Ethiopia, Impact Survey – Baseline 2015/16

1 Programmatic recommendations

- Follow up surveys to be conducted in these baseline schools on an annual basis prior to each treatment round. The surveys will be cross-sectional in nature (new children recruited each year) and the same indicators will be measured annually over the programme years.
- There is a need to ensure good quality training with due emphasis on the diagnostic techniques so as maximize the chance of parasite detection in low endemic areas.
- There is a need to strengthen the community mobilization in each implementation unit so as to increase the participation of non-enrolled / non-attending school children in the follow up surveys.
- The partners should review the advantages and disadvantages of the current sample size per site and determine the way forward for the benefit of the control programme.
- The partners should ensure that proper documentation is in place and the key findings are used to ensure corrective actions where necessary

2 Background (to the survey)

Monitoring and evaluation (M&E) should form an integral part of national control programmes against neglected tropical diseases (NTDs). Robust M&E will allow the implementation process and impact of the programme to be critically assessed in a timely manner. The findings can be used to help the national programme management team take necessary actions to improve implementation and safeguard the success of the programme. While M&E encompasses a range of processes, this report addresses the progress of impact monitoring for Ethiopia's schistosomiasis (SCH) and soil-transmitted helminthiasis (STH) control programme.

Impact monitoring is used to assess the impact of the programme on a set of health indicators. It provides a mechanism to measure the control programme's effectiveness at reducing the burden of disease and its transmission. This enables the tracking of progress towards a given control objective, and can provide motivation and guidance to those involved in the programme. It also provides feedback to the government and partners. Impact monitoring consists of a series of surveys. It starts prior to treatment intervention in order to determine the pre-treatment, 'endemic equilibrium' level of infection. This will serve as a reference against which later years can be compared. Measurement of infection prevalence alone is not sufficient as an indicator of impact because of the non-linear relationship between prevalence and intensity of infection. It is also though that intensity of infection provides a stronger proxy to infection-related morbidity.

The effectiveness of praziquantel (PZQ) against schistosomiasis and mebendazole (MEB) against STH is well established – the aim of impact monitoring is to ensure that this effectiveness is being achieved in the context of the national control programme.

3 Objectives of the Impact monitoring

- To monitor the impact of large-scale distribution of PZQ and MEB on infection prevalence and intensity of SCH and STH.

4 Survey Methods

Impact monitoring uses cross-sectional cohort which will recruit new, randomly-selected pupils of ages 9, 10, 11, and 12 years.

4.1. Sample size determination

The sample size was calculated in the following way. The calculations assume a target of a 40% reduction in *Schistosoma mansoni* in school children following a single treatment round. The average prevalence of infection in medium and high endemicity districts (woredas) during nationwide prevalence mapping was 26%. The sample size was powered in order to have an 80% chance (i.e. beta = 0.8) of detecting a true 40% reduction in prevalence at the regional level from the initial levels of 26%. From this it was estimated that 180 schools were required to be followed across the country. This we required at least 180 schools to be followed across the country. This will allow an estimation of the impact of the programme at the regional level to be calculated. This calculation assumed an intra-class correlation coefficient (ICC), taken from previous studies, of 0.1 and a within-school correlation between baseline and follow-up of 0.2. Given the higher focality of infection for schistosomiasis compared to STH, the same sample size was assumed to provide sufficient statistical power for changes in STH infection.

Endemic districts (woredas) were categorized as either medium or high prevalence for schistosomiasis (based on World Health Organization classifications). Sentinel sites (schools) were selected from a list of all schools within eligible districts with no accounting for school size.

4.2. Study areas and Population

The baseline survey was conducted in all of the country's nine regional states and two city administrations newly initiating large-scale distribution of PZQ and MEB in 2015. Surveys were conducted prior to the commencement of large-scale treatment campaigns, although the possibility of prior, local treatment cannot be discounted.

A total of 155 students were targeted to be sampled per school, made up of 125 enrolled and 30 non-enrolled school-aged children. The ages of the students equated to the highest four grades in primary school to be sampled in equal numbers, as schistosomiasis prevalence generally increases with age in childhood. Accordingly, approximately 30 children aged 9, 10, 11 and 12 years were sampled from each age group in each school. New groups of children will be recruited for the subsequent years and the same indicators measured annually over the programme years.

For the survey activities, schools were contacted as the site of the study. The directors of the schools were informed fully about the study and requested to provide informed consent, allowing the study to collect samples from children within their respective schools.

Parents of children at the school were also informed about the survey through school meetings and requested to provide informed consent for their children to participate in the study. Prior to consent they were provided with detailed information as to why the study was taking place and questions were answered by technical staff. A random selection of children was conducted by the survey team. Any child who was unwell was not enrolled in the study and was advised to visit nearby health facilities for treatment.

4.3. Training, Data collection and Analysis

Survey teams were drawn from the respective implementation areas, to ensure team members had a strong understanding of the local area and knew the local language(s). A total of three days of training was provided to the survey teams. The training was provided in three rounds to a total 45 survey teams (each consisting of four members). Training focused mainly on the survey protocol and theoretical and practical diagnostic techniques. One team leader was assigned for each survey team to coordinate all the survey-related activities in the field. Data collection activities were supervised by the central team comprised of EPHI and Schistosomiasis Control Initiative personnel throughout the data collection periods.

Due to the phased nature of the scale-up of the country's SCH and STH programme, it was necessary to also implement a phased approach to sentinel site surveys. Baseline data were collected in three rounds prior to each round of treatment. The first round data were collected from 21 schools in March 2015; the second round data were collected from 113 schools in November 2015 and the third round data were collected from 41 schools in March 2016. Paper data collection forms were used to collect school information and parasitological data. Data were entered by trained data clerks into a bespoke database. Data cleaning and checking was conducted by EPHI and Schistosomiasis Control Initiative staff. The data were analyzed by the Schistosomiasis Control Initiative for key indicators of the programme.

4.4. Parasitological data collection

Indicators	

A total of 155 (125 enrolled and 30 non-enrolled) children from ages 9, 10, 11 and 12 years were randomly selected from each of the school to be enrolled into the study. Kato-Katz diagnostic technique was used to determine the presence of intestinal schistosomiasis (caused by *S. mansoni*) and STH infections. A combination of Haemastix® urine dipsticks and the urine filtration technique was used to determine the prevalence and intensity of urogenital schistosomiasis (caused by *Schistosoma haematobium*). Haemastix® measure the presence of micro- and macro-haematuria (visible and non-visible blood in urine). Where these results were positive urine was filtered to identify the presence of *S. haematobium* eggs to determine infection status (Montresor et al. 2002).

Each child was provided one urine (10ml) sample and two stool samples of 2-3g (one sample per day) for parasitological examination.

Stool samples were examined by standard Kato-Katz procedures (41.7mg template) to determine the prevalence and infection intensity of *S. mansoni*, and the common STHs: hookworm, *Trichuris trichiura,* and *Ascaris lumbricoides.* Two slides were examined from each stool sample making 4 samples in total for each child. Slides were read by an expert medical technologists within an hour of preparation to maximize the chance of hookworm ova detection.

5. Results

The survey was conducted in nine regional states and two city administrations of the country. Baseline data were collected in three rounds prior to each round of treatment. The first round data were collected from 21 schools in March 2015; the second round data were collected from 113 schools in November 2015 and the third round data were collected from 41 schools in March 2016. Accordingly, out of 180 schools originally planned, 175 (97.22%) schools were successfully surveyed. These schools were distributed between 117 districts across the country. The remaining five schools were not able to be surveyed due to security concerns (3 schools) and inaccessibility due to floods (2 schools). A total of 20,023 individuals (10,481 males and 9,542 females) participated in this baseline study with the average age of 11.10 years for both sexes. Table 1 provides a summary of the key indicators from the surveys.

Number of sentinel sites included in the analysis	175
Number of districts included in the analysis	117
Number of individuals surveyed	20,023
Overall prevalence of *S. mansoni*	3.9%
Overall percent of heavy infection of *S. mansoni*	0.6%
Overall prevalence of *S. haematobium*	0.3%
Overall percent of heavy infection of *S. haematobium*	0.00%
Overall prevalence of hookworm	4.8%
Overall percent of heavy infection of hookworm	0.00%
Overall prevalence of *Ascaris lumbricoides*	10%
Overall percent of heavy infection of *Ascaris lumbricoides*	0.00%
Overall prevalence of *Trichuris trichiura*	3.9%
Overall percent of heavy infection of *Trichuris trichiura*	0.00%

Table 1. Summary of key indicators

5.1. Prevalence of schistosomiasis

According to this baseline study, the overall prevalence of intestinal schistosomiasis (caused by *S. mansoni*) was found to be 3.9% and that of uro-genital schistosomiasis (caused by *S. haematobium*) was 0.3%. Harari region reported the highest prevalence of *S. mansoni* (44%) followed by Tigray (8.9%) region. Infection with *S. haematobium* was much more focal, with only Somali (2.5%) and Gambella (2.4%) regional states reporting infection (Table 2 and Figure 1)

Region	Individuals Surveyed- *S. mansoni*	Prevalence- *S. mansoni*	Individuals Surveyed- *S. haematobium*	Prevalence- *S. haematobium*
Gambella	1201	0.6%	1233	2.4%
Addis Ababa	1097	0.0%	1101	0.0%
Afar	128	0.0%	128	0.0%
Amhara	2587	1.6%	2592	0.0%
Beneshangul-Gumuz	1315	1.6%	1315	0.0%
Dire Dawa	588	0.9%	588	0.0%
Harari	325	44.0%	606	0.0%
Oromia	5357	3.5%	5357	0.0%
SNNPR	3635	3.5%	3641	0.0%
Somali	902	0.0%	927	2.5%
Tigray	2579	8.9%	2587	0.0%

Table 2. Prevalence of intestinal and uro-genital schistosomiasis by region

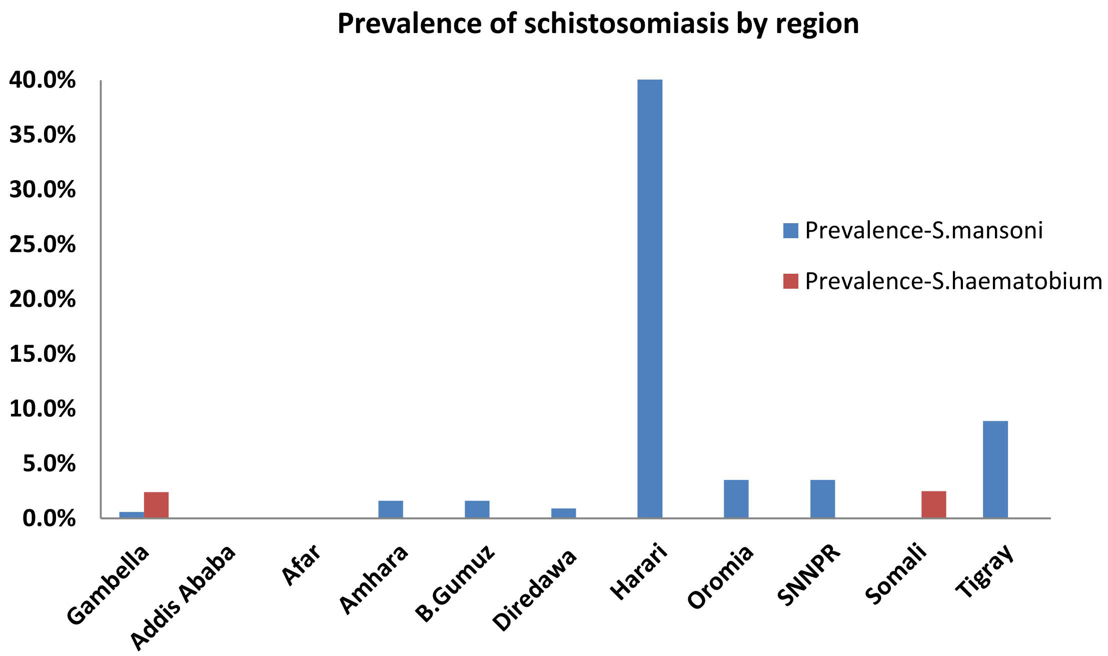

Figure 1. Prevalence of schistosomiasis by regions

It can be seen from Table 1 above that the prevalence of heavy intensity infections was low. Only 0.6% of individuals harboured heavy *S. mansoni* infections and there were no cases of heavy *S. haematobium* infections recorded. The mean intensity of infection with *S. mansoni* was 9.0 eggs per gram of faeces (epg). The mean intensity of infection with *S. haematobium* was 0.024 eggs per 10ml urine (eggs/10ml).

5.2. Prevalence of STH infection

In this survey, all of the regions were found to be infected with one of the STH species. The overall average prevalence of infection with STH 15.1%. Higher levels of prevalence were observed in SNNPR (26.3%), Gambella (23.9%) and Oromia (16.7%) regions (Table 3 and Figure 2).

Region	# *Hookworm*	*Hookworm prevalence*	# *Ascaris*	*Ascaris prevalence*	# *Trichuris*	*Trichuris prevalence*	Any STH prevalence
Gambella	1201	10.5%	1201	14.1%	1200	0.8%	23.9%
Addis Ababa	1097	0.2%	1097	0.8%	1097	0.7%	1.3%
Afar	128	0.0%	128	0.8%	128	0.0%	0.8%
Amhara	2588	3.5%	2587	9.9%	2588	0.7%	13.1%
Beneshangul-Gumuz	1315	10.6%	1315	5.9%	1315	1.2%	14.0%
Dire Dawa	587	0.0%	587	0.2%	587	0.2%	0.3%
Harari	223	5.4%	213	0.9%	212	0.0%	6.2%
Oromia	5357	5.4%	5357	11.6%	5357	4.7%	16.7%
SNNPR	3635	5.0%	3636	18.0%	3636	12.3%	26.3%

Somali	903	0.8%	905	14.1%	900	1.0%	15.7%
Tigray	2579	1.6%	2580	1.6%	2579	0.1%	5.2%

T able 3. Prevalence of STH species by region

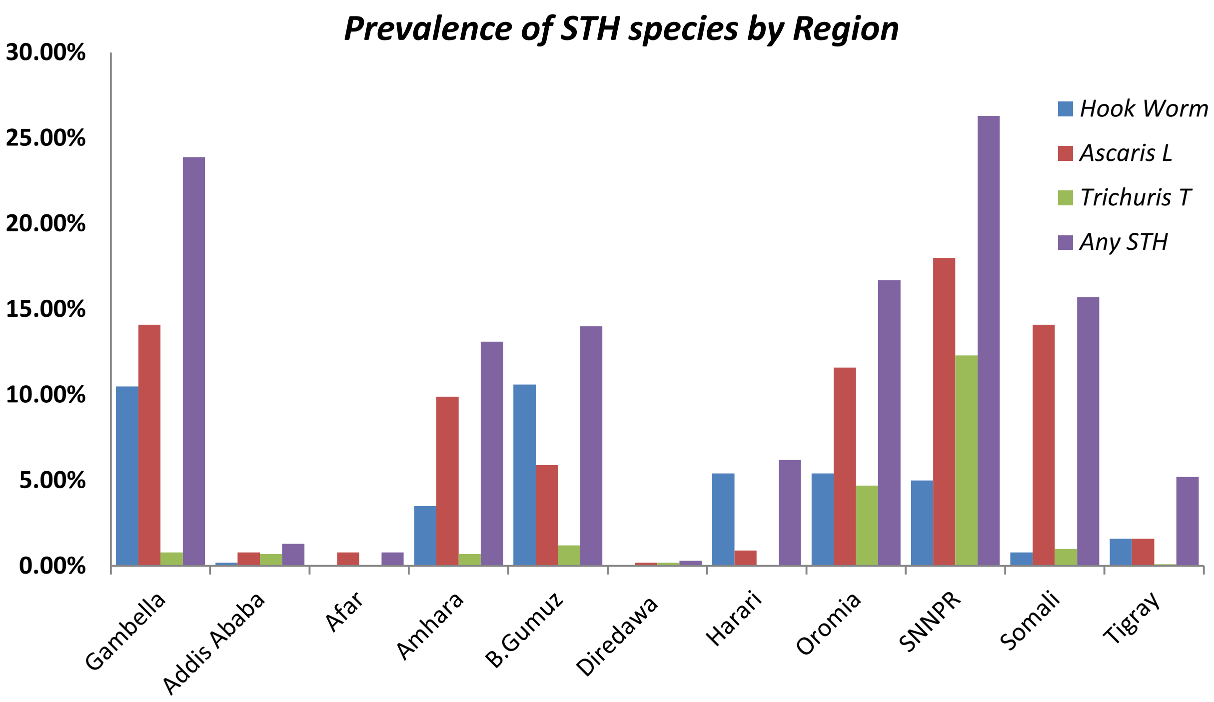

Figure 2. Prevalence of STH by region

As with schistosome infections, Table 1 demonstrates that the prevalence of heavy infection with STH species was low, with no reported cases of heavy infection for the three STH species. The average intensity of infection with STH was 184.9 epg for *A. lumbricoides*, 10.3 epg for hookworm, and 8.2 epg for *T. trichiura*.

6. Next Steps

- Dissemination of findings by the Ethiopian Public Health Institute (EPHI) to the Federal Ministry of Health (FMOH) and programme partners
- Planning, implementation, and analysis of follow-up surveys prior to subsequent rounds of treatment