MEETING REPORT

PROGRAMME MANAGERS MEETING ON NEGLECTED TROPICAL DISEASES
IN THE ASIA SUBREGION

Convened by:

WORLD HEALTH ORGANIZATION
REGIONAL OFFICE FOR THE WESTERN PACIFIC

Manila, Philippines
13–14 March 2018

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NOTE

The views expressed in this report are those of the participants of the Programme Managers Meeting on Neglected Tropical Diseases in the Asia Subregion and do not necessarily reflect the policies of the conveners.

This report has been prepared by the World Health Organization Regional Office for the Western Pacific for Member States in the Region and for those who participated in the Programme Managers Meeting on Neglected Tropical Diseases in the Asia Subregion in Manila, Philippines from 13 to 14 March 2019.
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Keywords:
Neglected diseases - prevention and control / Regional health planning / Zoonoses
# ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>CL-SWASH</td>
<td>Community-led initiatives to eliminate Schistosomiasis by combining deworming with WASH interventions</td>
</tr>
<tr>
<td>Cs</td>
<td>Clonorchis sinensis</td>
</tr>
<tr>
<td>DALY</td>
<td>disability-adjusted life year</td>
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<tr>
<td>DHIS</td>
<td>District Health Information System</td>
</tr>
<tr>
<td>DOH</td>
<td>department of health</td>
</tr>
<tr>
<td>EITB</td>
<td>enzyme immunotransfer blot</td>
</tr>
<tr>
<td>ELISA</td>
<td>enzyme-linked immunosorbent assay</td>
</tr>
<tr>
<td>GIS</td>
<td>geographic information system</td>
</tr>
<tr>
<td>IgM</td>
<td>immunoglobulin M</td>
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<tr>
<td>IgG</td>
<td>immunoglobulin G</td>
</tr>
<tr>
<td>LAMP</td>
<td>loop-mediated isothermal amplification</td>
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<tr>
<td>LF</td>
<td>lymphatic filariasis</td>
</tr>
<tr>
<td>MDA</td>
<td>mass drug administration</td>
</tr>
<tr>
<td>NTD</td>
<td>neglected tropical disease</td>
</tr>
<tr>
<td>MIS</td>
<td>management information system</td>
</tr>
<tr>
<td>Ov</td>
<td>Opisthorchis viverrini</td>
</tr>
<tr>
<td>PCR</td>
<td>polymerase chain reaction</td>
</tr>
<tr>
<td>SDG</td>
<td>Sustainable Development Goal</td>
</tr>
<tr>
<td>WASH</td>
<td>water, sanitation and hygiene</td>
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<tr>
<td>WHO</td>
<td>World Health Organization</td>
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</table>
SUMMARY

The Programme Managers Meeting on Neglected Tropical Diseases in the Asia Subregion was convened on 13–14 March 2018 in Manila, Philippines. The meeting was attended by 14 participants from eight countries in Asia, six temporary advisers, representatives from two partner agencies and five World Health Organization (WHO) Secretariat members.

Significant progress has been made in Asia towards elimination of lymphatic filariasis as a public health problem and elimination of blinding trachoma. Cambodia was congratulated for its recent validation by WHO of elimination of lymphatic filariasis as a public health problem and also validation of elimination of blinding trachoma. The Lao People’s Democratic Republic was also congratulated for its recent validation by WHO of elimination of blinding trachoma. Ongoing efforts to accelerate elimination of schistosomiasis in Asia through mass drug administration and improvement of sanitation coverage in collaboration with water, sanitation and hygiene (WASH) programmes were also acknowledged.

With this, the landscape for neglected tropical diseases (NTDs) in the Western Pacific Region is fast changing, and new situations and opportunities are emerging. While preventive chemotherapy has been highly effective in reducing the prevalence and burden of some NTDs such as lymphatic filariasis and trachoma, the limitations of relying only on preventive chemotherapy to control and eliminate other NTDs, particularly schistosomiasis and other foodborne and zoonotic NTDs, are increasingly evident. Participants shared experiences, challenges and lessons learnt in strengthening multisectoral interventions and surveillance for control of remaining zoonotic and foodborne NTDs in Asia.

As more countries achieve elimination targets, there is an urgent need to establish and sustain post-elimination surveillance and provision of universal care for patients in post-elimination countries. Experiences of post-elimination surveillance of lymphatic filariasis in China and the Republic of Korea were shared.

With success in eliminating LF and trachoma as the most prevalent public health problems throughout the Region, diversity in disease endemicity and progress across the Western Pacific Region are expanding, with more focus on zoonotic and foodborne diseases in Asia and on skin-related NTDs in the Pacific. Against this new backdrop, it has become difficult to develop a one-size-fits-all strategy for control and elimination of NTDs. NTDs are now included in the Sustainable Development Goals. Universal health coverage will be key for NTD control and elimination, helping sustain gains by ensuring that needed health services reach all people, particularly marginalized and neglected populations. The SDGs present opportunities to accelerate progress on NTDs through whole-of-system multisectoral interventions, such as improvements in water and sanitation, food safety, environmental health and veterinary public health, in addition to health services.

Acknowledging the changing NTD landscape and remaining challenges in Asia, the meeting suggested three strategic pillars for the draft Regional Framework for Control and Elimination of NTDs: surveillance (including response), strengthening multisectoral cooperation, and universal access to interventions and community empowerment through effective risk communication.
1. INTRODUCTION

1.1 Meeting organization

The Programme Managers Meeting on Neglected Tropical Diseases in the Asia Subregion was convened on 13–14 March 2018 in Manila, Philippines. The meeting was attended by 14 participants from eight countries in Asia, six temporary advisers, representatives from two partner agencies and five World Health Organization (WHO) Secretariat members. The full list of participants is available in Annex 1, and the programme agenda is presented in Annex 2.

1.2 Meeting objectives

The objectives of the meeting were:

1) to share among countries the progress, emerging challenges and lessons learnt since the 2016 NTD Programme Managers Meeting in accelerating elimination and sustaining control of NTDs relevant to Asia;
2) to update the programme managers on the latest WHO guidance, tools and strategies for elimination and control of neglected tropical diseases (NTDs); and
3) to review and provide inputs to the draft Regional Framework for Elimination and Control of NTDs in the Western Pacific from the subregional perspective.

2. PROCEEDINGS

2.1 Opening session

Dr Shin Young-soo, WHO Regional Director for the Western Pacific, warmly welcomed the participants. The Regional Director commended Member States for the significant progress made towards eliminating and controlling NTDs in the Western Pacific Region. He emphasized the need for a comprehensive whole-of-system approach improving water, sanitation and hygiene (WASH) and strengthening collaborations with animal health and food safety programmes to accelerate the control and elimination of NTDs. He also called for continued vigilance in the fight against NTDs with sustained surveillance even after Member States had achieved elimination of NTDs, to help prevent recrudescence of transmission. It was through global collaboration that NTDs would become diseases of the past. In closing, Dr Shin thanked the participants for sharing their expertise and experience to guide the Region in the fight against NTDs.

2.2 Updates

2.2.1 WHO global updates on control and elimination of NTDs

Dr Bernadette Abela-Ridder presented the overview of global updates on NTDs with a focus on the linkage between the Sustainable Development Goals (SDGs) and the WHO Thirteenth General Programme of Work 2019–2023 and the work to control and eliminate NTDs. There are five primary interventions for control and elimination of NTDs: innovative and intensified disease management; preventive chemotherapy; veterinary public health; vector ecology management; and WASH. Most NTDs require a combination of multiple interventions, and these interventions are aligned with a number of SDGs. Ensuring universal health coverage (SDG 3.8) and availability and sustainable
management of water and sanitation (SDG 6) are examples of goals and targets that intersect with and influence control and elimination of NTDs.

Significant global progress has already been made in control and elimination of some of the NTDs such as lymphatic filariasis and trachoma, through preventive chemotherapy, supported by generous pharmaceutical donors making large-scale donations of medicines. However, to advance the control and elimination of many other NTDs, particularly zoonotic and foodborne NTDs that are highly prevalent in the Western Pacific Region, other interventions in WASH, vector control and veterinary public health will also need to be scaled up. There are effective tools to control and manage most NTDs, but investments for supplies of medicines and vaccines, and the piloting and scale-up of such tools in the public health context are still lacking. There are still significant shortcomings in the availability of highly specific and sensitive diagnostic tools and techniques for many NTDs that are inexpensive and easy to use in the field. Progress on mapping of zoonotic and foodborne NTDs to target interventions and measure the impacts of control interventions is also limited in many countries.

The WHO Thirteenth General Programme of Work 2019–2023 is structured around three interconnected strategic priorities to ensure healthy lives and well-being for all at all ages: achieving universal health coverage, addressing health emergencies and promoting healthier populations. These strategic priorities are supported by three strategic shifts: stepping up leadership at all levels through health diplomacy and advocacy as well as multisectoral actions; driving the public health impact in every country with strategic and technical support, policy dialogue and enhanced service delivery; and focusing global public goods on impact through normative guidance, research and innovation. The work to fight against NTDs is in line with and further enhances progress on this strategic direction. Dr Abela emphasized that WHO would continue its efforts in partnership with Member States and partners to address

2.2.2 Regional progress and challenges on control and elimination of NTDs in the Western Pacific

Dr Aya Yajima presented the progress in the elimination and control of NTDs in the Western Pacific Region. There are 15 NTDs prevalent in the Region, including scabies and snakebite envenoming that have been recently added in the portfolio. The specific targets of the Regional Action Plan for Neglected Tropical Diseases in the Western Pacific Region (2012–2016) included eliminating lymphatic filariasis (LF), schistosomiasis, blinding trachoma and leprosy, reducing cases of yaws, and reducing morbidity from soil-transmitted helminthiases and foodborne trematodiases in respective countries.

Six (Cambodia, Cook Islands, the Marshall Islands, Niue, Tonga and Vanuatu) out of 22 endemic countries have been validated for having eliminated lymphatic filariasis in 2016–2017. Seven other countries have already stopped mass drug administration (MDA) and are undertaking post-MDA surveillance nationwide. The remaining nine are also progressing with MDA. In Asia, five remaining LF-endemic countries (Brunei Darussalam, Cambodia, the Lao People’s Democratic Republic, Malaysia and the Philippines) continue to be on track to stop MDA and move to post-MDA surveillance nationwide by the end of 2020. However, progress of assessment and reporting of the morbidity burden associated with LF also needs to be accelerated. Countries achieving elimination of LF as a public health problem must also continue to be vigilant by establishing post-validation surveillance to help prevent recrudescence of transmission.

Two (Cambodia and the Lao People’s Democratic Republic) out of 10 endemic countries have been validated for elimination of trachoma as a public health problem in 2017. In Asia, China also claims to have achieved the elimination target, and Viet Nam continues to implement targeted MDA against trachoma.
All four schistosomiasis-endemic countries in the Region (Cambodia, China, the Lao People’s Democratic Republic and the Philippines) have a long history of MDA against schistosomiasis, which helped significantly reduce the prevalence of schistosomiasis in many endemic areas. In 2016, WHO supported an external evaluation of the status of schistosomiasis in Cambodia and the Lao People’s Democratic Republic, which validated achievement of the targets of elimination of schistosomiasis as a public health problem in both countries. To accelerate the elimination of schistosomiasis, both countries are strengthening collaboration with WASH programmes to improve sanitation coverage in all endemic communities. China also is progressing with a comprehensive multisectoral approach combined with selective preventive chemotherapy. By the end of 2016, five out of 12 endemic provinces had achieved the national elimination criteria, and seven others had also passed the transmission control criteria. The Philippines presents the most complex situation, having both areas struggling to improve MDA coverage and those considered to be close to elimination. In addition to efforts to sustain high MDA coverage, collaboration with WASH programmes and animal health sectors are being strengthened to accelerate elimination of schistosomiasis in the Philippines. On 22–23 May 2017, WHO organized an Expert Consultation to Accelerate Elimination of Asian Schistosomiasis in Shanghai, China, to discuss new regional goals, targets and strategies towards the elimination of Asian schistosomiasis. The meeting participants agreed on the provisional operational criteria for elimination of transmission of Asian schistosomiasis and the targets of achieving the elimination criteria by 2025 and being verified for elimination of transmission of schistosomiasis by 2030. The meeting also recommended community empowerment through the One Health approach as a core strategy to accelerate and sustain elimination of Asian schistosomiasis. Following the consultation, Cambodia and the Lao People’s Democratic Republic organized national multisectoral consultations to develop the national strategic plan for elimination of schistosomiasis in their respective countries in 2017. The Philippines also initiated a situation analysis and programme evaluation.

Deworming against soil-transmitted helminthiases in four countries in Asia that are considered to require preventive chemotherapy (Cambodia, the Lao People’s Democratic Republic, the Philippines and Viet Nam) continues on a semi-annual, nationwide basis with over 70% coverage.

The WHO global burden of foodborne disease study convened in 2015 found that the Western Pacific Region represents the second highest burden of foodborne diseases, following the African Region, and major contributors to disability-adjusted life years (DALYs) were found to be foodborne and zoonotic NTDs, including paragonimiasis, opisthorchiasis, clonorchiasis, cysticercosis and echinococcosis. Nonetheless, foodborne and zoonotic NTDs are the most neglected diseases of all NTDs in the Region. To address this situation, WHO organized an Expert Consultation to Accelerate Control of Foodborne Trematodiases, Taeniasis and Cysticercosis on 17–19 May 2017 in Seoul, Republic of Korea. The Consultation recommended community empowerment through the One Health approach, composed of effective risk communication, animal and human treatment, agricultural interventions, food safety and WASH, as a core strategy for control of these diseases. Classified countries in the Region are those where disease mapping is a priority and those that are considered ready to initiate interventions. The Consultation also recommended that WHO strengthen collaboration with the Food and Agriculture Organization of the United Nations (FAO) and the World Organisation for Animal Health (OIE) in country support for control of zoonotic and foodborne NTDs. Following the Consultation, several countries initiated disease mapping or national multisectoral consultation to develop national action plans.
2.3 One Health approach for control of foodborne and zoonotic NTDs (schistosomiasis, foodborne trematodiases, taeniasis/cysticercosis, echinococcosis)

2.3.1 Basic considerations for control of foodborne and zoonotic NTDs through the One Health approach

The transmission cycle of the cestode is complex. It is best tackled in individual stages. Transmission cycles of cestodes and their control principles are similar, whether *Taenia solium* or *Echinococcus granulosus*. The transmission of *T. solium* occurs between humans as the final host holding the adult tapeworm and pigs as the intermediate host holding the larval stage. Cysticercosis, which can cause neurocysticercosis, occurs when a human becomes an accidental host by ingesting eggs or proglottids from the *T. solium* final host and the larval stage develops. Similarly, transmission of *E. granulosus* is between dogs as the final host and sheep or lambs as intermediate hosts. Echinococcosis or hydatid disease occurs when a human becomes an accidental host by ingesting eggs of *E. granulosus* and the larval stage develops. In both diseases, the treatment of accidental hosts does not affect the transmission cycle. To control and ultimately interrupt their active transmission, action needs to be taken against the final and intermediate hosts (Fig. 1).

![Fig. 1. Basic principles of control of transmission of cestodes](image)

The basic control principles of cestodes were explained, taking as an example control of *T. solium*. Public health interventions on humans include education, improvement of hygiene and basic sanitation, and preventive chemotherapy. Preventive chemotherapy can be given to an entire population (MDA), to the specific population at risk (targeted preventive chemotherapy) using a ring strategy (50–100 meters) based on the identification of infected pigs, or to individuals who test positive (selective preventive chemotherapy) (Fig. 2). In veterinary interventions, pig management and rearing, and meat inspections for slaughter can be improved, and direct action on the parasite can be conducted through vaccination and treatment of pigs.
The most commonly used vaccine is TSOL18© developed at the University of Melbourne and validated independently in Mexico, Honduras, Peru, Cameroon and other countries. It is effective in preventing new infections but has no effect on the cysticerci already present at the time of vaccination. It was used on a large scale in the Peruvian cysticercosis elimination project (>55,000 pigs) and is now commercially produced by India Immunologicals Limited in India (Cysvax©). It requires two doses of 1 millilitre each, the first dose given after 2 months of age and the second dose within 1–4 months of the first vaccination. For pig deworming, several anthelmintics can be used to treat cysts. Oxfendazole is preferred because one dose is effective in killing the cysticerci present at the time of medication, whereas praziquantel and albendazole need multiple doses in a short period of time. A waiting period of a minimum of three weeks after treatment is required for the meat to be fit for human consumption. It should also be noted that oxfendazole does not eliminate cysts in the brain, nor does it not prevent new infections. For these reasons, it is recommended to combine pig vaccination with pig medication.

Selection and combination of interventions should be based on local circumstances (see example in Fig. 3), including the prevalence of infection, logistics, available resources and experience in large-scale interventions. Mathematical models suggest coverage of at least 75% for preventive chemotherapy and vaccination and medication of pigs and a duration of five years for combined vaccination and medication of pigs to achieve a significant reduction on the transmission of *T. solium*. Indeed, it has been determined that the best practice to maximize resource use for better results within a shorter time is a two-part combination of the pig vaccine and medication along with human MDA. Pig medication is to be given at the same time as the vaccine, since the vaccine alone does not treat current cysts. The vaccine should be performed first, followed by two rounds of MDA in humans. Additionally, MDAs should always integrate educational awareness campaigns and sanitation improvement, as well as consider when during the year pork is consumed and conduct pig interventions accordingly.
2.3.2 Sharing experience on the One Health approach for control of foodborne and zoonotic NTDs – actions, challenges and lessons learnt

One Health approaches in control of echinococcosis in China

A national survey conducted in 2012–2016 found that 368 out of 413 target counties were endemic for either alveolar echinococcosis or cystic echinococcosis and 115 counties were endemic for both. A total number of over 160,000 human cases were estimated for the whole country. Following the survey, a demonstration project was started in Sichuan. Twelve departments worked together, signing the multisectoral joint guideline and strategy for prevention and control of echinococcosis and other priority parasitic diseases. They implemented multisectoral interventions such as strengthening surveillance with active ultrasound screening of patients, dog surveys, dog management and deworming with traditional Chinese medicine (arecoline hydrobromide), providing safe drinking water by building appropriate wells and water sources, and intensifying health promotion in schools and communities. Results showed a drop in the detection rate of echinococcosis in humans from 2.77% in 2007 to 0.04% in 2017, and in the infection rate of dogs from 21.66% in 2007 to 1.68% in 2017. Challenges included cultural and religious principles forbidding the killing of animals for disease prevention, and a lack of sustained human resources to implement various interventions in the harsh environment in endemic areas. Additionally, it was found that people were more likely to listen to medical recommendations from temples or traditional healers than from medical professionals, thereby compromising their treatment. Such findings are being incorporated in the next phase of echinococcosis control in China.

Controlling of foodborne trematodiases, taeniasis, and cysticercosis in the Lao People’s Democratic Republic

A national survey conducted in the Lao People’s Democratic Republic in 2002 showed that over 70% of the population was at risk of contracting *Opisthorchis viverrini*, with the prevalence ranging between 0.1% and 77% by province. Six provinces in the north of the country were considered to be the most endemic with the prevalence above 20%. The study conducted on *T. solium* taeniasis and cysticercosis in two provinces (Luang Prabang and Savannakhet) in 2011 revealed a seroprevalence of taeniasis in humans of 2.3% (95% confidence interval: 0.9–3.7%) in Luang Prabang province and 2.9%
(95% confidence interval: 1.4–4.6%) in Savannakhet province. The national policy and strategies on NTD prevention and control were developed in 2015, which included MDA, improving WASH, veterinary interventions, and food safety and health education as the strategy. However, in six highly endemic areas, only MDA and health education were implemented in 2010–2015 due to a lack of resources – and impacts on the prevalence of infection were accordingly limited. In 2017–2018, a series of national intersectoral consultation meetings were organized among all related partners involved in NTD control, animal health, WASH and food safety to develop the national action plan for control of foodborne and zoonotic NTDs in the Lao People’s Democratic Republic and agree on pilot sites to implement multisectoral interventions. The baseline survey to initiate multisectoral interventions is planned for 2019.

**One Health approach for control of foodborne and zoonotic NTDs in Mongolia**

In Mongolia, zoonoses such as rabies, echinococcosis, brucellosis, anthrax and plague are one of the most important public health problems. This is due to the vast territorial area with 61.5 million livestock, combined with widespread unregulated slaughtering by private abattoirs and ever more stray dogs being fed with raw offal. The retrospective study of medical records in national hospitals and subnational health facilities in two selected provinces from 2008 to 2012 showed human echinococcosis cases rising yearly, with 30% of cases in children under 16 years of age. Surgical cases of echinococcosis were reported from 19 provinces, of which Omnogovi and Bayankhongor recorded the highest number. In response to these results, a multidisciplinary stakeholders workshop on clinical management and control of echinococcosis in Mongolia was held in 2016, along with hands-on training on the WHO Informal Working Group on Echinococcosis algorithm for clinicians of the first central hospital in Ulaanbaatar and general hospital (secondary) of Omnogovi province. The training was conducted with the support of WHO and the Swiss Tropical and Public Health Institute. The key output of the meeting was the development of the technical standards of diagnosis, treatment, prevention and control of echinococcosis, which were approved by Mongolia’s Ministry of Health in the same year. The Ministerial Order on Control and Prevention of Echinococcosis, covering surveillance to clinical management, was also issued in 2017, mandating registration of diagnosed echinococcosis cases (non-surgical) in the notifiable disease registration system. However, due to the absence of a case definition at provincial (secondary) level, cases continue to be reported without a clear validation mechanism. Future priorities include obtaining political support and endorsement of the national plan and policies, conducting a joint baseline assessment by the public health and animal health sector, improving national capacity for diagnosis, intensifying health education for high-risk groups and cooperation with neighbouring countries in the efforts to control echinococcosis.

**2.4 Improving NTD diagnosis and laboratory**

**2.4.1 Diagnostics of food-borne and zoonotic NTDs**

**Cysticercosis and echinococcosis**

When choosing a diagnostic tool for zoonotic NTDs, it is important to understand the purpose of each tool. Some tools are useful at clinical level, but not at population level or for monitoring impacts of public health interventions (Fig. 4).

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For detection of taeniasis due to *T. solium*, direct microscopy, copro-antigen enzyme-linked immunosorbent assay (ELISA), antibody serum and DNA detection (copro-polymerase chain reaction, or PCR) are available. All, except for direct microscopy, are relatively sensitive but only copro-PCR is suited to population-level detection and monitoring the impacts of control interventions.

For neurocysticercosis, antigen and antibody detection methods are currently available. However, antibody tests do not differentiate between patients with viable and non-viable cysts. Another major challenge of both tests is the presence of transient positives even in the absence of clinically relevant cysticercosis. In this scenario, the same individual could be tested three times in six months and show inconsistent results. Therefore, imaging for confirmation is critical before the treatment of a patient with viable cysts.

For detection of pig cysticercosis too, serological tests (antibody and antigen detection) are available, but specificity is an issue. For instance, current antigen tests and even enzyme immunoassays (EITB) are known to cross-react with other taenia species such as *T. hydatigena*. Transient positives are also frequently reported with antigen ELISA. Therefore, serology can be used only for screening, but confirmation of true positives requires necropsy.

For detection of cystic echinococcosis in dogs, direct microscopy is not specific. A recent interlaboratory comparison of copro-ELISA and copro-PCR for detection of egg in faeces of dogs also found significant discordance and heterogeneity in sensitivity and specificity. They cross react with *T. hydatigena* and, furthermore, no commercial kits are available.

In humans, on the other hand, serology can be used as an adjunct with imaging. Most patients are serologically positive using indirect hemagglutination assay, ELISA or western blots, and therefore two tests might be combined to improve accuracy.

For detection of cystic echinococcosis in livestock, serological response of echinococcosis infection in livestock is generally weak and ubiquitous co-infections with related taeniid cestode species (*T. hydatigena*, *T. ovis* and *T. multiceps*) is another issue in developing serological attests. Antigen ELISA is not available. Antibody ELISA is reportedly highly sensitive and specific but requires external validation by testing infected and uninfected animals from the same herd/background where infection has been determined by necropsy.

In summary, there are still important gaps when it comes to diagnostics of zoonotic NTDs. There is a lack of highly specific and sensitive diagnostic tools/techniques that are inexpensive and easy to use in the field, and proper external validation of tools in endemic populations and standardization of diagnostic techniques are urgently needed.
Fig. 4. Summary tables of pros and cons of various diagnostic tools for *T. solium* taeniasis/cysticercosis and cystic echinococcosis

### Diagnostic tests – summary

<table>
<thead>
<tr>
<th></th>
<th>T. solium taeniasis/cysticercosis</th>
<th>Cystic Echinococcosis</th>
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<tbody>
<tr>
<td><strong>Kato Katz</strong></td>
<td>Humans: Low sensitivity, need PCR to differentiate species, intermittent shedding of eggs.</td>
<td>Dogs: Egg faecal counts can’t differentiate from <em>Taenia</em> spps.</td>
</tr>
<tr>
<td><strong>Capro ELISA</strong></td>
<td>Humans: High sensitivity. Typically not specific. Difficult to standardise.</td>
<td>Dogs: Developed in-house, difficult to standardise</td>
</tr>
<tr>
<td><strong>Capro PCR</strong></td>
<td><strong>Humans: High sensitivity and specificity. Needs molecular expertise</strong></td>
<td>Dogs: Needs molecular expertise and careful validation</td>
</tr>
<tr>
<td><strong>Tongue palpation</strong></td>
<td>Low sensitivity but highly specific. Useful to detect pigs with high burden of infection.</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Antigen ELISA</strong></td>
<td>Humans: Issues with transient positives. Valuable for individual clinical cases but not for monitoring. Pigs: Issues with transient positives &amp; with false positives (cross reactions: <em>T. hydatigena</em>, <em>T. orientalis</em>, and others). Positives should be confirmed by carcass dissection.</td>
<td>Humans: Not available</td>
</tr>
<tr>
<td><strong>Antibody ELISA</strong></td>
<td>Humans: Not as specific as EITB or Ag ELISA. Valuable for individual clinical cases, not for monitoring. Does not differentiate active infection. Pigs: Issues with false positives.</td>
<td>Livestock: Not available</td>
</tr>
<tr>
<td><strong>Immuno blot (EITB)</strong></td>
<td>More specific than Ab ELISA. Difficult to set up and use.</td>
<td>Livestock: cross reactions due to <em>Taenia</em> spps. Carcass dissection required.</td>
</tr>
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**Foodborne trematodes**

Foodborne trematodes of public health importance in the Western Pacific Region include *Clonorchis sinensis* (*Cs*), *Opisthorchis viverrini* (*Ov*), *Fasciola hepatica*, *F. gigantica*, *Paragonimus* spp., *Metagonimus* and other intestinal trematodes. Diagnostic methods for foodborne trematodes include: recovery of worms or worm fragments, direct stool microscopy, serology to detect antibody response, detection of proteins or DNA from worms, imaging or examination of pathologies.

*C. sinensis* in humans can produce as many as 4000 eggs per day per worm and there is a record to indicate that a single person can harbour as many as 110 worms in the body.² Recovery of worms or worm fragments provide definite diagnosis but is labour-intensive for routine diagnosis. Therefore, stool microscopy remains a gold standard for detection of *Cs* and *Ov*. It can be done using Kato–Katz or the formaline-ether concentration technique, which offers both qualitative and quantitative measures. Egg detection rates in both techniques do not differ significantly for individuals with heavy intensity infections, but in extremely light infections, the formaline-ether concentration technique is more sensitive. In cases of light infection, multiple Kato–Katz smears significantly improve sensitivity.

Recently the loop-mediated isothermal amplification (LAMP) method to detect genomic DNA of *Cs* in faecal samples and the use of real-time PCR or quantitative PCR to detect *Cs* DNA in faecal samples have been evaluated and shown high sensitivity and specificity, but they are costly and require more research for operational use in public health settings. Various immunoassays to detect

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immunoglobulin M (IgM) or immunoglobulin G (IgG) antibody to Cs (crude antigen from adult worms or recombinant antigen) have also been evaluated. Detection of IgG antibodies specific to Cs crude antigens shows relatively high sensitivity and specificity, but the response varies by tests and intensity of infection, and also cross-reaction with other helminths is commonly observed.

In summary, for diagnosis of Cs and Ov, stool microscopy should still remain the gold standard, with multiple smears in low-prevalence settings. Serology might be acceptable for mass screening, but confirmation of diagnosis by more specific diagnostic techniques is required.

For schistosomiasis too, the Kato–Katz smear is still considered the gold standard because of relatively high sensitivity (particularly in high-endemicity settings) and specificity as well as its ease to apply in the field setting. In China, miracidia hatching technique is combined with Kato–Katz smear to further improve diagnostic sensitivity. It does not require expensive apparatus and provides both qualitative and quantitative measures. However, this approach is labour-intensive and time-consuming, thus not suitable for routine or large-scale screening.

There are multiple immunological tests developed for antigen or antibody detection of Schistosoma japonicum in China. The existing antigen detection assays are, however, generally of low sensitivity. The antibody detection assays show relatively high sensitivity but require external validation of their performance. Slow negative conversion of antibody response is also an important consideration for use of such assays in surveillance for verification of interruption of transmission. DNA detection techniques such as PCR and loop-mediated isothermal amplification (LAMP) are also increasingly valued, but, as indicated earlier, the use of these techniques in the public health setting needs to be further investigated because of their high cost and the need for special apparatus.

2.4.2 Building a laboratory network in the Philippines

Universal health care is the fulcrum for accomplishing the SDGs and the Philippine Health Agenda. Ninety percent of the population in the Philippines is institutionally covered by government health care, but how can the remaining 10% be reached? The Government implements the health programmes, but unfortunately there is a low prioritization of health.

There are six endemic NTDs in the Philippines; three (leprosy, LF and rabies) are in the elimination phase and the other three (soil-transmitted helminthiasis, schistosomiasis and foodborne trematodes) are in the control phase. Despite being in different programmatic phase, all diseases require surveillance capacity. For instance, baseline data are needed for foodborne trematodiasis, regular surveys to track progress and impacts of interventions are needed for LF and schistosomiasis, and intensive case-finding and management is needed for rabies. Surveillance to sustain the gains and facilitate system responses is needed even for areas and diseases that have achieved elimination status.

An integrated laboratory network will upgrade the capacity of local government units to make better diagnoses, and improve decision-making, response, reporting and coordination. The vision of the NTD integrated laboratory network in the Philippines is that the Department of Health (DOH) will be responsible at central and regional levels for securing adequate resources to ensure quality and standardized operation of NTD diagnosis, and the Research Institute for Tropical Medicine in the Philippines will serve as a national reference laboratory (Fig. 5). Village health workers will provide screening, intensive case finding and timely response, such as basic treatment and preventive management, free of charge to individuals and families in the peripheral areas.
Currently, policies and guidelines for capacity-building, quality assurance, reporting and knowledge management, laboratory and clinical procedural work, and required infrastructure are being developed with relevant Department of Health units and associated agencies. Once the draft concept is ready, it will be piloted in Regions 8 and 10.

The Philippines has valuable capacity in the private sector, in universities, and among colleagues at national, regional and provincial levels. A suggestion was made during the discussion to build an inclusive coordinating mechanism of all such facilities, linking national, regional and local, and human to animal, among both public and private entities in order to use all existing strengths to enhance NTD surveillance in the Philippines. This could also serve as a model for other countries in and outside the Western Pacific Region.

2.4.3 Sharing experience on integrated and sustainable NTD surveillance

**Philippines: Integrated diagnosis of tuberculosis and paragonimiasis**

Tuberculosis (TB) and paragonimiasis persist as public health problems in the Philippines. As paragonimiasis often shares a similar clinical manifestation, misdiagnosis of paragonimiasis as a non-response to pulmonary TB treatment or even multidrug-resistant TB is not uncommon in co-endemic areas. Between 1997 and 2007, studies were conducted to assess the burden of pulmonary paragonimiasis and tuberculosis, and treatment outcomes of pulmonary paragonimiasis in the Philippines. In 2012, the University of the Philippines Manila, in collaboration with the Department of Science and Technology-Philippine Council for Health Research and Development, the Department of Health, and the local government of Zamboanga del Norte developed and tested a model for integrating paragonimiasis surveillance and control with the pulmonary TB control programme. In 2018, this was translated into Department Memorandum (2018-0065): “Guidelines on integrating paragonimiasis in the national tuberculosis programme microscopy services”. It aims to integrate the detection of paragonimus ova and acid-fast bacilli for TB in areas where the two diseases are known to be co-endemic so as to utilize the laboratory framework/method of the National Tuberculosis

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Program that is already in place in diagnosing paragonimiasis. In 2017, regional training was given on the use of the Ziehl Neelsen Staining Technique in endemic areas (Regions 5, 9, and 11) to medical technologists, TB microscopists and food and waterborne disease focal points. Additionally, slide banks of paragonimus ova were developed in the Research Institute for Tropical Medicine. This was followed by a regional training exercise in March 2018.

The Philippines experience demonstrates that two disease control and surveillance activities can be integrated into one for mutual benefits. However, implementation on the ground is not without challenges. There is a high turnover of trained lab staff, poor documentation of diagnosis results and unsatisfactory treatment of patients, not to mention weak coordination between the Department of Health and the local government unit on supplies and reporting. Continuous capacity-building and close coordination and communication at all levels will be necessary to sustain the integration of the two programmes.

Cambodia: Integrated risk mapping of soil-transmitted helminthiasis

Epidemiological information on foodborne trematode infections in Cambodia has been limited, even though raw fish dishes are commonly eaten there. To better understand the geographical burden of foodborne trematode infections, several soil-transmitted helminthiasis prevalence surveys were conducted along with assessments of foodborne trematode infections in 2016. These surveys identified a significantly high prevalence of \textit{Ov} in Prey Veng, Koh Kong, Oddor Meanchey and Preah Vihear provinces, up to 65.0% at community level using the Kato–Katz stool examination. Additionally, stool samples collected from all provinces in the country (30–35 people per village and 10 villages per province) for assessment of the burden of strongyloidiasis were also analysed for \textit{Ov}, which singled out two more provinces (Stung Treng and Kampong Thom) with high prevalence of \textit{Ov}. Based on these results, preventive chemotherapy and health education are being planned in these high-burden areas.

Cambodia’s experience served to demonstrate the cost-effectiveness of integrating detection and diagnosis of multiple parasitic diseases, where feasible.

China: Integrated screening of foodborne trematode infections and cysticercosis in food safety surveillance

In 2009, the Food Safety Law was enacted in China. Then in 2010, food safety surveillance began, covering 32 provinces and 93% (2660 of a total 2865) of the counties in China, and proved effective in identifying risk areas for further investigation and providing specific guidance towards better food safety risk management. In 2011, the China National Center for Food Safety Risk Assessment was founded, and in 2015, foodborne parasites such as \textit{Cs}, \textit{metorchis orientalis}, echinostomas in fish and \textit{T. solium} in pork meat were included in the food safety surveillance items. This enabled identification of high-risk provinces for each foodborne parasite based on the detection rate of each parasite in the screened food items. Once a specific parasite is identified, targeted surveys are conducted in selected areas, such as fish ponds, retail shops and restaurants to sample food items and detect the parasite. For instance, the specific survey in Shunde in Guangdong identified \textit{Cs} in 21 out of 158 items investigated (live fish in markets, raw fish and fish porridge served in restaurants), or 13.29%. Once risks are identified, risk management and communication take place. This includes advice to the restaurant about not serving sliced raw fish with a high risk of parasitic infection, to the fish pond about proper construction of latrines and reuse of night soil to fertilize ponds, and to the public on safe and hygienic handling and cooking of food items.
China’s experience suggested that including foodborne and zoonotic parasites of public health concern in the food safety surveillance systems could be a passive yet effective option to identify risk areas for appropriate response and management.

2.5 Involving the WASH sector for control and elimination of NTDs (trachoma, yaws, soil-transmitted helminthiases, schistosomiasis, foodborne trematodiases, taeniasis/cysticercosis, echinococcosis)

2.5.1 Sharing experience in institutionalizing WASH-NTD collaboration – challenges and success factors

*China: Echinococcosis*

As discussed earlier, improvement of WASH has long been an important component of control and elimination efforts of parasitic diseases such as schistosomiasis and echinococcosis in China (Fig. 6 and 7). The national echinococcosis control programme in China is currently implementing a pilot study to evaluate the impacts of WASH interventions on transmission of the disease, with a focus on building latrines, providing water containers on boats, safe water for cooking, sanitary toilets in rural areas and intensive health education in schools. This follows a similar path taken by the national schistosomiasis elimination programme on WASH interventions, effectively combined with rigorous MDA and leading to a significant reduction in the prevalence of schistosomiasis in the majority of endemic areas. The impacts have also been observed on the prevalence of soil-transmitted helminthiases in the same target areas. The lessons include the importance of monitoring and evaluation for feedback to policy levels and regularly updating strategies based on the evidence.

*Fig. 6. WASH scale-up strategy for control of schistosomiasis in China*
Schistosomiasis is endemic in 202 villages covering two districts in Champasak province. MDA for control of schistosomiasis has been implemented since 2007, targeting both adults and children aged 5 years and above. This has resulted in a significant reduction of the prevalence of schistosomiasis in the area, but the experience has also shown that MDA alone cannot interrupt transmission of schistosomiasis. To accelerate the interruption of transmission of schistosomiasis, an initiative called CL-SWASH (Community-Led initiatives to eliminate Schistosomiasis by combining MDA with WASH interventions) was jointly launched by the National Centre of Environmental Health and Water Supply (Nam Saat) and the Department of Communicable Disease Control in the Ministry of Health at the end of 2016 (Fig. 8). This initiative aims to build on national water, sanitation and hygiene efforts by developing water safety plans in schistosomiasis-endemic communities in the Lao People’s Democratic Republic. It aims to equip community members with knowledge on the link between transmission of schistosomiasis and their sanitation and hygiene behaviours, thereby driving behaviour change and voluntary latrine construction without external funding support. A similar initiative has been launched in Cambodia.
Based on the monitoring and evaluation after one year of implementation, most of the 10 initial villages showed an increase in latrine coverage despite no provision of financial support for construction of latrines (Fig. 9).

MDA has not proven capable of interrupting transmission, and WASH education and animal health support are needed to supplement the efforts. The programme was expanded to 10 villages in 2016 and latrine coverage had increased after one year. It was further expanded to 14 villages in 2018.

The success is due to close coordination and collaboration among relevant programmes (NTD and WASH) in the Ministry of Health from the central, provincial and district levels and strong leadership
from many village authorities. Challenges include limited staff availability at district level to facilitate and conduct regular monitoring visits, limited capacity of staff at the district and health centres working on health promotion to encourage behaviour change, community expectations for subsidies for sanitation improvements, and lack of leadership and support from some of the village authorities.

2.5.2 Opportunities to invite WASH sectors to support control of NTDs

Provision of safe water, sanitation and hygiene is critical for the prevention and care of many NTDs. However, it is frequently overlooked in NTD control and programmes. There are three components to WASH interventions – water supply, sanitation and hygiene – each of which might be handled by different programmes and ministries in each country. For instance, in Cambodia, rural water supply and sanitation are handled by the Ministry of Rural Development. In the Lao People’s Democratic Republic, rural water supply and sanitation are handled by Nam Saat. Depending on the need, it is important to distinguish which one to collaborate with.

NTD programmes need to collaborate with WASH programmes, because their technical support is essential for control and elimination of NTDs. WASH interventions in NTD-endemic communities not only demonstrate impacts on the transmission of NTDs but also help sustain impacts of other interventions such as MDA. They also have collateral impacts on many other waterborne diseases. One approach to market WASH programmes while collaborating with NTD programmes is to argue for the benefit of using NTDs to demonstrate the health impacts of WASH activities. A lack of safe water, sanitation and/or hygiene is a direct and fundamental cause of many NTDs. Therefore, NTDs can be used as a tracer of equity in progress towards universal WASH in the SDG. NTDs, particularly worms, are also easier to control and it is therefore easier to demonstrate the impacts of WASH interventions than many other waterborne diseases.

When NTD programmes work with WASH programmes, new funding opportunities might emerge, such as those targeting climate change and health. Examples include the Global Environment Fund and the Green Climate Fund. NTDs are indeed “climate sensitive” diseases because natural disasters might break down the sanitation infrastructure and increase their transmission. Increasing evidence shows that rising temperatures can change the distribution of intermediate vectors of NTDs such as lymphatic filariasis, leishmaniasis, dengue and schistosomiasis, potentially expanding the at-risk population. In coastal areas, the predicted rise in the sea level might increase salinity in underground water, affecting the availability of safe freshwater for human and animal use and increasing hygiene-related NTDs. To facilitate discussion between the two programmes, support from academic partners to generate more evidence to demonstrate the linkage between NTDs and WASH interventions, and their relation to climate change, is essential.

2.6 Sustaining post-validation surveillance

2.6.1 Operationalizing LF post-validation surveillance in the Asia subregion

The Informal Consultation on Post-Elimination Surveillance of NTDs on 13–14 June 2017 in Siem Reap, Cambodia, agreed that the objectives of LF post-validation surveillance are to ensure recrudescence of LF transmission has not occurred, to confirm that interruption of transmission has been achieved and to respond to ongoing transmission if detected. The recommendations of the Consultation noted that it is not feasible to conduct LF post-validation surveillance in every part of the country. In operational terms, the areas with potential risks should be prioritized, with consideration for diagnostic tools, age groups to be surveyed and platforms to build the LF surveillance activities.
LF post-validation surveillance needs to be “active”, since the time lag between infection and clinical symptoms is very long and therefore clinical indicators cannot be used as early warning signs. Countries are encouraged to identify existing national or subnational representative surveys and sentinel surveillance activities as potential platforms to integrate post-validation surveillance activities in the most cost-effective and sustainable manner. One of the most realistic options to identify risks is to follow up areas where positives were identified in transmission assessment survey 2 or 3 as potential hotspots, using antigen and antibody detection. Alternatively, opportunistic or other population-based surveys might offer an opportunity to integrate LF testing. One example, from Cambodia, was the integration of the detection of antibody response to malaria, LF, toxoplasma, cysticercosis and strongyloides into a national serosurvey of vaccine-preventable diseases (tetanus, measles and rubella) using a multiplex bead assay, which successfully detected elevated antibody response to LF antigens in formerly LF-endemic areas.4

Funding to pilot and determine the most feasible option to establish LF post-validation surveillance might be available through the Task Force for Global Health, based in Atlanta, USA. An expression of intent with a proposal indicating the primary investigator, objectives, diagnostic tools to be used, study area and population, sample size and timeline, and estimated budget can be submitted to the Task Force for Global Health.

2.6.2 Sharing experience on LF post-validation surveys

China

National efforts to control LF in 864 endemic counties and cities in China started in the 1950s. MDA started in 1956. In 1983, the health ministry issued a document on criteria for the basic elimination of filariasis and assessment methods, where the main criterion was “in a filariasis prevalent county/city, through intervention, the microfilaraemia rate was reduced to below 1% in the population of administrative villages”. The assessment of basic elimination of filariasis was based on blood smear for microfilaraemia and serological testing as well as clinical diagnosis of chronic manifestation. This was carried out at three levels: self-assessment by the county, spot checks by the provinces of the county results and spot checks of the provincial results by the health ministry. By 1994, all 864 endemic counties/cities in 16 provinces/autonomous regions/municipalities had reached the basic elimination criteria, considered to be equivalent to elimination as a public health problem. Post-elimination surveillance continued, focusing on 261 counties in 10 formerly high-burden provinces in 1996–2005. In 2005, a number of serological surveys were conducted: one of these covered 11 396 individuals from among a floating population in five provinces, which detected 0.14% IgG4 (immunoglobulin G4) antibody positive rate and two microfilaraemia positives; another covered 3036 individuals residing in the border area with Viet Nam, which detected a 0.33% IgG4 antibody positive rate and no microfilaraemia positives; a further survey covered 253 individuals (72 Chinese nationals and 181 foreigners) entering China from other endemic countries, which detected 6 IgG4 antibody positives. In 2005, WHO validated China for having achieved elimination of LF as a public health problem. Post-elimination surveillance still continued. In 2008, the National Institute of Parasitic Diseases in the Chinese Center for Disease Control and Prevention implemented another survey testing 50 424 individuals in 80 administrative villages within 38 counties in 7 formerly endemic provinces. It detected 0.327% IgG4 antibody positive rate and no microfilaraemia positives. LF continues to be in the list of notifiable diseases. In 2007, the working protocol for the care of patients with chronic filariasis was issued, and in 2010, the national LF post-elimination surveillance protocol

was further issued. It involves passive surveillance through the so-called Notifiable Infectious Diseases Report System and active surveillance through serosurveys in formerly endemic areas and spot-check sites every 10 years. Every two years, a national training course on filariasis surveillance continues to sustain post-elimination surveillance capacity. Indeed, there was an incident in 2007 where a transmission focus of *Wuchereria bancrofti* was found in Fuchuan County in Guangxi Zhuang Autonomous Region through identification of a chronic case, which had been missed in any historical surveys and where MDA had not been implemented in the past.

**Republic of Korea**

The first authentic case of LF in the Republic of Korea was identified in 1927. Between 1920 and the 1970s, numerous surveys were carried out and identified three main transmission foci of *Brugia malayi*: the north-eastern part of Gyeongsangbuk-do, western coastal areas of Jeollanam-do and Jeju-do. Mass and selective chemotherapy was introduced in the late 1960s, which significantly reduced the prevalence of infection to 1% or lower by 1990. Surveillance for validation of elimination of LF as a public health problem continued from 2002 to 2006 in formerly endemic areas. It included testing for microfilaremia in all age groups, using blood smear and antibody detection, and among children aged 10–13 years using the antibody rapid test as per WHO recommendations. The survey in 2006 found zero antibody positives in all age groups in the formerly-endemic areas (3049 children and 1526 individuals of all ages). Consequently, WHO validated the Republic of Korea as having eliminated LF as a public health problem in 2008.

Post-validation surveillance has continued between 2009 and 2011 in the formerly endemic areas, using filarial antibody tests among elementary school children and xenomonitoring of LF vector mosquitoes (*Aedes togoi* and *Anopheles sinensis*), both of which continued to show negativity. In xenomonitoring, adult mosquitoes were collected twice weekly using light traps, species were identified by dissecting, and PCR was performed to detect filariasis DNA. Vector surveillance for various pathogens including LF continues in the Republic of Korea to date.

### 2.7 Improving NTD data reporting and management

#### 2.7.1 DHIS2-based NTD data reporting and management

Currently, WHO collects three kinds of Excel-based forms annually to monitor progress in preventive chemotherapy and epidemiological surveys and to facilitate requests for donations of medicines for preventive chemotherapy. These are the Joint Request for Selected Preventive Chemotherapy Medicines, the Joint Reporting Form and the Epidemiological Data Reporting Form from endemic countries. The reported data are reviewed, stored, summarized and published in the WHO Preventive Chemotherapy Databank and the WHO Global Health Observatory on the WHO website.

The District Health Information System, or DHIS2, is a flexible, web-based, open-source information system, developed by the University of Oslo, to enable data collection, visualization (including GIS, charts and pivot tables) and sharing. It is increasingly used as national health information systems in many countries that do not have their own working national health information system. To enable collection, visualization and summarization of data in a standardized manner, various public health programmes in WHO are developing DHIS2-based standardized data reporting modules, and the NTD programme is no exception. Currently, the preventive chemotherapy disease module is under development with the aim of simplifying data reporting from countries and having a regional/national NTD dashboard to improve strategic use of NTD data. It has been designed to use common administrative units across programmes down to district level, and to allow integrated data
analysis/comparison on results of interventions and active/passive surveillance across multiple NTDs and beyond in each district/province. The NTD module is expected to be ready by the end of 2018 and to be piloted in selected countries in 2019.

2.7.2 NTD management information system project in the Philippines

In the past, the national NTD data reporting system in the Philippines has suffered from shortcomings such as delay, incompleteness and inaccuracy. This is partly because of lack of standardized reporting forms and decentralized preventive chemotherapy campaigns with different implementation schedules by region, province and municipality. In 2016, the Department of Health of the Philippines harmonized the schedule of MDA campaigns across the country: January for soil-transmitted helminthiases and schistosomiasis and July for soil-transmitted helminthiases and LF. In the same year, a data quality assessment was conducted to identify problems with the existing NTD data reporting system in the country. Following the assessment, development began on the m-health-based NTD Management Information System (MIS) with the support of WHO. It is designed to address the major challenges identified at the data quality assessment, enabling timely data submission and analysis with a dashboard showing real time data at all levels from villages up to the national level. The Department of Health is looking to scale up the use of the NTD MIS in other provinces and to expand it to include other zoonotic NTDs. It is also planning to organize a programme implementation review meeting in December 2019 to review the progress and experience in use of NTD MIS in all pilot provinces and identify areas to be further improved before scale-up.

2.8 Burden assessment and operational research on NTDs

2.8.1 Regional situational analysis of new NTDs

Scabies

Scabies is not simply a nuisance but a highly infectious disease that is transmitted from person to person, causes significant morbidity such as secondary skin infection and other secondary autoimmune reactions, and affects the quality of life and causes economic loss for those infected, their families and communities. Scabies was added in the global NTD portfolio in 2017 through a request from some of the affected Member States, including Fiji and Solomon Islands in the Western Pacific Region.

Currently, treatment options include a topical cream, which needs to be applied for 6–8 hours, or an oral administration of ivermectin. The results of a study in Fiji showed that ivermectin treatment had the best results with 94% reduction at 12 months, compared to topical administration of permethrin (62% reduction at 12 months). Since ivermectin does not kill the eggs, it is necessary to apply it a second time after two weeks. This allows time for the eggs to hatch and the mites to be killed before they are able to lay more eggs. The prevalence of impetigo was also reduced simply by treating the scabies with no additional antibiotics. By reducing scabies to less than 2%, impetigo was reduced by two thirds. Scabies also continued to decline in prevalence with no additional treatment after the two courses were completed. Operational research to assess impacts and safety of integrated MDA with azithromycin for trachoma and ivermectin for scabies conducted in Choiseul province of Solomon Islands also showed a 89% reduction in prevalence of scabies and a 75% reduction in prevalence of impetigo at 12 months post-treatment. Studies to assess impacts, safety and cost-effectiveness of MDA using single dose ivermectin for control of scabies are continuing in Fiji and Solomon Islands, as the costs of generic ivermectin for mass treatment will be problematic in many endemic countries.
The WHO Regional Office for the Western Pacific conducted a regional situation analysis of scabies with support of the team of Australian experts, based on the published data or data available through the health system and disease burden studies. There is also a systematic review of the prevalence of scabies and impetigo worldwide.\(^5\) It concluded that the entire Western Pacific Region was at risk and identified 14 countries at high risk, particularly in the Pacific. However, experience in Fiji, Solomon Islands and several other countries where specific community-based studies on scabies are conducted demonstrated that the actual burden of scabies is much higher than the estimated numbers or prevalence of scabies drawn from the data reported through the health system. This is because skin conditions are generally underdiagnosed or underreported by communities. The regional situation analysis also identified only four countries with scabies-specific treatment and management guidelines, while other low-burden countries may have guidelines only to tackle outbreaks. Since routine data are not sufficient to estimate the actual burden of scabies, developing two-stage tools for evaluating data will be a priority for the Region in the coming years. These will involve rapid assessment, using key informants such as clinicians and communities, and health data, followed by standardized surveys, perhaps integrated with others, further mapping of scabies in the Region, the development of guidance for public health control of the disease and improving access to treatment.

**Snakebite envenoming**

Snakebite envenoming is a potentially life-threatening disease that typically results from the injection of a mixture of different toxins (venom) following the bite of a venomous snake. Medically important venomous snakes can be found in 160 countries worldwide, and snakebite envenoming is a particularly important public health problem in rural areas of tropical and subtropical countries situated in Africa, the Middle East, Asia, Oceania and Latin America. It is estimated that approximately 1.8–2.7 million cases of snakebite envenoming occur every year, and 30–45% of the victims are women and children. To increase visibility and awareness of this significant public health issue, Member States, civil society, stakeholders and antivenom manufacturers jointly submitted a request for the inclusion of snakebite envenoming in the WHO NTD portfolio in 2017, which was endorsed by the WHO Director-General in the same year.

While some snakebites are poisonous and can cause death, others may cause morbidity and mutilation. Some are not poisonous at all. Treatment difficulties lie in a lack of access to and availability of affordable, effective and quality-assured antivenoms. Prevention is another key part of the solution.

A WHO road map, global strategy and the World Health Assembly resolutions for prevention and control of snakebite envenoming are being developed by the Strategic and Technical Advisory Group Working Group with key thematic areas: community engagement, health system strengthening, safe, effective and affordable antivenoms, treatment and recovery, and global coordination.

2.9 Consultation on the Regional Framework for Control and Elimination of NTDs in the Western Pacific

As indicated above, remarkable progress has been achieved in control and elimination of NTDs in the Western Pacific Region since the launch of the *Regional Action Plan for Neglected Tropical Diseases in the Western Pacific Region (2012–2016)*. This includes a significant overall reduction of NTD burdens resulting from full-scale preventive chemotherapy interventions for multiple NTDs, the growing number of countries achieving elimination targets or on track to achieve them for LF and

trachoma by 2020, and recent success in institutionalizing intersectoral collaboration for elimination of Asian schistosomiasis. With this, the NTD landscape in the Western Pacific Region is fast changing, and new situations and opportunities are emerging. While preventive chemotherapy has been highly effective in reducing the prevalence and burden of some NTDs such as LF and trachoma, the limitations of reliance on preventive chemotherapy alone to control and eliminate other NTDs, particularly schistosomiasis and other foodborne and zoonotic NTDs, are increasingly evident. Second, even though NTDs are far less neglected as a result of intensive advocacy at global level, NTDs beyond LF and trachoma often continue to receive scant attention, particularly in affected communities. It is increasingly realized that community engagement is essential to enhance and sustain impacts of ongoing interventions. Third, as more countries achieve elimination targets, there is an urgent need to establish and sustain post-elimination surveillance and provision of universal care for patients in post-elimination countries. Fourth, with success in elimination of LF and trachoma as the public health problems that have been most prevalent throughout the Region, diversity in disease endemicity and progress across the Region is expanding, with more focus on zoonotic and foodborne diseases in Asia and skin-related NTDs in the Pacific. With this new picture, it becomes difficult to develop a one-size-fits-all strategy for control and elimination of NTDs. Furthermore, in 2017, three disease conditions were added to the global NTD portfolio: scabies and other ectoparasitic infestations, snakebite envenoming, and chromoblastomycosis and other deep mycoses. As new disease conditions are added, it will be necessary to consider the best way to integrate them into the overall framework for control and elimination of NTDs. Finally, NTDs are now included in the SDGs. Universal health coverage will be key for NTD control and elimination, helping sustain gains by ensuring that needed health services reach all people, particularly marginalized and neglected populations. The SDGs present opportunities to accelerate progress on NTDs through whole-of-system multisectoral interventions, such as improvements in water and sanitation, food safety, environmental health and veterinary public health, in addition to health services.

Acknowledging progress and recognizing opportunities, it is increasingly understood that a new regional vision for control and elimination of NTDs in the Western Pacific is required. The new regional framework on NTDs will be different from the existing Regional Action Plan in the following aspects:

1. It will focus on an integrated and comprehensive approach across the Region to effectively address all NTDs:
   a. with a more sustainable approach for programme managers that will allow island nations to cover more diseases at once,
   b. while simultaneously building capacities of health systems and governments, and
   c. moving ahead of all other Regions with a region-specific plan for success to be replicated beyond LF & trachoma.
2. It will include a plan for new NTDs (scabies and snakebites), along with post-elimination surveillance and universal and sustained access to morbidity care.
3. It will indicate how to develop multi-sectoral programmes that also address disease-specific targets and individual interventions set out in the previous action plan.

The outline of the draft and the key components of the proposed regional action framework were presented. The framework will reflect a vision of a Western Pacific Region free from NTDs thanks to robust health systems equipped to detect, respond and manage NTDs and associated morbidity and disabilities so that quality of life of the affected people and communities are improved in the Region. The purpose is to meet two goals: (i) to achieve and sustain the status of elimination of those NTDs targeted in resolutions of the World Health Assembly, and (ii) to achieve and sustain control of other
NTDs and alleviate suffering due to NTD-associated morbidity and disabilities (Fig. 10). In order to achieve these goals, three action pillars to focus strengthening of NTD programmatic components were proposed: (i) effective and sustained surveillance, (ii) universal access to a comprehensive NTD intervention package, and (iii) empowerment of affected people and communities.

**Fig. 10. Schematic of a draft regional framework for control and elimination of NTDs**

![Regional Framework for Control and Elimination of NTDs](image)

Proposed objectives, expected outcomes and priority actions under each pillar were presented and discussed. Emphasis was placed on the fact that many NTDs have various commonalities. Multiple NTDs frequently affect the same population in the same environment where poverty prevails, safe water supply and sanitation are lacking and disease vectors thrive. Interventions to achieve control and elimination of diseases and programmatic activities required to deliver such interventions effectively also overlap across multiple diseases, and this strength should be utilized to make further progress in strengthening NTD programme capabilities more effectively and efficiently. In countries or areas where multiple NTDs are co-endemic, integration and coordination of planning and implementation of intervention and associated activities across multiple diseases are expected to improve cost-effectiveness, logistic convenience, acceptability by affected populations, ancillary and synergic impacts of the intervention and political attention through increased visibility. The participants agreed that inclusiveness, integration and coordination across multiple diseases wherever feasible would help build a robust framework. It was suggested that integration and coordination should not be limited to NTDs alone but should be explored with other health programmes and service delivery within the health system where feasible, including animal health systems and WASH.

It was also proposed to include behaviour change within the targets of risk communication. Participants discussed whether case management alone accurately captured management, care and rehabilitation of morbidity associated with all NTDs. The group noted that financing should also be included under system needs and that research innovation deserved consideration as well in the Western Pacific Region, where many countries were advancing with control and elimination of NTDs into areas where global guidance was still lacking; research and innovation thus played an important
role in guiding further progress. All the suggestions and inputs from the session would be incorporated into the draft framework and circulated to all Member States and partners for further consultation.

3. CONCLUSIONS AND RECOMMENDATIONS

3.1 Conclusions

Significant progress has been made in the Asia subregion towards elimination of LF as a public health problem and elimination of blinding trachoma. Cambodia was congratulated for its recent validation by WHO of elimination of LF as a public health problem and of elimination of blinding trachoma. The Lao People's Democratic Republic was also congratulated for its recent validation by WHO of elimination of blinding trachoma.

Ongoing efforts to accelerate the elimination of schistosomiasis in Asia through MDA and improvement of sanitation coverage in collaboration with WASH programmes were also acknowledged.

There is concern about the possibility of re-introducing and re-establishing transmission of NTDs in post-validation countries due to significant cross-border population movements and migration of people from endemic countries and areas, and the meeting participants agreed on the urgent need to establish post-validation surveillance with the support of partner agencies.

The participants noted the ongoing efforts in many countries to integrate NTD survey or surveillance activities with other diseases or programmes, such as integrated surveillance of TB and paragonimiasis and screening of foodborne and zoonotic NTDs in food safety surveillance.

The participants highlighted the importance of standardizing the tools and methods for diagnosis and detection of NTDs at the regional or global level, and of external validation of diagnostic tools to accurately understand the burden and distribution of NTDs in the Western Pacific Region.

The participants acknowledged the global and regional progress being made following the inclusion of scabies and snakebite envenoming in WHO’s NTD portfolio and noted the need for assessing the true burden of the diseases in the Region.

Acknowledging the changing NTD landscape and remaining challenges in Asia, the meeting agreed that the three strategic pillars of the draft Regional Framework for Control and Elimination of NTDs could be surveillance (including response), strengthening multi-sectoral cooperation, and universal access to interventions and community empowerment through effective risk communication.

3.2 Recommendations

3.2.1 Recommendations for Member States

Member States were encouraged to consider the following:

1) Advance cross-divisional discussions to explore potential platforms that will help in establishing post-validation surveillance of lymphatic filariasis in countries that have achieved or are nearing validation of elimination of lymphatic filariasis as a public health problem, or in areas that have passed the third transmission assessment surveys.
2) Initiate dialogue with the animal health sector to identify the One Health interventions most appropriate to the local context and explore the possibility of jointly planning and implementing a comprehensive approach for control of *T. solium* taeniasis/cysticercosis or echinococcosis in priority areas.

3) Continue progress on strengthening collaboration with WASH and environmental health sectors and explore opportunities to jointly mobilize resources in the context of climate change and health.

4) Estimate the need of niclosamide, triclabendazole and praziquantel for control of *T. solium* taeniasis and foodborne trematode infections in countries, and instruct WHO to negotiate with potential donors and partners for future donations.

5) Share views, inputs and suggestions with WHO on the next draft of the Regional Framework for Control and Elimination of NTDs.

### 3.2.2 Recommendations for WHO

WHO was requested to do the following:

1) Facilitate standardization of tools and methods for NTD diagnosis and validation of NTD diagnostics relevant to the Western Pacific Region, in collaboration with WHO collaborating centres and other laboratories or institutions working on NTD detection and diagnosis in the Region.

2) Provide technical support and guidance and facilitate cross-sectoral collaboration with WASH, animal health and food safety sectors at the national and regional levels by identifying and engaging relevant partners to accelerate control of foodborne and zoonotic NTDs.

3) Facilitate regular communication and sharing of operational research priorities and updates among countries and research/academic institutions in the Western Pacific Region.
**ANNEX 1**

**List of participants**

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### Meeting programme

#### Day 1: Tuesday, 13 March 2018

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
<th>Presenter(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>08:30 – 09:00</td>
<td>Registration</td>
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<tr>
<td><strong>Opening Session</strong></td>
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<tr>
<td>09:00 – 09:30</td>
<td>Welcome address</td>
<td>Dr Shin Young-soo, Regional Director, WHO-WPRO</td>
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<tr>
<td></td>
<td>Meeting objectives and the proceedings</td>
<td>Dr Rabi Abeyasinghe, Coordinator, WHO/WPRO</td>
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<tr>
<td></td>
<td>Self-introduction of participants and observers</td>
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<tr>
<td></td>
<td>Administrative announcements</td>
<td>Dr Aya Yajima, NTD focal point, WHO/WPRO</td>
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<tr>
<td>09:30 – 10:00</td>
<td>Group photograph followed by coffee/tea break</td>
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<tr>
<td><strong>Session 1: Global and regional updates on control and elimination of NTDs</strong></td>
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<tr>
<td>10:00 – 10:30</td>
<td>Global progress, challenges and updates on elimination and control of NTDs</td>
<td>Dr Bernadette Abela-Ridder, NZD team leader, WHO/HQ</td>
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<td></td>
<td>Discussion</td>
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<tr>
<td>10:30 – 11:00</td>
<td>Regional progress, challenges and the draft Regional Framework for Elimination and Control of NTDs</td>
<td>Dr Aya Yajima</td>
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<td>Discussion</td>
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<tr>
<td><strong>Session 2: Universal access to comprehensive NTD interventions</strong></td>
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<tr>
<td><strong>Session 2.1: One health approach for control of foodborne and zoonotic NTDs</strong></td>
<td>Schistosomiasis, foodborne trematodiases, taeniasis/cysticercosis, echinococcosis</td>
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<tr>
<td>11:00 – 12:30</td>
<td>Basic considerations for control of foodborne and zoonotic NTDs through One Health approach with cysticercosis as an example</td>
<td>Dr Meritxell Donadeu, University of Melbourne, Australia</td>
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<td></td>
<td>Sharing experience on One Health approach for control of foodborne and zoonotic NTDs – actions, challenges and lessons learnt (10 min each)</td>
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<td></td>
<td>o China (Echinococcosis)</td>
<td>- CDC, China</td>
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<td></td>
<td>o Lao PDR (foodborne trematodiases and cysticercosis)</td>
<td>- MOH, Lao PDR</td>
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<td>o Mongolia (Echinococcosis)</td>
<td>- MOH, Mongolia</td>
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<td>Group discussion on building a one health programme</td>
<td>Dr Meritxell Donadeu</td>
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<tr>
<td>12:30 – 13:30</td>
<td>Lunch break</td>
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<tr>
<td><strong>Session 3: Effective and sustained NTD surveillance</strong></td>
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</table>
**Session 3.1: Improving NTD diagnosis and laboratory**

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<thead>
<tr>
<th>Time</th>
<th>Activity</th>
<th>Speaker(s)</th>
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</thead>
<tbody>
<tr>
<td>13:30 – 14:30</td>
<td>Experience in diagnostics of foodborne and zoonotic NTDs for human and animals</td>
<td>Dr Meritxell Donadeu, Prof Sung-Tae Hong, Seoul National University, Korea, Prof Zhou Xiao Nong</td>
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<tr>
<td></td>
<td>- Cysticercosis and echinococcosis</td>
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<td></td>
<td>- Foodborne trematodiases</td>
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<td>- Asian schistosomiasis</td>
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<td>Interactive session to complete diagnostics reference matrix</td>
<td>Dr Meritxell Donadeu</td>
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<tr>
<td>14:30 – 15:00</td>
<td>Regional validation of diagnostics and quality assurance of NTD diagnosis – malaria programme as an example (10 min)</td>
<td>Dr Rabi Abeyasinghe</td>
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<td>Building laboratory network in the Philippines (10 min)</td>
<td>DOH, Philippines</td>
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<td>Discussion on the way forward</td>
<td>All</td>
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**Session 2: Universal access to comprehensive NTD interventions**

**Session 2.2:** Involving WASH sector for control and elimination of NTDs (trachoma, yaws, STH, schistosomiasis, foodborne trematodiases, taeniasis, cysticercosis, echinococcosis)

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<tr>
<th>Time</th>
<th>Activity</th>
<th>Speaker(s)</th>
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<tbody>
<tr>
<td>16:20 – 16:40</td>
<td>Sharing experience in institutionalizing WASH-NTD collaboration – challenges and success factors (10 min each)</td>
<td>CDC, China, MOH, Lao PDR</td>
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<td></td>
<td>- China (echinococcosis)</td>
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<td></td>
<td>- Lao PDR (CL-SWASH)</td>
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<tr>
<td>16:40 – 17:30</td>
<td>Opportunities to invite WASH sectors to support control of NTDs (10 min)</td>
<td>Dr Aya Yajima on behalf of Dr Kim Rokho, Health and Environment focal point, WPRO</td>
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<td></td>
<td>Discussion to identify key linkages between NTD control and climate change</td>
<td>All</td>
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**Day 2: Wednesday, 14 March 2018**

**Session 3: Effective and sustained NTD surveillance**

**Session 3.2:** Sustaining post-validation surveillance

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<thead>
<tr>
<th>Time</th>
<th>Activity</th>
<th>Speaker(s)</th>
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<tbody>
<tr>
<td>09:00 – 09:45</td>
<td>Operationalizing lymphatic filariasis (LF) post-validation surveillance in the Asia sub-Region</td>
<td>Dr Kim Won, USCDC and Dr Molly Brady, RTI, USA</td>
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<td></td>
<td>Sharing experience on LF post-validation surveillance (10 min each)</td>
<td>CDC, China, CDC, Korea</td>
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<td>- China</td>
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<td>- Korea</td>
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<td></td>
<td>Discussion</td>
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<tr>
<td>10:00 – 10:30</td>
<td>Coffee/tea break</td>
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<tr>
<td>10:30 – 11:30</td>
<td>Break-out sessions to develop a proposal for piloting post-validation surveillance options</td>
<td>Dr Kim Won and Dr Molly Brady</td>
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<tr>
<td>Time</td>
<td>Session 3.3: Improving NTD data reporting and management</td>
<td>All</td>
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<tr>
<td>11:30 – 12:00</td>
<td>Improving NTD data reporting and management (10 min each)</td>
<td>Dr Aya Yajima DOH, Philippines</td>
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<td></td>
<td>o DHIS2-based NTD data reporting and management</td>
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<td>o NTD Management Information System Project in the Philippines</td>
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<td>Discussion</td>
<td>All</td>
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<tr>
<td>12:00 – 13:00</td>
<td>Lunch break</td>
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<tr>
<td>Session 4:</td>
<td>Burden assessment and operational research on NTDs</td>
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<tr>
<td>13:00 – 13:40</td>
<td>Regional situation analysis of new NTDs</td>
<td>Dr Daniel Engelman, Secretary, International Alliance for the Control of Scabies (skype)</td>
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<td>o Scabies</td>
<td>Dr Aya Yajima</td>
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<td>o Snakebite envenoming</td>
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<td>Discussion on priorities and support need</td>
<td>All</td>
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<tr>
<td>13:40 – 14:00</td>
<td>Global updates and priorities for elimination of rabies relevant to Asia sub-Region</td>
<td>Dr Bernadette Abela-Ridder</td>
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<tr>
<td></td>
<td>Discussion on priorities and support need</td>
<td>All</td>
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<tr>
<td>14:00 – 15:00</td>
<td>Review and discussion on Regional Framework for Control and Elimination of NTDs in the Western Pacific</td>
<td>All</td>
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<td>o Vision, goal and aim</td>
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<td>Session 5:</td>
<td>Consultation on the Regional Framework for Control and Elimination of NTDs in the Western Pacific</td>
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<td>15:00 – 15:30</td>
<td>Coffee /tea break</td>
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<td>15:30 – 17:00</td>
<td>o Action pillars</td>
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<td>o Key elements</td>
<td>All</td>
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<tr>
<td>Session 4:</td>
<td>Closing session</td>
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<tr>
<td>17:00 – 17:20</td>
<td>Plenary discussion on regional priority of operational research on NTDs and ongoing activities in Asia sub-Region</td>
<td>Dr Aya Yajima</td>
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<td></td>
<td>Discussion</td>
<td>All</td>
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<tr>
<td>17:20 – 17:30</td>
<td>Summary of priorities, support need and the way forward in Asia sub-Region</td>
<td>Dr Aya Yajima</td>
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<td>Discussion</td>
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<tr>
<td>17:30 – 17:35</td>
<td>Conclusions and recommendations</td>
<td>Dr Rabi Abeyasinghe</td>
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<tr>
<td>17:35 – 17:40</td>
<td>Closing</td>
<td>Dr Rabi Abeyasinghe</td>
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