THE ACCESS AND DELIVERY PARTNERSHIP

New Health Technologies for TB, Malaria and NTDs

National strategy for implementation and operational research to support prevention and control of

tuberculosis, malaria and neglected tropical diseases

2016–2019

National Institute of Health Research and Development
Ministry of Health, Republic of Indonesia

TDR For research on diseases of poverty
UNICEF • UNDP • World Bank • WHO

From the People of Japan

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Preface

The strategy for implementation and operational research to support prevention and control of tuberculosis (TB), malaria and neglected tropical diseases (NTDs) in Indonesia 2016–2019 is a document containing the framework and agenda for implementation research on TB, malaria, leprosy, yaws, filariasis, schistosomiasis and helminthiasis. This strategy is expected to serve as the basis for strengthening the implementation and operational research capacity to support programmes to prevent and control these diseases in Indonesia.

The National Institute of Health Research and Development (NIHRD) of the Ministry of Health of the Republic of Indonesia is the agency leading programme implementation on pathway 2 of the Access and Delivery Partnership in Indonesia. Pathway 2 focuses on improvement of implementation research capacity in Indonesia. This activity is in accordance with the mandate of NIHRD, as outlined in Ministry of Health Decree Number 64 of 2015, namely to conduct research and development in the health sector. This includes developing policy for research on clinical biomedicine and epidemiology, community health efforts, health services, pharmacy and medical devices, human resources and health humanism. Implementation research is intended to study gaps between formulated policies and their actual implementation, in accordance with NIHRD's focus on client-oriented research activities.

The preparation process of this implementation research strategy has involved researchers of NIHRD, programme implementers under the Directorate-General of Disease Prevention and Control, Ministry of Health representatives and academics. Further, it is anticipated that the research agenda elaborated in this implementation research strategy will be carried out in the prescribed manner by all stakeholders.

I extend my highest appreciation to all parties contributing to the development of the strategy for implementation and operational research to support prevention and control of TB, malaria, and NTDs in Indonesia, 2016–2019. May God Almighty bless this implementation research strategy.

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About the Access and Delivery Partnership

The adverse impact of tuberculosis (TB), malaria and neglected tropic diseases (NTDs) on development outcomes has resulted in new approaches and partnerships to address the global deficiencies in research and development, and treatment access. One such initiative is the strategic partnership between the Government of Japan and the United Nations Development Programme (UNDP), which promotes research and development, and expedites access to and delivery of health technologies used to address TB, malaria and NTDs. This partnership comprises two complementary components, which reflect the strategic goals on global health of the Government of Japan and the UNDP:

The **Global Health Innovative Technology (GHIT) Fund**, which focuses on the promotion of innovation and research through the development of drugs, diagnostics and vaccines for TB, malaria, and NTDs. The GHIT Fund stimulates research and development of new health technologies through funding of research and product development partnerships between Japanese and non-Japanese organizations.

The **Access and Delivery Partnership (ADP)**, which aims to assist low- and middle-income countries (LMICs), enhance their capacity to access, and deliver and introduce new health technologies for TB, malaria, and NTDs.

Led and coordinated by UNDP, the ADP is a unique collaboration between UNDP, TDR (the Special Programme for Research and Training in Tropical Diseases, co-sponsored by UNICEF, UNDP, the World Bank, and WHO) and PATH. Working together, the project partners leverage the expertise within each organization to provide the full range of technical skills necessary to strengthen capacity in LMICs. The ADP emphasizes consultation, collaboration and implementation with partner-country governments and stakeholders, working to develop LMICs' capacities to access and introduce new technologies.

New health technologies are broadly defined as drugs, diagnostic tools, and vaccines that are relevant for the prevention, treatment or cure of TB, malaria, and NTDs, but are not yet available for market introduction or have not been introduced in LMICs. The introduction of new health technologies can place burdens on existing health systems, including new requirements for drug regulation, supply and distribution, and health personnel training. Accordingly, the ADP will focus on providing LMIC stakeholders with the necessary skills to develop the systems and processes required to effectively access new health technologies, and introduce them to populations in need.

The ADP is a five-year project, running from April 2013 until March 2018.

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Abbreviations

AFB	acid-fast bacilli
APBD	Regional Budget (Anggaran Pendapatan dan Belanja Daerah)
APBN	State Budget (Anggaran Pendapatan dan Belanja Negara)
BBTKL-PP	Center for Environmental Health and Disease Control (Balai Besar Teknologi Kesehatan Lingkungan dan Pengendalian Penyakit)
CoV	coefficient of variation
DOTS	directly observed treatment, short course
e-SISMAL	Electronic Surveillance Information System for Malaria (Elektronik Sistem Informasi Surveilans Malaria)
IEC	information, education and communication
LPDP	Indonesia Endowment Fund for Education (Lembaga Pengelola Dana Pendidikan)
MDA	mass drug administration
MDR-TB	multidrug-resistant tuberculosis
NGO	nongovernmental organization
NIHRD	National Institute of Health Research and Development
NTD	neglected tropical disease
SIHA	HIV/AIDS Information System (Sistem Informasi HIV/AIDS)
SITT	Integrated Tuberculosis Information System (Sistem Informasi Tuberkulosis Terpadu)
SMS	short message service
TB	tuberculosis
TDR	Special Programme for Research and Training in Tropical Diseases
UNDP	United Nations Development Programme
WHO	World Health Organization

Contents

1. Introduction

Indonesia is facing a high burden of tropical infectious diseases, despite the availability of adequate technology to control them. The dominant tropical infectious diseases include tuberculosis (TB), malaria, and various neglected tropical diseases (NTDs), such as helminthiasis, filariasis, schistosomiasis, leprosy and yaws. Although a number of tropical infectious diseases are endemic in Indonesia, differences in disease distribution require the implementation of strategies that are adapted to specific conditions in each region, in order to achieve control or elimination targets.

Indonesia has implemented many programmes to control tropical infectious diseases, including TB, malaria and NTDs. However, the results achieved so far have not met the expected targets. Every year, 1 million new cases of TB are reported (399 new cases per 100 000 people). There were 647 TB patients per 100 000 people in 2014. While this was a reduction compared to 2013, the decrease was slight, and accelerating the decrease in TB prevalence and incidence is a significant challenge for TB programme managers at all levels. Malaria programme managers also face a similar challenge. In some areas of Indonesia (12% of the country) malaria transmission rates remain high (over 1 per 1000 people). Furthermore, the malaria resistance profile, which would facilitate development of more effective therapies, has not yet been described. Meanwhile, efforts to mitigate NTDs are hindered by environmental conditions and behavioural patterns.

In recent years, new preventive, diagnostic and therapeutic technologies have been developed, potentially improving the successful control of TB, malaria and NTDs. However, implementation of new technologies is often hindered by implementation or operational problems in the field. Therefore, disease control programmes should be supported by implementation and operational research efforts.

Research funding in the country is beginning to increase, supported by improved opportunities to secure funding from other countries. There are also greater opportunities for implementation research. However, implementation and operational research in Indonesia is relatively less developed compared to biomedical, clinical or epidemiological research due to the following factors: (a) weak understanding of implementation and operational research; (b) few training programmes on implementation and operational research; (c) limited funding specific to implementation and operational research; and (d) inadequate coordination of efforts to develop implementation and operational research. Accordingly, strategies are needed to develop implementation and operational research in a more systematic manner and provide guidelines to align research with priority research topics, thus responding to the needs of disease control programmes.

1.1 Implementation research and operational research

The origin of the term "implementation" is the Greek word "*implere*", which means to perform or put into effect. In this document, "implementation" means the performance of policies, programmes or interventions to control tropical diseases in Indonesia. Implementation research capacity is growing in Indonesia, but understanding of this concept remains varied. In general, implementation research aims to increase the

effectiveness, efficiency and achievement of the implementation of policies, programmes or interventions in the health sector. Implementation research focuses on factors that influence the implementation, processes and outcomes of health programmes. With a greater understanding of health programme implementation, it is anticipated that achievement of health programme targets will improve significantly.

Operational research is a well established tool to support the control of tropical infectious diseases. The key difference between implementation research and operational research is the scope of the research. Operational research focuses more on operational issues of specific health programmes, and the utility of results is thus primarily local. Implementation research focuses on implementation strategies for specific products and services; as such, the utility is generally broader than for operational research. This strategy document aims to present measures to improve programme effectiveness and will therefore encompass both implementation and operational research questions.

1.2 Strategy formulation process

This document on strategies for implementation and operational research to control TB, malaria, and NTDs in Indonesia was prepared between February and June 2016 through the process illustrated in **Figure 1**.

Figure 1. Strategy formulation process

The formulation process started with a coordination meeting on 11 February 2016, chaired by the Head of the Centre for Research and Development of Community Health Efforts, National Institute of Health Research and Development (NIHRD). The meeting commenced with a presentation on the Access and Delivery Partnership by a representative of the United Nations Development Programme and a subsequent presentation on implementation research by the writing team coordinator. The meeting was also attended by a representative of the Directorate of Prevention and Control of Directly Communicable Diseases and a representative of the Directorate of Prevention and Control of Vector-Borne Communicable Diseases and Zoonotic Diseases. During the meeting, an agreement was reached on the strategy formulation process and structure, and the representatives of the relevant units were selected to form a core development team. Based on this meeting, the core development team started to conduct a literature review and prepare the Delphi survey plan.

The first workshop was held on 19 February 2016 to discuss the draft programme gap analysis based on the document and literature review. The draft analysis was reviewed by the representative of the

Directorate of Prevention and Control of Directly Communicable Diseases and the representative of the Directorate of Prevention and Control of Vector-Borne Communicable Diseases and Zoonotic Diseases. During the workshop, the Delphi survey plan was also discussed, and a list of experts that would be requested to participate in the survey was proposed. On the basis of the workshop outcome, the core development team revised the draft gap analysis and the Delphi survey plan. The second workshop was held on 21 March 2016 to review the revised draft programme gap analysis and finalize the Delphi survey plan. Based on further input in the course of the workshop, the core development team made further revisions to the draft gap analysis and commenced the Delphi survey. Details of the Delphi survey process are set out in Chapter 3 of this strategy document.

The draft gap analysis revision and the interim results of the Delphi survey were then discussed with experts external to the core development team in a preparatory workshop. The workshop started with an alignment of perceptions regarding the implementation research concept. Further, experts for each disease category were requested to critique the revised draft gap analysis and the interim results of the Delphi survey. Based on the feedback of the external experts, the core development team further revised the draft gap analysis and sharpened priority research questions for the next round of the Delphi survey.

The final discussion on the components of the draft implementation and operational strategy was held on 29 and 30 March 2016 in a national workshop involving further national experts. The workshop again started with a discussion on the alignment of perceptions regarding the implementation research concept, and continued with a panel discussion on strategies to mitigate TB, malaria and NTDs with representatives of programme administrators, as resource persons. On the basis of the outcome of the discussion on strategies to mitigate TB, malaria and NTDs, the experts were requested to validate the mapping of programme implementation obstacles. On the following day, in accordance with the outcome of the validation of the draft gap analysis, the experts were requested to validate the priority research questions identified from the previous round of the Delphi survey. The workshop ended with a roundtable discussion on strategies for capacity improvement and strengthening of network and funding opportunities.

Outcomes of the strategy preparation process are elaborated in this document on strategies for implementation and operational research to support prevention and control of TB, malaria and NTDs. Chapter 2 explains the gap analysis of the programmes to prevent and control TB, malaria and NTDs. Chapter 3 reports the process and results of the Delphi survey, set out as a list of priority questions on implementation and operational research to support prevention and control of TB, malaria and NTDs. Finally, Chapter 4 discusses the strategies for capacity improvement and strengthening of network and funding opportunities for implementation and operational research to support prevention and control of TB, malaria and NTDs.

2. Gap analysis

2.1 Gaps in implementation of the tuberculosis (TB) control programme

Gaps were identified in TB control programme implementation in the following areas, as described in the ensuing subsections: case finding; treatment and prevention; monitoring and evaluation; and programme management. Table 1 summarizes the gaps in the implementation of the TB control programme, and potential solutions.

2.1.1 Case finding

The 2014 TB prevalence survey estimated that the TB caseload in communities remained high *(1)*. Fewer cases were reported by the national TB control programme compared to the TB caseload estimates reported by the survey. Intensive case finding, particularly focusing on TB high-risk groups, is therefore needed to assess the true picture.

The use of sputum acid-fast bacilli (AFB) testing as the only TB diagnostic tool has not been satisfactory for TB case finding in the community. The 2014 TB prevalence survey showed that sputum smear microscopy can only detect one third of TB cases *(1)*. Sputum examination is also difficult to perform in the presence of co-morbidity (with HIV and diabetes mellitus) and in cases of TB in children.

Intensive TB case finding needs to use diagnostic tools of higher sensitivity through use of the latest sputum examination technology. Chest X-ray examination has acceptable levels of sensitivity, and can therefore be used as an additional screening tool. The Xpert MTB/RIF assay may be used for intensive TB case finding among high-risk groups. If additional TB diagnostic tools are used in TB case finding, further review of the TB diagnosis flow applied in the national TB control programme is required.

Sputum examination is not an optimal procedure for TB case finding among children. Ikatan Dokter Anak Indonesia (the Association of Indonesian Paediatricians) has introduced an innovative method for easier diagnosis of TB in children using a scoring system *(2, 3)*. The scoring system can be implemented by general practitioners at primary service level. In 2015, the World Health Organization (WHO) recommended the use of a new diagnosis flow for TB in children, but further evidence of its effectiveness is required, and implementation is still limited.

There is a lack of laboratory facilities capable of conducting molecular, culture and medicine sensitivity tests for multidrug-resistant tuberculosis (MDR-TB) case finding. Until 2016, diagnostic laboratories for anti-TB medicine resistance were found in only 42 referral hospitals across Indonesia *(3)*. In addition, human resources capable of conducting the Xpert MTB/RIF assay remain limited *(3)*. Implementation of the Xpert MTB/RIF assay is primarily funded by a grant from the Global Fund to Fight AIDS, Tuberculosis and Malaria.

Considering the importance of the Xpert MTB/RIF assay in TB case finding, the procedure needs to be implemented in various settings, including hospitals and correctional institutions, and applied to different TB risk groups. For wider utilization, "pick-up points" should be established in health service facilities, enabling couriers to pick up sputum samples to be delivered to a laboratory for Xpert MTB/RIF assay *(2)*.

2.1.2 Treatment and prevention

Drug resistance is a threat to the national TB programme; however, national data on TB drug resistance prevalence are unavailable, and further research is needed to gather information on the prevalence of TB drug resistance.

Ongoing research is being carried out to identify new anti-TB drugs; research on the efficacy of bedaquiline, for example, is currently entering phase 3. Research is also needed to evaluate new evidence on medicine regimes with a shorter treatment duration.

Treatment dropout is a risk factor for anti-TB drug resistance. Treatment side-effects are a common cause of dropout. The national TB programme has a strong focus on the prevention of anti-TB drug resistance and improving compliance with TB treatment.

Lack of compliance with management standards for TB treatment also contributes to drug resistance, and remains an issue among private hospitals and practitioners. The government has made efforts to implement accreditation for TB services in hospitals in recent years, but accreditation rates remain low *(3)*. Although the Association of Indonesian Doctors (Ikatan Dokter Indonesia) supports the application of International Standards for Tuberculosis Care, branches of the association at province, district and municipal levels have not incorporated those standards into the health service for licensure. Accordingly, it is necessary to expand accreditation for TB services to other hospitals and develop a regulation model for private practitioners.

Efforts to improve the quality of TB services have been strengthened by interventions at the micro level in the area of service provision for patients, for example in the development and implementation of clinical pathways, which have been shown to improve the quality of TB services in hospitals *(4)*. The development and application of clinical pathways in hospitals is an activity required by the accreditation scheme. The application of the universal health coverage scheme since 2014 has served as a further opportunity to enhance efforts to improve the quality of clinical service.

The capacity of private hospitals and practitioners to monitor the treatment received by patients is limited. Private hospitals and practitioners usually do not have a systematic patient tracking system, increasing the risk of treatment dropout. TB operational research conducted by the Tuberculosis Operational Research Group, Indonesia, in 2014 suggested that use of short message services (SMS) is an effective tool to increase compliance with TB treatment in hospitals *(5)*.

The rate of successful treatment of MDR-TB remains low, due to the high occurrence of side-effects arising from the treatment. Although drugs for MDR-TB are provided free of charge by the government, the costs of treatment and productivity loss suffered by patients are high. The national TB programme needs to take further action to manage the side-effects of MDR-TB treatment, and intersectoral cooperation is necessary to provide financial support and day-to-day assistance for patients with MDR-TB.

Preventive therapy and infection control are below the required standards. The coverage of isoniazid preventive therapy for children and co-trimoxazole for TB/HIV patients remain below target *(2)*. An infection control policy has been formulated, though implementation of the policy requires strengthening.

2.1.3 Monitoring and evaluation

The Integrated Tuberculosis Information System (Sistem Informasi Tuberkulosis Terpadu, SITT) has been introduced to provinces, districts and municipalities, but its implementation and utilization have been insufficient. SITT reports still do not reflect the actual situation, due to underreporting *(3)*. For example, in 2014 only 163 (35%) correctional institutions reported their activities to the national TB control programme *(2)*. Furthermore, in the reports submitted by correctional institutions, data were aggregated with case finding contributions from other health service facilities, so that individual contributions are unclear.

SITT data utilization for actual programme management is also insufficient. Data sharing between programmes has been suboptimal, and measures such as inventory studies, mandatory studies, and better coordination and sharing between programmes are needed to effect improvement. Routine data on deaths caused by TB are not available, and registration of deaths caused by TB needs to be incorporated into vital statistics. TB programme managers require further training on the use of SITT data for improved programme management.

TB/HIV programme collaboration requires synchronization of the outputs of SITT and the HIV/AIDS Information System (Sistem Informasi HIV/AIDS, SIHA). However, a key difference between SITT and SIHA is that SITT is based on individual data, while SIHA presents aggregate data. System harmonization is therefore needed to synchronize TB and HIV/AIDS data *(3)*.

2.1.4 Programme management

Funding of the national TB control programme has been dependent on donors *(3)*. Indonesia has an exit strategy for TB programme funding, which requires further implementation. TB funding by regional governments must be increased, for example through the establishment of regulations to increase the budget for the TB programme at regional administrative levels. The TB control programme needs to be incorporated into the government's Minimum Service Standards to ensure sustainability.

Table 1. Gaps in TB control programme implementation, and potential solutions

Problems	Causes	Problem-solving efforts
Case finding		
The number of cases identified is lower than the estimated number of cases in the community	• Case finding has been not carried out optimally in order to target TB high-risk groups • Sputum microscopy examination only detects one third of the total number of cases • It is difficult to identify cases of TB in patients with HIV and in children using sputum microscopy examination	• Intensified case finding is necessary in high-risk groups • Sputum examination technology needs updating • Thoracic X-ray examination needs to be used as an additional screening tool • New diagnosis technology is needed in addition to sputum microscopy examination • The existing TB diagnosis system requires further review • Scoring of TB in children by the Association of Indonesian Paediatricians (Ikatan Dokter Anak Indonesia), especially in primary services, needs intensification • Review of the diagnosis flow of TB in children is required, as recommended by WHO
Implementation of the Xpert MTB/RIF assay for case finding is limited in terms of its scope and continuity	• The Xpert MTB/RIF assay has not been implemented for intensive case finding in various settings	• The scope of implementation of the Xpert MTB/RIF assay in various settings (for example, hospitals and correctional institutions) and for different cases (TB in children and patients with HIV) needs expansion

Problems	Causes	Problem-solving efforts
	• The number of referral laboratories capable of conducting molecular, culture and medicine sensitivity tests is limited • Human resources for the Xpert MTB/RIF assay are limited • Funding depends on the Global Fund	• Courier pick-up points need to be established in health service facilities for collection of sputum samples to be taken to a laboratory for the Xpert MTB/RIF assay • Expansion and decentralization of diagnostic services and laboratory certification are needed, and the number of Xpert MTB/RIF assay machines needs to be increased • An exit strategy for TB diagnosis funding should be applied for the Xpert MTB/RIF assay
Treatment and prevention		
TB drug resistance is widespread	• TB treatment dropout frequently occurs • The extent of national TB drug resistance has not been assessed	• Improvements are needed in compliance with medication • Clinical trial of the anti-TB drug bedaquiline is continuing • Research on new anti-TB drugs with a shorter treatment regimen is required • A national survey on drug resistance should be carried out
Compliance with the standard operating procedures and standards for TB treatment among private hospitals and practitioners remains low	• Instruments to improve compliance with treatment standards have not been applied • TB accreditation in hospitals is still limited • Local branches of the Association of Indonesian Doctors have not incorporated TB standards into the evaluation standards for the health service permit grant • The capacity of private hospitals and practitioners to conduct case monitoring is limited	• Dissemination and application of clinical pathways are required to improve clinical service quality • Regulations should be put in place to encourage compliance with standards, for example through accreditation • More widespread use of information technology (SMS) would help to increase compliance with TB treatment in hospital
The rate of successful MDR-TB treatment is low	• Drug side-effects are common • Treatment costs are high	• Improvements in the management of MDR-TB treatment side-effects are required • Funding support should be increased for patients with MDR-TB
Preventive therapy and infection control have not been implemented	• The application of isoniazid preventive therapy and coverage of co-trimoxazole for TB/HIV patients have been suboptimal	• The scope of isoniazid preventive therapy should be widened • Improvements are needed in the coverage of cotrimoxazole for TB/HIV patients • Implementation of infection control programmes should be strengthened

Problems	Causes	Problem-solving efforts
Monitoring and evaluation		
Implementation and utilization of SITT has not been optimal	• There has been underreporting in SITT reports • SITT data utilization for actual programme management remains insufficient • Data sharing between programmes has been insufficient • Data on deaths caused by TB is only based on survey	• An inventory study (funded by the Global Fund) should be carried out • Mandatory notification should be in place • Coordination and data sharing between programmes should be improved • The capacity of TB programme managers for SITT data utilization should be increased in order to improve programme management • Registration of deaths due to TB should be incorporated into vital statistics
SITT and SIHA have not been synchronized	• There are differences between the SITT and SIHA recording systems; SITT is based on individual data, while SIHA presents aggregate data	• SITT and SIHA recording systems should be harmonized
TB case reports from correctional institutions remain low	• The capacity of correctional institutions in reporting TB cases to TB programmes remains low • Correctional institutions report TB cases to the nearest health service facility, but the contribution of TB data cannot be identified because the data are aggregated	• The capacity of correctional institutions reporting to the TB control programme needs to be increased • Greater coordination is needed between the network of correctional institutions and other health service facilities • Recording and reporting need improvement • An inventory study is needed to evaluate underreporting to health service facilities • A mandatory notification plan would be beneficial
Programme management		
TB programme funding is dependent on donors	• An exit strategy exists but has not been implemented • Local regulations to support TB programme funding do not exist	• An exit strategy for TB programme funding needs to be put in place • Local regulations should be established to increase the budget for the TB programme • The TB control programme should be incorporated into the Minimum Service Standards

2.2 Gaps in implementation of the malaria control programme

Gaps were identified in the implementation of the malaria control programme in the following areas, as described in the ensuing subsections: case finding and treatment; vector control; counselling, information and education; monitoring and evaluation; and programme management. Table 2 summarizes the gaps in the implementation of the malaria control programme, and potential solutions.

2.2.1 Case finding and treatment

Some provinces in the eastern part of Indonesia are highly endemic for malaria, for example Papua, West Papua, East Nusa Tenggara and Maluku *(6)*. More intensive efforts are therefore needed to identify cases, combining passive and active case finding procedures *(7)*. In some areas, village malaria posts and village malaria workers exist, but treatment regimens vary because health officers lack knowledge of up-to-date malaria treatment methods. Implementation of the mass mosquito net campaign should be integrated with the maternal and child health programme. In addition, the malaria programme should be integrated into primary health care services and the coverage of village malaria posts increased *(6–8)*.

Delays in case management frequently occur in transmission focus areas, such as mines, rice fields and forests *(7, 8)*, due to the difficult transportation from these focus areas to health service facilities *(9)*. In such instances intersectoral coordination is necessary. Control in focus areas must prioritize protection from mosquito bites, for example through the distribution of insecticide-treated nets, supported by mass advocacy campaigns. Surveys of the origins and destinations of migrants would help to inform analysis of the spread of malaria *(7, 9, 10)*.

Strategies for malaria control in low-endemic areas and for malaria elimination include early case finding and management, carrying out migration surveys, receptive area observation, and active case finding through the Mass Blood Survey *(7, 8)*. A frequently encountered difficulty is the transfer of the disease from high-endemic areas to low-endemic areas *(9, 10)*. Shortcomings in case management systems compound the adverse effects arising from the lack of clinical awareness of malaria cases.

The success of malaria elimination programmes is difficult to determine because it is hard to detect *Plasmodium vivax* relapse cases. An efficient method is required to facilitate identification of such cases *(11)*. The quality of malaria microscopy examination remains poor, with a high error rate *(9)*. Most diagnoses are still based on clinical symptoms *(7–9)*, and further improvements are needed in this area.

Treatment compliance is also an issue *(9)*. Chloroquine resistance has been found to occur in Indonesia *(9)*, though chloroquine is still used by patients and clinicians. It is difficult to obtain azithromycin in some parts of the country. Utilization of malaria drugs is still low, while abundant stocks of malaria drugs remain in warehouses.

2.2.2 Vector control

Vector control is challenging, including as a result of environmental changes. Different malaria vector species and community mobility and behaviour make vector control difficult. For more effective vector control, mapping of receptive areas *(9–11)* and development of a *Plasmodium* database are required. Currently, research on the *Anopheles* vector is ongoing in four provinces, though expansion of the research and wider dissemination of the results would be beneficial. Innovative research, for example focusing on the sterilization of mosquitoes, should be further encouraged.

The distribution of *Plasmodium knowlesi* in Indonesia has not yet been assessed *(11)*; mapping of the species would assist control. New *Plasmodium* species may yet be identified during the mapping exercise, and it is necessary to formulate a strategy for dealing with such an eventuality.

Insecticide resistance is another challenge to malaria vector control *(9)*. Insecticide resistance is mapped by region, and the mapping data can be used to advocate the establishment of regulations on insecticide circulation in regions where resistance occurs.

Currently, evidence exists on the effectiveness of vector control strategies, including various combinations of long-lasting insecticidal nets, indoor residual spraying, larvicide application, environmental management, personal protection, zooprophylaxis and other prevention measures *(7)*. However, further research is required to ensure that interventions are evidence based.

Malaria vector control requires changes in personal behaviour. For example, a study found variations in the level of acceptability of different mosquito net colours *(11)*. It is important to carry out research on personal behaviour patterns and preferences in order to assess the acceptability of interventions. Use of personal protection against mosquito bites is still lacking *(9)*. An approach based on cooperation within the community has positive implications for vector control *(6, 7)*, for example in the form of community empowerment through village malaria workers.

2.2.3 Counselling, information and education

People's behaviour is a vital factor in malaria control. For example, low utilization of insecticide-treated nets was found to be in part attributable to unfavourable reaction to the colour chosen for the nets. Low levels of self-protection and self-treatment arise from the lack of education on malaria and disease prevention among the public.

2.2.4 Monitoring and evaluation

The Electronic Surveillance Information System for Malaria (Elektronik Sistem Informasi Surveilans Malaria, e-SISMAL) is assisting case finding and monitoring and evaluation of malaria programmes. However, cases in focus areas, such as illegal mines, have often not been reported through e-SISMAL. Moreover, incomplete data, including on monitoring of drug use, remains an issue.

Surveillance coverage among private practitioners, hospitals and clinics remains low. Utilization of e-SISMAL by partners for malaria case finding and treatment has been inadequate *(8)*. Greater use of public-private partnership would help improve malaria service provision *(6–8)*. Research results also need to be synchronized with programme monitoring and evaluation.

Measures are needed to ensure sustainability in areas where malaria has been eliminated, and to prevent the disease being imported from high-endemic areas. Malaria prevention activities are still needed in post-elimination areas, including promotional, behavioural and environmental interventions, to ensure that elimination status is maintained.

The existing spatial endemicity mapping does not reflect the actual situation *(7, 8)*, partly due to poor data quality. There is some mapping of areas that are receptive to malaria transmission, but the data need to be broken down into smaller areas, for example villages, and by case classification. Routine updates of monitoring and evaluation data must be conducted, in addition to improvements in quality assurance for malaria diagnosis through use of improved tools and human resources.

2.2.5 Programme management

Staff turnover is considerable, and staff skills in active case detection are often inadequate. Greater regulation is needed to support minimum service standards for malaria control programmes, and to ensure that staff appointment is compliant with standards of competency.

Malaria logistics management remains poor, with abundant stocks remaining stored and unused. Logistical improvements are needed to distribute stocks from province level to districts and municipalities, and from districts and municipalities to subdistrict health centres.

Multisectoral coordination is poor, and there is inadequate implementation of Ministry of Health Decision No. 131/Menkes/III/2012 on a national forum for malaria eradication and programme decentralization by districts and municipalities *(6–8)*. Mosquito net distribution must involve greater coordination between programmes, sectors, nongovernmental organizations (NGOs) and communities. Further, a policy on insecticide resistance, including insecticide use in agriculture, is needed.

Central government resources to implement the malaria control programme are limited, and integration and collaboration with other programmes and sectors are necessary *(6–8)*.

Table 2. Gaps in malaria control programme implementation, and potential solutions

Problems	Causes	Problem-solving efforts
Case finding and treatment		
There are areas with high malaria endemicity	• Case finding is inadequate	• Passive case detection and active case detection need improvement by involving the community (village malaria workers) and integration with other programmes (for example the Integrated Management of Childhood Illness programme) • A mass mosquito net campaign should be carried out in high-endemic areas • Routine mass distribution of mosquito nets should be integrated with the maternal and child health programme to combat malaria in pregnant women and children aged under 5 years in high-endemic areas
Case management delays occur in focus areas outside human settlements (mines, rice fields, transmigration forests, refugee camps)	• Transport and communication present difficulties in focus areas	• Distribution of insecticide-treated nets in transmission areas (mines, rice fields, etc.) should be improved • Mass campaigns should be carried out • Improvements in migration surveillance are needed • Cross-sectoral coordination should be increased
Case management presents difficulties in malaria low-endemic and elimination areas	• Transfer of malaria from high-endemic to low-endemic areas remains a risk • There is suboptimal implementation of case management systems in low-endemic areas • There is a lack of clinical awareness of malaria in endemic areas	• Improvements in migration surveillance are needed • Improvements are needed in case management, primarily for imported cases, and case management systems in health service facilities • Clinical awareness of malaria in elimination areas needs improvement

Problems	Causes	Problem-solving efforts
It is difficult to determine malaria elimination status	• It is difficult to determine relapse cases in *Plasmodium vivax*, especially indigenous and imported cases	• Research should be undertaken to determine an efficient method to identify relapse cases for *P. vivax*
Microscopic examination is of low quality	• The error rate is high • Most diagnoses are clinical	• Improvement in the quality of microscopic examination is required
There are variations in the use of drug regimens	• Health workers have little knowledge of the most up-to-date malaria treatment methods; chloroquine is still used by the community and clinicians • Artemisinin is difficult to obtain in parts of the country	• Training of health workers, and dissemination of up-to-date information on malaria treatment, would assist case management • The Centre for Environmental Health and Disease Control (BBTKL-PP) can monitor the efficacy of malaria medicines • Improved access to artemisinin would assist malaria control
Vector control		
Vector control is difficult	• There are many malaria vector species • High human mobility and people's behaviour increase risk of transmission	• Receptive area mapping is required • A database of *Plasmodium* and its genetic variation is needed • A genetic study is required, which may be combined with a migration survey • Specific research on the *Anopheles* vector in four provinces needs to be expanded and the results disseminated • A collaborative approach, involving the community, would assist vector control • Evidence-based interventions are required, for example applying research results on the effectiveness of vector control methods and the efficacy of insecticide-treated nets • Malaria vaccine development or innovative research to sterilize mosquitoes should be encouraged and extended
Insecticide-resistant malaria parasites are widespread	• Insecticide resistance mapping is poorly developed	• The Centre for Environmental Health and Disease Control (BBTKL-PP) can monitor insecticide resistance • Insecticide resistance mapping should be undertaken at local levels • Policies should be put in place to deal with the issue of resistance to insecticides, including with regard to the use of insecticides in agriculture (taking into account the impacts of insecticide advertisement and marketing on agriculture)

Problems	Causes	Problem-solving efforts
Counselling, information and education		
There is low utilization of insecticide-treated nets	• Acceptability of insecticide-treated nets has been low • Specific local issues relating to people's behaviour require resolution, for example colour preferences for insecticide-treated nets	• Evidence-based interventions are needed, for example taking into account the results of research on the acceptability of net colour • People's acceptance of insecticide-treated nets should be mapped (sociocultural study on the use of insecticide-treated nets in the community)
Self-protection behaviour is often inadequate	• There is lack of knowledge of malaria symptoms and signs, and protection methods for different malaria vectors	• IEC is required to educate the community on malaria symptoms, signs and protection methods
Self-treatment behaviour is often inadequate	• Information, education and communication (IEC) are lacking	• IEC should be applied at community level
Monitoring and evaluation		
The existence of new *Plasmodium* spp., such as *P. knowlesi*, presents a threat	• Distribution of *P. knowlesi* is unknown in Indonesia	• Research is needed on *P. knowlesi* mapping in Indonesia • Strategies should be put in place to deal with the possibility of new *Plasmodium* spp. being identified during the mapping process • A centre of excellence for malaria diagnosis should be created
Surveillance of malaria cases in focus areas is inadequate	• Implementation of migration survey has been insufficient • Case reporting is inadequate	• The migration survey should be improved for early identification of malaria cases in focus areas • The use of e-SISMAL should be extended to record cases in focus areas, including illegal mines • More detailed mapping of focus areas is required by case classification and by smaller areas, such as villages
Area endemicity mapping has not reflected the actual situation	• Data quality is inadequate	• Research to map area endemicity should be carried out • Routine update, analysis and follow-up of monitoring and evaluation data should be carried out • Improvements are needed in malaria diagnosis quality assurance (tools, human resources, etc.)

Problems	Causes	Problem-solving efforts
Data are lacking for monitoring treatment using eSISMAL	• e-SISMAL data completion does not comply with standard operating procedures	• Supervision should be improved
Malaria elimination areas have been certified, but sustainability is not measured	• Early detection of cases in malaria elimination areas and treatment needs improvement	• Polymerase chain reaction technology should be made available for early detection of malaria, including in malaria elimination areas • Promotion and malaria prevention activities should be carried out in malaria elimination areas, taking account of behavioural and environmental factors
Geographical, economic, and human resource obstacles limit access to health services for many villages with malaria challenges	• Surveillance coverage among private practitioners, hospitals and clinics is still low • Greater use of partnerships would help malaria case finding and treatment	• Village malaria posts should be adequately utilized • A mixed public-private network system for malaria services should be applied
Programme management		
Cross-sectoral and cross-programme cooperation is inadequate	• There is a lack of cross-sectoral and cross-programme coordination • Central government resources are limited	• Implementation of Ministry of Health Decision No. 131/Menkes/III/2012 on a national forum for malaria eradication needs improvement • Programme implementation should be further decentralized to districts and municipalities • Integration and collaboration between programmes and sectors should be encouraged • Local resource allocation for the malaria control programme should be improved
Human resource management for malaria control is inadequate	• The turnover of health workers is still high • Skills in active case detection are lacking	• Regional regulation is required to support the malaria control programme as the minimum service standard • Regulation is also needed to make staff assignment compliant with competency standards • Workers' capacity for conducting active case detection needs improvement
Malaria logistics management is weak	• There is a lack of monitoring and evaluation of malaria logistics management	• Monitoring and evaluation of logistics management are required

2.3 Gaps in implementation of the leprosy control programme

Gaps were identified in the implementation of the leprosy control programme in the following areas, as described in the ensuing subsections: case finding, treatment and prevention; mitigation of disease impact; counselling, information and education; and programme management. Table 3 summarizes the gaps in the implementation of the leprosy control programme, and potential solutions.

2.3.1 Case finding, treatment and prevention

Leprosy case management has prioritized early case finding and intensified case finding, with a primary focus on voluntary self-reporting *(12–14)*. Community advocacy and mobilization, production of IEC materials, conducting an IEC campaign, rapid case finding and home contact examination are all required *(12, 13)*.

Not all leprosy cases have been detected, due in part to inaccurate information on the disease. Clinical symptoms of leprosy are widely known as consisting of numb white patches on the skin; in fact, these are the signs of paucibacillary leprosy only. Early case finding of leprosy based upon other clinical signs is necessary, and accurate information on leprosy needs to be disseminated. Moreover, the "contact" definition applied by health care workers is limited to home contacts, and the definition needs to be extended to include neighbours (defined as those occupying premises up to four or five houses from the home of the leprosy case, in all directions) and social contacts, such as school friends and colleagues.

According to the leprosy programme report 2013–2015, the leprosy treatment success rate is approximately 80–95%. Supportive supervision is therefore required *(12)*. Strategies include coordination of supervision with district health offices, partnerships with professional associations, and training of health workers (from province level to puskesmas level) on leprosy treatment policies. Treatment compliance needs to be improved by patient and family counselling activities as part of the case management.

With regard to preventive strategies against leprosy transmission, prophylactic therapy for contacts has been tested. Research on prophylactic therapy has been conducted in Sampang, Maluku and four other areas. However, little is known about the factors, including geographical factors, that may impact the effectiveness of prophylactic therapy.

2.3.2 Mitigation of disease impact

The risk of physical disability in leprosy is high and treatment and rehabilitation of patients with disability is crucial. A leprosy control programme needs to provide psychosocial and economic support for patients *(12)*. Disability in leprosy can also give rise to social stigma *(12)*, and community involvement in leprosy education is important *(13)*.

2.3.3 Counselling, information and education

The stigma of leprosy remains widespread in the community, and it is therefore crucial to involve the community in order to disseminate correct information on the disease, for example by training village health workers to provide education on leprosy.

2.3.4 Programme management

The leprosy control programme is hindered by inadequate human resource capacity, and improvements in health worker training are required. Standard training modules for programme workers at province, district or municipal, subdistrict health centre, and health worker levels have been introduced *(12)*, though this training has not yet been accredited.

In some districts and municipalities, stocks for multidrug therapy are scarce, while in other areas there is excess, redundant stock. More efficient logistics management *(12)* and coordination between districts and municipalities and hospitals on the availability of stocks for multidrug therapy are required *(13, 14)*.

Coordination with other programmes and stakeholders needs improvement. Political commitment at district and municipal level is lacking, as evidenced by the lack of a strategy implementation fund to achieve targets. An integrated NTD programme is needed, focusing on issues such as advocacy and education in the community, medicine distribution and case detection *(12)*. Programme planning is required at district and municipal level.

Table 3. Gaps in leprosy control programme implementation, and potential solutions

Problems	Causes	Problem-solving efforts
Case finding, treatment and prevention		
Detection and case finding rates are low	• Inaccurate information on leprosy: clinical symptoms of leprosy, generally described as "numb white patches", apply to paucibacillary leprosy only	• Early case finding and intensified case finding are needed, prioritizing the strategy of case finding through voluntary self-reporting • Case finding can be improved by community advocacy and mobilization, production of IEC materials, and carrying out IEC and rapid case finding campaigns • Early case finding of leprosy by using other clinical signs (anamnesis) is necessary, without exclusively focusing on numb white patches • It is necessary to provide accurate information on leprosy
	• Diagnosis may not be accurate	• Supportive supervision is required
	• The "contact" definition used in the programme is limited to home contacts	• The definition of "contacts" needs to be extended to include neighbours (within a radius of four or five houses from the index house) and social contacts (school friends and colleagues)
Leprosy treatment is not adequate or complete	• Not all doctors understand correct leprosy treatment	• Monitoring and supervision of implementation should be improved in line with the national guidelines for leprosy medical services
Treatment adherence rates are low	• There is inadequate monitoring of treatment	• Counselling should be expanded as part of case management activities
Prophylactic therapy effectiveness is limited	• Research on prophylactic therapy is required	• Research on prophylactic therapy has been conducted in Sampang, Maluku and four other areas
Mitigation of disease impact		
Risk of disability in leprosy is high	• Treatment and rehabilitation of physical disability in leprosy are inadequate	• Implementation of treatment and rehabilitation of physical disability in leprosy should be improved

Problems	Causes	Problem-solving efforts
Psychosocial and economic impacts can be severe	• Leprosy is often associated with stigma in the community	• Psychosocial and economic support should be provided for patients • Counselling should take place as part of case management activities
Counselling, information and education		
Stigma of leprosy is considerable	• There is inadequate involvement of the community in IEC	• Village workers should be trained to conduct extension work on leprosy
Programme management		
Human resources are limited	• Health worker training needs optimization	• The standard training module for programme workers at province, district and municipal, subdistrict health centre, and health worker levels needs to be accredited • Training needs to be carried out
Logistics can be a challenge	• In some districts and municipalities, stocks for multidrug therapy are low, while stocks are excessive in other districts	• A workshop on logistics management should be held • Coordination should be improved between districts and municipalities and hospitals to increase availability of multidrug therapy
There is a lack of cross-sectoral and cross-programme coordination	• There is a lack of coordination with other programmes and stakeholders • Political commitment at district and municipal levels is lacking • Funds are not available for strategy implementation and achievement of targets	• An integrated NTD control programme should be introduced • Use of the same medicine distribution lines and case detection for NTDs would increase efficiency • Programme planning at micro (district and municipal) level needs greater coordination

2.4 Gaps in implementation of the yaws control programme

Gaps were identified in the implementation of the yaws control programme in the following areas, as described in the ensuing subsections: case finding and treatment; counselling, information and education; and programme management. Table 4 summarizes the gaps in the implementation of the yaws control programme, and potential solutions.

2.4.1 Case finding and treatment

Since 2001, the incidence of yaws has been increasing in Indonesia, indicating that yaws transmission still occurs. Active case finding *(12)* is therefore necessary through strategies such as mobile health

clinics in villages with suspected yaws transmission, house visits, determination of village endemicity, and serology surveys for evaluation of transmission levels *(15)*. The use of rapid diagnostic tests is crucial *(15)*. Not all health workers have adequate diagnostic skills for yaws, so there is a need to increase those skills through training and supervision.

Yaws treatment is conducted by treating the case and the contact. Treatment is through mass drug administration (MDA) using single oral dosage regimens of azithromycin. Furthermore, post-MDA mitigation is required, including MDA implementation studies, and post-MDA surveillance *(12)*.

2.4.2 Counselling, information and education

In many districts and municipalities yaws is not common. Consequently, district governments regard the management of yaws as low priority, and community support for the prevention and control of yaws is deficient. Community mobilization and formulation of partnerships for coordination of programmes and activities would assist with education efforts, early identification of yaws suspects, and health supervision *(12)*.

2.4.3 Programme management

Professional associations have been engaged in the management of the yaws control programme *(15)*. Currently, there are 74 districts and seven municipalities in which yaws is endemic, while the remaining districts and municipalities are considered free of yaws *(15)*. However, in the endemic districts and municipalities, lack of commitment and inadequate budget for programme implementation are obstacles to control of the disease. Partnership with regional governments is required in areas such as budget management, policy formulation and support for control measures. There is also scope for a number of ministries and other governmental organizations to be actively involved in yaws control. For example, the Ministry of Social Welfare, with relevant partners, can support social and economic rehabilitation in affected areas, and the Public Works Office can assist with control of environmental risk factors and provision of clean water supply. The Ministry of Labour can lead policy formulation on minimizing discrimination with regard to job opportunities and providing skills for yaws patients, in cooperation with the private sector (applying the principle of corporate social responsibility), taking into account the fact that many yaws patients are located in remote areas with deficient social and economic opportunities. Cooperation between the Ministry of Communication and Information and other stakeholders can help disseminate accurate information on yaws, and NGOs can take the lead in advocacy to ensure that yaws patients receive fair and equitable treatment.

Integration with other NTD control programmes is required for efficient resource utilization. For example, collaboration with health service facilities and hospitals will assist with medical rehabilitation and referral of complications. Integration of the yaws control programme with health promotion programmes would assist with IEC activities and the dissemination of IEC materials. Cooperation with filariasis, schistosomiasis and helminthiasis prevention and control programmes needs to be improved, particularly in the area of early detection, as these programmes share a similar geographical profile. Risk control relating to the environment would benefit through collaboration with the environmental health improvement programme.

Programme sustainability is the main challenge in the implementation of the yaws control programme. Close cooperation with the Planning Division is necessary to assist in this area.

Table 4. Gaps in yaws control programme implementation, and potential solutions

Problems	Causes	Problem-solving efforts
Case finding and treatment		
The number of new cases is increasing	• Transmission still occurs in the community	• Active case finding should be increased • Levels of village endemicity need to be determined • A serology survey could help evaluate transmission levels • Measures to improve case detection include mobile health clinics in villages where yaws transmission is suspected and house visits or surveys • Rapid diagnostic testing should be improved
Treatment is inadequate	• There is inadequate treatment of cases and contacts, and shortcomings in MDA • Mitigation of post-MDA incidence is inadequate	• Improvement of treatment in cases and early case contacts would assist yaws control • Improvement is needed in the correct treatment using azithromycin • MDA should be extended using a single oral dosage of azithromycin • Improved mitigation of post-MDA yaws can be achieved through management of co-occurring incidence in the provision of yaws prevention medicine, review of yaws MDA implementation, and surveillance of post-MDA yaws
Counselling, information and education		
There is low community awareness of yaws	• Community support for the yaws control programme is insufficient	• Community support can mobilize environmental health improvement, for example through promoting the use of water and soap • Partnerships should be built for programme implementation
Programme management		
Human resources are deficient	• Not all health workers can diagnose yaws properly	• The capacity of subdistrict health centres and hospitals for case detection and management should be built
Logistics for yaws control are lacking	• Procurement of injected benzathine penicillin depends on overseas providers, as there is no provider company in Indonesia • Logistics for the programme are lacking, while there is potential for integration with other NTD programmes	• National pharmacy companies should be approached to procure benzathine penicillin • Cross-programme integration of activities with those of other NTD control programmes would promote efficiency

Problems	Causes	Problem-solving efforts
Cross-sectoral and cross-programme coordination is inadequate	• There is a lack of commitment to and budget for programme implementation	• Partnership with professional organizations can be promoted through the Yaws Expert Committee • Certification for yaws-free districts and municipalities would help promote control activities • Partnership with filariasis, schistosomiasis and helminthiasis prevention and control programmes should be encouraged • Partnerships with the private sector can aim to increase the commitment to and budget for programme implementation, taking account of corporate social responsibility

2.5 Gaps in implementation of the lymphatic filariasis control programme

Gaps were identified in the implementation of the lymphatic filariasis control programme in the following areas, as described in the ensuing subsections: case finding and treatment; vector control; and programme management. Table 5 summarizes the gaps in the implementation of the lymphatic filariasis control programme, and potential solutions.

2.5.1 Case finding and treatment

The number of filariasis cases in Indonesia is underreported. There are no national data available on the endemicity of lymphatic filariasis, requiring research on the prevalence of the disease.

Filariasis microscopic examination is hindered by the lack of human resource personnel and their limited capacity for case management; further health worker training is needed. A standard training curriculum for programme workers at province, district and municipality, and subdistrict health centre levels has been established; however, the content of the training needs to be tailored to specific locations, for example taking into account local languages *(12)*.

Management of lymphatic filariasis treatment is often in the form of community home-based care to reduce and limit disability. Treatment for lymphatic filariasis is currently not effective or sustainable, and there is a need to identify more efficacious alternatives.

MDA is not conducted in all endemic areas, and compliance with MDA remains poor. One reason is fear of post-MDA reaction, and further education is needed at community level on the lymphatic filariasis control programme *(12)*, with the assistance and involvement of relevant NGOs.

2.5.2 Vector control

Xenomonitoring to identify filariasis transmission, primarily post-MDA, is still rarely performed in filariasis endemic areas, particularly in areas where *Mansonia* mosquitoes are endemic.

2.5.3 Programme management

The autonomy of regional administrative districts can be an obstacle in programme implementation, especially for MDA implementation. A further review is required to establish whether districts and municipalities can act as implementation units for control of lymphatic filariasis. A circular issued by the Ministry of Home Affairs has been effective in making MDA mandatory; however, advocacy and dissemination involving regional governments are important to gain their support for MDA.

Table 5. Gaps in lymphatic filariasis control programme implementation, and potential solutions

Problems	Causes	Problem-solving efforts
Case finding and treatment		
Cases of chronic lymphatic filariasis are underreported	• No national data on lymphatic filariasis endemicity are available to assist in identifying a more effective strategy	• Research on lymphatic filariasis prevalence is needed
Lymphatic filariasis transmission still occurs in the community	• Management of community home-based care to reduce and limit disability often does not function effectively • The lymphatic filariasis treatment method is not effective • The effectiveness of the transmission chain discontinuation method in reducing lymphatic filariasis transmission rates is unknown	• Case management continuity through integration with other programmes (for example leprosy) at the community level is needed • It is necessary to find more effective lymphatic filariasis case treatment methods • Review of the use of the current transmission chain discontinuation method (according to WHO recommendations) is required
The scope of MDA is inadequate	• Budget limitations occur	• MDA advocacy should be carried out in districts and municipalities with high prevalence
MDA compliance is still poor	• People fear post-MDA reactions • People do not understand the lymphatic filariasis control programme	• Education of the community on MDA reaction is required • Involvement of NGOs would assist community education
Vector control		
There are zoonotic filariasis vectors (including apes and cats)	• The contribution of zoonotic filariasis incidence to lymphatic filariasis incidence is unknown	• Estimate contribution of zoonotic filariasis in areas endemic of *Brugia malayi*

Problems	Causes	Problem-solving efforts
Xenomonitoring is rarely conducted in filariasis endemic areas (particularly in *Mansonia* areas) to provide evidence on filariasis transmission, primarily post-MDA	• Capacity for monitoring is lacking	• Xenomonitoring should be promoted • Greater integration of vector control and other programmes would be beneficial
Programme management		
Human resources are inadequate	• Human resources for filariasis microscopic examination are lacking • Human resource capacity for case management is inadequate	• Training to increase the capacity of health workers is required • A standard training curriculum for programme workers at the levels of province, district and municipality, and subdistrict health centres is available, but the training content need to be adjusted to specific localities (for example through use of local languages)
There is a lack of cross-sectoral and cross-programme coordination	• Regional administrative autonomy is an obstacle to MDA implementation, and further review is required as to whether districts and municipalities should become implementation units for lymphatic filariasis control	• Advocacy and dissemination of information to regional governments are required to support MDA • A circular letter from the Minister of Home Affairs aims to enforce mandatory MDA

2.6 Gaps in implementation of the schistosomiasis control programme

Gaps were identified in the implementation of the schistosomiasis control programme in the following areas, as described in the ensuing subsections: case finding; vector control; information, education and communication; and programme management. Table 6 summarizes the gaps in the implementation of the schistosomiasis control programme, and potential solutions.

2.6.1 Case finding

Schistosomiasis cases have been reported in the Bada, Napu and Lindu valleys in the highlands of Central Sulawesi. However, further evaluation is needed, with mapping of other schistosomiasis receptive areas.

There is a lack of human resource personnel for diagnosis of schistosomiasis, and it has been difficult to evaluate the success of the programme. Further research is required to identify more sensitive diagnostic procedures.

2.6.2 Vector control

Schistosomiasis transmission is relatively complex because it involves snails and other animals (buffaloes, cows and horses), and transmission chain discontinuation must therefore involve sectors other than the health sector. However, data on the roles and distribution of animals other than snails in schistosomiasis transmission are scarce. Laboratory examination techniques for diagnosis in animals should be standardized by the Health Office and the Animal Health Office.

Intermediate hosts in the form of rats and snails (*Oncomelania hupensis lindoensi*) are still found in endemic areas. Remapping of snail foci is necessary because of potentially occurring geospatial change. Endemic areas are found on the border of national park forests. Surveillance of intermediate hosts is required, in cooperation with the Agriculture Office. Dry farming methods are used across agricultural lands in endemic areas, while endemic areas bordering the national park forests are planted with productive plants. Accordingly, cross-sectoral cooperation between the relevant authorities is required, starting at the village level.

2.6.3 Information, education and communication

It is generally the case that local people depend greatly on easy access to medicines, are unwilling to undergo routine examinations, and tend to practise self-treatment. Community awareness of schistosomiasis prevention in schistosomiasis focus areas is insufficient, and community-level education on schistosomiasis control is needed.

2.6.4 Programme management

Programme sustainability is a major challenge, primarily due to lack of policy support and deficient programme budget allocation *(12)*. There is a lack of coordination between the Ministry of Health, the Ministry of Agriculture and the Ministry of Environment regarding the implementation of schistosomiasis control strategies. Despite the existence of a schistosomiasis control integrated team, chaired by the Governor, the budget and procurement levels are not consistent with the epidemiological evidence. Further advocacy directed at the regional government is required.

Table 6. Gaps in schistosomiasis control programme implementation, and potential solutions

Problems	Causes	Problem-solving efforts
Case finding		
Schistosomiasis transmission still exists	• There is mapping of schistosomiasis receptive areas, but further mapping is needed • It has proved difficult to evaluate the success of the programme	• Mapping of other endemic areas is required, in addition to the Bada, Napu and Lindu valleys in the highlands of Central Sulawesi • Further research is required to identify more sensitive diagnostic procedures
Vector control		
Schistosomiasis transmission is complex, involving snails and animals (buffaloes, cows, horses)	• There are no data on the levels of animal contribution to transmission	• Standardization is required for laboratory examination in animal diagnosis between the Health Office and Animal Health Office • An animal treatment protocol is required, according to transmission priority

Problems	Causes	Problem-solving efforts
Intermediate hosts (rats and snails) are still found in endemic areas	• Endemic areas are on the border with the national park forests	• Surveillance is required of intermediate hosts (rats and snails) in cooperation with the Ministry of Agriculture, taking account of more intensive rice farming and extensive dry farming • Endemic areas bordering the national park forests are planted with productive plants • Pilot projects in cross-sectoral cooperation are required at village level • Remapping of snail foci is necessary
Information, education and communication		
Self-treatment is common	• People heavily depend on medicines, making them unwilling to have routine examinations • Community awareness of schistosomiasis prevention in focus areas is insufficient	• Education on schistosomiasis control aimed at the local community is required
Programme management		
Human resources are lacking	• There is a lack of human resources for diagnosis	• Training should be carried out
Support and funding are inadequate	• There is a lack of sustainable policy support and programme budget allocation • Despite the existence of a schistosomiasis control integrated team chaired by the Governor of Central Sulawesi Province, the budget and procurement levels are not consistent with the epidemiological evidence • Coordination between the Ministry of Health, Ministry of Agriculture and Ministry of Environment is lacking in implementing schistosomiasis control strategies	• Further advocacy directed at regional government is required • Coordination between the Ministry of Health, Ministry of Agriculture and Ministry of Environment is required in implementing schistosomiasis control programmes • Cross-sectoral collaboration in schistosomiasis control is needed

2.7 Gaps in implementation of the helminthiasis control programme

Gaps were identified in the implementation of the helminthiasis control programme in the following areas, as described in the ensuing subsections: case finding and treatment; information, education and communication; and programme management. Table 7 summarizes the gaps in the implementation of the helminthiasis control programme, and potential solutions.

2.7.1 Case finding and treatment

Although soil-transmitted helminths are a problem across Indonesia, there are sparse data at national level, and mapping of endemicity levels is not available. A national survey of soil-transmitted helminths and endemicity mapping with sampling are required. Although school-based surveys have been periodically conducted in nine schools in each of eight provinces annually *(12)*, the data gathered are not representative of national data.

Case finding using faeces examination is considered ineffective due to the insufficient capacity of laboratory technicians and the unpractical examination method. A low-cost but effective method of diagnosis is needed.

The coverage of treatment remains low *(12)* and there is inconsistent implementation of MDA due to delayed availability of medicine, unsustainable funding *(12)* and inadequate regional government budget to conduct MDA. Furthermore, some parents refuse to participate in anti-worm campaigns *(12)*. The capacity of health workers to provide education on MDA is also limited.

2.7.2 Information, education and communication

Knowledge of helminthiasis and related hygiene behaviour are poor. Health and hygiene promotional activities have not used locally specific approaches *(12)*. There is inadequate utilization of community-based sanitation facilities. Preventive programmes for water, sanitation and hygiene have not been established as priorities, and further cross-programme and cross-sectoral coordination is necessary, for example with the Public Works Office.

2.7.3 Programme management

Distribution of anthelmintic drugs to schools remains an issue in eastern Indonesia, and more efficient methods of drug transportation need to be developed *(12)*.

Programme management resources are limited and may be shared between the helminthiasis and filariasis control programmes. Greater integration with the filariasis control programme would assist programme management. Examples include:

- integration of anthelmintic drug and vitamin A administration to children of early age;
- integration of anthelmintic drug administration to school-age children with screening in elementary schools;
- integration of the filariasis MDA programme with anthelmintic drug administration to school and preschool children;
- integration of anthelmintic drug administration with net distribution in malaria endemic areas.

There has been some programme integration, for example between control of helminthiasis and vitamin A supplementation, though gaps still exist in programme implementation. For example, reports on vitamin A supplementation are available, while reports on worm diseases are generally not available *(12)*.

A draft regulation on helminthiasis is under preparation by the Ministry of Health. The regulation aims to improve programme integration, starting with the following areas: West Nusa Tenggara, North Sulawesi and Bali. However, in view of the ongoing process of decentralization, the role of regional authorities is crucial in activity funding.

Table 7. Gaps in helminthiasis control programme implementation, and potential solutions

Problems	Causes	Problem-solving efforts
Case finding and treatment		
Although helminthiasis is considered as a problem that exists throughout Indonesia, relevant data at national level are incomplete	• Mapping of endemicity levels is not available	• A national survey of soil-transmitted helminths and endemicity mapping with sampling are required
Case finding using faeces examination is ineffective	• The faeces examination method is considered too difficult • Examiner capacity is inadequate	• A more simple diagnostic technique is required
The scope of treatment activities is narrow	• Opportunities to integrate with other programmes have not been taken	• Integration with other programmes is crucial
MDA is inconsistently conducted	• Medicine availability and funding are delayed	• Logistics management needs to be improved • Regional governments should be lobbied for budget allocation
Information, education and communication		
People's behaviour often does not support control of helminthiasis	• Knowledge and behaviour on hygiene and helminthiasis are still poor • Some parents refuse to participate in anti-worm campaigns • Reasons for poor utilization of sanitation facilities are unknown	• Local, specific health promotion and education on hygiene should be carried out (sociocultural approach) • It is necessary to provide health education to parents prior to anti-worm disease campaigns
Poor community sanitation and low use of sanitation facilities are barriers to control of helminthiasis		• Research on community utilization and acceptance of sanitation facilities is required
Programme management		
Monitoring and evaluation: gaps exist in reporting of integrated programme activities	• There is a gap in the implementation of programme integration, for example vitamin A reports exist but worm disease reports do not	• Cross-sectoral coordination should be improved

Problems	Causes	Problem-solving efforts
Human resources are inadequate	• The capacity of health workers in community education needs improvement	• Training of health workers is needed, through implementation of a standard training curriculum for programme workers at province, district and municipal, subdistrict health centre, and health worker levels
Logistical elements face challenges	• There are difficulties in transporting anthelmintic drugs to schools, primarily in eastern Indonesia	• More efficient transportation modes for drugs are needed
Policy formulation is not supportive	• There is a lack of cross-sectoral and cross-programme coordination	• Improved intersectoral and interprogramme coordination would be beneficial • Potential integration with filariasis and malaria programmes should be explored • A draft regulation on helminthiasis is under preparation by the Ministry of Health to maximize integration of activities (starting with West Nusa Tenggara, North Sulawesi and Bali, which are not filariasis endemic)
Preventive measures are lacking	• Preventive programmes on water, sanitation and hygiene have not been a priority	• Cross-programme and cross-sectoral coordination is required (e.g. with the Public Works Office)
Funding is inadequate	• Due to decentralization, regional governments must fund MDA implementation using their own budgets	• Lobbying of regional governments would assist budget prioritization

3. Priority agenda for implementation research

A Delphi survey was chosen as the methodology to identify priority implementation research areas for malaria, TB and NTD control. The Delphi survey aimed to reach consensus among a group of experts through a two-round process, with an opportunity to offer questions on additional research. The survey was sent by email, and the email was re-sent if the selected expert did not reply within two days. Failure to respond to the reminder email was considered as a decision not to participate.

3.1 Selection of panel of experts

Two groups of experts participated in this activity. The first group of experts consisted of experts in TB, malaria and NTDs working in NIHRD and the Ministry of Health, along with practising doctors in those areas. Members were actively involved in group discussions. The second group of experts consisted of experts and researchers in TB, malaria and NTDs recommended by NIHRD and the Ministry of Health. The recommended experts were from NIHRD, the Ministry of Health, universities, and NGOs. Additional relevant experts were identified through a PubMed database search, though most experts identified for participation in the second group were based on the recommendations of experts in the first group. Most experts in the first group were also included in the second group. The second group of experts was actively involved in providing opinions, by email, on the ranking of priorities for the implementation research agenda. All experts involved received feedback in the form of interim results of the ranking of priorities for the research agenda.

Expert selection was made according to specific criteria. Experts in the first and second groups were purposefully selected by convenience sampling. Given that the experience and knowledge of the experts would affect the reliability and validity of the study results, the following inclusion criteria were applied:

- sufficient research experience and knowledge of TB, malaria, and NTDs;
- Indonesian citizenship;
- authorship of at least one scientific publication on TB, malaria, and NTDs;
- willingness to participate;
- sufficient time to participate.

Exclusion criteria for experts were as follows:

- unavailable expert contact details, such as email address or phone number;
- ineffective communication with the expert, such as delayed delivery of questionnaire answers or return of an incomplete questionnaire.

Each participant with clearly identifiable contact details received an invitation by email to participate in the Delphi survey. The invitation specified the survey duration and the time required for participation in the survey. All participants were able to withdraw from the Delphi survey at any time without giving reasons. Informed consent to participate in this study was provided in writing to the administrator by form or email. Return by the expert of the completed questionnaire was treated as informed consent.

3.2 Objectives of the Delphi survey

3.2.1 First round

to evaluate whether the list of research questions proposed by the team were relevant to the requirements of the prevention and mitigation programmes for TB, malaria and NTDs;

to provide an opportunity for the invited experts to propose research questions considered important for the TB, malaria and NTD prevention and mitigation programmes.

3.2.2 Second round

To rank priorities for the research agenda based on the selection results of the research questions in the first round.

3.3 Survey implementation, 2016

March 8–15	Researcher identification
March 16	Commencement of recruitment and data collection
March 18	Reminder sent for the first round
March 19	End of data collection for first round
March 20	Summarize first round data
March 21	Workshop on selection of priorities for research agenda 1
March 22–27	Second round survey
March 25	Reminder sent for second round
March 29–30	Workshop on selection of priorities for research agenda 2

3.4 Survey results

3.4.1 First round Delphi survey

Response rates of the first round Delphi survey are presented in Table 8.

Table 8. Response rates of first round survey

Criteria	TB	Malaria	Leprosy Yaws	Filariasis Schistosomiasis Helminthiasis
Invitation	36	38	27	29
Response received	9	11	7	12
Response rate (%)	25.0	28.9	25.9	41.3

In the first round, research questions were considered relevant if the median score was ≥ 4; response consistency was considered high if the coefficient of variation (CoV) was < 20%. Proposed questions with a median value of < 4 or a CoV of > 20% were further discussed in a workshop and replaced with proposed questions from the participants. After the results of the first round Delphi survey were collected, the first

group of experts gathered to discuss the first round survey results. Revisions were made to research questions in the first round and some first round questions were replaced with research questions asked by the Delphi survey participants. Results of the first round Delphi survey are presented in Annex 1.

3.4.2 Second round Delphi survey

The second round Delphi survey was conducted between 22 March and 27 March 2016. Questionnaires were distributed by email to all selected experts. Reminders were sent close to the deadline for questionnaire submission. Table 9 presents the response rates in the second round Delphi survey.

Table 9. Response rates of second round Delphi survey

Criteria	TB	Malaria	Leprosy Yaws	Filariasis Schistosomiasis Helminthiasis
Invitation	34	38	23	29
Response received	11	15	7	13
Response rate (%)	32	39	30	45
Rank	1–13	1–12	1–13	1–11

Ranks were made by calculating the average of ranks given for each research response. Research questions with the same average value were given two similar consecutive ranks, which would then be decided upon in a panel discussion. Results of the second round Delphi survey are presented in Annex 3.

Results of the second round Delphi survey were intensively discussed in an expert discussion held for two days in Jakarta, 29 and 30 March 2016. In this discussion, 10 research questions were selected as the most urgent for TB, malaria and NTD control. In addition to selection of research questions, experts also improved the formulation of the research questions.

3.5 Priority agenda for implementation and operational research

3.5.1 Tuberculosis prevention and control

Within the research agenda, the main priority for TB control in Indonesia was research to improve TB case finding, including by identifying the most effective TB case reporting methods by health practitioners (rank 1), identification of strategies to improve case finding for TB in children (rank 3), and identification of strategies to improve the role of doctors in private practice in TB case finding and treatment (rank 6) (Table 10). Efforts to increase therapy success remain a priority, including through evaluating the efficiency and effectiveness of treatment support programmes conducted by NGOs (rank 2), improving the flow effectiveness and diagnostic quality and treatment using the DOTS (directly observed treatment, short course) methodology (rank 5), applying effective and efficient TB clinical pathways (rank 7), utilizing information technology (rank 8), and TB medicine regulation in the market (rank 10). Improvement of capacity and quality of TB diagnosis in health facilities is needed in TB mitigation efforts, for example by increasing the utilization of GeneXpert and improving the effectiveness of the TB diagnostic pathway.

Table 10. Priority research questions for TB prevention and control

Research questions	Rank
How to improve compliance of health service providers in reporting TB cases to the national TB programme?	1
How efficient and effective are treatment support programmes for TB and MDR-TB patients conducted by NGOs?	2
How to improve case finding for TB in children?	3
How to increase utilization of new diagnostic technology (e.g. GeneXpert) for TB and MDR-TB suspects and patients in Indonesia?	4
How to improve the effectiveness of diagnostic and treatment flow and quality of the DOTS service?	5
How to enhance the role of private practitioners and primary services in TB case finding and treatment?	6
Can the application of effective and efficient TB clinical pathways increase the compliance of clinicians with TB/MDR-TB administration standards in hospitals?	7
How effective is information technology utilization in increasing TB patient compliance with treatment regimens?	8
How to improve sustainability of TB programme funding?	9
How to regulate effectively the circulation of anti-TB medicines in Indonesia?	10

3.5.2 Malaria prevention and control

The main research priority identified for malaria was to increase the effectiveness of malaria programme implementation (rank 1), followed by identifying the most effective methods to increase worker competency (rank 3), improving cross-programme integration (rank 4), increasing utilization of village malaria posts (rank 5), and improving the effectiveness and efficiency of malaria logistics management (rank 10) (Table 11). Research on utilization of new technology is also required, to evaluate the following: application of information system technology and malaria surveillance (rank 2), cost-effectiveness of G6PD diagnostic tools (rank 6), and use of rapid diagnostic tests in health service facilities (rank 7). Identification of effective health promotion strategies is required to prevent irrational treatment behaviour (rank 8) and to increase the success of programmes (rank 9).

Table 11. Priority research questions for malaria prevention and control

Research questions	Rank
How can the implementation and sustainability of malaria control programmes be made more effective, taking into account different factors and contexts?	1
How feasible is it to extend use of e-SISMAL?	2
How can the competency of microscopic, medical and paramedical staff be sustainably increased to accelerate achievement of malaria control programme targets?	3
How to improve effectiveness of malaria control through cross-programme and cross-sectoral integration?	4
How to increase community utilization of village malaria posts?	5
Is utilization of the G6PD diagnostic tool in primary health service facilities cost-effective?	6
How feasible, effective, efficient and quality assured is application of the rapid diagnostic test for malaria case finding in remote areas?	7

Research questions	Rank
What factors lead to irrational treatment behaviours in the community?	8
What are the most effective and efficient health promotion strategies in achieving malaria control programme targets?	9
What factors inhibit malaria logistics management, for example underutilization of long-lasting insecticidal nets?	10

3.5.3 Leprosy/yaws prevention and control

Leprosy and yaws are two of the most important NTDs because they are still found in most areas in Indonesia and may result in physical disability. In terms of research agenda priorities, funding to guarantee programme sustainability remained the top priority (rank 1), followed by increasing the effectiveness of case finding, specifically through active case finding (rank 2), evaluation of the effectiveness of leprosy/yaws training for health workers (rank 7), evaluation of the effectiveness of leprosy-free and yaws-free certification for districts and municipalities (rank 8), and evaluation of the effectiveness of extension to the community (rank 9) (Table 12). The research agenda to increase treatment effectiveness was also a priority, for example through increasing the effectiveness of patient counselling methods (rank 3), efforts to reduce stigma by adopting a community approach (rank 4), efforts to improve clean and healthy life behaviours to prevent transmission (rank 5), and factors influencing successful mass prevention medication (rank 6). Evaluation of the surveillance programme for disability cases and resistance to mass prevention medication for people with leprosy following release from treatment is also a priority agenda for leprosy control (rank 10).

Table 12. Priority research questions for leprosy/yaws prevention and control

Research questions	Rank
What operational funding commitments are regional governments making to eliminate leprosy and eradicate yaws?	1
How can community participation increase the effectiveness of contact examination (active case finding) in leprosy case finding?	2
What are the characteristics of effective counselling methods to increase levels of compliance with leprosy treatment?	3
How effective is the community approach in reducing the stigma of leprosy?	4
How effective is community involvement (including workers, teachers) in encouraging behaviour change and promoting a clean and healthy lifestyle as part of efforts to reduce transmission of yaws?	5
What factors contribute to the achievement of coverage targets for mass prevention medication for yaws?	6
Is training for staff at subdistrict health centres and hospitals contributing to improved detection and management of yaws cases?	7
Does the programme of yaws-free certification in districts and municipalities help achieve reductions in transmission of yaws?	8
How effective is education in increasing people's understanding of leprosy and yaws and encouraging early case finding?	9
How effective is surveillance of disability cases and resistance to mass drug administration for people with leprosy following release from treatment?	10

3.5.4 Prevention and control of filariasis, schistosomiasis and helminthiasis

The research priority agenda to control filariasis, schistosomiasis and helminthiasis primarily aims to improve programme effectiveness by increasing active community participation (rank 1); increasing the role of regional government in screening, prevention and eradication of diseases (rank 3); and increasing the effectiveness of integration with eradication of other communicable diseases, such as leprosy, yaws and lymphatic filariasis (ranks 4 and 7) (Table 13). Research to discontinue the transmission chain is also required, for example through application of proper environmental management strategies (rank 2), decreasing zoonotic transmission risk (rank 6), and reducing vector distribution and breeding places in endemic areas (rank 9). Research to increase successful treatment is also a priority, for example by identifying factors affecting successful mass prevention medication (rank 5), increasing patient compliance with treatment plans (rank 8), and increasing successful case management in primary health facilities (rank 10).

Table 13. Priority research questions for filariasis, schistosomiasis and helminthiasis prevention and control

Research questions	Rank
How to increase public participation, including that of schoolchildren, in the screening, prevention and eradication of filariasis, schistosomiasis and helminthiasis?	1
How effective is the environmental management strategy to discontinue the transmission chain of filariasis, schistosomiasis and helminthiasis?	2
How to increase regional government and cross-sectoral action to achieve the elimination targets of filariasis and schistosomiasis, and reduction of helminthiasis?	3
How to enhance effectiveness of integrated programming to mitigate helminthiasis and filariasis?	4
What factors need to be considered when deciding on the scope of the mass drug administration programme?	5
How to reduce the transmission risk of zoonotic filariasis *Brugia* spp.?	6
How effective is the integration of the lymphatic filariasis programme and the leprosy and yaws programme in maintaining continuity of lymphatic filariasis case management?	7
How to increase compliance of lymphatic filariasis patients to self-management?	8
How to reduce the vector distribution and breeding places in filariasis endemic areas?	9
What factors affect successful schistosomiasis management in primary health facilities?	10

3.5.5 Agenda for cross-programme implementation and operational research

Some topics of implementation and operational research were identified as having priority for prevention and control of more than one communicable disease. The topics may be formulated as follows:

- How to strengthen sustainability of communicable disease prevention and control programmes?
- How to effectively integrate prevention and control of communicable diseases?
- How to increase local government and cross-sectoral support for communicable disease prevention and control programmes?
- How to increase public participation, including that of schoolchildren, in communicable disease prevention and control programmes?

4. Strengthening the capacity, network and funding of implementation research

4.1 Implementation research capacity

The capacity discussed in this strategy document relates to human resource capacity in conducting implementation research. More specifically, it considers the capacity of researchers to understand the definition of implementation research, to develop implementation research proposals, and to analyse implementation research results.

4.2 Gap in implementation research capacity

To apply the implementation research strategy, sufficient capacity in implementation research is required. Currently, a gap in implementation research capacity among academics and community health practitioners still exists. Furthermore, the capacity to conduct implementation research even within one research institute is highly variable. Researchers at all levels (beginner, intermediate and expert) conduct research and have different understanding of an observed problem. This variation occurs within the same research institute and between different institutes.

Most researchers and community health practitioners still have inadequate understanding of the implementation research concept. They consider implementation research as similar to the usual research they have been conducting. However, from the data quality perspective, there is a huge gap. Implementation research frequently uses secondary data collected during programme implementation, so the validity of data is highly variable, for example due to variations in the quality of data collection methods.

In general, researchers have deficient understanding of programmes in the Ministry of Health. Accordingly, within implementation research, identification of problems by researchers alone may be insufficient. Even within the Ministry of Health or Health Office, those responsible for programme implementation may not fully understand the implementation research concept. In addition, government prioritization of research is still insufficient.

To improve the analysis of the gap in implementation research capacity, particularly related to the prevention and control of TB, malaria and NTDs in Indonesia, quantitative and qualitative mapping of researcher capacity is required. Mapping will strengthen basic data on the capacity of researchers in implementation research and allow planning of a more directed capacity-strengthening programme.

4.3 Strengthening implementation research capacity

To increase the understanding of researchers and community health practitioners of implementation research, self-learning and mentoring are needed. Self-learning may be obtained through the dissemination of implementation research concepts and methodology, as the basic teaching material. When the basic material has been mastered, mentoring can be provided for further implementation of research materials. There are existing learning modules from WHO and academic institutes that may be disseminated to researchers and community health practitioners. By using the existing modules, time and funds for training can be saved.

Researchers' understanding of health programmes and programme managers' understanding of implementation research may be increased through collaboration between researchers, practitioners and clinicians. This collaboration may begin with problem identification, until follow-up of the implementation research result. With this collaboration, an understanding may be reached of the gap between policy and implementation of the programme to prevent and control diseases. Capacity increase may also be achieved through cooperation between institutes and professional associations.

The National Institute of Health Research and Development (NIHRD) has also launched an internship programme for young researchers. This programme is still in the planning phase. The aim is to send young researchers on an internship to the smallest unit of the Ministry of Health. The unit is the client of NIHRD. Through such internship for several months, it is expected that young researchers may increase their understanding of the programme to prevent and control diseases within the Ministry of Health. This internship programme may be extended and applied by other research institutes, further enhancing researchers' understanding of community health-related programmes in the Ministry of Health. Involvement of local researchers is being encouraged to enrich their understanding of and capacity to undertake implementation research.

Finally, cooperation with overseas research institutes is also required in order to disseminate the understanding and capacity of researchers and community health practitioners in Indonesia to researchers overseas. Such cooperation can help to narrow the gap with developed countries. Some institutes and researchers in Indonesia have been utilized as data collectors by research institutes overseas. More equal cooperation is needed, however – if Indonesian researchers act only as data collectors, the added value gained by domestic institutes and individual researchers will be very small.

4.4 Implementation research network

Establishment of an implementation research network would have a number of advantages. It could facilitate coordination and collaboration; increase the potential of researchers to have a positive impact on community health; and enable mobilization of implementation research funding.

The implementation research network would include different categories of stakeholders. Health policy-makers need to be involved in the network, in addition to education institutes and researchers. Institutes in sectors other than health, for example the education, social and economic sectors, should also be represented in the network.

One institute should coordinate the network. Identification and collection of information on the existing research networks are needed to enable coordination with the implementation research network. The main functions or tasks of the implementation research network would be as follows:

- to act as a medium of communication for researchers, practitioners and policy-makers on implementation research to support prevention and control of TB, malaria and NTDs in Indonesia;

- to map implementation research to support prevention and control of TB, malaria and NTDs in Indonesia;
- to function as an information source or database of specific experts or researchers with expertise in different sectors relating to the prevention and control of TB, malaria and NTDs in Indonesia;
- to identify and mobilize potential funding for implementation research through involvement of entities with potential to support such funding, for example the Ministry of Research, Technology and Higher Education, NGOs, donors and private companies.

NIHRD is mandated to coordinate all research in the health sector in Indonesia. However, due to bureaucracy and the heavy workload at the Indonesian Ministry of Health, the secretariat of the implementation research network could be delegated to another institution. Thus, for more flexibility, the network secretariat may be hosted by a university or research institute.

A full-time secretariat is required to manage the network. Further, legal regulation is required for the implementation of the research network for smooth implementation of activities in the future. In the context of the network, a strict job description and mandate is required from the start so that all parties involved may conduct research effectively.

Currently, NIHRD already has some research networks, for example the TB Inventory Study Network. The development process of that and other networks may serve as a model and learning opportunity for development of the implementation research network. Supporting factors and obstacles in establishment of the TB Inventory Study Network may serve as a reference for development of the implementation research network.

In its coordinating function, NIHRD would remain the lead institute of the implementation research network. Health researchers would be required to report their research results to NIHRD as the coordinator. Within the coordinating role of NIHRD, it is expected that the implementation research strategy for prevention and control of TB, malaria and NTDs in Indonesia would be aligned with the health research agenda developed by NIHRD.

4.5 Funding

The potential funding sources for the implementation research strategy to support prevention and control of TB, malaria and NTDs in Indonesia are significant. Focus diseases in the implementation research strategy are highly relevant to funding from domestic and overseas sources. To assist mobilization of funding for the strategy from various potential sources, an open mindset for cooperation is needed.

To ensure sustainability of funding for the implementation research strategy, priority should be given to funding by the State Budget (Anggaran Pendapatan dan Belanja Negara, APBN). APBN funding is sustainable and therefore may continuously meet implementation research needs. NIHRD is a government institution with the function of conducting health research. However, APBN funding in the health sector for research is very limited compared to fund allocation for technical programmes. Accordingly, there is a need to harmonize the perceptions between the technical programmes of the Ministry of Health and NIHRD so that the research fund may be increased in proportion to the increase in the APBN allocated to the health sector.

In addition to the APBN, further exploration is needed on the possible use of the Regional Budget (Anggaran Pendapatan dan Belanja Daerah, APBD). Since the commencement of the regional autonomy era, there has been a significant increase in the APBD. In addition, regional governments are expected to understand and mitigate problems in their own regions. Further studies on the potential use of the Village Fund are required, primarily for research implementation in subdistrict health centres and a number of communities.

Different domestic funding sources for implementation research to support prevention and control of TB, malaria and NTDs in Indonesia include:

- routine funding of NIHRD;
- Development Research Fund of NIHRD;
- Ministry of Research, Technology and Higher Education through research funding for lecturers and students;
- Ministry of Finance through the Indonesia Endowment Fund for Education (Lembaga Pengelola Dana Pendidikan, LPDP), involving master and doctoral students;
- regional (district and municipal) governments by providing understanding on the importance of implementation research for successful programmes in the regions;
- prominent philanthropists;
- national private companies through the corporate social responsibility fund.

Meanwhile, potential overseas funding sources include:

- Global Fund to Fight AIDS, Tuberculosis and Malaria;
- Gavi Alliance;
- National Institutes of Health (United States of America) through direct research funding to institutes and individual researchers;
- European Union;
- WHO Special Programme for Research and Training in Tropical Diseases (TDR);
- Direct donations from developed countries;
- Philanthropic foundations, including the Bill & Melinda Gates Foundation, the Wellcome Trust, and the Carter Center;
- Global Health Action;
- Global Network for Neglected Tropical Diseases.

To strengthen the bargaining position of institutes and researchers proposing to access the fund, the implementation research network may be used as an entity to negotiate with potential donors. WHO may also become a facilitator to connect donors and researchers through its extensive network and cooperation with international institutes.

To mobilize funding and increase the commitment to implementation research, support from academics, such as master and doctoral students, is also needed. The implementation research strategy needs to be disseminated to master and doctoral students so that they will be able to conduct research in line with the formulated priority agenda.

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Annexes

Annex 1. Results of the first round survey

Tuberculosis group (*n* = 9)

No.	Proposed questions	Total responses					Median	CoV (%)
		1	2	3	4	5		
1	What is the method to implement the GeneXpert programme for MDR-TB suspects/patients in Indonesia in different settings?			1	3	5	5	16
2	What method is effective to increase the compliance of health service providers to report TB case finding to the national TB programme?				4	5	5	12
3	How can technology utilization increase TB patient compliance with treatment course completion?				4	5	5	12
4	How efficient is the treatment support programme for TB and MDR-TB patients conducted by NGOs?			1	4	4	4	16
5	How is the application of the scoring system for TB in children in primary health facilities?		1	2	3	3	4	27
6	What obstacles are faced in the application of the diagnosis flow of TB in children in first-tier health service facilities?				6	3	4	12
7	How is the clinical pathway application to increase clinician compliance with the TB/MDR-TB administration standard in hospitals?			1	2	6	5	16
8	How is the sustainability of community approach initiated by NGOs in Indonesia?		1	4	2	2	3	29
9	How is the feasibility of the exit strategy application for TB programme funding?		1	1	5	2	4	24
10	How is the planned exit strategy for TB programme funding adopted by the relevant parties?			3	4	2	4	20

Malaria group (*n* = 11)

No.	Proposed questions	Total responses					Median	CoV (%)
		1	2	3	4	5		
1	What are the factors affecting the implementation of early malaria case finding programme in the eastern part of Indonesia?			1		10	5	13
2	Can the malaria information and surveillance system (e-SISMAL) help increase early malaria case finding?			3	2	6	5	21
3	Do rapid diagnostic tests for malaria contribute to improved case finding?			4	5	2	4	20
4	Can village malaria posts improve community access to improved malaria health services?			3	4	4	4	20
5	How does health promotion on malaria affect patient's decision on treatment?		1	1	4	5	4	23
6	Is the combined intervention of indoor residual spraying and long-lasting insecticidal nets acceptable to the community?			1	7	3	4	14
7	What is the role of the partnership programme in the implementation of the malaria control programme?		1	3	5	2	4	24
8	Has the health promotion programme been designed by considering local characteristics to help better achieve the targets of the malaria control programme?			2	3	6	5	19
9	What is the level of malaria control in districts/municipalities or provinces with malaria centres?			3	3	5	4	21
10	Will the involvement of doctors, hospitals, and clinics in the private sector contribute to better outcomes of malaria patients?			3	4	5	4	18

Leprosy and yaws group (*n* = 7)

No.	Proposed questions	Total responses					Median	CoV (%)
		1	2	3	4	5		
1	What is the effectiveness of home contact examination (active case finding) in leprosy case finding?			1	2	4	5	18
2	What is the effectiveness of counselling to increase the obedience level of leprosy treatment?			1	3	3	4	18
3	What is the scope of efforts initiated by NLR and Sasakawa foundation for physical disability management in leprosy?			2	3	2	4	20
4	What are the sustainability efforts initiated by NLR and Sasakawa foundation for physical disability management in leprosy?			3	3	1	4	20
5	How is the effectiveness of leprosy education conducted by village workers?			3	2	2	4	23
6	What are the factors affecting the effectiveness of active yaws case finding?				1	6	5	8
7	What is the scope of mass prevention medication with single oral dosage of azithromycin?			3		4	5	26
8	What is the effectiveness of community involvement (workers, teachers, etc.) in behavioural change in yaws transmission prevention?				3	4	5	12
9	Is training for staff of subdistrict health centres and hospitals contributing to better detection and management of yaws cases?			2	3	2	4	20
10	Does the programme of free yaws certification/yaws eradication in districts/ municipalities affect the reduction of yaws transmission?	1		2	4		4	34

Filariasis, schistosomiasis, helminthiasis group (*n* = 12)

No.	Proposed questions	Total responses					Median	CoV (%)
		1	2	3	4	5		
1	Is integration of the lymphatic filariasis programme and other programmes effective to maintain continuity of lymphatic filariasis case administration?			3	6	3	4	18
2	How is patient acceptance of the implementation of home care programmes for lymphatic filariasis patients?			5	4	3	4	22
3	What factors affect successful scaling up of the MDA programme?			2	6	4	4	17
4	Can the support of the current regional government affect better achievement of lymphatic filariasis control programme targets?			1	4	7	5	15
5	How is the feasibility of the implementation of new schistosomiasis diagnostic tests (e.g. urine CAA test) in Indonesia?		2	3	4	3	4	29
6	Are community education programmes effective to improve community acceptance to the schistosomiasis screening programme?			2	5	5	4	18
7	What are the factors affecting successful schistosomiasis administration in primary health facilities?		3	2	6	1	4	29
8	Has the clean and healthy lifestyle behaviour education programme adjusted to the local requirements contributed to the decrease in worm disease status in their areas?		1		3	8	5	20
9	Is integration of work disease mitigation programme with other programmes, such as filariasis or malaria, effective to reduce worm disease status?		1		7	4	4	20
10	What is the scope of anti-worm medication in worm disease endemic areas?		1	2	6	3	4	23

Annex 2. Proposed additional research questions from experts

Proposed additional research questions for TB control

1. What is the community empowerment model to reduce risk factors of TB transmission in the community?
2. What is the involvement of stakeholders for P2TB?
3. How is infection control in health service facilities providing TB services?
4. How can the role of private practising doctors/primary services be increased in order to increase TB case finding?
5. How can patient-centred care in TB services in health service facilities be increased?
6. What is the perception (knowledge and attitude) of health workers on isoniazid prevention programme (PP-INH) for HIV patients?
7. What is the perception (knowledge and attitude) of HIV patients on isoniazid prevention programme (PP-INH) in hospitals?
8. What is the evaluation of TB treatment on TB/HIV patients in health services?
9. How is the development of new TB vaccine in Indonesia?
10. What is the effectiveness of isoniazid preventive therapy implementation in Indonesia?
11. How is the cost-effectiveness of active TB case finding in TB high-risk groups in the population?
12. What is the extent of NGO contribution to TB programme implementation in Indonesia?
13. What is the quality of TB medicines and reagents stored in the medicine warehouses of districts/municipalities in Indonesia?
14. What are the most effective efforts to regulate the free circulation of anti-TB medicines in Indonesia?
15. What is the most effective and efficient TB diagnostic flow to support the achievement of universal DR-TB testing in Indonesia?
16. How is the feasibility of community-based TB medicine resistant services compared to health facility based services?

Proposed additional research questions for malaria control

1. Are there any influences of BOK, APBD1, and APBD2 budgets in mitigation?
2. What is the role of regional governments in the provision of training for staff?
3. Has the reporting recording system in subdistrict health centres been verified?
4. Can sustainable microscopic staff quality assurance help to support improved malaria control programme targets?
5. What are the factors influencing people to consume antimalarial medicine without laboratory examination?
6. Is the current malaria medicine (dihydroartemisinin-piperaquine) still effective or is its effectiveness decreasing, especially in the eastern part of Indonesia?
7. Are the logistics of malaria and rapid diagnostic test medicines available?
8. Are doctors trained in treatment and diagnosis?

9. Are paramedics/laboratory staff trained in malaria examination?
10. What is the capacity and competency of human resources at the level of subdistrict health centres, district/municipalities, and provinces in malaria prevention and control in terms of case administration and environmental risk factors?
12. Are vector surveillance and environmental mapping conducted according to the needs to support successful malaria control in each region?
13. Can information on the proportion of malaria parasite species and malaria vector aspects be obtained in malaria control programme implementation in this area?
14. What other factors influence malaria outbreak in low-endemic areas?
15. What is the influence of co-infection and co-morbidity on prevalence of malaria parasitemia and clinical malaria?
16. What is the public role in malaria control, prevention, and elimination in these areas?

Proposed additional research questions for leprosy and yaws control

1. Is the community approach effective to reduce the stigma of people with leprosy?
2. Is comprehensive rehabilitation necessary for people with leprosy?
3. Can an understanding of leprosy transmission reduce the number of people with leprosy?
4. What is the most effective method in providing post-exposure prophylaxis with rifampicin in areas with a high load of leprosy in Indonesia?
5. Does post-release from treatment surveillance in people with leprosy significantly contribute to comprehensive control of leprosy?
6. Can a mobile technology-based leprosy training approach affect the capacity increase of health workers in early detection of leprosy and yaws?

Proposed additional research questions for control of filariasis, schistosomiasis and helminthiasis

1. How to increase public participation in FSH control?
2. How is the endemicity of soil-transmitted helminths, filariasis, and schistosomiasis?
3. How is the efficacy and safety of routine triple medication of diethylcarbamizine, albendazole, and praziquantel in efforts to control soil-transmitted helminths, schistosomiasis, and filariasis infections in endemic areas?
4. What is the process of FSH transmission?
5. What is the microfilaria incidence following the filariasis mass prevention medication programme for schoolchildren?
6. What is the public role in the continuity of worm disease mitigation?
7. What is the role of worm infection and eradication of worm infection in epidemiological transition?
8. What is the optimization of worm disease surveillance and worm infection control in Indonesia, including their coverage in cities and areas that are difficult to reach?
9. How can surveillance ensure that the worm disease database is valid?

10. What is the extent of programme attention to maintain microscopic diagnosis quality in areas as the main aspect to diagnose people with helminthiasis (schistosomiasis and filariasis)?
11. Has the local community in worm disease endemic areas been involved as the subject in case finding and worm disease control?
12. What is the method to raise community awareness and maintain it high in schistosomiasis control effort?
13. What is the cross-sectoral role in schistosomiasis control in endemic areas?
14. How does the community socioculture influence a successful lymphatic filariasis MDA programme?
15. Can sustainable promotion and education encourage the community as the main subject in schistosomiasis control?
16. Why is schistosomiasis found only in certain areas in Central Sulawesi?

Annex 3. Result of second round Delphi survey

Tuberculosis group

Research questions	Rank
What method is effective to increase health service provider reporting of TB case finding to the national TB programme?	1
Is diagnosis by GeneXpert for MDR-TB suspects/patients in Indonesia feasible for application in different settings?	2
What obstacles are faced in the application of diagnosis flow of TB in children in first-tier health service facilities?	3
What is the sustainable and effective strategy to increase the role of private practising doctors/primary services to increase TB case finding and treatment?	4 or 5
Can the application of effective and efficient TB clinical pathways increase clinician compliance with TB/MDR-TB administration standards in hospitals?	4 or 5
Is the scoring system for TB in children effective for implementation in primary health facilities?	6
What is the most effective and efficient TB diagnostic flow to support the achievement of universal TB and DR-TB testing in Indonesia?	7
How effective is information technology utilization in increasing TB patient compliance and treatment completion?	8
How is the feasibility of the exit strategy for TB programme funding?	9 or 10
How efficient is the treatment support programme for TB and MDR-TB patients conducted by NGOs?	9 or 10
What are the most effective efforts to regulate the free circulation of anti-TB medicines in Indonesia?	11
What obstacles should be overcome in order to adopt an exit strategy for TB programme funding by the relevant parties?	12

Malaria group

Research questions	Rank
Does community participation play a role in the implementation of the malaria control programme?	1
What are the factors affecting the implementation of the early malaria case finding programme in eastern Indonesia?	2
What is the effectiveness of the malaria information system and surveillance programme (eSISMAL)?	3
Can sustainable microscopic staff quality assurance help support better malaria control programme targets?	4
Are doctors trained to conduct screening of malaria suspects and malaria treatment?	5
Are vector surveillance and environmental mapping conducted according to the needs to support successful malaria control, primarily in receptive areas?	6
Can village malaria posts improve community access to improved malaria health services?	7
How to ensure safety of primaquine administered to patients with G6PD?	8
Do rapid diagnostic tests for malaria contribute to better case finding in remote areas?	9
What are the factors influencing people to consume malaria medicine without laboratory examination?	10
Has the health promotion programme been designed according to local characteristics in order to help better achieve the targets of the malaria control programme?	11
Is the combined intervention of indoor residual spraying and long-lasting insecticidal nets acceptable by the community?	12

Leprosy/yaws group

Research questions	Rank
What is the effectiveness of home contact examination (active case finding) in leprosy case finding?	1
How is community participation in the early case finding?	2
How is the regional government's support in efforts to eliminate leprosy and eradicate yaws?	3
How is the effectiveness of counselling to increase the obedience level of leprosy treatment?	4
Is the community approach effective to reduce the stigma of people with leprosy?	5
How is the effectiveness of community involvement (workers, teachers, etc.) in behavioural change in yaws transmission prevention?	6
What is the scope of mass prevention medication with single oral dosage of azithromycin?	7
Is training for staff of subdistrict health centres and hospitals contributing to better detection and management of yaws cases?	8
Does the programme of free yaws certification/yaws eradication in districts/municipalities affect the reduction of yaws transmission?	9 or 10
Can understanding on leprosy transmission reduce the number of people with leprosy?	9 or 10
What are the factors affecting the effectiveness of active yaws case finding?	11
How is the effectiveness of leprosy extension conducted by village workers?	12

Filariasis, schistosomiasis, helminthiasis group

Research questions	Rank
What is the effective method to increase public participation in the prevention and eradication of filariasis, schistosomiasis and helminthiasis?	1
Has the clean and healthy behaviour education programme adjusted to the local requirements contributed to the decrease in worm disease status in their areas?	2
Can agricultural and plantation engineering reduce the population of *Oncomelania* snails in schistosomiasis endemic areas?	3
Is the community education programme effective in improving acceptance of the schistosomiasis screening programmes in the community?	4
Is the integration of the work disease mitigation programme with other programmes, such as filariasis or malaria, effective to reduce worm disease status?	5
Does the current support by the regional government enable the achievement of lymphatic filariasis control programme targets?	6
What are the factors affecting successful scaling up of an MDA programme?	7
How is public acceptance to anti-worm medication in worm disease endemic areas? (DOT)	8 or 9
What are the dynamics of filariasis transmission in areas where many zoonotic *Brugia filaria* worms are found?	8 or 9
How is compliance of lymphatic filariasis patients to self-case administration?	10
Is integration of the lymphatic filariasis programme and other programmes effective to maintain continuity of lymphatic filariasis case administration?	11

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