COR-NTD 2020
Virtual Meeting, November 12 – 14
Integrating for Impact

Developing a M&E framework for schistosomiasis and prioritizing operational research to achieve schistosomiasis elimination

Meeting Report 22 December 2020

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Session Summary

Session Date: 11/13/2020 **Session Time:** 9:00 AM - 12:00 PM EST

Session Description: Schistosomiasis has been targeted for elimination as a public health problem (EPHP) by 2030 in the World Health Organization (WHO) Neglected Tropical Diseases (NTD) Roadmap 2021 – 2030. A

meeting of the Global Schistosomiasis Alliance suggested "*Interruption of transmission should be the overarching goal, with "elimination as a public health problem" or equivalent terms as the intermediate goal*" (Addis meeting, 2019).

To date, many countries have successfully controlled morbidity, some have managed to achieve elimination as a public health problem (country wide or in districts), and few have likely interrupted transmission. On the pathway to elimination of transmission, programmatic challenges occur that are subject to critical action in order to ensure effective, appropriate, and equitable use of resources. These include defining the optimal indicators for measuring morbidity and transmission and the optimal programmatic actions to respond to them, the implementation of effective treatment strategies and micromapping, the development of new rapid diagnostic tests and non-mass drug administration (MDA) interventions, including behaviour change communication (BCC), water, sanitation & hygiene (WASH), and environmental management & snail control. Ultimately, to address the focality of schistosomiasis transmission, national programmes will need to adopt increasingly targeted, multi-sector interventions, and develop a framework that monitors and evaluates progress at a finer scale to strengthen evidence-based decision-making.
This session will synthesize presented findings and experiences and identify key operational research questions for the programmatic continuum towards elimination of schistosomiasis. Speakers from national programmes, supporting organizations and the WHO will develop OR priorities around the following questions:

1) When NTD programmes reach EPHP, what has been achieved and what measures are needed for sustaining the gains?
2) Which tools and intervention strategies do we need when moving beyond EPHP, towards interruption of transmission for schistosomiasis?
3) How can we establish an evidence-based framework for monitoring and evaluation of schistosomiasis programs, considering biological thresholds for measuring morbidity and transmission?

The output of this session will be an operational research pathway to support the development of a programmatic framework that leverages improved diagnostic tests, data analysis and modelling tools, appropriate indicators, and targeted interventions for the elimination of schistosomiasis.

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KEY DISCUSSION POINTS

What key findings and data did the group identify via presentations? What issues were raised in discussions?

During September and October 2020, we held three COR NTD - GSA pre-meeting sessions to explore operational research questions relating to schistosomiasis elimination. The pre-meeting sessions were:

1. Elimination of schistosomiasis as a public health problem: Experiences on reaching the goal and what to do next from endemic countries.
2. Approaching schistosomiasis elimination: from mass treatment to targeted interventions.
3. Decision making in schistosomiasis: Biological thresholds & acceptable risk in the implementation of schistosomiasis control strategies.

The final synthesized meeting at COR NTD gave an overview of the discussions and key operational research questions. The session recording can be accessed here. Below we share the key issues and operational research needs that were raised and discussed.

Session 1: Elimination of schistosomiasis as a public health problem: Experiences on reaching the goal and what to do next from endemic countries.

When NTD programmes reach EPHP, what has been achieved and what measures are needed for sustaining the gains? Key representatives from the Tanzanian, Ethiopian and Malawian Ministries of Health shared their challenges and experiences on achieving and maintaining EPHP, as follows;

- Challenges of using intensity of infection as a measurement of EPHP: As per current WHO guidelines EPHP is <1% heavy intensity infection. The data presented from schistosomiasis programmes demonstrated that this goal is met in most districts, and so is the control of morbidity, defined as <5% heavy intensity infection. Nevertheless, symptoms and evidence of morbidity are still observed in the population.
- It was also noted at the sub-district level there is variation in the distribution of infection and the achievement of the WHO guidelines targets may be reached when data are aggregated to district level, but not always at the sub-district level.
- The goal of EPHP is measured using infection intensity, yet programmatic decisions are made using prevalence. There is an unclear link between prevalence and intensity, which was demonstrated with several countries reporting that although EPHP targets had been reached within districts, prevalence of infection remained high enough to require annual or biennial mass drug administration (MDA) i.e. reaching the EPHP did not result in any programmatic change to interventions.
- The main intervention strategy for schistosomiasis programmes remains MDA targeting school-age children (SAC), even though there are areas where high-risk adults need to be treated. The availability of donated, or funds to purchase praziquantel for high-risk adults is a great challenge which ultimately means a key group of individuals are not being targeted through MDA and are a source of community transmission leading to reinfection.
- Each country underlined the need for a strengthened approach to BCC and community engagement, intersectoral WASH-NTD coordination and vector control. With strengthening surveillance systems also being a high priority to support progression towards interruption of transmission.

Session 2: Approaching schistosomiasis elimination: from mass treatment to targeted interventions.

Which tools and intervention strategies do we need when moving beyond EPHP, towards interruption of transmission (IoT) for schistosomiasis? This session discussed and presented the following:

- Intervention strategies beyond MDA: To reach EPHP or IoT until 2030, interventions beyond MDA in SAC are needed: for example, Kenya is expanding MDA to all age-groups by multi-platform delivery, coupled with improvements in BCC and WASH. Chemical molluscicide coupled with MDA can reduce the number of infected snails in certain settings such as seasonal transmission settings in Cote D'Ivoire. Snails, however, return quickly after spraying and it is difficult to identify and reach out to all waterbodies that might be used by humans, particularly when working in remote and large areas with a lot of vegetation.
- Modelling: Assumptions in models matter a lot and good quality data are needed to inform models. To model the impact of interventions other than MDA, such as snail control, WASH and BCC, there is a need to know more about the coverage and effectiveness of the interventions. There is also a need to assess/quantify the reduction of individual exposure to infection and the decrease of environmental contamination from individuals, following an intervention. There is a need that modelers and field epidemiologists communicate better so that models can inform but also benefit from improved data collection.
- Diagnostics: Depending on the programmatic phase there are different requirements on what a diagnostic method or test needs to offer. When getting into elimination settings where less people are infected and with lighter infections, there is a need to adapt the tests and to use highly sensitive and also specific tests that are based on DNA or antigen detection. While offering a high sensitivity and specificity these tests should still be simple and applicable at the point-of-care and affordable not only for research purposes but also for programmatic use and large-scale surveillance.

Session 3: Decision making in schistosomiasis: Biological thresholds & acceptable risk in the implementation of schistosomiasis control strategies.

How can we establish an evidence-based framework for monitoring and evaluation (M&E) of schistosomiasis programs that considers biological thresholds for measuring morbidity and transmission and results in programmatic decisions? This session highlighted that an M&E Framework is crucial to enabling ministries of health to measure programmatically meaningful progress toward achieving their goals and empowering strategic, evidence-based decision-making. To develop the M&E Framework the following critical factors need to be addressed:

- A threshold for EPHP which considers the complex relationship between infection and morbidity, is programmatically simple to determine, and which shows measurable health impact is needed to establish confidence in programmatic decision making. Secondary analysis has demonstrated that prevalence of heavy intensity is not a robust target for determining EPHP and that micro-haematuria is a potential biological indicator for *Schistosoma haematobium* morbidity in children with <10% prevalence of micro-haematuria being a target for EPHP.
- The poor diagnostics sensitivity of current egg detection methods for schistosomiasis where transmission has been reduced or is low is well established. Alternative, more rapid and sensitive diagnostics are available but WHO guidance is based on the egg-detection outcomes and there are challenges in how to interpret the alternative diagnostics readings into decisions on preventive chemotherapy strategy. Interpretations via modelling have been completed for Kato Katz to Circulating Cathodic Antigen (CCA) and are underway for

urine filtration to urine dipstick. Other diagnostics are also in development such as the Circulating Anodic Antigen (CAA) which may improve programmatic decision making but will also need interpretation.

- Increased delivery of preventive chemotherapy has reduced disease risk from baseline and importantly has increased the heterogeneity of schistosomiasis, intensifying the focal nature of its distribution. This increased heterogeneity necessitates new survey designs that can efficiently capture the risk of schistosomiasis transmission and prevalence at a finer geospatial scale and remain affordable. Such survey designs need to consider *archetypes*[1]*; acceptable risk; unit for evaluation/intervention; diagnostic approach; precise prevalence or threshold; mean risk or max observed; and age.* A proposed operational research approach to determine the most efficient survey designs is to first understand the underlying true prevalence by conducting oversampling surveys within an implementation unit and then use geostatistical models to evaluate programmatically feasible survey designs.
- Programmatic data show that even once EPHP has been achieved, overall prevalence can still be high and mathematical models confirm that stopping MDA is not an option due to the risks of recrudescence, which will be faster in archetypes with higher transmission. The apparent disconnect between programmatic goals and programmatic decisions leaves a dilemma for national programmes on determining what to do next once the EPHP goal has been achieved but transmission remains.
- Achieving EPHP using the current threshold does not lead to a programmatic change. To be useful to programmes the EPHP target should be meaningful and low enough to confidently allow a change in programmatic implementation of MDA. Such a threshold would empower programs to secure the progress made and maintain EPHP using a specific combination of interventions and surveillance designed to limit recrudescence. Then when a programme decides to move towards IoT a different combination of interventions can be used. A M&E framework that encompasses both EPHP as well as IoT will help programs target interventions appropriately and ensure a more efficient use of resources.

KNOWLEDGE GAPS IDENTIFIED

What data and tools need to be generated to address the issues raised by the group?

Operational research (OR) questions/points that were raised in the pre meeting sessions were collated and re-conceptualized into OR needs to support a proposed M&E Framework (see tables in Annex 1) that spans across programmatic phases (columns) for schistosomiasis control and elimination. This OR pathway was then categorized into three groups: (i) Monitoring and Evaluation, (ii) Interventions and (iii) Epidemiology. We then consolidated all OR questions, removing repetition and grouping them into primary questions and sub-questions. During the COR NTD breakout groups these tables were reviewed and OR questions prioritized.

[1] **archetype: something (in this case, a transmission setting) that is a typical example of a particular kind of thing, because it has all the most important characteristics. For schistosomiasis, these characteristics are parasite species, snail species, ecology/environmental factors, behavioural exposures, access to water and sanitation etc. A combination of these characteristics leads to transmission archetypes, for example, S. mansoni in large permanent water bodies; S. haematobium and seasonal small water bodies etc.*

We highlight here **the three top OR priorities identified in each breakout group** and discuss the data and tools needed.

Monitoring and Evaluation

Knowledge Gap 1. Following multiple rounds of effective preventive chemotherapy, transmission becomes increasingly heterogeneous and focal. Current guidance dictates that after 5 or more rounds of MDA, programmes need to reassess the burden of infection and adapt intervention strategies but current mapping and M&E tools do not sufficiently capture or address the focality and heterogeneity of schistosomiasis transmission.
What is the optimal survey design (approach), in terms of accuracy and feasibility, to (i) inform a more focused, likely sub-district, intervention to achieve EPHP and (ii) to determine progress beyond EPHP to IoT?
Data and tools: *Data and tools that can help to identify optimal survey designs*

- Secondary analysis on available age-infection-profile datasets will help determine which are the best age-group/at-risk groups to sample i.e. are SAC sufficient or should pre-SAC and adults be included?
- Further fine scale spatial species-specific data should be collected and geostatistical analysis used to determine programmatically feasible survey designs .
- Optimal survey designs should include new and improved diagnostics which are available for programmatic use and sufficiently sensitive at lower levels of infection. In addition to this, for (ii) IoT, optimal survey designs will potentially need environment/surveillance diagnostics.
- The optimal survey design needs to be standardized, unless archetype has an influence, and produce data which identify residual foci of transmission.
- Optimal survey designs should allow for integration, where feasible, with soil-transmitted helminths (STH).

Knowledge Gap 2. EPHP is currently defined by prevalence of heavy intensity infections rather than an indicator of disease. In addition, both acute and chronic morbidity exist at light and moderate infection intensities.
What is the biological threshold which programmes can measure, directly or by proxy, below which schistosomiasis morbidity is eliminated or is no longer a public health burden?
Data and tools: *Data and tools to define targeted thresholds and indicators for EPHP*

- Secondary analysis on available data and collection of new data will be needed to determine whether we need species-specific indicators of prevalence, morbidity or intensity, as well as age and sex specific indicators to inform the EPHP threshold(s).
- New data analysis is needed to determine what diagnostics can be used by programmes to assess whether EPHP thresholds have been met. It is likely that some of these thresholds will require improved diagnostics tools to be developed.
- Mathematical modelling can be used to determine how reaching the EPHP threshold will inform programmatic decisions.

Knowledge Gap 3. The primary schistosomiasis target for the WHO's NTD Roadmap for 2021 – 2030 is achieving EPHP. How do we monitor for EPHP being maintained below threshold levels to achieve validation and should the monitoring be morbidity focused or transmission focused?

Data and tools: *Data and tools that can help to determine that EPHP has been achieved and maintained.*

- Available data will need to be analysed and new data collected to determine what are the key interventions and surveillance approaches required to maintain EPHP and if this differs by archetype.
- Data analysis should address which age-groups, areas and occupations should be monitored once EPHP is achieved? And what should be the frequency of monitoring?
- New data collection and analysis is needed to determine whether active or passive, or both surveillance strategies are needed to validate that EPHP has been, and continues to be, maintained.
- New and improved diagnostic tools should be developed and used for surveillance (morbidity/transmission) of EPHP.
- New data collection and analysis is needed to determine how surveillance strategies can be embedded into health systems.

Epidemiology

Knowledge Gap 1. Remaining pockets of high transmission in elimination settings are a challenge for the area- or country-wide achievement of EPHP and IoT. What is the role of hotspots for achieving and maintaining EPHP and how can they be eliminated?

Data and tools: *Data and tools that can help to identify and respond to transmission hotspots.*

- Prediction models that can be used to help identify and target hotspots.
- Data analysis revealing the characteristics of hotspots (e.g. archetypes, snail abundance, infection levels, behavioural characteristics, access to WASH).
- Improved diagnostics that can identify (re)infection levels in humans and snails (and other reservoir hosts), also shortly after treatment.
- Development and testing of intervention packages to sustainably reduce transmission in hotspots.

Knowledge Gap 2. Once EPHP has been achieved, surveillance and response measures need to ensure that the achievements are maintained (and best advanced to IoT) and that potential recrudescence of infection and disease is discovered early and responded to in time. What is the optimal way to measure transmission during surveillance for EPHP?

Data and tools: *Tools and strategies for effective surveillance and response, and validation of EPHP.*

- Using any available data from countries & areas that have low prevalence and intensity of schistosomiasis, modelling can be applied to explore surveillance strategies for EPHP.
- Collecting data from low prevalence areas and regions (AFRO/PAHO /WPRO) and testing out surveillance approaches using active and passive case detection and environmental surveillance.
- Data analysis can help define "early warning characteristics" for recrudescence and determine optimal response to outbreaks and recrudescence.
- Testing of strategies to determine how to address individuals with high intensity infections in low transmission settings that are contributing to transmission.

Knowledge Gap 3. Surveillance to detect and respond to resurgence of transmission in areas where EPHP and IoT have been achieved is essential to maintain the achievements made. What are the optimal surveillance-response systems for ensuring IoT will be monitored and maintained?

Data and tools: *Tools and strategies for effective surveillance-response and verification of IoT*

- Available data from IoT areas and data collected from near IoT areas could be used to determine how and where surveillance should be done.
- Data from active (e.g. risk-based), passive (e.g. at peripheral health level), reactive (e.g. follow-up of infected individuals/contaminated water bodies) case detection should be collected and analysed to determine which surveillance approach is most effective and feasible.
- Determine and define what are the diagnostic needs at different levels depending on the strategy of surveillance. Point-of-care at peripheral level? High throughput at central level? Pooling strategies? Sensitivity *versus* specificity? For humans and snails?
- Define what are "early warning characteristics" for recrudescence using available data and collecting new data from IoT and near IoT areas.
- Determine what cross-border surveillance is required.
- Collect data from recent outbreaks and use modelling analysis to determine what is the optimal response to outbreaks and recrudescence?
- Investigate and collect new data in settings where EPHP and IoT have been achieved to determine what is the optimal response to outbreaks and recrudescence?

Interventions

Knowledge Gap: Interventions designed to achieve the goals of the specific phases of Control to EPHP to IoT are required. Once the goal of each phase is achieved, those gains must be maintained and a decision on the feasibility/appropriateness of moving to the next phase must be made after which the appropriate tools and interventions should be rolled out accordingly.

What are the optimal tools for achieving and maintaining EPHP, how will EPHP validation be assessed and surveilled, and how will it be decided when and where the IoT phase should be implemented and what interventions will it entail? For each of these phases do interventions need to be tailored to the transmission archetype (see previous definition footnote[1])?

Data and Tools:

- These archetypes will need to be defined using available data.
- Modelling analysis could help answer questions on what PC pressure (frequency, delivery, target population), BCC, coverage threshold for safely managed water and sanitation, effective Vector Ecology Management (VEM) and Veterinary Public Health (VPH) for each phase.
- Testing interventions for BCC, WASH, VEM, VPH in different archetypes and prevalence settings requires a good design and monitoring strategy to collect evidence.

RECOMMENDED NEXT STEPS

What operational research and other actions need to be taken to address the knowledge gaps identified by the group?

Developing a Monitoring and Evaluation Framework

As we move into a new WHO NTD Roadmap for 2021-2030 we need to address the highlighted knowledge gaps and prioritize operational research to establish a stronger M&E framework in order for schistosomiasis programmes to progress beyond the current, often repetitive cycle. This would be an end-to-end pathway from baseline to verification of elimination with key phases of:

- **Baseline Mapping and Attack:** Appropriate survey designs that assess where schistosomiasis infection is a risk and guides required interventions.
- **Achieving and maintaining elimination as a public health problem (EPHP)**. This is where the majority of countries with the highest burdens of schistosomiasis currently (in 2020) sit. To achieve and maintain EPHP, programmes will need to sustain an appropriate level of MDA and strengthen cross-sectoral interventions.
- **Surveillance and validation of EPHP**. Here a programme could decide to remain in this phase post-validation with a specific package of reduced interventions, or, proceed to
- **Achieving Interruption of transmission (IoT)** with tailored micro-interventions such as focal MDA (fMDA) or focal test-treat-track (fTTT) targeted at the borough, parish or village level, coupled with effective BCC, water and sanitation coordination, VEM and where required, VPH. Here prevalence thresholds are required to guide decisions on when to stop large-scale MDA and start tailoring interventions to the micro-level. Once IoT has been achieved, the process of verification and surveillance will begin.
- **Surveillance and verification of IoT / Maintaining IoT by surveillance-response.** The verification of IoT requires a clear surveillance strategy. Once IoT has been reached in some areas or countrywide, continued surveillance will be necessary to maintain this achievement and to detect recrudescence of transmission/imported infections early. Timely and effective response mechanisms and measures need to be in place to react immediately to potential outbreaks. Such a surveillance will also be needed to build the evidence for the WHO IoT verification.

A strong M&E framework for schistosomiasis would ensure equitable distribution of resources to communities based on need, risk, and epidemiologic phase, provide clear evidence-based programmatic decisions and would capitalize on the investments made to control and eliminate schistosomiasis. We highlight here key **recommended actions and OR needed to develop a M&E framework for schistosomiasis elimination**.

Optimal survey designs for key programmatic stages

Population-based cross-sectional survey data collected through an oversampling approach to inform geostatistical modelling which would test survey designs. The optimal survey design would then be determined based on accuracy (under/over treatment error) and programmatic feasibility (number of sites required – a key

driver of cost); sample size (total and per primary surveillance unit (PSU)); availability of sampling frame (e.g. list of schools or villages within subdistrict); statistical/analytic expertise required to design and interpret the survey.
Secondary analysis on available age-infection-profile datasets to determine which are the best age-group/at-risk groups to sample i.e. are SAC sufficient or should pre-SAC and adults be included, will help determine this.

Identifying and addressing hotspots/non-responding communities

Studies across multiple archetypes and countries to assess what environmental, behavioural and socio-economic factors render a hotspot a hotspot/persistent hotpot. Essential will be the collection of good quality data that can help to inform prediction models at very small scale. If there are unique characteristics over all settings, these can help to develop a hotspot/non-responding check list to determine what may be the cause for the failure to respond to interventions. However, the term "hotspot" will most likely require different definitions and thresholds in different programmatic phases that need to be investigated. Intervention studies are needed to determine how transmission in hotspot areas can be effectively and sustainably reduced. Ideally, a hotspot/non-responding communities intervention flowchart will be developed based on the potential causes of the hotspot and indicating what measures to implement. This could include:

a. MDA frequency for addressing non-responding / hotspot communities
b. WASH & BCC coverage levels by archetype
c. VEM intervention by archetype

Defining threshold for EPHP and maintaining EPHP

Cross-sectional surveys to be conducted across multiple archetypes to identify meaningful and measurable targets for detecting the control and elimination of schistosomiasis-related morbidity in Africa. Here we refer to chronic morbidity that can be prevented by regular PC rather than established, severe morbidity that requires an individual clinical treatment and management intervention.
The study would be designed to answer the following primary evaluation questions:

- What are the optimal morbidity markers for *S. mansoni* and *S. haematobium* in different age groups, including PSAC, SAC, adolescents and adults and how do they relate to infection indicators (prevalence and intensity of infection)?
- What are the species- and age-specific morbidity goals for which schistosomiasis programmes should be aiming for in an EPHP context?

Following these surveys, there will need to be further operational research to determine which optimal combination of interventions are required to maintain the EPHP threshold for which there is little, or no, new detectable schistosomiasis-associated morbidity.

Defining threshold for IoT and determining surveillance-response approaches

Initially, modelling can help to identify surveillance/case detection strategies that are suitable to detect infected individuals that might contribute to/re-introduce transmission. This might include active (risk-based) case detection, passive case detection (at the peripheral health level) and/or reactive case detection (by tracking

infected individuals to identify individuals with a similar risk-behavior/exposure), xenomonitoring of snail infections, with appropriate diagnostics for each approach. Response interventions to react to infected individuals/contamination of environment need to be investigated for their ability to avoid recrudescence. Surveillance-response approaches need to be investigated for their operational feasibility, their sensitivity to detect cases, their ability to maintain IoT, and for cost-effectiveness. The sensitivity of surveillance will only be as good as the diagnostic methods applied. Hence, highly sensitive and specific point-of-care diagnostics are needed.

Thresholds of IoT and at what prevalence levels it is safe to move towards a surveillance-response approach (or back to MDA) need to be determined, considering the diagnostics available and recommendable.

Determining which interventions are required to efficiently maximize impact

Initially mathematical modelling could utilize existing data to explore and present how EPHP and IoT thresholds could be met in different archetypes, using different combinations of interventions to different target populations. Interventions would include preventive chemotherapy, BCC, safely managed water and sanitation (and their coverage thresholds), vector ecology management and veterinary public health. With the acknowledgement that more intervention impact data would need to be made publicly accessible / accessible to modelling groups for robust projections and that data may be scant for some interventions.

Following the modelling, operational research evaluating the impact achieved in a programmatic context by combinations of interventions would need to be conducted. These would include collecting data that would help to strengthen the model parameters.

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ANNEX 1: OPERATIONAL RESEARCH NEEDS - TABLES PRESENTED AT COR NTD

Monitoring and Evaluation Framework: Synthesized Operational Research needs for each Phase, split into three categories to answer the following question: To address barriers for progressing through programme phases, what ORs do we prioritize? (votes from COR NTD breakout groups highlighted in yellow)

Monitoring & Evaluation

Baseline Mapping & Attack Phase	Achieving and Maintaining EPHP	Surveillance and Validation of EPHP	Interruption of Transmission (IoT)	Surveillance and Verification of IoT
Primary question: What is the best survey design (approach) for more precise mapping to guide focused interventions? (13 votes) *Sub-questions within primary:* *· Age-groups?* *· Diagnostics?* *· What different designs at different stages i.e. baseline; post-PC etc?* *· Different design for different geographical/ecological areas?* **Primary question:** How many effective rounds of intervention are required before the next epidemiological survey for decision-making is conducted? (3 votes) **Primary question:** What are the most appropriate water, sanitation and behaviour outcome indicators that demonstrate a reduction in the risk of SCH transmission? (3 votes)	**Primary question:** What is the threshold which programmes can measure, below which SCH morbidity is eliminated as a public health problem? (4 votes) *Sub-questions within primary:* *· Do we need species specific indicators?* *· Do we need age/ sex specific indicators?* *· Sh: Can we use microhaematuria target; Can we use 10% prevalence threshold?* *· Sm: How do we use CCA; Is there a prevalence threshold?* *· How will this measure translate to programmatic decisions?* **Primary question:** What programmatically feasible survey design can we use to measure whether Elimination as a Public Health Problem (EPHP) has been achieved/maintained? (9 votes) *Sub-questions within primary:* *· Age-groups?* *· Diagnostics?* *· Where should this design be tested i.e. different archetypes?* *· How frequently should the survey be conducted to determine EPHP has been achieved/maintained?* **Primary question:** What water, sanitation and behaviour monitoring needs to be in place to ensure EPHP is achieved/maintained? (2 votes)	**Primary question:** How do we monitor for EPHP being maintained below threshold levels? (11 votes) *Sub-questions within primary:* *· Morbidity focused or transmission focused?* *· Which age-groups?* *· Occupations?* *· Frequency of monitoring?* *· Active surveillance strategies?* *· Passive surveillance strategies?* *· Diagnostic tools for surveillance (morbidity/transmission)?* *· How are surveillance strategies embedded into health systems?* *· Does this differ by archetype?* **Primary question**: What data are required for the validation process? (2 votes) **Primary question:** What are the most appropriate vector ecology management (VEM) and veterinary public health (VPH) indicators that demonstrate a reduction in the risk of SCH transmission? (2 votes)	**Primary question:** What is optimal programmatically feasible survey design to determine progress to IoT? (10 votes) *Sub-questions within primary:* *· Which populations (age/risk groups)?* *· Which diagnostics and at what sensitivity should be used?* *· What non-infection diagnostics are required?* *· Does this vary by species?* *· Does this vary by archetype?* *· How can the survey identify residual foci of transmission (hotspots, and hotpops)?* *· What actions should be triggered by failing the survey?* **Primary question:** What role can surveillance play in identifying the need for, and targeting of, micro-interventions for IoT? (6 votes) **Primary question:** What water, sanitation and behaviour, VEM and VPH monitoring needs to be in place to ensure IoT is achieved? (4 votes)	**Primary question:** What survey design is required to determine absence of infection in humans/snails/animals? (3 votes) *Sub-questions within primary:* *· Which populations (age/risk groups)?* *· Which diagnostics? Which confirmatory diagnostics?* *· Does this vary by species?* *· Does this vary by archetype?* *· How many times and when should this survey be performed?* **Primary question:** What water and sanitation monitoring needs to be in place to ensure IoT is maintained? (2 votes) **Primary question:** What data are required for the verification process? (7 votes)

Interventions

Baseline Mapping & Attack Phase	Achieving and Maintaining EPHP	Surveillance and Validation of EPHP	Interruption of Transmission (IoT)	Surveillance and Verification of IoT
Primary question: What is an effective round of PC in target populations? (3 votes) *Sub-questions within primary:* · *Age-groups of target pop?* · *Coverage?* · *Compliance?* **Primary question:** How do we ensure good MDA coverage? (2 votes) *Sub-questions within primary:* · *Frequency of delivery?* · *Platform for delivery?* **Primary question:** How do we implement effective Behaviour Change Communication (BCC)? (5 votes) *Sub-questions within primary:* · *What are essential components of effective BCC?* · *Frequency of BCC campaigns?* **Primary question**: What are the effective coordination measures to ensure adequate targeting of water and sanitation interventions? (2 votes)	**Primary question:** How can we maintain Elimination as a Public Health Problem (EPHP) once it has been reached? (7 votes) *Sub-questions within primary:* · *What PC frequency?* · *What PC coverage?* · *What effective cross-sectoral coordination is required?* · *How is community engagement in interventions maximised?* · *How do we design and implement effective BCC to achieve and maintaining EPHP?* · *What is the coverage threshold for safe water and sanitation to achieve & maintain EPHP?* · *Is vector ecology management (VEM) required in this phase?* · *Is veterinary public health (VPH) required in this phase?* · *At what unit should these interventions be implemented?* **Primary question:** How do we design intervention packages for non-responding, hotspot communities where EPHP is not being achieved? (6 votes) **Primary question:** Does SCH need and MMDP component and if so, what model would work?	**Primary question:** Post validation: what interventions do we need to maintain EPHP? (8 votes) *Sub-questions within primary:* · *Do these differ from what is needed pre-validation?* · *Do these differ by archetype i.e. need to be tailored?* · *At what unit should these be targeted?* · *What PC is required (frequency, delivery, target pop)?* · *What BCC needs to be embedded?* · *What is the coverage threshold for safely managed water and sanitation?* · *What role do health centres play?* · *What effective VEM is required in this phase?* · *What effective VPH is required in this phase?* **Primary question:** What interventions are required in response to a schistosomiasis morbidity/transmission trigger through surveillance? **Primary question**: What is the minimum intervention package that needs to be in place to ensure a country can move to IoT? (1 vote)	**Primary question:** What are the optimal packages of micro-interventions required to achieve interruption of transmission? (7 votes) *Sub-questions within primary:* · *How do these differ by archetype i.e. need to be tailored?* · *At what intervention unit should they be targeted?* · *What PC is required (frequency, delivery, target pop)?* · *What BCC needs to be embedded?* · *What is the coverage threshold for safely managed water and sanitation?* · *What role do health centres play?* · *What effective VEM is required in this phase?* · *What effective VPH is required in this phase?* **Primary question:** What interventions are need if an outbreak happens? (1 vote)	**Primary question:** Which water and sanitation interventions need to be in place, through cross-sectoral collaboration, to ensure IoT will be maintained? (4 votes)

Epidemiology

Baseline Mapping & Attack Phase	Achieving and Maintaining EPHP	Surveillance and Validation of EPHP	Interruption of Transmission (IoT)	Surveillance and Verification of IoT
Primary question: How can baseline mapping data be used to identify sites that risk turning into hotspots? (9 votes) *Sub-questions within primary:* · *Which models can be used to predict which populations are at risk?* · *What are key characteristics of hotspots and which archetypes?* **Primary question:** What data are needed to improve models and predictions (6 votes)? *Sub-questions within primary:* · *Adult data?* · *PSAC data?* · *Archetype data (Water-environment-climatic-snail-SCH spp data?*	**Primary question:** What data are required to identify hotspots? (15 votes) *Sub-questions within primary:* · *Which prediction models?* · *Parasitological and malacological?* · *What are key characteristics of hotspots and which archetypes?* **Primary question:** What is the rate of transmission following PC? (7 votes) *Sub-questions within primary:* · *Who are contributing to transmission and how quickly post-PC (age/occupation/compliance)?* · *When are people actively transmitting? Determined by which diagnostics?* · *Who are more susceptible to infection?* · *What is the effect of poly-parasitism and hybrids on transmission?* **Primary question:** What morbidity may still be present after the current Elimination as a Public Health Problem (EPHP) threshold (1% prevalence of heavy intensity (PHI)) is reached? (5 votes) *Sub-questions within primary:* · *What interventions are required to eliminate morbidity below the current threshold?* · *Could using microhaematuria as a target for EPHP, instead of PHI, correspond to the reduction of other morbidities to background levels?* · *How do we collect and include FGS data?* · *Is morbidity present in older ages?*	**Primary question:** What is the optimal way to measure transmission during surveillance? (15 votes) *Sub-questions within primary:* · *Which diagnostics?* · *How to address individuals with high infection intensities in low prevalence areas that are contributing to transmission?* · *What are 'early warning characteristics'?* · *What cross-border surveillance is required?* **Primary question:** At what threshold do the residual foci of transmission become of public health relevance i.e. require increased interventions? (4 votes) **Primary question:** Do all endemic areas in a country need to be below the EPHP threshold and validation achieved before moving to Interruption of Transmission (IoT)? (3 votes)	**Primary question:** Is there a threshold where mass PC can be stopped and test and treat be used, with other interventions continuing? (10 votes) *Sub-questions within primary:* · *Which age/risk groups?* · *Which diagnostics should be used?* · *Does this vary by species?* · *Does this vary by archetype?* **Primary question:** What is the threshold below which SCH transmission cannot be maintained and PC can be stopped i.e. interruption of transmission? (6 votes) *Sub-questions within primary:* · *Which age/risk groups?* · *Which diagnostics and at what sensitivity should be used?* · *Does this vary by species?* · *Does this vary by archetype?* **Primary question:** What is the minimum threshold for coverage of: (4 votes) · water, sanitation & behaviour · vector ecology management (VEM) · veterinary public health (VPH) to support stopping PC and ensure no recrudescence?	**Primary question:** What are the optimal surveillance systems for ensuring IoT will be monitored? (12 votes)

COR-NTD 2020
Virtual Meeting, November 12 – 14
Integrating for Impact

ANNEX 2: LIST OF ALL SPEAKERS, RAPPORTEURS AND PANELLISTS FROM COR NTD SESSIONS

Speakers & Rapporteurs

- Alex Carlin
- Anouk Gouvras
- Bonnie Webster
- Charlie King
- Danis Kailembo
- Darin Evans
- David Rollinson
- Federica Giardina
- Fikre Seife
- Fiona Allan
- Fiona Fleming
- Jaspreet Toor
- Jessica Clark
- Katie Fantaguzzi
- Lazarus Juziwelo
- Matt Weaver
- Neerav Dhanani
- Nora Monnier
- Pauline Mwinzi
- Penelope Vountasou
- Rachel Pullan
- Ryan Weigand
- Steffi Knopp
- Sultani Matendechero
- Upendo Mwingira
- Yves-Nathan Tina-Bi

All Panellists

- Achille Kabole
- Alistidia Simon
- Amadou Garba
- Andreas Nshala
- Anna Kildemoes
- Anna Philips
- Anthony Bettee
- Anthony Danso-Appiah
- Antonio Montresor
- Aya Yajima
- Bagrey Ngwira
- Beatriz Calvo
- Betty Nabatte
- Briana Furch
- Cara Tupps
- Carlos Torres Vitolas
- Charles King
- Chelsea Toledo
- Chris Hoover
- Claire Chaumont
- Dan Colley
- Deirdre Hollingsworth
- Derick Osakunor
- Diepreye Ayabina
- Emily Griswold
- Eugene Ruberanziza
- Evan Secor
- Frank Richards
- Govert Van Dam
- Humphrey Mazigo
- Humphrey Mazigo
- Isaac Njau
- Janelisa Musaya
- Jaspreet Toor
- Jean Coulibaly
- Jean T Coulibaly
- Joanne Webster
- Jonathan King
- Katie Gass
- Katie Gass
- Katja Polman
- Laura Appleby
- Linsey Blair
- Lisette van Lieshout
- Louis-Albert Tchuem Tchuenté
- Lydia Leanordo
- Mita Eva Sengupta
- Monique Dorkeno
- Moses Arinaitwe
- Moudachirou Ibikounlé
- Moussa Sacko
- Mutale Nsakashalo-Senkwe
- Narcis Kabatereine
- Nathan Lo
- Nicholas Midzi
- Pauline Mwinzi
- Peter Steinmann
- Ploi Swatdisuk
- Poppy Lamberton
- Rachel Bronzan
- Ron Hokke
- Ronaldo Carvalho Scholte
- Russel Stothard
- Safari Kinunghi
- Said M Ali
- Sarah Nogaro
- Seke Kayuni
- Shaali Ame
- Ulrich-Dietmar Madeja
- Uwem Ekpo
- Winston Palasi
- Yael Velleman
- Yaobi Zhang
- Zvi Bentwich