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ABBREVIATIONS

ACT  Artemisinin-based combination therapy
API  Annual parasite index
APLMA  Asia Pacific Leaders Malaria Alliance
APMEN  Asia Pacific Malaria Elimination Network
G6PD (deficiency)  Glucose-6-phosphate dehydrogenase (deficiency)
GIS  Geographic information system
Global Fund  Global Fund to Fight AIDS, Tuberculosis and Malaria
GMEP  Global Malaria Eradication Program
GMP  Global Malaria Programme
GMS  Greater Mekong Subregion
IRS  Indoor residual spraying
ITN  Insecticide-treated mosquito net
LLIN  Long-lasting insecticidal net
MEG  Malaria Elimination Group
MHMS  Ministry of Health & Medical Services
NMCP  National malaria control programme
NVBDCP  National Vector Borne Disease Control Programme
P. falciparum  Plasmodium falciparum
P. vivax  Plasmodium vivax
PACMI  Pacific Malaria Initiative
RBM  Roll Back Malaria
RDT  Rapid diagnostic test
SEARO  WHO Regional Office for South-East Asia
UCSF  University of California, San Francisco
VECNet  Vector Ecology and Control Network
WHO  World Health Organization
WPRO  WHO Regional Office for the Western Pacific
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Contributors included Mario Baquilod (Philippines Department of Health); Albino Bobogare (Ministry of Health & Medical Services, Solomon Islands); Herdiana Herdiana (UNICEF Indonesia); Ric Price (Menzies School of Health Research, Australia); Christina Rundi (APMEN country partner at the Malaysia Ministry of Health); Cara Smith Gueye (Global Health Group [GHG] at the University of California, San Francisco [UCSF]); and Majhalia Torno (Research Institute for Tropical Medicine, Philippines).

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The authors are responsible for any errors or omissions.
It is my pleasure, as the present Chair of the Advisory Board of the Asia Pacific Malaria Elimination Network (APMEN), to introduce this important publication. This book is a milestone of the first five years of the Network. APMEN was developed to meet a felt need of the Asia Pacific countries to have a platform to discuss the particular challenges they were facing in the intensified control of malaria, to be a voice to bring more attention to supporting countries with an elimination agenda. It was also created to complement and support the work of the World Health Organization (WHO) and the Roll Back Malaria (RBM) Partnership in the region, recognizing the important and ongoing roles of these organizations to the malaria efforts. APMEN has supported countries in the region facing issues such as Plasmodium vivax (P. vivax), outdoor biting vectors and shared borders, which vectors and people, and therefore parasites, cross.

APMEN has come a long way since the beginnings of informal discussions within the region amongst malaria programme managers, scientists, development partners and advocates and the first meeting in Brisbane in February 2009 when APMEN was launched. In these five years, with the support of technical agencies including the WHO, the region has seen a doubling in the number of malaria-endemic countries who have declared an elimination vision, and all of these 16 are members of the APMEN. The need identified by the Network for a high-level political commitment in the region to malaria has been addressed by the development of the Asia Pacific Leaders Malaria Alliance (APLMA) kindly hosted by the Asian Development Bank and with foundation funding from development partners. In the country programmes and institutions that support them, we have witnessed increased capacity within the Asian and Pacific countries to undertake operational and implementation research to address the countries’ challenges; and a spirit of mutual learning and sharing of knowledge has developed. Country partners and partner institutions have provided solid and consistent in-kind contributions to the Network, for which we are appreciative. And now some of the countries are providing financial contributions to the Network for capacity building of people, teams, programmes and institutions to eliminate regional malaria.

Challenges remain, including the well documented challenge of sustaining financial and political commitment, programme focus and community ownership of malaria programmes as countries move to lower levels of endemicity. The global health landscape is changing, and soon the Sustainable Development Goals will be launched. The “cloud” of both antimalarial and insecticide resistance looms over the region and the elimination agenda. Now more than ever, all of us working in malaria and health systems strengthening in the region, including the WHO, the RBM Partnership, APLMA and APMEN, must bring together the strengths of all of our stakeholders to advocate for sustained resourcing of the malaria agenda to reach the regional vision of a malaria-free Asia Pacific by 2030. We must work together to find efficient, effective, affordable and accessible solutions to country malaria programme challenges. And we must reach 100% of the people in the region with our programmes—no matter where they live, what work they do, where they move—and support them to engage in malaria programmes and achieve healthy productive malaria-free lives.

I hope you enjoy reading about the APMEN, its approach, achievements, challenges and lessons learnt. APMEN welcomes your interest and feedback and looks forward to working with the global community to address this ancient and remaining scourge of the world: malaria.

Gao Qi
Chairperson, APMEN Advisory Board 2012–2014
Malaria Expert, Jiangsu Institute of Parasitic Diseases, Wuxi, PR China
EXECUTIVE SUMMARY

The APMEN was established in 2009 with growing political support from within the region and substantial financial assistance, namely from the Australian Government. Since then, it has not only emphasized and shared the successes of malaria control across a highly diverse region, but it has also worked with regional country programmes towards advancing the fight against the disease a few steps further on the continuum to elimination. Today it brings 16 countries and a wide range of international malaria control institutions together, with a formal commitment to support each other’s efforts and to achieve the long term goal of eliminating malaria regionally. It provides complementary support to the WHO and RBM Partnership efforts and contributions that have assisted, and continue to assist, the countries of the region progress their malaria agendas.

• APMEN is led by a secretariat between the University of Queensland (Australia) and the Global Health Group at the University of California, San Francisco. Its work is guided by annual work plans driven by country partners in reflection of the views of the network and the changing malaria landscape and a strong performance evaluation foundation. As an innovative “community of practice”, the network has governance structures in place allowing elimination efforts to be led by countries with support from international and funding organizations, and academic and private sectors.

• Through annual technical and business meetings, workshops and publications, APMEN enables countries to voice their experiences and progress, thereby bringing recognition to successes within the region. Since 2009, Thailand, Cambodia, Nepal, Viet Nam, the Lao People’s Democratic Republic and Bangladesh have joined the network. During this period regional support has also seen the formation of the APLMA.

• The network plays a facilitation role on malaria elimination in a region where the disease is highly prevalent and its burden underestimated. The Asia Pacific is home to 67% of the world’s population at risk of malaria (2.2 billion people); concentrates 91% of the global burden of P. vivax; has diverse transmitting vectors; is culturally and linguistically diverse; consists of low-, middle- and high-income nations; however it is a region where many countries face similar challenges.

• The network gathers countries that have committed to national/subnational malaria elimination in their national strategy, which provides legitimacy to these ambitious targets. It is a collegial platform for experience/knowledge sharing on malaria elimination, building advocacy and leadership for this goal in the Asia Pacific and identifying priority areas for action.

• The network identifies specific focus areas on the way to malaria elimination, setting up technical working groups on P. vivax, vector control and surveillance and response. It brings scientists and programme managers together, partners with research institutions and other malaria stakeholders from the public and private sectors in order to develop fellowship programmes for collaborative peer-led trainings. APMEN organizes study tours to share field work experiences, and supports catalytic and implementation research programmes to inform future elimination strategies or implement specific programmatic actions in response to country needs.

• APMEN has been a significant contributor in accelerating the elimination agenda in the Asia Pacific through its core functions and, in that regard, it has undoubtedly become a model for other regions to consider. As high-level political will for malaria elimination is continuing to strengthen in that part of the world, two priorities have been identified for APMEN to support: mobilization of sustained commensurate funding levels to reach and maintain elimination; and fine-tuning of elimination implementation approaches involving private-public partnerships, community engagement, cross-sectoral work and cross-border activities.
APMEN AT A GLANCE

Network of countries and institutions committed to working collaboratively towards malaria elimination.

Composed of the national malaria control programmes (NMCPs) of countries in the Asia Pacific with formal commitments to elimination, in addition to partner institution representatives from academic, development, government, nongovernmental and private sectors, and global agencies.

Works towards elimination by supporting NMCPs of partner countries; acting as a collegial platform for knowledge sharing; bringing scientists and programme managers together; building the evidence base for priority actions to achieve elimination; generating collaborative research and training; facilitating innovative partnerships; building advocacy and leadership for long-term support for elimination.

Key activities include the annual technical and business meetings; working group meetings; APMEN fellowships; other capacity building trainings; catalytic and operational research through the country partner technical development programme; matrix database of elimination programmes in partner countries; gap analyses for core elimination topics; developing tools for capacity development; advocacy.

Key points of connection are the annual technical and business meetings; Vivax working group; Vector Control working group; Surveillance and Response working group; advisory board; secretariat, social media.
**Box 1: What has been achieved?**

### Leadership and advocacy
- Created country-led forum to drive elimination agenda in the Asia Pacific.
- Increased awareness of country successes and regional capacity to achieve elimination.
- Drove catalytic action and interest around malaria elimination.
- Accelerated efforts to address the challenges of *P. vivax*.
- Facilitated innovative partnerships amongst a wide range of stakeholders involved in malaria elimination.

### Capacity building
- Developed a highly successful fellowship programme for collaborative peer-led trainings.
- Established or cosponsored other training programmes in response to country partner needs.

### Knowledge exchange
- Brought together stakeholders for meetings, working groups and study tours to share experiences and knowledge, identify priorities and develop strategies for elimination.
- Provided collegial platform for discussion, boosting motivation and exchanging ideas.
- Fostered action-oriented knowledge exchange (task-specific study tours to disseminate best practices, “hands-on” mentoring approach).

### Building the evidence base
- Identified priorities for advocacy, leadership and operational research (*P. vivax*, vector control and surveillance/response) to help identify strategies and operating procedures for elimination implementation.
- Created technical working groups on *P. vivax*, vector control, and surveillance and response.
- Supported operational research through research grants, addressing priority areas identified by the Vivax working group.
CHAPTER I

THE FORMATIVE YEARS

APMEN formed in 2009 in recognition of the dramatic successes in malaria control that countries across the Asia Pacific were achieving, supported by global partners including WHO, the RBM Partnership and the Global Fund to Fight AIDS, Tuberculosis and Malaria (Global Fund). Elimination had once again become a feasible goal, yet many countries remained hesitant to establish formal elimination targets, lacking the necessary technical, operational and political support. This was a time of growing political support for malaria elimination globally and in the region, including from the Australian Government. Those champions for elimination mobilized high-level political support, funding and key partners to enable countries to come together in this new forum. As a network, APMEN has enabled country programme managers and other stakeholders to cooperate, share with and learn from each other to achieve their individual country targets and the long-term collective regional goal of eliminating malaria. It has also provided a complement to the existing suite of support and technical advice provided through WHO, the RBM Partnership and others.

APMEN developed at a time when malaria control was rapidly progressing on a global level. Between 2000 and 2010 malaria incidence declined globally by 17% and mortality rates declined by 26%. In 2007, Bill and Melinda Gates made a call for global malaria eradication, with support from the WHO Director-General Margaret Chan and several heads of state. The RBM Partnership, development of the Global Malaria Action Plan in 2008 and the Regional Action Plan for Malaria Control and Elimination in the Western Pacific (2010–2015) in September 2009, as well as the establishment of the Global Fund, with the subsequent increases in funding and technical assistance to many malaria programmes in the region added momentum to the elimination agenda.

Malaria elimination remained controversial in the wake of the missed objective of the Global Malaria Eradication Program (GMEP). Although the GMEP facilitated the malaria-free certification of 20 countries between 1955 and 1972 (including Taiwan in 1965), the programme ended in 1972 as a result of technical and operational challenges such as chloroquine and dichlorodiphenyltrichloroethane (DDT) resistance and waning funding and political commitment. In 1969, WHO recommended a reorientation of the programme to one of control, and most national programmes switched to a goal of malaria control from 1970.

Some countries in the Asia Pacific, however, sustained the national elimination programmes they had begun during the GMEP era, and Australia (1981), Brunei Darussalam (1987), the Maldives (1984) and Singapore (1982) eventually achieved WHO malaria-free certification. Although the NMCPs of many countries have faced ongoing operational and technical challenges, by 2009 a large number of countries had successfully reduced malaria. Some notable successes included Bhutan, China and Sri Lanka which had greatly reduced their case loads, while countries such as Malaysia, the Republic of Korea and Thailand were achieving rapid successes and demonstrating strong country capacity within their NMCPs. These country successes were followed by growing political and funding support, so that elimination once again seemed feasible. Interest in malaria elimination was growing at the global level and particularly in the Asia Pacific region.
There was a need, therefore, for a complementary platform to bring recognition to successes and to stimulate international support for the next phase for malaria, that of elimination from the region. Historically, malaria in the Asia Pacific has received marginal global attention, despite high prevalence and an underestimated burden, with most programme and technical support directed towards the high mortality of *Plasmodium falciparum* (*P. falciparum*) malaria in Africa. In 2008, approximately 2.2 billion people in Asia Pacific were at risk of malaria, representing 67% of the world population at risk. The Asia Pacific region is culturally and linguistically diverse, and consists of low-, middle- and high-income nations. The malaria risk of countries in the region is highly heterogeneous, but many countries face similar challenges (see Box 2).

In 2006 the Australian Government, recognizing malaria continued to be a major health burden and barrier to economic development, declared reducing malaria in the region a high priority and made a substantial funding commitment. Australia initially focused on intensifying malaria control in the Pacific through the Pacific Malaria Initiative (PACMI) and established the Malaria Reference Group.

As successes in intensified malaria control and elimination became visible, prominent figures in the field, including in WHO and the RBM Partnership, began to discuss the need for a regional, country-led forum to help countries mobilize the political, technical and financial support necessary to pursue elimination. A regional approach to elimination in Asia Pacific was seen to be necessary for many reasons:

- It would enhance the leadership to support malaria elimination by providing a platform through which regional countries could collectively address the global malaria community.
- It would improve knowledge exchange across countries.
- Common elimination challenges are multi-country in nature, for example populations at higher risk for malaria that are mobile and may move across porous borders.

Development of the network took place in 2008 through the leadership of the Australian Government, the School of Population Health of the University of Queensland, and the University of California, San Francisco (UCSF) Global Health Group, directed by Sir Richard Feachem, in close collaboration with the WHO Global Malaria Programme (GMP) and the Regional Offices for South-East Asia (SEARO) and the Western Pacific (WPRO).

Although political support for a regional elimination network had been implicitly established over several years, the Australian Government made its first official commitment to APMEN on 25 September 2008. Mr Kevin Rudd, the Prime Minister of Australia, attended the Millennium Development Goals Malaria Summit at the United Nations General Assembly in New York stating “Australia’s responsibility, as we see it, is to take the lead in eliminating this terrible disease among our Pacific Island neighbours, and we will do so.” He also announced the inaugural meeting of APMEN would be held in Brisbane in February 2009.

The announcement of the formation of APMEN confirmed the high-level political support for such an initiative. The Pacific Malaria Initiative Support Centre (PacMISC) and the School of Population Health at the University of Queensland were tasked to assist the Australian Government, the Malaria Reference Group and UCSF Global Health Group to convene the inaugural meeting.

The inaugural meeting drew representatives from the NMCPs of ten founding countries: Bhutan, China, the Democratic People’s Republic of Korea, Indonesia, Malaysia, the Philippines, the Republic of Korea, the Solomon Islands, Sri Lanka and Vanuatu.
Although not all APMEN countries were classified as elimination or pre-elimination countries by WHO, they were selected because they had all made commitments to national or subnational elimination in their national strategies and had achieved success in markedly reducing incidence. Some, such as Indonesia, the Philippines, the Solomon Islands and Vanuatu, were already partners in Australia-funded malaria programmes and APMEN built on this ongoing commitment from Australia for malaria control. Other countries were identified based on successes achieved by their malaria control programmes, the need for technical assistance to achieve elimination, and because they could offer valuable lessons for higher-burden countries preparing for elimination.

In addition to these ten founding countries, the inaugural meeting was attended by representatives from WHO headquarters, SEARO and WPRO, the RBM Partnership, Asian Collaborative Training Network for Malaria (ACT Malaria) and other malaria initiatives working in the Asia Pacific. Representatives from scientific and academic institutions carrying out operational research to support malaria elimination were also invited, which was a unique feature of the meeting. The meeting was attended by senior representatives from the Australian Government, so political support for the network was visible from the outset.

The meeting agenda showcased country progress and gaps in programme capacity, while WHO was invited to give an overview of malaria in the region. *P. vivax* and vector control were identified as key thematic priorities, which later led to the formation of the Vivax working group and the Vector Control working group. It was mentioned that funding should be allocated for “emerging issues” since the needs and priorities of network partners could be expected to change over time. Advocacy and leadership were also nominated as important areas of work for APMEN in order to bring recognition to countries and build the long-term support needed to achieve elimination.

A joint secretariat was established and shared between the School of Population Health at the University of Queensland and the UCSF Global Health Group. The University of Queensland was to manage the implementation of the Network’s work plan, governance document and reporting, and the grant budget for activities supported by the Australian Government. The UCSF Global Health Group provided additional support to the technical and strategic direction of the Network and provided personnel time to the joint secretariat through funding from the Bill & Melinda Gates Foundation. The Menzies School of Health Research received a subcontract through the University of Queensland to coordinate work on *P. vivax*.

Ideas generated at the inaugural meeting needed to be developed into a work plan and a draft governance document in order to secure funding and build the network structure. The joint secretariat developed drafts, and these were further refined in consultation with country partners. In November 2009, the Australian Government committed initial funding for APMEN of US$ 6.15 million over five years; by the second annual meeting in Sri Lanka in February 2010, APMEN had become an active and funded network with a country partner-ratified governance structure.

From the 10 founding countries, APMEN has evolved to a network including 16 countries (see Figure 1), 33 partner institutions, the WHO GMP, WPRO, SEARO and the RBM Partnership.
Ten countries are the “founding fathers” of the APMEN: Bhutan, China, the Democratic People’s Republic of Korea, Indonesia, Malaysia, the Philippines, the Republic of Korea, Solomon Islands, Sri Lanka and Vanuatu. Below are represented in different colours the countries having joined since 2011.


The inaugural meeting in 2009 was attended by 54 people; in 2013, the fifth annual technical meeting (APMEN V) in Bali (Indonesia) was attended by 160. The network continues to grow and potential new member countries and partner institutions sharing the vision of malaria elimination have expressed an interest in joining. WHO, the RBM Partnership and other major regional and global partners have continued to engage in and support the network and its activities.
APMEN aims to support malaria elimination efforts in the region in four areas:

- leadership and advocacy for elimination
- capacity building
- knowledge exchange
- building the evidence base on elimination.

APMEN supports a number of programmes and activities to achieve these aims. Some of its most well-known activities include the annual technical meeting; the annual business meeting; the Vivax working group; the Vector Control working group; the APMEN fellowships; the country partner technical development programme (previously known as the research grants programme); and other capacity building trainings. The work plan, composition and activities of the network have evolved over the years to reflect the views of the network and the changing malaria landscape (e.g. the recent formation of the Surveillance and Response working group in 2013 voted for by the country partners).
### Figure 2
Strategic elimination goals* of APMEN countries (as of June 2014)

<table>
<thead>
<tr>
<th>Country</th>
<th>Goal 1</th>
<th>Goal 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Democratic People’s Republic of Korea</td>
<td>By 2012 Reduce overall malaria morbidity by 50% compared to 2007 levels.</td>
<td>By 2012 Reduce morbidity in the higher transmission zone by 70% compared to 2007 levels.</td>
</tr>
<tr>
<td>Federal Democratic Republic of Nepal</td>
<td>By 2016 Reduce malaria by 90% compared to 2011 levels.</td>
<td>By 2026 Achieve a malaria-free Nepal.</td>
</tr>
<tr>
<td>Kingdom of Bhutan</td>
<td>By 2016 Achieve zero local transmission.</td>
<td>By 2016 Achieve zero malaria deaths.</td>
</tr>
<tr>
<td>Kingdom of Cambodia</td>
<td>By 2015 Scale up prevention and control activities; address artemisinin resistance.</td>
<td>By 2020 Pre-elimination with a focus on <em>P. falciparum</em>.</td>
</tr>
<tr>
<td>By 2020</td>
<td></td>
<td>By 2025 Elimination programme for all forms of malaria.</td>
</tr>
<tr>
<td>Kingdom of Thailand</td>
<td>2008 to 2012 Reduce malaria in the population at risk by 50%.</td>
<td>2008 to 2012 Reduce morbidity and mortality rates by 50%.</td>
</tr>
<tr>
<td>By 2020</td>
<td></td>
<td>By 2020 80% of Thailand is malaria free.</td>
</tr>
<tr>
<td>Lao People’s Democratic Republic</td>
<td>By 2015 Reduce malaria morbidity and mortality by 75%.</td>
<td>2011–2025 Roll out elimination in selected provinces.</td>
</tr>
<tr>
<td>By 2020</td>
<td></td>
<td>By 2020 Eliminate locally acquired human-only malaria by 2020.</td>
</tr>
</tbody>
</table>

*These goals are subject to revisions and updated targets set out in national malaria strategic plans.
<table>
<thead>
<tr>
<th>Country</th>
<th>Year(s)</th>
<th>Goal Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>People’s Republic of Bangladesh</td>
<td>By 2016</td>
<td>Achieve zero malaria deaths.</td>
</tr>
<tr>
<td></td>
<td>By 2016</td>
<td>Achieve phased elimination in target districts.</td>
</tr>
<tr>
<td>People’s Republic of China</td>
<td>By 2015</td>
<td>No indigenous cases in the preceding three years in all Type III countries.</td>
</tr>
<tr>
<td></td>
<td>By 2017</td>
<td>No indigenous cases in the preceding three years in Type I and non-border Type II countries in Yunnan province.</td>
</tr>
<tr>
<td></td>
<td>By 2020</td>
<td>Indigenous malaria elimination in the whole country.</td>
</tr>
<tr>
<td>Republic of Indonesia</td>
<td>By 2015</td>
<td>Malaria elimination in low transmission provinces (Java, Balim and Batam).</td>
</tr>
<tr>
<td></td>
<td>By 2020</td>
<td>Malaria elimination in intermediate/variable transmission provinces (Sumatra, Kalimantan and Sulawesi).</td>
</tr>
<tr>
<td></td>
<td>By 2030</td>
<td>National malaria elimination.</td>
</tr>
<tr>
<td>Republic of Korea</td>
<td>2010–2015</td>
<td>Reduce malaria incidence annually by 25%.</td>
</tr>
<tr>
<td></td>
<td>By 2017</td>
<td>Achieve zero indigenous malaria cases.</td>
</tr>
<tr>
<td></td>
<td>By 2020</td>
<td>Eliminate malaria.</td>
</tr>
<tr>
<td>Republic of the Philippines</td>
<td>By 2014</td>
<td>Achieve zero deaths due to malaria.</td>
</tr>
<tr>
<td></td>
<td>By 2020</td>
<td>Reduce malaria incidence rate by 80% compared to 2013 levels.</td>
</tr>
<tr>
<td></td>
<td>By 2030</td>
<td>Achieve a malaria-free Philippines.</td>
</tr>
<tr>
<td>Republic of Vanuatu</td>
<td>By 2016</td>
<td>Eliminate malaria from one province.</td>
</tr>
<tr>
<td></td>
<td>By 2025</td>
<td>Achieve a malaria-free Vanuatu.</td>
</tr>
<tr>
<td>Socialist Republic of Viet Nam</td>
<td>By 2015</td>
<td>Maintain elimination in 34 provinces/municipalities.</td>
</tr>
<tr>
<td></td>
<td>By 2030</td>
<td>Eliminate malaria in 40 provinces.</td>
</tr>
<tr>
<td>Solomon Islands</td>
<td>By 2014</td>
<td>Eliminate malaria in Isabel and Temotu Provinces.</td>
</tr>
<tr>
<td></td>
<td>By 2035</td>
<td>Achieve a malaria-free Solomon Islands.</td>
</tr>
</tbody>
</table>
Box 2: The challenges of *Plasmodium vivax*, specific vectors and low disease burden in Asia Pacific

While *P. falciparum* continues to persist in some countries, *P. vivax* is common throughout the region. In 2009, 91% of the global burden of *P. vivax* was concentrated in Central and South-East Asia.\(^29\) *P. vivax* has several characteristics that make it difficult to eliminate. Unlike *P. falciparum*, once *P. vivax* has infected a person the parasite can remain dormant in the liver, for which there is no diagnostic test. *P. vivax* infections may also relapse 0–12+ months later and can cause asymptomatic infections that are difficult to capture in the general population. *P. vivax* is distributed over a wide geographical range, as it can develop in tropical, subtropical and temperate regions and since it produces hypnozoites inside its human host, although tropical *P. vivax* infections are more prone to relapse.\(^30\) In addition, *P. vivax* transmission can occur before any symptoms of malaria may appear, making it less responsive to conventional control methods.\(^31\) *P. vivax* is, therefore, more difficult to eliminate and tends to become proportionately more frequent as countries near elimination.\(^32\) However, *P. vivax* infections were not well understood and accounted for only 3.1% of expenditures on malaria research between 2006 and 2009.\(^33\) This neglect may have been due to the common misperception that *P. vivax* is benign.\(^34\) As APMEN was being formed in 2009, there were large gaps in understanding of *P. vivax* biology and the safe and effective treatment of infections, such as how to treat the blood stage, prevent relapse and safety concerns surrounding the use of the drug primaquine in people with glucose-6-phosphate dehydrogenase (G6PD) deficiency.\(^35\) APMEN continues to address these gaps through advocacy for *P. vivax* research and development and building regional capacity to support this research.

There are also several vector-related challenges facing many countries in the region. Malaria transmitting vectors are more diverse in Asia Pacific...
than in any other region, with 19 incriminated dominant vector species. Defining effective vector control measures requires a well-developed knowledge of habitat and behaviours. In the region there are a large number of outdoor biting vectors that are more difficult to reach through indoor residual spraying (IRS) and insecticide-treated mosquito nets (ITNs), the mainstay of vector control. The Solomon Islands and Vanuatu are attempting to control vectors that breed in brackish water along coastal areas. There are numerous forest vectors that breed in small ponds, yet larviciding and vector control methods suitable for outdoor breeding and outdoor resting vectors are not well understood. In addition, some forest malaria occurs in places and populations that are hard to reach, such as along borders and in regions with increased population movements by indigenous groups, migrant workers or military operations. This calls for greater entomological skills, yet in the Asia Pacific there is insufficient training and knowledge on entomological surveillance and strategy building for vector control for elimination.

Finally, regional countries shared many challenges in adjusting to a low transmission context. As malaria incidence declined, the epidemiology of clinical malaria began to shift from traditional at-risk groups of children and women towards adult men and populations for whom services are not reaching, suggesting the need for new interventions and strategies. In 2009, countries were facing a rising burden of *P. vivax* infections and asking how they should work in hard-to-reach places and populations. Many sought guidance on how to reduce and adapt the use of IRS and other vector control strategies as malaria prevalence decreased. Other regional challenges included mobility across shared land borders, managing malaria control amid conflict and political instability, and detecting and responding to imported malaria.
AN ACHIEVING NETWORK

APMEN has achieved several successes in its core areas of advocacy and leadership, knowledge exchange, capacity building and building the evidence base for elimination. It has developed a country-led network with a strong sense of country ownership, progressing the elimination agenda in the region by providing advocacy and leadership for elimination and bringing attention to challenges and successes. Through annual meetings, working groups, study tours and workshops, APMEN partners are able to share experiences, identify priorities and develop strategies. APMEN builds capacity via training activities, including its fellowships programme, while the working groups and the country partner technical development programme have built the evidence base on matters of critical importance to the region. Central to APMEN’s success has been its well-developed governance processes, its collegial and collaborative platform and the diverse composition of the network that supports a collaborative approach to elimination within the network and with other critical malaria partners, such as WHO and the RBM Partnership.

a. Creating a country-led elimination network

One of APMEN’s key achievements has been creating an innovative, country-led network through which stakeholders can come together to work collectively toward elimination. The network’s unique composition provides benefits to countries that are not readily available through conventional aid arrangements. Arguably the most important of these, it supports mutual learning and sharing between countries, working with assistance from academic, private sector and international and funding organizations. The governance structures were developed from the outset to ensure the substantive work plan, priorities and composition of the network are driven by the country partners. APMEN partners report these governance procedures work smoothly and their sense of ownership of the network has developed over time as APMEN has developed an institutional identity and country partners have taken a more visible lead in decision-making. In addition, the secretariat arranges annual meetings that showcase
country knowledge and successes, prioritize country decision-making and focus discussion to allow countries to work towards consensus on priorities.

The inclusive atmosphere of APMEN has also nurtured country ownership of the network, with partners able to openly debate ideas, discuss experiences and identify priority areas for future work. This open discussion is valued by partners and has boosted motivation. This collegiate spirit has developed a sense that regional malaria elimination is mutually beneficial for all countries. Many partners say the network empowers them by bringing them together in a forum with people with a shared vision. Some describe the network as a “community of practice” and many enjoy the multiple points of connection the network structure fosters.

This country ownership is reflected in the activities that APMEN supports, such as peer-to-peer knowledge sharing and collaborative research and training activities. For example, many APMEN partners value the opportunity to send staff to institutions within the region for fellowships and other training, as this equips them with skills most relevant to addressing emerging regional issues, helps establish informal partnerships in the region and builds upon existing expertise.
Annual meetings are structured to support country ownership of the network.

A collegial atmosphere allows for open debate and supports country ownership of the network.
Box 3: Malaysia sharing 50 years of experience in malaria control

By Dr Christina Rundi, Director, Sabah Health Department, Ministry of Health, Malaysia, and Chair of APMEN Vector Control working group

Malaysia is a founding member of APMEN. At its inception in 2009, Malaysia committed to the elimination of locally acquired malaria by 2020. Malaria, once rampant in Malaysia in the 1960s when there were more than 200,000 cases a year, had declined to about 7000 cases in 2009. The story of malaria and Malaysia’s successful achievement is an account of sound policy, political will and a celebration of many hard-working committed local champions. However, it remains a public health burden in some rural areas, especially in Sabah and Sarawak.

Through APMEN, Malaysia has shared her almost 50 years of experiences in malaria control. During annual meetings, delegates are able to understand better the strategies that need to be strengthened during the elimination phase, technologies such as the use of GPS for documentation and planning, and the role of research in elimination, particularly on *P. vivax*.

Malaysia hosted APMEN III in Kota Kinabalu, Sabah (East Malaysia) in May 2011. During the study trip, delegates met health volunteers who continue to be important team members in malaria control and elimination, especially in the state of Sabah. Their involvement in the control programme began on an ad-hoc basis when their main task was to obtain blood slides from villagers with fever. Their participation was formalised in 1987 and gained state-wide acceptance. In addition, formal training was put in place and their responsibilities were extended to vector control activities, such as IRS and retreatment of bednets within their communities.

Malaysia is on track to achieving elimination by 2020 and APMEN has contributed to this success. Malaysia continues to be a productive and resourceful member of APMEN in the push to eliminate malaria in the Asia Pacific region.
b. Elimination becomes a regional goal

In just a few years, APMEN has witnessed the achievement of one of its original core aims, which was to advocate for malaria elimination, provide legitimacy to the subnational elimination targets of partner countries and support the development of leadership for elimination in the Asia Pacific. The network’s efforts have added further weight to those of the WHO and the RBM Partnership also with these aims. To be eligible to join the network, countries must have committed to national or subnational malaria elimination in their national malaria control strategy. Some, such as Sri Lanka, joined when they were close to achieving elimination but needed further support to sustain it. Other countries, such as Thailand, joined the network because they had already achieved subnational elimination in several provinces and were seeking regional perspectives as they concentrated on addressing border malaria.

The endorsement of the Western Pacific elimination goal in the regional action plan (2010–2015) provides a framework for complementary support in the Western Pacific parts of the Asia Pacific region.

Many countries report that prior to APMEN’s formation, elimination seemed largely unachievable, with ministers not convinced of the feasibility of elimination. APMEN advocacy has helped them achieve a commitment to elimination within their NMCPs and ministries of health. APMEN has encouraged countries to establish formal national and subnational elimination targets and strategies, and has facilitated the necessary technical, operational and political support. The network is continuing to expand as countries attend meetings as observers with an interest in joining APMEN.
Box 4: Country motivations for joining APMEN

By Mr Mario Baquilod, Division Chief, Infectious Disease Office, National Center for Disease Prevention and Control, Department of Health, Philippines, and Member of the APMEN Advisory Board

The vision for our country is a malaria-free Philippines by 2030. We aim to achieve this through four specific strategies: i) universal access to preventive measures, diagnosis and treatment; ii) strengthened governance and human capacity at all levels; iii) secured government and non-government financing in support of malaria elimination, and iv) reinforced health information and regulations (vector control measures, diagnosis and treatment).

Over the last 12 months the main programmatic activities I have been coordinating with my team and the provinces are:

• A comprehensive external national malaria programme review, which started during the first quarter of 2013 in collaboration with the College of Public Health, University of the Philippines Manila (academia), development partners (WHO Country Office, WPRO and WHO headquarters), local and external consultants, the private sector (PSFI) and local government units.


• Development of the Concept Note for malaria under the New Funding Model, which was submitted to the Global Fund on 15 May 2014.

• Coordination and collaboration with related government in the development of programme activities for special populations (Overseas Filipino Workers [OFW], military personnel, indigenous populations, communities with developmental projects, displaced populations). We are starting to gather baseline data.

One of the biggest challenges over the last few years has been sustaining sufficient and trained health workers in malaria. With the implementation of the rationalization of government workers, our trained workers were either transferred to other health programmes, or had early retirement. This becomes more of a challenge as we are enhancing our capability to implement a sound disease surveillance and response system. Another challenge has been ensuring universal coverage of health services to all high risk populations, especially those living in hard-to-reach areas, mobile populations. Additionally, responding to outdoor transmission is a challenge, certain population groups in high transmission areas being engaged in late night outdoor activities and therefore exposed to vector mosquito bites. There have been notable successes. The programme was able to mobilize trained malaria microscopists and hence improve early diagnosis and prompt treatment. These volunteers were trained to provide treatment under the supervision of the local health physician. Also, with the deployment of the volunteer health workers, the need for quality health services became more apparent. The programme implemented a quality assurance system for microscopy to ensure that diagnosis is maintained to high standards.

The Asia Pacific Malaria Elimination Network has supported the Philippines’ efforts towards malaria elimination. It has specifically provided the following:
• A forum for sharing information on various concerns, such as *P. vivax*, vector control (long-lasting insecticidal nets [LLINs] and IRS), disease surveillance and response, leadership, operational research and relevant institutions/academia involved in malaria.

• Capacity building: a staff from the Research Institute for Tropical Medicine was trained on vector mapping, she is now helping the programme conduct entomological assessment of low risk and malaria-free areas. Other trainings attended were on geographic information systems (GISs) and disease surveillance and response.

• Conduct of operational research on *P. vivax* and G6PD in Palawan.

• Co-financing and supporting training on malaria elimination (early 2014) implemented by WPRO and SEARO.

I believe that APMEN has provided an opportunity for country programme managers to enhance further their malaria elimination plans and programmes. It has linked us with the vast technical resources outside the Asia Pacific region such as the academia, development partners, research institutions, as well as with programme managers for us to compare and replicate successes, and avoid failures. As one programme manager has said, with the advances of travel, it would be very difficult for a country to remain malaria free if his or her neighbouring countries are not, but once the whole region is malaria free, chances of sustainability are higher.

APMEN should continue its facilitation role in the region on malaria elimination. Health systems strengthening should be a priority, especially in disease surveillance and response. It needs to continue its current efforts on *P. vivax*, vector control, leadership training, capacity building and on the development of the Global Technical Strategy and the second *Global Malaria Action Plan* (GMAP2). I would expect APMEN to play a vital role in translating these important documents to support our efforts towards malaria elimination.
c. Building awareness of successes and challenges in the Asia Pacific

A core goal of APMEN has been to highlight the successes of countries in the Asia Pacific and to build advocacy and leadership for malaria elimination. APMEN has sought to provide a forum for countries to leverage support to sustain successes and work with others in the region to achieve shared goals. APMEN allows countries to voice their experiences of malaria elimination in a collegial environment, giving visibility to the region at global level.

APMEN has brought recognition to successes within the region. The annual technical and business meetings, the technical working groups and other meetings and workshops create a tangible presence of the region within the global malaria community. As countries come together to voice their experiences, APMEN highlights the progress being made towards elimination, focusing global attention on emerging issues within the Asia Pacific. At the annual meeting, country partners give updates on progress by their NMCPs, particularly in regard to the meeting’s theme. For example, at APMEN IV in Seoul in 2012, representatives from the Indonesian NMCP and UNICEF, which is working with the Ministry of Health in the province of Aceh, shared an overview of their surveillance and response activities, particularly the successes achieved on the island of Sabang. Four of the six countries that have joined APMEN since 2009 are combating malaria within the Greater Mekong Subregion (GMS). As a result, issues facing the GMS, such as porous borders and drug resistance, have become part of APMEN discussions and interested observers from across the globe have been drawn to the network. The Vivax working group has been highly active, expanding awareness of \textit{P. vivax} at a global level.

In addition to meetings and workshops, APMEN helps partners produce publications and products, such as the \textit{Atlas of the Asia Pacific Malaria Elimination Network} and the \textit{Vector Pocket Guide: Malaria Vectors in Asia-Pacific Countries}. Other products include country briefings and posters showcasing APMEN-supported activities. A number of peer-reviewed publications have brought attention to APMEN and to progress being made in the region. Branded products operate as an advocacy device to highlight the network itself and bring attention to countries in the region.

APMEN’s growing visibility also brings recognition to the region, the six countries joining since its formation in 2009 reflecting a growing interest in the network and in elimination. In addition, the number of observers at the annual meetings has grown steadily. APMEN was highly visible at the Malaria 2012 meeting hosted by the Australian Government in Sydney, attended by political figures and malaria experts from across the region and globally. APMEN welcomed the formation of the APLMA, the country partners for several years stressing the need for high-level political engagement on such issues as the quality of antimalarial pharmaceuticals, border malaria and preventing the spread of artemisinin resistance, and a long-term commitment to regional elimination.
d. Sharing and learning from others’ experiences

APMEN, recognizing that sharing and learning from others’ experiences is central to achieving elimination, has developed a range of knowledge-sharing activities that help identify priority areas for action and the need for capacity building among malaria programme staff. Face-to-face meetings are essential to developing a shared agenda, as are practical opportunities to observe elimination programmes, such as the study tours. While APMEN enables countries to agree on priority areas for action, the thematic focus of APMEN discussions changes in response to the changing malaria landscape. Adaptability and flexibility allow for knowledge exchange to remain relevant to the evolving needs of countries as they move towards elimination.

Identifying priority areas for action

One of the core aims of APMEN is to facilitate knowledge exchange across the region and help countries identify priority actions. In 2009, in addition to establishing malaria elimination as the central theme of APMEN, the founding members identified *P. vivax* and vector control as priority focus areas. This guided the development of the annual work plan and led to the formation of the two technical working groups. At subsequent meetings, the work area of GIS was identified, and led to the GIS workshop and several research grants and fellowships. Community engagement, advocacy and leadership were other topics that developed from annual meetings and were translated into workshops.
and fellowships. The Surveillance and Response working group, launched in 2013, evolved from discussion and debate at annual meetings. Topical issues are developed into work streams because the face-to-face interaction of network partners and governance processes allow for flexibility to respond to emerging priorities. APMEN documents also help countries identify priority areas for action. For example, APMEN co-supported a study on Sri Lanka’s elimination efforts as part of the malaria elimination case study series, activities that help programme managers better understand the region, identify priority actions and develop strategies to respond to the emerging challenges.

Building dialogue between programme managers and scientists

APMEN is a forum in which policy-makers, scientists and other stakeholders can help each other to achieve the shared goal of malaria elimination. APMEN partners include country programme managers, research institutes, implementing and training nongovernmental organizations, bilateral and multilateral donors, foundations, United Nations agencies, innovators, industry and other malaria networks. APMEN’s diverse expertise is an important value-add to the regional health architecture, allowing knowledge and expertise to be exchanged across different programmes and scientific disciplines.

Many APMEN partners say diverse composition enables them to understand the “big picture” needed to progress towards elimination. For example, APMEN has helped programme managers to better understand the needs of their technical staff and the priorities and strategies employed by neighbouring countries. Country partners see APMEN as a mechanism to learn about evidence-based strategies and another avenue to strengthen the technical and programme capacity of their NMCPs. Programme managers recognize this broader understanding of emerging science and new interventions is necessary for them to develop programmes that are responsive to changing malaria situations within their country.

Likewise, many research-based partner institutions had limited opportunities to communicate their work to policy-makers and even fewer opportunities to work with policy-makers, such as country programmes, funders and other organizations, to develop the elimination agenda. Many partner institutions found APMEN helped them understand the political and logistical challenges of implementing an elimination programme. Joining APMEN has given them the opportunity to contribute to the development of better elimination strategies. In turn, their technical expertise helps countries to understand and adopt evidence-based elimination strategies.

Practical, peer-to-peer knowledge sharing

APMEN supports activities that enable partners to share practical experiences and expertise with their peers, and its fellowships are valued for this reason. Fellowships are usually based in the field or the laboratory, with training carried out by a mentor who guides fellows in developing technical and professional skills and learning through observation.

Study tours are another highly valued activity that enables partners to observe elimination efforts and strategies in other countries. Each year the NMCP hosting the annual meeting organizes a study tour to a site of interest to the country programme; these tours have included visits to referral and remote health clinics, vector control interventions and community mobilization schemes. Through study tours, partners are exposed to field activities and have an opportunity to ask questions about successes and challenges, giving the host country an opportunity for peer review and to build motivation in their team.
Sharing strategies for vector control at APMEN IV, Seoul (Republic of Korea).
For example, during APMEN V in Bali (Indonesia) in 2013, partners travelled to the municipality of Sabang in the province of Aceh, where staff from UNICEF and Indonesia’s Ministry of Health explained how they had achieved a 30-fold decline in incidence from 2008–2011 after observing the experiences of Sri Lanka on a tour carried out during the annual meeting in 2010 (see Box 5). As a result of that APMEN study tour, Aceh wanted to review the approach to subclinical parasitaemia and mass blood surveys, and to highlight the importance of political commitment to elimination. This practical knowledge exchange has been highly valued and effective in enabling NMCPs to develop elimination strategies responsive to the challenges faced by particular countries.

Box 5: Knowledge exchange in action, Aceh adapts lessons from Sri Lanka

By Dr Herdiana Herdiana, UNICEF Officer, Child Survival and Development cluster, UNICEF Indonesia Country Office

I attended the APMEN meeting in Sri Lanka in 2010. This was my first involvement in an international initiative to explore the experiences of other countries in malaria elimination. I work for UNICEF in collaboration with the Government of Indonesia building a model of malaria elimination in Indonesia. The elimination programme took place in Sabang municipality, Aceh province.

Together with the chief of the Ministry of Health in Sabang and the NMCP, I carried out a case study and epidemiology investigation, as well as routine case detection. The methods we used were based on those I observed in Sri Lanka on the study tour as part of APMEN II. We developed a local protocol for case study and epidemiology, and adjusted those lessons from Sri Lanka to local conditions in Sabang. I monitored the implementation of the new model in Sabang and, within three years, its protocol had been scaled up to other districts throughout Aceh.

Interestingly, while we learned our techniques at an APMEN study tour in Sri Lanka, APMEN country members later visited Sabang on a study tour in 2013. It was then that I realized the value of sharing experiences among countries or provinces that have similar goals of excellence. Many things inspired and stimulated me to think outside the box and try new things that others had used successfully. Together we can make a difference: I am a witness to it. I am proud to become part of the APMEN story.
e. Building partnerships

APMEN has facilitated strategic partnerships to support the goal of accelerating elimination in the Asia Pacific. One of the first key partnerships was between the Australian Government, the University of Queensland and the UCSF Global Health Group. Together, these partners established funding for the network and mobilized countries and other partners with a range of expertise. WHO regional offices and NMCPs of the ten founding countries became active partners, together with research institutions, such as the Menzies School of Health Research which coordinates the Vivax working group.

APMEN brings together 16 countries, 33 partner institutions and other organizations that contribute in various capacities. It also continues to build partnerships between NMCPs, research institutions, WHO SEARO and WPRO, the Roll Back Malaria Partnership, other malaria networks and donors from both the public and private sectors. APMEN has established formal partnerships beyond the network with initiatives, such as the Malaria Atlas Project (MAP), the Malaria Elimination Group (MEG), the WorldWide Antimalarial Resistance Network (WWARN), Malaria No More, Malaria Consortium and Jhpiego.

APMEN has generated informal partnerships within the network, these collegial ties and mentoring relationships valued by partners as a means to better understand the priorities of others across the sector and develop efficiencies in their own work. Since many partners participate in APMEN in a pro-bono capacity, this presents good value for money. However, these informal partnerships, while common and valued, tend to operate on an interpersonal rather than on an institutional level. Countries continue to pursue elimination independently but with increased knowledge sharing and a greater awareness of cross-regional issues and the strategies employed by others, knowing they have peers from whom they can seek support and advice.
Box 6: Partnerships in elimination, a series of country case studies on malaria elimination

The Malaria Elimination Group (MEG), a group of malaria elimination experts regularly convened by the UCSF Global Health Group since 2008, held its annual meetings in different eliminating country settings and saw first-hand i) that there was tremendous country progress underway, but ii) that these experiences were not well documented. Thus, in 2009, the Global Health Group began to document these experiences in a series of case studies of malaria eliminating countries. APMEN included case studies as part of its foundation five-year strategic plan.

The first countries that were approached for this series were Mauritius and Sri Lanka. Successive case studies were chosen to represent different regions, epidemiological contexts, and different phases along the spectrum of malaria control to prevention of reintroduction. Some case studies included an intensive expenditure costing analysis.

In 2011, the UCSF Global Health Group and the World Health Organization Global Malaria Programme realized that they were both developing separate series of elimination case studies with financial support from the Bill & Melinda Gates Foundation, and the decision was made to collaborate on a joint series instead. A collaboration and co-publishing agreement was drawn up to guide this work which would eventually result in ten country case studies: the Eliminating Malaria series. A Case Study working group was developed by the MEG, UCSF Global Health Group, WHO and APMEN as members of this group. The case studies were undertaken in close collaboration with national malaria control programmes and other important partners. The ultimate objective was to assist malaria-endemic countries in making well-informed decisions on whether or how to pursue malaria elimination. Understanding the experiences of other countries, particularly those countries in similar eco-epidemiological settings, was seen as an important step in this process.

Three of the four Eliminating Malaria case studies for which the UCSF Global Health Group took the lead described the experiences of APMEN country partners Bhutan, Malaysia and Sri Lanka, as did the jointly authored UCSF Global Health Group-WHO case study of the Philippines. APMEN contributed to the funding of these case studies and to the dissemination of the reports. These four case studies in APMEN partner countries have also resulted in strengthened collaborations with national health authorities and research institutes, leading to further research projects and other contributions of support to the network such as hosting APMEN meetings.
f. Collaborating to build capacity across the network

APMEN supports various capacity building activities, including fellowships, meetings and workshops. Collaborative approaches to capacity building are highly efficient and have a greater potential to carry benefits beyond the training participants, trainers and NMCPs of home and host countries. This collaboration also has secondary impacts, such as an increase in collegiality and motivation, the formation of partnerships across and beyond the network, recognition for the work being done by countries and the provision of models for other networks.

Fellowships programme

The fellowships programme was initiated in 2010 after participants at the inaugural meeting in Brisbane identified capacity building as a core APMEN activity. The fellowships aim to increase the technical aptitude and professional capacity of future leaders of NMCPs and to develop strategic partnerships between fellows and host and home institutes.

Candidates apply for a fellowship with official endorsement from their NMCPs or from their home institutes if based at a partner institution. Fellows are expected to provide feedback to the NMCP, to ensure fellowships are consistent with national programme priorities. Most malaria programmes endorse junior-level staff considered to be future leaders of NMCPs.
leaders within their country programmes and whose interests align with the strategic needs of the programme. Fellowship hosts may be other country partner malaria control programmes, research institutes or nongovernmental organizations and universities. In most cases, the NMCP or home institution of the fellow identifies the candidate, the field of training and the host institution, but in some cases the secretariat suggests a host institution and helps candidates prepare an application. The fellowships programme is designed to build the capacity of partners while facilitating partnerships across organizations.

APMEN sponsors five fellowships each year, which range from 4–11 weeks in duration, are funded by APMEN and cost from US$ 4700 to US$ 14 000 supplemented by in-kind contributions by the host institution and staff. While some fellows attend formal courses in academic institutions, most work closely with a mentor from a partner institution. This hands-on approach helps develop a broad range of technical and professional skills in a network that supports their ongoing work. Fellowships have focused on topics such as vector taxonomy and mapping, genotyping *P. vivax*, G6PD mapping, spatial epidemiology, GIS and community engagement. In 2013, APMEN introduced a thematic fellowships programme, inviting applications for fellowships on topics of critical interest identified by network partners.

Almost all fellows have reported learning new skills they have integrated into their ongoing work. These include technical skills, such as training in GIS, vector identification or G6PD screening and mapping, which have been identified as key areas for achieving progress in elimination programmes, together with other professional skills such as field and laboratory management, grant writing and cross-cultural communication. Fellows often find that although certain types of expertise may not have been available in their home country, knowledge was available within the region. For example, one fellowship recipient travelled to a neighbouring country to learn techniques for vector identification and mapping, which she was able to incorporate into ongoing work in her home programme.

For some fellows, this experience is their first formal training in their field of work. This has frequently been the case for fellows working within NMCPs. Many see their fellowships as opportunities for their own professional development and that of their peers. While not a requirement of the fellowships programme, many took the initiative to establish ongoing training activities within their home institutions after completing their fellowship, training peers or staff from other infectious and vector-borne disease control programmes.

The collaborative nature of APMEN fellowships has a secondary impact that capacity building activities by experts outside the region might not achieve. Collaborative capacity building brings benefits to training participants, their trainers and to the host and home institutions. Peer-to-peer training within the region increases pride and motivation since it recognizes the skills of programme managers and scientists. In-country, practical approaches to training help to broaden awareness of regional issues and of the variety of strategies and elimination experiences.

While almost all fellows have described the fellowships programme as a highly valuable source of training, some were disappointed they were able only to partially implement the new skills. Many returned highly motivated to influence policy, but found that their ideas could not always be accommodated within their national programmes. It is accepted, however, that it will take time for this capacity building to transform into broader programmatic or policy change.
The APMEN fellowships programme supports future leaders in malaria elimination through collaborative training activities (featured here, clockwise from top left: Frilastia Yudiputi, Majhalia Torno, Ervi Salwati, and Pema Sandrup and Tshering Dema).
Box 7: Fellowship aids understanding of vector diversity in Philippines

By Ms Majhalia Torno, Entomologist, Research Institute for Tropical Medicine, Philippines (APMEN fellowship recipient, 2010)

In 2010, I applied for an APMEN fellowship grant with a proposal to receive training in anopheline mosquito taxonomic identification and GIS mapping. The objective was to improve my identification skills for re-evaluating mosquito diversity in the Philippine Islands and to contribute to mosquito distribution information that had not been revisited for more than three decades. The Vector Biology and Control Department of the Armed Forces Research Institute of Medical Sciences (AFRIMS) hosted the training from 16 October 2010 to 19 November 2010.

The fellowship provided me with the necessary skills to undertake the considerable task of re-evaluating the mosquito diversity in the numerous islands of the Philippines. Since dedicated funding for this research was unavailable at the time, mosquito collection was conducted as part of other funded
activities, such as insecticide resistance monitoring, entomological investigation for other mosquito-borne diseases and malaria-free assessment. I have also completed basic training on mosquito collection and preservation, and participated in the national integrated vector management training programme to build the capacity of sanitary inspectors and other health workers at local health facilities and encourage them to conduct mosquito collections. This not only encouraged mosquito collection activities, but also strengthened institutional and/or interagency linkages and collaborative efforts for vector surveillance. It has also increased awareness of the value of vector surveillance in controlling mosquito-borne diseases.

Mosquito diversity assessment has been performed in 50 municipalities of 27 provinces through field collections and submissions from local health units. This is but a fraction of the 81 recognized provinces, but variation in the spatial distribution of malaria vector species was already evident when GIS maps of literature data and current collections were compared. It is highly probable these changes in vector distribution and abundance may be linked to the non-uniform malaria stratification of the Philippine archipelago, with the changing environmental conditions as contributory factors.

The fellowship has provided me with good foundation to pursue understanding of malaria vector diversity, distribution and abundance in the Philippines, and this new information will help us reinforce elimination efforts in the country.

Other workshops and training activities

Other trainings and workshops supported by APMEN include the GIS workshop in Shanghai (China) a community participation meeting in Chiang Mai (Thailand) and an advocacy workshop in Manila (Philippines). Workshops aim to build capacity to fill gaps in knowledge, capacity or offerings available from other partners, and are identified by network partners at annual meetings and in the APMEN work plan.

For example, at the APMEN II and APMEN III meetings in 2010 and 2011, a lack of capacity for using GIS for elimination in APMEN countries was identified. A survey of what had already been undertaken in APMEN countries showed factors inhibiting the development of GIS skills, namely a lack of trained staff, a lack of access to training and the cost of GIS training. A short course based on the needs identified in the survey was held in Shanghai in November 2011 under the aegis of APMEN, the Malaria Atlas Project/Oxford University, the University of Queensland and the National Institute of Parasitic Diseases, Chinese Center for Disease Control and Prevention (NIPD, China CDC). Most participants found the course enabled them to develop skills they could implement in their country, many leaving with a desire to learn more about GIS and continuing communication with the GIS training facilitator or partner institutions, and some conducting capacity building training in their home countries. After the training, GIS continued to be a common theme raised at annual meetings. Partners wanted to further their knowledge of the potential applications of GIS in an elimination context, including for instance for active case detection. The recognition that surveillance and response was a weakness in many elimination strategies, together with this interest in GIS, contributed to the country partners voting for the formation of the Surveillance and Response working group in 2013 to be coordinated by the Jiangsu Institute of Parasitic Diseases, China.

The network has continued to identify areas for capacity building, such as an advocacy workshop in the Philippines in September 2013.
When APMEN was formed in 2009, there was limited support for researchers from the region to expand their knowledge on critical issues for malaria elimination in the Asia Pacific. The Vivax working group, the Vector Control working group and the Surveillance and Response working group seek to build the evidence base on malaria elimination. In addition, the country partner technical development programme has expanded the knowledge base of *P. vivax*. While these activities are seen as important, there has been debate on the extent to which APMEN should support research. The network has taken steps to give countries greater control over the research agenda by identifying operational research priorities and allowing for flexibility and adaptation. This illustrates to others the importance of defining the relative priorities of a network, developing mechanisms to ensure operational research needs are identified by countries, and ensuring a network can adapt and respond to challenges as they arise.

**Vivax working group**

Active since the early stages of APMEN, the group is coordinated by a team at the Menzies School of Health Research in Darwin (Australia). *P. vivax* was identified as a topic to be addressed at the inaugural meeting in 2009, since diagnosing, safely treating and preventing relapses of *P. vivax* were identified as key challenges to reaching elimination in the region. Presentations discussed the significance of *P. vivax* to elimination and to public health, emphasizing that it was often poorly understood in comparison with *P. falciparum*. Critical knowledge gaps that needed to be addressed were identified as follows: optimizing the treatment of blood stage; understanding relapse and achieving radical cure; risks, prevalence and diagnosis of G6PD deficiency; and diagnostics for case management and population surveillance. At APMEN III in Kota Kinabalu (Malaysia), the Vivax working group decided to focus on the themes of diagnostics, treatment and surveillance.

The group has held annual meetings in conjunction with each APMEN annual meeting, with a series of workshops to share knowledge and identify priority areas for progressing the evidence base for *P. vivax*. For example, the group held a workshop on G6PD deficiency and primaquine treatment in the Asia Pacific in conjunction with APMEN IV in Seoul (Republic of Korea) in May 2012. Following discussions at this workshop, the working group published a comprehensive literature review on knowledge gaps associated with *P. vivax*. In addition, the group has played a critical role in supporting operational research on *P. vivax*, including research supported through the country partner technical development programme (see below). The group has become known throughout the region and to global *P. vivax* specialists, with APMEN representatives invited to consultations on *P. vivax*. Many partners and observers consider the group to be one of APMEN’s key successes.

The country partner technical development programme, formerly the Vivax Research Grant Program, provides small catalytic grants of up to US$ 47 000 for operational research that addresses priority areas identified by the Vivax working group. The programme encourages collaborative, ethical and quality research, and is aimed primarily at early career researchers who must have received a letter of endorsement. The technical development programme works closely with the Vivax working group and is administered by that group’s coordinating team based at the Menzies School of Health Research, subcontracted through the University of Queensland.
Since commencing in 2010, the programme has made 22 grants to applicants from 9 APMEN countries. Successful grant titles include: “Malaria elimination in Bhutan using mobile technology for disease mapping and early diagnosis”; “Improving the accuracy of \( P. \) \text{vivax} \) case reporting using molecular methods”; “Genetic diversity of \( P. \) \text{vivax} \) in Indonesia”; “Evaluation of \( P. \) \text{vivax} \) diagnostic methods”; and “Assessment of G6PD prevalence and \( P. \) \text{vivax} \) population structure in the Republic of Korea”.

In addition to research grants, the programme has supported the development of clinical trials in Bhutan, Malaysia and Vanuatu which aim to build the evidence base for treating and eliminating malaria and the capacity of national staff to establish and run clinical trials. For example, in 2013, APMEN granted USD 47,000 to Bhutan to establish a clinical trial to identify safe treatment and prevent relapses of \( P. \) \text{vivax} \) malaria in six locations. The Vivax working group coordinating team travelled to Bhutan for a training workshop with staff from Bhutan’s Ministry of Health. The trial began in March 2013 and is expected to provide data on the safety and efficacy of chloroquine and primaquine in treating and preventing relapses of \( P. \) \text{vivax} \) as Bhutan nears elimination.

Although countries generally wish APMEN to continue supporting operational research, many were concerned that it was not always in direct support of countries. This shows the importance of developing mechanisms to ensure operational research priorities are clearly identified and driven by countries, and the need to establish clear, realistic benchmarks for performance, since research often requires lengthy ethical views and can take several years to complete. It also demonstrates the importance of remaining responsive so that a network can adapt activities to country priorities.
In 2013, in response to a call from country partners to review research priorities, the technical development programme called for applications on thematic grants on topics identified by the partners. In the first round these thematic grants focused on the following topics:

• Diagnostics and surveillance in relation to G6PD deficiency, mapping and diagnostics, and rapid diagnostic tests (RDTs) for *P. vivax* infections, or seroepidemiologic studies examining trends in *P. vivax* transmission.

• Treatment trials of *P. vivax* in relation to the optimal treatment of blood stages or hypnozoites.

The technical development programme has a capacity building function in addition to directly expanding the evidence base on priority themes for elimination. Most research grant recipients communicated their results in written reports to their APMEN country partners and their NMCPs. Some have been invited by their NMCPs to expand their research to other districts. Several grant recipients have been able to use these grants as an opportunity to effect policy or to expand certain dimensions of their national programmes. In March 2013, the recipients of research grants presented their results to the network at the fifth annual technical and business meeting in Bali (Indonesia), with posters on the grants and clinical trials available through the APMEN website. Several grant recipients have disseminated their research results within their country programmes, at international meetings and through peer-reviewed publications.
Yaobao Liu learning P. vivax genotyping techniques as an APMEN fellow.

Vivax working group at Jiangsu Institute of Parasitic Diseases, Wuxi (China) in September 2011.
Box 8: Vivax working group, developing expertise in diagnostics, treatment and surveillance

By Professor Ric Price, Professor of Global Health at Menzies School of Health Research, Australia, and Chair of APMEN Vivax working group

P. vivax malaria remains endemic in all APMEN countries. It is harder to eliminate than P. falciparum, and in areas where malaria control programmes are successfully decreasing the burden of P. falciparum, there is often an increase in the proportion of P. vivax infections. This can be attributed to a number of factors, particularly the ability of P. vivax to develop dormant liver stages that can relapse weeks to months after the initial infection. The recurrent nature of P. vivax is recognized as an important cause of morbidity and associated mortality.

In 2009, APMEN formed the Vivax working group to address key challenges in controlling and eliminating P. vivax malaria. Over the past four years, the working group has focused on generating knowledge, tools and in-country technical expertise, specifically in the areas of diagnostics, treatment and surveillance. This has been achieved through a series of comprehensive reviews, interactive workshops and funded projects to gather the relevant evidence to inform policy-makers.

Surveillance projects are addressing the need for a better understanding of the diversity of the parasite and the human host. These have included mapping the prevalence of G6PD deficiency across APMEN countries to identify patients at greatest risk of haemolysis following treatment with primaquine. Mapping of G6PD deficiency will help countries provide a safer radical cure of P. vivax malaria. As malaria incidence declines, imported malaria becomes proportionately more common and the parasite tends to become clustered in hotspots. The working group has also been supporting molecular analysis of the parasite to develop methods for highlighting the origin of malaria outbreaks and the movement of parasites across borders. This research will help countries improve the timely response to malaria outbreaks. The working group has been collaborating with international experts to develop and evaluate better diagnostics for detecting patients with low-level infections. These innovations will help countries detect and treat asymptomatic malaria cases that can sustain transmission and delay the successful elimination of malaria.

Evidence is emerging that drug-resistant strains are present in several endemic areas and spreading to neighbouring countries. The radical cure of P. vivax remains a major challenge, since prolonged courses of primaquine are needed, and these are associated with poor adherence and potentially severe adverse reactions. The working group is supporting studies to investigate alternative strategies to improve the early diagnosis and treatment of patients with P. vivax malaria, a key element for the successful elimination of malaria.

Sarah Auburn from the Vivax working group coordinating team with Yaobao Liu and Jun Cao from the Jiangsu Institute of Parasitic Diseases, Wuxi (China).
Vector Control working group

Although vector control has long been central to global malaria control programmes, it was noted at the inaugural APMEN meeting in 2009 that many countries did not have a specific vector control strategy for elimination, but were continuing established strategies, such as IRS and the use of ITNs or LLINs. Since these strategies were developed for high-burden settings, many countries were concerned that vector control strategies might no longer be appropriate in an elimination context. In addition, the Asia Pacific has particular challenges that highlight the need for innovative approaches to vector control. The Asia Pacific has 19 dominant vector species, compared to 7 in sub-Saharan Africa and 9 in the Americas.36 The region includes many outdoor biting and outdoor resting vectors, including vectors that breed in forests, small ponds and other outdoor sites that are difficult to reach through traditional vector control tools.37 Country partners also informally reported a lack of entomological expertise and vector control capacity. Some said decentralization of health services tended to produce gaps in entomological capacity, while many NMCPs spoke of carrying out vector control without formal training and sufficient knowledge of the vectors they were seeking to target. Although malaria declined in most countries due to enhanced vector control in the 2000s, lack of knowledge prevented countries from developing targeted strategies to strengthen vector control in an elimination setting.

In 2009, there was a sense that innovative approaches to vector control were needed for elimination, but the specific challenges were not clearly identified, prompting the Vector Control working group to assess existing programmes and capacities and to identify the critical challenges faced by the countries. These initial landscaping activities included a survey on vectors and vector control strategies that identified entomological and programme capacities, and the human and financial resourcing of vector control activities. The working group reviewed the literature on the evidence base for the use of larviciding and personal repellents in an elimination environment, and past vector control field manuals, to identify strategies and training materials for the present situation. Country partners contributed data on their present vector control strategies to the APMEN matrices, a user-friendly tool to allow countries to easily access and compare strategies being used by others in the region.50
The working group determined that many countries were not using control methods appropriate for the habitats and behaviours of the dominant vectors. Reviews confirmed several countries were working from inaccurate or incomplete evidence relating to vectors, and many had acute shortages of field entomological staff, with little or no training opportunities for staff in vector identification or taxonomy. This analysis helped identify priority actions, and APMEN supported a series of literature reviews on environmental management in an elimination setting and the potential application of larviciding in an elimination context by University of Queensland students under the supervision of working group members. They found a limited understanding of the potential uses of larviciding in an elimination context in the Asia Pacific region.

APMEN helped the Armed Forces Research Institute of Medical Sciences (AFRIMS) in Thailand with support from the Walter Reed Biosystematics Unit produce *Malaria vectors in Asia-Pacific countries*, a pocketbook on the distribution, bionomics and medical importance of 26 species of malaria vectors in the Asia Pacific. The first book of its kind for the region, it aimed to increase the capacity of field workers to identify species.

In addition, a number of capacity building training activities have focused on vector control, including Majhalia Torno’s fellowship on vector taxonomy (see Box 7). In 2013, APMEN launched a thematic vector and ecology control network fellowship, cosponsored by the Vector Ecology and Control Network (VECNet). APMEN funded 16 people to attend the integrated vector management course in the Institute for Medical Research, Kuala Lumpur (Malaysia). The working group carries out annual study tours with a focus on vector control.

While vector control remains an ongoing theme of APMEN, the working group has had to prioritize activities as the challenges surrounding vector control were not clearly defined in 2009. Reviews and surveys have helped the network develop a targeted programme of work for the next five years and to establish strategic partnerships with groups like VECNet, Innovative Vector Control Consortium (IVCC) and others involved in developing innovative approaches to vector control. APMEN representation on the RBM Partnership’s Vector Control Working Group has strengthened its capacity to play a stronger role in this agenda in the region.

**Surveillance and Response working group**

Country partners have presented surveillance strategies and operational research at each annual meeting. These activities have varied across APMEN, with gaps in the level of elimination of the most effective and cost-effective methods for identifying and responding to cases in the various country and regional contexts. The Surveillance and Response working group was created in 2012 to share knowledge and address these evidence gaps. Surveillance and response is an important strategy for elimination contexts.

In September 2013, the first surveillance meeting (Wuxi, China) identified the priority gaps for addressing mobile and migrant populations at higher risk of malaria: integrating multiple reporting systems, IT, Internet and telecommunication timeliness, maintaining malaria microscopy, and the lack of data analysis skills and response standard operating procedures. The group also identified points of action for each of these gaps to develop into a work plan.
Vector Control working group identifying priorities at Kota Kinabalu (Malaysia).

This pocket-sized field guide provides guidance for countries with limited entomological expertise.

Outdoor breeding vectors, such as this A. farauti breeding site in Vanuatu, present a challenge for many Asia Pacific countries.

The inaugural meeting of the Surveillance and Response working group.
LESSONS OF COLLABORATIVE, REGIONAL APPROACHES TO ELIMINATION

APMEN can offer many lessons to other regions wishing to establish collaborative approaches to malaria elimination. Some apply to all types of regional initiatives, while some are unique to networks. Challenges APMEN has faced include maintaining focus in a diverse and rapidly changing malaria landscape, developing mechanisms for engaging with others in the global health architecture and identifying benchmarks for measuring success. APMEN shows that a successful elimination network is an adaptive, learning organization; establishes clear and relevant aims that reflect country needs; attracts a strong base of expertise; has a defined role in regional health architecture; develops clear governance and an effective secretariat; and advocates for sustainable funding and ongoing political support to reach and sustain elimination.

a. Being a learning organization

APMEN’s structure has allowed it to develop as a learning organization that evolves over time in response to internal and external changes. This flexibility is particularly advantageous for malaria elimination, since the technical and operational challenges can change rapidly as countries near elimination. If an elimination initiative focuses on a single thematic issue, it is unlikely to be broad enough to address the diverse challenges faced by countries.

This dynamism has enabled APMEN to adapt its thematic focus as knowledge gaps are filled, other actors enter the landscape or engage in the agenda, and countries identify emerging challenges and opportunities. For example, APMEN country partners identified surveillance and response as an important area for future work, leading to the formation of a working group in this area. Other themes have been discussed but not incorporated into the work plan; *P. knowlesi* was discussed at APMEN III in Malaysia, for example, but not deemed relevant to all countries in the region and, in the absence of human-to-human transmission, not directly related to elimination at this time.

APMEN adapts its governance, composition and activities in relation to internal changes in the network and external changes in the field of elimination (see Figure 3). It monitors and evaluates activities, incorporating feedback from network partners when designing annual meetings, the fellowships programme and the working groups. APMEN has also carried out internal and external evaluations of the network, including focus groups with a total of 21 participants, and interviews with 63 partners and observers. This evaluation contributes to strategic planning and is used to modify individual activities to improve their effectiveness as the needs of countries shift. APMEN’s governance has evolved in response to broader changes in the network to ensure APMEN continues to work towards its central goal of supporting countries to lead the elimination agenda.
Figure 3
APMEN, a learning organization that adapts to the changing malaria landscape

Previous years
- Successes and challenges
- Network composition
- Priority themes
- Health architecture
- Past strategies

Growing evidence
- New actors in malaria landscape
- Shifting priorities of countries
- Shifting funding and political environment
- New technologies, approaches, emerging issues

Evolution of the Network
- Shifting priorities
- New partners
- Evolving governance
- Monitoring and evaluation
- New strategies

APMEN today

THE ASIA PACIFIC MALARIA ELIMINATION NETWORK (APMEN) PROGRESS & IMPACT SERIES
b. Establishing clear and relevant aims

APMEN has faced the challenge of maintaining focus in a diverse and rapidly changing context. APMEN’s aim is to support NMCPs in the Asia Pacific to work collaboratively towards regional malaria elimination. However, the Asia Pacific is a diverse region, and elimination strategies must be tailored to each country and remain responsive to emerging issues.

To stay relevant, it was decided that APMEN should not carry a single thematic focus such as *P. vivax* or drug resistance, since these topics are not of equal significance to all countries. Instead, APMEN’s thematic priorities have shifted over time as countries identify needs and as other agencies emerge to address and support/fund activities. APMEN has been able to collectively identify thematic areas of interest by developing effective governance processes and a strong sense of country ownership.

However, it can be challenging for an evolving network to maintain focus, especially when partners have disparate expectations. Some look to APMEN as a platform for supporting effective elimination strategies, while others see it primarily as a tool for advocacy and leadership. Many partner institutions see APMEN as a mechanism for building partnerships. All these activities fall within APMEN’s broad mandate, but this diversity obscures the priorities of APMEN, especially to external stakeholders, including funders. Although it is essential to maintain focus, to some extent it seems inevitable that diverse stakeholders will have differing expectations and that this will shape the form the network takes. Maintaining balance between focus and flexibility is a common challenge for many networks.

APMEN’s experience shows the importance of identifying and communicating priority areas of work and justifying these priorities in programme aims. The network has attempted to maintain focus by developing clear governance processes to collectively identify the priorities of the network as it evolves and to communicate these via the APMEN website, meetings and other products.

c. Providing expertise and including key partners

APMEN’s success is in part due to its high quality partners and their active engagement. Partners include countries, key academic or scientific institutions, funders, the private sector, government agencies and political bodies. The impact and value-add of any regional initiative will depend on the combined expertise that it brings together, while the scope and thematic focus will depend on the priorities of the partner countries. APMEN’s diverse composition is a strength, but one that also creates challenges.

For example, there are views within APMEN that the network has become too focused on operational research. While countries want to ensure it remains country-led, most also value the evidence-building components of APMEN and the broader dialogue between programme managers and scientists. For a network to be successful, it is necessary to bring together a broad range of expertise, and to develop mechanisms for facilitating communication and collaboration between these types of partners.
d. Moving towards a defined role in the regional health architecture

APMEN demonstrates the importance of clarifying the role of regional networks in the global health architecture and establishing clear mechanisms for engaging with others in the region. Representatives from WHO SEARO and WPRO are on the advisory board of APMEN as observers, while many other prominent elimination initiatives are actively involved in APMEN. Nevertheless, the network is yet to clearly define its role in relation to these global health actors, or to develop clear mechanisms through which regional and global malaria programmes can collaborate.

Many observers describe APMEN as a value-add to the health architecture but one that could be more effective with clearly defined mechanisms for collaborating with WHO and other malaria elimination initiatives. Likewise, many country partners would like to develop a more active and systematic engagement with non-health regional entities, such as the Association of Southeast Asian Nations (ASEAN), the Asian Development Bank and the newly formed APLMA. As the elimination agenda progresses, APMEN will continue to build new partnerships with a wide range of regional and international bodies.

e. Managing a network

APMEN demonstrates the importance of an effective network secretariat. The APMEN secretariat coordinates activities, including annual meetings, workshops and fellowships. It harmonizes activities across the network, ensuring activities support country and network aims and are in line with network governance. The secretariat manages and evaluates the progress of activities to assess the use of funding by network partners and to provide accountability to funders. A secretariat helps to ensure the continuity of the network between face-to-face meetings, accountability to network funders, supports the maintenance of the partnerships and monitors the overall effectiveness of the network.

APMEN’s well-developed governance processes, available in a comprehensive document online, help to support the secretariat. Ongoing evaluation of network activities and communications with a broad range of stakeholders can be carried out only by an effective secretariat. Every activity, meeting and training workshop is evaluated and the network has had two external reviews (one mid-term, the other after five years), as well as an internal evaluation using qualitative and quantitative methods by an external consultant. Annual meetings take into account feedback from the previous year to try to address concerns or requests. For example, based on feedback from meeting participants, the secretariat circulates draft agendas and makes free time at annual meetings to governance processes and to the composition of the advisory board have strengthened country ownership, increased transparency and addressed potential risks. In the beginning the network was happy with a looser governance document, but has seen the value of clear management guidelines.
for APMEN partners to have informal discussions. Overall, APMEN’s governance procedures ensure the secretariat facilitates network activities that support countries, and that the substantive work and strategic decision-making of APMEN is performed by country partners.

While the secretariat is considered highly efficient, it has faced a number of challenges likely to be shared by other regional elimination initiatives. For example, APMEN expanded rapidly in its first five years but the growth has not been matched by its budget. In response, the network has increased staff at the University of Queensland-based secretariat from two to three and has engaged short-term support and outsourced some activities. In addition, APMEN is diversifying its funding base. The secretariat carries out ongoing advocacy to establish strategic partnerships with other peak regional bodies to ensure the continuity of elimination efforts in the region.
f. Identifying benchmarks for measuring success

An important challenge for APMEN has been to find ways to measure its success. APMEN does not directly implement malaria elimination programmes but rather performs activities to help NMCPs implement their own programmes. APMEN is one initiative among many helping to progress malaria elimination; reductions in incidence cannot be directly traced to any one programme. The successes being achieved in malaria elimination are rightly attributed to countries themselves.

However, it is important to find ways to measure impact in order to maintain accountability to funders and evaluate the effectiveness of activities. APMEN measures the success of the network against its core aims of advocacy and leadership for elimination, capacity building, knowledge exchange and building the evidence base. This is in line with the expectations of countries and of one of the foundational donors, the Australian Government, and reflects the recognition by other networks that the evaluation of a network needs to reflect the original intent and the evolution over time of the network. This is done through ongoing monitoring and evaluation of APMEN activities and the periodic evaluation of the network as a whole.

In most cases, APMEN activities have had a clear impact on the individuals or institutions directly involved. APMEN capacity building activities, such as the fellowships, build technical and professional skills of participants. These activities are also perceived to be a value-add to the region by a wide range of stakeholders. Since many APMEN fellows carry out ongoing training with their peers upon returning to their NMCP, training benefits extend beyond individual participants, but it remains difficult to illustrate their impact on broader programme development.

Likewise, it is possible to quantify outputs of evidence building activities. This can be illustrated by the growing literature surrounding *P. vivax*, which in 2009 was considered a significant knowledge gap and barrier to elimination in the Asia Pacific. The results of research build cumulatively and do not always lead directly to policy recommendations. However, concerns about the impact of research have been more controversial within APMEN, since the value of research is not always clearly communicated to country partners. This has focused APMEN on the importance of clear communication, and the value of measuring the perceived benefit of network activities, since the broader impact of scientific research cannot usually be demonstrated in a short time frame. It highlights the important role of the WHO policy development process to support the translation of research into policy and practice.

It is also difficult to demonstrate the impact of knowledge sharing and partnership building activities, though these activities are clearly seen as beneficial to network partners. This is a challenge for APMEN since the sharing of country experiences aims to uncover new implementation strategies for elimination. Clear evidence of knowledge sharing can be seen in Aceh, where UNICEF and the Indonesian NMCP adapted techniques observed during an APMEN study tour to Sri Lanka (see Box 5). However, changes in programme implementation do not usually occur in such a short space of time; the process is slow, the shift from control to elimination a long-term process. Some country partners still face ongoing
internal resistance to elimination, with barriers to implementation that are beyond the scope of APMEN, such as health systems strengthening.

To measure effectiveness and impact, APMEN evaluates the impact of its activities on network partners and on the network itself. Prior to beginning a programme, APMEN governance processes ensure the activity supports country priorities and is, therefore, likely to have a positive impact on the network. Qualitative monitoring and evaluation methodologies, including in-depth interviews, seek to monitor the perceived benefits of APMEN activities and the network as a whole, and to assess the extent to which programme design matches the network aims. This feedback is used to improve programme design. The branding of research and training outputs adds visibility to the network, while also tracing the outputs generated through APMEN funding. APMEN utilizes its broad base of expertise to develop strategies that are more likely to have an impact on malaria incidence. By valuing the experience and expertise of country partners and other network partners, APMEN builds consensus and shares knowledge about elimination strategies that are widely recognized as effective and that can be feasibly taken up by countries. APMEN ensures any successes made by countries in reducing malaria are rightly highlighted as country successes.

g. Sustainable funding and long-term political support

The history of malaria control is full of reminders that elimination is a long-term effort that requires sustained political will and adequate funding. While APMEN has generated awareness of progress within the malaria community, country partners now wish to target advocacy efforts at higher-level political leadership and health actors beyond the malaria community. Advocacy at the regional level is seen to build expertise, funding and political support for elimination. Advocacy within countries is also necessary to sustain domestic support for elimination. This will involve advocacy efforts targeted at local communities, civil society and local political actors, in addition to strengthened engagement with heads of state and regional political bodies.

This high-level political will is continuing to strengthen in the Asia Pacific region. The Australian Government hosted for the first time a meeting of countries and organizations from across the Asia Pacific in Sydney at the Malaria 2012 meeting. Attended by ministers of health and other high-level officials from 30 countries across the region, Malaria 2012 reaffirmed political commitment to the Millennium Development Goal of reducing malaria by 75% by 2015 and promoted elimination as the ultimate aim of the region. In 2013 the East-Asia Summit announced the establishment of the APLMA, a network that will support political leadership and collaboration for malaria control and elimination. The challenge for APMEN will be to respond to this changing context, maximizing the potential for APMEN partners to benefit from emerging developments to ensure continuity in the network and in regional malaria elimination efforts.
In the last 12 months we have undergone a programmatic review and then, based on that and other data and support, developed our new five-year plan (2015–2020) for malaria in the Solomon Islands. The vision of the Solomon Islands Government (SIG) is to achieve a malaria-free Solomon Islands by 2035. The overall goal is to reduce annual parasite index (API) from 44/1000 to ≤25/1000 by 2020. This is to be achieved with the following priority objectives:

• Maintain high LLIN coverage, increase usage and target supplementary vector control measures based on epidemiological needs.

• Maximize access to and utilisation of early laboratory confirmed diagnosis and appropriate treatment for malaria.

• Meet health systems related elimination criteria in pre-elimination provinces and reach and maintain API <1/1000 in provinces already designated for elimination (Temotu and Isabel).

• Maximize programme impact through partnership and improved programme management.

However, sustained action is required, and to address this, efforts will now be made to bolster the health system to support effective elimination activities. As robust systems are put in place and malaria is reduced, provinces will shift to elimination mode.

The main programmatic activities being coordinated in this endeavour have been focused on aggressive control and elimination since 2008. Based on these efforts, the Ministry of Health & Medical Services (MHMS) has had phenomenal success in significantly reducing malaria incidence. The Malaria Action Plan 2008/9–2014 was developed with a view to building on previous gains made as a result of Global Fund support and to taking an aggressive approach to malaria prevention, control and treatment in order to underpin the decision to trial malaria elimination in Temotu and subsequently Isabel. It was recognized that the implementation of a wide range of interventions would be necessary to sustain the trend of decreasing incidence to a level where elimination could be considered a viable option for the country over the long term. Programme activities aimed at achieving this impact included a transition to 100% parasite-based diagnosis, introduction of artemisinin-based combination therapies (ACTs), expansion of IRS to include high transmission urban areas, achievement and maintenance of close to 100% population ownership of LLINs, and intensification of surveillance required to identify cases at low levels of transmission. Malaria control and elimination falls under the remit of the MHMS, the operational arm of which within the Ministry is the National Vector Borne Disease Control Programme (NVBDCP). Technical and financial support for all malaria interventions implemented by the NVBDCP are provided by the MHMS and the donor community, namely the Global Fund (through the Secretariat of the Pacific Community), the Australian aid programme, Rotarians Against Malaria, Japan International Cooperation Agency and WHO, a long time partner providing valuable technical assistance.
Since 2007, the country has achieved significant success in reducing incidence by two thirds, from 132 cases to 44 cases per 1000 people in 2012. The successes achieved over the last five years demonstrate that the chosen interventions have been largely effective. The NVBDCP has reduced malaria API to its lowest point in nearly three decades. Technical challenges remain which need to be resolved in order to further reduce the malaria burden. The most significant of these include: identifying methods to effectively target outdoor biting Anopheles farauti, improving diagnosis-based treatment, increasing use of primaquine to treat P. vivax, and understanding the impact of population movement on transmission dynamics.
However, the **most significant challenges** faced by the programme are related to the **health system and logistics** at national and provincial levels. There is a shortage of trained cadres for delivery of good quality services which has affected the quality and coverage of diagnosis and treatment of uncomplicated malaria. This is exacerbated by stock-outs of ACTs, RDTs and primaquine because of difficulties in forecasting needs. This is also complicated by the logistical challenges of delivering services to the more geographically remote areas. A complex financial system has delayed implementation and supervision of activities. Human resource shortages and financial delays impact negatively on case investigation and response, leading to long delays in follow-up. Although the NVBDCP has successfully distributed LLINs throughout the country and ownership levels are relatively high, utilization of LLINs is variable, indicating an urgent need for strengthened behaviour change communication. Surveillance for the programme is carried out through parallel malaria indicator surveys set up because of a weak health management information system, yet both systems face challenges including a weak communication infrastructure. Overall, the health systems challenges have prevented the NVBDCP from prioritizing elimination.

**APMEN has assisted the Solomon Islands Programme** in many ways. It has helped create an environment for improved partnerships and collaboration within the Pacific and the region. It also supports information sharing, for example we are now helping Papua New Guinea see that elimination is possible in the Pacific Islands. Importantly, we still feel “held together” by APMEN, as even if funding decreases or country commitment fades, APMEN helps keep us motivated. It provides opportunities for informing countries of new strategies and innovations to consider trialling in our plans for elimination, in addition to the existing guidance provided by other partners. In the region, APMEN builds up a sense of “brotherhood”, working together which gives you a good feeling: you are part of a regional and global team. You are not alone, you can share the challenges, mistakes, successes and learning and you feel like you are moving forward. It gives you a good feeling of satisfaction. The engagement of many donors and partners in the region and in malaria is important and is even broadening to discuss health system issues for elimination.

**In the future, APMEN** can work with WHO to move the Global Technical Strategy and elimination agendas forward. APMEN should strongly support APLMA and should help provide a bridge between regional needs and global plans. It needs to be an avenue where regional and country voices can be heard and represented in these strategies. We, as countries, are now relying upon APMEN to provide up-to-date information on various challenges and strategies to ensure elimination is smooth and implemented. It can pull together all this evidence base, without which we cannot convince donors and partners, which is an important part of what APMEN does to support countries.

The more we reduce malaria, the more the support is reduced by others. APMEN agenda must be to sustain the elimination agenda at regional level, not to have it “cloudy” but clear for the countries and the region.
FUTURE OUTLOOK

Malaria elimination is viewed as an achievable goal for many countries. There is a growing consensus that the global incidence of malaria will continue to decline and that many countries in the Asia Pacific will reach their elimination targets provided funding and political support for elimination continue. APMEN has played an important role in accelerating the elimination agenda in the Asia Pacific through its core functions of knowledge exchange, capacity building, building the evidence base, and advocacy and leadership for elimination. By continually evolving, APMEN has been able to continue to support countries, even as country priorities and the political support for malaria have changed.

However, barriers to elimination remain. Future challenges for the Asia Pacific include reducing malaria in high-burden countries, responding to drug and insecticide resistance and developing strategies for implementation in a low-transmission context. The strategies used in elimination may shift as new medicines and other technologies are developed. Many of these challenges are best approached regionally. APMEN is part of a growing trend towards regional and collaborative approaches to malaria elimination that involve private-public partnerships, cross-sectoral work and cross-border work. This is reflected, for instance, in the formation of Elimination 8 (E8) and the Mesoamerican Health Initiative.

APMEN is growing and adapting, and working to support countries in the region to reach and sustain elimination. Following the formation of APLMA, in February 2014 the Australian Government renewed its commitment to malaria elimination as part of the US$ 17 million grant to the newly formed Regional Malaria and Other Communicable Diseases Trust Fund within the Asian Development Bank. As momentum gathers around elimination efforts, APMEN will continue to adapt to changes in the malaria landscape. In March 2014, APMEN country partners signed a Declaration of Commitment, supporting the Malaria 2012 Declaration target that half of the countries in the region will have achieved their elimination targets by 2025, and reconfirming a commitment to working together to pursue the long term goal of regional malaria elimination. APMEN’s fluidity, its reputation as a successful and collegiate platform, and its unique combination of expertise and country ownership will ensure that APMEN continues to play a vital role in pursuing malaria elimination in the Asia Pacific.
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