA	No	12	360	0.0%	(0.0, 0.0)	0.0%	0, 0, 0	0.0	0, 0, 0
	BALAKA	Yes	10	300	0.0%	(0.0, 0.0)	0.0%	0, 0, 0	0.0	0, 0, 0
	BLANTYRE CITY	Yes	15	450	0.9%	(0.8, 1.0)	0.0%	0, 0, 0	0.7	0, 0, 0
	BLANTYRE RURAL	Yes	16	480	0.0%	(0.0, 0.0)	0.0%	0, 0, 0	0.0	0, 0, 0
	CHIRADZULU	Yes	15	448	0.0%	(0.0, 0.0)	0.0%	0, 0, 0	0.0	0, 0, 0
	LILONGWE CITY	No	13	390	0.2%	(0.2, 0.3)	0.0%	0, 0, 0	0.1	0, 0, 0
	LILONGWE CITY	Yes	16	479	0.2%	(0.2, 0.3)	0.0%	0, 0, 0	0.0	0, 0, 0
	LILONGWE RURAL EAST	No	14	400	0.0%	(0.0, 0.0)	0.0%	0, 0, 0	0.0	0, 0, 0
	LILONGWE RURAL EAST	Yes	11	330	0.0%	(0.0, 0.0)	0.0%	0, 0, 0	0.0	0, 0, 0
	LILONGWE RURAL WEST	No	11	322	0.2%	(0.1, 0.2)	0.0%	0, 0, 0	8.5	0, 0, 0
	LILONGWE RURAL WEST	Yes	13	390	0.2%	(0.2, 0.2)	0.0%	0, 0, 0	14.1	0, 0, 0
	MZIMBA NORTH	No	12	360	0.0%	(0.0, 0.0)	0.0%	0, 0, 0	0.0	0, 0, 0
	MZIMBA NORTH	Yes	10	300	0.0%	(0.0, 0.0)	0.0%	0, 0, 0	0.0	0, 0, 0
	MZIMBA SOUTH	No	15	450	0.5%	(0.5, 0.6)	0.0%	0, 0, 0	2.1	0, 0, 0
	MZIMBA SOUTH	Yes	10	300	0.0%	(0.0, 0.0)	0.0%	0, 0, 0	0.0	0, 0, 0
	MZUZU CITY	Yes	20	600	0.0%	(0.0, 0.0)	0.0%	0, 0, 0	0.0	0, 0, 0
	NENO	No	12	360	1.1%	(0.9, 0.12)	0.0%	0, 0, 0	0.6	0, 0, 0
	NENO	Yes	8	240	0.0%	(0.0, 0.0)	0.0%	0, 0, 0	0.0	0, 0, 0
	NTCHEU	No	12	360	0.0%	(0.0, 0.0)	0.0%	0, 0, 0	0.0	0, 0, 0
	NTCHEU	Yes	10	300	0.0%	(0.0, 0.0)	0.0%	0, 0, 0	0.0	0, 0, 0
NTCHISI	No	11	330	0.3%	(0.3, 0.4)	0.0%	0, 0, 0	66.8	0, 0, 0	
NTCHISI	Yes	11	328	0.4%	(0.3, 0.5)	0.0%	0, 0, 0	0.2	0, 0, 0	

Infection	Characteristics				Prevalence		Prevalence of heavy infections		Mean Intensity (epg / ep10ml)	
	District	Hotspot (0 = No, 1= Yes)	No. Schools	No. Pupils	Prevalence	95% confidence interval	Prevalence of heavy infections	Prevalence of heavy infections percentiles† across all schools	Mean Intensity (epg / ep10ml)	Mean intensity percentiles† across all schools
Any STH	BALAKA	No	12	360	6.5%	(6.2, 6.8)	n/a			
	BALAKA	Yes	10	300	7.7%	(7.3, 8.1)				
	BLANTYRE CITY	Yes	15	450	4.2%	(4.0, 4.5)				
	BLANTYRE RURAL	Yes	16	480	1.8%	(1.7, 1.8)				
	CHIRADZULU	Yes	15	448	6.2%	(6.0, 6.4)				
	LILONGWE CITY	No	13	390	13.1%	(12.6, 13.6)				
	LILONGWE CITY	Yes	16	479	4.7%	(4.5, 4.8)				
	LILONGWE RURAL EAST	No	14	400	10.3%	(9.7, 10.8)				
	LILONGWE RURAL EAST	Yes	11	330	4.0%	(3.8, 4.3)				
	LILONGWE RURAL WEST	No	11	322	6.4%	(5.8, 6.9)				
	LILONGWE RURAL WEST	Yes	13	390	2.4%	(2.3, 2.4)				
	MZIMBA NORTH	No	12	360	6.2%	(6.0, 6.3)				
	MZIMBA NORTH	Yes	10	300	8.7%	(8.2, 9.1)				
	MZIMBA SOUTH	No	15	450	4.7%	(4.6, 4.8)				
	MZIMBA SOUTH	Yes	10	300	6.2%	(5.8, 6.6)				
	MZUZU CITY	Yes	20	600	2.3%	(2.1, 2.4)				
	NENO	No	12	360	6.5%	(6.3, 6.8)				
	NENO	Yes	8	240	5.1%	(4.1, 6.2)				
	NTCHEU	No	12	360	6.1%	(6.0, 6.3)				
	NTCHEU	Yes	10	300	1.9%	(1.6, 2.1)				
NTCHISI	No	11	330	9.3%	(9.0, 9.5)					
NTCHISI	Yes	11	328	7.0%	(6.6, 7.4)					

† 25th, 50th (median), 75th

Table 4. Mapping survey results by sex and by species

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
<i>S. mansoni</i>	2018	277	4047	4069	1.10%	1.10%	0.00%	0.00%	1	1
<i>S. haematobium</i>	2018	277	4139	4135	2.40%	3.20%	0.20%	0.30%	0	1
Any STH	2018	277	4047	4070	5.50%	4.30%	n/a	n/a	n/a	n/a
<i>A. lumbricoides</i>	2018	277	4048	4070	3.50%	2.70%	0.00%	0.00%	3	3
Hookworm	2018	277	4047	4070	0.40%	0.10%	0.00%	0.00%	0	5
<i>T. trichiura</i>	2018	277	4048	4070	1.80%	1.60%	0.00%	0.00%	1	2

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

Table 5. Mapping survey results by district

Infection	Characteristics			Prevalence		Prevalence of heavy infections		Mean Intensity (epg / ep10ml)	
	District	No. Schools	No. Pupils	Prevalence	95% confidence interval	Prevalence of heavy infections	Prevalence of heavy infections percentiles† across all schools	Mean Intensity (epg / ep10ml)	Mean intensity percentiles† across all schools
<i>S. mansoni</i>	BALAKA	22	648	0.8%	(0.7, 0.9)	0.0%	n/a	0.22	0, 0, 0
	BLANTYRE	31	929	1.1%	(1.1, 1.2)	0.0%	n/a	0.68	0, 0, 0
	CHIRADZULU	15	447	5.3%	(5.1, 5.5)	0.0%	n/a	2.35	0, 0, 0
	LILONGWE	78	2,247	1.0%	(1, 1.1)	0.0%	0, 0, 0	1.14	0, 0, 0
	MZIMBA NORTH	42	1,232	0.0%	(0, 0.1)	0.0%	n/a	0.02	0, 0, 0
	MZIMBA SOUTH	25	729	0.0%	(0, 0)	0.0%	n/a	0.06	0, 0, 0
	NENO	20	597	0.8%	(0.7, 0.9)	0.0%	n/a	0.30	0, 0, 0
	NTCHEU	22	650	1.3%	(1.2, 1.4)	0.0%	n/a	0.77	0, 0, 0
	NTCHISI	22	637	0.1%	(0.1, 0.2)	0.0%	n/a	0.04	0, 0, 0
<i>S. haematobium</i>	BALAKA	22	659	1.7%	(1.6, 1.8)	0.20%	0, 0, 0	0.4	0, 0, 0
	BLANTYRE	31	930	2.4%	(2.3, 2.5)	0.11%	0, 0, 0	0.4	0, 0, 0
	CHIRADZULU	15	448	8.3%	(8, 8.5)	1.08%	0, 0, 0	1.6	0, 0, 0
	LILONGWE	78	2,309	2.7%	(2.6, 2.7)	0.31%	0, 0, 0	0.6	0, 0, 0
	MZIMBA NORTH	42	1,260	2.5%	(2.4, 2.6)	0.03%	0, 0, 0	0.3	0, 0, 0
	MZIMBA SOUTH	25	750	3.0%	(2.8, 3.1)	0.02%	0, 0, 0	0.3	0, 0, 0
	NENO	20	600	1.0%	(0.9, 1.2)	0.00%	n/a	0.0	0, 0, 0
	NTCHEU	22	660	2.1%	(2, 2.2)	0.32%	0, 0, 0	0.5	0, 0, 0
	NTCHISI	22	658	3.3%	(3.1, 3.4)	0.61%	0, 0, 0	0.8	0, 0, 0

Infection	Characteristics			Prevalence		Prevalence of heavy infections		Mean Intensity (epg / ep10ml)	
	District	No. Schools	No. Pupils	Prevalence	95% confidence interval	Prevalence of heavy infections	Prevalence of heavy infections percentiles† across all schools	Mean Intensity (epg / ep10ml)	Mean intensity percentiles† across all schools
<i>Ascaris lumbricoides</i>	BALAKA	22	649	3.5%	(3.3, 3.7)	0.0%	n/a	1.9	0, 0, 0
	BLANTYRE	31	930	1.3%	(1.3, 1.4)	0.0%	n/a	4.2	0, 0, 0
	CHIRADZULU	15	447	4.8%	(4.6, 5)	0.0%	n/a	3.1	0, 0, 0
	LILONGWE	78	2,247	3.5%	(3.4, 3.6)	0.0%	n/a	1.8	0, 0, 0
	MZIMBA NORTH	42	1,232	3.2%	(3.1, 3.3)	0.0%	n/a	1.6	0, 0, 0
	MZIMBA SOUTH	25	729	2.8%	(2.7, 2.8)	0.0%	n/a	1.0	0, 0, 0
	NENO	20	597	3.1%	(2.9, 3.3)	0.0%	n/a	1.3	0, 0, 0
	NTCHEU	22	650	4.8%	(4.7, 4.9)	0.0%	n/a	2.9	0, 0, 0
	NTCHISI	22	637	5.5%	(5.4, 5.7)	0.0%	n/a	40.5	0, 0, 0
Hookworm	BALAKA	22	648	3.6%	(3.4, 3.8)	0.0%	n/a	1.8	0, 0, 0
	BLANTYRE	31	930	1.1%	(1, 1.2)	0.0%	0, 0, 0	2.4	0, 0, 0
	CHIRADZULU	15	447	1.6%	(1.5, 1.7)	0.0%	n/a	0.9	0, 0, 0
	LILONGWE	78	2,247	1.9%	(1.8, 2)	0.0%	n/a	1.1	0, 0, 0
	MZIMBA NORTH	42	1,232	1.4%	(1.3, 1.5)	0.0%	n/a	3.4	0, 0, 0
	MZIMBA SOUTH	25	729	2.0%	(1.9, 2)	0.0%	0, 0, 0	1.2	0, 0, 0
	NENO	20	597	2.6%	(2.4, 2.7)	0.0%	n/a	1.3	0, 0, 0
	NTCHEU	22	651	0.3%	(0.3, 0.3)	0.0%	n/a	0.1	0, 0, 0
	NTCHISI	22	637	2.9%	(2.7, 3)	0.0%	n/a	2.1	0, 0, 0

Infection	Characteristics			Prevalence		Prevalence of heavy infections		Mean Intensity (epg / ep10ml)	
	District	No. Schools	No. Pupils	Prevalence	95% confidence interval	Prevalence of heavy infections	Prevalence of heavy infections percentiles† across all schools	Mean Intensity (epg / ep10ml)	Mean intensity percentiles† across all schools
<i>Trichurus trichura</i>	BALAKA	22	648	0.0%	n/a	0.0%	n/a	0.0	n/a
	BLANTYRE	31	930	0.4%	(0.4, 0.5)	0.0%	n/a	0.3	0, 0, 0
	CHIRADZULU	15	447	0.0%	n/a	0.0%	n/a	0.0	n/a
	LILONGWE	78	2,247	0.2%	(0.2, 0.2)	0.0%	n/a	3.2	0, 0, 0
	MZIMBA NORTH	42	1,232	0.0%	n/a	0.0%	n/a	0.0	n/a
	MZIMBA SOUTH	25	729	0.5%	(0.4, 0.5)	0.0%	n/a	1.8	0, 0, 0
	NENO	20	597	1.0%	(0.9, 1.1)	0.0%	n/a	0.6	0, 0, 0
	NTCHEU	22	650	0.0%	n/a	0.0%	n/a	0.0	n/a
	NTCHISI	22	637	0.3%	(0.3, 0.4)	0.0%	n/a	51.4	0, 0, 0
ANY STH	BALAKA	22	648	6.9%	(6.6, 7.2)	n/a			
	BLANTYRE	31	930	2.9%	(2.8, 3)				
	CHIRADZULU	15	447	6.2%	(6, 6.4)				
	LILONGWE	78	2,247	5.3%	(5.2, 5.4)				
	MZIMBA NORTH	42	1,232	4.5%	(4.3, 4.6)				
	MZIMBA SOUTH	25	729	4.9%	(4.7, 5)				
	NENO	20	597	6.4%	(6.2, 6.7)				
	NTCHEU	22	650	5.0%	(4.9, 5.1)				
	NTCHISI	22	637	8.7%	(8.5, 9)				

Table 6. SCH and STH prevalence results for 2012 mapping and 2018 re-assessment surveys, by mapping area

Mapping Area	2012		2018		2012		2018	
	Prevalence any schisto (%) (confidence interval)	SCH risk	Prevalence any schisto (%) (confidence interval)	SCH risk	Prevalence any STH (%) (confidence interval)	STH risk	Prevalence any STH (%) (confidence interval)	STH risk
Balaka	13.73	Moderate	2.58	Low	0.39	Low	6.91	Low
	(8.92, 18.53)		(2.45, 2.71)		(0.00-0.96)		(6.65, 7.17)	
Blantyre City	11.66	Moderate	3.29	Low	1.42	Low	4.22	Low
	(8.13, 15.20)		(3.04, 3.54)		(0.06-2.78)		(3.98, 4.46)	
Blantyre Rural	30.18	Moderate	3.71	Low	1.32	Low	1.75	Low
	(21.92, 38.45)		(3.59, 3.84)		(0.40-2.25)		(1.66, 1.84)	
Chiradzulu	34.53	Moderate	11.68	Moderate	1.02	Low	6.24	Low
	(23.17, 45.89)		(11.43, 11.94)		(0.28-1.77)		(6.04, 6.44)	
Lilongwe City	14.63	Moderate	3.16	Low	1.01	Low	6.17	Low
	(8.63, 20.62)		(3.03, 3.29)		(0.27-1.74)		(6, 6.33)	
Lilongwe Rural East	22.15	Moderate	8.08	Low	3.33	Low	5.24	Low
	(11.59, 32.70)		(7.85, 8.31)		(1.81-4.85)		(5.03, 5.45)	
Lilongwe Rural West	13.63	Moderate	2.2	Low	3.85	Low	2.92	Low
	(7.48, 19.77)		(2.13, 2.28)		(0.58-7.11)		(2.81, 3.03)	
Mwanza and Neno	19.48	Moderate	1.88*	Low	0.35	Low	6.45*	Low
	(8.22-30.74)		(1.73, 2.03)*		(0.00-0.84)		(6.19, 6.71)*	
Mzimba North	8.52	Moderate	3.06	Low	3.24	Low	7.25	Low
	(2.89-14.14)		(2.95, 3.17)		(1.57-4.90)		(7.06, 7.45)	
Mzimba South	10.81	Moderate	3.13	Low	2.54	Low	4.86	Low
	(5.29-16.33)		(2.97, 3.29)		(0.84-4.24)		(4.75, 4.97)	

Mapping Area	2012		2018		2012		2018	
	Prevalence any schisto (%) (confidence interval)	SCH risk	Prevalence any schisto (%) (confidence interval)	SCH risk	Prevalence any STH (%) (confidence interval)	STH risk	Prevalence any STH (%) (confidence interval)	STH risk
Mzuzu City	5.01	Low	2.25	Low	2.67	Low	2.27	Low
	(1.37-8.65)		(2.09, 2.4)		(0.94-4.39)		(2.12, 2.42)	
Ntchisi	24.51	Moderate	3.58	Low	3.18	Low	8.74	Low
	(13.79-35.24)		(3.41, 3.75)		(1.43-4.94)		(8.51, 8.96)	
Ntcheu	12.31	Moderate	3.05	Low	0.48	Low	5.01	Low
	(6.31-18.33)		(2.92, 3.18)		(0-1.03)		(4.89, 5.14)	
* Neno only								

4.3 Pdf of dashboard



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