Guide for Mapping Neglected Tropical Diseases Amenable to Preventive Chemotherapy in the African Region

February 2014 (Revised March 2018)

Contents

Foreword

A strong and new momentum now exists for the control or elimination of neglected tropical diseases (NTDs), which has translated into an increase in political commitment and funding for NTDs at the global, regional and country levels. High-level advocacy has resulted in increased large scale funding opportunities for the control of NTDs, particularly from USAID, DFID and the Bill and Melinda Gates Foundation (BMGF). The historic partners' endorsement of the "London Declaration on NTDs" in London in January 2012 was an unprecedented boost to eradicate, eliminate and intensify control of NTDs.

In order to capitalize on this momentum, the WHO/AFRO provided guidance and technical assistance to countries in the WHO African region to develop comprehensive multi-year integrated plans for NTD control/elimination. All endemic countries in the African Region have been supported to develop their multiyear strategic Master Plans for NTDs. To strengthen coordination and partnership, WHO/AFRO organized a regional stakeholders' consultative meeting on NTDs in June 2012, which resulted in the "Accra Urgent Call to Action on NTDs", urging countries of the Region to rapidly scale up NTD interventions.

All these efforts provide a landmark for the rapid scale-up of NTD interventions in the African region, which bears a disproportionately high burden of NTDs – about 50% of the global burden of NTDs. However, to achieve the regional scale-up, there is an urgent need to complete the mapping of all NTDs targeted by preventive chemotherapy (PC), i.e. lymphatic filariasis (LF), onchocerciasis, schistosomiasis, soil-transmitted helminthiasis (STH) and trachoma. Mapping of NTDs is indeed essential for developing adequate strategies and types of drug co-administrations, and is critical for scaling up interventions to control and eliminate targeted NTDs.

While a huge milestone in assessing the burden of NTDs was achieved by the end of 2017, a few gaps still exist in various settings. Resources and technical assistance for mapping are still available from various donors (mainly DFID, USAID and BMGF). There have been several partners supporting mapping activities in different countries. However, each partner has his own vision, interest and mapping approach. Poor communication among the various groups remains can be a major problem, resulting in duplication of mapping of the same diseases in some areas in endemic countries.

This document was developed to ensure greater coordination and mutual understanding of the priorities, and to harmonize the mechanisms for coordinating mapping interventions, while ensuring government leadership and ownership.

Acknowledgements

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Acronyms

AFRO	-	Regional Office for Africa, World Health Organization
CM	-	Coordinated Mapping
DSM	-	Disease-Specific Mapping
ICT	-	Immunochromatographic Card Test
IU	-	Implementation Unit
LF	-	Lymphatic Filariasis MDA
	-	Mass Drug Administration
MoH	-	Ministry of Health
NTD	-	Neglected Tropical Disease
PC	-	Preventative Chemotherapy
REMO	-	Rapid Epidemiological Mapping of Onchocerciasis
SCH	-	Schistosomiasis
STH	-	Soil-Transmitted Helminthiases
TEC	-	Trachoma Expert Committee
TF	-	Trachomatous inflammation, Follicular
TI	-	Trachomatous inflammation, Intense
TT	-	Trachomatous trichiasis
WHO	-	World Health Organization

Definitions

Mapping

The term refers to data collection that is conducted at the beginning of NTD control or elimination programmes for the purpose of determining if a public health action or intervention is necessary.

Coordinated Mapping (CM)

The term refers to an effort to identify the elements of disease-specific mapping activities that can be feasibly linked in order to achieve efficiencies and save valuable human and financial resources. In the case of preventive chemotherapy interventions this mapping provides critical action-oriented information to national NTD control programmes of the Ministries of Health and their partners.

Introduction

The World Health Organization (WHO), in collaboration with a range of partners, promotes the integration of control activities for the Neglected Tropical Diseases (NTDs) that can be targeted with preventive chemotherapy (PC). These include: lymphatic filariasis (LF), onchocerciasis, schistosomiasis, soil-transmitted helminthiases (STH), and blinding trachoma. The proposed coordination of control efforts is intended to decrease programme duplication, increase efficiency and maximize the use of available resources to enable more people to be reached with treatment.

As Ministries of Health (MoH) in disease-endemic countries plan integration and scale-up of NTD control activities, it is essential to understand both the geographic distribution of each of the targeted diseases (including where disease overlaps occur) and whether the prevalence of each disease is high enough to warrant treatment intervention. To date, the protocols for 'mapping' have been individualized for each disease. This means that multiple teams are required to conduct multiple assessments in potentially endemic areas, at considerable expense to each programme. Coordinated mapping is thus imperative.

Coordinated Mapping approach allows countries with multiple diseases to maximize the effectiveness of the limited human, financial, and logistical resources available for mapping.

For the purpose of this document and the integrated NTD programmes, the term "mapping" is used to refer to data collection that is conducted at the *beginning* of NTD control or elimination programmes for the purpose of determining if a public health *action* of intervention is necessary.

'*Coordinated mapping'* refers to an effort to identify the elements of *disease-specific* mapping activities that can be feasibly linked in order to achieve efficiencies and save valuable human and financial resources. In the case of preventive chemotherapy (PC) interventions this mapping provides critical action-oriented information to national NTD programmes of the MoHs and their partners.

This document identifies the elements of Disease-Specific Mapping (DSM) and indicates similarities that can be exploited to achieve more resource-effective Coordinated Mapping (CM) of the NTDs. WHO's established disease-specific indicators and thresholds are not altered in this guide, as it is critical that the recognized, principal disease-specific objectives be maintained in the NTD programmes.

Importantly, not all elements of DSM can be 'coordinated'. There is no single CM that will apply to all targeted NTDs in all endemic countries since countries differ with respect to their disease burden and distribution and their mapping needs. The purpose of Coordinated Mapping is to allow countries with multiple diseases to maximize the effectiveness of the limited human, financial, and logistical resources available for mapping. The final result is not a geographic depiction of overlapping disease prevalence but, rather, a geographic depiction of actions to be taken to target the diseases. For example, mapping data for each disease and the co-endemicity of NTDs (Figure 1a) will be used to determine the drug packages required for each district. The product is an *action map* (Figure 1b) that provides information on the public health action or interventions required.

This guide is intended to serve as a manual for countries planning and carrying-out mapping of NTDs, and it is meant to be adapted by countries according to their particular situations, disease distributions, and logistics. The CM is not going to be appropriate in all circumstances, but will prove resource-effective in many.

The co-endemicity map guides creation of an action map that reveals the geographically-targeted approach required in a country.

Ideally, all countries where the targeted NTDs are co-endemic should create an action map like the one illustrated in Figure 1b, which will be used to guide the development and/or updates of the National Plan of Action (PoA) for NTDs, including control strategies.

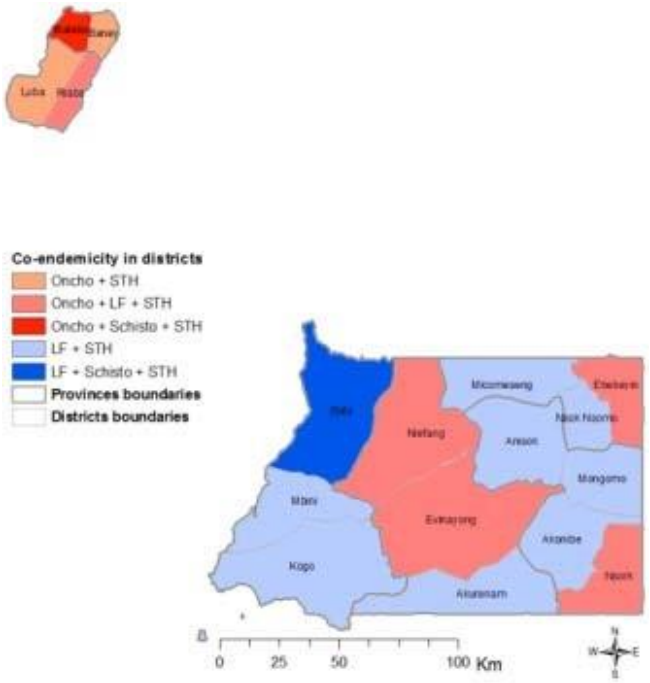


Figure 1a. Disease co-endemicity map for 4 PC-NTDs (Onchocerciasis, LF, Schistosomiasis and STH) in Equatorial Guinea (mainland and Bioko Island).

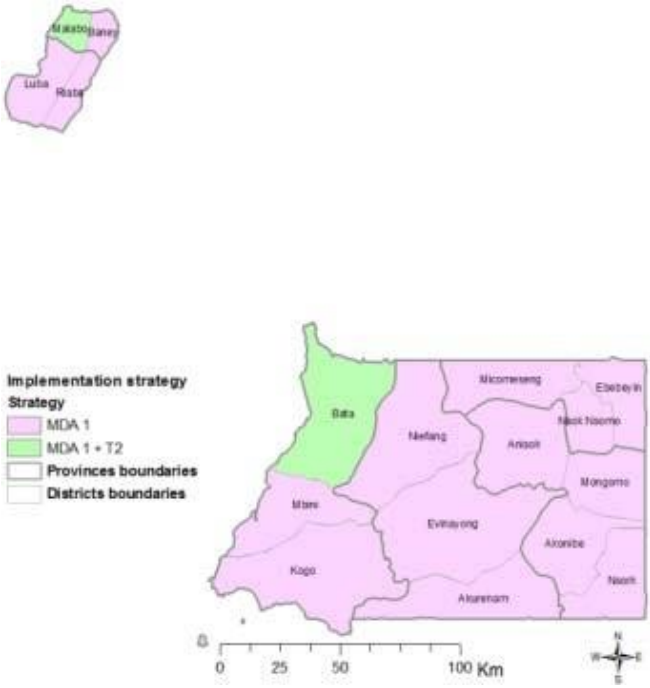


Figure 1b. Coordinated Action Map for 4 targeted NTDs in Equatorial Guinea (mainland and Bioko island). 'MDA 1' is the administration of ivermectin and albendazole; 'MDA 1+T2' is the administration of ivermectin + albendazole followed 6 months later by praziquantel + either albendazole or mebendazole.
Map source: Tchuem Tchuenté et al., APOC.

Purpose of the guide

The purpose of this manual is to provide a clear overview on how to conduct mapping of NTDs. It is meant to serve as a guide for choosing an appropriate protocol, organizing and training mapping teams, collecting and analysing data, and reporting results.

The manual outlines the WHO-recommended disease-specific mapping (DSM) methodologies and indicates the value of coordinated mapping (CM) approaches where feasible and appropriate. Indeed, there are certain regions/districts that may be endemic for a single NTD, and thus coordinated mapping would not be applicable in such areas. This guide provides directions regarding selection of the appropriate mapping approaches to ensure efficient use of resources (financial and material) and manpower. The disease-specific methods described are for schistosomiasis, STH, LF, onchocerciasis and trachoma. In addition, the manual includes mapping methods for loaisis because of the impact that loa endemicity has on implementation guidelines for LF and onchocerciasis.

The objectives of this manual are:

1. To assist health planners at national, regional or district levels in the planning and collection of data on the prevalence and distribution of targeted NTDs using a coordinated approach where appropriate;
2. To provide guidelines for conducting disease specific mapping and coordinated mapping;
3. To provide a framework for developing potential actions post mapping.

NTD mapping phases

In order to harmonize interventions in the different countries and to ensure a good coordination of NTD mapping activities in the African region, WHO/AFRO recommends a "Three Phase approach": Phase I - Stakeholders' meeting, Phase II - Mapping survey, and Phase III - Take action (Figure 1).

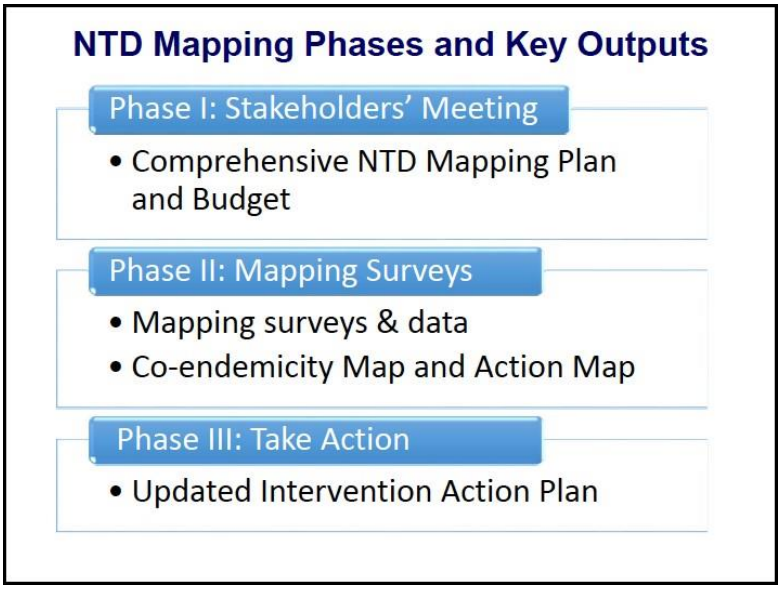


Figure 1. NTD mapping phases and key outputs.

Importantly, the in-country stakeholders' meeting is a key activity for preparing NTD mapping.

I. PREPARING FOR NTD MAPPING

A successful mapping survey depends largely on good planning, which is the responsibility of the planning team. The composition of the planning team and tasks to be performed by each individual should be clearly defined. Members of the planning team should include, but are not limited to, national NTD programme managers/coordinators, technical directors/advisors of NTD programmes and public health advisors. It should also include local experts from universities, research institutions, etc. This team is responsible for planning all mapping activities.

Duties of the planning team include:

- Defining needs;
- Adapting and finalizing the mapping survey protocol;
- Adapting and finalizing the mapping survey and budget;
- Obtaining necessary ethical approvals;
- Contacting local authorities in the survey area to inform them about the study;
- Identifying the survey team members;
- Organizing survey logistics and provisioning the necessary materials;
- Conducting trainings for the mapping survey team;
- Supervising the team and ensuring strict protocol adherence;
- Overseeing data entry and analyses.

In the initiation and planning of the mapping process, the following should be done:

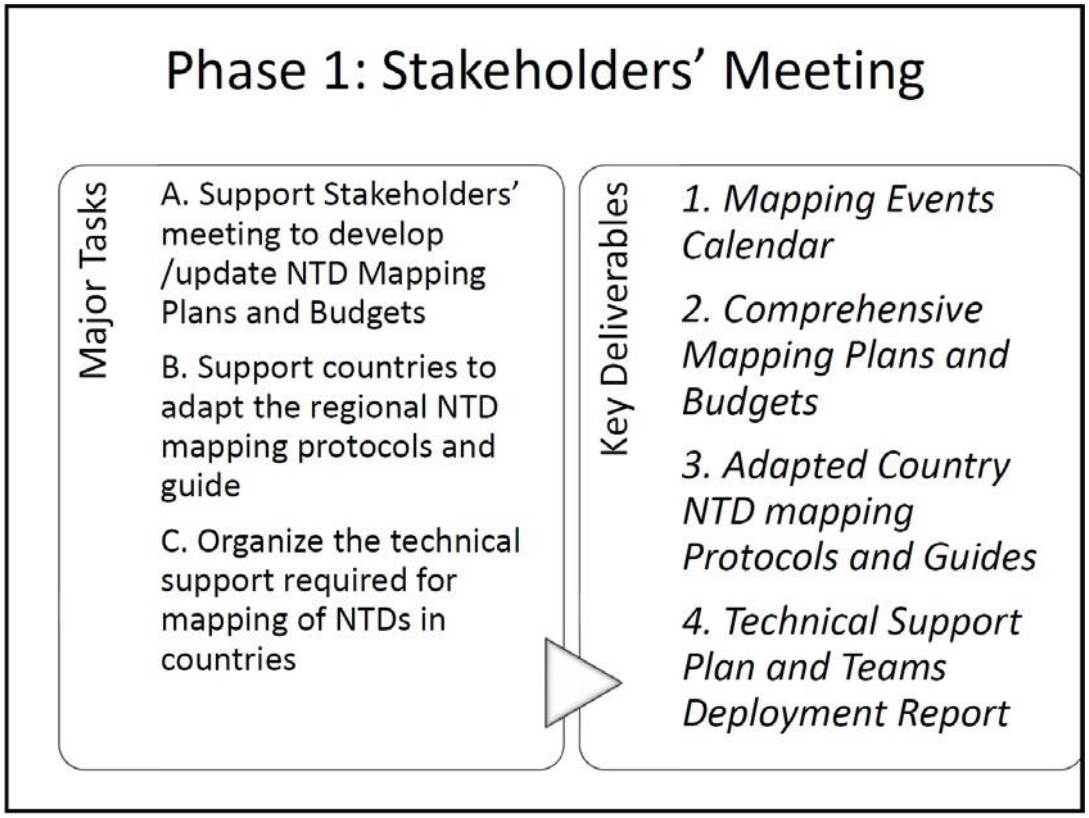
- ***Identification of stakeholders and partners***: An exhaustive list of program managers, academicians, researchers and other players with multidisciplinary expertise will be established by the national NTD team.
- ***Planning/organization of stakeholders' meeting***: The national NTD should plan a workshop to develop a comprehensive mapping plan and budget. Key stakeholders and partners supporting NTD mapping should be identified and selected from the list established above. Consultants provided by WHO/AFRO will facilitate the actual workshop.
- ***Stakeholders' meeting on comprehensive mapping plan and budget***: This workshop will allow to:
    - review existing data for each NTDs, either published or not;
    - assess usefulness of available data for NTD mapping;
    - review and discuss country master plan and action plan;
    - identify gaps in existing NTD maps;
    - analyze needs for PC-NTD mapping: mapping gaps, personnel, resources, equipment, transport, budgeting (what is available, what are the sources, what are the funding gaps);
    - review and discuss appropriate mapping methodology and approach;
    - develop mapping protocol;
    - develop mapping plan;
    - elaborate budget for mapping implementation;
    - identify and define roles of the different partners/stakeholders, with emphasis on mapping coordination.

I.1. Stakeholders' meeting

In each country, a large consultative workshop, involving all stakeholders, will be organized to collect existing data for each NTD, identify mapping gaps, determine mapping needs, and develop a comprehensive mapping plan and budget for completing the mapping of all PC-NTDs.

The major tasks and key deliverables of the stakeholders' meeting are summarized in the Table 1 below.

Table 1. Major tasks and key deliverables of the NTD mapping stakeholders' meeting.



I.1.1. Determining mapping needs

In practice, *mapping is carried out and recorded at the district level (or implementation unit)*, even though sometimes further mapping for treatment decisions may be undertaken more focally (*e.g.*, at a sub-district level). The result of this mapping will be a 'line-listing' of every district in the country with information for each NTD. This information can eventually be expressed in tabular and/or graphic (map) form.

The first step in this country planning effort is a situation analysis to identify what is known about *each disease in each district*. The goal is to determine whether the information already available is sufficient to categorize each district as needing to be mapped or not (for each NTD):

1) No mapping needed
   - because it has been mapped and found to be non-endemic
   - because there is no indication that the disease is endemic ('suspected non-endemic')
   - because knowledge on disease endemicity and prevalence is already sufficient

2) Mapping needed
   - because endemicity is undefined and no survey data is available
   - because the district is suspected to have focal disease that requires focal ('sub-district') mapping

I.1.2. Review of existing data

Since on-the-ground disease mapping is expensive and requires a significant amount of resources, the existing or historical data on disease burden and distribution should be utilized to the maximum possible extent before any new data collection/mapping is begun. The planning team must understand what information is already available, assess the quality of any existing data, and then determine if on-the-ground mapping is actually necessary. In many cases, appropriate data might already exist and be able to provide enough information for an informed decision as to whether or not preventive chemotherapy (PC) is necessary for a particular disease in a given implementation unit (usually the district), and how frequently PC (through mass drug administration [MDA]) is required.

Collection and analysis of all epidemiological and treatment information available for each of the diseases before on-the-ground mapping is undertaken must be an important first step in the process of updating the distribution or mapping of any of the target NTDs. This process is illustrated in Figure 2, where Steps 1 and 2 refer to the collection and review of the existing data, and Steps 3-5 refer to the identification of the mapping gap and how to approach it.

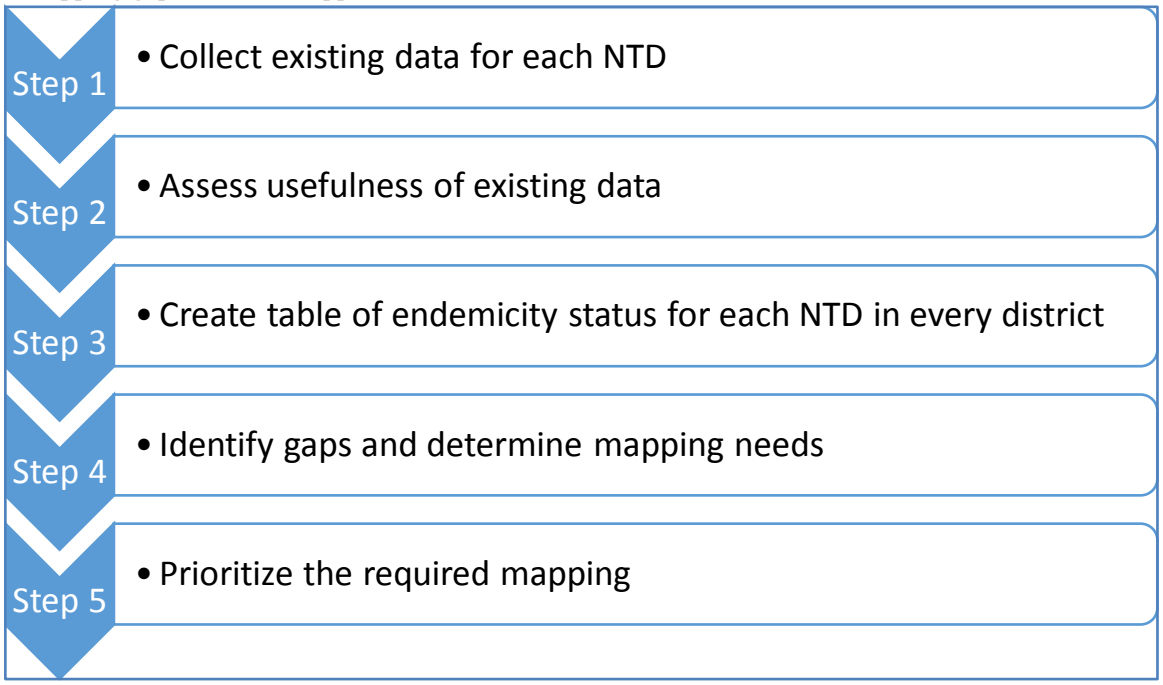


Figure 2: Determining mapping needs

Step 1: Collect existing data for each NTD

Abundant data might already be available for each targeted disease in a country. These data can exist in the form of published literature, unpublished reports, national and local health facility records (Ministry of Health routinely collected health statistics), or records from local experts. The coordination/planning team should collect these data from various sources for initial mapping analysis. Please refer to Annex 1 for potential sources of data.

Step 2: Assess usefulness of available data

The available data from different sources should be checked to determine if they can be a reliable guide for planning interventions (Box 1). It is understood that historical data might have been collected with various objectives and methodologies, and in some cases WHO guidelines might not have been followed, particularly in surveys that were conducted for research purposes. Any data, however, that reliably confirms presence of disease can be of value for determining the need for further data collection in order, ultimately, to relate local disease prevalence to the prevalence thresholds that determine the disease-specific intervention strategy to be implemented.

Box 1. Factors to consider when determining the usefulness of existing data

1. Year data collected: *Refer to the disease-specific guidelines for inclusion criteria of such data if applicable.*
2. Whether interventions or environmental changes/modifications occurred after data collection.
3. Sample size: *Statistically valid sample size assessed. Please refer to the disease-specific guidelines for the minimum number of sample size.*
4. Methodology used in obtaining the data. Data collected using the following appropriate methods for the various diseases are considered reliable:
    - Lymphatic filariasis: Parasite antigen test (FTS), night blood microfilaria surveys;
    - Onchocerciasis: nodule palpation, microfilaria by skin snips;
    - *Schistosoma haematobium:* Urine filtration, dipsticks, WHO standard blood-in-urine questionnaire, or sedimentation;
    - *Schistosoma mansoni:* Kato-Katz method, concentration methods, direct smear;
    - Soil-transmitted helminths: Kato-Katz method, concentration methods, direct smear;
    - Trachoma: Clinical examination of eyes for TI, TF and TT.

Step 3: Create table of endemicity status for each NTD in every district

After assessment of the available data collected from various sources, the data that provide valid disease prevalence and meet the above considerations should be used to determine whether or not each NTD is endemic in each district. A 'line-listing' table of the status of all districts in a country can also be used to create disease-specific maps that record the *known* distribution of each NTD.

Step 4: Identify gaps and determine mapping needs

The disease-specific maps and table from step 3 provide an overview of the distribution of NTDs in the country and identify the gaps where on-the-ground coordinated mapping activities can be planned. Data available but not judged to be sufficient or new enough can provide a valuable guide as to where further data collection might be conducted within the country.

Step 5: Prioritization of the required mapping
The final step after determining the mapping needs is to prioritize the approach to filling these gaps. Such prioritization must be done locally in response to local determinants, but some factors that might figure in prioritizing certain districts for mapping include the presence of morbidity, suspected high-risk of infection, seasonal opportunities, along with other very pragmatic factors like the plans or availability of other groups with the potential for coordinating their activities with the NTD mapping.

I.1.3. Technical mapping plan

Current WHO disease-specific mapping protocols are available and should be followed. Based on these protocols a specific, coordinated mapping plan tailored to the country's needs should be prepared. The plan should include all protocols, technical approaches, data capture and assessment strategies, and should be shared with the partners (*e.g.*, donors, implementing NGOs, academic institutions helping with the mapping, Ministry of Education, and others). By doing so, all the information related to the mapping process is integrated into one document. The process and methods are explained, and realistic budgets developed and presented. Partners can also contribute to the improvement of the plan.

An important element in advancing the mapping plan at this stage is determining the national requirements for ethical review or informed consent for this public health survey activity. Once the requirements are identified, appropriate steps can be taken to assure compliance with the national ethical standards, including potentially the review and approval of disease-specific or coordinated survey protocols by all necessary in-country national ethical committees as well as ethical committee(s) of any partner organizations prior to initiating the mapping survey.

I.1.4. Selection of survey teams

Local technical resources should be involved in the mapping process. Participation of local experts and research centers can provide skilled technicians and supervisors already trained and accustomed to field work; they may also assist in providing materials for the survey (microscopes, power generators, etc). While external experts may be necessary to start some of the mapping, such support should focus principally on local capacity building.

I.1.5. Logistics

The amount and type of supplies needed for a survey depend on several factors, including the NTD being mapped, whether multiple NTDs are being mapped in a coordinated fashion (and the number of NTDs being mapped), protocol, and size of the district. Lists of basic supplies needed for each of the NTD mapping surveys are included in the disease-specific appendices. An assessment of resources available in country should be undertaken and additional needed supplies obtained. If electronic data capture is to be used, devices will likely need to be purchased outside of the country. Most rural areas may lack electricity therefore a generator to power microscopes used in microscopic examination of samples may be needed. Other logistics that should be planned for include transportation, accommodation, and food for the mapping team.

I.1.6. Timeline

Based on the determination of mapping needs in the previous section, an estimation of the timeline necessary to conduct mapping activities can be determined. In determining the timeline factors that should be considered include the specific NTDs that will be mapped, total number of individuals to be surveyed (sample size), the geographical distribution of the area to be mapped, accessibility of areas that require mapping, the date of the past MDA (mapping surveys should not be done just after MDA, a minimum of 6 months post-MDA is required) and the resources available.

I.2. Ethical considerations

Depending on the requirement of the country, consent must be obtained for all persons surveyed, including parental/custodian consent obtained for all participating children under the age of 18, and assent obtained from all children 6-18 years of age. In the absence of parents or custodians, it may be acceptable for village chiefs or elders and school principals/directors to provide consent for children. Also, verbal consents/assents may be obtained in lieu of written consents/assents depending on literacy levels of individuals taking part in the mapping surveys. A sample verbal informed consent and assent can be found in Annex 2.

II. MAPPING SURVEYS

The present manual provides updated guidelines for disease specific mapping, and a coordinated mapping approach to allow optimization of the use of limited human, financial and logistical resources available for mapping NTDs in endemic countries.

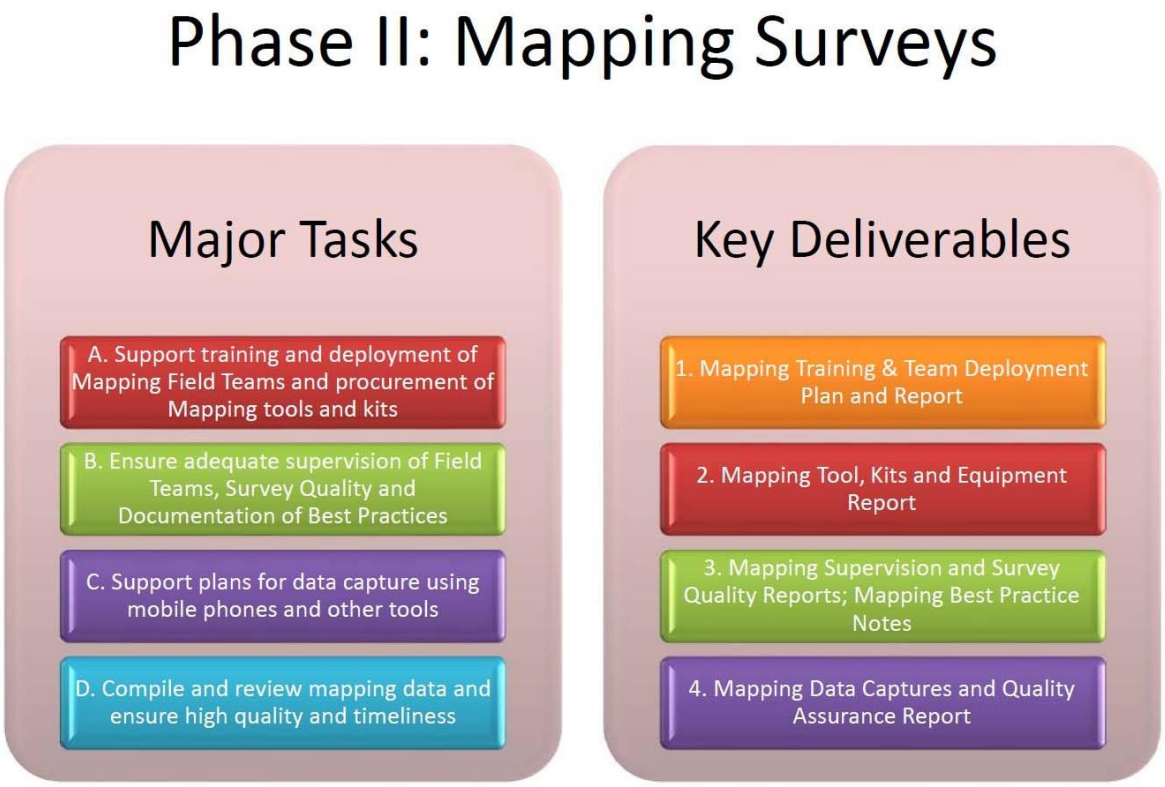
Mapping surveys will be conducted following recommendations resulting from consensus on investigation/implementation unit, the sample size for each disease, and the laboratory tests to be used. Quality control and supervision of the activities are essential for the validity of the mapping results. Capacity building, training and involvement of local resources such as experts, research centres and laboratories are also essential for mapping implementation.

For the Mapping survey phase, the followings are required:

1) ***Ministry of Health and Partners' agreement*** on the mapping of NTDs. Advocacy meetings to ensure that all relevant ministry departments (e.g. MoE) and all stakeholders are notified and available to contribute to the process as needed.
2) ***WHO Manual for coordinated mapping of NTDs*** targeted by PCT in the African Region: this guide specifies all steps, requirements and tools necessary for coordinated NTD mapping.
3) ***Coordinated request of ethical clearance***
4) ***Coordinated training of mapping team***: Identify training needs, personnel to be trained, trainers, place and times. Identify timelines and logistics. Training plans and training documents should be completed. WHO Experts will review country proposal, ensure planning is on course, advice on adherence to WHO guidelines and adapted to local situation.
5) ***Coordinated mapping surveys of NTDs***
6) ***Integrated national data base for mapping***.
7) ***Coordinated logistics***, including equipment, materials and consumables required for NTD mapping, e.g. FTS kits and other diagnostic tests.

The major tasks and key deliverables of the mapping surveys are summarized in the Table 2.

Table 2. Major tasks and key deliverables of the NTD mapping surveys.



II.1. General requirements

II.1.1. Training of survey teams

Prior to the start of the mapping surveys, training should be conducted to ensure that all mapping staff are aware of their duties and responsibilities. Individuals involved in the mapping surveys should undergo training on specific survey methodology, obtaining informed consent/assent, interviewing skills, accurate completion of data forms or use of electronic data capture devices, sample handling and management practices. The actual length of the disease specific training varies and national planning and coordination teams should keep this in mind when assessing if and how mapping for different NTDs can be coordinated jointly. Depending on their level of proficiency and frequency of performing the various laboratory tests recommended for targeted NTDs, the technicians may require an extensive training or simply a brief refresher on specimen collection and testing. Since trachoma grading is based solely on clinical eye examination and usually conducted by several graders, training of graders must include intra-observer grading assessment. For detailed descriptions of disease-specific training issues, the available training documents should be consulted.

For all specific NTDs, after the theoretical training it is necessary to have a practical session before the team starts the actual mapping activities. Such practical sessions will identify the workflow, and possible problems which should be solved before the team formally starts the mapping survey across the country/district. If district mapping is coordinated with more than one NTD, the field practice (pilot) should include those NTDs involved in the coordinated mapping. The practical session will test:

- All the technical procedures and examinations
- Flow of people
- Logistics
- Use of equipment
- Interview skills
- Form completion
- End-of-day data summary

Quality control is critical during all mapping surveys to ensure that the data are collected using the appropriate guidelines. The following approaches could be considered:

- Periodic spot checks by supervisors to ensure that data collection forms are complete and correctly filled out;
- Review of findings for clusters from electronic data capture to look for inconsistencies (*e.g.*, GPS data should be different for each household);
- If using paper forms, double enter data into an electronic database.

II.1.2. Initiating contact with villages and schools

It is important to inform district authorities about the mapping surveys and to involve them as much as possible during the planning processes. District authorities can provide valuable information, including inaccessible roads, broken down bridges, village populations, and location of health centers. District authorities should be consulted on information regarding the most convenient and effective manner of notifying village chiefs/elders and school principals/directors. In addition, village chiefs/elders must be informed in advance regarding the date and approximate time of the mapping survey to ensure that all eligible residents are notified and encouraged to attend. This will enable the mobilization of village residents since it is fairly common for residents to farm, fish, etc. during most of the day. For some disease mapping (e.g., trachoma mapping), village chiefs/elders need to be requested to prepare a list of households in the village. Additionally, before school surveys, school principals/directors should be notified in advance of the date and approximate time of the mapping survey.

II.1.3. Procedure to follow on arrival in villages and schools

Before conducting the mapping surveys, the village chief/elders should be consulted for permission to perform the mapping surveys in their village, even if they have been previously informed. The mapping survey teams with assistance from village chiefs/elders, community health workers, etc., if possible, will ask village residents to participate in the survey, determine the age of participants, and obtain informed consent of eligible participants. Similarly, for school surveys, the school principal/director should be consulted prior to the start of any mapping activities in the school.

II.1.4. Management of clinical cases identified during mapping

All positive cases found during the surveys should be treated for the relevant PC diseases. The following medicines will be administered to infected individuals, using the recommended and appropriate dosages:

- Praziquantel for Schistosomiasis;
- Albendazole or Mebendazole for STH;
- Ivermectin for Onchocerciasis;
- Ivermectin/Albendazole or Diethylcarbamazine/Albendazole for LF;
- Azithromycin or Tetracycline eye ointment for Trachoma.

These individuals should also be advised to participate in the MDA according to the control/elimination programme strategies.

II.1.5. Nomadic populations

During the planning phase for each disease, the presence of nomadic populations should be inquired about in the district being mapped. Although nomadic populations are highly mobile, they may integrate with a village or from their own settlements either temporarily or for an extended period of time. The locations of these populations may be represented in district/sub-district maps as villages although in reality they could be transient. Nomadic populations should be included in the surveys if they are present.

II.2. Methods for mapping PC NTDs

There are important differences in the mapping approaches for each of the 5 PC NTDs, as well as loaisis. Some of the disease-specific mapping variations and guidelines are summarized in Table 3.

Table 3. Summary of PC NTD specific guidelines for disease-specific mapping

Disease	Indicator	Persons tested	Diagnostic tool	Sample size	Survey sites
Lymphatic filariasis	Prevalence of *W. bancrofti* antigen	≥ 15 year old; living ≥ 10 years in the community/village	Filariasis Test Strip (FTS) kits	50-100 people per site	At least 1 village/site in a district
Schistosomiasis	Prevalence of microhaematuria or parasite eggs in urine for *S. haematobium*, Prevalence of parasite eggs in stool or circulating cathodic antigen (CCA) in urine for *S. Mansoni*	School age children (10-14 years)	Dipsticks for microhaematuria or urine filtration for *S. haematobium* Kato-Katz or concentration method for *S. mansoni* Point-of-care CCA (POC-CCA) cassette test	50 school age children per school/village	At least 5 villages in each ecological zone[1]
Soil-transmitted helminthes	Prevalence of parasite eggs in stool	School age children (10-14 years)	Kato-Katz	50 school age children per school/village	5 villages in each ecological zone
Trachoma	Prevalence of active trachoma (TF) and trichiasis (TT)	1-9 years old for active trachoma (TF) and ≥ 15 years old for TT	Clinical examination of eyes according to WHO guidelines	Approximately 50 children from sampled households per village At least 50 adults ≥ 15 years old	20-30 villages (clusters) per district
Onchocerciasis	Prevalence of nodules or *O.volvulus* microfilaria	≥20 year old, living ≥ 10 years in the village	Palpation of nodules (REMO) or skinsnip	30-50 adults	Villages selected every 30-50 km along rivers with black fly breeding sites
Loiasis	Prevalence of history of eye worm	≥ 15 year old, living ≥ 5 years in the community	Questionnaire for history of eye worm	80 adults per site	Communities where loaisis endemicity is suspected and LF or oncho treatment is required

[1]Ecological zone is defined as: geographical area that is homogenous in terms of humidity, rainfall, vegetation, population density, and sanitation level.

The detailed methods for conducting mapping of each of these NTDs are further described in the following sections.

II.2.1. Detailed methods for disease-specific mapping

II.2.1.1. Lymphatic Filariasis

Survey area and population

The implementation unit for mapping LF should follow the MoH lower level management unit, normally the health district. Sampling is performed at the village level and the testing is conducted in adults (≥ 15 years of age).

Site Selection and Sample Size

At least 2 villages should be selected in each district. Selection of villages should be based on disease occurrence information, i.e., reports of occurrence of pathology associated with infection. The selection of the 2 villages should preferably be made before survey initiation by the planning and coordination team using expert opinion and health information from each district to be mapped, in close collaboration with district health authorities or other relevant organizations working in the district. The 2 villages chosen for sampling should be at least 25 km apart.

Within each selected village, 50-100 adults (balanced number of men and women) ≥15 years and resident for more than 10 years in the village should be chosen for testing, using the Filariasis Test Strip (FTS) point-of-care rapid diagnostic tool that measures the presence of *Wuchereria bancrofti* circulating filarial antigen in the blood. The FTS tests are conducted using blood drawn by finger stick. If among the first 50 individuals tested, 2 or more tests are positive, testing can be stopped, otherwise testing should continue until 100 individuals have been examined. In case it is not possible to complete the sample in the first village, the survey can continue in a neighbouring village.

The second selected village only needs to be surveyed if ICT positivity rate in the first village is <1%. The survey must always be first carried out in the more probably endemic village, according to disease occurrence data and local information. In cases where the district borders highly endemic districts or where there is substantial evidence of clinical disease occurrence additional villages may need to be surveyed before concluding that infection is absent.

Survey Indicator

The indicator for LF is filarial antigenaemia measured by FTS. Districts are considered endemic if the FTS positivity rate is ≥1%. The antigen procedure is described in Annex 3.

II.2.1.2. Onchocerciasis

Survey Methodology

The implementation unit for mapping is the river basin. Sampling is performed at the village level and onchocerciasis infection is determined by conducting skin snips and/or nodule palpation (REA).

Site Selection and Sample Size

In the river basin, 1 village is selected every 30-50 km along rivers with black fly breeding sites. At least 1 high-risk village should be selected. In each village, 50 adults (village residents for more than 10 years) should be selected for testing. Individuals should be ≥ 20 years old.

Survey Indicator

The prevalence of nodules is determined via the rapid epidemiological assessment (REA), and the intervention zone is defined by the REMO (Rapid Epidemiological Mapping of Onchocerciasis) guidelines.

The presence of *O. volvulus* microfilaria is determined via skin snip. The procedure is described in Annex 4.

II.2.1.3. Schistosomiasis

Survey Methodology

Although the district is the implementation unit, sub-districts may be considered in certain circumstances due to the high focality of schistosomiasis transmission.

When resources are a constraint such that not every sub-district in a district can be mapped independently, the mapping design could combine several sub-districts into up to three mapping units (Figure 3), where transmission is likely to be similar, according to ecological factors affecting schistosomiasis transmission.

Based on health centre morbidity and parasitological records, and on local knowledge or previous survey data, each sub-district should be classified into one of the three following categories:

- Mapping Unit 1 (Group 1 sub-districts): Group of sub-districts, within the same district, where schistosomiasis is known to be present.
- Mapping Unit 2 (Group 2 sub-districts): Group of sub-districts, within the same district, where schistosomiasis is suspected to be present.
- Mapping Unit 3 (Group 3 sub-districts): Group of sub-districts, within the same district, where schistosomiasis is suspected not to be present or the presence of schistosomiasis is unknown.

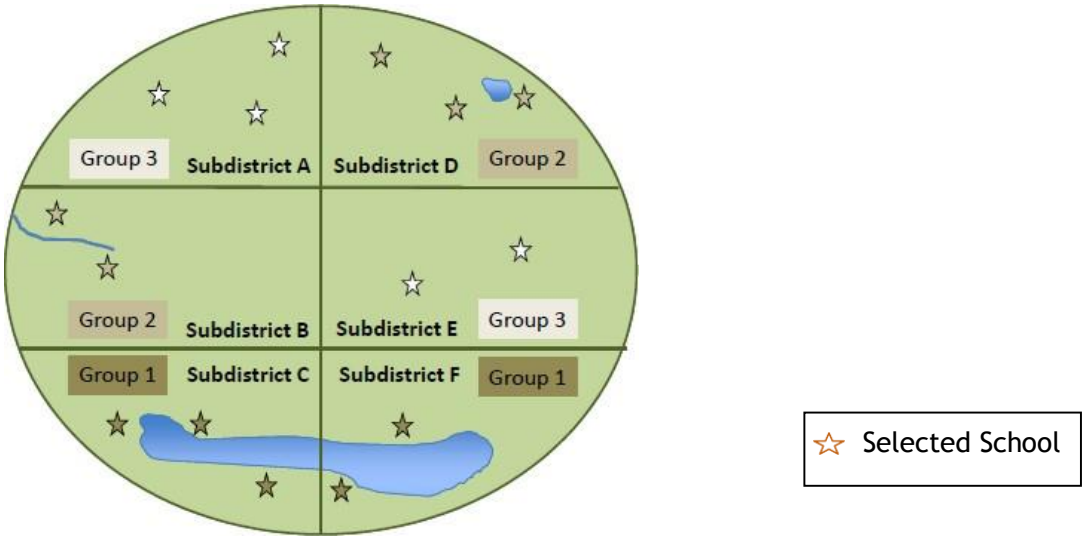


Figure 4: Example of classification of 6 sub-districts into 3 mapping groups within one district

If all sub-districts within a district are classified as being in group 1 or group 2 or group 3, the entire district should form a single mapping unit.

For each mapping unit, *one* prevalence will be estimated and all sub-districts in the group classified as non-endemic, low, moderate or high-risk area. One treatment strategy will be decided based on this classification.

Site Selection and Sample Size

In each mapping unit 5 primary schools should be selected. Selection of schools should be purposive and will be guided by previous knowledge in the areas where transmission is known, suspected or more likely (proximity to lakes, streams, water bodies, etc.). Schools should not be selected in the same locality, but selection should consider geographical distribution of schools in order to be representative.

Importantly, due to the high focality of schistosomiasis transmission, random selection of schools should be avoided.

In each school, 50 children (25 boys and 25 girls), ranging between 10 and 14 years of age (ages where infection rates would be expected to be the highest) should be randomly selected. If 50 children 10-14 years old cannot be found in the selected school, either select children from an expanded age range or move to the surrounding community to make up the random sample. If still not possible to include 50 children, move to the next nearest school.

One stool and one urine sample per child is considered enough for mapping. If a child cannot provide both urine and stool samples, he/she should be replaced by another child.

Survey Indicator

The indicator for intestinal schistosomiasis is the presence of intestinal schistosome (*S. mansoni, S. intercalatum, S. guineensis*) eggs in stool samples. This is determined using the Kato-Katz procedure (Annex 5). This will provide a prevalence estimate for each mapping unit that will permit classification of the mapping units into non-endemic, low, moderate or high risk.

The indicator for urinary schistosomiasis (*S. haematobium*) is the presence of haematuria or schistosome eggs in urine samples. Presence of haematuria is determined via a dipstick (Appendix 10) and schistosome eggs in urine are determined via a urine filtration kit. Microhematuria testing should be conducted at the test site in the school, while urine samples for testing the presence of eggs by urine filtration could be processed and examined in a laboratory later in the day.

When possible, it is highly recommended to calculate the number of eggs per gram of feces or per 10 ml of urine. Intensity of infection is not strictly necessary to make an initial treatment decision, however it would be useful for monitoring and evaluation purposes since infection intensity is a major determinant of morbidity.

Considerations for Co-endemicity of Schistosomiasis with STH

It is recommended to map schistosomiasis and STH together whenever both diseases occur in the same region. When mapped together, the same stool specimen provided by school children should be simultaneously tested for both intestinal schistosomiasis and STH.

II.2.1.4. Soil-transmitted helminths

Survey Methodology

The implementation unit for STH is the district. When resources are a constraint, for mapping purposes districts can be combined into homogeneous ecological zones where transmission is likely to be similar.

All districts in the same homogeneous ecological zone could form a mapping unit. Ecological zones should be defined by variables that reflect temperature, humidity, rainfall, vegetation, population density and sanitation levels as these are factors that affect STH transmission (egg survival).

The schools serve as the testing sites and STH infection is determined by testing stool samples collected from children.

Site Selection and Sample Size

In each district or in each mapping unit (formed by the group of districts in each homogeneous ecological zone) 5 schools should be selected. In each school, 50 children (25 boys and 25 girls) ranging between 10 and 14 years of age (where infection rates would be expected to be the highest) should be randomly selected. If 50 children 10-14 years old cannot be found in the selected school, either select children from an expanded age range or move to the surrounding community to make up the random sample. If still not possible to include 50 children, move to the next nearest school. One stool sample per child is considered enough for mapping.

When mapping of STH and schistosomiasis is done simultaneously, the same stool samples collected from school children will be examined for STH and intestinal schistosomiasis using Kato-Katz method (see Annex 5). The slide has to be read twice: first within 30 minutes from the preparation of the slide in order to be able to identify hookworm eggs, and later to identify other parasite species.

Survey Indicator

The indicator for STH parasites (*A. lumbricoides*, *T. trichiura* and hookworm: *A. duodenale* or *N. americanus*) is the presence of STH eggs in the stool samples, detected using the Kato-Katz procedure. When feasible it is highly recommended to calculate the number of eggs per gram of feces for each helminth species. Intensity of infection is not strictly necessary to make an initial treatment decision, but it would be useful for monitoring and evaluation purposes since infection intensity is a major determinant of morbidity.

II.2.1.5. Trachoma

Survey Methodology

The WHO recommended methodology is a 20-30 cluster survey. Districts are used as the survey area.
Because clusters are administrative units (i.e., villages) in most cases, clusters are selected with probability proportionate to estimated size of the administrative units or villages. This sampling frame allows every individual in the study area equal opportunity to be selected; thus the survey is a true population based prevalence survey. Within each of the 20-30 selected villages, houses are selected using systematic sampling. This means that a list of the households in the village must be prepared in advance; sampling of households can be done at the village on the day of the survey. Compact sector sampling can also be used if lists of households cannot be generated. All eligible individuals in the household are examined for trachoma. An eligible individual is a child age 1-9 years (for prevalence of infection) or an adult age $\geq$15 (for prevalence of trichiasis).

This survey protocol allows you to examine a small portion of the population but still draw conclusions about the surveyed population as a whole (i.e., survey area); however, it is not statistically valid to compare the prevalence of trachoma in different clusters in the district. More detail on trachoma mapping and training is available in the **Global Trachoma Mapping Project Manual**.

Site Selection and Sample Size

To select the 20-30 clusters/villages to visit during the survey, the first step is to compile a complete list of all villages (i.e. administrative units) and each village's population that exists in the district being mapped. There are several important items to note when compiling this data:

- The village is the administrative unit most often used because a village has clear boundaries. Other administrative units may be used if they have clear boundaries;
- The list should use population figures taken from a single source or census that includes ALL administrative units in the survey area or district. If the population for a village is not known or included in the list, estimate the population by comparing this village to a village with a known population, and add the estimated figure to the list.

In most settings, within each cluster/village, 50 children (1-9 years) and approximately 50 adults (≥ 15 years) should be clinically examined for signs of trachoma. No specific sample size calculation is done for adults; all adults (age 15+ years) in the sampled households should be examined.

All persons in the sampled household meeting the age requirements are eligible to be examined. Children will be examined for signs of trachoma follicles (TF), trachoma intense (TI), and trachomatous trichiasis (TT) while adults will be examined for signs of TT. See Annex 6 for more information on training graders and recorders.

Survey Indicator

The specific indicators that are used to determine public health action for trachoma are TF and TT. See Annex 9 for the thresholds for intervention.

II.2.1.6. Loiasis

Due to the risk of serious adverse events (SAE) associated with high *Loa loa* microfilaremia after ivermectin treatment, loiasis mapping should be conducted where this infection is suspected. The knowledge of the distribution of loiasis throughout the country is necessary to delineate clearly areas of its co-endemicity with either onchocerciasis or LF.

Survey Methodology

Sampling is performed at the same villages selected for onchocerciasis or LF.

Site Selection and Sample Size

The study population should consist of about 80 males and females aged ≥ 15 years who have been resident in the village for a minimum of five consecutive years. In each study community, house to house surveys should be conducted and a 'rapid assessment questionnaire for *Loa loa* (RAPLOA), which collects information about the respondent's past history of 'eye worm', will be administered to eligible participants.

Survey Indicator

The prevalence of loiasis is approximated via RAPLOA.

II.2.2. Coordinated Mapping

Throughout the preparation and implementation of disease-specific mapping, there are opportunities for programs to coordinate activities. Ability to coordinate depends mainly on two factors: 1) overlap of age range of survey population, and 2) overlap of geographic area of survey population.

Coordination of mapping efforts is meant to save time and resources by reducing or eliminating many of the logistical costs. It also promotes efficiency through development of coordinated (multi-disease) protocols as well as for application and submission for ethical clearance where necessary. Examples of mapping component that can be linked or coordinated are illustrated in Figure 4.

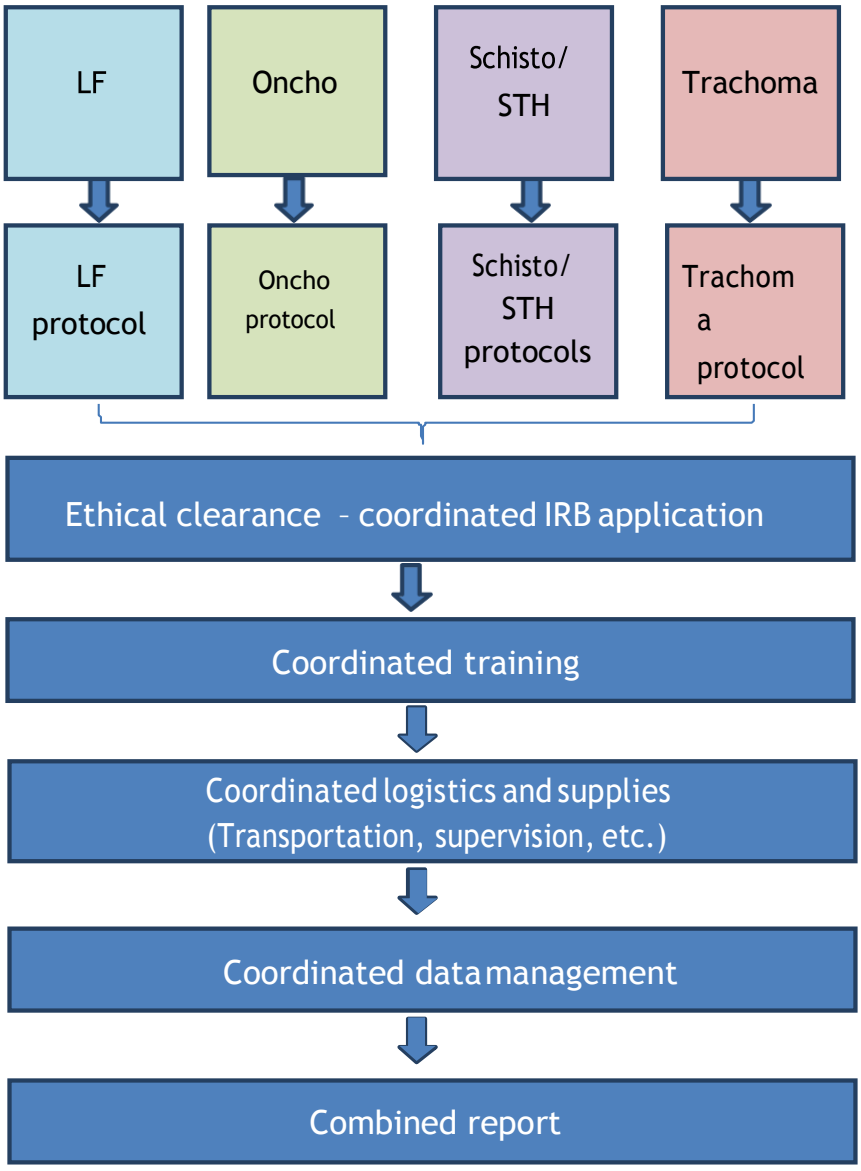


Figure 4. Coordinated Mapping Project Development

CM, in addition, implies that individual disease-specific NTD programs will not embark on needed mapping without first seeking out information as to the mapping needs of the other endemic or potentially endemic PC NTDs. If control program coordination is not possible because of difficult practical considerations, disease-specific mapping can still go ahead, but the effort to gain the efficiencies of CM will still have been made.

Survey Methodology

Coordinated Mapping can be carried out with any or all of the 5 PC NTDs, as each disease has its own independent module and, therefore, can be added or removed from the coordinated approach depending on the mapping needs in a particular area. This coordinated approach allows for the incorporation of disease specific mapping methodologies into a single mapping effort.

Some examples include:

- Collecting data from health facility records on lymphedema, hydrocele, and trichiasis at the same time
- Requesting ethical review and approval of mapping protocols (if required) by submitting a combined protocol
- Writing one letter to local authorities to inform them about (multiple) surveys
- Sending mapping supplies to district level
- Requesting informed consent from parents (if required) by asking consent for multiple sample procedures, e.g. fingerpricks and stool samples
- Combining transport to survey areas for survey teams
- Holding a single community information and mobilization session for multiple diseases being mapped
- Providing a common platform for the training of survey teams and the implementation of multiple disease mapping (including infrastructures/logistics, computers, mobile devices, GPS, etc.)
- Utilizing the same community workers or interpreters to support field mapping activities

II.3. Data management and reports

II.3.1. Data entry and management

Data collection can be carried out using paper forms or using electronic data capture. If paper forms are used, questionnaires and other data collection forms should be completely and legibly filled out. Forms should be collected at the end of every day by the supervisors or team leaders who should then crosscheck for proper filing or recording. Feedback has to be provided to the team. The completed forms should be forwarded to a central point as soon as the survey is completed in one district, where the supervising team should double check for validation before data entry. Data should be entered into a database by double entry and cleaned. Please see Annex 7 for sample data collection forms.

If data collection is carried out using electronic data capture, there is a series of steps that need to be carried out prior to the start of the survey. At the national level a server mechanism needs to be identified for collection of data. A project coordinator or epidemiologist will need to configure the collection devices to facilitate electronic transfer of data. It may be necessary to source the devices from outside of the country. Update or change of data collection formats can be carried out in country by the project coordinator/epidemiologist. Experience shows that there are fewer errors in using electronic data capture; however it is important for the survey coordinator to check data as it is received, on a daily basis, to identify any inconsistencies. Back-up of data should be carried out on a daily basis.

II.3.2. Data analysis

For each disease specific survey analysis of data is standardized using appropriate statistical software. As shown in Table 3, for each disease there are one or two indicators; for all of them, however, these indicators are a prevalence. The prevalence of each disease should be calculated for each district (or mapping unit used).

If electronic data capture is utilized, it is anticipated that the standardized reporting can minimize the need for using other statistical software.

The thresholds for each NTD in each district can be determined according to the WHO preventive chemotherapy (PC) guidelines for public health intervention. A summary of PC thresholds for each of the targeted NTDs is given in Appendix 18. Disease-specific programme managers need to supervise the data cleaning, analysis and interpretation. The disease-specific prevalences should be compared with the current thresholds for public health intervention as recommended by WHO (Appendix 8).

As noted in the disease specific mapping manuals, trachoma data collected from all villages in the district should be combined to generate prevalence (of TF and TT) for the entire district. STH data should be analyzed using the same method. Schistosomiasis data should be analyzed at either the district or the sub-district level. For lymphatic filariasis, if the data collected from one village in a district (or 'implementation unit') demonstrates ≥1% prevalence, the entire district should be treated. Onchocerciasis treatment is determined by prevalence at the village level that is then geostatistically mapped, especially along river systems.

II.3.3. Reports

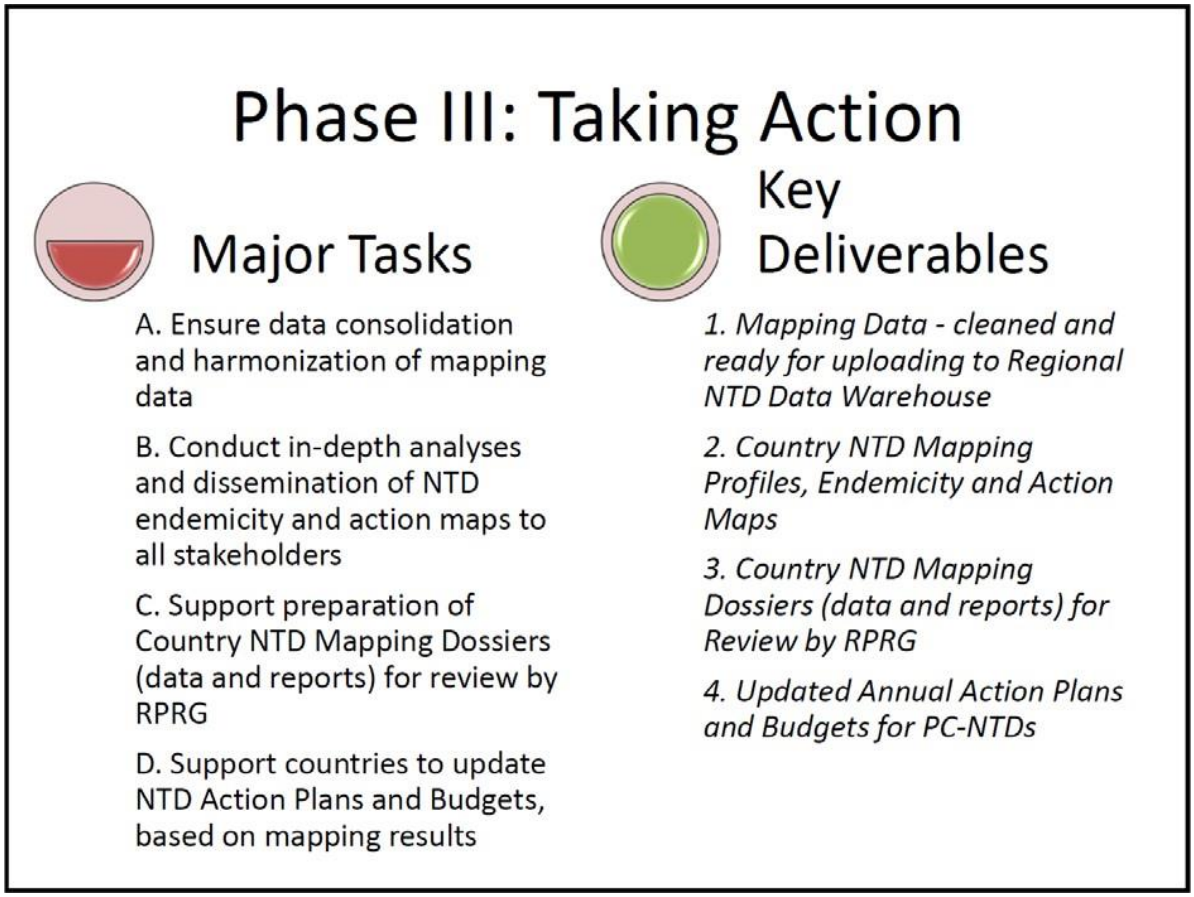
As surveys are completed, reports should be timely and shared with all key stakeholders. A meeting should also be convened to discuss and validate the results of the surveys, and actions to be taken should be decided by this meeting (*e.g.*, decision to treat, need for reassessment, etc.).

III. TAKE ACTION

Based on the results of the mapping survey and WHO guidelines for treatment, a decision for the type of preventive chemotherapy required will be made. Action maps for each disease will then be created, and a roll out strategy for the necessary MDAs will be established.

The major tasks and key deliverables of the NTD mapping phase III are summarized in the Table 4.

Table 4. Major tasks and key deliverables of the NTD mapping surveys.



An example of Action Map based on the results of mapping and disease co-endemicity is illustrated in Figure 5.

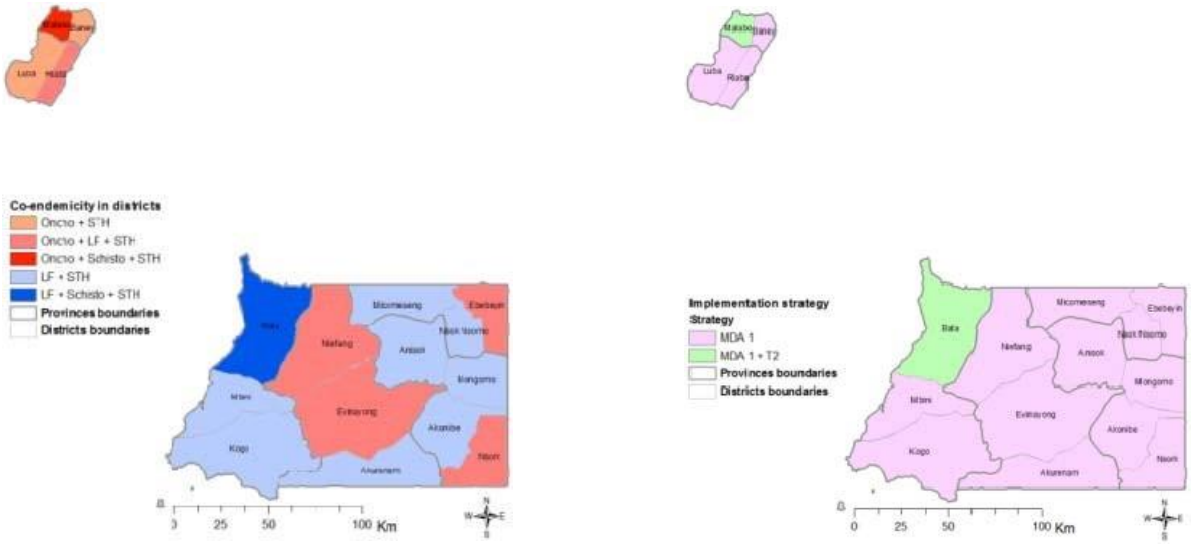


Figure 5. Example of Coordinated Action Map (B) for 4 PCT-NTDs developed from disease co-endemicity (B) in Equatorial Guinea.

Monitoring mapping progress

The progress on the mapping plan implementation will be monitored through:

- Regular teleconferences on mapping: every two weeks.
- Coordinated planning review meetings.

To monitor adherence to agreement, the following indicators will be used:

- Coordinated planning meetings.
- Use of country systems.
- Training of mapping personnel.
- Selection and composition of survey teams as specified in the approve mapping manual.
- Use of country experts.
- Coordinated budget and logistics support.
- Information sharing mechanism put in place.
- Availability of result management (i.e. joint data collation & analysis, periodic reviews, etc.) framework.
- Availability of program data in the country.
- Performance review mechanism put in place (periodic reports and review meetings).
- Country capacity building.
- Timeliness and Completeness of survey data.
- Budget availability.

Annexes

ANNEX 1: SOURCES OF EXISTING DATA

Potential sources of existing data include:

- Ministry of Health reports/records
- Academic theses and research projects
- Non-Governmental Organizations reports
- In-country published literature
- In-country disease-specific specialists records
- Health facility records/statistics
- Published international literature
- Lymphatic filariasis websites:
  - WHO/AFRO http://www.afro.who.int/en/clusters-a-programmes/dpc/neglected-tropical-diseases.html
  - WHO/HQ http://www.who.int/neglected_diseases/preventive_chemotherapy/lf/en/index.html
- Onchocerciasis websites:
  - APOC http://www.who.int/apoc/en/
- Schistosomiasis/STH websites:
  - WHO/AFRO http://www.afro.who.int/en/clusters-a-programmes/dpc/neglected-tropical-diseases.html
  - WHO HQ http://www.who.int/neglected_diseases/preventive_chemotherapy/sth/en/index.html
  - Schistosomiasis Global Atlas http://www.who.int/schistosomiasis/epidemiology/global_atlas/en/index.html
  - Global Atlas of Helminth Infections http://www.thiswormyworld.org/
- Trachoma websites:
  - WHO/AFRO http://www.afro.who.int/en/clusters-a-programmes/dpc/neglected-tropical-diseases.html
  - WHO HQ http://www.who.int/neglected_diseases/preventive_chemotherapy/trachoma/en/index.html

ANNEX 2: INFORMED CONSENT AND ASSENT

Verbal Informed Consent Script
(Flesch-Kincaid Grade level 8.5)

Hello, my name is_____, and I am with the Ministry of Health. We are asking you or your child to take part in an evaluation to measure the level of infection of____*(filariasis, loaisis, onchocerciasis, schistosomiasis, STH, trachoma**) in your district. Please ask questions if you do not understand. The Ministry of Health needs to know this in order to plan how best to offer treatment for these infections in this district. You or your child's participation will only take a few minutes. If you agree to take part in this evaluation, we will ….. (*prick your finger to collect some of your blood to check for filariasis infection/ask about a history of eye worm infection /snip your skin for onchocerciasis infection / / take urine and stool samples to check for schistosomiasis and worm infections/ check your eyes for trachoma infection*). You/your child may find this uncomfortable, but there are no other risks to you/your child for taking part. Any information you share with us will be kept private. We will not be doing any other types of testing other than what we just explained to you. If we see any other type of health problem or infection, we will refer you/your child to a health dispensary for care that can be provided there as usual. By taking part in this evaluation, you/your child will help us learn how to better plan programs for these diseases in your neighborhood. This might help you or others in the future. If you have any questions about these activities, your rights, or if you/your child have any concerns after taking part in this evaluation, you can contact (*MOH Director for Disease Prevention, Dr……. on the phone number…….*). You can participate in only some of the tests or stop at any time without any penalty or loss of benefits. You/your child do/does not have to take part in this evaluation. If you are satisfied with this explanation, may we check you/your child for ___ (*filariasis, loaisis, onchocerciasis, schistosomiasis, STH, trachoma*)? ..

I confirm that I have explained fully to the patient mentioned above (or to his/her custodian) all necessary details of this evaluation.

** Use of local terminology identifying these diseases is encouraged.*

Verbal Assent Script
(Flesch-Kincaid 7.6)

Hello, my name is_____. We are asking you to help us learn more about the amount of infection caused by germs called_____*(filariasis, loaisis, onchocerciasis, schistosomiasis, STH ,trachoma*)* in your district. Please ask questions if you do not understand. The Ministry of Health wants to know which of these infections *(filariasis, loaisis, onchocerciasis, schistosomiasis, STH, trachoma)* are in your district so they can know how best to offer treatment for them. If you agree to take part in this evaluation, we will ….. *(prick your finger to collect some of your blood to check for filariasis infection/ ask for a history of eye worm infection /snip your skin for onchocerciasis infection/take urine and stool samples to check for schistosomiasis and worm infections/check your eyes for trachoma infection).* The finger-stick or eye exam might hurt a little, but you will help us learn how to fight these diseases in your neighborhood. You can stop participating whenever you want. If you would want to stop being a part of this evaluation, please tell your parents or the evaluation team. You do not have to take part in this survey. You will not be in trouble if you say no. Do you want to take part?

** Use of local terminology identifying these diseases is encouraged.*

ANNEX 3: LF MAPPING SUPPLIES AND PROCEDURES

Supplies Needed

- FTS kits
- Consumables (gloves, safety bins, lancets, slides, soap, specimen containers, cotton buds)
- Disease-specific data collection forms
- GPS hand sets

Diagnostic Techniques: Filariasis Test Strip (FTS) procedure

Person 1

1. Clean the finger to be pricked with an alcohol swab.
2. Allow the finger to dry.
3. Prick the internal side of the finger using a sterile lancet.
4. Discard the lancet into the sharps container provided.
5. Draw 75 µL of blood using the micropipette provided.
6. Give the blood in the micropipette to person 2.

Person 2

1. Carefully place the blood on to the white sample area of the FTS.
2. When sample has flowed into pink area, close card.
3. Write time and participant ID number on the work tray or adhesive tape provided.
4. Read and record the FTS results exactly at 10 minutes.

Further details of the FTS procedure are provided below.

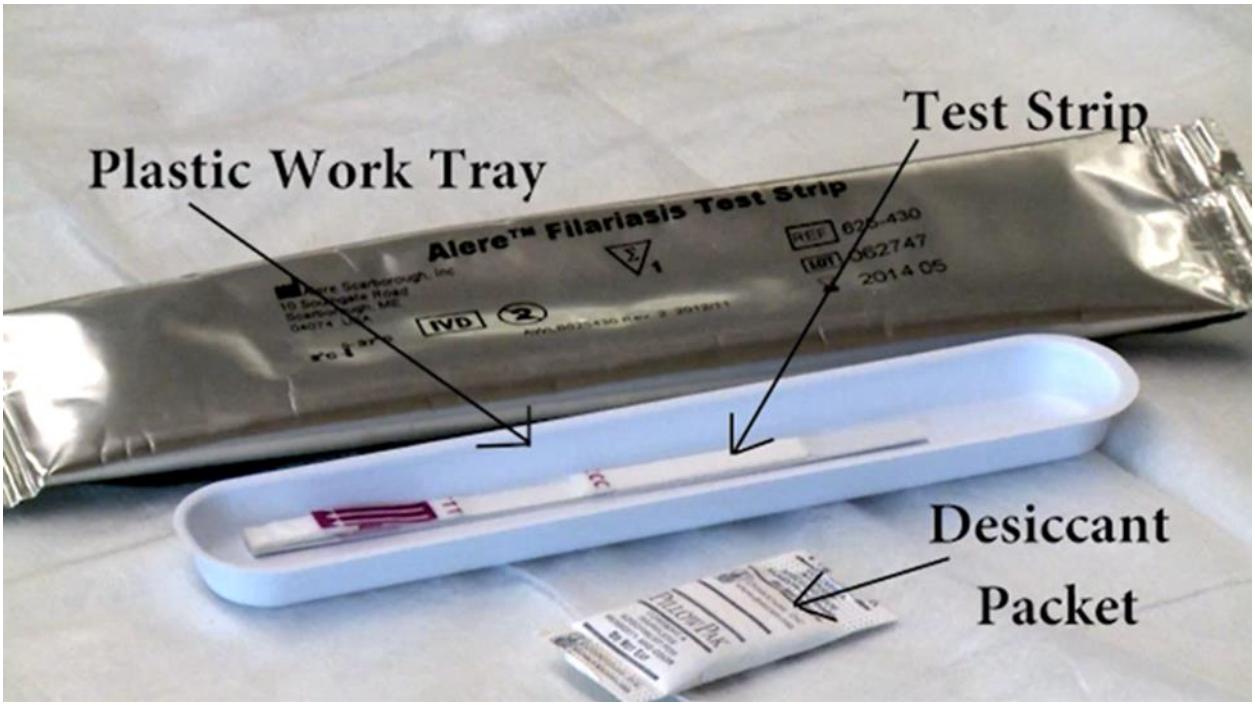


Figure. Contents of each individual foil pouch of the FTS kit.

v2 (July 2016)

Alere™ Filariasis Test Strip

The Alere™ Filariasis Test Strip is a rapid diagnostic tool used for the qualitative detection of *Wuchereria bancrofti* antigen in human blood samples collected by fingerstick. Although the test is relatively simple to use, adequate training is necessary to reduce inter-observer variability and to reduce the misreading of strips.

Basic Guidelines

i. Kits should be stored at 2-37°C. Test strips should NOT be frozen. The Alere™ Filariasis Test Strip kit is stable until the expiration date marked on its outer packaging when stored as specified. Kits should NOT be used past the expiration date.

ii. Before beginning field surveys, two strips from each lot of kits should be tested using a positive control that can be obtained from the Filariasis Research Reagent Repository Center (www.filariasiscenter.org). DO NOT use strips that are negative when tested with the control.

iii. When transporting strips for use in the field, a cool box is not required. However, care should be taken not to expose strips to extreme heat for prolonged periods of time.

iv. Strips must be read using bright unfiltered light. Faint lines can be difficult to see when lighting is not adequate. This is especially important when reading strips at night.

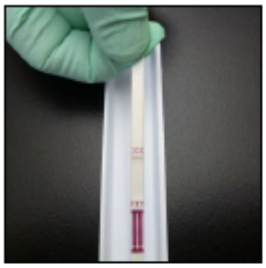
Test Procedure

1

Allow all kit components to equilibrate to ambient temperature (15-37°C) before testing.

Remove contents from the foil pouch just prior to use. Provided materials include one test strip, plastic work tray and fixed volume (75µL) micropipette.

2



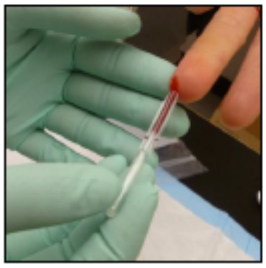
Strips should be handled carefully and held only at the end without the arrows. DO NOT apply pressure to the sample pad at the bottom of the strip.

Strips should be labeled with appropriate patient identifiers. Strips can be labeled directly (preferred) (A). Alternatively, the work tray can be labeled (B).

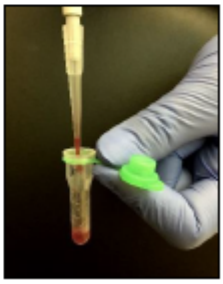
The strip should be placed in the work tray before the sample is added.

NOTE: It is advisable to secure the strip to the work tray with a sticker -type patient identifier label or tape.

3



Collect 75µL of fingerstick blood by holding the supplied micropipette slightly above the horizontal plane. DO NOT squeeze the bulb end of the micropipette when collecting the sample. Alternatively, measure 75µL of anti-coagulated blood (**heparin only**) from a microcentrifuge tube using a calibrated micropipettor. DO NOT add blood directly from the finger to the strip.



4

Slowly add the blood sample to the lower half of the sample pad by gently squeezing the bulb.

Set a timer for 10 minutes.

NOTE: It is helpful to record the reading time on the work tray.

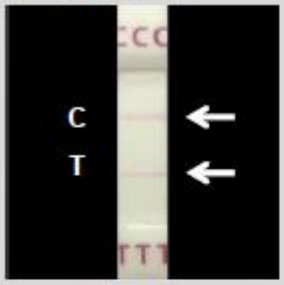
5

Read test results 10 minutes after the sample has been added.

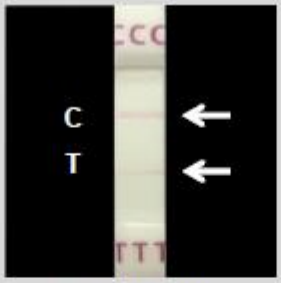
NOTE: Record the appropriate result on the strip (preferred) or work tray.

DO NOT read tests if the sample has not migrated ALL the way up the strip.

Test Interpretation

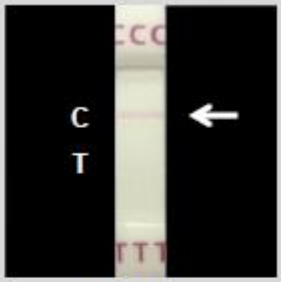


POSITIVE*



POSITIVE (weak)*

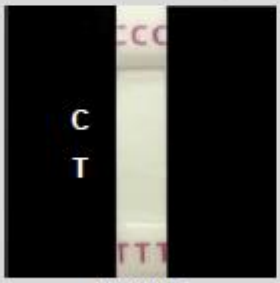
Any visible pink line in the test area should be interpreted as a positive result



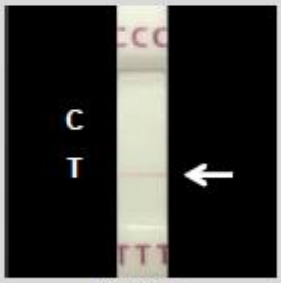
NEGATIVE*

Control line only

C = control
T = test



INVALID
No lines appear



INVALID
Test line only

**Scoring of test strips is useful but optional. Negative, 0; test line weaker than control line, 1; test line equal to control line, 2; test line stronger than control line, 3*

An electronic version of this bench aid can be found at: http://www.ntdsupport.org/resources

ANNEX 4: ONCHOCERCIASIS MAPPING SUPPLIES AND PROCEDURES

Supplies

To be filled in by APOC

Diagnostic Techniques

To be filled in by APOC

ANNEX 5: SCHISTOSOMIASIS/STH MAPPING SUPPLIES AND PROCEDURES

Kato-Katz Examination of Stool Samples

Supplies

- Microscopes
- Kato-Katz kits [applicator sticks, screen (60-105 mesh), template, cellophane (40-50µm thick)]
- Forceps
- Flat-bottomed jar
- Glycerol-Malachite Green
- Consumables (gloves, safety bins, slides, soap, specimen containers, newspaper, toilet paper)
- Disease-specific data collection forms
- smart phone

Diagnostic Techniques

1. Collect a small quantity of stool (10g) in a container.
2. Label a glass slide with the sample number and then place a template on top of it.
3. Place a small amount of the fecal sample on a newspaper and press a piece of screen on top. Using a spatula, scrape the sieved fecal material through the screen so that only the debris remains.
4. Scrape up some of the sieved feces to fill the hole in the template, avoiding air bubbles and leveling the feces off to remove any excess.
5. Carefully lift off the template and place it in a bucket of water mixed with concentrated detergent so that it can be reused.
6. Place one piece of the cellophane, which has been soaked overnight in malachite green glycerol solution, over the fecal sample.
7. Place a clean slide over the top and press it evenly downwards to spread the feces in a circle. If done well, it should be possible to read newspaper print through the stool smear.
8. Place the slide under a microscope and examine the whole area in a systematic zigzag pattern. Record the number and the type of each egg on a recording form alongside the sample number. Multiplication can be done after data entry.

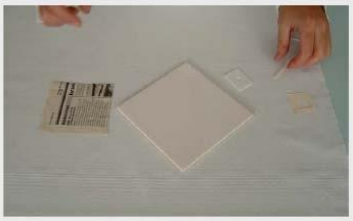
Kato-Katz technique for helminth eggs

Materials:

- Kato-set
(Template with hole, screen, nylon or plastic, plastic spatula)
- Newspaper or glazed tile
- Microscope slides
- Cellophane as cover slip, soaked in Glycerol-malachite green solution
- Fresh stool
- Gloves

Prepare the layer

Glazed tile or newspaper



Place the template with hole in the centre of a microscope slide

Use gloves !

Place a small amount of faecal material on the newspaper or the glazed tile.

Press the screen on top so that some of the faeces filters through and scrape with the flat spatula across the upper surface to collect the filtered faeces.

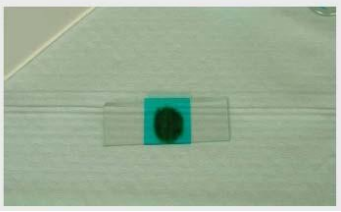
Add the collected faeces in the hole of the template so that it is completely filled.

Remove the template carefully so that the cylinder of faeces is left on the slide.

Cover the faecal material with the pre-soaked cellophane strip.

Invert the microscope slide and firmly press the faecal sample against the cellophane strip on a smooth hard surface such as a tile. The material will be spread evenly.

Carefully remove the slide by gently sliding it sideways to avoid separating the cellophane strip. Place the slide with the cellophane upwards.



The smear should be examined in a systematic manner and the eggs of each species reported. Later multiply by the appropriate number (see inlet-information of the Kato-set) to give the number of the eggs per gram faeces.

Urine Reagent Test for Hematuria

Supplies

- Dipsticks
- Consumables (gloves, plastic cups)
- Disease-specific data collection forms
- smart phones for data recording

Diagnostic Techniques:

1. Collect a fresh urine sample in a clean plastic container.
2. Examine it within 2 hours of collection. If there is a delay, refrigerate the sample.
3. Remove one dipstick from its bottle and replace the cap immediately. Completely immerse the reagent areas of the strip into the urine sample for 2 seconds. When removing the strip, run its edge against the rim of the container to remove any excess urine.
4. Hold the strip horizontally so that the chemicals do not mix together from the adjacent reagent areas. Now match the color of the strip with the color chart on the bottle label and record the results on the monitoring form. Do not lay the strip on the color chart as this will soil the chart.
5. Read the strip between 1and 2 minutes after it has been dipped in the urine sample. Any color changes that occur after 2 minutes are of no diagnostic value and should be ignored.

Urine Filtration Technique for *S. Haematobium*

Supplies:

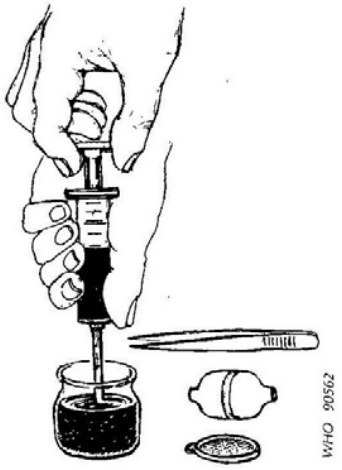
- Coverslips
- Microscope slides
- Filter holder, diameter 13 mm or 16 mm
- Forceps
- Syringe, plastic, 10 ml
- Membrane filter, 12 µm or 20 µm (polycarbonate); nylon filter; or paper filter
- Lugol's iodine (stock 5% solution) (reagent no. 17)
- Disease-specific data collection forms
- smart phones for data recording

Diagnostic Techniques:

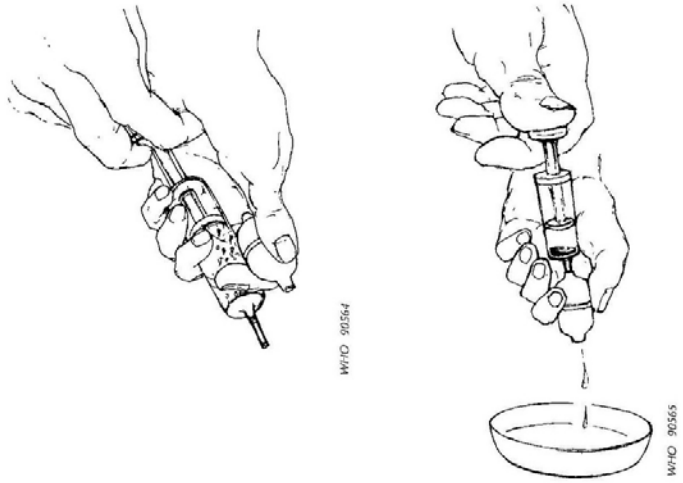
1. Place a polycarbonate or nylon filter (pore size 12-20 µm) in the filter holder. Alternatively, paper filters (Whatman No. 541 or No 1) can be used. Agitate the urine sample by shaking it gently or by filling and emptying the syringe twice.

2. Draw 10 ml of the urine into the syringe and attach the filter-holder to the bottom of the syringe. If less than 10 ml is available, record in the notebook.

3. Keeping the unit level, expel the urine from the syringe into the filter holder over a bucket or sink.



4. Carefully unscrew the filter holder, draw air into the syringe, reattach the syringe to the holder, and expel the air. (This is important as it helps to remove excess urine and also makes sure the eggs, if present, are attached to the filter.)



5. Unscrew the filter holder, remove the filter with the forceps, and place it (top side up) on a microscope slide. Add one drop of Lugol's iodine and wait for 15 seconds for the stain to penetrate the eggs.

6. Examine the whole filter under the microscope immediately at low power (x40). Schistosome eggs stain orange and can be seen clearly. Infection loads are recorded as the number of eggs per 10 ml of urine. Therefore it is important to note the amount of urine examined, if it is less than 10 ml. To estimate the intensity of infection of the sample, divide the number of eggs counted by 10. If less than 10 ml was examined, use the following equation:

$$\text{Number of eggs per 10 ml sample} = \frac{\text{number of eggs counted}}{x} \times 10$$

where x = *no. of ml of urine examined.*

Reuse of filters:
Remove the plastic filter immediately after use and soak it overnight in a 1% hypochlorite solution (domestic bleach). Wash the filter thoroughly with detergent solution and then several times with clean water. Check the filter microscopically to ensure that it is free of parasites before being reused.

ANNEX 6: TRACHOMA MAPPING SUPPLIES AND PROCEDURES

Supplies

- Torches and batteries
- Trachoma Grading Card
- Magnifying loupes (2.5X magnification)
- Consumables (gloves)
- Disease-specific data collection forms
- GPS hand sets

Diagnostic Procedures and Training: WHO Simplified Grading Scheme for Trachoma

- *Trachomatous trichiasis (TT)*
  - TT is defined as "at least one eyelash rubs on the eyeball or evidence of recent removal of in-turned eyelashes".

- *Trachomatous inflammation – follicular (TF)*
  - TF is defined as "the presence of five or more follicles at least 0.5 mm in diameter in the central part of the upper tarsal conjunctiva".
  - Follicles are round swellings up to 3.0 mm in diameter.
    - They are grey or creamy and are therefore paler than the surrounding conjunctiva.
    - Peripheral follicles and follicles smaller than 0.5 mm in diameter do not contribute to a diagnosis of TF, since they may be normal.

- *Trachomatous inflammation – intense (TI)*
  - TI is defined as pronounced inflammatory thickening of the upper tarsal conjunctiva obscuring more than half the normal deep tarsal vessels.
  - A person is said to have active trachoma if he or she has TF and/or TI in either eye, but for purposes of the survey, only TF is used to assess trachoma

A minimum of four days should be devoted exclusively to trachoma training. The first two days are a qualifying workshop for trachoma graders and, for those who pass the IOV test the second two days will be training survey methods along with recorders. Emphasis has been put on practice and testing in the field, rather than just on slides. Experience everywhere has shown that passing an intra-grader agreement (IGA) test with slides is relatively easy, but passing one on children in the field is relatively difficult. Training of graders should be led by an experienced ophthalmologist who has had regular and sufficient practice conducting clinical examinations for signs of trachoma. It should be acknowledged from the beginning that some graders will NOT pass the IGA test and therefore a greater number of trachoma grader trainees than is required for the actual mapping survey should enter the qualifying workshop before the training begins. If an experienced ophthalmologist is not present within the country, efforts should be made to obtain the services of an ophthalmologist from another country. Recorders (who also conduct interviews at the household level) will require their own trainer and need two days of training.

Trachoma grader training should generally follow the format below (see the **Global Trachoma Mapping Project Manual** for more details):

Day 1 and Day 2. Qualifying workshop for trachoma graders

- Potential graders will be informed of the importance of IGA testing and of the fact that not all will pass and become members of the survey team.

- A presentation on the WHO simplified grading system which is the recommended method for use in grading trachoma. During this presentation discussion between the trainer and the trachoma graders should be facilitated to ensure that the objectives and process of the WHO trachoma grading system are being well communicated. An IGA test with slides will be conducted after several hours are spent discussing clinical slides.

- For those who pass the IGA with slides, a presentation on correctly examining the eyes for trachoma will be given. This session should also highlight the importance of adequate lighting, sitting positions when conducting clinical examinations, supporting children and correctly averting eyelids. A role play during this session will help reinforce the important concepts.

- Practice in the field will begin on day 1 for those who passed the IGA with slides (a kappa of 0.7 is required for passing). A practice IGA in the field will be given on day 1.

- Day 2 will include more practice in the field and conclude with an IGA test in the field. Those who pass this will go on to survey team training. A kappa of 0.7 (compared to the grader trainer) is required to pass

Day 3 & 4

- Grader trainees will join recorder trainees for 2 days of survey team training

- Both graders and recorders will be trained in 2nd stage sampling (selection of households) to ensure a random representative sample. They will demonstrate that they can do this.

- Recorders will learn how to interview households and use the recording forms (or electronic devices)

- The graders will be trained in how to make introduction at the households and obtain consent

- Graders will be trained to deal with patients who need treatment or referral

- On the final day, graders and recorders will have an opportunity to "pilot" the methodology in a village, selecting households and doing interviews.

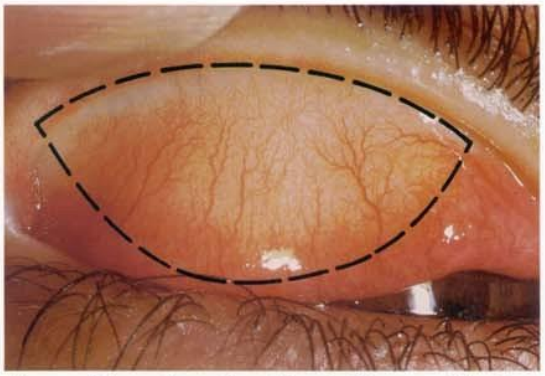
During the actual implementation of the mapping survey, it is advised that the ophthalmologist assess the work of the trachoma graders in the field the first few days as a quality control check.

TRACHOMA GRADING CARD

– Each eye must be examined and assessed separately.
– Use binocular loupes (x 2.5) and adequate lighting (either daylight or a torch).
– Signs must be clearly seen in order to be considered present.

The eyelids and cornea are observed first for inturned eyelashes and any corneal opacity. The upper eyelid is then turned over (everted) to examine the conjunctiva over the stiffer part of the upper lid (tarsal conjunctiva).

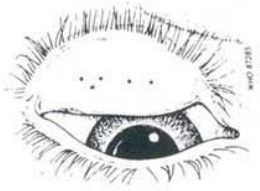
The normal conjunctiva is pink, smooth, thin and transparent. Over the whole area of the tarsal conjunctiva there are normally large deep-lying blood vessels that run vertically.

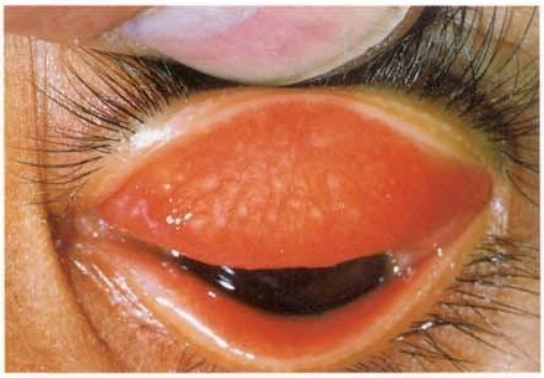


Normal tarsal conjunctiva (x 2 magnification). The dotted line shows the area to be examined.

***TRACHOMATOUS INFLAMMATION – FOLLICULAR (TF)**: the presence of five or more follicles in the upper tarsal conjunctiva.*

Follicles are round swellings that are paler than the surrounding conjunctiva, appearing white, grey or yellow. Follicles must be at least 0.5mm in diameter, i.e., at least as large as the dots shown below, to be considered.

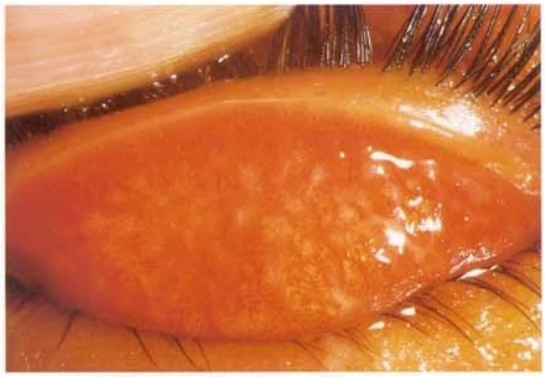




Trachomatous inflammation – follicular (TF).

***TRACHOMATOUS INFLAMMATION – INTENSE (TI)**: pronounced inflammatory thickening of the tarsal conjunctiva that obscures more than half of the normal deep tarsal vessels.*

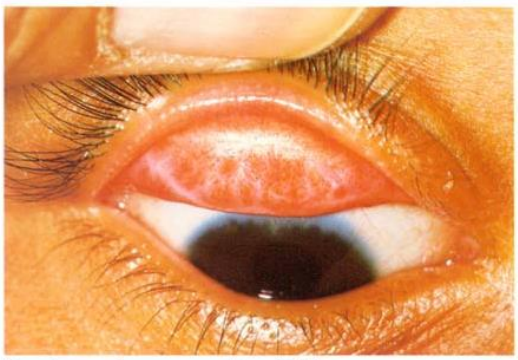
The tarsal conjunctiva appears red, rough and thickened. There are usually numerous follicles, which may be partially or totally covered by the thickened conjunctiva.



Trachomatous inflammation – follicular and intense (TF + TI).

***TRACHOMATOUS SCARRING (TS)**: the presence of scarring in the tarsal conjunctiva.*

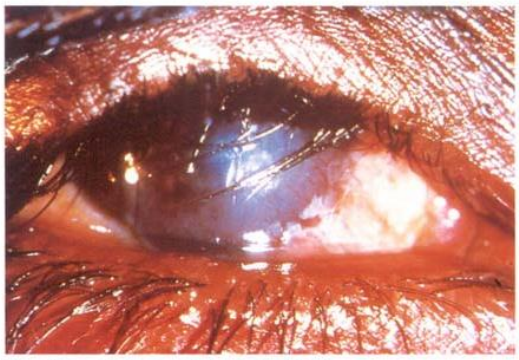
Scars are easily visible as white lines, bands, or sheets in the tarsal conjunctiva. They are glistening and fibrous in appearance. Scarring, especially diffuse fibrosis, may obscure the tarsal blood vessels.



Trachomatous scarring (TS)

***TRACHOMATOUS TRICHIASIS (TT)**: at least one eyelash rubs on the eyeball.*

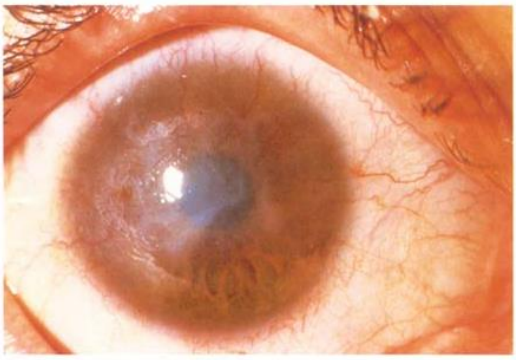
Evidence of recent removal of inturned eyelashes should also be graded as trichiasis.



Trachomatous trichiasis (TT)

***CORNEAL OPACITY (CO)**: easily visible corneal opacity over the pupil.*

The pupil margin is blurred viewed through the opacity. Such corneal opacities cause significant visual impairment (less than 6/18 or 0.3 vision), and therefore visual acuity should be measured if possible.



Corneal opacity (CO)

TF:– give topical treatment (e.g. tetracycline 1%).
TI:– give topical and consider systemic treatment.
TT:– refer for eyelid surgery.

WORLD HEALTH ORGANIZATION
PREVENTION OF BLINDNESS AND DEAFNESS

Support from the partners of the WHO Alliance for the Global Elimination of Trachoma is acknowledged.

ANNEX 7: SAMPLE DATA COLLECTION FORMS

1) LF

District:……. Sub-District:…….

	NAME	SEX			RESULT	
1		M	F		+	-
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						
32						
…						
…						
TOTAL						

2) Schistosomiasis/STH

	Name	Age	Sex		Schistosomiasis				Soil-Transmitted Helminth			Comments
					Urine	Stools			Stools			
					S. haem	S. man	S. int / S. gui	Total	Asc.	Tric.	Hook.	
1			M	F								
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
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30												
31												
32												

3) Trachoma (1-5 years)

District : **TRACHOMA**

Sub-District_____ Village_____

TRACHOMA: children 1 to 5 years

	AGE	SEX		TF	TI	TS	TT	OC	COMMENTS
1		M	F						
2		M	F						
3		M	F						
4		M	F						
5		M	F						
6		M	F						
7		M	F						
8		M	F						
9		M	F						
10		M	F						
11		M	F						
12		M	F						
13		M	F						
14		M	F						
15		M	F						
16		M	F						
17		M	F						
18		M	F						
19		M	F						
20		M	F						
21		M	F						
22		M	F						
23		M	F						

Trachoma (6-9 years)

District : **TRACHOMA**

Sub-District_____

Village_____

TRACHOMA: Children 6 to 9 years

	AGE	SEX		TF	TI	TS	TT	CO	COMMENTS
1		M	F						
2		M	F						
3		M	F						
4		M	F						
5		M	F						
6		M	F						
7		M	F						
8		M	F						
9		M	F						
10		M	F						
11		M	F						
12		M	F						
13		M	F						
14		M	F						
15		M	F						
16		M	F						
17		M	F						
18		M	F						
19		M	F						
20		M	F						
21		M	F						
22		M	F						
23		M	F						
24		M	F						
25		M	F						

Trachoma (>=15 years)

TRACHOMA

Sub-District_____ Village_____

TRACHOMA: girls ≥ 15 years

	AGE	TF	TI	TS	TT	CO	COMMENTS
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
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19							
20							
21							
22							
23							
24							
25							
26							
27							

Trachoma baseline prevalence survey

Date

(A) Household questionnaire **Recorder**

Section 1: Identifying information		
1	Country [write name or put code in boxes]	
2	Evaluation Unit [write name or put code in boxes]	
3	Cluster [write name or put code in boxes]	
4	Household [write name of household head or put code in boxes]	
Section 2: Household information and GPS		
5	How many people live in this household?	
G1	Latitude (N)	.
G2	Longitude (E)	.
G3	Elevation (metres)	
G4	Accuracy (metres)	
Section 3: Water, sanitation and hygiene questions		
W1	What is the main source of drinking-water for members of your household?	01=Piped water into dwelling 02=Piped water to yard/plot 03=Public tap/standpipe 04=Tubewell/borehole 05=Protected dug well 06=Unprotected dug well 07=Protected spring 08=Unprotected spring 09=Rainwater collection 10=Water vendor 11=Surface water (e.g. river, dam, lake, canal) 99=Other (specify)
W2	How long does it take to go there, get water, and come back?	1=Water source in the yard 2=Less than 30 minutes 3=Between 30minutes and 1 hour 4=More than 1 hour

W3	What is the main source of water used by your household for washing?	01=Piped water into dwelling 02=Piped water to yard/plot 03=Public tap/standpipe 04=Tubewell/borehole 05=Protected dug well 06=Unprotected dug well 07=Protected spring 08=Unprotected spring 09=Rainwater collection 10=Water vendor 11=Surface water (e.g. river, dam, lake, canal) 99=Other (specify)
W4	If you collected water there to bring back to the house, how long would it take to go there, get water, and come back?	1=Water source in the yard 2=Less than 30 minutes 3=Between 30 minutes and 1 hour 4=More than 1 hour
S1	Where do you and other adults in the household usually defecate?	1=Shared latrine 2=Private latrine 3=No structure, outside near the house 4=No structure, in the bush or field 9=Other
S2	Ask to see the latrine/toilet. *Observation:* What kind of toilet facility does the family use/have access to?	01=Flush/pour flush to piped sewer system 02=Flush/pour flush to septic tank 03=Flush/pour flush to pit latrine 04=Flush/pour flush to open drains 05=Flush/pour flush to unknown place 06=Ventilated improved pit latrine (VIP) 07=Pit latrine with slab 08=Pit latrine without slab/open pit 09=Composting toilet 10=Bucket 11=Hanging toilet/hanging latrine 12=No facilities or bush or field 99=Other (specify)
H1	*Observation*: Is there a handwashing facility within 15 meters of the latrine/toilet?	0=No 1=Yes 5=Not applicable (no latrine/toilet)
H2	*Observation:* At the time of the visit, is there water available at the handwashing facility?	0=No 1=Yes 5=Not applicable (no handwashing facility)
H3	*Observation:* At the time of the visit, is there soap available at the handwashing facility?	0=No 1=Yes 5=Not applicable (no handwashing facility)

(B) Census and examination findings

Country EU Cluster

Household Recorder

List all household residents. Ask for consent to examine all 1-9 year-olds and all those aged ≥15 years. Mop-up should focus on 1-9 year-olds.

ID number		Name	Sex [1=M; 2=F]	Age (years)	Examined? [1=Yes (with consent); 2=Absent; 3=Refused; 4=Other]	Right Eye 0=Sign absent; 1=Sign present			Left Eye 0=Sign absent; 1=Sign present			Notes
						TT	TF	TI	TT	TF	TI	

ANNEX 8: DISEASE SPECIFIC THRESHOLDS AND ASSOCIATED PUBLIC HEALTH INTERVENTIONS

Disease	Threshold for Intervention	Public Health Intervention
Lymphatic filariasis		
	Prevalence of ≥ 1% in adults ≥ 15 year	PC in total population once a year
Onchocerciasis		
	Prevalence of infection (positive skin snips) >= 40% or prevalence of palpable nodules >=20%	PC in total population once a year
Schistosomiasis *S. haematobium (S.h.);* *S. mansoni (S.m.)*	Prevalence of S.h. and S.m. between <10% in children aged 5-14 years	PC in school-age children at least twice in during their school time (at entry and at exit), or PC after every three years.
	Prevalence of *S.h.* and *S.m.* between 10-50% in children aged 5-14 years	PC in school-age children every two years
	Prevalence of *S.h.* and *S.m.* ≥ 50% in children aged 5-14 years	PC in school-age children and high risk population once a year
Soil-transmitted Helminthiases		
	Prevalence between 20-50% in children aged 5-14 years	PC once a year in school-age children
	Prevalence of ≥ 50% in children aged 5-14 years	PC twice a year in school-age children
Trachoma		
	TF Prevalence of ≥ 10% in children aged 1-9 years	SAFE strategy (including PC in total population once a year)
	TF Prevalence of 5-9% in children aged 1-9 years	Targeted treatment at the sub-district level
	TT Prevalence of ≥ 0.1% in adults aged ≥ 15 years	Surgery program