



**Sustaining village malaria worker programmes with
expanded roles and primary care integration:
Evidence from the Greater Mekong Subregion and
with Thailand as a case study**

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A thesis submitted for the degree of Doctor of Philosophy

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Bangkok, Thailand

August 2025

ABSTRACT

Despite decade-long progress, malaria remains a public health threat in remote rural areas in the Greater Mekong Subregion (GMS). As malaria declines, there will be an increase in the proportion of non-malarial febrile illnesses, and consequently a growing inability of the village malaria workers (VMWs), who currently can only test, and sometimes treat, for malaria, to manage the bulk of fever cases that present to them. Evidence has shown that VMWs are essential to malaria elimination strategies by providing accessible care to the highest risk populations of forest goers and mobile and migrant populations and are a valuable resource to address other illnesses. However, gaining political and financial support to maintain their services is challenging as malaria declines as a health priority. This could undermine malaria elimination efforts. Identifying new roles that allow VMWs to address a wider range of local health needs will keep them relevant, active, and motivated. It should also increase the number of people with fevers who attend VMWs and thus ensure a high proportion of malaria cases are reached.

This social science research examines these public health issues at three interrelated levels. First, it explores the landscape of role expansion among malaria community health workers in the Asia Pacific, focusing on the enabling factors of, and entry points to, programme sustainability. Second, it aims to understand how VMW role expansion could be designed and implemented in Thailand which is facing a changing primary care landscape and a malaria resurgence along the western border. Particular attention is paid to the roles and perceptions of multi-level stakeholders directly engaged with malaria interventions including policymakers, programme implementers, health workers, and members of endemic communities. The third part of the thesis explores a policy window to integrate VMWs into primary care and discusses approaches to sustain malaria services until and beyond elimination as well as improve access to care more broadly. Throughout the research, its implications for policy and practice in Thailand, and other GMS countries, are discussed.

บทคัดย่อ

การต่อยอดและบูรณาการบทบาทของพนักงานมาลาเรียคลินิกชุมชนเข้ากับระบบสุขภาพปฐมภูมิ: การศึกษาหลักฐานจากอนุภูมิภาคลุ่มแม่น้ำโขงและกรณีศึกษาของประเทศไทย

มาลาเรียเป็นโรคภัยไข้เจ็บที่ยังคงส่งผลกระทบต่อชีวิตของผู้คนที่อาศัยอยู่ในพื้นที่ห่างไกล โดยเฉพาะในกลุ่มผู้ที่เดินทางเข้าป่า และผู้อพยพย้ายถิ่นในอนุภูมิภาคลุ่มแม่น้ำโขง พนักงานมาลาเรียคลินิกชุมชนหรือที่ในประเทศไทยเรียกว่าเอ็มพีเป็นอาสาสมัครในชุมชนที่สามารถตรวจไข้มาลาเรียให้กับกลุ่มเสี่ยงในพื้นที่ และบางคนสามารถจ่ายยารักษาให้แก่ผู้ป่วยได้ อาสาสมัครกลุ่มนี้จึงมีความสำคัญอย่างยิ่งต่อการกำจัดโรคไข้มาลาเรีย โดยเฉพาะเมื่ออัตราการแพร่เชื้อมาลาเรียลดลงและยังคงมีความจำเป็นที่จะค้นหาผู้ป่วยในช่วงโค้งสุดท้ายของการ फैาระวังและกำจัดโรคอย่างเข้มข้น อย่างไรก็ตาม เมื่อมาลาเรียลดลงผู้ที่ไข้ในชุมชนอาจมาหาเอ็มพีด้วยอาการป่วยไข้จากโรคอื่นๆ มากขึ้นและทำให้เอ็มพีที่ให้บริการเฉพาะด้านมาลาเรียเพียงอย่างเดียวไม่สามารถตรวจหรือดูแลไข้อื่นๆ ในชุมชนได้ นอกจากนี้ จำนวนผู้ป่วยและผู้เสียชีวิตจากมาลาเรียที่ลดลงยังอาจส่งผลให้การดำเนินงานของเอ็มพีในชุมชนได้รับแรงสนับสนุนทางการเงินและการเมืองน้อยลง ซึ่งอาจส่งผลกระทบในทางลบต่อความพยายามตลอดสิบปีที่ผ่านมาที่จะกำจัดโรคนี้ให้หมดไปจากภูมิภาค การนำเสนอบทบาทด้านสุขภาพใหม่ๆ ที่เอ็มพีสามารถให้บริการแก่ชุมชนของเขาอาศัยอยู่ได้ จึงเป็นหนทางหนึ่งที่จะสร้างแรงจูงใจให้ชุมชนที่เมื่อป่วยยังคงมาตรวจไข้กับเอ็มพีและยังสามารถได้รับบริการสำหรับโรคภัยไข้เจ็บอื่นๆ ด้วย

วิทยานิพนธ์เล่มนี้นำเสนองานวิจัยสังคมศาสตร์ที่พยายามหาคำตอบให้กับโจทย์ด้านสาธารณสุขดังกล่าวจากการศึกษาวิเคราะห์ประเด็นสำคัญสามประเด็น ประเด็นแรก ด้วยการระดมกลุ่มอาสาสมัครที่ได้ขยายบทบาทการให้บริการให้ครอบคลุมโรคอื่นๆ นอกเหนือจากมาลาเรีย ภายใต้การดำเนินโครงการหรือหน่วยงานของประเทศต่างๆ ในภูมิภาคเอเชียแปซิฟิก เพื่อปูพื้นฐานความเข้าใจว่าอะไรคือปัจจัยส่งเสริมและจุดประกายการขยายบทบาทดังกล่าว ประเด็นที่สอง ด้วยการศึกษานโยบายการออกแบบและดำเนินการขยายบทบาทนี้จะเกิดขึ้นได้จริงอย่างไรในบริบทของประเทศไทยที่กำลังเผชิญกับการเปลี่ยนแปลงทั้งจากการกระจายอำนาจด้านสาธารณสุขและการระบาดของโรคที่เพิ่มสูงขึ้นตามแนวบริเวณชายแดนไทย-เมียนมาร์ โดยให้ความสำคัญกับการวิเคราะห์บทบาทและมุมมองของผู้มีส่วนได้ส่วนเสียกลุ่มต่างๆ ได้แก่ ผู้กำหนดนโยบาย เจ้าหน้าที่โครงการบุคลากรสาธารณสุข และสมาชิกชุมชนที่เป็นผู้รับบริการ โดยตรง ประเด็นที่สาม ด้วยการทดลองเปิดหน้าต่างนโยบายร่วมกับชุมชนและผู้มีส่วนได้ส่วนเสียเพื่อผลักดันให้เกิดการบูรณาการงานมาลาเรียในชุมชนเข้ากับระบบสุขภาพปฐมภูมิโดยรวม ตลอดจนร่วมกันแลกเปลี่ยนและถกเถียงถึงวิถีและทัศนคติต่อการต่อยอดบทบาทของเอ็มพีนี้ไปสู่การขยายบริการสุขภาพที่ครอบคลุมมากยิ่งขึ้นและที่ชุมชนสามารถเข้าถึงได้อย่างยั่งยืน สุดท้าย ผู้วิจัยจะนำเสนอด้วยว่าผลการวิจัยนี้สะท้อนอะไรถึงนโยบายและแนวทางการดำเนินงานมาลาเรียในอนาคตของประเทศไทยและประเทศอื่นๆ ในอนุภูมิภาคลุ่มแม่น้ำโขง

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PREFACE

A. Acknowledgement

My DPhil journey emerged from communal efforts, and its success is dependent on the many individuals and organisations who have contributed in unique ways. I would like to take this opportunity to give special thanks to those who have made this thesis and the journey possible.

My first thanks and deepest gratitude go to my supervisors. Richard, thank you for securing the core research funding, for trusting me with it, and for guiding me through this research with your passion and genuine interest in the topic and policy engagement. Chris, you have made this journey much more enriching and enjoyable with your kind, firm and consistent guidance on my ideas and drafts at every stage. Obviously, I would not have been on this journey if both of you had not interviewed me for a social science position back in 2019 and made sure that I was well trained and supported—not only while I was based in Bangkok but also during my time into Cambodia, Laos, and Vietnam. For this, I am extremely thankful to you both. Marco, thank you for agreeing to supervise me and show me the value of storytelling with data and qualitative data visualisation. Your attention to detail and advice on career path during our coffee chats have always filled my Fridays with food for thought.

I could not have wished for a better team and colleagues at the MORU Epidemiology: Marina, Chawarat, Worarat, Rapeephan, Panarasri, Suwanna, Hue, Long Heng, Aum and Tum. Marina, our brainstorm sessions—perfectly blended academic and leisure curiosities when we needed to bounce ideas around—quickly became my best time at work. P'Toto, I am grateful for your mentorship and your support throughout my research journey and especially for our work in Kanchanaburi. P'Por, thank you for your care during my time at MORU and for your support in Chiang Rai. Hue, thank you for bringing me with you to Vietnam; our time on route and in the

villages have made the trip during the pandemic a very memorable one. Mhor Meen, you have my immense gratitude for introducing me to your unit in Ubon Ratchathani where this all began and for your continued support of my work.

This journey would have been impossible if not for Aum and Tum who have rose to meet every task, no matter how difficult. Thank you for bridging the gaps between this researcher from Bangkok with your families and friends in Buntharik, and for guiding me around the communities. Without your presence and hands-on skills, this researcher who do not know how to drive a manual pick-up truck or ride a motorcycle, and spoke broken Isan, would have been completely hopeless.

I am tremendously fortunate to receive invaluable mentorship and friendship at MORU. P’Pong and Qian, thank you for always having my back. Leigh, your kind words and check-ins have always been much appreciated. I also wanted to thank Cherry Lim, Anne Osterrieder, and Bipin Adhikari for your advice and sharing your research and career journeys with me. I also could not ask for better DPhil assessors, Arjen, Phaik Yeong, Sonia, and Rene who have provided me with the key intellectual guidance and resources at critical times.

I am grateful for financial support towards my doctoral studies: the Tropical Network Fund at the Nuffield Department of Clinical Medicine. This research presented in this thesis also received funding from multiple sources: the RAI3E component was funded by the Global Fund to Fight AIDS, Tuberculosis and Malaria. Two internal bursaries were received from MORU’s Mahidol-Oxford Translational Innovation Partnership and Bioethics and Public Engagement, and another from the Oxford University Policy Engagement Network. The regional CSO platform and another research grant from the Health Systems Research Institute partly funded the collaborative activities at Kanchanaburi sites. The research was also funded in part by MORU’s core funding from the Wellcome Trust. While working on this thesis and attending to trainings in Oxford, I also

drew supports from the Oxford Thai Foundation, Green Templeton College, and the Health System Collaborative.

The achievement of the research and engagement activities are truly owed to the study participants and collaborators at sites. I would like to express my gratitude to the individuals I interviewed and interacted with upon which my whole thesis is grounded. I would also like to thank my colleagues at Buntharik hospital, Chiang Rai Clinical Research Unit, ALIGHT and the regional CSO platform for hosting me and sharing your insightful discussions and time for consultations. The conversations and the thoughts you shared opened my views about the research topics and served as a constant reminder of why it was important to keep going. My entire DPhil experience was more meaningful because of these opportunities, and I look forward to continuing our collaborations in the near future.

I would not also have made it through this journey without the care from the closest families and friends. I will always be grateful for my parents who have always been kind and supportive throughout my career, education, and upbringing.

Phakin, it is beyond doubt that your companionship and confidence in me are what kept me grounded and lifted me up. I am endlessly thankful for always being by my side—through life and throughout this DPhil journey—and inviting me onto yours.

Sai

August 2025

B. Declarations and Attributions

This approximate number of words in this thesis is 50,000 exclusive of bibliography, prefaces, appendices, diagrams and tables. The contents of this thesis were prepared by me. All words, figures, and tables are my own, unless otherwise indicated. The multi-country research is a collaborative effort across multiple disciplines, and many individuals have played a vital role in the work presented in this thesis. This thesis is based on my own independent work, except where acknowledged.

Chapters 1 and 9: They were conceptualised and written by me.

Chapters 2 and 3: The multi-disciplinary regional research project of which these Chapters were a part was conducted by a team of researchers led by the principal investigator (PI), Richard Maude. I co-led protocol development, led the article screening and data extraction, conducted data analysis and wrote up the results. Massaya Sirimatayanant, Panarasri Khonputsa and Worarat Khuenpetch assisted with article screening, data extraction, the quality assessment of the included articles and write-up of manuscripts. Elinor Hariss assisted with the search strategy and database searches. Phone Si Hein, Laura Buback, Naomi Beyeler, and Amita Chebbi gave input on the survey design and assisted with distribution.

Chapter 4, 5, and 6: I conceptualised the primary data collection and analysis, drafted the protocol, submitted the ethics applications, collect the data, analysed the data, and wrote the manuscript and thesis chapters. I trained and supervised the research assistants, Orathai Prasert and Supitsara Maneenet to conduct data collection. Chawarat Rojanaprasert and Nipaphan Kanthawang assisted in facilitating data collection at sites. My team of supervisors, Richard Maude, Christopher Pell, and Marco Liverani provided mentorship throughout the study.

Chapter 7 and 8: I conceptualised the projects, obtained funding, drafted the protocol, designed and led the engagement activities, analysed the data, wrote the manuscripts and the thesis chapters. Shreehari Acharya, Siripim Piboonwach, Paradorn Sopa, and Itthisak Charoensap, and the project collaborators supported the engagement activities at sites.

C. Publications

I have published the following papers related to the work presented in this DPhil thesis:

1. **Jongdeepaisal M**, Khonputsas P, Sirimatayanant M, Khuenpetch W, Harriss E, et al. (2024) Expanded roles of community health workers beyond malaria in the Asia-Pacific: A systematic review. PLOS Global Public Health 4(10): e0003113. <https://doi.org/10.1371/journal.pgph.0003113>
2. **Jongdeepaisal M**, Sirimatayanant M, Khonputsas P, Hein PS, Buback L, et al. (2024) Expanded roles of community health workers to sustain malaria services in the Asia-Pacific: A landscaping survey. PLOS Global Public Health 4(8): e0003597. <https://doi.org/10.1371/journal.pgph.0003597>
3. **Jongdeepaisal M**, Khonputsas P, Prasert O, Maneenate S, Sirimatayanant M, et al. (2024) Expanding the roles of malaria post workers in Thailand: A qualitative study of stakeholder perspectives. PLOS Global Public Health 4(9): e0003670. <https://doi.org/10.1371/journal.pgph.0003670>
4. Nguyen H, **Jongdeepaisal M**, Tuan DA, Khonputsas P, Ngo T, et al. (2024) Sustaining village malaria worker programmes with expanded roles: Perspectives of communities,

healthcare workers, policymakers, and implementers in Vietnam. PLOS Global Public Health 4(8): e0003443. <https://doi.org/10.1371/journal.pgph.0003443>

5. Orng LH, **Jongdeepaisal M**, Khonputsas P, Dysoley L, Sovannaroth S, Peto TJ, et al. (2024) Rethinking village malaria workers in Cambodia: Perspectives from the communities, programme managers, and international stakeholders. PLOS Glob Public Health 4(12): e0003962. <https://doi.org/10.1371/journal.pgph.0003962>
6. Buback L, Daniels K, Etim-Inyang T, **Jongdeepaisal M**, Sirimatayanant M, et al. Integrating community health workers to sustain malaria services in the Greater Mekong Subregion: findings from implementer case studies. PLOS Glob Public Health, in press.

D. Abbreviations

Abbreviations are defined upon their first appearance in each chapter. For clarity, any abbreviations used in figures or tables are explained in texts below them or in the relevant paragraphs. A comprehensive, alphabetically ordered list of abbreviations is also provided in the following table.

Abbreviation	Definition
ACCODS	Authority, Accuracy, Coverage, Objectivity, Date, Significance
ACD	Active case detection
ACF	Active case finding
ACT	Artemisinin-based combination therapy/treatment
AFS	Active fever screening
AIDS	Acquired immunodeficiency syndrome
AMC	Anti-Malaria Campaign
AMG	ASHA mentoring group
ANC	Antenatal care
ANM	Auxiliary nurse midwife
APLMA	Asia Pacific Leaders Malaria Alliance
APMEN	Asia Pacific Malaria Elimination Network
ARC	ASHA resource centre
ARI	Acute respiratory infection

Abbreviation	Definition
ASHA	Accredited social health activist
AWW	Anganwadi worker
BEPE	Bioethics and Public Engagement
BHP	Better Health Project
BHS	Basic health staff
BHS	Barangay Nutrition Scholars
BHW	Barangay Health Workers
BMGF	Bill and Melinda Gates Foundation
BPHWT	Backpack health worker team
BRAC	Bangladesh Rural Advancement Committee
CAG	Community Action Group
CBD	Community-based distributors
CBHW	Community-based health workers
CBM	Community-based monitoring
CCM	Community case management
CCM	Country coordination mechanism
CCRU	Chiang Rai Clinical Research Unit
CHEPP	Community health education and prevention program
CHV	Community health volunteer
CHW	Community health worker
CLM	Community-led monitoring
CMAT	Community malaria action teams
CMPE	Center for Malariology, Parasitology, and Entomology
CNM	National Center for Parasitology, Entomology and Malaria Control
CPR	Contraceptive prevalence rate
CRS	Catholic Relief Services
CSO	Civil society organization
DHO	District health office
DVBD	Division of Vector-Borne Disease
EHC	Essential health care
FCHV	Female community health volunteer
FGD	Focus group discussion
FLW	Frontline health worker
FMW	Forest Malaria Worker
GEDSI	Gender Equality, Disability and Social Inclusion
GFATM	Global Fund to Fight AIDs, Tuberculosis, and Malaria
GMS	Greater Mekong Subregion
G6PD	Glucose 6 Phosphate Dehydrogenase
HA	Health Assistant
HDC	Health dashboard centre
HIV	Human immunodeficiency virus
HMM	Home-based malaria management
HPA	Health Poverty Action
HPH	Health promotion hospital
HSRI	Health Systems Research Institute
iCCM	Integrated community case management
ICMV	Integrated community malaria volunteer
IDI	In-depth interview

Abbreviation	Definition
IMCI	Integrated management of childhood illnesses
IDP	Internally displaced person
IEC	Information, Education, and Communication
IHRP	Institute for the Development of Human Research
IOM	International Organization for Migration
IRS	Indoor residual spraying
ITN	Insecticide-treated net
ITP	Intermittent Preventive Treatment
ITPf	Intermittent Preventive Treatment for Forest goers
IVM	Integrated vector management
KII	Key information interview
LAO	Local administrative organisation
LF	Lymphatic filariasis
LHP	Local health professional
LHW	Lady health worker
LLIN	Long lasting insecticidal net
LLIHN	Long lasting insecticidal hammock net
LMIC	Low- and middle-income country
MC	Malaria clinic
MC	Malaria consortium
MC	Malaria coordinator
MCC	Myanmar Council of Churches
MCHP	Maternal and child health programme
MCP	Medical care programme
MDA	Mass drug administration
MEDP	Malaria Elimination Demonstration Project
MEI	Malaria Elimination Initiative
METF	Malaria Elimination Task Force
MEV	Malaria elimination volunteers
MHW	Maternal health worker
mHealth	Mobile health
M-FUND	Migrant fund
MI	Malteser International
MIS	Malaria information system
MMAT	Mixed Method Appraisal Tool
MME	Mekong malaria elimination
MMW	Mobile malaria worker
MOM	Mobile obstetric maternal health worker project
MoPH	Ministry of Public Health
MORU	Mahidol-Oxford Tropical Medicine Research Unit
MOT	Mobile outreach team
MOTIP	Mahidol-Oxford Translational Innovation Partnership
MP	Malaria post
MPW	Malaria post worker
MV	Malaria volunteer
NCD	Non-communicable disease
NGO	Non-government organization
NIMPE	National Institute of Malariology, Parasitology and Entomology

Abbreviation	Definition
NMP	National malaria programme
NRHM	National rural health mission
OPEN	Oxford University Policy Engagement Network
OR	Operational Research
OxTREC	Oxford Tropical Research Ethics Committee
PCU	Primary care unit
Pf	Plasmodium falciparum
PHC	Primary health centre
PHO	Provincial health office
PNC	Postnatal care
PMI	President's Malaria Initiative
PoR	Prevention of re-establishment
PSI	Population Services International
Pv	<i>Plasmodium vivax</i>
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
RAI	Regional Artemisinin-resistance Initiative
RASR	Reactive surveillance and response
RDT	Rapid diagnostic test
RTF	Raks Thai Foundation
SC	Save the Children
SCDI	Supporting Community Development Initiatives
SK	Shasthya Komi
SPH	Sun Primary Health
SMC	Seasonal malaria chemoprevention
SMRU	Shoklo Malaria Research Unit
SS	Shasthya Shebika
sVMW	Shop-based volunteer malaria worker
TBA	Traditional Birth Attendant
TDA	Targeted drug administration
ToC	Theory of change
TB	Tuberculosis
TBA	Traditional birth attendant
UCSF	University of California, San Francisco
UHC	Universal health coverage
USAID	United States Agency for International Development
VietMCI	Vietnam Civil Society Consortium for Malaria Control Initiative
VBDC	Vector Borne Disease Control Center
VBDC	Vector Borne Disease Control Unit
VHV	Village health volunteer
VHG	Village Health Guide
VHSG	Village health support group
VHW	Village health workers
VPHA	Vietnam Public Health Association
VMW	Village malaria workers
WHO	World Health Organization
YMAT	Young Muslim Association of Thailand

Chapter 1 Introduction

I first visited Buntharik in northeastern Thailand in 2019 to study how forest-going activities exposed local communities and workers to malaria, and how their risks could be minimised. What struck me most about this small border town was how conversations about poverty and the hardships of rural livelihoods permeated daily life, and how this closely linked to illness. Nearly every forest goer I interviewed had experienced not only malaria but also cycles of debt from agricultural instabilities as part of their routine struggles. The scale of timber logging was striking: one public health worker explained to me that high-quality *Pa-yung* (rosewood) could fetch as much as 6,000–10,000 US dollars (200,000–300,000 Thai Baht) per cubic meter. The rise in the rosewood trade during 2013–2014 coincided with malaria outbreaks, with Ubon recording up to 7,500 cases in 2014—the highest incidence in the country at the time. In towns where monthly household incomes averaged just 6,000 Thai Baht, week-long trips into the forest were seen as necessary. Many people I spoke with described falling ill with fever in the forest, seeking quick treatment at a nearby provider, and then returning immediately to logging to avoid losing income.

These narratives underscore how malaria and poverty were not only co-occurring phenomena but also dominant frames through which local residents articulated their lived realities. Despite decade-long progress, malaria remains a public health threat in the Greater Mekong Subregion (GMS), particularly in remote rural areas where access to health care is limited and communities bear the greatest health and economic burden (1). Accessible community-based malaria services are essential to reach the most at-risk populations, particularly forest goers and mobile and migrant populations. As malaria declines, there will be an increase in the proportion of non-malarial febrile illness cases presented to the village malaria workers (VMWs), who currently can only test and treat for malaria, will hence find it increasingly difficult to manage the bulk of fever cases that present to them. Gaining political and financial support to maintain their capacity and

services have also become more challenging as malaria declines as a health priority (2). In addition to malaria, demand for healthcare to address other communicable and non-communicable diseases is increasing rapidly in the region (3, 4). This development could undermine malaria elimination efforts. Identifying new roles that allow VMWs to address febrile illnesses and other local health needs may increase the number of people with fevers who attend VMWs, keep them relevant and motivated, and ensure that a high proportion of malaria cases are reached (5, 6). This transformation could also open a window for malaria services to be sustainably integrated into primary care and leverage additional resources for VMWs in the last mile of elimination.

The research presented in this thesis aimed to understand how the role expansion of VMWs could be designed and implemented as a strategy in Thailand and the wider GMS. The information needed to inform the development of such a strategy was identified through: (1) landscaping and gathering insights from existing VMW programmes in the Asia-Pacific region, followed by an in-depth analysis of Thailand as a case study to (2) explore the prospect of VMW role expansion from the perspectives of the policymakers, implementers, and end-users in various settings, and (3) translate this evidence into practices that aim to sustain community-based malaria services by engaging with the stakeholders at multiple levels in Thailand.

1.1 Background

Malaria elimination in the Greater Mekong Subregion

Malaria is a serious disease that can be life-threatening. Bitten by infected female Anopheles mosquitoes with *Plasmodium* parasites (7), malaria patients may experience mild symptoms such as fever, chills and headache, particular among those with past infection, to severe ones including

difficulty breathing, fatigue, confusion, and seizures. The disease is most common in tropical and subtropical areas, with *P. falciparum* and *P. vivax* being most common species. Left untreated, *falciparum* malaria can progress to death within 24-72 hours (7). Because some symptoms of malaria are not specific and can also be similar to many febrile illnesses, making malaria difficult to recognise, it is crucial to get tested early, especially for infants, children aged under five, pregnant women, and people with HIV. Although malaria is preventable and curable, the disease remains a public health threat that particularly affects individuals and communities living in endemic areas. Avoiding mosquito bites and getting malaria treatment remain difficult in geographically remote locations, such as in the case in border communities in the GMS.

In six countries across the subregion – Cambodia, China (Yunnan province), Laos, Myanmar, Thailand, and Vietnam – primarily populations and communities most affected by malaria are those residing and travelling in international border and forested areas (8, 9). Many are mobile and migrant populations (MMPs) and forest goers, who tend to be working-age adults residing or travelling close to and across border to undertake forest-based income generating activities, such as foraging, hunting, logging, and farming, particularly when these activities take place during the night (10-14). Among these populations, migrants living in informal settlements and travelling in forested areas, especially along the Thailand-Myanmar border, are at particular risk and also face additional barriers to accessing health care. Women and young children are at higher risk of malnutrition and violence, and this increases their vulnerability to a range of diseases (15) due to a range of factors such as occupation, gender, age, ethnicity and migration affecting their marginalised structural and economic statuses. Additionally, military officials and forest rangers stationed and patrolling along the border are also at increased risk of the disease (16).

In addition, the region also faced a growing threat of multi-drug resistance, along with resistance to its partner drugs to malaria, with the epicentre located at the border of Thailand and Cambodia (8, 9). In response, the Regional Artemisinin-resistance Initiative (RAI) was launched in 2013

among the key partners in the five GMS countries, namely the ministries of health, international and local non-governmental organizations, have worked closely to accelerate progress towards eliminating malaria transmission and preventing the spread of drug-resistant strains. The Global Fund to Fight AIDS, Tuberculosis, and Malaria, commonly known as the Global Fund, is the primary funder of the grant and the largest international funding source for malaria control and elimination in the subregion (17). Under the Regional Steering Committee's governance, RAI grants were awarded to national malaria programmes (NMPs) and civil society organizations (CSOs) to support malaria case management, increase malaria service coverage for remote populations in border areas, and strengthen national surveillance systems. One of the key interventions funded through the RAI has been the establishment and training of the VMWs in endemic communities to provide malaria-related services – a network of community-based providers who have been leveraged to provide malaria care at the very local levels (17).

Despite recent substantial progress in case reduction, particularly in the eastern GMS, progress towards malaria elimination may fall short. Since 2015, GMS countries have committed to achieve the regional targets to eliminate *P. falciparum* by 2025 and all human malaria by 2030 (18). With this goal set under the World Health Organization (WHO) Mekong Malaria Elimination (MME) programme, the countries have significantly reduced indigenous malaria cases during 2015-2020 and the eastern GMS is largely on track to meet its elimination targets (19, 20). However, several challenges – the growing number of migrants, resource constraints, and barriers to accessing healthcare – hinder efforts to interrupt local transmission and ensure early testing and treatment services to all high-risk populations. In Thailand, the malaria situation has deteriorated following increased cross-border movement along the western border, driven by political unrest in Myanmar and the resulting influx of migrants (2). Although the elimination targets are within reach in Laos, Vietnam, Cambodia and eastern Thailand, this recent surge in malaria cases in Myanmar with

subsequent importation into western Thailand followed by local spread eastwards is a major cause of concern and jeopardises regional progress (2).

First responders: Community health workers and village malaria workers

Globally recognised as an essential workforce in primary healthcare systems, community health workers (CHWs) play an essential role in improving access to, and quality of, primary health care (21). CHWs are primarily managed by primary care or horizontal programmes (22). In many countries, horizontal programmes, which may also be referred to as integrated programmes, focus on delivering comprehensive, integrated health services through existing health systems, aiming for a holistic approach to health care. Whereas vertical programmes selectively target specific health issues and are not fully integrated into the wider health system, such as in the case of malaria. Within the GMS, the CHW cadres that are managed by NMPs or CSOs under the RAI programme are generally termed VMWs. Within each country, CHWs and VMWs may be known by other names; for example, in Thailand, VMWs are referred to as malaria post (MP) workers (23), where members of a broader network of CHWs are known as village health volunteers (VHVs) (24).

Within the vertical malaria programmes, VMWs, a specific cadre of CHWs under the malaria programmes in GMS countries, have been the closest services to endemic communities over the past 10-20 years (9). The programmes have been established in countries by NMPs to train selected local community members as service providers: the services are free-of-charge, closer to home than public health facilities, and generally accepted by the patients who may be less inclined to visit public facilities due to their legal statuses and forest-based activities (25-27). Under the RAI-funded programme, NMPs and CSOs may recruit and train new community members as VMWs to provide malaria services; they may also draw on existing CHW programmes to provide malaria services in addition to basic health services. Embedded in the

endemic communities they serve, and occasionally former malaria patients or their relatives, VMWs have been focal contacts between the at-risk populations and the malaria programmes to conduct surveillance and control activities, deliver health services in remote and crisis-affected areas, and reach malaria patients who face barriers to healthcare access due to discrimination, language, gender, and cultural differences (28).

There are many terms used to refer to these workers in the GMS and globally, and in each country, the terms also vary. This research follows and expands on the WHO definition of CHWs as a group of healthcare workers selected by, or working in, their communities, and who may receive training to perform specific health interventions and/or roles related to healthcare delivery (29). In this thesis, the term 'CHW' is thus used when referring to the cadre broadly. This is intended to accommodate identification of CHW groups with different names that exist within the same country, and the varying combinations of roles they may perform within their communities. Across the various literature documented and cited in this thesis, studies and reports often referred to these workers by their specific cadre names in respective countries, or sometimes called them by their general terms, such as CHWs or VMWs. Additionally, the term 'worker' and 'volunteer' were sometimes used interchangeably, both in the literature and in the communities. These reflect the complex and compounded identifies of these workers and how they were perceived. In Thailand, the term 'volunteer' or '*Aa-sa-samak*' in Thai (directly translated as 'volunteer to and/or willing to be part of something'), or '*Aor-sor-mor*' (an official abbreviated title of the 'VHV' in Thai), is more commonly used among the programmes and community members. The role is also often called '*Jit-aa-sa*' in Thai (directly translated as 'volunteering mind'), characterised by a voluntarism principle that guides many aspects of VHV programme design and implementation. As for the malaria programme, although the official title of the VMW cadre is 'Malaria Post Worker', the workers are more commonly referred to by a shorter name, i.e. '*MP*', directly in English by the communities and by the programme staff. The 'Post' referred to their

workstation where they provide malaria services. For many MPs, the locations are their own residence; for some, a post could be a shelter located in a strategic spot close to forest or border entries, or elsewhere in their communities such as schools.

Table 1.1 and 1.2 provide the VMW cadres in general and among the malaria programmes in the GMS and a more general overview role of the CHW cadres, respectively. Although the positions of these workers are outlined by their names and/or terms known for each specific cadre in each country, it is crucial to note that many of the individuals who performed the roles of general CHWs may also belong to VMW cadres if they were also employed by the respective malaria programmes. The connection between CHWs and VMWs is hence embedded in each individual worker in the communities, as well as the operation of the primary care and malaria programmes in each specific context. This linkage, to a certain extent, signified the combination of community-based roles in health services which may originate by the programme design to recruit VMWs from a pool of CHWs, or vice versa.

Table 1.1 Common CHW and VMW cadres in the GMS

Country	CHW cadre	VMW cadre
Cambodia	Village Health Support Group (VHSG)	Village malaria worker (VMW); Mobile Malaria Worker (MMW)
Laos	Village Health Worker (VHW)	Village malaria worker (VMW); Mobile Malaria Worker (MMW)
Myanmar	Village Health Worker (VHW); also referred to as Community and/or Community-based Health Worker (CHW)	Malaria Volunteer (MV); Malaria Post (MP); Mobile Malaria Post (MMP); among those with integrated roles: Integrated Community Malaria Volunteer (ICMV) and/or Worker (ICMW)
Thailand	Village Health Volunteer (VHV); Migrant Health Volunteer (MHV)	Malaria Post Worker; often referred to as Malaria Post (MP), and if located at a border crossing, Border Malaria Post (BMP)
Vietnam	Village Health Worker (VHW)	Village malaria worker (VMW) or Malaria Post Worker (MPW); also often referred to as Malaria Post (MP)

Table 1.2 Definition and roles of community health workers

	WHO's community health worker	Thailand Ministry of Public Health (MoPH)'s village health volunteer	Thailand MoPH's malaria post worker
Definition	Community health workers (CHWs) are health care providers who live in the community they serve and receive lower levels of formal education and training than professional health care workers such as nurses and doctors.	Village health volunteers (VHVs) are individuals who were selected from and by the communities and received training from the MoPH to perform a role as 'change agents' on health behaviours and communication, education, planning and facilitate health promotion activities.	Malaria post workers (MP or MPW) are individuals who were trained and worked in the communities to control and prevent malaria by providing malaria information to the communities, screen and test for malaria, treat malaria patients and manage malaria foci.
Roles	<p>Common primary roles:</p> <ul style="list-style-type: none"> - Deliver diagnostic, treatment or clinical care; - Encourage uptake of health services; - Provide health education and behaviour change motivation; - Data collection and record-keeping; - Improve relationships between health system functionaries and community members; and - Provide psychosocial support. <p>Additional roles in specific contexts:</p> <ul style="list-style-type: none"> - Provide human HIV counselling; - Deliver injectable contraceptives; or - Conduct rapid malaria diagnosis tests 	<ul style="list-style-type: none"> - Communicate public health information between health officials and the population in the village; - Provide health advice and knowledge to neighbours and household leaders; - Deliver basic health services such as referring patients to and from health facilities, providing contraceptives, first aids; - Conduct health surveillance and control in the village such as on malnutrition and iodine deficiency, maternal and child care, local diseases; - Lead health planning and development in the villages; - Encourage villagers to participate in public health activities; and - Facilitate discussions among the villagers, local leaders, and authorities on public health needs. 	<ul style="list-style-type: none"> - Screen malaria patients with RDT and provide treatment - Explain correct use and adherence to malaria treatment, and follow up with all malaria cases - Monitor treatment adherence and provide consultation - Report malaria cases onto malaria information system within one day - Notify or accompany all <i>Pf</i> and <i>Pv</i> cases to attend follow-up visits - Refer all cases with severe symptoms, pregnant women, and children under one - Perform behavioral change communication to target population - Coordinate vector-control intervention implementation - Supervise malaria treatment - Perform active case detection among population with outdoor infection risk - Complete relevant reports

CDom malaria as well as other vertical programmes shows that it can also cause new challenges if not carefully managed. Challenges may arise when an integrated programme produces weak data quality, undermines tailored interventions, disrupts responsive supply chains, and risks stockouts or wastage (34). In Sub-Saharan Africa, integrating HIV and non-communicable disease (NCD) care faced persistent gaps in infrastructure and workforce capacity, and reported challenges from shortages of skilled staff (43) and heavier workloads without increases in staffing, longer consultation times, and unchanged vertical HIV reporting requirements, leading to duplicative and burdensome parallel reporting systems and resulting in longer patient wait times and risking treatment interruptions (37).

For malaria programmes approaching elimination, similar full integration risks diluting focus and undermining elimination efforts, especially when malaria remains a threat in certain areas (30). In areas where malaria incidence drops, integrated health workers often face competing priorities from other pressing health needs which can push malaria surveillance and case management to the margins. As VMWs are absorbed into general health systems, supervision may shift from malaria programme specialists to general health managers who may lack malaria expertise, leading to under-detection and weaker oversight of surveillance and vector control. These developments can also weaken disease-specific diagnostic and accountability for malaria-specific targets, as indicators and skills get diluted in broader health performance measurement (44). Moreover, although combining malaria services with the Integrated Management of Childhood Illness (IMCI) has been reported to reduce child mortality and been adopted by over a hundred countries, evidence on the quality and delivery of such 'packaged' integration is limited, and the resources needed for large-scale implementation remain insufficient (45). On the contrary, evidence from other countries in Asia such as Sri Lanka (46) and Yunnan province in Southern China (47) shows that, instead of an integrated horizontal approach, their intensive vertical

programmes with ring-fenced funding for surveillance and clear reporting structures, have accelerated their elimination achievement.

Perhaps the most notable risk arising from integration relates to funding instability. Financial support for malaria programme operation and particularly for VMWs is highly reliant on external donors. Beyond the four key Global Fund grants (RAI, RAI2E, RAI3E and RAI4E), other donors to GMS countries include the Bill and Melinda Gates Foundation (BMGF) and the U.S. Agency for International Development President's Malaria Initiative (USAID-PMI) (2). Several reasons underpinned this reliance on donor funding. As vertical programmes have been shaped by donor-funding as a technical, commodity-focused challenge, emphasis was made on the implementation of vector control activities such as distributing LLIN and implementing indoor residual spraying (IRS), over health system strengthening. Additionally, several of these and other key interventions, such as mass drug administration (MDA), present distinct challenges for integration as this selective approach detaches malaria control efforts, such as the VMW malaria-specific services, from their broader healthcare services and systems (30). Meanwhile, in low-and-middle-income countries (LMICs), domestic financial limitations and competing priorities make it challenging to allocate adequate resources for under-prioritised health programmes, especially in remote places like malaria-prevalent communities along borders (48). Local governments in these countries often face shortages of infrastructure, expertise, and funding, making it difficult to implement and sustain effective malaria interventions, particularly those requiring specialised training and resources (49). Additionally, in countries where Universal Health Coverage (UHC) is absent, there are few opportunities provided for programmes to leverage domestic funding sources that can be allocated for malaria elimination (48). Despite UHC, countries may still face competing priorities to invest in other higher-burden health programmes, including NCDs which have become a major public health concern in Southeast Asia, accounting for a significant portion of deaths and imposing a substantial economic burden on the region (30, 48). This heavy reliance

on external funding and competing local priorities can lead to obstacles to achieving long-term sustainability, a process which requires a shift towards local ownership and more comprehensive health system strengthening and financing strategies (30).

Malaria programme integration, hence, faces a difficult paradoxical situation. Although integration is promoted and currently proposed as a sustainability strategy, without dedicated malaria budgets and clear lines of responsibility, the programme risks being deprioritised—especially if the remaining malaria burden lies with marginalised populations or politically-sensitive areas, such as in the case of the GMS. To ensure a sustainable transition from a vertical malaria to an integrated (horizontal) care programme, the development of broader health system capacity is important. This encompasses enhancing the availability and use of high-quality data across all levels, prioritising equity, fostering research and innovation for new tools, building knowledge on effective intervention implementation, advocating for malaria investment among stakeholders, and actively involving affected communities and countries (30, 33). Suggestions have also been made that the entry point of such integration should take place at programmatic level across multiple programmes within a Ministry of Health such as infectious disease, primary healthcare or reproductive and maternal child health services (45).

Among many of these issues, task shifting and/or role expanding of CHW and/or VMW is undeniably an important consideration, particularly for their capacity to provide testing and treatment services as well as conducting local surveillance activities and timely data reporting. A clearer understanding of whether and the extent to which these VMWs are part of the primary care programme and the country's general health system, which varies contextually among countries, is essential to assess the prospects of this development, along with its opportunities and challenges (50). Table 1.3 summarises the functionality of the horizontal and vertical health programmes, and the implications for malaria programmes of a shift towards their integration with the wider health system. Programme aspects, including governance, funding sources, and

workforce, are key to understand where the design and implementation of the VMW role expansion sit in the wider transition of vertical to horizontal (integrated) programme.

Table 1.3 General characteristics of horizontal and vertical health programmes

Horizontal programme	Vertical programme	Implications for malaria programme
Definition		
Integrated delivery of a broad range of health services, usually through public, government-financed health systems	Focused delivery of specific health interventions or disease-control activities, often managed separately from the general health system	From focusing exclusively on malaria prevention, diagnosis, treatment, and surveillance > To address malaria alongside other febrile illnesses and broader public health services.
Scope		
Comprehensive – covers multiple health conditions, preventive care, treatment, and health promotion	Selective – targets one disease or a small set of health problems	From dedicated malaria staff, separate from primary health care facilities > To malaria services provided within primary care units or by multi-purpose CHWs
Governance		
Fully embedded within primary healthcare systems	Operates in parallel to existing health systems, sometimes with separate staff, facilities, and supply chains	From centralised, disease-specific management through NMP > To malaria oversight integrated into primary healthcare and management under the Ministry of Health's broader health system structures
Funding sources		
Usually domestic government budgets, sometimes supported by general health sector funding from donors	Often donor-driven, with earmarked funding for specific diseases or interventions	From earmarked donor funding > To combining financing from national health budgets and broader health sector funding
Workforce		
Staff are multi-skilled, covering a broad range of health needs	Staff are trained specifically for a single disease or health issue	From specialised malaria staff with under disease-specific supervisors > To general health staff trained to manage malaria as part of routine care

1.2 Research question and objectives

My DPhil research focuses on the prospect for VMW role expansion beyond malaria in the context of elimination in Thailand and the wider GMS. The main research question is: How can

community-based malaria services be sustained through expanding the roles of VMWs to provide health services that are additional to their existing roles in malaria? The approach to address this overarching research question was broken down into three parts, each with a set of sub-questions.

Part 1. What has been done elsewhere in the Asia-Pacific? What is the extent to which the roles of malaria CHWs have been expanded beyond malaria? What can we learn from countries in the Asia Pacific? What are the additional roles of CHWs and the characteristics of their programmes? What enables their implementation and the extent to which they are sustainable?

Part 2. What are the prospects for role expansion of these workers and how could it be designed and implemented as a strategy in Thailand? What additional roles could VMWs perform and how can their roles be integrated into primary care in varied transmission settings? Who are the stakeholders involved in the design and implementation and what are their perceptions on the proposed strategy and future direction?

Part 3. What approaches have been or can be implemented to initiate the role expansion or service integration in Thailand? What is the evidence for the design and implementation at the community and policy levels? How can they be taken forward to inform the decisions of the communities and policymakers? How could stakeholders be effectively engaged to prioritise this issue?

The thesis investigates these questions through three approaches: (1) a systematic review and scoping survey to landscape and learn from the malaria programmes in the Asia Pacific region, (2) an analysis of communities, stakeholders and health system to understand the context and assess the prospects of VMW role expansion in Thailand across varied transmission settings, and (3) public and policy engagement in Thailand to document with, and inform, stakeholders of the evidence and entry points for role expansion and service integration. This thesis thus

combines regional-level landscaping with in-depth analysis of the health system at multiple levels in Thailand, and builds on these to inform the design, implementation, and evaluation of the subsequent stakeholder engagements.

1.3 Outline of study and scope of contribution

This thesis presents data from one multi-country research project, and four smaller studies in Thailand that focus on the prospects and engagement for CHW/VMW role expansion and primary care integration. Each component has distinct aims and objectives (Table 1.4). The first component is part of an Operational Research (OR) project, within which my DPhil is grounded, and funded through the RAI3E regional two-year grant (2021-2022) (51). The project was a collaboration between a network of researchers in MORU, *Asia Pacific Malaria Elimination Network (APMEN)*, *Malaria Elimination Initiative (MEI)* at the *University of California, San Francisco (UCSF)*, and the NMPs in Cambodia, Thailand, and Vietnam (52). In **Chapters 2 and 3**, the data and results from the landscaping components comprising a systematic review and a scoping survey of malaria programmes in the Asia Pacific are presented, followed by a country-level component focusing on the investigation of VMW roles and the malaria programme in Thailand in **Chapter 4**.

The four subsequent projects focused specifically on the setup of the primary care system and the prospects for integration of the malaria programme in Thailand. **Chapter 5** presents a study focused on primary care units (PCU), which aimed to explore the roles of malaria and wider CHW cadre and their linkages with PCUs in primary healthcare delivery in a resource-limited setting, and identify local health priorities to inform the prospects for primary care interventions beyond malaria. The PCU study was a collaborative work with *Chiang Rai Clinical Research Unit (CCRU)*

and *Buntharik District Hospital*. The study presented in **Chapter 6** investigated the role expansion strategy amidst the ongoing malaria outbreak along the Thailand-Myanmar border and the extent to which malaria programme integration has progressed in a high transmission setting. In **Chapters 7 and 8**, two stakeholder engagement projects are presented which aimed to inform stakeholders of the formative research evidence for role expansion and service integration, and engage them to translate this evidence in actions, using two case studies in low and high transmission settings. **Chapter 9** concludes with the overall discussion of the research, its limitations, and the implications for Thailand and more broadly in the GMS.

Alongside the studies presented in this thesis, the RAI3E project encompassed a broader research programme with collaborating partners and employed a variety of methods to expand the evidence base beyond Thailand, including interviews of regional implementing organisations, two parallel country studies in Cambodia and Vietnam, and an implementation study in Cambodia. Although I contributed to these studies, my main focus was on the regional landscaping and Thailand country components, so I have not included this wider set of studies in this thesis.

Table 1.4 Research components and objectives

Component	Objective
Part 1 Landscaping the Asia Pacific	
Landscaping studies of CHW and VMW roles and malaria programmes	<ol style="list-style-type: none"> 1. Identify and characterise expanded malaria programmes and the expanded roles of CHW and VMWs 2. Explore the critical determinants of sustainable programme and evidence of impact 3. Characterise and describe the enabling factors of successful implementation and policy implications to ensure successful roll-out
Part 2 Assessing the prospects for VMW role expansion in Thailand	
Malaria programme overview and assessment of VMW roles in low transmission community	<ol style="list-style-type: none"> 1. Assess prospects for the potential expansion of VMWs, considering current public health needs and priorities in the communities 2. Examine the need and preference for expanded roles of VMWs 3. Explore potential additional health services that could be provided by VMWs, design and feature of implementation, and necessary support to accompany expanded roles

Component	Objective
Overview of primary care programme and assessment of integration	<ol style="list-style-type: none"> 1. Identify and describe roles of PCUs and available health services and their linkages with CHWs and VMWs 2. Explore the prospects for use of appropriate technologies to improve the provision of health services at the PCUs within a resource-limited setting
Malaria outbreak case study	<ol style="list-style-type: none"> 1. Identify roles of CHWs and VMWs and perspectives of local stakeholders on the role expansion in high transmission setting 2. Explore the prospects for integration of malaria services in the context of primary care decentralisation
Part 3 Translating evidence into practice through engagement in Thailand	
Public engagement project	<ol style="list-style-type: none"> 1. Inform local stakeholders and the community of the formative research evidence 2. Co-create engagement activities that promote the integration of community-based malaria services in a low-transmission setting
Policy engagement project	<ol style="list-style-type: none"> 1. Inform managers and implementers of malaria programmes of formative research evidence 1. Document entry points and sustainable approaches to CHW and VMW role expansion and malaria service integration in high transmission setting

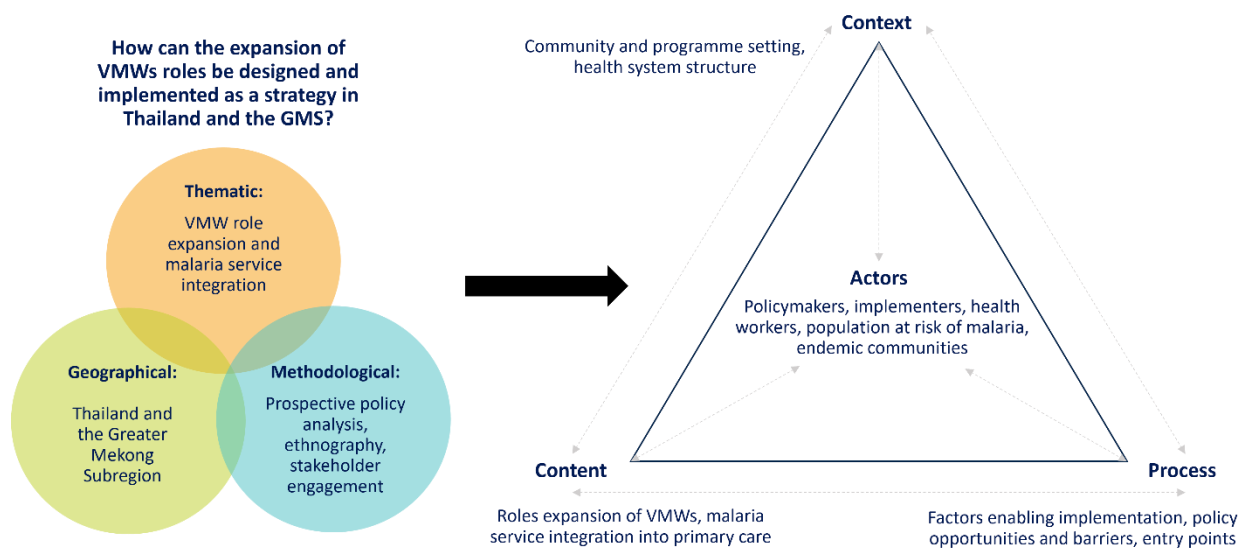
1.4 Overall methods and materials

Conceptual frameworks: Prospective policy analysis and health policy triangle

This research followed a prospective policy analysis which offers an approach to position and analyse the prospects of policy under investigation and can be used to identify the information and resources needed to inform the extent to which the policy under investigation will be feasible. The approach also provides an analytical framework for identifying and assessing the stakeholders in the process, including individuals or organisations who have an interest, might be affected, or are involved in the design and implementation of the policy (53). To deepen the understanding of VMW role expansion strategy, the health policy triangle (53) was used to inform my investigation of the VMW programme pertaining to the relevant actors (policymakers, implementers, beneficiaries or communities), content of the proposed policy (role expansion, service integration), context of implementation (targeted populations in endemic community, the

setting of malaria programme and primary care), and implementation process (enablers, barriers, entry points) (see Figure 1.2). This framework largely informed the stakeholder analysis in Thailand and the strategic selection of a number of key informants that were best positioned to elicit information on the policy prospects (54). In addition, the approach provided a chance to view this topic from an elevated perspective, highlighting this VMW role expansion policy as a complex issue with a number of influencing health system factors involved. I focused on addressing this complexity as I proceeded from the formative research activities to the stakeholder engagement activities which aimed to extend my attempts to understand how the policy under investigation would be translated into practice.

Figure 1.1 Conceptualising the health policy triangle framework



Landscaping studies: systematic review and scoping survey

This work focuses on prospective analysis of the VMW role expansion policy in the GMS and is organised around three interconnected levels of analysis. At the outset, a systematic review of malaria CHW role expansion in the Asia Pacific, followed by a scoping survey among multi-level implementers were conducted to evaluate the research and programmes in the region. This regional level of analysis mainly involved the collection and critical reading of documentation

reporting CHW roles within the malaria programmes in 23 Asia Pacific countries, including research publications and programme reports that are largely available on academic archives and organisational websites. This regional analysis was followed by an online survey distributed to the identified programmes from the review and key malaria programmes managed by the government, non-government, academic/research, and relevant private organisations in the region. This mixed-methods approach combining document review and scoping survey allowed the landscaping study to gain a more comprehensive overview of the malaria programmes with expanded roles of their workers. By collecting, analysing, and interpreting data using a mix of techniques, this also allowed for triangulation of the data pertaining to the characteristics and implementation of various programmes, and complemented to the building of a conceptual framework outlining factors enabling effective implementations and contributing to sustainability of such programmes.

Qualitative methods: interviews, focus groups, observations, and document analysis

The subsequent research focused on the policy prospects for VMW role expansion and integration of malaria services in Thailand. In a second level of country context analysis, I aimed to identify and explore the country's policy and programmes that have underpinned the implementation and roles of healthcare providers, with a focus on RAI-funded malaria post workers or MPs who were the key community-based providers of malaria services in the country. The analysis began with a document review to explore the structure of the vertical and horizontal programmes, followed by the identification of key policy documents and all relevant stakeholders for key informant interviews (KIIs). At field sites, the research focused on understanding the setup of MPs, as well as other community-based health programmes embedded in varied malaria transmission contexts. To gain a more in-depth and nuanced understanding of such programmes, mix-methods design combining qualitative and quantitative methods was employed and incorporated a variety of data collection techniques: in-depth interviews (IDIs), focus group

discussions (FGDs), questionnaire-based survey, informal conversation with and observations of MPs and their communities, healthcare workers and relevant programme implementers in each site. In this research component, I have paid particular attention to the (malaria and non-malaria) roles of MPs embedded within the current semi-vertical structure of the malaria programme, and to the policy vision to integrate malaria roles and services into primary care, and the opportunities and challenges of its implementation. I emphasised on gathering in-depth information on the contexts and perspectives of the stakeholders at multiple levels (55) and gaining a deeper understanding of the attitudes, beliefs, motives, and behaviours of the communities whom MP served and who are the target population of the malaria programme (56). This approach was particularly valuable in in this project as it offered ways to explain the socio-cultural contexts of malaria endemic communities where at-risk populations reside and to whom MPs provide their services. By exploring their experiences, qualitative research also provides insight into the social structures or processes that inform the development or improvement of the malaria programmes and promote the uptake and implementation of the malaria services. With the focus on the MPs and malaria services, understanding health-seeking behaviours, characteristics of health providers, and factors related to programme implementation are crucial to inform the policy under investigation.

Stakeholder engagement and community action research

Finally, I am aware that this prospective policy analysis work was embedded in an ongoing process of changes driven by the RAI programme and the Global Fund's funding direction and implemented by Thailand and GMS countries. The micro-level of community-based analysis involved the participatory research of two cases as the progress towards the implementation the VMW role expansion and service integration was unfolding itself. In one case, I followed the changing roles of MPs and their relationship with the local health network in the context of low malaria burden and priority where there was a risk of discontinuing MP roles without replacing

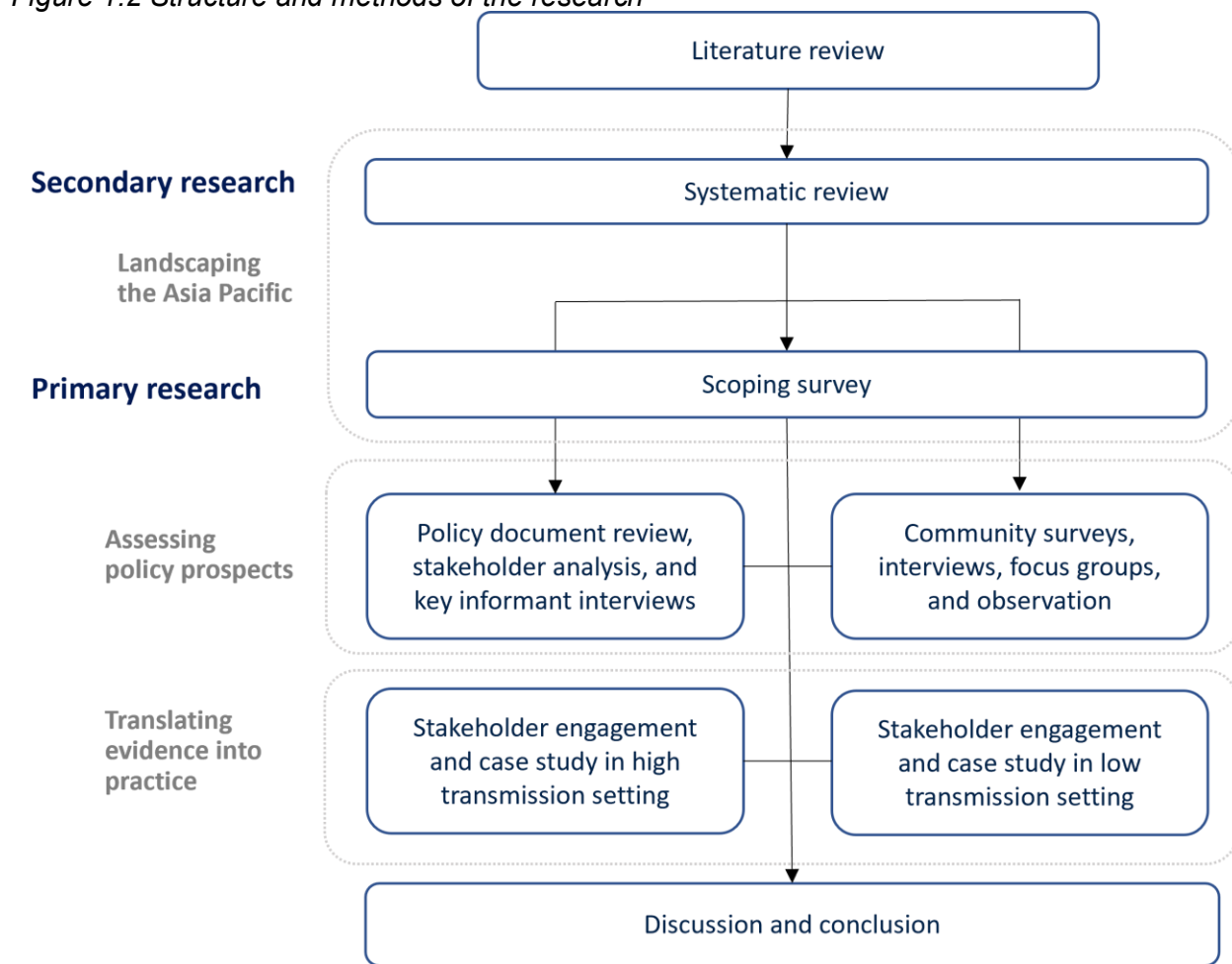
theirs with other equivalent community-based services. In the other case, I decided to focus on this development in high transmission areas along Thailand-Myanmar border because it can uncover role expansion of multiple cadres of workers and integration efforts ‘in action’ driven by local implementers and community representatives. In both cases, stakeholder engagement was used as an approach to inform the relevant stakeholders of the formative research results, seek their feedback and inputs, and collaborate to track the developments and document the evidence of these transitions. The analysis of the formative research, including regional landscaping and Thailand country studies, was disseminated to the relevant stakeholders on multiple occasions and also used to inform the design and implementation of the engagement projects. Both works include an application of various data collection methods: observations, field notes, informal conversation, semi-structured interviews and participant evaluation were recorded throughout the engagement activities. In particular, I focused on the participatory approach using co-creation methods to bring different viewpoints on the future of MPs and community-based malaria care among diverse stakeholders and collaborate on bottom-up actions that have successfully integrated or aim to integrate malaria roles and services in the future. Table 1.5 and Figure 1.2 provide an overview of the data collection methods and key focuses of each research component, and a visual diagram of the research structure.

Table 1.5 Data collection methods and key stakeholder or focus respondent

Study component	Data collection method	Key stakeholder/focus respondents
Part 1 Landscaping the Asia Pacific	<ul style="list-style-type: none"> ▪ Systematic review ▪ Scoping survey 	Programmes and implementers in the Asia Pacific
Part 2 Assessing the prospects for expanding the roles of VMWs in Thailand	<ul style="list-style-type: none"> ▪ Document review ▪ Key informant interviews ▪ In-depth interviews ▪ Focus group discussions ▪ Participant observation ▪ Informal conversations ▪ Fieldnotes 	All level of stakeholders in Thailand and field sites including: <ul style="list-style-type: none"> - Regional organisations - Government organisations - Non-governmental organisations - National malaria programme - Sub-national malaria and primary care programmes

Study component	Data collection method	Key stakeholder/focus respondents
		<ul style="list-style-type: none"> - Healthcare workers at community hospitals and primary care units - Community health workers (malaria post workers, village health volunteers and others) - Community members, malaria patients and at-risk groups
Part 3 Translating evidence into practice through engagement in Thailand	<ul style="list-style-type: none"> ▪ Co-creation activities ▪ Evaluation interviews ▪ Participant observation ▪ Informal conversations ▪ Fieldnotes 	All level of stakeholders at sites in case studies of low and high transmission settings

Figure 1.2 Structure and methods of the research



Reflexive thematic analysis

A crucial component of my analysis also involved a level of flexibility in the approach to the framework, with it adapted based on the ongoing analysis. This included thematic analysis which was used to systematically identify, analyse, and report patterns within data from primary and secondary sources that were collected using mixed methods designs throughout the research (57). Several data sources and data collection techniques have yielded mainly qualitative ‘thick’ descriptions encompassing contextualised accounts of meaning and interpretations of text-based data from the documents and the study participants, as well as the non-verbal data from the observations. This allowed for triangulation of data from multiple sources, and development of thematic frameworks for data analysis in each formative research component. To this aim, during the initial stages of my research, I identified key thematic categories based on the findings about CHW/VMW roles, malaria programme characteristics, and implementation enablers from the systematic review. This thematic framework was translated to the scoping questionnaire-based survey to expand on the details of the implementing organisations. Once this information was organised, a conceptual framework on enabling factors to CHW/VMW’s role expansion was developed and further used to inform the subsequent analysis of the Thailand malaria programme. At this stage, data was primarily derived from key policy documents, in-depth interviews and focus groups conducted in Thailand to shed light on the key thematic issues identified from the health policy analysis triangle. I began the process with a research journal and fieldnotes I kept while engaging with the research participants and in fieldwork that I kept returning to whenever I had the chance, particularly to review the notes on observation I had when I was in the field and in writing. This reflexive exercise continued through getting myself familiarised with the data by reading the text and occasionally translating them from Thai to English, and sometimes English to Thai. This iterative analysis also allowed me to approach the analysis deductively based on the key topics initially identified from the landscaping’s conceptual

framework, and inductively as the additional key topics emerged from the subsequent primary data collection.

Based on the conceptual frameworks, qualitative research methods are the essential tools of choice for collecting data that goes beyond numerical measurement, emphasizing the exploration of experiences, perspectives, and meanings surrounded the VMW programme development and its future prospect. By employing techniques such as interviews, focus groups, observations, and document analysis, I aimed to generate nuanced, in-depth insights that reveal context, complexity, and diversity of viewpoints on the topics from multiple individuals and communities with similar and varying lived realities. Using open-ended questions and follow-up probes, in-depth and/or semi-structured interviews allow for flexibility to explore the key and emerging themes with each individual and across types of respondents, while a group discussion provide the opportunity to explore dynamics and consensus within the communities or stakeholder groups on the topics. Non-verbal data such as observation notes and photos the research team and I took also enhanced my process of understanding the lived realities from the study participants' point of views, particularly when discussing issues around access to health services and working environment of the malaria workers in the communities.

One important consideration when employing this is the potential for self-report bias, where participants may consciously or unconsciously present information in ways that are selective, socially desirable, or influenced by recall limitations (58). To minimise these effects, I employ several strategies. First and foremost, it was essential to build rapport and trust by ensuring that informed consent was provided by the study participants and their confidentiality was safeguarded. To do so, careful considerations were made to select a safe space for the conversation and allow for time for the participants to ask questions or raise any concerns they may have throughout the process. The team and I paid particular attention using appropriate language(s) and neutral and non-leading questions during the conversations, taking pause(s) and

using silence to pace the conversation for reflection and interpretation, and encouraging, and even sometimes challenging, the participants to question their own or others' responses. Triangulating data through multiple sources or methods and cross-checking the self-reported responses against observations or documentary evidence is also embedded in the iterative process of data collection and analysis. In many of these studies, particularly community-based data collection activities, deliberate efforts were made to phase interviews and group discussions over several weeks to months, allowing myself to think through the key and emerging themes, adapt the topic guides, and ask more questions when needed to ensure data saturation. Reflexivity on the part of the researcher—remaining aware of my own assumptions and positionality—also helps reduce the impact of bias and strengthens the credibility of the findings.

To accommodate that comprehensiveness of reporting qualitative research, the writing of this thesis, and each study presented, were guided by the Consolidated Criteria for Reporting Qualitative Research (COREQ) (59). As a large component of this research involved ethnographic methods to observe and interact with the study participants, including MPs and their clients in endemic communities, I paid particular attention to reporting the important aspects of reflexivity, participant selection and settings of the research and engagement activities conducted in Thailand. To accommodate the large amount of text-based data for analysis from multiple sources, NVivo software, a computer-assisted qualitative data analysis software (CAQDAS), was used to facilitate the data storage, the process of coding and memoing, and triangulation (56). Additionally, notetaking of field notes, interviews, informal conversations, and observations by myself also assisted the development of my understanding of the data within each research component and throughout the project. Because of the different objectives and focuses of the analyses, further details of the thematic analysis and data collection tools are described in each respective chapter.

Positionality and reflexivity

The research components presented in this thesis were led by me, a female Thai social scientist at Bangkok-based Mahidol Oxford Tropical Medicine Research Unit (MORU), a collaborative research unit between the Centre for Tropical Medicine and Global Health, University of Oxford, and the Faculty of Tropical Medicine, Mahidol University. I am part of a research team at MORU Epidemiology Department which works in close collaboration with NMPs, local and international implementing partners in the GMS and the wider Asia Pacific towards informing policy decisions. Before the DPhil, my first research project with MORU was RAI2E (2019-2022) which aimed to assess the acceptability and feasibility of chemoprophylaxis as a malaria prevention strategy for forest goers, and characterise their risks and travel patterns in Cambodia, Laos, and Thailand. I worked with the clinical trial and engagement teams in Cambodia where a clinical trial was implemented, and two field epidemiologists in Laos and Thailand. I also supervised two local research assistants and worked with a research team based at local units and primarily within hospital settings; many of whom I continued to collaborate with in conducting the RAI3E project and the studies presented in this thesis.

I began this project with prior academic and professional training in political science and public policy, a background which unavoidably informed my views on and interpretations of the studied topic. However, malaria as a disease and public health issue is not widely experienced firsthand or even known among the general Thai population, especially those living in urban developed settings, including myself. Additionally, I am neither a specialist in, nor a provider of, malaria care and had no prior experience dealing with the pathogens or caring for patients. My position in malaria research appears to be at the edges of disciplines where medicine meets social science, and of health systems where decision makers meet end users. Along with the evidence gathered from scientific methods in each study, my reflections from the experience and journal underpinned the architecture of this thesis. I also acknowledge that my interpretive analysis of the issues and policy under investigation is influenced by my role as an embedded researcher at an academic

and international institute. I will further reflect on the benefits and challenges of this position in conducting the research in the final chapter.

1.5 Study context, sites and case studies

In Thailand, primary data were collected at three sites along international borders in the northeastern, northern, and western regions across four provinces namely Ubon Ratchathani and Sisaket, Chiang Rai, and Kanchanaburi. These were selected to capture diversity in malaria prevalence, at-risk populations, and malaria programme implementation. The RAI3E study sites Ubon Ratchathani and Sisaket were selected to reflect a low malaria transmission area with risks of drug resistance along the north-eastern border (60). For the PCU study, the choice of Ubon Ratchathani and Chiang Rai was a result of the need to include PCUs representing urban and rural areas while operating in a border setting and nearing malaria elimination. For the malaria outbreak study in Kanchanaburi, the study site needed to reflect high malaria prevalence along the western border and the increased risks of malaria in the ethnic and migrant populations. Sociocultural factors pertinent to the populations including language, culture, gender and migration status were also diverse and varied across sites. Two engagement projects were developed as an extended part of these studies, one embedded in the near elimination setting in the northeastern site and another in the western site with high malaria transmission. Across all sites, practical factors in study site selection included the existence of established collaborations with the local research units and contacts to carry out data collection.

In these communities, residents relied heavily on forests for both income and subsistence, collecting seasonal wild products year-round. From my previous studies in Thailand and the subregion (25, 26, 60), I have learned that forest visits were part of daily life for both men and women, as many worked in rubber plantations and farms close to or outside forest areas. These

forest visits, day-and-night work, and stays in farm huts exposed them to mosquito bites. Among forest goers and local residents at the study sites in Thailand, the word ‘*malaria*’, in its original English term, is not uncommon, particularly among those who had experienced malaria multiple times, and among those who were able to recognise the malaria symptoms, simply called the disease ‘*kai-ma-la-ria*’ (malaria fever). In the past, malaria was more commonly referred to by other local terms, such as ‘*kai paa*’ (forest fever) and ‘*kai jab san*’ (shivering fever). Several other words in local language(s) are known as and/or used to call malaria: ‘*kai yoong*’ (mosquito fever) in Thai and Lao languages (61), ‘*ta-nya-goh*’ (fever with chilling) and ‘*pa-zo-su*’ (poison from mosquito) in Karen (*Kayin*) language (62); in Vietnamese and Khmer, ‘*sốt rét*’ (chilling fever) (63) and ‘*krun-chan*’ (disease that defeats you) are the common terms, respectively (64). The understanding of the associations of the illness with forest livelihoods, febrile symptoms, and mosquitoes, is crucial to documenting and analysing the lived experience of the CHWs/VMWs and their patients, particularly when these elicited the perceived risks and awareness of the disease which may influence the awareness and uptake of malaria and other health services.

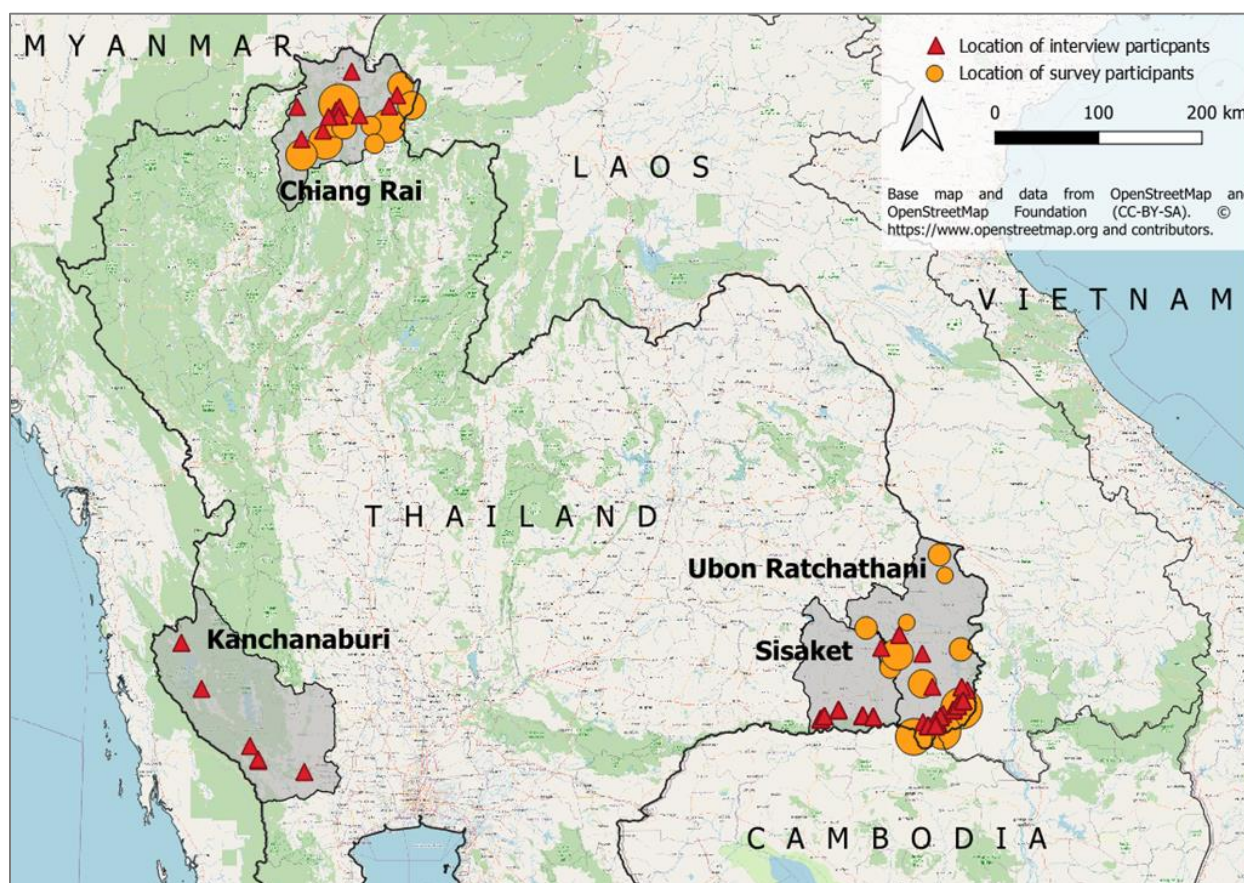
Table 1.6 and Figure 1.3 depict the study sites across Thailand with more details provided in each respective chapter. According to Thailand’s national malaria elimination strategy, A1 villages refer to administrative areas defined as active foci areas with indigenous cases in the current year) while A2 villages are defined as residual non-active foci areas with no indigenous cases in the previous 1-3 years. The number of villages and malaria posts are reported by Thailand’s RAI3E implementation strategy in 2021.

Table 1.6 Study sites in Thailand

Site	Border	Malaria transmission	Presence of MPs (2021-2023)	Study components
Ubon Ratchathani Northeastern region	Laos	10 A1 villages; 26 A2 villages	8	Low-transmission case study; malaria and primary care programme review, and stakeholder engagement

Site	Border	Malaria transmission	Presence of MPs (2021-2023)	Study components
Sisaket Northeastern region	Laos and Cambodia	12 A1 villages; 14 A2 villages	5	Low-transmission case study: malaria programme review
Chiang Rai Northern region	Laos and Myanmar	0 A1 and A2 villages	0	Low-transmission case study: primary care programme review
Kanchanaburi Western region	Myanmar	50 A1 villages; 25 A2 villages	46	High-transmission case study: malaria programme review and stakeholder engagement

Figure 1.3 Map of study sites



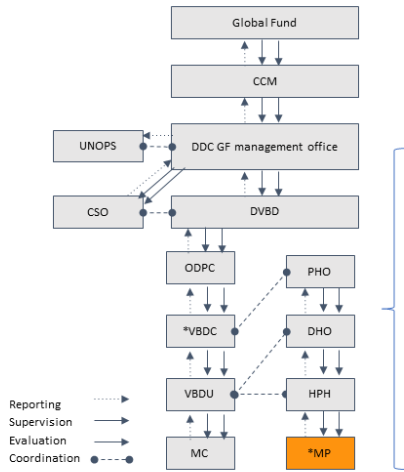
Stakeholder mapping

The selection of study participants, study sites, and case studies is significantly shaped by the initial landscaping studies and stakeholder mapping conducted at the early stage of the research. Figure 1.4 visualised how I developed the stakeholder mapping throughout the formative research and the engagement projects and used them to inform the design of case studies in Thailand. The first schematic diagram (Figure 1.4a) outlined the identification of key organisations and their interconnected operational features under the RAI grant, within which the MPs were set-up. The diagram (Figure 1.4b) was expanded to include the relevant organisations to the primary care programme under the general health system and the decentralised system. Here, I tried to visualise where the policy-oriented transitions of malaria services and surveillance activities in the elimination phase will take place, where MPs sit in this scheme of changes, and where the role expansion and integration strategy might fit in. These two diagrams were used to identify and map the key and additional stakeholder for the key informant interviews and data collection activities conducted at the central level, and subsequently at each study site.

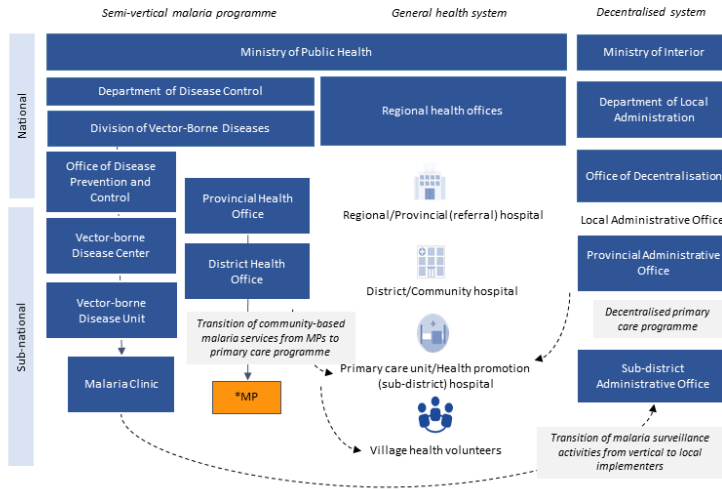
As the key stakeholders were mapped, a stakeholder analysis was also conducted to review the key stakeholders in our studies by their level of interests to promote the proposed strategy and by their level of power in decision-making and implementation, visualised in Figure 1.4c. This analysis assisted in identifying which key stakeholders that we needed to collaborate with to mobilise their support. In the respective chapters, more information of the key stakeholders in the malaria programme, influencers such as donors, technical advisory groups at the national and international levels, are provided in details in attempts to identify the key informants and participants in the engagement activities, and where they are positioned in the scheme at large.

Figure 1.4 Development of stakeholder mapping from formative research to engagement projects (a) schematic diagram of malaria programme, (b) with primary care under the decentralised health system, and (c) power and interest map of key stakeholders.

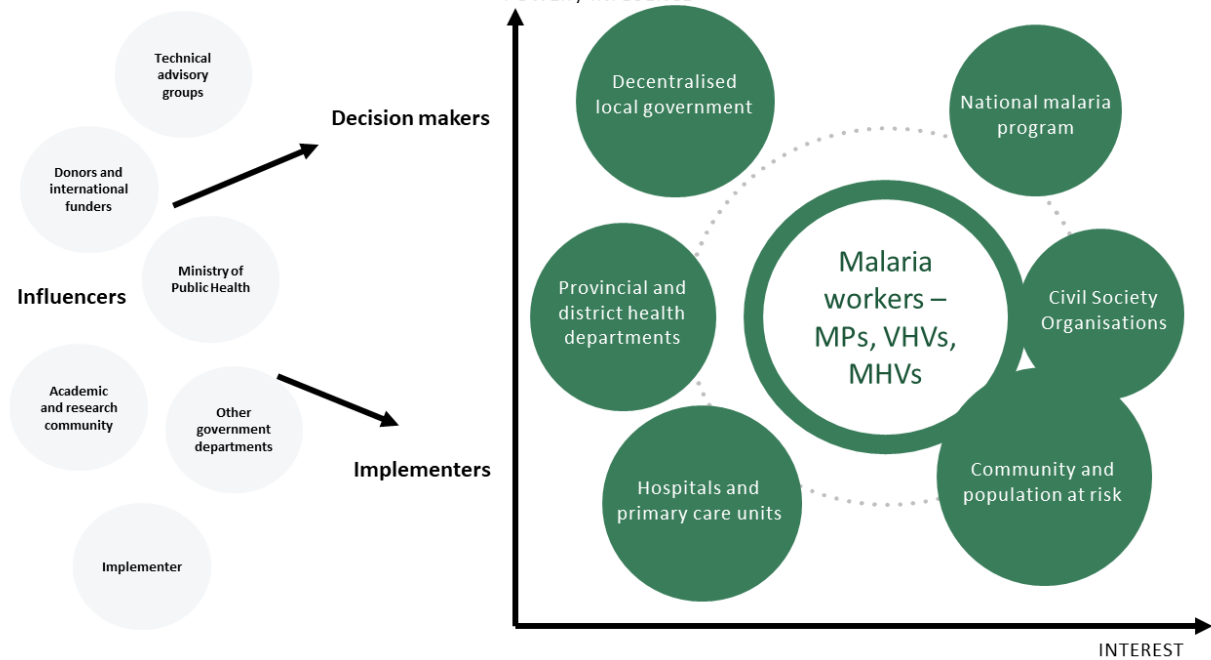
(A) Schematic diagram of malaria programme



(B) Overview of semi-vertical malaria programme and primary care programme under general and decentralised health system



(C) Power and interest map of key stakeholders



In addition to these key research sites, I attended public meetings and conferences on malaria and public health research and programmes, including those (co-)organised by NMPs at national level, by the CSO platform, and AP MEN at the regional level. During the ongoing research activities, several dissemination activities and presentations of preliminary and final results were

delivered to key stakeholders and interested audiences in these occasions. These direct opportunities provided the chance to receive feedback and comments on my ongoing work which contributed to my better understanding of the evolving CHW/VMW roles and the implementation of the malaria programmes in different contexts, and the interest/influence of each key stakeholder, some of which were participants in my case studies in Thailand, as well as the perspectives of other implementers across the GMS and Asia Pacific countries.

1.7 Ethical issues

The main ethical issues in this study related to privacy and confidentiality from the primary data collection and research activities at the study sites. The main risk from participation in this study is disclosure of the interview/survey/discussion data about their personal experiences and opinions about the communities, malaria risks, malaria services, and the malaria programmes, as well as a broader view of primary care and the health system. Sensitive information involved descriptions of prohibited activities in the forests, undocumented migrants, and illegal cross-border movement. Informed consent, careful field activities, and confidentiality of the data were thus the key components of ethical considerations for this research which received ethical approval from relevant ethics committee including Oxford Tropical Research Ethics Committee (OxTREC) at the University of Oxford for both regional and country-specific studies and from the Institute for the Development of Human Research Protections (IHRP) in Thailand for the research and engagement projects conducted in Thailand. Details of ethical considerations applied to each study and how they were addressed are described in each chapter.

PART 1 Landscaping the Asia Pacific

The two following chapters present the results from the systematic review and scoping survey that aim to identify and describe the extent to which the roles of community health workers (CHWs) in malaria programmes have been expanded beyond malaria in the Asia Pacific. The systematic review in Chapter 2 situates the discussion within the broader regional landscape, where malaria transmission has declined significantly in recent years and several countries are on the cusp of, or have already achieved, elimination. The review results are supplemented by a scoping survey distributed to the programme managers and implementers identified from the review and extended to include a wider group of programmes and actors in the region in Chapter 3. These experiences provide valuable lessons on the evolution of CHW roles in sustaining surveillance, maintaining vigilance against resurgence, and addressing other health priorities as malaria burdens decrease. The results of this landscaping studies therefore provide not only an overview of the VMW role expansion strategy in the GMS but also comparative insights from other Asia Pacific countries at different stages of elimination. Furthermore, key findings on the enablers and barriers to implementing active CHW programmes—including financing, supervision, integration into health systems, and community acceptance—were synthesized into a conceptual framework of VMW programme features. This framework subsequently guided the context-specific analysis in Thailand, particularly on programme identification and stakeholder mapping in Part 2, as well as the design of stakeholder engagement activities in Part 3, ensuring that cross-country lessons from both regional successes and persistent challenges were incorporated into future programming.

Chapter 2 Systematic review of expanded roles of community health workers in the Asia Pacific

This chapter is based on the published paper: **Jongdeepaisal M**, Khonputsra P, Sirimatayanant M, Khuenpetch W, Harriss E, et al. (2024) Expanded roles of community health workers beyond malaria in the Asia-Pacific: A systematic review. PLOS Global Public Health 4(10): e00031113. <https://doi.org/10.1371/journal.pgph.0003113>

Summary

This chapter presents the results of a systematic review of 54 sources (38 peer-reviewed articles, 12 programme reports, 4 programme briefs) which identified 31 programmes in the Asia-Pacific countries where CHWs were found to perform multiple health roles managed under disease-specific programmes such as malaria, HIV, and tuberculosis, as well as broader care services such as maternal and child health. Among these programmes, key factors for effective implementation included robust monitoring and evaluation, quality training, and consistent supervision of the CHWs, as well as cross-sector collaboration between malaria and other programmes or stakeholders. Integrating CHW programmes into broader health systems, securing political and financial backing, and involving local communities were found to contribute to the sustainability of their services. For long-term success, interested programmes in the GMS should consider shifting from vertical, disease-specific approaches to integrated health systems that reflect local health needs while also obtain the necessary policy and financing support.

Highlights

- Beyond malaria, CHWs often manage common illnesses like diarrhoea and tuberculosis, while also engaging in health education, promoting broader health awareness and preventive practices.

- Examples in the GMS showed the successful use of multiplex rapid diagnostic tests (RDTs) for fever screening alongside health education in Cambodia, while an integrated community case management (iCCM) and similar models in Myanmar demonstrated the effectiveness of combining malaria services with broader primary healthcare delivery.
- Although key success factor for programme implementation lied in the integration of malaria services into national health systems, which supported both implementation and financial sustainability, this integration was largely influenced by each country's existing CHW structure.
- The results of this review guided further characterisation of programmes in the scoping survey to understand the management of expanded CHW programmes in practice, and exploration of potential roles in fever screening and service integration in primary care among VMWs in Thailand country studies.

2.1 Introduction: Roles of community health workers beyond malaria in the Asia Pacific

Globally, community health workers (CHWs) have been recognised for their contribution to improve the access to and quality of care delivery in low-and-middle-income countries (LMICs) (65). In alignment with the Declaration of Alma Ata in 1978, many countries, including the GMS, have initiated the CHW programmes to support their primary care delivery (66) where CHWs were leveraged to promote people-centred care and link communities with the formal health system (67). Their various contributions ranged from maternal and child health services to infectious disease control especially in remote settings where health professionals and access to care are limited (68).

Past literature of CHWs has focused on CHW programme performance (69), yet there is limited research on their effectiveness particularly of health services addressing multiple diseases. Such

integrated packages have been primarily reported in high endemic countries in Sub-Saharan Africa (70-73); for example, integrated community case management (iCCM) for malaria, pneumonia, diarrhoea, and malnutrition for children under five - an intervention that has proven to yield quality of malaria services when CHWs can address multiple diseases (71, 74, 75). Although some implementation challenges have been reported by programmes implementing iCCM in Africa and Asia (76), it is difficult to generalise findings from the region to other low transmission setting given the heterogeneity of the community-delivered models and their impact on health outcomes (8). Question remains whether and how the role expansion of CHWs roles can be designed and implemented in the GMS context.

In light of limited evidence, this systematic review was conducted to identify and characterise malaria CHW programmes in the Asia Pacific that have expanded the role of their workers beyond malaria in order to inform existing and prospective programmes in the GMS.

2.2 Methods

Search strategy and review process

The systematic review was conducted following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. The protocol was registered on PROSPERO (CRD42021250639) (77). Based on the PICO framework, the population and intervention of interest are CHWs in the Asia Pacific and their provision of malaria services or implementation of malaria programme, respectively. The outcomes of interest and inclusion criteria were derived from the three main questions and informed by insights from two published systematic reviews (69, 78). There is no comparison group for this systematic review.

Table 2.1 Review questions, key outcomes, and inclusion criteria

Review question	Key outcome	Inclusion criteria
1) What expanded roles beyond providing malaria services do	Malaria roles and expanded roles of malaria CHWs	1. Identify CHWs or related cadre roles, AND

CHWs perform in the Asia-Pacific region?		
2) What evidence is there for the outcomes or impact of each programme?	Evidence of outcomes or impact of the CHW programme	2. Focus on malaria programme(s) in Asia-Pacific countries, AND 3. Identify expanded roles of CHW or related cadres beyond malaria services, AND 4. Provide analysis of outcomes or impact of the CHW programme on malaria, AND/OR 5. Provide information on sustainability of the CHW programme, AND/OR 6. Are qualitative studies, case studies, process evaluations, and/or cost-effectiveness studies that identify barriers to, and/or facilitators of, effective implementation.
3) What strategies are used to ensure sustainability?	Strategies to ensure sustainability and factors for effective implementation	

The search strategy was developed for six databases with the support from an information specialist at Bodleian Library from inception (11/06/2021) to the final search date (26/02/2024): Ovid Medline; Ovid Embase; Ovid Global Health; Cochrane Central Register of Controlled Trials; WHO Global Index Medicus; and PubMed. Additional searches were conducted in Google Scholar, and web searches for grey literature. Studies were selected for inclusion based on fitness for purpose rather than following a hierarchy of evidence and ranged from published peer-reviewed articles to grey literature including unpublished reports, evaluations, and project briefs. Items published in languages other than English were excluded, as English was the only spoken language of the reviewers (for example, manuscripts and/or abstracts that are published in Spanish or Chinese). Exclusion also applied to items that were conference abstracts, clinical trial registration, review or opinion papers, and publications where full text could not be acquired or only reported activities outside of the Asia Pacific.

The review team consisted of four researchers, including myself, assigned to independently screen items. Full-text articles and grey literature subsequently underwent a final screening for eligibility and extraction. A pre-designed data extraction form was developed and piloted through joint assessment of selected literature; adjustments were subsequently made to clarify the

extraction sheet. Quality assessment was conducted for extracted items using tools for peer-reviewed articles and grey literature, Mixed Method Appraisal Tool or MMAT (79), and Authority, Accuracy, Coverage, Objectivity, Date, Significance or AACODS, respectively (80). Items were not excluded based on the results of their quality assessment, as papers of lesser quality may still facilitate the characterisation of CHW programmes, CHW roles, their impact on malaria and other health outcomes, or describe factors contributing to the sustainability of CHW programmes. Endnote software and Microsoft Excel were used to store and manage extracted data from the literature. Full details of the systematic review process, including the search strategy, article selection, data extraction, quality assessment are provided in [appendix 1](#).

Conceptual framework development

Thematic coding and descriptive analysis were adopted to identify and synthesise the data. Inductive and deductive approaches guided the coding process, and emerging themes from the selected articles were added to the framework where needed. Where required, additional information from web searches also supplemented extracted data to support the characterisation of the programmes. For data on the strategies to ensure sustainability, an interpretive approach (81) and framework-based synthesis (82) were used to derive a conceptual framework for sustainability factors through three complementary processes:

1. Initial review is conducted for key articles related to CHWs (69, 78, 83) to identify factors that enable or influence implementation and sustainability of CHW programmes;
2. The factors extracted were subsequently used to design an extraction template and categorize extracted data according to themes;
3. To complement the data extraction, existing frameworks on malaria programme management (84) and Community Health Worker Assessment and Improvement Matrix (85) were consulted to develop a conceptual framework on CHW programme implementation and sustainability.

Table 2.2 Conceptual framework on factors influencing sustainability of CHW programmes

Theme	Sub-theme
1) Programme design and management	Programme structure, management, monitoring and evaluation
2) Financing or funding	Sources and management of programme funding
3) Support system	Political commitment and stakeholder collaboration
4) Community ownership and engagement	Community engagement and mobilisation, involvement of community in programme implementation and CHW role
5) Capacity building and human resource management	Recruitment, motivation and performance of CHW, provision of training and supervision for CHWs

2.3 Results

The searches retrieved 3,059 records from databases, from which 1,649 deduplicated articles underwent title and abstract screening. An additional 560 unique records were identified from conducting searches on Google Scholar, implementing organisations website, and citations in articles screened for eligibility. A total of 68 and 65 records were retrieved and reviewed full text from each respective search method. The extracted records included 28 records from database searches and 33 records from other methods comprising: 45 published studies, 11 programme reports, and 5 programme briefs. Of all published studies, 15 were qualitative, 15 quantitative, and 8 mixed-methods studies.

Of all 61 included records that met the first three inclusion criteria, 33, 33, and 51 records met the fourth, fifth, and sixth criteria respectively. Published studies had a mean MMAT categorical score of 6 out of 7. Based on the ACCODS checklist for reports and grey literature, 12 programme reports and 2 peer-reviewed articles were on average of medium quality (mean scores of 12 out of 14); 2 programme briefs were of medium quality (scores 17 and 18) and 2 of low quality (scores 8 and 11) as they lacked details in the significance and/or accuracy dimensions, or otherwise were inapplicable to the checklist due to the nature of the literature.

This result section reported findings responding to two review questions and key outcomes (outcome 1 and 3) from the systematic review: the roles of CHWs and factors related to effective implementation and sustainability. Findings on evidence of outcomes or impact of the CHW programme (outcome 2) can be found in the publication of this systematic review.

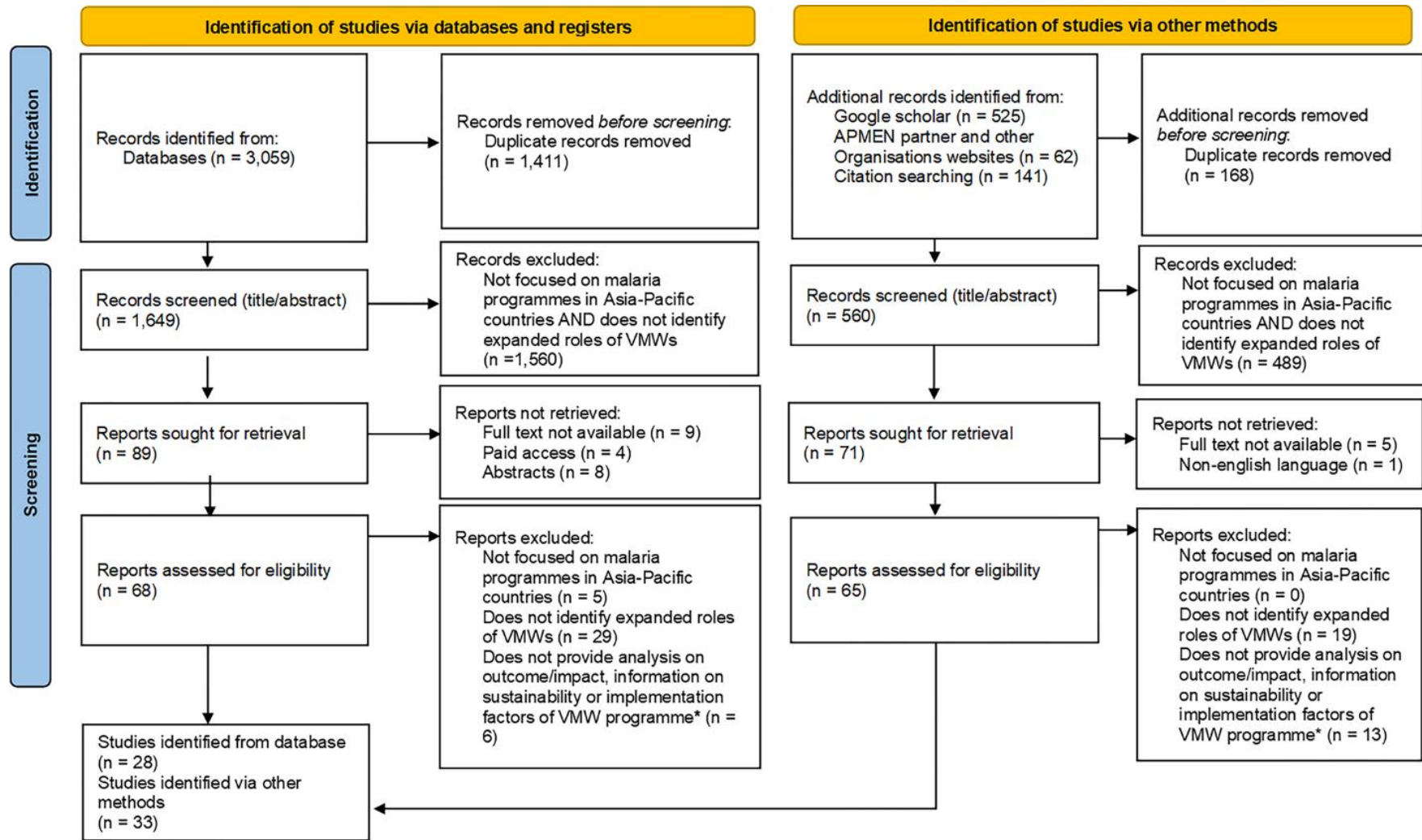
Characteristics of identified programmes

A total of 31 expanded CHW programmes were identified in 13 countries: 6 in Myanmar, followed by 5 programmes each in India and Cambodia, 2 programmes each in Indonesia, Laos, and Papua New Guinea, and 1 programme each in Afghanistan, Bangladesh, Iran, Nepal, Pakistan, Philippines, and Sri Lanka. The status of programmes was reported as follow: 19 active, 9 inactive, and 4 unspecified (86-89). Inactive programmes included 6 short pilot programmes (90-99), 2 that transitioned into other succeeding programmes (100), and 1 discontinued (101). Programmes were operating at varied levels: 10 programmes reported national-level implementation; 9 among which did not specify whether malaria services were being offered by the whole CHW cadre in the programmes and/or countries (87, 89, 101-112).

The roles of CHWs and their services

Across all programmes, CHWs performed an average of 3.6 types of malaria services which ranged from provision of a single to seven services namely treatment, testing, case referral, provision and/or promotion of preventive measures and vector control activities, surveillance and case reporting, health education, and patient follow-up. Among non-malaria roles, the most common services were related to diarrhoea, tuberculosis, antenatal care and maternal and child health. Three programmes explicitly indicated implementing malaria service integration namely iCCM and integrated management of childhood illnesses (IMCI). In addition to malaria rapid diagnostic test (RDT), new diagnostics, such as Glucose-6-phosphate dehydrogenase (G6PD), dengue rapid test, and multiplex biosensors were piloted and used among CHWs in Cambodia.

Figure 2.1 PRISMA Flow diagram of the systematic review



* Referring to optional inclusion criteria 4-6

Table 2.3 General information of the identified programmes from systematic review

Country name (abbrev.)	Programme name / Implementing institution	CHW cadre	Scale (number of CHWs, locations)	Start date, status
Afghanistan (AFG) (102, 103)	National CBHC programme (community basic health care) / Ministry of Public Health in partnership with NGOs (names not mentioned)	Community Health Workers (CHW)	26,560 CHWs in 34 provinces	2003, active (113)
Bangladesh (BNG) (114)	Malaria Control Programme / Partnership between Bangladesh Rural Advancement Committee, the National Malaria Control Programme, and 20 partner NGOs	Shasthya Shebika (SS) Shasthya Komi (SK)	3,132 SS and 686 SK in 13 high malaria endemic districts	2007, active (68)
India (IND-I) (115-119)	Accredited Social Health Activists (ASHA) programme / State-level management under the National Rural Health Mission (NRHM), Ministry of Health and Family Welfare	Accredited Social Health Activists (ASHA)	971,000 ASHAs, 376,017 ASHA trained on malaria services in high endemic areas across 24 states	2005, active
India (IND-II) (120-123)	Mandla Malaria Elimination Demonstration Project (MEDP) / Indian Council of Medical Research, National Institute of Tribal Health, Government of Madhya Pradesh and the Foundation of Disease Elimination and Control (Corporate Social Responsibility initiative under Sun Pharmaceuticals Industry)	Village Malaria Worker (VMW) Accredited Social Health Activists (ASHA) Auxiliary Nurse Midwife (ANW) Multipurpose Health Worker (MPW)	MEDP-specific 235 VMWs and 25 VMW coordinators, and existing system comprising of 1300 ASHA per village), and approximately 1 ANM and 1 MPW per sub-center in 1233 villages in Mandla district	2017, active
India (IND-III) (104, 105)	Mitanin Programme/Department of Health and Family Welfare, Government of Chhattisgarh in collaboration with State Health Resource Center	Mitanins (female health volunteers)	69,000 Mitans in Chhattisgarh state	2002, active (124)
India (IND-IV) (101)	India's National Village Health Guides Scheme /Health and Medical Education Committee (Srivastava Committee), Ministry of Health and Family Welfare	Village Health Guide (VHG)	Approximately 500,000 VHGs	1977 – 2002, discontinued
India (IND-V) (125)	Multipurpose Health Scheme / National Malaria Eradication Programme, National Vector Borne Disease Control Programme	Multipurpose Health Workers (MPW)	52,215 MPW trained in malaria services in high endemic areas across 24 states	1973, active (126)
Indonesia (IDN-I) (86)	Integrated Malaria and Maternal and Child Health Programme (MiP-MCH) / Ministry of Health, UNICEF, Indonesian Society of Obstetrics and Gynaecology	Midwives	34 provinces in 511 districts	2016, not specified
Indonesia (IDN-II) (106)	Posyandu (integrated health care post) Programme / Ministry of Home Affairs, Ministry of Health, Family	Kaders	Over 1 million kaders nationwide	1984, active

Country name (abbrev.)	Programme name / Implementing institution	CHW cadre	Scale (number of CHWs, locations)	Start date, status
	Welfare Movement (Pemberdayaan Kesejahteraan Keluarga or PKK) and Village Community Health (Pembangunan Kesehatan Masyarakat Desa or PKMD)			
Iran (IRN) (107)	Iran's Community Health Worker Programme Ministry of Health and Education, Tehran University, WHO (at piloting phase)	Behvarz	34,000 Behvarzs (2019)	1984, active
Cambodia (KHM-I) (127-129)	VMW programme on appropriate treatment for malaria and childhood illnesses amongst the most vulnerable populations in Cambodia / National Centre for Parasitology, Entomology and Malaria Control (CNM)	Village Malaria Workers (VMW)	1,602 villages in 17 provinces, approximately 400 villages part of the expanded programme	2001, 2009 (expanded roles), active
Cambodia (KHM-II) (100)	Greater Mekong Subregion Elimination of Malaria through Surveillance (GEMS) /Population Services International sub-project collaboration with National Centre for Parasitology, Entomology and Malaria Control (CNM)	Mobile Malaria Workers (MMW)	273 MMWs (prior to 2020) 0 MMVs (2020 discontinued support to 236 and transitioned 39 to NMCP)	2016 – 2019, transitioned to GEMS+ project in 2022 (130)
Cambodia (KHM-III) (90)	The Roll Out Radical Cure (RORC) Research Project / Mahidol Oxford Tropical Medicine Research Unit with National Centre for Parasitology, Entomology and Malaria Control (CNM)	Village Malaria Workers (VMWs) Lab technicians	28 VMWs and 5 laboratory technicians in Kravanh and Prognil health centers, Kravanh district, Pursat province enrolled in pilot programme from 2,548 VMWs and 275 Mobile Malaria Workers in the national programme [129]	May 2021 – July 2022 (15 months) pilot study
Cambodia KHM-IV (91)	Program to develop novel multiplex point-of-need (PON) diagnostics for surveillance of emerging infectious diseases / U.S. Defense Threat Reduction Agency Joint Science and Technology Office (DTRA-JSTO) with support from the National Malaria Center (CNM) and Naval Medical Research Unit-2 (NAMRU-2)	Village Health Workers (VHW)	45 VHWs in peri urban areas near Phnom Penh were enrolled in pilot study from a larger nation-wide VHW programme	2018, pilot study ended
KHM-V (95, 96)	Sustaining village health worker programmes with expanded roles in the GMS / Action for Health Development Cambodia (AHEAD), Cambodian National Center for Entomology, Parasitology and Malaria	Village Malaria Workers (VMWs)	120 VMWs trained on health education package and 9 health centres in 4 districts in Battambang province	18 months during 2021-2023, operational

Country name (abbrev.)	Programme name / Implementing institution	CHW cadre	Scale (number of CHWs, locations)	Start date, status
	Control (CNM), and Mahidol Oxford Tropical Medicine Research Unit (MORU)		105 VMWs from 82 villages in Battambang and Pailin provinces trained to use new diagnostics	research study ended
Lao PDR (LAO-I) (131-134)	Village Health Volunteer and Village Malaria Workers Programme / National Malaria Control Programme, Lao PDR Center for Malariology, Parasitology, and Entomology (CMPE)	Village Health Volunteers (VHV) Village Malaria Workers (VMWs)	13,722 VHVs and 2,576 VMWs across the country	1980s for VHV programme, 2008 for VMW programme, active
Lao PDR (LAO-II) (100)	Greater Mekong Subregion Elimination of Malaria through Surveillance (GEMS) /Population Services International (PSI) sub-project collaboration with National Malaria Control Programme, Lao PDR Center for Malariology, Parasitology, and Entomology (CMPE)	Shop-based volunteer malaria workers (sVMW) and PSI/Laos supported private providers	9 sVMW and 474 private providers	2016 – 2019, transitioned to GEMS+ project (130)
Sri Lanka (LKA) (87)	Health Volunteers Programme / Ministry of Health	Health Volunteers (HV)	Approximately 18,000 volunteers (1989)	1976, not specified
Myanmar (MMR-I) (135, 136)	Sun Primary Health (SPH) Network / Population Services International (PSI)	Sun Primary Health (SPH) providers	2,192 SPH/CHWs in 74 townships in Myanmar	2008, active (137)
Myanmar (MMR-II) (6, 138)	MAM Village Health Workers* / Medical Action Myanmar (MAM) and Myanmar National Malaria Control Programme	Village Health Workers (VHW) overall, community health workers (CHWs) in Mon state	2,000 VHWs; among which are 172 CHWs in 4 townships in Mon state	2011, 2015-2016 (expanded roles), active [132, 133]; Programme in Mon state transitioned to Department of Health since 2018
Myanmar (MMR-III) (92, 93)	Myanmar Integrated Community Case Management (iCCM) Pilot Project / Malaria Consortium (MC) in partnership with the Ministry of Health and Sports, the National Malaria Control Programme and township health departments	Malaria Volunteers (MV) superseded by Integrated Community Case Management Volunteers (ICMV)	Sagaing region	2016 – 2017, the pilot period ended

Country name (abbrev.)	Programme name / Implementing institution	CHW cadre	Scale (number of CHWs, locations)	Start date, status
Myanmar (MMR-IV) (139-143)	Integrated Community Malaria Volunteers Programme*/ Myanmar National Malaria Control Programme and other implementing partners (including Save the Children, and Myanmar Council of Churches)	Integrated Community Malaria Volunteers (ICMVs) preceded by Malaria Volunteers (MV) (2004-2017) or Village Health Volunteers (VHV)	9,074 ICMVs in 218 townships in Myanmar (approximately 38% of originally trained 40,000 MVs still active); 1,500 ICMVs in 47 townships trained to do Malaria Case-Based Reporting (MCBR) since 2018	ICMV training provided from 2016 but malaria volunteer programmes started prior, active
Myanmar (MMR-V) (144)	Integrated Community Malaria Worker (ICMW) / Malaria Elimination Task Force (METF) under the Shoklo Malaria Research Unit (SMRU)	Integrated Community Malaria Worker (ICMW)	ICMWs located at 435 malaria posts - 237 located in Hlaingbwe, 152 in Kawkaik, and 46 in Myawaddy	ICMW training rolled out in 2019 but programme started in 2014, active
Myanmar (MMR-VI) (145)	Better Health Together Project / Community Partners International and 6 ethnic health organizations	Integrated Community Malaria Volunteer (ICMV)	632 volunteers in 17 townships of Kachin, Kayah, Kayin, and Mon states, and Tanintharyi Region	2017, active
Myanmar (MMR-VII) (146-148)	Medical Care Programme / Backpack Health Worker Team (BPHWT)	Backpack Health Worker (BPHW)	1,460 BPHWT members (447 BPHWs, 777 Trained Birth Attendants, and 236 Village Health Volunteers/Workers) [134]	1998, active
Myanmar (MMR-VIII) (97-99)	Mobile Obstetric Maternal Health Worker (MOM) Project / Mae Tao Clinic, Karen Department of Health and Welfare, Burma Medical Association, local ethnic health departments (from Shan, Mon, Karenni, and Karen states), Johns Hopkins Center for Public Health and Human Rights, Global Health Access Program	Community-based maternal health workers, Maternal Health Workers (MHW), Traditional Birth Attendants (TBAs)	33 lay or community-based maternal health workers, 131 MHWs, 288 TBAs in a total of 12 communities in 4 states (Karen, Shan, Karenni, and Mon) with approximate target population of 60,000	2005-2008, 3-year pilot project ended
Nepal (NPL) (94, 149)	Rapid response team (Combined Fever Camp Approach) and Female Community Health Volunteer Programme (Incentive approach) / Visceral	Female community health volunteers (FCHVs) as part of the rapid response team	49 local health workers and 76 FCHVs enrolled in Combined fever camp pilot	June – August 2016, pilot period ended;

Country name (abbrev.)	Programme name / Implementing institution	CHW cadre	Scale (number of CHWs, locations)	Start date, status
	Leishmaniasis National Programme and District Public Health Office		study; the FCHV programme comprises of over 50,000 volunteers	programme was established since 1988, active
Pakistan (PAK) (108, 109)	National Programme for Family Planning and Primary Health Care or Lady Health Worker Programme (LHW-P) / Federal Development Programme or the Programme for Family Planning and Primary Health Care, Government of Pakistan	Lady health workers (LHWs)	Approximately 100,000 LHWs nationwide	1994, active
Papua New Guinea (PNG-I) (88)	Home-based Management of Malaria / Population Services International (PSI) in collaboration with the PNG National Malaria Control Programme	Volunteer Community-based Distributors (CBDs)	1,000 CBDs trained by PSI	2017, not specified [135]
Papua New Guinea (PNG-II) (89)	Village Health Volunteers / National Department of Health, Papua New Guinea	Marasin meri or Marasin man (Village Health Volunteer or VHV)	Not specified	Not specified
Philippines (PHL) (110-112)	Barangay Health Workers Program / Department of Health and decentralized management by local government units at cities (urban) and municipality (rural) levels, in collaboration with the national malaria control programme and other implementing partners for site specific projects (Agusan del Sur Malaria Control and Prevention Project – ADS-MCP)	Barangay Health Workers (BHWs) Barangay Nutrition Scholars (BNSs)	196,562 BHWs (2009) nationwide [136]	1979 and officially established in 1995 under the Barangay Health Worker Act (150), active

Figure 2.2 Malaria and non-malaria roles of CHWs identified from systematic review

Roles and/or services	AFG	BNG	IND-I	IND-II*	IND-III	IND-IV	IND-V	IDN-I	IDN-II	IRN	KHM-I	KHM-II	KHM-III*	KHM-IV	KHM-V	LAO-I	LAO-II	LKA	MMR-I	MMR-II	MMR-III	MMR-IV	MMR-V	MMR-VI	MMR-VII	MMR-VIII	NPL	PAK	PNG-I	PNG-II	PHL*	Total			
Malaria																																			
Treatment																																	26		
Testing**																																		26	
Referral																																		16	
Provision/promotion of preventative measures																																		15	
Surveillance, case reporting																																		11	
Education and promotion activities																																		8	
Patient follow-up																																		5	
Early diagnosis and treatment																																		2	
Active case detection																																		2	
Integrated vector management																																		1	
Total	3	4	3	5	3	2	2	3	1	3	6	5	5	1	5	7	4	3	4	6	3	6	3	3	3	2	4	2	2	2	7	112			
Non-malaria: health promotion activities																																			
Immunisation and vitamin A supplementation																																		16	
Antenatal care, mother and child health																																			16
Sensitisation and mobilisation activities																																			15
Family Planning																																			10
Sanitation; personal, food and water hygiene																																			9
Nutrition																																			6
HIV/AIDs and sexually transmitted infections																																			2
Family Welfare																																			1
Total	5	6	4	0	4	5	4	0	3	1	1	1	0	0	4	4	2	4	0	0	1	1	0	2	5	4	4	6	1	0	3	75			
Non-malaria: direct patient care activities																																			
Diarrhoea																																		18	
Tuberculosis																																			17
Antenatal care, mother and child health																																			14
Minor or unspecified common illnesses																																			12
Family planning																																			11
Acute respiratory infection																																			10
General case referral to the health centres																																			8
Leprosy																																			7
Fever																																			7
Dengue																																			5
Anemia																																			5
Pneumonia																																			5
HIV/AIDs and sexually transmitted infections																																			5
Child development and malnutrition																																			4
CCM, IMCI, iCCM***																																			3
Non-communicable diseases																																			3
Lymphatic filariasis																																			3
Other infectious diseases																																			3
Visceral leishmaniasis																																			2
COVID-19																																			2
Environmental and occupational health																																			2
G6PD testing																																			1
Unspecified infectious diseases																																			1
Total	10	10	7	1	6	5	4	1	2	7	4	2	1	3	2	9	2	2	4	6	5	5	8	4	6	3	6	12	4	2	5	148			
General non-direct patient care activities																																			
Conduct household visits																																		9	
Collect, report and/or record health data																																			7
Conduct disease surveillance																																			4
Respond to outbreaks and emergencies																																			3
Manage supplies																																			3
Total	2	1	2	2	2	0	2	0	1	0	0	0	0	0	0	2	0	0	0	0	0	0	0	2	0	2	1	1	4	1	0	1	26		

Note: The color gradient in the total column represents the concentration of identified roles and/or services across all programs and services categories

*Indicates where reported roles and services can be specified for a specific CHW cadre in the programme: VMWs (IND-II), VMWs (KHM-III), BHWs (PHL)

**Specific testing methods are specified for some programs including: testing with RDT alone (BNG, IND-I, IDN-I, KHM-I, KHM-II, LAO-I, LAO-II, MMR-I to IV, MMR-VI to VIII, PNG-I, PNG-II), obtaining blood smears for microscopic testing along (IND-V), and testing with both methods (IND-II, IND-III, PHL)

***Refers to Community case management (CMM) of acute childhood illness for AFG, Integrated Community Case Management (iCCM) for KHM-I, and Integrated Management of Neonatal and Childhood Illness (IMNCI) for MMR-III

Figure 2.3 Features of programmes based on the conceptual framework on sustainability

Reported programme features and characteristics	AFG	BNG	IND-I	IND-II	IND-III	IND-IV	IND-V	IDN-I	IDN-II	IRN	KHM-I	KHM-II	KHM-III	KHM-IV	KHM-V	LAO-I	LAO-II	LKA	MMR-I	MMR-II	MMR-III	MMR-IV	MMR-V	MMR-VI	MMR-VII	MMR-VIII	NPL	PAK	PNG-I	PNG-II	PHL	Total	
Programme Design and Management																																	
<i>Integration mode</i>																																	
Malaria tasks into a basic healthcare or horizontal programme																																	17
Non-malaria tasks into a vertical malaria programme																																	11
Malaria services into existing private-sector health services																																	3
Malaria tasks into another vertical programme																																	1
<i>Monitoring and Evaluation</i>																																	
Assessment of CHW, health facility, community's health, and/or data quality																																	12
Describes challenges in the monitor and evaluation process																																	6
Financing or funding																																	
Receives support from donor funding																																	16
Describes impact of diminishing donor funding																																	8
Describes impact of incentivized funding structures of vertical programmes																																	5
Programme funded or co-financed through government budget allocations																																	8
Recommendations regarding funding source and other opportunities																																	3
Support system																																	
<i>Stakeholder collaboration</i>																																	
Collaborate with partners to design, implement, train, supervise, monitor and evaluate																																	15
Use of task forces/steering committee to design programme, maintain linkage, provide technical support and oversight																																	7
<i>Political commitment and intra-governmental communication</i>																																	
Political commitment as enabling sustainable implementation																																	3
Impact of intra-governmental communication on performance																																	2
Community engagement and mobilisation																																	
Through health education and awareness activities																																	16
Community representation in CHW recruitment or selection																																	11
CHWs mobilise community decisions about health																																	10
CHWs as a part of community initiatives																																	10
Capacity building and human resource management																																	
Financial incentives as CHW motivation factor																																	17
Non-financial incentives as CHW motivation factor																																	9
Factors that impact CHW performance																																	19
CHW training activity																																	25
CHW supervision activity																																	18

Note: The color gradient in the total column represents the concentration of identified features and characteristics across all categories

Strategies to ensure sustainability and factors for effective implementation

Based on the pre-developed conceptual framework, finding related to factors related to CHW programme implementation and programme sustainability are summarised here; however, the reported factors, primarily the implementation barriers and enablers, do not necessarily imply a causal relationship with their sustainability.

1) Programme design and management

The findings showed that the most common programme design to integrate multiple roles for CHWs was adding malaria roles into a basic care programme, reported by 17 programmes, followed by adding non-malaria roles into a vertical malaria programme, reported by 11 programmes. Only one programme reported integrated malaria roles into another vertical disease programme. In addition, programmes have identified various channels CHWs were linked to the general health system; for example, through national guideline development (86), budget allocation for CHW (101, 117, 120), their recruitment (114, 116, 119, 120), their training and supervision by public health facilities (102, 108, 118), and health information reporting system (102, 108, 118). To ensure effective implementation, monitoring and evaluation of the programme and CHW performance was highlighted and conducted across programmes but varied in terms of frequency, scope, and targets. CHW performance was the most evaluated dimension of the programmes; other aspects include supply, functionality, and impact of programmes.

2) Programme funding

Sixteen programmes reported donors as the primary source of funding and highlighted challenges from inadequate equipment, training and supervision for CHWs as well as inconsistent evaluation and limited scale-up of the programmes. In Laos and Cambodia, stakeholders have expressed concerns that financial and in-kind support for CHWs have not increased to match the increasing integrated services (132), while emphasised that such integration required additional resources to compensate CHWs delivering more complex roles (134). Eight programmes reported receiving funding from their government but faced challenges from budgetary constraints to provide sufficient support (107, 108), or fill donor's gap (86, 104). Recommended strategy to fund integrated services were made to identify additional national budgets (111, 134), donor funding (86, 134), or co-financing opportunities that are can be used for both malaria and other diseases (132).

3) Support system

Fifteen programme reported collaborating with stakeholders for the purpose of programme implementation, followed by other collaborative purposes including for CHW training and supervision, and programme monitoring and evaluation. Establishment of collaborative tasks force and steering committee was described to initiate collaborative implementation (86, 98, 118), contribute to strong ownership of programmes by multiple stakeholders (86), encourage a sense of collective accountability and learning (98, 117), enhance effective implementation by not duplicating or substituting any pre-existing programme activities (116) and by providing clear technical guidance and maintain effective communication among partners (97, 102, 115, 139, 148). Political leadership and commitment at subnational level (115), and intra-governmental collaboration (138) were also key to ensure CHW programme remains a priority and receive adequate support from the local and national governments.

4) Community ownership and engagement

Nineteen programmes described conducting community engagement and mobilisation activities; many of which were the key role of CHWs in their programmes. Purposes of these activities were primarily to inform the communities about targeted health issues, initiate community dialogues (92, 93, 135), and sometimes promote the CHW services (116, 128). Recruitment of CHWs from the community was also considered a method to ensure community representation, particularly when the members were involved in the selection process. Gender (102, 134), literacy (40), ethnicity (77, 78), spoken language (97, 99) and residency in the community (87, 97, 99, 102, 108, 111, 117) were important considerations for community acceptance and utilisation of CHW services. In addition to service provision, CHWs were involved in several community initiatives, such as by joining meetings with local government (116) and community committees (102, 103), and sometimes led the initiatives themselves by organising local meetings, self-help groups, and action groups (102, 103, 107, 111, 117).

5) Capacity building and human resource management

Seventeen programmes reported that CHW received financial incentives, such as monthly stipends (97, 115, 116, 118, 135) and per diem allowance or task-based incentives for their roles (97, 103, 115, 117). CHWs reported that they perceived non-financial values in performing these roles, including social recognition (87, 102, 112, 116, 139), sense of accomplishment (102, 103) and communal responsibilities (96), knowledge and career advancement (108, 117, 140), as well as being awarded with an academic degree (107) or better career opportunities (87, 140). However, unpaid working hours (149), delayed payments (107), lack of pension, and payment discrepancy between different cadres of workers (134) demotivated CHWs, while prospects for higher paid work elsewhere has increased their turnover (119, 134). CHWs performing integrated services faced challenges when their roles overlapped with other health providers resulting in CHWs being less accepted (95, 101, 106, 117, 118), and when such roles brought growing workload (95, 108) resulting in CHWs selectively performing their roles (125) or providing lower quality malaria services (139, 142). CHWs operating in conflict zones also reported security issues and logistical constraints (98, 102, 147, 148), resulting in inconsistent or limited coverage of their service provision. Training and supervision activities of CHWs were considered crucial among programmes and were reported in 15 and 18 programmes respectively. To facilitate integrated roles of CHWs, suggestion was made to combine training or workshop sessions between multi-cadres of CHWs or with other primary care staff; sessions should ideally enable CHWs to share their learning experience with (97, 147, 148) and feedback to the programme staff (120).

2.4 Discussion

In the Asia-Pacific region, CHWs take on various responsibilities, including direct patient care, health education, and administrative tasks like management and reporting. In addition to malaria

services, CHWs across the region were responsible for managing various common illnesses, with diarrhoea and tuberculosis being the most frequently addressed. Their role often extended to community education and engagement. For malaria programme in GMS countries, this highlights the potential for VMWs to serve as primary health educators, sharing knowledge beyond malaria and promoting health awareness and preventive practices within their communities. This broader preventive role could be combined with providing services for common illnesses, such as fever screening using multiplex RDTs and health education initiatives, as tested in Cambodia (95, 96). Additionally, integrated healthcare approaches for vulnerable groups, like mothers and children under five, have proven effective, as seen in Myanmar's delivery of maternal and child health services (97, 99) and implementation of iCCM (92, 93, 104) offering a combination of services.

Among 31 CHW programmes reviewed, many shared common enabling characteristics, most notably the integration of malaria programme into the country's health system, that contributed to their implementation and financial sustainability. The integration of malaria-related roles into CHW programs is largely shaped by the existing CHW framework in each country (72, 78, 151). In places where CHWs were already providing healthcare services, such as ASHAs in India, malaria care was incorporated into their existing duties. Conversely, in countries without (or with limited) established CHW workforce, donor-funded malaria CHW programmes, such as integrated community malaria workers and volunteers (ICMW and ICMV) in Myanmar, were used as a foundation to extend basic healthcare services. However, challenges to these integrated services were found in limited funding and political support, particularly as donor contributions declined.

Despite sharing common roles and integrated services, the designs of the (expanded) malaria programme varied significantly due to the diverse contexts of different countries. Our findings indicate that the approach and effectiveness of expanding VMWs roles beyond malaria largely depend on the specific country context and the structure of its public health system. Table 2.4

summarises the key findings from the systematic review and identifies gaps in information to be further explored in the subsequent scoping survey, and assessed in the Thailand case study.

Table 2.4 Key findings and gaps for further investigation

Key findings	Gaps
Prospects for expansion of roles beyond malaria	
<ul style="list-style-type: none"> • Diverse roles: In the Asia Pacific, CHWs perform a wide range of roles beyond malaria such as addressing common illnesses like diarrhoea and tuberculosis and engaging in community sensitisation and mobilisation activities. • Expansion Opportunities: In the GMS, malaria CHWs role may be expanded to include preventative health education and integrated services for local health issues. A pilot project in Cambodia found that CHW's preventative roles may be coupled with the delivery of services targeting common febrile illnesses. • Challenges and Considerations for Expansion: Effective CHW role expansion will need to address challenges such as workload, performance bias due to financial incentives, and the need for adequate training and supervision to prevent negative impacts on CHW performance. 	<ul style="list-style-type: none"> • What are the common illnesses in endemic communities in Thailand and the GMS? <ul style="list-style-type: none"> - Local health concerns • What services are CHWs legally allowed to provide? <ul style="list-style-type: none"> - New RDTs and screening roles • What may be the challenges if they were to perform new roles? <ul style="list-style-type: none"> - Barriers to programme implementation
Defining programme features for effective implementation (and sustainability)	
<ul style="list-style-type: none"> • Integration and Collaboration: Effective integration of malaria CHW programs into health systems supports program sustainability and credibility, clarifies CHW roles, and fosters collaboration between CHWs and higher-level health system actors. However, the design of such programmes depends heavily on the pre-existing CHW system and should involve collaboration with key multilateral stakeholders. • Funding and Political Support: Ongoing funding and political support is vital for sustainability of CHW programmes. As donor funding declines, leveraging local funding or integrating malaria services into primary care may help maintain and extend these programmes. However, this may face constraints of competing local health and non-health priorities. 	<ul style="list-style-type: none"> • How can malaria services be integrated into health system? <ul style="list-style-type: none"> - Vertical vs horizontal programme - Entry points for integration • What is the setup of community-based care and CHWs in Thailand? <ul style="list-style-type: none"> - Cadres/types and roles of CHWs • Who will support the role expansion/integration politically and financially? <ul style="list-style-type: none"> - Domestic vs donor funding - National oversight vs decentralisation

Key findings	Gaps
Tailoring and combining motivation package for CHWs with multiple tasks	
<ul style="list-style-type: none"> • Programmatic factors: CHW performance is enhanced by a combination of financial and non-financial incentives, frequent supervision and training, integration into community and health systems, clear role definitions, and effective communication. • Contextual factors: local community, economy, environment, and health system policies also significantly influence CHW performance, alongside collaboration among key implementing partners and stakeholders 	<ul style="list-style-type: none"> • What is the optimum incentive and work package for CHWs? <ul style="list-style-type: none"> - Capacity building and work performance • How are the enabling factors to implement the strategy? <ul style="list-style-type: none"> - Stakeholders' roles and collaboration
Community engagement approach to empower CHWs and their communities	
<ul style="list-style-type: none"> • Community Participation and Ownership: Community participation in CHW programmes significantly improves the uptake of malaria services and interventions, as observed in mass drug administration, targeted malaria treatment, and community-driven vector control. Encouraging communities to take ownership of their health needs and services also helps sustain community-based services. • Key Linkage to Care: CHWs serve as health promoters and key links between communities and the health system. Empowering CHWs is crucial for maintaining community trust and respect, which can be achieved by assigning meaningful roles, and informing CHWs about their service outcomes. CHWs have also displayed their adaptability by maintaining their role as key linkage to care during public health emergencies. 	<ul style="list-style-type: none"> • What (expanded) malaria services are preferred and expected by the community? <ul style="list-style-type: none"> - Preference for additional services • How can CHW roles as linkage to formal care be strengthened to ensure access to and quality of care? <ul style="list-style-type: none"> - Community-based care & primary care programme - CHW representation and empowerment

Strengths and limitations

Adding to previous literature more typically studied African context and some previously studied in Asia (67, 68, 152, 153), this review explored the delivery of integrated health services by CHWs in programmes identified in the Asia Pacific. A comprehensive and systematic search was conducted in six databases and Google Scholar, supplemented by grey literature searches from the bibliography and web pages of relevant organisations in the Asia Pacific. Eligible literature was not excluded based on quality but may result in limited robustness of findings for in-depth

programme assessment. Although application of specific inclusion criteria allowed for a particular focus on programmes, this may exclude literatures that did not report on the outcomes of interest, did not directly document non-malaria services, or were not reported in English.

Due to the widely heterogeneous contexts and findings, there was difficulty in synthesising and comparing information on the implementation and sustainability factors. Additionally, the systematic review is a retrospective investigation of ongoing or past programmes, and the literature searches may not capture programmes that have yet to report on or publish about their work. With the exception of two programmes (107, 120), none of the extracted literature described changes in implementation since the COVID-19 pandemic began. Therefore, a subsequent scoping online survey was conducted to capture additional expanded CHW programmes that have not been described in the current academic or grey literature, identify gaps and provide a more updated description of programmes included in this review.

2.5 Conclusion

Our systematic review identified 31 programmes in 13 countries in the Asia Pacific with CHWs performing various roles related to malaria and healthcare. Presence of and evidence from such programmes in GMS suggested the possible of role expansion for CHWs to address local health needs in the communities. Programme monitoring and evaluation, stakeholder collaboration, and capacity building for CHWs are key considerations for effective implementation. A sustainable approach to role expansion and malaria service integration could best be achieved by transitioning malaria services from under vertical disease programme to a broader community-centric model. To do so, implementers of malaria programmes may need to consider leveraging additional funding and political support as well as strengthening their CHW linkages with their communities and the broader health system.

Chapter 3 Scoping survey of expanded roles of community health workers in the Asia Pacific

This chapter is based on the published work: **Jongdeepaisal M**, Sirimatayanant M, Khonputsra P, Hein PS, Buback L, et al. (2024) Expanded roles of community health workers to sustain malaria services in the Asia-Pacific: A landscaping survey. PLOS Global Public Health 4(8): e0003597. <https://doi.org/10.1371/journal.pgph.0003597>

Summary

This chapter presents the results of the scoping survey which was conducted in parallel with the systematic review in order to fill information gaps identified from the review, particularly programmes that may have not published their work in peer-review articles and grey literature. An online scoping survey was distributed to national malaria programmes and implementing organizations in the Asia Pacific during October 2021–February 2022. Target respondents were national malaria programs (NMPs) and implementing organisations managing or supporting malaria community health worker (CHW) programmes in the region. The survey received 54 responses from 28 CHW programmes across 14 countries. CHWs have shown adaptability by incorporating newly emerged roles related to non-communicable diseases (NCDs) and dengue, as well as COVID-19 and emergency response activities, demonstrating resilience in shifting public health contexts. A major challenge highlighted by the implementers is declining donor funding. This posed a barrier to the role expansion strategy if it were to be implemented by an underfunded malaria programme; however, this may also provide an opportunity for NMPs and implementing partners to make the case for domestic resources for integration and donor schemes aimed at health system strengthening to ensure sustainability.

Highlights

- The scoping survey result emphasises the traditional focus of CHW programmes prioritising maternal, newborn, and child health, along with their common roles in health promotion and education in resource limited settings. However, dengue case investigation and NCD service delivery, particularly in hypertension and diabetes care, were found to be emerging roles of CHWs, indicating their adaptability to take on broader preventive and surveillance roles.
- Reports of additional roles related to COVID-19 support and referral services were found in many programmes, providing opportunities for programmes and health staff to explore potential new roles in fever screening and rapid testing beyond malaria.
- Decreasing donor funding was reported as a common challenge for effective implementation, prompting concerns from programme managers about this barrier to sustain additional roles of CHWs.
- Lessons can be extracted from government programmes in Nepal and Malaysia which have successfully formalise CHW, and village malaria workers (VMWs), and their malaria service into the national public health system, and through a well-established non-government programme in Bangladesh.

3.1 Introduction: Implementers of expanded malaria programme in the Asia Pacific

Over the past two decades, the GMS has seen a significant decline in malaria incidence and mortality. This progress is largely due to targeted interventions reaching at-risk populations in rural areas (18). CHWs and VMWs have played a key role in expanding access to malaria services, including timely testing services (154-156). To support malaria elimination and sustain community-level services, GMS countries are considering expanding the role of malaria-focused CHWs and VMWs to include additional health services. These CHWs currently operate under

vertical programmes, which target malaria specifically and are separate from broader health systems (1, 18). One potential strategy involves combining malaria control initiatives with other public health programmes. This integrated approach brings several advantages, such as more efficient use of resources, stronger health systems, enhanced data collection and monitoring, improved overall health outcomes, and greater long-term sustainability of interventions. By leveraging CHWs, the programmes can also ensure that malaria and other targeted health services remain accessible to the population at-risk (157).

The integration of malaria control with other health programmes varies by country, depending on local disease patterns and resources. Many countries have already combined malaria efforts with other vector-borne diseases (VBDs) (such as Thailand), neglected tropical diseases (NTDs), or through integrated community case management (iCCM) (such as Myanmar) (157). In some cases, malaria programmes are also coordinated alongside HIV/AIDS, tuberculosis (TB), or NCDs. Additionally, NGOs and international organisations also support integrating malaria efforts with broader health goals (157). For example, the U.S. PMI links malaria interventions with maternal and child health, HIV, TB, and neglected tropical diseases (NTDs) (158). The Roll Back Malaria (RBM) Partnership promotes iCCM and service delivery through CHWs, while aligning malaria with universal health care promotion (159). Similarly, the Global Fund is moving towards more integrated, people-centred services by combining malaria, HIV, and TB efforts with other health initiatives, such as sexual and reproductive health and maternal and child health, to advance primary health care for all (160).

This scoping survey aimed to gather more evidence on how such integrated approaches are implemented and managed across Asia Pacific and the extent to which CHWs are leveraged to support these integrations. It also provided an opportunity to update the operation of identified programmes from the systematic review and document the statuses and challenges of the programmes during the COVID-19 pandemic. As part of the RAI3E OR project, the survey further

identified potential programmes and respondents for further implementer interviews conducted by University of California, San Francisco; results of which was reported and published separately from this study and the thesis.

3.2 Methods

Survey development and distribution

Based on the preliminary results of the systematic review presented in chapter 2, a questionnaire was developed to collect updated information on malaria CHW programmes in the Asia Pacific and revised based on a pre-test with five potential respondents. The survey included thirty questions under three topics: (1) information about the respondent and programme, (2) CHWs' types, roles, and services, and (3) implementation characteristics of the programmes, including the challenges and the impact of COVID-19. Questions and responses were tailored to the systematic review results on programme characteristics, factors that affect sustainability and challenges, with open-ended responses available if the respondents wish to provide other and/or detailed information about their programmes. Respondents were asked to respond based on how the programme was operating at the time of the survey, or, if no longer active, how it operated prior to discontinuation. Respondents were limited to submitting responses for up to three programmes per one survey submission, a constraint of the Jisc software used for the online survey (see [appendix 2](#)).

The survey was designed to be self-administered, online, in English, and distributed to managers and staff of NMPs in 23 Asia-Pacific countries, and other APMEN partners implementing or supporting malaria CHW programmes in the region. Target respondents were individuals involved in managing or implementing malaria CHW programmes in these countries; they were invited to

participate by email with an embedded link to the online survey. Respondents who provided their consent to participate were asked the following screening questions to ensure their eligibility: whether the CHWs in their programme provide malaria and other health services, and whether they can provide more details about the particular programme. The survey was launched on 15/10/2021, with follow-up email reminders being circulated throughout the data collection period until the closing date on 31/01/2022.

The responses were processed and analysed in Microsoft Excel with unique codes created to identify each individual programme and respondent. Quantitative data was calculated as a percentage and summarised in categorical data and visualised in GraphPad Prism. Qualitative data including free text responses were coded thematically using NVivo software.

Ethical consideration

This study was approved by OxTREC (reference no. 534-21). All respondents provided formal written informed consent prior to taking the survey by ticking a box in the online form to indicate that they had understood the information about the study, confirmed that they met the inclusion criteria, and agreed to take part. Survey responses did not record names, email addresses, or IP addresses of respondents, but collected contact information of programme representatives who were referred to be contacted for additional survey response or nominated for further interview. To maintain confidentiality of the identified representatives, their contact information was not shared beyond the study team, nor used in data analysis and reporting.

3.3 Results

Characteristics of survey respondents and identified programmes

The survey received 54 responses from 29 programmes in 16 Asia-Pacific countries: 19 responses were subsequently screened out: 11 programmes did not directly manage the CHW programme and 8 managed CHWs that only provided malaria services. Among 35 eligible responses, 28 programmes were identified in 14 countries. Among survey respondents included 17 programme managers/directors, 9 programme staff, and 9 technical advisors or specialist. We did not receive responses from 7 out of 22 APMEN country partners.

Of 28 programmes, 24 reported active status: 11 operating at national level, 12 sub-national, and 1 ad-hoc programme for COVID-19 emergency responses; 4 programmes were no longer active: 1 pilot programme, 1 transitioned into another programme, and 2 discontinued. Eight programmes were identified in Myanmar, followed by 4 in Cambodia, 2 each in India, Nepal, Thailand and Vietnam, and 1 each in the following countries: Afghanistan, Bangladesh, Bhutan, Laos, Sri Lanka, Malaysia, Papua New Guinea, and Solomon Islands.

Table 3.1 Baseline characteristics of eligible survey respondent participants

	Respondents		Programmes	
	Total 35		Total 28	
Country	n	%	n	%
Afghanistan (AFG)	1	2.9	1	3.6
Bangladesh (BNG)	1	2.9	1	3.6
Bhutan (BTN)	1	2.9	1	3.6
Cambodia (KHM)	5	14.3	4	14.3
India (IND)	2	5.7	2	7.1
Lao PDR (LAO)	1	2.9	1	3.6
Malaysia (MYS)	2	5.7	1	3.6
Myanmar (MYM)	9	25.7	8	28.6
Nepal (NPL)	2	5.7	2	7.1
Papua New Guinea (PNG)	1	2.9	1	3.6
Solomon Islands (SLB)	1	2.9	1	3.6
Sri Lanka (LKA)	3	8.6	1	3.6
Thailand (THA)	4	11.4	2	7.1
Viet Nam (VNM)	2	5.7	2	7.1
Organisation type				
Academic/Research Institution	4	7.4	2	7.1
International (non-governmental) organization	16	29.6	13	46.4

	Respondents		Programmes	
Non-governmental organization	12	22.2	3	10.7
Government/National Malaria Control Programme	16	29.6	8	28.6
Private sector	1	1.9	1	3.6
Other	4	7.4	1	3.6
Work position				
Director/manager	25	46.3		
Project/programme officer	13	24.1		
Technical advisor or specialist	16	29.6		

The roles of CHWs and their services

Various cadres of CHWs were identified their roles may differ despite operating in the same countries or managed under the same programmes. Eleven programme each reported managing 1 or 2 CHW cadres, with 5 programmes managing between 3-5 cadres. Of 52 CHW cadres, most common malaria roles of CHWs were malaria education and health promotion (n=44), reported in 13 of 14 countries, followed by roles related to vector control, case reporting and surveillance activities, and testing with malaria rapid diagnostic test (RDT). Most common non-malaria roles of these workers were also health promotion and education but for other diseases, followed by activities related to COVID-19 and non-malaria case referral. CHW cadres covering most non-malaria roles were identified from non-vertical malaria programmes and were part of a large multi-purpose health workers in countries like Afghanistan, Bhutan, Nepal, and Thailand; however, some specific CHWs, such as in Integrated Community Malaria Volunteer (ICMV) in Myanmar who were assigned integrated services in addition to malaria, also reported performing similar range of non-malaria roles to such multi-purpose workers.

Table 3.2 General information of the identified programmes from landscaping survey

Country (abbrev.)	Implementer/Programme name	CHW cadre(s)	Programme scale (no. of health facilities/posts and CHWs)	Programme duration, status
Afghanistan (AFG)	Community Health Worker Programme	Community Health Workers (CHW)	Almost 2000 Health posts/mobile health units, Basic Health Centers, Comprehensive Health Centers, district and provincial hospitals >50,000 CHWs (>30,000 MoPH and about 20,000 International Red Cross Society)	More than 5 years, active
Bangladesh (BNG)	Bangladesh Rural Advancement Committee (BRAC) in partnership with National Malaria Control Programme	(1) Shasthya Sebikas (SS), Community Health Volunteers (2) Shasthya Kormi (SK), Health Workers	71 Health facilities/posts 4252 volunteers/workers	More than 5 years, active
Bhutan (BTN)	Vector-Borne Disease Control Programme	(1) Health Assistant (HA) (2) Village Health Worker (VHW), members of Community Action Group (CAG)	650 HAs deployed at all Primary Health Centres (184) 1,053 VHWs deployed in every village(161)	More than 5 years, active
India (IND1)	Malaria Elimination Demonstration Project (MEDP) in Mandla District, Madhya Pradesh	(1) Village Malaria Worker (VMW) (2) Malaria Field Coordinators	298 health facilities/posts 260 workers (25 Malaria Field Coordinators and 235 Village Malaria Workers)(162)	1 to 5 years, active
India (IND2)	National Health Mission of Chhattisgarh	Mitanin	1 medical college, 1 district hospital, 10 community health centre, 45 Primary health centre, 350 sub health centres >4000 Mitandin	More than 5 years, active
Cambodia (KHM1)	Catholic Relief Services (CRS)'s RAI3E, TB Programme and Resilient Sustainable System for Health Programme	(1) Village malaria worker (VMW) (2) Mobile malaria worker (MMW) (3) Village Health Support Group (VHSGs) (4) Community DOTs Watchers	80 health facilities/posts 774 workers (breakdown unspecified)	More than 5 years, active
Cambodia (KHM2)	Health Poverty Action (HPA)'s COVID-19 Emergency Response	Mobile Malaria Worker (MMW)	Approx. 20 health facilities/ posts N/A workers due to inactivity of programme	6 months to less than 1 year, no longer active
Cambodia (KHM3)	Population Services International (PSI)'s Worksites Programme	Mobile Malaria Worker (MMW)	<20 Operational Districts 274 MMWs	More than 5 years, no longer active
Cambodia (KHM4)	National Center for Parasitology, Entomology and Malaria Control	(1) Village malaria worker (VMW) (2) Mobile malaria worker (MMW)	>1000 health facilities/posts Number of workers not specified	More than 5 years, active

Country (abbrev.)	Implementer/Programme name	CHW cadre(s)	Programme scale (no. of health facilities/posts and CHWs)	Programme duration, status
	(CNM)'s Village Malaria Worker Project	(3) Village Health Support Groups (VHSG)		
Lao PDR (LAO)	National Malaria Control Programme's Center for Malariology, Parasitology, and Entomology (CMPE)	(1) Village Malaria Worker (VMW) (2) Forest Malaria Worker (FMW)	260 health facilities/posts 2199 workers (breakdown unspecified)	More than 5 years, active
Sri Lanka (LKA)	Anti-Malaria Campaign (AMC)	(1) Public Health Field Officers (2) Health Entomology Officers (3) Spray Machine Operators (4) Public Health Laboratory Technicians (5) Public Health Inspectors	AMC-HQ and 27 RMO offices Approx. 80 workers (PHFO, HEO, and SMO)	More than 5 years, active
Myanmar (MMR1)	Shoklo Malaria Research Unit (SMRU)'s Malaria Elimination Task Force (METF)	(1) Malaria Post Worker (MP) (2) Community Health Worker (CHW)	Approx. 1000 health facilities/posts >900 workers (breakdown not specified)	More than 5 years, active
Myanmar (MMR2)	Malaria Consortium (MC)'s expanding rural communities' access to health services in Myanmar programme	(1) Malaria Volunteer (MV) (2) Integrated Community Malaria Volunteers (ICMV)	Unspecified number of health facilities/posts 120 workers (breakdown unspecified)	1 to 5 years, active
Myanmar (MMR3)	Population Services International (PSI)'s Community Health Services Programme	Community Health Services Provider	Unspecified number of health facilities/posts N/A workers due to inactivity of programme	1 to 5 years, no longer active
Myanmar (MMR4)	Save the Children's Regional Artemisinin Initiative Programme in Myanmar	Integrated Community Malaria Volunteer (ICMV)	Health facilities/post not involved in programme 235 ICMVs	1 to 5 years (for ICMVs under regional grants) More than 5 years (for ICMVs under country grants), active
Myanmar (MMR5)	Malteser International (MI)'s Regional Artemisinin Initiative Programme in Myanmar	Integrated Community Malaria Volunteer (ICMV)	4 Health facilities/posts 182 ICMVs	1 to 5 years, active
Myanmar (MMR6)	Medical Action Myanmar (MAM)'s Community Health Worker Programme	(1) Community Health Workers (CHW) (2) Integrated Community Malaria Volunteer (ICMV) (3) Auxiliary midwives (AM)	Workers operate from their homes in 2000 villages (not associated to health facilities/posts) Approx. 2000 workers (unspecified breakdown)	More than 5 years, active
Myanmar (MMR7)	Myanmar Council of Churches (MCC)'s Community Based	(1) Village Health Volunteer (VHV)	532 health facilities/post	More than 5 years, active

Country (abbrev.)	Implementer/Programme name	CHW cadre(s)	Programme scale (no. of health facilities/posts and CHWs)	Programme duration, status
	Malaria Prevention and Control Project	(2) Integrated Community Malaria Volunteer (ICMV)	532 workers (unspecified breakdown)	
Myanmar (MMR8)	ALIGHT Regional Artemisinin Initiative Programme	(1) Integrated Community Malaria Volunteer (ICMV) (2) Microscopist (3) Community Mobilizer	45 health facilities/posts 729 workers (unspecified breakdown)	More than 5 years, active
Malaysia (MYS1)	Malaria Ambassador and Primary Health Care Volunteer Programme	(1) Malaria Ambassador (2) Primary Health Care Volunteer	368 health facilities/posts 482 workers (unspecified breakdown)	More than 5 years, active
Nepal (NPL1)	Community Based Testing in National Malaria Elimination Programme	Malaria Village worker (MVW)	55 health wards 55 MVWs	6 months to less than 1 year, active
Nepal (NPL2)	Health Assistants in the National Malaria Elimination Program	Health Assistant (HA)	55 health wards 210 HAs	1 to 5 years, active
Papua New Guinea (PNG)	Village Malaria Assistants Network from the Lihir Malaria Elimination Programme	Village Malaria Assistant (VMA)	8 health facilities/posts 84 VMAs (2020, pre-discontinuation)	1 to 5 years, no longer active
Solomon Islands (SLB)	Vector Borne Disease Control Programme	(1) Community Malaria Microscopists (CMM) (2) Civil Society Organizations (CSO) (cadre not specified)	> 200 health facilities/posts > 1000 for LLIN distribution (breakdown not specified)	6 months to less than 1 year, active
Thailand (THA1)	Mae Tao Clinic	(1) Community Health Workers (CHW) (2) Medic	1 health facility/post 15 CHWs 53 MDs	More than 5 years, active
Thailand (THA2)	Division of Vector Borne Disease (DVBD)'s Malaria Elimination Programme	(1) Malaria Post Worker (MPW) (2) Malaria Volunteer (MV)	450 health facilities/posts 450 workers (breakdown not specified)	More than 5 years, active
Vietnam (VNM1)	Health Poverty Action (HPA)'s Regional Artemisinin-resistance Initiative Programme	(1) Village Health Worker (VHW) (2) Malaria Volunteer (MV) (3) Malaria Coordinator (MC)	39 health facilities/posts 403 workers (breakdown unspecified)	1 to 5 years, active
Vietnam (VNM2)	National Institute of Malariology, Parasitology and Entomology (NIMPE)'s National Malaria Control and Elimination Programme	Village Health Worker (VHW)	All health stations in 63 provinces Unspecified number of VHWs	More than 5 years, active

Programme characteristics and implementation factors

1) CHW training and supervision

All programme reported providing training and supervision to their CHWs. Types of training varied among programme: 25 reported conducting introductory training, coupled with other sessions including on-the-job training and refresher trainings in groups or one-on-one, with some conducted online. Training was mostly provided on an annual basis, with some ad-hoc training based on CHW needs or funding availability. CHW supervision was conducted more frequently than training, mostly on a quarterly or monthly basis; ad-hoc supervision sessions might be needed but varied based on geographical accessibility and CHW needs. Majority of the supervisory session took place within the communities their CHWs worked at, followed by be hosted at a health facility or supervisor's home. Principal providers of these training and supervision were governmental organisation or NMPs, followed by international organisations and local NGOs or CSOs. Lack of available trainers, updated training materials or guidelines, funding was reported as challenges for programmes to provide these sessions consistently. Additionally, in-person and group sessions were limitedly conducted during the COVID-19 pandemic.

2) CHW compensation and programme funding

Donors were the primary source of programme funding: 18 reported receiving donor funding along and 6 in combination with government budget. Only 2 programmes were funded by domestic budgets alone, and one programme by private funding. Funding for CHW compensation and supply was more diverse, with responses citing NMPs or government, international organisations, and donors as sources. Forms of CHW compensation also varied, and many programmes reported providing a combination of incentives to CHWs including performance-based incentives, monthly salary, and non-financial rewards. None of the CHWs were paid by their clients for their service provision, and none of the programmes were self-funded. In practice, 18 programmes

also reported partnering with other organisations to provide training, supervision, supply, and compensation to the CHWs.

3) Programme evaluation

Programme evaluation was conducted primarily by their own organisations, followed by external party, or both. Most commonly evaluated dimensions were programme impact on malaria incidence and mortality, followed by coverage of malaria prevention measures, community awareness of malaria, data quality, CHW knowledge and skills, malaria testing and treatment rates, use of malaria prevention measures, time from testing to treatment, and feedback from patients or clients. Only two programmes reported evaluating the impact on other diseases beyond malaria.

4) Programme implementation during COVID-19

Many CHWs were assigned additional roles during the pandemic; for example, promotion knowledge and awareness of COVID-19, vaccination, and use of personal protection equipment. Five programmes specified that the CHWs were tasked with fever surveillance and migration tracking by taking temperature of suspected cases and tracing contacts within the communities, health facilities, or quarantine centre. Key challenge for programmes and CHWs during the pandemic was travel and activity restrictions, resulting in reduction, delay, or suspension of non-COVID-19 patient referral, training and supervision, as well as community-related activities such as indoor residual spraying and mass gathering for health campaigns. Additionally, challenges were reported in terms of increased workload of CHWs and shortage of health facility staff and commodities. Some programmes addressed these challenges by shifting their activities online, using more mobile applications and phone calls for supervisory activities among team and for CHWs to communicate and follow-up with patients.

5) Views of programme sustainability

Of 24 active programmes, respondents were asked to select factors that contribute to sustainability of their programmes: ongoing funding, community engagement, political commitment, and stakeholder collaboration were identified as key factors. In response to CHW role expansion strategy, a programme in Myanmar indicated that *"the fact that the [malaria] CHWs provided a broader package of health activities made them effective and sustainable. Patients visit because they are ill, not necessarily due to malaria. If you want to have a good uptake, you need to address most health issues of the patient"*. All 4 inactive programmes cited lack of funding for their discontinuation. One programme in Cambodia was established in response to COVID-19 pandemic as a short-term programme funded by donor through a local NGO, leveraging mobile malaria workers and outreach teams. Two others in Cambodia and Myanmar, a longer-term GEMS program aimed to reduce malaria cases in worksites across the country, were also funded by donor, were reported to end in 2020 and transition to other succeeding programmes. Papua New Guinea's programme was co-funded by a local private organization and international organization through a newly established local NGO specifically working towards malaria elimination in Lihir Islands.

Figure 3.1 Malaria and non-malaria roles of CHWs identified from the survey

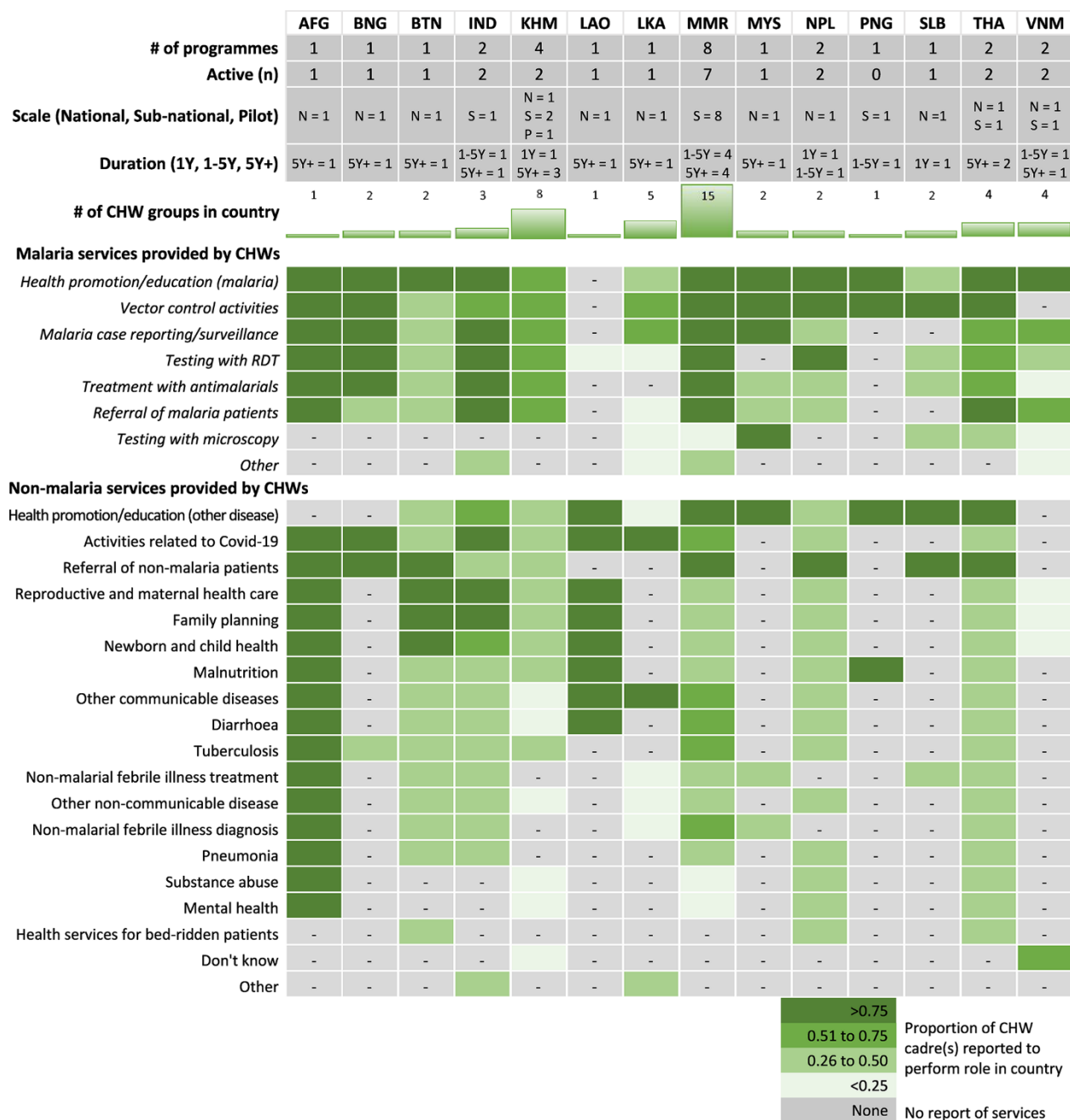


Figure 3.2. Programme evaluation

	AFG	BNG	BTN	IND	KHM	LAO	LKA	MMR	MYS	NPL	PNG	SLB	THA	VNM
# of programmes	1	1	1	2	4	1	1	8	1	2	1	1	2	2
Active (n)	1	1	1	2	2	1	1	7	1	2	0	1	2	2
Scale (National, Sub-national, Pilot)	N = 1	N = 1	N = 1	S = 1	N = 1 S = 2 P = 1	N = 1	N = 1	S = 8	N = 1	N = 1	S = 1	N = 1	N = 1 S = 1	N = 1 S = 1
Duration (1Y, 1-5Y, 5Y+)	5Y+ = 1	5Y+ = 1	5Y+ = 1	1-5Y = 1 5Y+ = 1	1Y = 1 5Y+ = 3	5Y+ = 1	5Y+ = 1	1-5Y = 4 5Y+ = 4	5Y+ = 1	1Y = 1 1-5Y = 1	1-5Y = 1	1Y = 1	5Y+ = 2	1-5Y = 1 5Y+ = 1
# programmes self-reporting evaluation	N/A	1	N/A	2	2	N/A	1	8	1	1	1	1	2	1
<i>Impact on malaria incidence/morbidity/mortality</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Impact on coverage of malaria prevention</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Community knowledge and/or awareness of malaria</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Data quality</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Impact on malaria testing rate</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Impact on usage of malaria prevention</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Knowledge of CHWs</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Skills of CHWs</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Impact on malaria treatment rate</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Time from testing to treatment</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Patient/client feedback</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Other impact on malaria</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Impact on another disease/health condition</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Other</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note: Seven programmes did not report on evaluation (AFG, BTN, KHM2, KHM3, LAO, NPL1, VNM1).

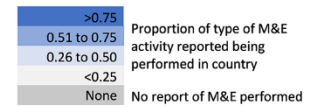
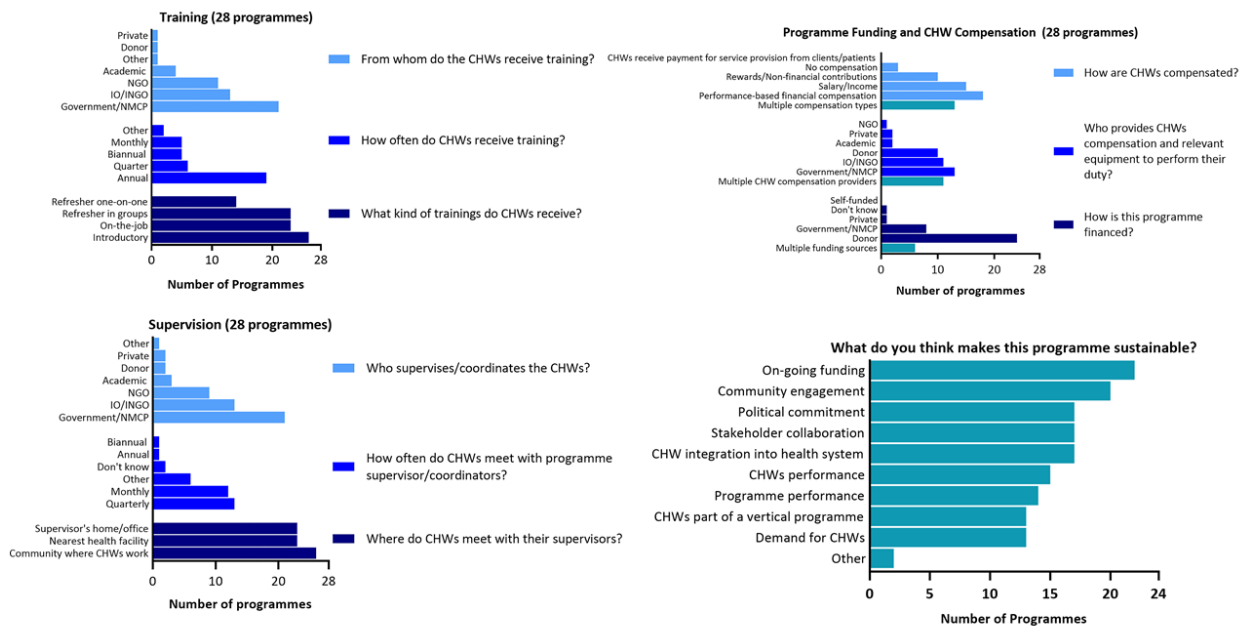


Figure 3.3a-c Programme characteristics

(a) training and supervision, (b) funding sources and CHW compensation, (c) views of programme sustainability

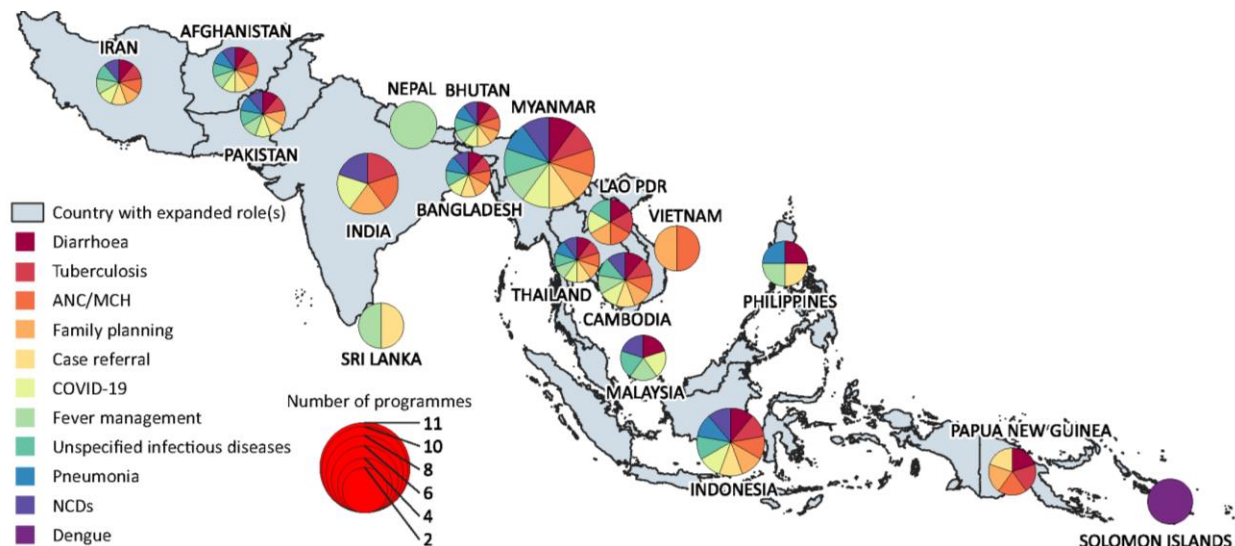


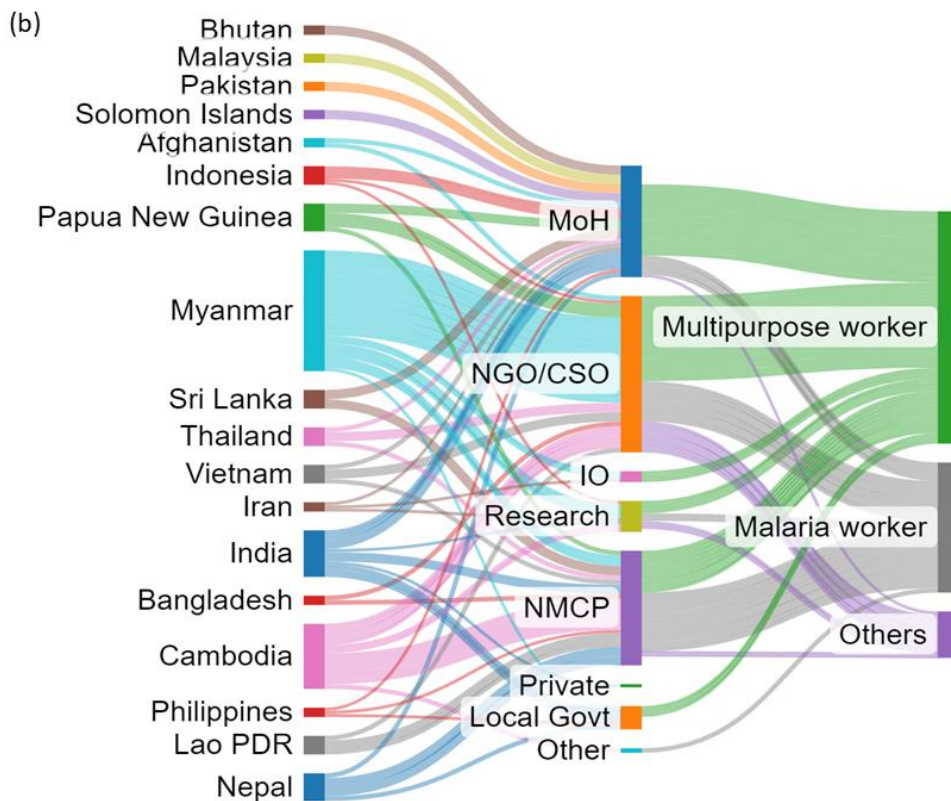
3.4 Discussion

This survey updated the findings from systematic review by identifying 16 new programmes in the Asia Pacific, adding programmes with expanded CHW roles in the following new countries not identified from the review: Bhutan, Malaysia, Solomon Islands, Thailand, and Vietnam. The survey also provided updated information of 13 programmes already identified in the review. In total, 49 programmes in 18 countries across the region were identified from both research components. Figure 3.4a visualises the Asia-Pacific countries with the number of identified programmes and their most performed CHW roles. Figure 3.4b depicts how each CHW cadre who were described as either multi-purpose workers who performed various health roles, malaria workers who specifically performed malaria roles with additional tasks, or other types of CHWs based at health facilities, were managed by multiple implementing programmes across countries.

Figure 3.4a-b identified expanded programmes and CHW cadres in the Asia Pacific from the landscaping studies

(a) colour-graded countries based on the number of identified programmes and top CHW roles and; (b) programme implementers in various organisations and CHW cadres across countries





The survey results reemphasised that the roles of malaria workers or VMWs in the GMS as health promoters, maintaining malaria awareness in their communities, who may also take on additional responsibilities by monitoring local health needs and addressing other concerns based on community feedback (163). In fact, several operational research studies have already explored the role expansion of VMWs in the region. In western Cambodia, health education, disease surveillance, first aid, mild illness management, vaccination, and antenatal care have been added to package of VMW services, with some also trained to screen febrile patients for dengue using multiplex RDTs (96). Feasibility studies into this strategy suggests that deploying user-friendly point-of-care tests selected for locally relevant pathogens, along with disease-specific education that is tailored to the literacy level and limited resources of VMWs, could be feasible and acceptable (164, 165). However, in Myanmar, where their roles have been expanded to include a basic healthcare package that incorporates the treatment of malnutrition, diarrhoea, and

respiratory tract infections, a study conducted by Shoklo Malaria Research Unit (SMRU) showed the added services did not significantly impact the uptake of malaria services (166), while the other conducted by Medical Action Myanmar (MAM) reported that integrated services contribute to sustaining malaria service uptake in the other programme (5). Although results vary, these examples show that workers can expand and adapt their preventive roles to meet community health needs while still fulfilling their core responsibilities of malaria surveillance and service delivery.

In response to the COVID-19 pandemic, the survey found that CHWs in many programmes have recently taken up the roles related to COVID-19 activities alongside their usual duties. This prompt changes highlighted their emerging roles in epidemic response, as well as their adaptive capacity to continue the programme implementation using phone-based services and joining online staff training. In addition to their contribution to COVID-19 vaccination campaigns (167), programmes have been recommended to integrate malaria and COVID-19 interventions, such as fever screening and rapid testing, to sustain essential services in high burden setting (168). These integrated services could also translate to near elimination setting, such as in the GMS, where concerns arose about reduced donor funding impacting malaria elimination, presenting an opportunity to maintain community-based malaria services alongside future pandemic responses (169).

Sustained investment and financial support are crucial for malaria elimination programmes, even prior to or without the implementation of the role expansion strategy (170-172). In the GMS, most programmes surveyed were primarily donor-funded, with NMPs and NGOs managing VMW compensation. However, payment structures vary among different cadres of volunteers and workers — typically relying on travel allowances or performance-based incentives. Experiences in Cambodia and Myanmar suggest that increasing financial incentives is essential to maintain service quality and retention, especially when VMWs take on expanded healthcare roles (92, 165,

173), in contrast, payment discrepancies can lead to demotivation (174) and weakened performance (175).

While programmes in the GMS may consider leveraging existing funding to support the expanded roles of VMWs, they may also consider additional funding sources beyond malaria programmes. Lessons from surveyed government programmes in countries like Afghanistan, India, and Sri Lanka, as well as NGOs like BRAC in Bangladesh, highlight the benefits of linking CHWs to local health facilities through public health funding. Similarly, evidence has shown that integrating malaria programs into primary healthcare systems, by leveraging established CHWs—such as in Nepal (FCHVs) (176, 177) and Malaysia (178, 179)—has strengthened malaria interventions. Alternative approaches, such as funded CHW programmes through collaborations between local governments and private entities were also identified in the survey with examples in Papua New Guinea (180) and India (162) where such partnerships were used to finance malaria programmes. However, the survey response did not indicate whether the former programme in Papua New Guinea has transitioned or integrated into a succeeded programme after it ended, while the completion of the active programme in India reported that the state government has adopted the best practices from their public-private partnership initiative in other districts (181). In addition to communicable diseases, increased risks on NCDs among the population in this region, and observed roles among the CHWs, present a strong case for expanding those of VMWs to include additional NCD services (182), for common illnesses like hypertension and diabetes (183). How different programmes may approach this integration will depend on the implementing context and entry points which require in-depth understanding of how VMWs and CHWs are recruited, trained, and funded. The various approaches for integration are further explored in the subsequent interviews with selected programme implementers at the Asia-Pacific level, as well as in country-specific studies in Vietnam and Cambodia, which are reported elsewhere (184, 185). The

following chapters investigated specifically how malaria programmes in Thailand, our case study, may approach this.

Strengths and limitations

Preliminary findings from the systematic review and pre-testing of survey questions provided key inputs and development of this landscaping survey, allowing the survey to capture existing programmes and comparability across programme in the analysis. Free-text responses also allowed respondents to report their programme implementation in detail, particularly on topics related challenges and sustainability. The survey was distributed among APMEN partners and wider networks to ensure coverage of malaria programme implementers across the Asia Pacific, Nevertheless, due to the voluntary nature of participation, we did not receive responses from all countries in the region, and received multiple responses were received from programmes actively engaged with APMEN or are sub-recipients of The Global Fund's grants, such as programmes in Myanmar, which could lead to programmes being more motivated to respond and create potential bias from their reliance with donor funding. Additionally, the survey was designed and distributed in English language, limiting the participation of non-English speakers in providing more information about their programme(s).

This survey excluded programmes that manage CHWs exclusively providing malaria services; therefore, the findings did not document the perspectives of programs that have not yet expand the roles of their CHWs. Additionally, the survey collected and reported on challenges experienced by CHW programmes during the COVID-19 pandemic. While this was a prominent concern when the survey was developed and implemented, many of the challenges experienced during this period may no longer be relevant. As the survey allowed for multiple responses from each implementing organisation, inconsistent data reported by respondents within the same programmes and other reconciliations on critical data points were rechecked with a representative of the responding organisation. It was also likely that some information is unknown to the

respondents and thus may not be specified in their responses; for example, specific services provided by the malaria CHWs or evaluation aspects of the programmes. Therefore, absence of service provision or other programme characteristics reported for each country in this survey should be interpreted as missing data, rather than lack thereof.

3.5 Conclusion

The findings from the scoping survey confirm that programmes in the region managed CHWs who perform multiple roles related to health and malaria, although these are foundational roles in health education and promotion and integrated case management for maternal and child health, and include some ad-hoc roles specifically during the COVID-19 pandemic. Donor funding was cited as key challenges for programmes to support their operation and the CHWs; therefore, central to the discussion is determining how to source funding for programmes and for VMWs in the GMS especially when their roles are expanded. Evidence of programme managing CHWs with multiple roles under primary care programmes or integrated-disease programme shows the possible of such expansion. Specific entry points and extracted implementation lessons for role expansion and integration have been investigated in subsequent case studies in the Asia Pacific; for the GMS, country-specific assessment is needed to identify roles that correspond with the specific health needs of the communities CHW serve and design the programme implementation that best fit the country context.

PART 2 Assessing the prospects of VMW role expansion

The overview of the characteristics of the malaria programmes in the Asia Pacific has contributed to the understanding of the wide spectrum of roles related to malaria and beyond among the CHWs and the various factors that have enabled and challenged their implementation. Presence of multi-purpose workers and integrated CHW cadres shed some light on how GMS countries could design their VMW role expansion strategy; however, such expansion and integration heavily depended on the contexts of implementation, the multi-level actors, the actual content of the expanded roles, and the process of which this strategy were to be implemented. The reported decrease of and reliance on donor funding, as well as limited domestic resources, added to this complexity. The following three chapters attempt to unfold and address these complexities through in-depth analysis of malaria-endemic communities, the key stakeholders involved in the implementation of malaria and primary care programmes and the health system, in order to understand the context and assess the prospects of VMW role expansion in Thailand. The analysis followed the main investigation into the malaria programme and the operation of malaria workers or MPs (equivalent to VMWs in Thailand) in near elimination settings driven by Thailand's national malaria elimination strategy guided by the Regional-Artemisinin Initiative (RAI) strategy during 2021-2023 and donor's funding in Chapter 4. The subsequent study in Chapter 5 moved to investigation from the initial role expansion to malaria service integration within the decentralised health system the potential of, exploring the potential to leverage primary care units (PCUs) and a wider group of village health volunteers (VHV) in the future. In Chapter 6, this assessment was extended to investigate the prospects of such strategy in a high-transmission setting, following the outbreak of malaria along the western border of Thailand in 2023.

Chapter 4 Thailand's malaria programme overview and assessment of VMW roles

This chapter is based on the published work: **Jongdeepaisal M**, Khonputsa P, Prasert O, Maneenate S, Sirimatayanant M, et al. (2024) Expanding the roles of malaria post workers in Thailand: A qualitative study of stakeholder perspectives. PLOS Global Public Health 4(9): e0003670. <https://doi.org/10.1371/journal.pgph.0003670>

Summary

This chapter presents the results of in-depth analysis of Thailand's malaria programmes, the stakeholders at multiple levels of the programme implementation, and their perspectives on community-based malaria care to assess prospects for expanding the role of MPs. Data was collected from in-depth interviews with policymakers and implementers (14 interviews) at national and sub-national levels, and from the representatives of MPs (13 interviews) and community members (23 interviews and 2 focus groups with 11 participants) in near elimination setting. In endemic communities, MPs were perceived to be trusted and essential to high-risk groups like forest goers and migrants who often avoid public health facilities, despite malaria no longer being seen as a top concern. Local health priorities in rural areas now shifted to health conditions like dengue, diabetes, insect bites, diarrhoea, mental health issues, and substance abuse—suggesting the need to expand MP roles for them to be more relevant to their patients. While challenges exist in training, supervision, and funding, opportunities were emphasised in the ongoing decentralised primary care and the availability of local administrative support. Respondents highlighted that any expansion of MP roles should reflect local needs, avoid overlap with existing programmes, and strengthen the linkages between malaria services with community and primary care to ensure its sustainability.

Highlights

- MPs were found to be well-established within their communities, often recruited from a pool of VHVs which was a large group of multi-purpose health workers, and also undertook

multiple volunteering roles such community leadership positions or mobilisers of local government and CSOs, suggesting that their roles may have been organically expanded based on the nature and setup of the community-based programmes which often leveraged the VHVs, a wider cadre of CHW programme in Thailand, and assigned them additional tasks.

- Care for dengue, diabetes and other common health problems related to febrile illnesses, agricultural and forest-based activities, and rural living were highlighted as potential roles for MPs but should be aligned with existing programmes and contextual needs from further evaluations through need assessment and participatory rural appraisal.
- Although malaria testing with RDTs were perceived by their patients and supervisors as the strongest, most valuable role of MPs, policymakers and health staff worried about the acceptability and feasibility of assigning other diagnostic tools for volunteers, highlighting a legal barrier against non-medical professionals taking blood samples for other health conditions besides approved programmes like malaria, HIV and diabetes.
- The expedited decentralisation of primary care in Thailand was positively viewed in support of malaria programme integration and MP service continuation, citing this as untapped political and financial resources to strengthen local disease control activities; however, compared to other pressing issues, malaria remained an under-prioritised issue in low-transmission area and the continuation of MP services may still be jeopardised.

4.1 Introduction: Development of malaria post worker programme in Thailand

Since 1960s, Thailand has established various programmes that implemented malaria control efforts from Malaria Eradication Program (1965-1970) to Malaria Control Program (1971), followed by reformation and integration of malaria programme into general health services in 1996 (186). These programmes involved multiple cadres of CHWs including malaria volunteers and

village health volunteers under the Ministry of Public Health (MoPH). Subsequently, the vertical malaria programme under Thailand's national malaria programme (NMP) established malaria-specific providers called malaria clinics (MCs) to provide early diagnosis and treatment (187). The introduction of malaria RDTs malaria in the early 2000s enabled the recruitment of community members to test for malaria, establishing the first cohort of malaria posts (MPs) or malaria post workers (2004). Similar to village malaria workers (VMWs), MP-equivalent in the subregion, the operation of MP programme has continuously received funding from the Global Fund (188).

With a substantial progress Thailand has made in reducing malaria cases up until 2021, the Global Fund has pushed donor-funded countries, including Thailand, to leverage more domestic resources for the disease control and elimination strategy, including for the employment and service provisions of MPs. After Regional Artemisinin-resistance Initiative (RAI3E) grant cycle ended, there is a risk that MPs and their community-based services are scaled back, limiting access to community-based malaria services among at-risk population. This trend could also undermine elimination efforts which requires robust surveillance and control activities; without MPs, the malaria programme may face difficulty in reaching the target population who may also be less inclined to visit public health facilities (189, 190).

The strategy to expand the role of MPs to include other health services have never been conducted before in Thailand and its success requires an understanding of community's health needs for additional services. There is also a limited understanding of policy challenges and opportunities at different levels of the health system and how the MP role expansion could align with malaria elimination strategy and public health priorities. This study examines (1) the prospects for this strategy from the perspectives of stakeholders involved in the malaria programme in Thailand, (2) the need and preference for expanded roles of MPs among the MP themselves, their clients, and their supervisors, and (3) explore potential additional health

services, design and feature of implementation, and necessary support to accompany expanded roles.

4.2 Methods

Study design

This study formed part of a broader RAI3E Operational Research project between 2021-2023 with country-specific studies conducted in Cambodia, Thailand, and Vietnam. Overall methods of this country study components include a rapid policy document review, stakeholder mapping, qualitative interviews with key stakeholders, and focus group discussion with community members in selected study sites. Additionally, a questionnaire-based survey was conducted at sites to explore the trends in health-seeking behaviours and utilisation of malaria services among a larger group of community members; the results of which will be published separately from this study and the thesis.

Rapid review of policy documents and identifying key stakeholders

Published policy documents and articles in Thai and English languages were selected for review to extract preliminary information regarding the structure and key implementers of malaria programmes in Thailand. Relevant policy documents from Thailand NMP, implementing partners, and other government and international organisations were identified from Google Scholar and web searches based on list of relevant organisations, some of which were identified from the previous landscaping studies. Preliminary findings of this rapid review described (1) the timeline and historical contexts of malaria programme in Thailand, (2) the organisation structure and characteristics of the programme, (3) the functions and features of MP and other cadres of workers/volunteers involved in malaria programme and produced (4) the initial list of key informants at relevant organisations. These preliminary findings are summarised in result section and elaborated in detail in [appendix 3](#).

The initial key informants were identified through this rapid document review and subsequently consultations with Thailand NMP at the Division of Vector-borne Diseases (DVBD). Eligible respondents included programme managers and implementers in the government, international organisations and CSOs and researchers with expertise in community-based care, and representatives of technical partners from relevant organisations. They were purposively selected for key informant interviews (KIIs) and approached by email, phone call, or in-person at work.

Identification of study sites for community IDIs and FGDs

The community survey component consists of in-depth interviews (IDIs) with MPs and community representatives and focus group discussions (FGDs) with community members. Ubon Ratchathani and Sisaket provinces in northeast Thailand were selected in consultation with DVBD; the main reasons for selecting these sites were that these endemic communities experience low malaria transmission and are located along the Thai-Lao-Cambodian border - the regional epicentre of Artemisinin combination treatment (ACT) resistance (191). In addition, this area recorded Thailand's highest malaria incidence rate during an outbreak in 2014, but this has greatly reduced since then (23). At site there were 13 MPs active during RAI3E 2021-2023 grant cycle located in A1 and A2 (active transmission) villages (188). Nationally (2021-2023), there were 180 MCs, and 400 MPs, and 444 HPHs located in 40 provinces with endemic malaria. The malaria zones and implementation areas under the RAI3E initiative are reviewed every year.

Respondents included adult members of the malaria endemic communities, MPs, healthcare workers and public health staff who are the key providers of malaria care including MCs, health promotion hospitals (HPHs), primary care units (PCU), and community hospitals. All active MPs were purposively selected for IDIs; each resided in the 13 endemic communities in the two provinces. Adults aged over 18 were identified through consultations with MPs and invited for IDIs if they were regularly exposed to malaria due to their work in the forest or had recently visited MPs for their services. Subsequent IDI respondents were recruited through snowballing to identify

a more diverse group of community members including pregnant women, elderly, families with children, and local community leaders. Similar criteria were applied for the selection of FGD participants. They were approached by phone call or in-person in the communities.

Data collection

The data collection tools were informed by findings from the document review and a previous study on forest malaria and at-risk groups in Thailand (60). IDI topic guides were lightly structured and tailored to each informant's role and experience. The interviews focused on gathering perspectives and expectations regarding current and future MP services, as well as identifying the resources required for effective implementation of expanded services. FGD explored these topics in a group setting, specifically addressing local health concerns, and how expanded MP roles could be developed to better serve specific populations. Initially drafted in English, the guides were translated into Thai and reviewed to ensure clarity and accuracy, and subsequently updated based on insights from earlier interviews, such as on the scope of the volunteer work in community settings or existing policy or guideline of malaria service provision by volunteers. Key topics of the guides are outlined in Table 4.1 with details in [appendix 3](#).

Data collection took place between November 2021 and June 2022 by me, one epidemiologist, and two research assistants. The process was iterative, whereby data from initial activities were analysed and informed the subsequent data collection until saturation point which no new information were found. The number of study participants was determined from the stakeholder mapping to identify key malaria programme representatives and the aim to reach a diverse group of community members at the study sites, using sampling techniques that are both purposive and snowballing. Respondents were interviewed in quiet settings, such as their homes, workplaces, or community spaces such as the village houses. Community members and healthcare workers were interviewed in Thai and Thai-Isan (Northeastern Thai) languages at the study locations. Programme managers and implementers were interviewed in Thai or English, either in person or

online, at their workplaces. Interviews lasted from 30 to 90 minutes, and FGDs from 60 to 75 minutes; both were digitally recorded with consent from respondents

Table 4.1 Topics covered in data collection

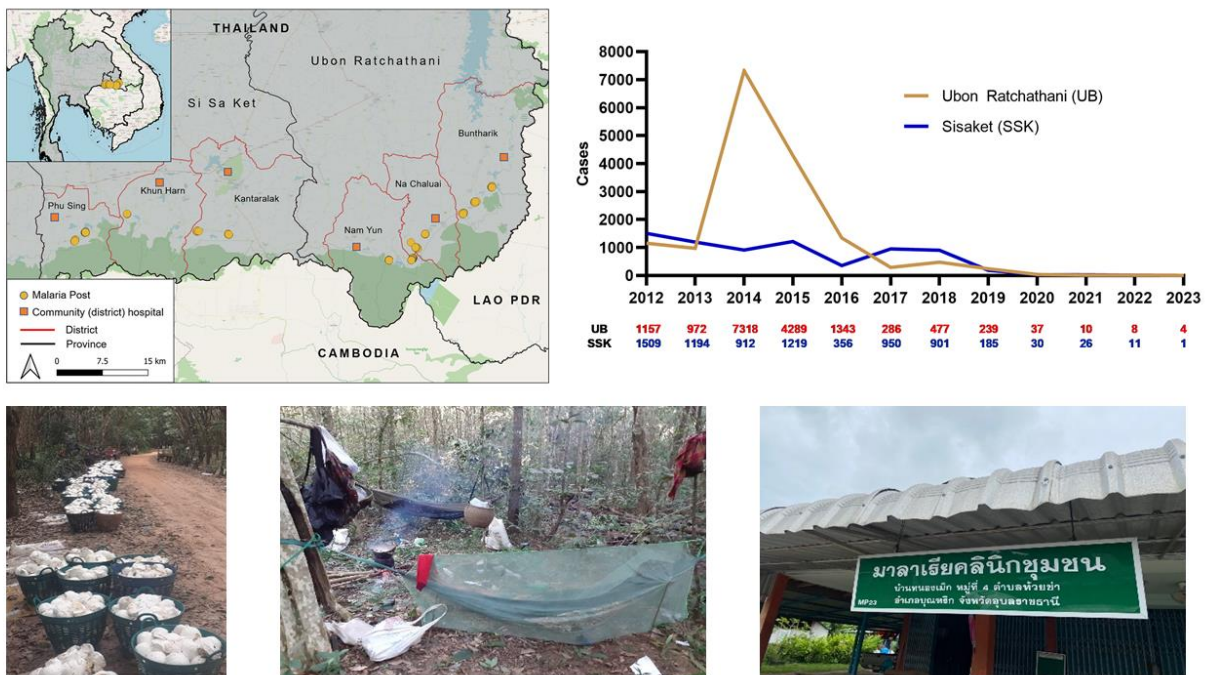
Respondent types	Interview topics
Programme managers and implementers	<ul style="list-style-type: none"> ▪ Health sector gaps <ul style="list-style-type: none"> - Service accessibility, availability, affordability, acceptability - At-risk population groups and health concerns ▪ Policy prospects <ul style="list-style-type: none"> - Entry points for strategy introduction and implementation - Policy challenges and opportunities ▪ Role expansion <ul style="list-style-type: none"> - CHW programmes: malaria, tuberculosis, HIV - Design and implementation factors ▪ Feasibility of RDT and other symptoms screening for community-based interventions <ul style="list-style-type: none"> - Management of febrile illness: diagnosis, referral, treatment <p>Acceptability and feasibility factors</p>
Malaria post workers / village health volunteers	<ul style="list-style-type: none"> ▪ Tasks and experience <ul style="list-style-type: none"> - Roles and services - Recruitment, training, supervision - Benefits and drawbacks of MP/VHV roles - Motivation and future plan ▪ Role expansion <ul style="list-style-type: none"> - Local health concerns - Additional services - Target population ▪ Consideration for implementation <ul style="list-style-type: none"> - Necessary support or resources <p>Local health providers collaboration</p>
Community members / at-risk population	<ul style="list-style-type: none"> ▪ Awareness and uptake of service <ul style="list-style-type: none"> - Service accessibility, availability, affordability, acceptability - Benefits and drawbacks of malaria services ▪ Role expansion <ul style="list-style-type: none"> - Local health concerns - Additional services - Target population ▪ Consideration for implementation <ul style="list-style-type: none"> - Necessary support or resources <p>Local health providers collaboration</p>

Data analysis

Audio recordings were transcribed verbatim, and, if necessary, translated into English. The transcripts and interview notes were coded line-by-line and underwent qualitative thematic analysis (57) on NVivo software version 12. A codebook was developed based on the key topics and updated based on themes and sub-themes that emerged from the data during coding. Interim outputs from key document review were also used to map stakeholders, creating matrix tables (54, 192), and network of community-based programmes to better elicit the roles of stakeholders and relevant guidelines and policy related to MPs and the malaria programme.

Figure 4.1a-e study sites in the Northeast of Thailand

(a) study provinces and locations of study villages along the Thailand-Lao PDR-Cambodia border; (b) number of malaria cases in Ubon Ratchathani and Sisaket provinces, 2012-2023; (c) rubber plantation (d) forest camp sites where population at site is commonly engaged; and (e) one of malaria post located at MP worker's house. The map was created using QGIS software version 3.26 (Buenos Aires) and contains information from OpenStreetMap and OpenStreetMap Foundation, which is made available under the Open Database License. National and provincial administrative boundaries from Global Administrative Areas version 3.6 (https://gadm.org/download_country_v3.html). Locations of the study sites from KoboToolbox. The figure was created based on Thailand malaria case during 2012-2023 from Thailand Malaria Elimination Program: https://malaria.ddc.moph.go.th/malariar10/index_newversion.php



Ethical consideration

Ethical approval was obtained from the Oxford Tropical Research Ethics Committee (OxTREC Reference: 535-21, 24 August 2021; 552-21, 22 September 2021) and the Institute for the Development of Human Research Protections (IHRP) at the Health Systems Research Institute (HSRI) (IHRP reference: 146-2564, 30 September 2021; 169-2564, 18 November 2021). All respondents provided written informed consent and were asked for consent to be audio-recorded. Respondents were informed that they could withdraw from the study at any time, with no consequences for them.

4.3 Results

Overview of Thailand's malaria programme

Based on the result of the rapid review of policy documents and reports, the following key stakeholders of malaria programme in Thailand were identified and mapped: the national malaria control programme or NMP is operated within the DVBD and remained the last (semi-) vertical disease programme, whereby malaria services were partially provided through the units-operating facilities alongside the wider public health facilities across the country. The NMP is implemented through a three-pronged strategy: (1) direct supervision through vector-borne disease centres/units (VBDC and VBDU) and MCs; (2) coordination with provincial health offices (PHO) in endemic provinces under the decentralised health system; (3) a network of CSOs who are also sub-recipients of donor funding operating in specific areas across the country and whose programmes may cover various health services including malaria. Several national and international bodies provide oversight for these programmes including the WHO, and the national-level committee comprising multiple departments in the MoPH and other ministries.

Thailand’s National Malaria Elimination Strategy (2017-2026) endorses further integration of community-based malaria service provision by donor-funded MPs and NMP-funded MCs into general health system where the HPHs and PCUs, along with a large cadre of VHVs, are key providers of primary health services to the populations in respective subdistricts. Concurrently, decentralisation of primary health care has been progressing through funding and task transfer to local administrative organisations (LAO) at provincial and sub-district levels across the country, prompting NMP to coordinate further with the relevant LAOs and local implementers to advocate for financial and technical resources to implement surveillance system.

Table 4.2 depicts the multiple layers of organisations and stakeholders involved in the malaria programmes, managing one or more cadres of malaria workers, namely MPs and VHVs, in endemic areas. Representatives of these organisations were identified as key informants (see *). Full results of the rapid review, including characteristics of MP and malaria programmes, are outlined in [appendix 3](#).

Table 4.2 Key stakeholders of malaria programmes at multiple implementation level.

Document sources: 2011 WHO’s NMP review report; 2014 MoPH’s primary health care division report; 2021 DVBD’s RAI3E Implementation Plan; additional web searches on government websites were conducted; CCM: Country Coordinating Mechanism.

Domestic stakeholders		International stakeholders
National programme management and coordination		
National malaria elimination committee: Ministry of Public Health and other ministries, associations, academics, non-government organisations, and international organizations		
Department of Disease Control*	Department of Health Services	Donors: GFATM, BMGF
Division of Vector-Borne Disease*	Division of Primary Health Care*	Technical support: WHO*, USAID-PMI*, CCM*, CSO platform*
Local implementers		
<i>Vertical malaria programme:</i>	<i>General health system:</i>	<i>Civil society organizations:</i>
Office of Disease Prevention and control	Provincial Health Office*	ALIGHT
Vector Borne Disease Center	District Health Office	International Rescue Committee
	Community Hospital (district)	Raks Thai Foundation*
	*	

Vector Borne Disease Unit* Malaria Clinic*	Health Promotion Hospital (sub-district)*	Shoklo Malaria Research Unit Stella Maris Young Muslim Association of Thailand*
Malaria post workers; Village health volunteers; CSO volunteers		
Community and population at risk of malaria		

Demographic of IDI respondents and FGD participants

Data were collected from IDIs with 50 respondents: 23 community members, 13 MPs, and 14 health sector managers and implementers. Most interviewed community members were male (17 of 23), particularly because they are more likely to engage in farming and forest work that puts them at greater risk of malaria compared to their female counterparts. Apart from their main occupation, many also reported part-time employment in other sectors, such as construction work outside the peak agricultural seasons. Two FGDs were conducted in each province: one with elderly aged between 60-70 who have frequently visited the forest and experienced malaria, and another with working adults who were familiar with the MP and their services. Among interviewed health sector managers and implementers across organisations, 8 were programmes directors or managers, 5 programme officers, and 2 technical advisors or specialists.

Table 4.3 Characteristics of interview respondents and focus group participants

Type of respondents	Characteristics
Programme managers and implementers	14 IDI (9 males; 5 females) <ul style="list-style-type: none"> - 5 national-level programmes - 3 sub-national-level programmes - 2 international organisations - 4 civil society organisations
Malaria post workers	13 IDI (8 males; 5 females) <ul style="list-style-type: none"> - 3 active MP and VHV - 7 active MP and former VHV - 3 active MP with no additional roles as VHV
Community members	23 IDI (17 males; 6 females) <ul style="list-style-type: none"> - 17 agricultural/livestock farmers - 2 houseworkers - 2 construction/plantation workers - 2 village leaders 2 FGD groups (7 males; 5 females)

-
- 5 participants; elderly aged 60-70
 - 6 participants; working adults aged 30-50
-

Profiles of malaria post workers

MPs often undertook various volunteer roles within the primary care system; many hence were already providing additional services beyond malaria. With years of residency and experience as MPs or in other community work, they were deeply embedded within the community-based network. All interviewed thirteen MPs had a minimum of 7 years' experience in malaria programme, having been assigned the role of MPs since 2012 when the RAI started. The majority were male, given the proportion of male forest workers and patients in these areas, and were aged between 33 and 76 years. Of the 13 interviewed MPs, 10 also served as VHVs. Among them, 4 were team leaders, supervising 8 to 15 volunteers in their communities. Many also performed other roles as village committee member, volunteer for non-health programme and CSO, and/or representatives of various organisations such as LAO and municipality. Their roles were primarily on a paid and part-time basis, without full time employment or official government status.

Although all MPs were compensated 3,000THB monthly for their malaria tasks, their monthly incomes varied depending on these roles and other income-generating activities, including the VHV role which pays 1,000THB (previously 600THB) and rubber-tapping and other agricultural work which are common livelihood activities of the members in their communities. Many of them hence did not have regular office hours, unlike other health facilities such as PCUs and HPHs, or private clinics which may operate from 8am to 4pm or 9am to 5pm. MPs described that their work hours and their patients' often were similar; many visited the MPs at home after finishing their work in the farms for the day, which was when most of the health facilities were closed. On other occasions, patients relied on the information MPs provided, usually at a whiteboard or a cardboard in front of MP house, what time they would be away and how the patients could contact them, either by leaving their message to MP's household members, or call the MPs on their phones. On

other occasions, MPs would visit a group of forest workers at their home or worksite to screen for malaria or follow up with them on their treatment. MPs viewed this flexibility to benefit their multi-role position as they were able to manage their own schedules, and as an appropriate compensation for their part-time commitment.

Table 4.4 Demographic information of malaria post workers

Demographics	Number of MPs
Sex	
- Female	5
- Male	8
Age	
- 30-39	2
- 40-49	5
- 50-59	2
- 60+	4
Education levels	
- Primary (Grade 1-6)	2
- Lower-secondary (Grade 7-9)	1
- Upper-secondary (Grade 10-12)	8
- College and/or vocational school	1
Monthly income in THB (USD)	
- 3,001-5,000 (101-150)	5
- 5,001-10,000 (151-300)	3
- 10,001-15,000 (331-500)	3
- 15,001-30,000 (501-1,000)	0
- 30,001-50,000 (1,001-1,500)	2

Table 4.5 Work profiles as malaria post worker, village health volunteers, and other roles

Code	Years as MP	Roles and responsibilities in the communities
MP1	14	Former VHV; resigned 5 years ago; active as assistant to the community leader
MP2	14	Active as head of VHV; active as non-MOPH volunteer
MP3	14	Active as head of VHV; active as local representative
MP4	14	Active as head of VHV
MP5	14	Recruited from HPH's recommendation
MP6	13	Recruited from previous drug abuse programme; active in the emergency services
MP7	12	Former VHV; resigned (years not specified)
MP8	11	Recruited from VHV's recommendation

MP9	10	Former VHV; resigned 5 years ago; previously village health correspondent
MP10	8	Former VHV; resigned 2 years ago; active as community's security volunteer
MP11	8	Former VHV; resigned 3 years ago; active as member of the village committee
MP12	8	Former VHV; resigned (years not specified)
MP13	7	Former VHV; resigned 5 years ago; currently active as CSO volunteer

Health seeking behaviours and choice of service providers

In endemic communities, proximity to health providers and availability of resources, in terms of time and costs, and quality of services have been crucial factors to decision-making regarding healthcare and health providers. Accessing community-based services, such as those offered by MPs, and HPHs, are common; while visits to higher level of facilities at district and provincial levels are reserved for necessary occasions that often result in additional expenses from hospitalisation, medical treatment, full-day travel or work loss. Unlike individuals covered with monthly salary or social security scheme who could afford days off work or additional expenses, members of the communities, especially the elderly and families that do not own private vehicles, expressed concern for these associated costs.

Decisions to visit private clinics and pharmacies were prompted when young members of the families were sick or faced urgency. Forest goers also reported visiting private providers when they experienced fever from non-mosquito insect bites (described as *Kai Maeng Dang*, a local term referring to scrub typhus) and were usually prescribed antibiotics. Pain management injections, muscle relaxants, or medication for gastritis were also commonly cited reasons for a clinic visit among working adults and older persons engaged in labour-intensive work. Seasonal work and agricultural livelihoods, especially rubber plantation work, could also deter some villagers to afford a hospital visit which operated at public working hours during which many

community members, especially those at risk of malaria may be working in the farm or foraging in the forest.

Access to and provision of malaria services

MPs viewed malaria testing with rapid diagnostic test (RDT), antimalarial treatment, and follow-up visits to their patients as their most valued services. However, MPs described that they now see far fewer patients and were recently tasked to conduct more active case detection by testing approximately 10-20 at-risk individuals in a month. All MPs reported that they were willing to continue their roles; often stating that this testing service should remain accessible given the distance from their village to the district hospital and difficult road conditions particularly during nighttime. In addition to geographical challenge, MPs explained that their services were convenient to those undertaking long forest visits or reluctant to disclose their personal information such as forest-based activities or history of substance abuse to public health officials.

“I think those who visit us (MPs) have trust in us. They might be concerned for other tests that could be done at the hospital so when they are sick, they may not go see a doctor. [...] those who visit the forest are more likely to use illegal drugs. So, they do not want to do any blood tests at a facility. They only come for a malaria test and nothing else. When malaria was very prevalent, [...] I had 50-60 visitors in a month, sometimes almost a hundred. Back then, these people came to see me. Some people who went to the district got arrested so others were afraid to visit a public facility. Young people obviously are scared, some grown-ups too. This place is close to their homes. If they get malaria, they know they get treated right away.” Interview with male malaria post worker

This acceptance of MP services is also influenced by their clients' perceptions of malaria as treatable, prompting them to seek testing from MPs, and that their symptoms were less severe than their past experience. Referral from MPs was also perceived as beneficial because RDT-

positive cases can bypass waiting hours and receive treatment directly at nearby hospitals. Those who were familiar with malaria testing expressed their willingness to pay for such services if the fee is comparable to alternative payment to clinics or to hospital transport for the same service. However, one respondent was reluctant to pay for a testing service if he had no symptoms. Regardless of malaria experience, all interviewed respondents stressed the significance of mosquito repellents and mosquito nets provision, citing these as necessity for their livelihoods.

Dissatisfaction with MP services was expressed by one Thai and one Cambodian community member respondents. One described how she refused to have her child tested for malaria and questioned the MP's eligibility to treat fellow village members. In another community where MP undertook both health-related roles as MP and VHV and political and administrative roles had resulted in a mixed reaction from a village leader and another member of community. While a multi-purpose worker performing more than one role may be convenient for community members as a type of one-stop service, some may opt out of malaria services if they disapproved of the other roles the MP undertook. Transparency and trustworthiness were thus cited as crucial qualities of MP as service provider.

"I wouldn't visit the MP in my village. [...] others might do. She did not get a degree. [...] only trained to provide medicines. I personally do not know her and am not close to her. Even some of her cousins do not visit her. [...] if she's able to provide another service I still would not go. We did not argue but I do not like her personality. I feel more comfortable visiting to the hospital. [...] it's easier to ask my neighbour to take me there rather than visiting the MP." Interview with male community member

"I think the MP in the village almost has too many responsibilities. She is wearing many hats. [...] I would want other VHVs to help the MP with malaria activities. Working together also makes the activities more transparent. Also, because VHVs are already looking after

households under their coverage, they can help distribute mosquito nets...better than only having only one person do all the work.” IDI with male village leader

Overburdened, underpaid, and underperforming?

Although many MPs viewed their workload related to malaria and VHVs as manageable, some, especially senior workers, highlighted their substantial workload from testing at-risk populations and monitoring malaria patients. For many, the ability to help patients recover was their key motivation. However, some expressed dissatisfaction with the compensation they received compared to the workload, particularly during the 2014–2017 malaria outbreaks. One MP viewed his current compensation, despite the decline in cases, as reimbursement for his previous out-of-pocket expenses incurred during frequent follow-ups. Many also felt overwhelmed by their responsibilities as VHVs during the COVID-19 pandemic in 2020-2021, with some complaining that remuneration for their VHV role did not fairly reflect the time, effort, and risk of self-infection involved.

“I conducted active case detection every year. In the past there were a lot of villagers coming to take the tests. But this year I said I would prefer not to go. [...] I called my supervisor and told them that I’d be at high risk. [...] we’re just volunteers, you know? What if I get infected (with COVID-19), what would I do? In the end, the province had MPs vaccinated as well (like other healthcare workers) so we could continue to work.” Interview with female MP (MP11)

Most MPs described their current tasks as manageable, stating that using RDTs, preparing slides, and administering medicine were within their capabilities. However, senior MPs reported difficulties in effectively using mobile phones for certain tasks, such as online case reporting, and expressed concern that this could impact their performance in future roles. In contrast, younger MPs found that smartphones had improved their work, particularly by enhancing communication

with their clients and public health officials during the pandemic. Despite this benefit, they were concerned about the limited internet connectivity in forested villages, which disrupted regular communication, and noted that they had to cover the costs of using these devices themselves.

Training was essential for MPs to gain acceptance from their clients, and they felt more confident when training was conducted annually. Their collaboration with local health providers and programme staff in implementing malaria interventions, such as health education, mobile malaria clinics, mosquito net distribution, and mass testing, strengthened their roles and presence in the community. In addition to their malaria roles, three MPs participated in health programmes related to HIV and NCDs organised by public hospitals and NGOs, citing that these opportunities kept them informed and enabled them to refer their patients to the appropriate services when needed.

MPs highlighted specific support needs to take on additional roles, including financial incentives such as fuel costs for their motorbikes or mobile data plans to support tasks that involved household visits, patient follow-ups, and real-time online case reporting. Although some MPs were already fulfilling their extended roles as VHVs and collaborating with other volunteers, they emphasised the importance of minimising overlapping tasks. To prevent excessive workload, they requested that any additional responsibilities be complementary to or an extension of their existing duties.

“We have tried to introduce more incentives for volunteers. During the (COVID) pandemic [...] we advocated for compensation for occupational risk to encourage and provide moral support to the VHVs. [...] At the time they seemed to be overloaded with the pandemic-related work. Another example [...] the Caregiver programme that trained caregivers to provide care for the elderly (disabled person and bedridden patients). This work was previously assigned to VHVs (before new caregivers were recruited and trained) and this programme helped remove the burden from the volunteers. These are the challenges VHVs

have raised and we tried to respond to.” Interview with national-level manager of the VHV programme in MoPH

Potential roles in addressing dengue, diabetes, and other common illnesses

Care for dengue, diabetes, and other common illnesses were described by MPs as their preferred additional activities which would benefit their clients. Dengue screening services were considered beneficial and more acceptable if they followed a similar process to malaria testing. At the time of the study, HPHs and PCUs did not offer dengue testing services but provided verbal assessments and physical examinations and the Tourniquet test. Some MPs proposed that they could provide dengue testing, because they were already involved in routine dengue surveillance. One respondent noted that introducing dengue testing would address a healthcare need within communities and help streamline the referral process to the hospitals.

Additionally, because many of their clients frequently visited forests or forest farms, one MP suggested expanding services to include scrub typhus-related care, such as providing information on insect bite prevention, recognising symptoms, and treating skin inflammation and itching caused by bites. A local health worker also specifically proposed offering blood chemistry screening for individuals engaged in "grey jobs" or illegal activities in the forest, such as logging and hunting, as well as for those with significant exposure to agricultural chemicals.

Diabetes care was highly sought after in the communities, particularly among the elderly, to minimise time-consuming check-up process at the hospitals. Additionally, transportation assistance was often required of MPs and VHVs who could be asked to arrange ad-hoc transport or an ambulance especially during emergencies. Suggestions were made to local health providers to expand malaria case referral to include assistance in patient referrals, household visits, and general health check-ups, such as blood glucose testing and blood pressure monitoring for individuals at risk of diabetes and hypertension respectively. While these services were

primarily highlighted as relevant for the elderly, MPs believed they would also benefit individuals at risk of malaria who avoided public health facilities for physical examinations.

To align MP's roles with the primary care programme, HPH staff suggested that MPs could offer basic health guidance on seeking care and provide information on common illnesses like diarrhoea or fever. They could also assist with initial consultations and referral support by conducting screening surveys for conditions such as mental illnesses or substance abuse. Substance use, such as *Amphetamine* and *Methamphetamine* was acknowledged as linked to mental health issues in border areas; post-therapy monitoring and follow-ups for recovering drug users were described as inadequate. However, these tasks were considered complex because they required patient's consent and voluntariness and also raised concerns about the personal safety of the healthcare workers involved.

Emphasis on screening, not diagnosis

From the views of health sector managers and implementers, the roles of MPs could be expanded from case screening for malaria to include other infectious and non-communicable diseases. In addition to the current authorized testing by health volunteers, namely glucose and malaria tests, several respondents suggested utilising RDTs for conditions such as COVID-19 or dengue. However, it was emphasised that patients screened by volunteers should be referred to a medical professional afterwards for proper diagnosis and that any invasive procedures, such as blood sample-based rapid testing, should be conducted under the close supervision of an authorised healthcare professional.

"We have consulted with the provincial health office, and they seemed to agree (to train volunteers to do RDTs) but we also need to advocate for this at the policy level. There are many conditions [...] but we have concerns about blood testing. From our current project under this grant (referring to RAI3E), we received support from the province actually, in

Kanchanaburi, to train VHVs to use malaria RDTs. In Sisaket we found that there were not enough RDTs for VHVs to use even though we are allowed to train them. So we focused on building communication skills, and this was well received by the volunteers. These tasks, tasks they were assigned to, made them proud. [...] prouder than being a regular VHV really because they were capable of doing so much more.” Interview with CSO implementer

Legal restrictions on volunteers performing tests and collecting blood samples remained a key concern. Although an exception was made for MPs to conduct malaria testing, blood sampling and RDTs were considered specialised tasks permitted only for MPs who received training and supervision from the malaria programme. However, dengue testing was cited as more complex than malaria RDTs, because it required specific training, including proper case investigation, accurate interpretation of results, and close supervision by medical professionals. Rather than performing testing, suggestion was made to build the capacity of MPs and VHVs to perform verbal investigations or health education sessions for dengue.

Alignment of “integrated” roles with national guidelines and local health priorities

Many respondents, both from government and non-government sectors, recognised that MPs may already be performing services beyond malaria through their roles as VHVs and other volunteer activities. Respondent from NMP suggested reframing the issue as "integration" rather than "expansion" and emphasised that the integration strategy should align with ministerial regulations regarding VHVs, particularly for additional tasks that require supervision by medical professionals. An international-organisation respondent suggested that updates to community-based health services, including those provided by MPs, should be responsive to changes in epidemiology and local needs. A CSO respondent also argued that the further development of MPs should take into account an evaluation of their performance in delivering both malaria and non-malaria services. While the malaria programme has remained "semi-vertical" whereby the MPs were managed by an infectious disease programme under the PHOs, the expanded roles of

MPs could thus take this integration efforts forward by serving a broader health system priorities, rather than only being guided by NMP or donors.

“So, the point is [...] that we need to have better tools to be able to do this kind of assessments [...] like participatory rural appraisal [...] you are more of an observer rather than someone coming in with preconceived ideas. You try to understand what's really going on and then design something that is applicable for that context. [...] If you want to have an impact, especially now in elimination with declining burden, there are so many other priorities in these communities even at the border [...] malaria is not the biggest problem. The people are affected by so many other different things like employment, fleeing from conflict, being separated from families and all kinds of mental health problems. So, there's a huge health concern and it's not just malaria. And if we address it only as malaria we will always struggle, I think, to find the right approach.” Interview with migrant health programme managers at international organisation

Progress towards malaria elimination and programme integration

As malaria elimination advances, NMP respondents highlighted that the national programme are prioritising horizontal integration, transferring responsibility for malaria programme implementation to the general health system. This approach will initially target areas with low transmission and later extend to other endemic regions where vertical malaria services are still required. However, such integration is not without challenges from limited human resources and system resistance to change.

“The malaria programme in Thailand is still semi vertical...we have planned for the integration of malaria services into general public health, and we are still at the beginning of the integration, a gradual integration [...] starting from provinces that are near elimination first. But in the area that still sees high prevalence of malaria, we still keep the vertical

programme. [...] Our priority is to extend the programme in high endemic villages...to have MPs funded by the local sub-district administrative units [...] We need to speed up the integration because many of our staff (under the vertical programme) will retire soon. But this is not easy and we may face resistance from both the vertical programme and the general public health system. So, what we are trying to do is to strengthen the capacity of local authorities to invest in malaria activities in their areas. At the same time, we trained staff at health promotion hospitals to test and treat for malaria.” Interview with national malaria programme manager

Despite a general agreement among the programme managers respondents that the public health system was well-equipped for malaria case management and surveillance, there was still a need for multi-sectoral coordination with NGOs/CSOs and border health services to control cross-border malaria. At the time of the interviews, implementers expressed concerns about the challenge of eliminating *P. vivax* along the Thailand-Myanmar border. There were fewer concerns about elimination in other regions, including those bordering Laos and Cambodia, where the cross-border movement has recently become less substantial.

Additionally, although many agreed that community-based malaria services remain crucial in areas where at-risk populations may still travel to malaria hotspots once COVID-19 travel restrictions were lifted, concerns were raised about the cost-efficiency of maintaining MPs in low-transmission areas. In this case, suggestions were made to engage MPs more in surveillance activities, prevention of re-establishment, and the 1-3-7 strategy. In these near-elimination provinces, MPs could be leveraged to ensure that zero malaria cases are maintained for three consecutive years to achieve malaria-free certification despite their reduced clients. With this enhancement, programme can continue to monitor the quality of surveillance data and adopt mobile technologies to improve the malaria information system (MIS) and also integrate this with the Health Data Center (HDC) dashboard under the primary health information system.

There was some consensus that, in the long term, these upgrades could benefit from the ongoing process of health sector decentralisation and the increasing availability of local funding pools. Both national and local implementers agreed that local stakeholders were more in touch with the communities and aware of local priorities, compared to central-level managers in the malaria programme; thus, their upgraded roles and functions of MPs should be defined by local stakeholders. Decentralisation of funding was also perceived as a favourable development which may provide the needed resources to support local malaria activities. However, both national and subnational government officials foresaw that a funding proposal for only malaria activities would face competing priorities with other high burden diseases.

“In this transition process, we work with DVBD to involve other partners like the hospitals and community health workers and train these people and develop the guidelines for the partners. We should empower the local partners...with the decentralisation, the primary care units should be stronger.... the trained health volunteer is the person closest to many of the population... I think the government should make it clear, under this act, that these community health workers could have more capacity. Interview with malaria programme technical officer at international organisation

4.4 Discussion

This study drew on insights from key policy document review, interviews with fifty stakeholders, including health sector managers, implementers, healthcare providers, and focus groups with community members from low-transmission areas, to explore the potential for expanding MPs' roles beyond malaria. While possible additional roles and functions for MPs were acknowledged, these roles should align with the overall integration strategy of the malaria programme, which aims to integrate malaria activities into the local health network and primary care system, and

more importantly, the best interests of the targeted communities. Additional considerations should also be made regarding legal and technical procedures for malaria (and non-malaria) RDT use, while programmes may also explore alternative funding sources and take a lead to ensure a well-functioning support system for their workers.

The decline in malaria cases and programme resources have prompted efforts to integrate malaria services in Thailand (193) and other GMS countries (194, 195) into broader community-based health initiatives. From the Asia-Pacific landscape, we have already found that VMWs and CHWs have been widely trained in health programmes like iCCM, vector-borne diseases, epidemic responses, as well common illnesses and local health priorities. Our study's findings align with 2022 provincial priorities at sites, which identified diabetes, hypertension, musculoskeletal disorders, gastrointestinal diseases, and mental illnesses as major health burdens (196, 197). Additionally, diseases such as acute diarrhoea, pneumonia, hand, foot, and mouth disease, melioidosis, and food poisonings were key priorities for surveillance in Thailand. Given the success of these interventions, malaria programmes in Thailand may consider expanding the roles of MPs to address these local health priorities in order to maintain the relevance of MPs and their services. More importantly, as recommended by several participants in this study, future role expansion could be approached through community needs assessments (198) or participatory rural appraisals (199), to better understand these evolving needs and design community-driven interventions (200).

Advancements in low-cost diagnostic tools for community-based testing have sparked interest in expanding vertical programmes (201-203). Mobile applications that turn smartphones into rapid test readers further enhance diagnostic accuracy (204). These innovations could significantly improve rural healthcare, particularly in areas with limited access to health facilities. Programme managers in our study expressed interest in testing kits for diabetes, dengue, and COVID-19, as well as smartphone-based screening and data reporting tools to streamline referrals in primary

care. However, proper selection, training, and supervision of MPs and the VHVs performing such tests would be necessary to align with the national guidelines, particularly on the legal and technical considerations on assigning non-medical professionals, including health volunteers, with medical procedures (see Table 4.6). In addition to disease screening using RDTs, opportunity was perceived in strengthening their role in referral of non-malaria cases to health facilities when presented to MPs, with lessons drawn from the successful dengue control programme (205). This expansion of services to cover febrile illnesses more broadly will reinforce the access to and quality of malaria and primary care, especially in remote areas.

Table 4.6 Description of the current and suggested tasks of MPs and VHVs.

Sources: The current tasks of VHVs are extracted and summarised from the 2011 Public Health Ministerial Regulations Regarding Village Health Volunteers (updated version 2013) and from the interviews conducted in this study.

Tasks and roles	Description
Current tasks and roles in the terms of references, according to the ministerial regulations	<ul style="list-style-type: none"> • Basic care to alleviate symptoms (such as fever, diarrhoea, pain/ache, anaemia, skin rashes) • First aid (such as for wounds, burns, animal bites) • Blood testing for malaria • Provision of household common drugs, herbal infusions, or medicine • Glucose test
Suggested examples of successful cases in the adoption of point-of-care testing by trained health volunteers	<ul style="list-style-type: none"> • Screening for symptoms of non-malaria diseases and case referral (such as for unspecified fever) • Screening using other rapid test kits (such as for diabetes, dengue, blood biochemistry) • Providing basic care for non-malaria illnesses (such as measuring blood pressure, providing Oral Rehydration Salt for diarrhoea, giving first aid care) • Health information provision for local health priorities (such as diabetes) and communicable diseases (such as dengue, COVID-19) • Providing basic consultation and referral (such as for mental illness or substance use pre- or post-treatment)

Certainly, this role expansion and service integration strategy requires political collaboration and financial support at both the policy and local levels. In Thailand, efforts have been made by the national programme to advocate for increased domestic funding (206) and greater engagement

from local administrations to maximise resources (207). Our interviewed policymakers and implementers emphasised the need for support from local health networks—including provincial and district health offices, community hospitals, and civil society—to ensure that MPs and malaria services remained well funded and supported. This is especially crucial because many workers juggle multiple jobs; many of which empowered them as community representatives and linkage to political leaders and public health officials (208-210). Although this presents an opportunity to further strengthen them as vital links between communities and the health system, their commitment to malaria services may shift to other more pressing needs. Additionally, limited digital literacy among senior workers may hinder their ability to adopt technology-based roles without proper training and support. Future programme efforts should continue to empower, support, and recognise their capacity and commitment, and seek stronger buy-in and engagement from local health networks (211) in identifying an entry point for role expansion and service integration that best fit their implementing contexts. For Thailand, Table 4.7 outlined the following programme and policy considerations for the prospective malaria role expansion/integration, which were presented to the NMP at the end-of-project meeting in August 2023.

Table 4.7 Considerations for expanded/integrated roles of MPs and programme design

Considerations for MP role expansion and/or integration strategy

1. Potential roles should be based on primary care essential services guidelines as indicated in the following: screening symptoms; health information provision; basic care - diarrhoea, first-aid; diabetes & blood pressure screening. The list should also be adaptable to changing local needs, such as documented in Ubon Ratchathani and Sisaket, including local health concerns for diabetes, cancer, malaria, febrile illnesses, dengue, and diarrhoea. This could be supplemented by results from rapid health assessment using approaches such as participatory rural appraisal.
 2. Linkage between the MPs and the wider local health system should be strengthened especially in support of their roles in screening programmes and referral to the public health facility while considering the capacity of local health networks to support MPs and VHVs as the referral link.
 3. Legal constraints for their testing role should be clarified - making a clear distinction between “testing” by volunteers and “diagnosis” by medical professionals; requirements including certification, training, performance evaluation, and supervision should be designed and planned by programmes and implementers.
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4. The role of local health network involved including MPs' supervisors should be strengthened within the provincial health offices, public hospitals and civil society organizations through multisectoral coordination, to support MPs and increase awareness of the communities
 5. The undertaking of multiple volunteer roles of MPs, especially those who are also VHVs, should be documented if the priority will be given to those who are already VHVs until certified malaria free – integrated MPs and/or VHVs are likely to receive further funding by the local authorities and health networks. This is be further supported by a clear direction for integration among MOPH, CSOs, and local health network will be crucial in the long run
 6. Capacity building for MPs and VHVs to integrate data collected within the general public health information systems and the malaria information system should be planned and piloted to support malaria surveillance interventions in low transmission settings.
 7. The national malaria programme with DVBD should continue to monitor and evaluate malaria activities as well as any expanded roles and activities performed by MPs.
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Strengths and limitations

Drawing on the perspective of stakeholders at multiple levels, this study contributes to a comprehensive understanding of community-based malaria care in Thailand. The intention was to document the expectations on these roles, as well as explore the complex nature of the workers and programme structure, complementing earlier studies that describe their specific roles in malaria interventions (60, 187, 212, 213) but might not fully investigate their other roles beyond malaria programmes. The qualitative methods and iterative approaches enabled the prospective policy analysis, supplemented by the policy document and desk reviews, to inform the design and implementation of malaria programmes in Thailand, and countries the GMS considering a similar strategy.

Although IDIs with central-level policymakers and health sector managers were conducted, findings from IDI with implementers and community members in two provinces cannot be generalised nationwide. The situation in high transmission areas and in provinces with high population mobility may yield different work experience among MPs and unique health-seeking behaviours among at-risk population including the ethnic populations; the prospect of which we

continued to explore in 2024 (see Chapter 6). Perceived illness experiences and health concerns, although extremely valuable, may not reflect the true burden of diseases in the areas. This was supplemented with secondary data from the provincial levels (burden of diseases, and prioritised disease surveillance in 2022), and more research conducted in the region. Although attempts have been made to recruit respondents from diverse groups, we did not interview former MP workers who chose to resign or were withdrawn from the programme due to relocation strategy, and policymakers outside of the MoPH who may offer more insights on the wider policy framework, such as Ministry of Finance or LAO. These additional views of key decision makers and implementers of the future development of community-based health programmes, the potential key entry point for local malaria service integration, were further explored in Chapter 5-6.

4.5 Conclusion

Our findings suggest that expanding and integrating the role of MPs would present several challenges. Any programme expansion should be tailored to local needs, some of which have been identified in this study, while acknowledging that these needs may evolve over time. It is also important to consider the complex landscape of MP-VHV volunteers with multiple, diverse, and sometimes overlapping responsibilities. In low transmission areas where malaria is no longer seen as the primary health threat, immediate concerns are of NCDs and dengue, as well as mental health and wellbeing issues in rural livings. To sustain community-based malaria services, it is crucial to strengthen the capacity and linkage of the remaining MPs with the primary care system and the advocacy of local administration to reinforce these workforces by enhancing connections between peripheral communities and the health system.

Chapter 5 Prospects for malaria service integration and linkage with primary care

Summary

Under Thailand's general health system, primary care units (PCUs) and village health volunteers (VHVs) were primarily preoccupied with disease screening, surveillance, and chronic condition management. Although novel technological devices have been introduced to a limited degree, in areas nearing malaria elimination, PCUs did not provide malaria testing services and were not generally supplied rapid diagnostic tests (RDTs), and reported referring patients with malaria symptoms to either nearby test providers such as malaria post workers (MPs) or further off to the community hospital. Beyond malaria, new point-of-care devices were suggested to mitigate delayed medical care and lessen the workload at PCUs, particularly for local infectious disease burden such as dengue, and tuberculosis. This presents opportunities for introducing RDT use at PCUs, whether for malaria and other prioritised health programmes. In resource-limited settings, benefits were also perceived in healthcare innovations enabling a stronger patient referral system, particularly for home-based care, mental health assessment, and cross-border health services. Challenge remained in translating integration policy of malaria programme into PCU's practice and gaining local administrative organisations (LAOs) continued action and support for implementing case management and surveillance activities among other competing priorities.

Highlights

- Although PCUs and VHVs in Thailand were familiar with point-of-care tools, such as glucose monitors and COVID-19 test kits, malaria testing is generally not offered in PCUs, especially in near-elimination areas.

- Despite a positive outlook towards expanding disease screening through new technologies, staffing shortages and limited disease programme coverage are key barriers to introducing new point-of-care testing.
- Tailoring of new testing services, including for malaria, thus needs to be integrated with screening for other common febrile illnesses like dengue and flu.
- Future interventions should creatively engage the local health workforce to address resource constraints and community health needs and strengthen the participatory of PCU staff and patients in the decision-making aiming to improve primary care quality.

5.1 Introduction: The roles of primary care providers in the borderlands

In many resource-limited and rural, particularly border, settings in Thailand, the key health providers for the population residing in these areas are at the community level. Alongside community-based providers from the vertical disease programmes like malaria post workers (MPs), Thailand's primary care programs have been developed and delivered through primary care units (PCUs), later also known as Health Promotion Hospitals (HPHs) (214), staffed with nurses and public health officials working closely with the community hospitals, often located in city or town centres, to bridge the service delivery gaps, particularly in rural and remote communities located many kilometres away. The village health volunteer (VHV) programme was concurrently introduced in the 1960s to strengthen such service delivery, especially in health communication and promotion within the communities (215). Initially an unpaid voluntary role, VHVs now receive monthly incentives from the Ministry of Public Health (MoPH). With their expansive network, VHVs have been supervised by the PCUs and leveraged to respond to urgent local health issues and disease-specific programmes. For the vertical malaria programme, the key strategy to maintain their community-based services, as was found in the previous Chapter, has been to recruit MPs from a pool of VHVs and additionally trained to perform malaria RDTs

and report cases. Many other primary care programmes employed similar strategies; for example, selected VHVs could also be enlisted as paid caregivers (216), and many were trained to screen diabetes using blood test strips (217). This frontline workforce was also instrumental in screening suspected COVID-19 cases by administering rapid tests in the communities (218). The difference between the two cadres exists in their governance and funding structure; while MPs were managed by the local authorities, their funding and mandates originate from the vertical malaria programme, unlike their VHV counterparts whose roles and compensation are assigned directly through the PCUs and the regular health system mechanisms.

Moreover, point-of-care testing, such as malaria RDT and other screening devices, have enabled the workers and volunteers to perform these roles effectively in their communities. With these devices becoming increasingly available, there was potential for improving the identification of a wide variety of infectious and non-infectious diseases amongst patients residing in remote areas, some of which could benefit from treatment in the community and others from referral to higher level facilities. Elsewhere in the GMS, private providers have been leveraged to conduct surveillance and detection of malaria cases in the communities (see PSI's GEMS Project identified from the systematic review in Chapter 2) (219). An assessment study in Rwanda on authorising malaria RDT use among licensed community pharmacists also proposed this as a strategy to promote the availability of screening and treatment services (220). To date, there has not been a study in Thailand to assess the feasibility of involving private providers in malaria testing and whether malaria RDTs and antimalarials could be purchased over the counter at public health facilities.

As malaria cases have been successfully reduced in many parts of Thailand, PCUs and VHVs remained minimally engaged in local malaria activities, including the provision of malaria testing with RDTs. This discontinuation threatened the policy-oriented transition of malaria services from vertical disease programme to the primary care system in areas nearing elimination (221), and

the progress towards elimination could be at risk if malaria control efforts are not sustainably integrated into their routine service delivery (193). The role expansion strategy, discussed in Chapter 4, needs to consider an integration beyond broadening MP' roles to provide services for other diseases. One approach in doing so is to integrate the MP themselves, and/or their services, into primary health care - and horizontal programme, namely the PCUs and the VHVs. For example, the VHVs could be leveraged to take on additional malaria roles, including screening for malaria cases with RDTs. Unlike the MP programme, VHVs are funded entirely through domestic budget; a more sustainable approach to maintain malaria services. PCUs were also ideally placed to supervise such activities and identify additional local health priorities that these workers/volunteers could additionally take on.

However, questions remain as to what health challenges the primary care system should prioritise, whether PCUs and VHVs may have set priorities to absorb malaria services (e.g. can VHVs legally and practically provide a malaria test with an RDT?), and whether the existing programmes in such settings have sufficient resources and capacity to undertake malaria surveillance and response activities. In addition, Thailand's primary care system is undergoing a decentralisation process where the PCUs are being transferred from the MoPH to respective local administrations offices or LAOs mandated under the Constitution (222). In this changing context, this chapter (1) identify and describe roles of PCUs and available health services and their linkages with VHVs, and (2) explore the prospects for use of malaria RDTs, as well as other health technologies, to improve the quality of health services within a resource-limited setting. The perspectives and experiences of healthcare workers, health programme managers and implementers regarding changing public health needs and the perceived added value of new low-cost diagnostic tools for community-based testing also provided insightful considerations for the design and implementation of community-based health programmes aimed at improving

healthcare delivery that could meaningfully and practically be used to address local health concerns.

5.2 Methods

Study design

This study used an exploratory sequential mixed-methods research design consisting of qualitative semi-structured interviews followed by quantitative questionnaires for triangulation and complementary purposes. I prioritised qualitative interviews to explore the experience with and perceptions of primary care providers on health interventions, particularly on the use of point-of-care testing, and local health needs. Based on the preliminary qualitative results, a subsequent questionnaire was designed to understand the current programmes, challenges and opportunities for improving their service delivery, and subsequently distributed to a larger group of PCU workers. My study team consulted with the main collaborators of the study, primarily programme managers at provincial and district levels, at the initial stage of the study to co-identify potential key informants and targeted PCUs for interviews, then reconvened to analyse the preliminary interview results and review the questionnaires.

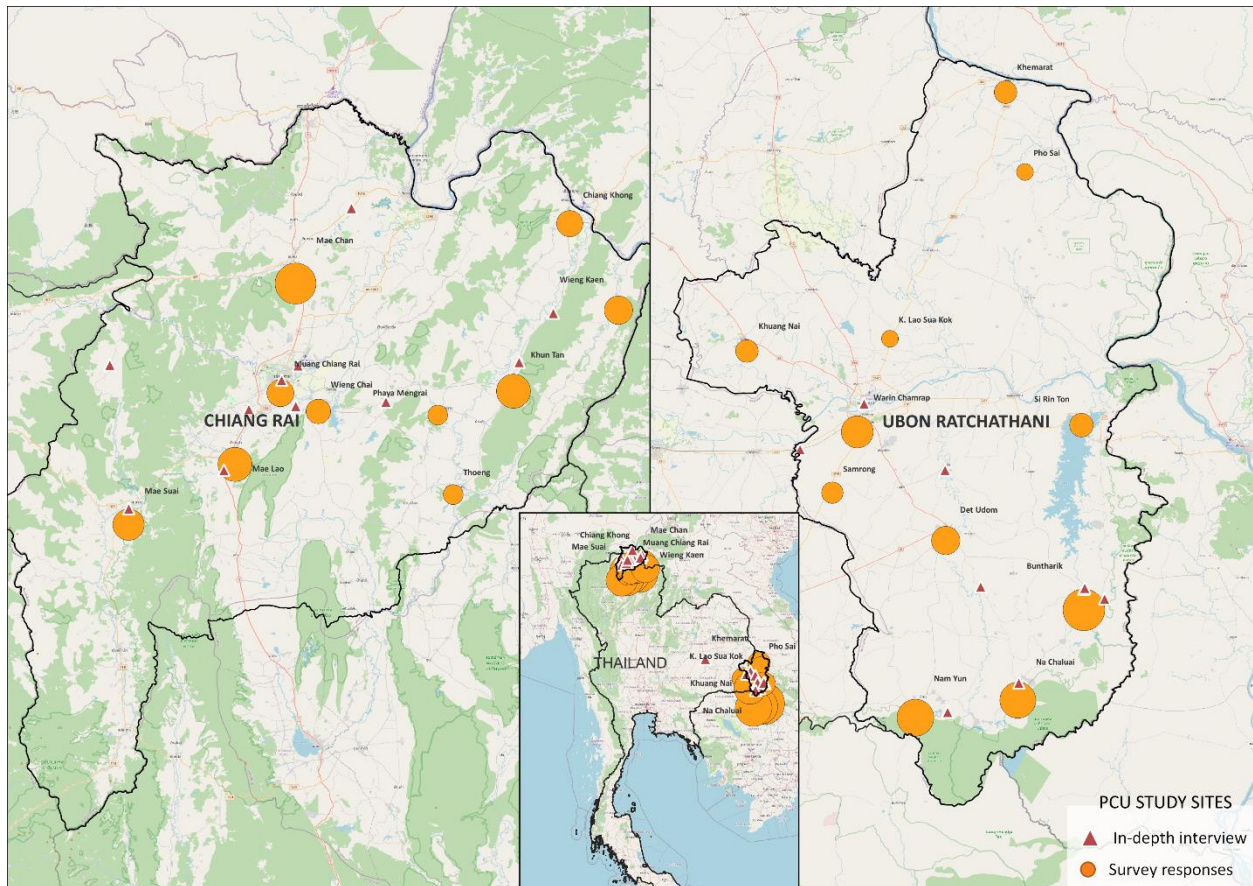
Study sites

The study was conducted in in two provinces: Chiang Rai in the north bordering Shan state of Myanmar and Bokeo province of Laos, and Ubon Ratchathani in the northeast bordering Champasak and Salawan provinces of Laos and Preah Vihear province of Cambodia. Data collection was conducted in six districts in each province with consideration for border and non-border (more urban) settings. The specific districts were determined at the beginning of the study through consultation with the collaborators in both provinces. Chiang Rai and Ubon Ratchathani were selected as the study sites because both provinces located along the international border

(see Figure 5.1) and are considered a large province with over a million-population covering large geographic areas, with presence of migrant and ethnic populations along the border communities.

PCUs serve as the first point of contact for non-specialised health services, providing care for a sub-district at health facilities, also referred to as sub-district HPHs. They are generally accessible within 30 minutes to a catchment population of around 10,000 people. Nationally, this extensive network, consisting of PCUs and over a million VHVs, remains a crucial pillar of the UHC scheme and primary care system. They play a key role in disease prevention efforts and community-based care, including vaccinations, family health support, and basic medical treatments. Nevertheless, human resources at PCUs are particularly lacking in rural areas (223, 224) and redistributing healthcare professionals between remote, rural and urban settings is challenging (225), with insufficient human, financial, and technological resources preventing economically disadvantaged groups from fully benefiting from the system (226, 227).

Figure 5.1 Map of study sites and locations of key interview informants and PCUs by districts



Identification of key informants and survey respondents

The rapid review and stakeholder mapping generated from the previous study in Chapter 4 was consulted to identify the key informants in primary care/horizontal programmes at the study sites. Interviewed participants include health sector programme managers, medical doctors, nurses, public health officials at provincial, district, sub-district levels. Initial informants were purposively selected among key primary care programme managers at different implementation levels, and subsequent respondents were identified from snowballing. At study sites, there were 219 and 317 PCUs in Chiang Rai and Ubon Ratchathani respectively, with an estimated 2,680 PCU workers in total, and within each PCU, 5 healthcare workers on average (228, 229). The sample size of the online questionnaires was determined based on the estimated population of 2,680 PCU workers in both provinces. Targeting 10% random sampling of the PCU workers, the required

questionnaire respondents was 268 which was increased by 10% to allow for any potential missing data in the questionnaire response, making the final target respondents 295.

Data collection

The interview guides were semi-structured; they were piloted with the initial respondents at each site in Thai language and revised for clarity for each topic (see Table 5.1). Questionnaires, also in Thai, were designed to be self-administered and accessible distributed online. The questions were piloted by the study team with five potential respondents who were PCU workers and previously joined the key informant interviews. The questions and response template were then revised for clarity. Free-text responses were primarily used to capture descriptive information, such as ongoing health programmes and challenges at the PCUs. The English translation of the interview guides and the questionnaires can be found in [appendix 4](#).

Data were collected by me and three trained field researchers. Interviews were mostly conducted in-person in a quiet location, typically at respondents' workplaces. For the interviews where this was not possible, they were conducted online using Microsoft Teams. Interviews lasted around 30-75 minutes. Online questionnaires were distributed to all potential respondents in both provinces by formal invitation letters through the respective PHOs or shared directly with PCUs using the professional contacts of the local teams. Follow-up reminders were circulated twice: once mid-way through implementation of the survey and another towards the end of implementation period. The interviews were conducted between October - November 2022, and the subsequent questionnaires were rolled out between January - February 2023.

Table 5.1 Topics covered in data collection

Key informant interviews	Questionnaires for PCU workers
<ul style="list-style-type: none"> ▪ Health sector gaps <ul style="list-style-type: none"> - Service accessibility, availability, affordability, acceptability - Population groups and health concerns ▪ Primary health care provisions 	<ul style="list-style-type: none"> ▪ Demographics <ul style="list-style-type: none"> - Age group, gender - Work position, years of experience, PCU size ▪ Work profiles of PCUs

<ul style="list-style-type: none"> - Local health priorities - VHV role and capacity ▪ Adoption of health interventions <ul style="list-style-type: none"> - Design and implementation considerations - Policy challenges and opportunities ▪ Feasibility of RDT and micro-technologies for community-based interventions <ul style="list-style-type: none"> - Management of febrile illness: diagnosis, referral, treatment - Management of other diseases - Acceptability and feasibility factors 	<ul style="list-style-type: none"> - Provision of health services: prevention, disease control, health promotion, treatment, other tailored health interventions - Utilization of medical and technological devices ▪ Considerations for health intervention design <ul style="list-style-type: none"> - Implementation challenges - Perceived benefits and drawbacks - Suggestion for improvement: required support, skills, resources
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Data analysis

All interviews were transcribed from the audio recordings in Thai. Transcribed interviews and field notes taken during the interviews and consultation were imported into NVivo version 12 (QSR International Australia) for qualitative thematic analysis. The survey responses were retrieved and exported from the online JISC survey platform. Survey responses were monitored and prompted two follow-up reminders to the PCUs to ensure that the target sample size was reached. Descriptive statistic and visualisation were conducted using Microsoft Excel and GraphPad PRISM software.

Ethical consideration

Ethical approvals were obtained from OxTREC (Reference no.: 551-22, 14 September 2022), Chiang Rai Provincial Health Office (CR-PHO-EC) (Reference no.: 117/2565, 30 September 2022), and IHRP (reference no.: 094-2564, 7 October 2022). All interview respondents provided written informed consent to join the study. Interview respondents were compensated for their time lost from work and for any travel costs of approximately 300-500 THB from joining in the interviews. Survey respondents provided their consent by ticking a box in the online survey; they did not receive any compensation.

5.3 Results

The stakeholder analysis from Chapter 4 was adapted to map and highlighted PCUs and VHVs as the key providers of services, and their supervisors at the provincial and district health offices, and recently LAOs, as the decision-making bodies of the local health priorities. Table 5.2 provided an overview of relevant organisations to the primary care programmes and key informants of the study (see *). The table is also expanded to include the recent developments of decentralised primary care programme (see also Figure 1.4b in Chapter 1). Additional information on PCU programme features and characteristics from document review is presented in [appendix 4](#).

Table 5.2 Key stakeholders of primary care programmes at national and subnational levels

General health system		Decentralised system
Ministry of Public Health		Ministry of Interiors
Department of Health Services	Department of Health	Department of Local Administration
Division of Primary Health Care	Regional health offices	Office of Decentralisation
Local implementers		
<i>General Health system:</i>	<i>Service providers:</i>	<i>Local Administration:</i>
*Provincial Health Office	Referral/Provincial hospital	*Provincial administrative office
*District Health Office	*Community hospital (district)	*Sub-district administrative office
	*Primary care units (PCUs)	
	*Sub-district primary care units & Health Promotion Hospital (HPH)	
Village health volunteers		
Community and population		

Demographic characteristics of respondents and profiles of PCU workers

Interviews were conducted with 28 respondents: eight were government officials or medical professionals in programme management at provincial level, four at district level and 16 were based at PCUs. Among the PCU workers, 12 were unit directors, two were nurses, and two were

public health workers. Of all interviews, 15 and 13 interviews were conducted in Chiang Rai and Ubon Ratchathani respectively.

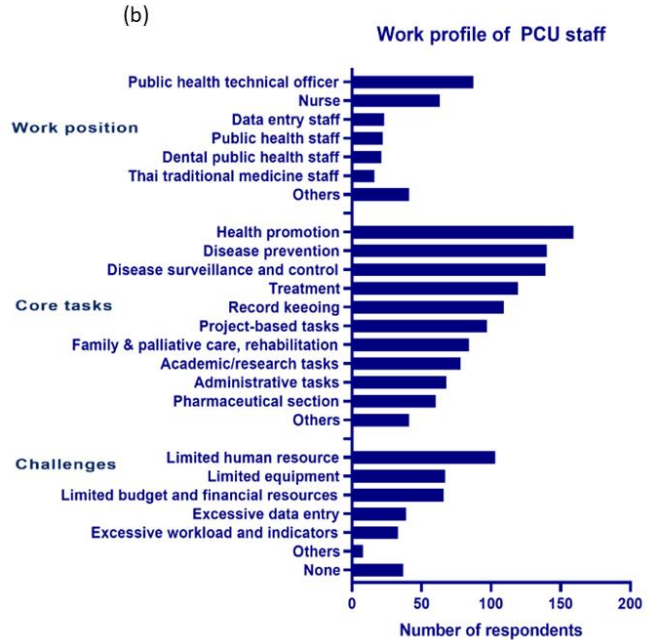
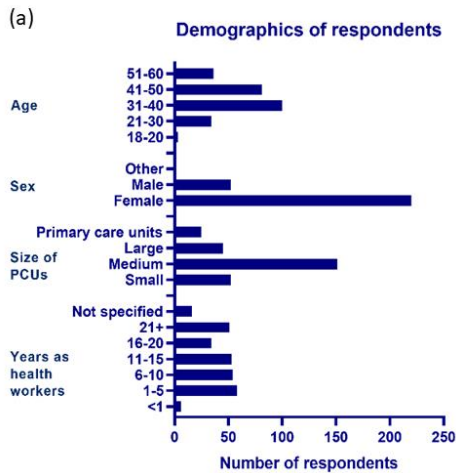
Table 5.3 Characteristics of interview respondents

Type of respondents	Characteristics
Policymakers and program managers	12 IDI (9 males; 3 females) <ul style="list-style-type: none"> - 8 provincial level - 4 district level
Primary care unit workers	16 IDI (4 males; 12 females) <ul style="list-style-type: none"> - 12 PCU directors - 2 nurses - 2 public health officers

A total of 273 PCU workers responded to the questionnaires (Figure 5.1). The majority (80.6%) were female and aged between 31-40 years old (36.6%); and more than half (50.8%) had more than ten years of experience as healthcare workers. The majority of the staff who responded to the questionnaires were public health officials (31.9%), many of whom were directors of their PCUs, followed by nurses, data entry staff, public health staff, dental staff, and traditional medicine practitioners. Other respondents (15%), typically positioned in a large-size PCU with 8-10 staff, included administrative staff, patient support staff, and caregivers. Health promotion (58.2%), disease prevention (51.3%), and disease surveillance and control (50.9%) were listed as the most common interventions at PCUs. Apart from patient care, recording keeping (39.9%) accounted for a large proportion of their workload. Treatment services available at PCUs were generally provided for minor injuries and ailments, including medication for relief of common symptoms such as fever or pain.

Figure 5.1a-c. Profiles of respondents at primary care units

(a) demographics of respondents, (b) work profile of PCU workers (n=273), and (c) images showing a two-storey PCU building and PCU worker training a group of VHVs to perform blood pressure monitoring using a handheld device.



Non-communicable diseases and elderly care-focused primary care

Healthcare services for NCDs constituted a large proportion of work at PCUs, particularly screening for symptoms and health promotion communication. More complicated specialised clinical tasks, such as patient management and prescribing medicines were performed under the supervision of general practitioners or family medicine doctors at district hospitals, who make monthly visits to perform medical consultations for patients with chronic NCDs. However, for some of the PCUs, these visits were reported to be less frequent due to a lack of available supervisors

and insufficient time allocated for primary care services; some also cited that these supervising doctors were chiefly occupied with their duties at the district hospitals. According to PCU respondents, VHVs were often leveraged to assist PCUs to deliver NCD care when dealing with a large number of patients.

“There is a huge burden of NCDs and PCUs now took a lot of NCD-related services from the hospitals where patients previously needed to visit for medication [...] the COVID-19 pandemic has put pressure on this and it was eventually implemented allowing patients to either take their medication package from the PCUs, or the VHVs deliver their package at home. We still cannot omit the consultation process where the patients need to be informed of their blood glucose and blood pressure results from the doctors. So, doctors must visit PCUs to consult the patients. This is crucial to maintain their treatment adherence.” Female provincial programme manager.

Although many of the PCU core tasks are related to NCD care, many examples of their health programmes reflected the local health issues in their communities (see Table 5.4). Increasingly, attention has been paid to palliative care programmes for elderly populations with additional services, such as home-based care and physical therapy. Many programmes also responded to the occupational risks related to rural living, such as drowning among children and chemical exposure among agricultural workers. Substance use and addictions were also described as constant problems in the communities, often associated with labour-intensive jobs and transportation of the substances along the border. Road accidents were highlighted as social and environmental risks, with several associated factors including lack of infrastructure in these remote communities, and elevated risks from motorbikes as main transport vehicles. However, health conditions resulting from these risks received less attention compared to other mentioned public health programmes.

Generally, PCU staff and VHVs were familiar with point-of-care testing devices, particularly blood glucose testing for diabetes patients, and for other conditions among some PCUs. Examples given were such as blood chemical test kits, *Opisthorchis viverrine* (OV)-RDT using stool, and COVID-19 test kits. In malaria endemic communities with low transmission, however, they were not generally supplied with and did not perform malaria RDTs on patients as their routine activities. Patients were reported to be referred to nearby malaria services provided by MPs or Malaria Clinics (MC), or the community hospital for testing and diagnosis. Table 5.4 summarises the primary health programmes reported by PCUs workers and their views of challenges in delivering these services.

Table 5.4 Current primary and community-based care and challenges at PCUs based on free-text responses from the questionnaires and compiled from interviews

Current health programmes at PCUs	
Health promotion	<ul style="list-style-type: none"> ▪ Behavioural change communication for NCD at-risk populations ▪ Skill building for VHVs, caregivers, patients, at-risk groups to monitor blood glucose and blood pressure ▪ Survival swimming practice, drowning prevention
Disease prevention	<ul style="list-style-type: none"> ▪ Blood chemical screening among at-risk groups especially agricultural workers ▪ Dengue prevention campaign such as mosquito nets use and distribution ▪ NCDs screening such as kidney disease, diabetes, hypertension, cancer ▪ HPV vaccination among at-risk population
Disease surveillance and control	<ul style="list-style-type: none"> ▪ Dengue screening (such as tourniquet testing) and control, foci management ▪ Infectious disease screening such as HIV/AIDs, tuberculosis ▪ OV-RDT for liver fluke screening
Treatment	<ul style="list-style-type: none"> ▪ Managing NCDs and their complications ▪ First aid and relief of common symptoms with medication ▪ Thai traditional medicine or practice for muscle pain and general pain relief ▪ Remote patient consultation and hospital referral
Family & palliative care, rehabilitation	<ul style="list-style-type: none"> ▪ Long-term care for persons with disabilities, road traffic accident victims ▪ Care for patients with osteoarthritis and arthritis of knees ▪ Newborn vaccination and child development assessment ▪ Home visits and elderly wellbeing care for patients experiencing stroke, ST segment elevation MI (STEMI) , hip fracture ▪ Consultation and information sessions on pregnancy ▪ Vitamin supplementation for pregnant women ▪ Mental illness symptom assessment
Others	<ul style="list-style-type: none"> ▪ Skill building for PCU workers in IT-related jobs and computer software
Implementation challenges	

Human resources	<ul style="list-style-type: none"> ▪ Inadequate family medicine physicians and general practitioners to supervise PCUs ▪ Inadequate healthcare workers especially nurses and public health staff in remote PCUs ▪ Excessive tasks of desk-based data entry into multiple databases
Capacity of workers	<ul style="list-style-type: none"> ▪ Limited skills, especially lifesaving skills, and skills to utilise some medical equipment, such as AEDs and electrocardiograms ▪ Limited experience in utilising computer software ▪ Limited digital skills to use mobile phones among aging village health volunteers
Availability of equipment	<ul style="list-style-type: none"> ▪ Unavailability of medical equipment, for example sterile dressing set, medical air mattresses, electric generators, stethoscopes, ambulances, muscle relaxants, first aid kits for VHVs (BMI meter, thermometers, flashlight), dextrostix (DTx), weighing scales, oxygen tanks, psychotropic drugs, adult diapers, accessible toilets at PCU, and transport vehicles for household visits.

Potential health interventions addressing local needs: dengue, tuberculosis, and cancers

There is a strong consensus among healthcare workers and policymakers that PCUs and VHVs have been the core feature of community-based and primary care and will remain so in the future.

In addition to the current programmes, the respondents proposed additional health interventions that are of priorities and can improve the quality of service by PCUs and VHVs in their settings.

Surveillance for infectious diseases, especially dengue, was highlighted and a priority for disease control in both urban and rural areas of the provinces. Additionally, melioidosis, scrub typhus, and rabies were also reported by policymakers as increasingly prioritised diseases along border and rural areas. For these infectious diseases, emphasis was placed on speeding up the referral process for patients presenting related symptoms to receive proper and timely treatment at the hospitals. With the limited availability of testing devices, PCU staff mentioned that they typically offered a non-prescription medication to adult patients presenting with fevers of unknown cause, and/or make a case referral to the community hospital. An urgent referral was often made for infants and children when they were suspected of dengue or other respiratory infections. Although novel technological devices have been introduced to a limited degree, new point-of-care devices

for febrile illnesses were suggested to mitigate delayed medical care and lessen the workload at PCUs.

Early detection of cancer and tuberculosis was highlighted by health programme managers due to delayed diagnosis and treatment. They also perceived that the coverage of health services for both diseases could be improved, and suggested that screening options should become more available at primary care level, including mobile chest X-rays, in addition to the diagnostic process available at hospitals. Although this had already been implemented in some settings, there were limited numbers of mobile screening devices to cover all target populations. Unless there was more investment into purchasing more devices, programme managers were open to explore interventions that pilot new diagnostics that optimise the utilisation of screening, or, in the cases that the new devices were not available, interventions that can manage the rotation of the existing devices at PCUs in resource-limited settings in an effective and cost-efficient manner.

Introducing new point-of-care testing devices: considerations for implementation

The potential for implementing point of care testing for some health conditions, with trained PCU staff and VHVs as key providers, were acknowledged and discussed with several considerations for implementation. An emphasis was placed, especially by programme managers and medical professionals, on the quality and precision of such devices: the device package and user guide should provide clear instructions for lay workers, especially on when the tests should be used and how the results of these tests should be interpreted. One programme manager referenced the COVID-19 antigen test kit as the optimal device type of for potential self-test, or ones that could be easily administered by trained health workers. A medical professional also mentioned that local private clinics offered an antigen test for other viral infection such as respiratory syncytial virus (RSV), COVID-19, and influenza, a screening service that was popular among parents with a sick child; however, there was yet no investment and employment of such devices in local public health facilities, including the PCUs and community hospitals.

“I believe VHVs can be trained to do testing. Actually, the PCU workers are also under the supervision of medical professionals. Strictly speaking, only the licensed doctors are allowed legally for perform these procedures, but in practice those under their supervisions are or should be allowed to do so as well. [...] Administratively, this requires an official approval and accreditation of their roles. I view this regulation as outdated. It has not been updated for a long time and cannot solve new problems.” Male provincial programme manager

“I do agree that they [point-of-care testing devices] would help us in targeting areas of transmission better. They need to be piloted in a certain area before being implemented, of course. Key consideration for these devices is the precision of the number of days since fever onset to do the testing, for example, should the test be administered on day 2 or day 3? If the tests are carried out earlier will this show any results? If there is a gold standard set for these testing devices, it will give confidence to the primary care teams. Those who are eligible to do a finger blood prick, such as for Dtx, or even malaria, should be able to perform these kinds of tests. The exception is if it requires extracting blood from the vein which requires the nurses’ roles. [...] Ideally, these devices should be something like how we are using the COVID-19 self-test kits.” Male provincial programme manager

In addition to the usability of the devices, the feasibility of these interventions also depended on the availability of the workers and their acceptability. One provincial programme manager stressed that the roll out of the point-of-care tests requires a pilot study and feasibility assessment at an implementing facility. In addition, administrative decisions are required in terms of accreditation and training of the VHVs and PCU staff, as well as appointment of supervisory medical professionals for future test providers. Another issue raised was the affordability of the devices if they were to be used and purchased by the implementers themselves, including the PCUs or health authorities, beyond the pilot phase.

“The feasibility depends very much on the policy. Where the priority lies. We need also to ask the implementers whether the intervention actually works on the ground. Many worry that this will add to their workload. Our role is to ensure that the intervention is useful and show them the results.” Male provincial programme manager

“I have proposed an idea for an intervention for the elderly on fall prevention [...] for technology like wrist bands that could monitor the falling with a sensor, and notify family members who can come back home and check on them. This is better than camera monitoring because it does not required one to monitor the screen all the time. If we were to adopt this technology, it needs to be affordable and accessible especially in our context.” Female provincial programme manager

Human resource capacity and quality of care

Inadequate human resource was particularly acute at PCUs in remote settings and posed a critical challenge for introducing new health interventions or even improving existing ones. Questionnaire responses highlighted how staff, equipment, and budget were perceived to be inadequate when considering the amount of work assigned to PCUs, especially the small units with an average of only three to four working staff without a full-time nurse. More skill training on basic treatment, lifesaving, and ability to the use of essential medical devices was also required by PCUs.

Data management tasks added to the workload of PCU workers who were required to complete through the Health Data Center (HDC) dashboard under the primary health information system. Although digitised health records were required of PCUs, many were not able to enter the patients' data at the time of visit and opted to utilise paper-based form sand subsequently entered the data into the software, thus doubling the workload of the staff when there was no position dedicated for data entry at PCUs.

Capacity to provide quality care was among the key concerns of PCU workers. Occasionally, the digital-related tasks limit time for PCU workers to provide patient care. Essential elements of giving good care such as having a conversation, remembering patients by their names, and following up on their health conditions, were given as examples that were missing from the recent daily routine care of PCUs. Additionally, with limited availability of testing and treatment services, their health programmes were bound only within the remit of health prevention and disease control. Their patients were often referred to district hospitals where they were required to spend more time and resources for each visit, or some may then bypass public health facilities and opt to pay for faster services at nearby pharmacies and private clinics. This was mentioned by the PCU workers as the key pain point for malaria patients who may be discouraged to visit the hospitals without pre-screened malaria testing and referral services by MPs due to long hours they would need to spend at the facilities. A similar case was perceived to also potentially apply with other patients with febrile symptoms.

Programme managers and PCU staff also emphasised on the need to develop interventions that are holistic, especially around wellbeing and integrated care outside of hospitals. Besides the technical aspects of technologies or interventions adopted, the workers highlighted the importance of setting up primary care networks to support such services. Suggestions were made that this existing community network should be leveraged to address multiple local wellbeing issues, including elderly and palliative care, pregnancy and newborn care, and child development. For example, home-based monitoring and post-treatment follow-up visits were suggested to complement PCUs' household visits or surveys in the community.

Such visions of PCUs aligned with the ongoing progress towards decentralisation of the primary care programme. Many viewed this progress as an opportunity for the improvement of their services. Locally driven health services and programmes were described as the future for PCUs under the local administration's supervision. PCU staff mentioned that this direction would

supposedly reduce their workload for data collection based on health indicators centrally set up at the Ministry that some perceived as infrequently responsive to local health problems. By reducing their work, PCU staff expressed a positive outlook that they would be able to resume their roles in delivering health and social care in the communities, although the outcomes of the transition were yet to be seen.

Leveraging VHVs to upgrade community-based health programmes

Community disease surveillance has become the key function carried out by the PCUs in collaboration with the VHVs, according to PCU respondents. For disease surveillance, their primary task was to perform regular foci investigation and area cleaning to control the transmission of dengue in villages. To speed up and increase the coverage of COVID-19 patient screening and referral in the communities, they were also heavily engaged to screen community members with febrile symptoms using a handheld temperature sensor, and those with travel history with a simple pre-referral questionnaire. Many PCU staff described that VHVs' positions were even more instrumental when they had taken a skill upgrade programme, as they would be able to perform more complicated tasks such as basic first aid, blood pressure monitoring, blood glucose screening, and long-term care.

“NCDs are the primary disease burden our district...diabetes, hypertension, obesity, and behaviour-related illnesses. VHVs have been helping us with this work. They make appointments with at-risk group to visit PCU staff for testing. VHVs in our district are also able to test for blood sugar. [...] This helps a lot to alleviate the workload of the PCU because many patients were fasted, not eating for many hours to come for this test and some came very early... at 5am in the morning. VHVs are already there in the community so they provide the test right away. If they identified complicated cases they know to refer the patient to us. We tried to at least train one VHV in each village for this task. Old-aged

VHVs are not very skilled at this. Some are more familiar with communication roles. We need to assign them the roles they are good at.” Female PCU workers

Another key contribution of VHVs was their capacity to perform screening and health communication tasks, which are essential for the volunteers to establish trust among the communities and the patients of PCUs. These roles are crucial to health interventions targeting hard-to-reach populations, particularly the migrant workers. At sites, there were many migrants from Myanmar and Laos who crossed the border seeking job opportunities. Migrant health volunteers (MHVs) were perceived to be an essential human resource in these border provinces, especially for health education campaigns that required language translation.

“Before we have migrant health volunteers, I used to organise health education session targeting thirty migrant workers in one of the districts along the border. Only two showed up in that day. The problem is they were afraid. They crossed the border to work, and the work is not a typical job, some exists in the grey area, not as organised as factory workers. The project failed entirely because we weren’t able to recruit anyone. After the migrant health volunteer programme was established, we trained them to facilitate these campaigns and health services for migrant workers [...] and we match them up with Thai VHVs to work together.” Male provincial programme manager

With these close-knit and dependent collaborations, VHVs were perceived as taking some of the primary care workload of the PCUs. However, many respondents pointed out that VHVs are primarily volunteers receiving minimal incentives and have other work and personal engagement and are not entitled to the same benefits that majority of the PCU staff (as government officials) received. This gradual shift in VHVs becoming an extensive part of PCUs and the primary care system was perceived by a programme manager as adversely affecting the unique role of VHVs as community leaders and mobilisers in health. The respondent also advocated for a

reestablishment of VHV-specific funding scheme to strengthen the community-based care. For future interventions, managing the relationships between PCUs and VHVs was also viewed as complex and required careful communication, personal ties, and fair treatment for a sustainable collaboration.

5.4 Discussion

This findings in this chapter drew from qualitative and quantitative responses from key programme managers, implementers and service providers in the primary and community-based care programmes. Overall, several areas for improve primary care and the possibility of advancing the roles of VHVs that better responded to public health needs in north and northeast Thailand were highlighted, particularly in the detection and surveillance of prioritised diseases utilising point-of-care tests and in the improvement of social and wellbeing care in rural communities.

Past successes of screening for communicable diseases boosted the confidence of the respondents. Examples include specific health programmes such as HIV and malaria, use of antigen testing in response to the recent COVID-19 pandemic, and point-of-care testing for NCDs e.g. blood glucose testing among diabetes patients – all of which were able to be administered by healthcare workers or trained volunteers, as well as caregivers or the patients themselves. Beyond cited examples from the study participants, examples could be drawn from other implementation research piloting available diagnostics in Thailand. For example, an evaluation of C-reactive-protein (CRP) point-of-care testing to address bacterial illnesses in addition to minimising unnecessary antibiotic description among febrile patients (230), with an investment case made to couple the CRP test with malaria screening for improving management of malaria cases in a low-transmission setting (231). A similar study showed pulse oximetry to be a cost-effective addition at PCUs to supplement standard care for acute respiratory infection among

children under five years and potentially older patients (232). Another assessment of PCUs in southern Thailand showed positive results from piloting a package of telemedicine and integrated point-of-care testing (glucose testing, urine glucose, and protein testing using test strips) to improve evidence-based diagnosis and management of patients with cardiac conditions (233). For vector-borne diseases, the uses of multiplex RDT for dengue, zika, and chikungunya viral infections had also been trialled in the hospital setting (234), paving the ways for future deployment in primary care. This presented an opportunity to explore other available devices that have not yet been trialled in primary care settings in Thailand, such as diagnostics for dengue (235-237), melioidosis (238), and tuberculosis (239).

In my study, the benefits of these tests were emphasised in enabling a faster referral and treatment process, particularly for high-burden NCDs and potentially life-threatening dengue haemorrhagic fever. Although prevention and control of some of these health conditions have been well developed and implemented in the country, among those living in remote areas, health conditions can often go undetected until they have reached an advanced stage, prompting more attention towards expanding the coverage of care delivery and capacities at the primary care level. However, challenges remain in ensuring primary care workers and PCUs are well-equipped to implement new health interventions that involved disease screening and RDT use. Although disease screening, surveillance and monitoring for selected NCD and communicable diseases have been assigned to PCUs, there was limited availability and implementation of diagnostics or decision-support devices that could enabled PCUs to make informed decisions about patient consultation and case referral, resulting in an overloaded and delayed services at the community hospitals and higher-level facilities. Inadequate human resources and disproportionate workload within the primary care needs to be strongly considered if new interventions or changes to existing ones were to be introduced. As several PCU staff in this study reflected on their experience, they questioned the extent to which their current work routine reduced their ability as care providers to

maintain close communication with their patients. Programmes introducing disease screening interventions, including future integration of malaria services into primary care, hence, need to not only ensure the technical capacity and availability of the testing devices, but also strengthen the human quality of the PCU services and human-centred goal of primary care.

In a resource-limited setting, the improvement of primary care programmes was also emphasised as a means to address local health and wellbeing issues among vulnerable, and potentially marginalised, populations. In our study context, these populations are the elderly, post-accident/trauma patients, people with disability, new mothers, former substance users, and patients with mental illnesses. Among programme staff and PCU workers, the continuity of care of such services at primary care level could be improved by providing more home-based services and social support for the patients. In Thailand, this continuous patient support for certain NCDs, chronic illnesses, and palliative care has been initiated through a well-advocated caregiver programme, but as found in the interviews, health services for mental illnesses and addiction therapies were often neglected from primary care programme despite constituting a large burden in this setting. These gaps are not unique to this study. In developing the performance of primary and community-based care to their full potential, a proposal has been made that a core set of primary care services should use local surveillance to identify epidemiological priorities, and engage the community to identify their own health needs (240). More attention should hence be paid to interventions strengthening care delivered by PCU for such local needs, and invest in human resources specifically to adequately meet those needs (241). This approach could, indeed, be realised in Thailand as primary care is undergoing decentralisation, reflected by respondents in our study that such locally managed primary care programmes could better respond to the local demands. Evidence for this approach, and its implication for malaria programmes that aim to expand the roles of these volunteers as well as integrate malaria services into primary care, remains sparse.

Strengths and limitations

Although several studies have investigated the feasibility or assessment of specific testing devices (187, 216, 230, 233, 234, 242), none has yet explored their prospects of malaria RDTs adoption by PCUs and VHVs from the views of primary care programme managers and workers, particularly since the COVID-19 pandemic as well as in response to the recently expedited decentralisation of primary care programme in Thailand. This study explored such recent development in the country's primary care system and employed an exploratory design to provide an updated investigation on the views of key stakeholders and introduction of point-of-care testing at primary care settings. The response rate to the questionnaire was 93% (273 responses received from expected 295). The questionnaires were sent purposively to PCUs with different sizes and geographical characteristics, in order to obtain views of both urban and rural facilities in the provinces, and among PCU workers with varying positions. However, the questionnaire did not receive the responses from all districts in the two provinces. I attempted to fill in these gaps from the interviews with programme managers and a diverse group of PCU workers. There was also potential risk of bias from existing research programmes at the sites focusing on specific health issues such as malaria, scrub typhus, and melioidosis. A reflexive approach during the interviews was applied to allow for probes and responses on other local health priorities from respondents about other infectious diseases. Programme managers of non-communicable diseases and wider primary care services were also interviewed to ensure a diverse perspective of local health priorities.

5.5 Conclusion

In Thailand, PCUs and VHVs have mainly focused on disease screening, monitoring, and managing NCDs and certain chronic illnesses. While some point-of-care testing—like blood

glucose monitors and, more recently, COVID-19 test kits—have been introduced, malaria testing was generally not available in PCUs, especially in areas close to malaria elimination. Although policymakers and healthcare workers responded positively to the potential of advancing disease screening, the main bottlenecks for consideration were the understaffed and limited coverage of certain disease programmes. For malaria programmes, this may imply additional tailoring of malaria testing service integration to include screening and potentially testing for other febrile illnesses that were prominently observed in the communities, including vector-borne and respiratory diseases such as dengue and flu. To navigate this resource-limited setting, future implementers of community-based interventions are encouraged to innovate in how they engage and leverage this workforce to meet local needs effectively. Ideally, decentralised primary care programmes should establish feedback mechanisms that allow more PCU staff, VHVs and their patients to share insights and inform the programmes of the local demands for primary care services.

Chapter 6 Malaria outbreak case study: new prospects for integration?

Summary

This last chapter on Thailand's malaria programme and health system assessment investigated the uncertainties about whether expanding the roles of malaria post workers (MPs) was needed in Thailand-Myanmar border communities where malaria still remained a high burden. Based on 12 interviews and 31 informal conversations with key local stakeholders, malaria programme managers, primary care unit (PCU) workers and village health volunteers (VHVs) in Kanchanaburi province, this chapter captures their perspectives on the recent malaria outbreak and challenges in controlling and preventing malaria among ethnic communities and mobile and migrant populations (MMPs) displaced by conflict and lacking access to public health services. Here, the findings underscore the significant ongoing efforts by both local malaria and primary care programme workers to reach these vulnerable groups, who also highlighted their integration efforts and offered recommendations for future integration of malaria services, while noting that dedicated malaria services remained essential.

Highlights

- In border communities, MPs worked closely with other health volunteer colleagues to provide malaria services to local residents and new migrants residing, working, and/or hiding in endemic forested areas in Thailand.
- Due to increased risks from the intensive cross-border mobility, at-risk populations included not only among male farm workers but also women, their children, students at border schools; many of the new arrivals were undocumented and faced additional barriers from risks of being arrested to accessing public health services.
- Demand for malaria care, along with other health needs and essential medicine, prompted local health providers - particularly the civil society organizations (CSOs) and non-

government organisations (NGOs) - to leverage resources from multiple health programmes and stakeholders beyond malaria to address these healthcare needs.

- Past local efforts to integrate malaria services were led by strong local leadership, funded locally, and supported by the expedited decentralisation of primary care programme; however, the continuity and scale-up of such efforts was yet to be seen.

6.1 Introduction: Mobile and migrant populations and the malaria outbreak situation along Thailand-Myanmar border

Although there has been a substantial decline in malaria across the country, any malaria outbreak in the western border region brings the threat of transmission to previously malaria free areas and challenges the goal of malaria elimination. This chapter builds on previous studies in low transmission settings in Chapter 4-5 and extends them to get comprehensive views of the prospects for expanding the role of MPs and integrating malaria services in primary care in a high-transmission setting. A particular focus is placed on comprehending the context of cross-border MMPs who are the most at-risk and vulnerable populations in these regions. Prompted by an outbreak of malaria in 2022 along Thailand's western border, this chapter presents an extended study to investigate the role of MPs as well as other cadres of workers, and the implementation of malaria programme amidst the outbreak and the extent to which integration of the vertical programme into primary care has progressed in a high-transmission setting.

Driven by political conflict in Myanmar, heightened border movement across the Thailand-Myanmar border has contributed to the increases in malaria incidence in Thailand. From 2022 to 2024, malaria cases have risen sharply, with an increase of over 200% (243). The majority of these cases were reported in provinces located along the border, with migrants accounting for more than half of the total infections, and over 80% of cases concentrated in six border provinces spanning from the northwest to southern Thailand: Tak, Mae Hong Son, Kanchanaburi,

Ratchaburi, Prachuapkirikhan, and Ranong (244). Besides migrant workers, these provinces are home to large ethnic communities, refugees and displaced individuals who resided in temporary shelters and in remote and endemic areas. Although malaria services are technically available and subsidised by donor funding and the national malaria programme, associated costs, undocumented status, geographical isolation and language barriers hinder timely access to care (245). Due to fear of arrest, undocumented migrants often delay accessing government health services until their condition becomes severe (39). Efforts to provide equitable healthcare to all high-risk populations face several obstacles from the growing number of the undocumented population, geographical difficulties, and resource constraints (39, 245).

Additionally, to control and eliminate *P. vivax* malaria in these border regions which made up more than 90% of both indigenous and imported cases, the national programme has approved the use of vivax radical cure with a single dose of Tafenoquine or 7-day Primaquine for hospitalised cases, along with glucose-6-phosphate dehydrogenase (G6PD) testing which is necessary before starting treatment to prevent haemolytic anaemia, a potential side effect of these drugs in individuals with G6PD deficiency. To effectively implement this radical cure strategy, strict monitoring and reporting of treatment adherence and adverse events among *P. vivax* cases were required at 27 implementing district hospitals in 8 provinces along the border (246).

In this context, there were gaps in information on whether additional roles for MPs would be necessary given that they were largely occupied with their malaria patients. Local health concerns for MMPs and ethnic communities that MPs or primary care programme could address may also differ from those in a low-transmission setting. Because there are a higher number of active MPs in this setting and higher funding and incentives to sustain these workers, there may be a different approach to expanding and/or integrating their roles into primary care programme.

6.2 Methods: key information interviews and informal conversations

Study design

This study followed the general design of the stakeholder and community study presented in Chapter 4 and 5, comprising interviews with the key stakeholders: malaria health programme managers at provincial and district levels, and service providers, including MP and MC staff. These qualitative interviews were followed by informal conversations with a larger group of primary care unit (PCU) staff and village health volunteers (VHVs) using a flexible approach and key findings emerged from the previous interviews.

Study context

This study was conducted in Kanchanaburi province, one of the six provinces situated along the Thailand-Myanmar border with the highest number of malaria cases in 2022, second only to Tak province. The province also recorded two outbreaks in 2017 and 2022, and a total of seven outbreaks since 2012 (247). Of all 13 districts in Kanchanaburi, three border districts recorded the highest cases in 2022 and were targeted for data collection: Sangkhlaburi (314 cases), Thongpapoom (326 cases), and Saiyok (332 cases). There were 16 NMP-managed malaria clinics (MCs) and 46 MPs active during 2021-2023 located in 50 A1 and 25 A2 villages (188) (A1 and A2 villages are area stratification of NMP in determining the level of malaria endemicity at the village level - see full definition in Chapter 1). In addition to malaria-specific providers, primary care providers included PCUs, and/or health promotion hospitals (HPHs), which, unlike our previous studies in the north and northeast Thailand, have significantly progressed in the decentralisation transition from Ministry of Public Health (MoPH) to the local administrative organisation (LAO).

Besides having the second highest number of malaria cases from 2022-2024, Kanchanaburi province is home to multiple ethnic populations: Karen (*Kayin* or *Paganyaw*) was the largest ethnic

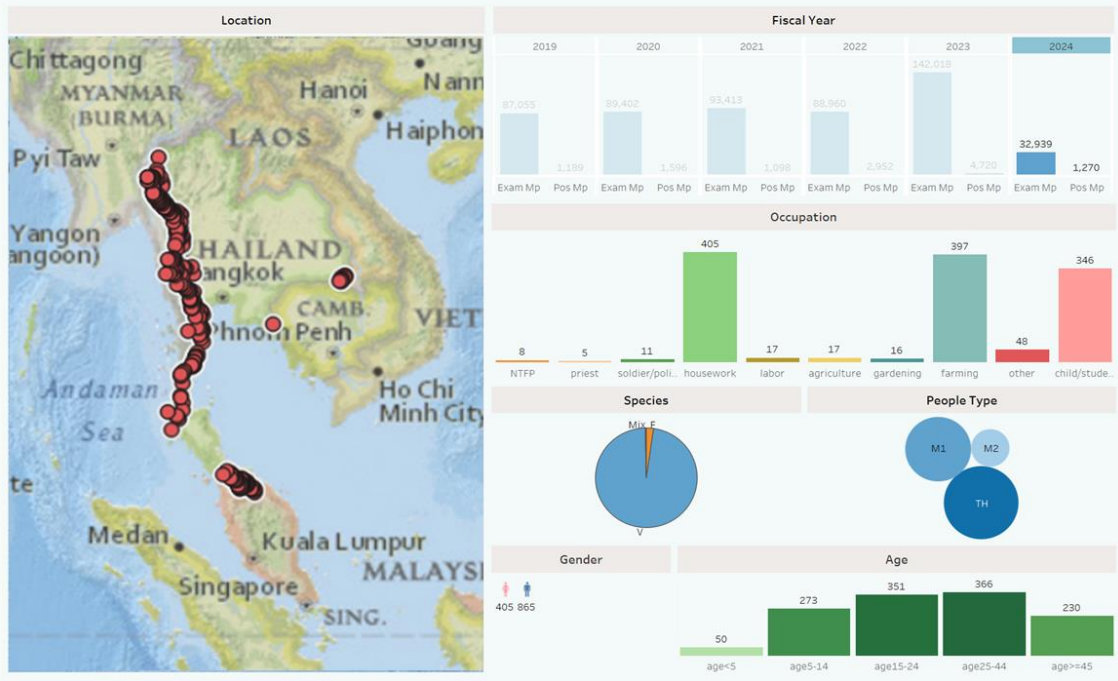
group in the province (62%), followed by Mon (19%), Burmese (15%), and others (4%) including Lao, Yao, Hmong, Khamu, and Tai Yai (248). The majority also lived in along the border and in endemic areas of the province, especially Mon ethnic communities in Sangkhlaburi district bordering Tak province in the north with hilly and mountainous geographic landscapes where Baan Don Yang temporary shelter (also commonly referred to as refugee camp) and a national conservation park also situated. There were two official Thailand-Myanmar border crossing points in the province; the high-traffic Three Pagoda temporary pass was officially closed during the COVID-19 pandemic and irregularly reopened following the political unrest situation in Myanmar. The new Baan Phunamron pass was recently opened to facilitate the higher volume of economic activities across the border reported to be diverted from Mae Sot in Tak province bordering Myawaddy where the fighting escalated in the Karen state (249).

During January - March 2024, a total of 1,270 confirmed malaria cases were reported in Thailand and concentrated along the western border. Although 68% of the cases were men, their demographics varied. Cases were reported across all age groups from 5-14 (21%), 15-24 (28%), 25-44 (29%), and over 45 (18%), whereas 32% of cases were house workers, 31% were farm workers, and 27% were children and students. Figure 6.1 depicts the malaria situation from 2019-2024 and the number of malaria examination rates and confirmed cases reported by MPs.

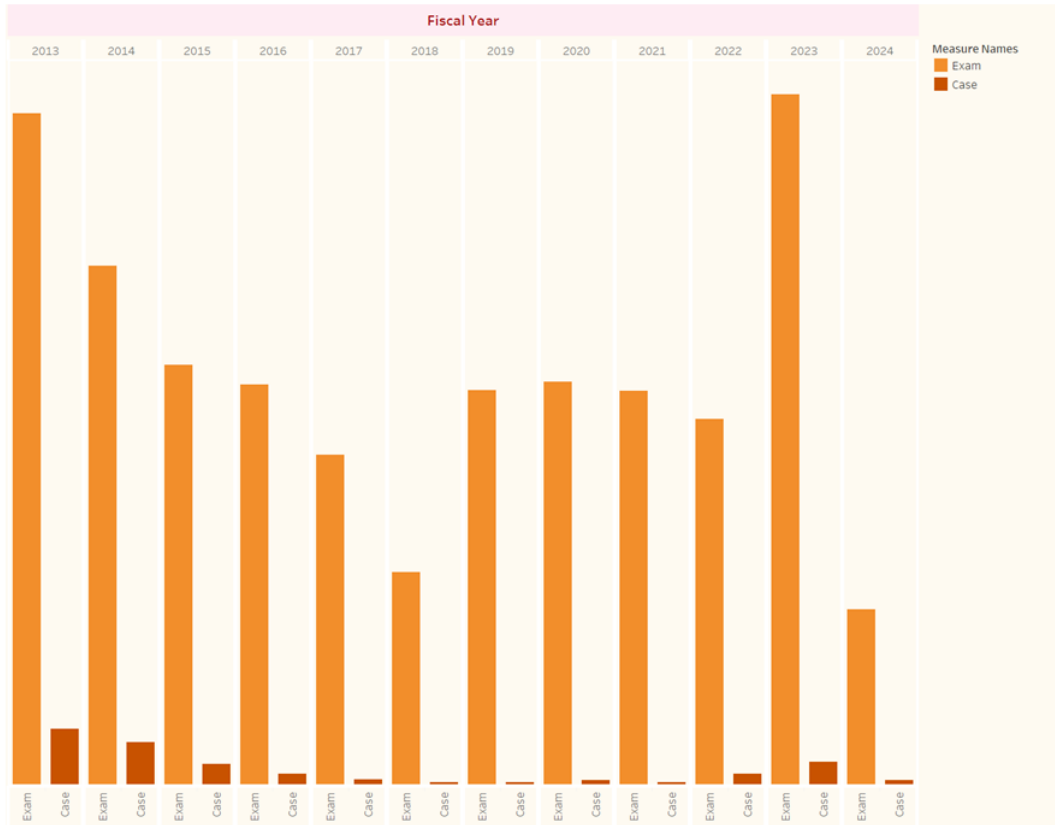
Figure 6.1a-b. Malaria situation along the Thailand-Myanmar border

(a) The number of malaria cases from 2019-2024, showcasing the outbreak in 2023 during which cases nearly doubled in numbers and were concentrated along the western border, and (b) number of malaria cases examined and confirmed by MPs from 2013-2024; the graph shows an increase in testing rate in 2023 with cases concentrated along the western border (data from DVBD, as of March 2024).

(a)



(b)



Identifying key informants and emerging topics of interviews

Key informants were identified based on their roles in managing and implementing malaria programme and primary care programme, or providing malaria services. The interview guide was updated based on the findings from previous data collection (presented in Chapter 4 and 5), incorporating a specific focus on malaria outbreak situation and the integration of community-based malaria services onto primary care (see [appendix 5](#)). Respondents were encouraged to discuss the potential and actual effect that integration may have on MPs and other types of health workers, including VHVs, migrant health volunteers (MHV), and PCU staff. They were also asked to provide views and experience of the past and current progress of the integration and the decentralisation of primary care programmes. Questions from existing topics on the overview of the at-risk population and gaps in service provision were also included to illicit contextual background of the malaria situation that maybe unique to the border setting.

Data collection and analysis

There were two rounds of data collection during August 2023 and March 2024. The in-depth interviews were conducted during the first field visit, and data from the interviews were analysed to inform the preliminary findings and target district and facilities for the subsequent visit to conduct observations and informal conversation with health providers and observations of health facilities, including PCUs and MCs, in the target districts.

Respondents were contacted and invited to join the study through professional emails and phone calls. They were mostly interviewed in-person and at their workplaces, and each interview took approximately 45-90 minutes. Audio recordings were transcribed verbatim in Thai language. Informal conversations were recorded as detailed field notes and observations during the second round of data collection. The interview transcription and notes processing followed the pre-developed codebook in NVivo software version 12 from the previous study, with new codes incorporated based on the themes that emerged from the interviews, such as description of new

at-risk populations including Burmese migrants and ethnic groups, and of additional roles of MPs, VHVs, and MHVs along the border.

Ethical considerations

An amendment to local ethical approval (IHRP reference: 146-2564, amendment approval dated 21 April 2022) was made to the RAI3E Thailand study for additional data collection activities in Kanchanaburi province. All respondents provided written informed consent and were asked for consent to be audio-recorded. Respondents were informed that they could withdraw from the study at any time, with no consequences for them. Informal conversation with the health providers were recorded as fieldnotes and not audio recorded.

6.3 Results

This section presents the results of 12 in-depth interviews with key informants and local stakeholders of the malaria programme and 31 informal conversations with PCU workers in Kanchanaburi province. It focused on their views on the recent malaria outbreak situation and their concerns regarding the access to care by MMPs, considered the key vulnerable populations along Thailand-Myanmar border. I also explored the intensive malaria services and programme implementations at the sites led by the local malaria programme implementers and their frontline workers - MPs, VHVs, and MHVs - and the PCU workers. Preferences for additional roles of these workers and volunteers, along with the services provided by the primary care programme and local civil society organization (CSO) who were to malaria programme implementers in the province were also reported, with emphasis on the past implementation and suggestions for the local approaches to malaria service integration.

Demographic of respondents

Twelve interviews were conducted with four programme managers at the provincial level, four at district levels, and four programme implementers at the community level - three in PCUs and one MP. All the informants were local governmental officials, except for one CSO programme manager and one MP. Informal conversations were made with 31 healthcare providers at PCUs in the three border districts.

Table 6.1 Characteristics of interviewed respondents

Type of respondents	Characteristics
Program managers and implementers	8 IDI (6 males; 2 females) <ul style="list-style-type: none"> - 4 provincial level (3 government and 1 CSO) - 4 district level
Health providers	4 IDI (3 males; 1 female) <ul style="list-style-type: none"> - 3 PCU workers - 1 MP worker 31 informal conversations with health providers at PCUs and HPHs

Profiles of MPs in border areas: multi-cadre collaborations

With the alarming increase in malaria incidence along the Thailand-Myanmar border, programme managers reported that they needed to put in a request for additional MPs to be recruited to address the increasing demand of services in these border communities. In 2023, a programme manager explained that 11 MPs were newly recruited, adding to the existing 46 active MPs during RAI3E implementation (2021-2023). Programme implementers stressed the importance of training these new workers in the malaria testing and treatment roles, and of maintaining the continuation of their roles for the next 3 years in the RAI4E period (2024-2026).

The recruitment of new MPs continued to be based primarily on the recommendations of PCUs in their respective areas. Although many of whom were (former) VHVs, and officially assigned to the malaria programme managed by the provincial health office (PHO), the programme also recruited border malaria post workers (BMP) whose post was set up nearby a cross-border checkpoint in the province with a commitment to nearly a full-time position with compensation of

9,000 THB per month, compared of 3,000 THB per month for a regular MP position. Similar to the findings from other communities where MPs were commonly recruited from a pool for VHVs, MPs in the province also undertook the VHVs roles, and those who did not hold a position of VHVs were village leaders or their assistants. However, at site, one MP was reported to be additionally employed by newly decentralised PCU to provide non-malaria health services full-time at the unit, which has not been observed previously or documented elsewhere. Additionally, one interviewed MP from a Mon ethnic community explained that, despite not owning a Thai citizenship, she was selected as representative from her community for the MP role.

“I’ve been MP for 2-3 years now. I can test for malaria and give the patients treatment, but there were times when the test kits ran out and I had to wait for their delivery from the provincial city centre. That took quite some time. [...] I wanted to apply for a VHV position in my village soon.” Female non-Thai resident and MP

In addition to their regular roles in testing and treatment, programme managers highlighted that MPs in these areas were tasked with coordinating with VHVs and MHVs to broaden the coverage of malaria prevention and control measures, particularly to ensure that mosquito net distribution and impregnation activities reached the “hidden” populations in their communities. Similar to elsewhere in Thailand, (non-MP) VHVs and MHVs were not allowed to perform malaria testing, hence they needed to refer their community members to either MPs or nearby health facilities for such services. Refresher training and on-the-job training were reported to be provided to MPs who were accredited to perform malaria testing on an annual basis, but their supervisory activities and stock management were monitored more frequently by the programme staff to ensure adequate rapid diagnostic test (RDT) and antimalarial were readily available with the MPs. One respondent stressed the importance of this continuation and availability of these human and medical resources on their reliability to perform malaria services:

“The most essential component of malaria care in these communities was that we still received support from the Global Fund. We have the commodities...and so we are reliable. In these remote communities, people depend a lot on our providers (referring to MPs and PCUs) [...] The ability of MPs to provide antimalarials, I think, is the main reason their clients keep coming back to see them. They provided so many tests...in some communities, MPs even used up more RDTs than the facilities. Even though many cases were not positive, people came to see them when they had fever. One thing to be mindful of is when MPs run out of antimalarials. We need to recheck the stock frequently, ideally on a weekly basis.” Male district primary care programme staff

Preferences for extended services: vivax case management and upgraded care for migrants

Several challenges to address *P. vivax* transmission, including cross-border mobility and ensuring treatment adherence, were anticipated by the implementers. Local programme implementers suggested that if MPs were trained to perform roles related to Glucose-6-phosphate dehydrogenase (G6PD), including providing G6PD testing, the programme would be able to increase the treatment of *P. vivax* patients in these communities with the newly adopted treatment guideline. However, they emphasised that many newly trained MPs following the recent outbreak were not experienced in preparing the blood slides for subsequent diagnosis with microscopy by staff at the vector-borne disease programme. Additional training to expand the skillsets of MPs regarding *P. vivax* case management has been suggested by district programme implementers, to minimise the need for the patients to make a visit to the facilities, which often lead to loss of follow-ups and incomplete treatment especially among migrant populations. In addition, respondents managing vector-borne disease programme highlighted how MPs could be tasked to take part in additional malaria screening and prevention activities to address the increasing number of malaria cases among children in the communities and students in border schools.

“All MPs are able to test with RDTs but many of them cannot make blood slides, so this requires us to still be here to confirm the cases with microscopy. Although we are not their supervisors, we provide them with guidance and training. We responded to their questions in the Line group (chat application) when they cannot read the RDT result or are unsure how to prescribe antimalarials. We also enter their case investigation reports...and we found that they sometimes were unclear if the case was a Migrant type 1 and type 2 (referring to case classification of migrant populations residing Thailand under or over six months). We also found that it is difficult for MPs to follow up these cases, and we then cannot perform 1-3-7 measures.” Male provincial malaria programme staff

“Ideally MP and VHV should very much work together. In fact, some MPs are VHVs, and some MPs are hired separately by PCU. They are able to do a ‘two-in-one’ role when their patients come to see them. They can provide malaria test, and they can also provide Dtx test. If their patient tested negative for malaria, MPs can help them with other things...like take the temperature, weigh them on the scale, take their blood pressure although they are not legally allowed to prescribe medicine [...] Together they can propose a local initiative, and it doesn’t only have to be about malaria or diabetes, through their village committee to the local government.” Male district primary care programme staff

From the views of primary care programme, PCU staff made similar suggestions that MPs could be additionally trained to perform the roles that VHVs have been accredited or assigned for, providing examples of screening roles were given, such as for non-communicable disease (NCD), older people and bedridden individual survey, student dental care at school, mental health, and breast cancer for women in their communities. Additional use of testing device, such as blood glucose testing with Dtx, was also an option for trained workers. When asked about available malaria services at health facilities, there was mixed response in terms of whether PCUs provide malaria testing with RDT or not. Programme staff described that this varied based on the locations

of the PCUs and the availability of RDT commodities in the areas. PCUs that are not supplied with RDTs often referred their patients to nearby MCs to receive services within public office hours, and to MPs, particularly when the patients required services off such hours.

Additionally, suggestions were made that MPs located in very remote areas could be upgraded to a multi-purpose worker managing a community-based centre for basic care, referring to the concept of a “community health house” which was once implemented by the MoPH to support self-care practices in the communities and strengthen the roles of VHVs to provide basic health services and make referral to health facilities. With this upgrade, MPs could also be supervised to treat common illnesses, such as fever or cold, and provide household medicines to their clients. As the transition of PCUs to LAOs progresses, such concepts were now revitalised to bridge the potential coordination gaps between VHVs (under MoPH) and PCUs (under LAO). The suggestion was made that in endemic areas MPs could be leveraged to complement the basic health services at such centre with their malaria testing and treatment services; however, considerations about how they would be funded would need further planning among the local programme managers, as these centres had not sufficiently funded and many were discontinued.

Access to care among vulnerable populations and undocumented migrants

Respondent from a malaria programme described how, along these border communities, more than half of the malaria patients were from migrant populations who do not have Thai nationality, and an increasing number were non-registered migrants who have resided in Thailand for less than six months. Sub-provincial level staff described that many migrants crossed the (natural) border regularly, back and forth, to visit their families and/or to undertake agricultural activities.

In fact, at one of the border point, informal border crossing was observed in a market not more than two kilometres from the formal border checkpoint (the front of the shop provided access to Thai side while the shop’s back entrance opened to Karen state in Myanmar). At the time, the

checkpoint was temporarily closed due to the fighting in Myanmar. From the informal conversations with the staff, many Burmese migrants and Mon residents in the neighbouring towns were seeking and often engaged in seasonal agricultural work from Thai plantation owners and factory jobs close to the border. Among these workers, unregistered border crossing, back and forth, on a day-to-day and weekly basis were reported. For those looking for a more permanent employment elsewhere in Thailand, remote border communities were described as a hiding place during their waits for jobs, for confirmation from Thai employers, and for arranged transport to their subsequent destinations. During these times, many were described to remain in hiding with their relatives or in plantations where they temporarily worked and often refused to travel to town centres where public facilities are located.

“I work in border and national park areas. Our patients were both Thai and from Myanmar who frequently cross the border. It’s very easy to miss these people because they are either working in the factories or go back home across the border. Some work in plantations and do not have a living settlement in the communities so it’s hard to find them. Those who do not want to register their migration status leave the community for illegal work in the cities.” Male malaria clinic staff

A younger age profile of malaria patients was also reported by the programmes, citing many migrants aged around 18-25 who had fled Myanmar to avoid military recruitment. In addition, Thai and migrant school students, males and females, along the border reportedly spent time outdoors at night and gathered near an internet connection hotpot in their communities, often at school or public office grounds, placing them at increased risk of malaria.

“Since cases surged, we have faced many implementation challenges because the cases are in very remote areas in our district. Usually, we have to wait for teachers to visit the town centre to buy food for their students and we visit the school and the nearby

communities with them, or sometimes with a helicopter that sends supplies in the areas. We also need to visit the patients directly in those communities to provide them medicines. Many refused to leave their house or their communities to visit our facility, especially the very mobile migrants.” Male district primary care programme implementer

“We observed that many do not like to use mosquito nets when they sleep. We need to come up with tricks to incentivise them...like asking them bring their old nets and we provided them new ones that were impregnated with insecticide. But some also complained that they liked their old nets better. They are softer, stronger and do not smell like chemicals,” Male district primary care programme implementer

The key barrier to access care among migrant population was meeting the healthcare costs and language barriers. A programme manager highlighted that their programme needs to continue their collaboration with the community hospitals in the implementation areas to recruit and hire translators who were able to communicate with the patients as well as the healthcare professionals at the public health facilities. Communication skills for Thai and Karen languages, and recently Burmese, and knowledge of medical vocabulary were essential, while ownership of a personal vehicle and/or a driving license are complementary when they need to accompany their patients to the facilities. Oftentimes, these roles were undertaken by skilled MHVs, or a representative of the population with transport and contacts with the healthcare facilities.

The role of CSOs and integrated health programmes for migrant populations

In addition to multi-cadre of workers and volunteers, local civil society has been described as instrumental in reaching vulnerable populations and facilitating malaria activities in the communities. Active CSO programme worked closely with MHVs to provide health educations on malaria and distribute mosquito nets, perform active case finding, make follow-up visits, and communicate with migrant workers and their employers in the private sector. In particular, CSO's

health programmes also covered other donor-funded health issues, such as tuberculosis and HIV, and other health demands within their migrant programmes such as disaster reliefs or migrant education. This integrated programmes and extended network within the border communities, especially for unregistered migrants who experienced poor healthy living conditions with limited access to health services. With training provided to MHVs for various programmes, their roles were frequently multi-purpose and were organically expanded beyond malaria.

Collaboration between CSO and government programmes was observed in outreach activities in the remotest areas, for which a pull of resources from both programmes was necessary to ensure comprehensive coverage of activities in the communities. Insufficient financial resource was cited as the key implementation challenge to cover all expenses especially for transportation by boat or helicopter to small communities in areas inaccessible by land and located in and around national parks and dams. Ad-hoc collaboration was also made with a medical volunteer programme, a national programme under the MoPH outside of malaria that provide essential and emergency health services in hard-to-reach areas, demonstrating the combination of malaria services with general health care for the in greatest needs.

“Since cases surged, we have faced many work challenges because the cases are in very remote areas in our district. Usually, we have to wait for the schoolteachers in those villages to visit the town centre to buy food for their students and we went back to the communities with them using their transport, or sometimes with a helicopter that send supplies in the areas. We need to visit the patients with those communities to provide them medicines. Many refused to leave their house or their communities to visit our facility, especially people who are migrants.” Male district primary care programme staff

“We have observed the surge of malaria cases from last April to September (in 2022). There are 3,000 population in our catchment areas, and 1,000 of them are not Thai

nationals. A few communities we provided services for do not have electricity. We also need to get on a ferry to cross the dam to those villages.” Male district primary care programme staff

The collaboration to provide malaria services was also described as extending beyond across the border. Government and CSO programme staff in Kanchanaburi explained that they provide technical guidance and training supports to Karen medical staff and volunteers to perform community-based malaria services similar to those provided by MPs. However, frequent changes or rotation of staff was described as a challenge to build the capacity and maintain the continuation of services on the Myanmar side of the border.

Local approaches to malaria programme integration: local human and funding resources

Programme integration initiatives have been trialled by district and sub-district programme managers in Kanchanaburi. Many have cited several examples and experience with integration efforts, and some also made proposals on how local implementers could best approach integration of malaria services. Allowing, and hiring, MPs to undertake a position at PCU, as previously mentioned, was one possible option to integrate human resources for malaria and other health services. Since PCUs have transitioned out of MoPH and became part of the decentralised system, the integrated role and/or position of PCU staff and MP was made possible because the transitioned PCU was able to make decisions regarding employment of their staff with more flexible regulation; positions were opened based on need basis rather than a MoPH's quota system which often limited PCUs to hire additional workers to support their operation.

Beyond integration of MP roles, LAOs at sub-district level have taken the initiative to officially organise training for their selected staff to diagnose malaria with microscopy, in preparation for the retirement and closure of one of the MCs in their district. The training was conducted by the VBDU staff with the support of the malaria programme, and advocated by the key local

implementers, including the LAO director and district governor, who were reported to have had past experience with malaria themselves. However, the training was discontinued, possibly due to reprioritisation of the local budget, following the change of a key leadership position.

In another sub-district, the LAO was reported to allocate their local budget to fund the implementation of malaria surveillance and response activities during the 2022-23 outbreak. Financial resources were partly provided for malaria programme staff to perform indoor residual spray (IRS) and malaria information sessions to migrant populations in several communities, and to compensate VHV's to perform household visits and mosquito net surveys in order to inform the programme's net distribution plan.

Additionally, efforts on disease integration were also taken by the local vector-borne disease programme. In addition to malaria, filariasis was also a disease under surveillance in Kanchanaburi. With MC and VBDU being tasked to diagnosis filariasis and monitor its transmission in their catchment areas, they were in the key position to engage MPs and other volunteers in their outreach activities and supervise them to perform surveillance of both malaria and other vector-borne diseases. Suggestions were heavily raised by PCU staff that indoor residual spraying (IRS) was one of the key malaria surveillance and response measures. Considerations for additional roles for MPs and their volunteer network could thus take the implementation of this vector control activities locally in their catchment areas. This delegation of surveillance activities could address a concern raised by the programme staff that as more direct malaria programme implementers reached their retirement; there would be fewer human resources at the local level with the specific skills and knowledge to continue these measures.

Moving forward, emphasis was made that the local malaria elimination activities will be driven by the provincial malaria committee which has recently been set up, following the recent outbreak and the need for more harmonised actions among implementers, to establish multi-level

coordination and implementation of malaria programme. The committee comprised of approximately 70 members across sectors, including the malaria programme, primary care programme, border police, border schools, and faith-based organisations. To push for integration, such committee serves as a platform for local implementers to advocate for (1) more participation of PCUs to provide facility-based malaria services, (2) more training for VHVs to perform selected MP roles, and (3) collaboration on surveillance and disease control among all local stakeholders.

6.4 Discussion

Drawing from in-depth interviews and informal conversations with key local stakeholders in Kanchanaburi province, this chapter explores their perspectives on the recent malaria outbreak and challenges with malaria control and prevention targeting MMPs, a highly vulnerable population along the Thai-Myanmar border displaced by conflict and isolated from general public health services. The findings highlight the extensive malaria services and intervention efforts carried out on-site by local malaria programme implementers, including MPs, MHVs and the PCU workers, in order to reach these population groups. Their insights emphasised the integration efforts which were already happening even though the malaria services were still needed, and provided recommendations for integrating malaria services in the future. However, the findings also revealed that many components of these essential services, particularly the testing device and the antimalarial treatments, and the service providers – the MP themselves – continued to be highly reliant on the external funding in addressing the outbreak situations.

Throughout the community-based studies in Thailand, I have acknowledged that the at-risk populations were not homogeneous and those living in endemic areas may be at risk at varying levels. Although malaria vulnerability among at-risk populations was intensively investigated in GMS countries, not all key factors, namely the exposure to mosquitoes, the barriers to access

healthcare, the challenges in receiving complete care, and the difficulties in completing treatment due to financial or social constraints (250), were equally addressed by the current malaria programmes. These challenges were further heightened by high-exposure transmission areas or worksites and by demographic vulnerability among low-income populations, displaced persons, and ethnic minorities whose cross-border mobility were induced by conflict-fleeing and (non-) income-generating activities (251). Moreover, the mobility of migrant workers was reported to be of both Thai and non-Thai community members who regularly engaged in cross-border movement. The case classification of malaria patients among non-Thai populations to length of residency in the country (namely the M1 and M2 statuses) leaves gap to identify and manage the high-risk Thai and non-Thai migrants residing in Thailand for over six months who regularly and seasonally cross the border for agricultural work in Myanmar side. These limited description of the variations among indigenous and imported cases and the presence of undocumented migrants could lead the implementation of malaria control activities along the border to be sub-optimal.

Unlike areas nearing-elimination in eastern Thailand and GMS countries, children and pregnant women have increasingly been at risk in this unstable environment. These age and gender factors may be compounded by the (in)ability of the populations to access care. With the recent rise in cases along the border, younger populations, particularly school-aged children and those under 15, have been identified as being at higher risk of malaria. This included children who resided at school dormitories or with relatives in the villages and travelled across the border on a daily basis or also weekends and school breaks. Their risk was further heightened by social behaviours such as use of smartphones and seeking internet access outdoors, especially at night, which increased their exposure to mosquitoes. Among female refugees, displaced mothers, and ethnic women, past studies on community-based reproductive health services by Shoklo Malaria Research Unit (SMRU) and Mae Tao Clinic in Tak province have reported several access challenges (252),

revealing that beyond the increased risks of malaria during pregnancy, women in refugee populations along the border experienced higher risk of suicide due to previous trauma and unplanned pregnancy (253). A study conducted among local ethnic populations in Laos identified similar barriers while also highlighting socio-cultural and gender-specific challenges that hinder women from preventing malaria or seeking appropriate care for themselves and their children (250). Although a comparable study has not yet been carried out in Thailand, the findings from Laos provided valuable insights into potential barriers to access service, where ethnic populations, let alone undocumented migrants, experienced more restricted healthcare choices compared to Thai nationals, further limiting their access to the broader essential services such as employment and education.

The presence of these “hidden” populations highlighted the necessity of community-based malaria care provided by MPs to ensure the community’s uptake of such services and also presented the chance for their role expansion to provide them with a more comprehensive care. Success cases can be drawn from the SMRU’s integrated community malaria workers (ICMW) model which operated particularly along Thai-Myanmar border (166), and from other programmes in Myanmar such as Medical Action Myanmar (MAM)’s programme (6) and the Community-delivered Integrated Malaria Elimination (CIME) model investigated by the Burnett Institute (254); several of which I have identified and explored in the landscaping studies in Chapter 2 and 3. These trials and service models however were limited to Tak province and implementing sites of each programme in Myanmar; high-burden provinces such as Kanchanaburi, Mae Hong Son, and other southern provinces, have yet to explore such integrated models and potential cross-border collaboration.

Beyond malaria, mental health concerns were a significant public health issue among migrant populations, largely due to their restrictive working conditions and conflict-fleeing status. A 2014 study on migrant workers along the Thailand-Myanmar border highlighted that migration journeys

were often characterised by debt, deception, and entry into exploitative workplaces. Workers across various industries reported experiencing forced labour, violence, abuse, and wage deductions (255). Those subjected to coercive working conditions may face additional barriers to healthcare access, often feeling hesitant to seek medical assistance due to fears of employer retaliation or exposure of their work conditions. Additionally, living condition in the temporary shelters or refugee camps further impacted their physical and mental health, as many individuals lack legal permission to work or leave the camps, exacerbating their vulnerability (256). Such barriers could be compounded by limited understanding of and access to health insurance to cover healthcare expenditures; an additional barrier experienced among migrant workers from in southern Thai-Myanmar border province (257). These workplace challenges posed a unique opportunity to strengthen the roles of MHVs who were members of migrant communities and dedicated their time to supporting public health initiatives that enhance migrant access to healthcare services (258). Recruited from ethnic or border communities, as well as workplaces or factories, many MHVs collaborated closely with NGOs and CSOs to engage migrant populations, mobilise communities, and facilitate participation in malaria prevention, control interventions, and outreach activities. Opportunities to train and promote them as MPs and equivalent cadre may support the malaria programme in a high-transmission setting to better reach the bulk of malaria cases, as well as vulnerable populations at risk of various public health programmes.

Finally, this investigation in high-burden context shed light on the role expansion of MPs that has already happened beyond their malaria services. These examples were observed in an MP who was employed by a decentralised PCU to carry out other assigned health roles in her communities. This multi-tasking role has several implications: one was that as patients visited this MP for their malaria service, s/he can directly refer them the PCU if the patients were not sick with malaria, or that s/he can provide additional services assigned by the respective PCU to their patients as well. This also implied that the locally-hired MP was well supported by the PCU staff

while maintaining the (expanded) roles in their community; however, additional evaluation is needed to ensure that their services remained accessible to their clients especially among reluctant undocumented migrants as the status of MPs may be upgraded to that similar to public officials managed under the local authorities. Other existing approaches observed in this setting included expanding the roles of VHVs and MHVs to include more malaria services. As malaria cases surged, these worker groups were increasingly leveraged to support MPs by following up with the patients in their respective community and monitoring their treatment adherence.

However, evidence on whether the involvement of these volunteers contributed to an increased uptake of malaria services remained unclear. Future programmes looking to engaging these volunteers should thus evaluate the extent to which this integration of roles, both organically and by design, had affected the implementation of malaria control and surveillance measures. For example, a direct assessment could be made to investigate whether MPs who also undertook the roles of VHVs or MHVs received a higher uptake of services than their non-volunteer counterparts. Vice versa, implementers could also evaluate the extent to which the participation of VHVs and MHVs in selected communities has increased the accessibility of their services and outreach activities, compared to communities where such participation was absent. These evaluations could further inform the programmatic decisions to design and implement role expansion/integration programme that best fit their existing networks and setup of workers. Beyond the contribution of these MP-VHV-MHV, efforts to sustainably integrate their roles into primary care should advocate for more buy-in from the PCUs and LAOs to locally co-fund the services of these workers/volunteers, particularly for their compensations, in collaboration with the local malaria programmes. While this contributed to the progress in programme integration, this strategy will also reduce the reliance of malaria services on external funding sources, and contribute to long-term sustainability of such services in these high-risk communities.

Strengths and limitations

Data collection at two different timepoints allowed this study to capture progresses and changes of the malaria integration efforts that either were expedited or discontinued during the grant cycle. However, I was not able to collect more direct views of the MPs and at-risk population unlike my earlier study in northeast Thailand due to lack of funding to conduct in-person data collection in this study. In-depth interviews with their supervisors, however, still contributed to the better understanding of additional functions of various cadres of CHWs, particularly border MPs, MHVs and their roles, that were not documented in prior studies. This was supplemented by informal conversations which allowed for in depth and ease of conversation about their views towards sensitive issues such as illegal cross-border movement, resulting in a more nuanced understanding of the demographics and access to care among MMPs and the hidden health burdens in this transmission setting. These insights contributed to understanding and determining the best approach to integrate malaria services and activities in the already complex formal healthcare system, and led to a subsequent policy engagement project to document evidence on entry points and best practices on service integration in Chapter 8.

6.5 Conclusion

In the context of border malaria, MPs remain a crucial provider of services among migrants and vulnerable populations in the communities. Interviews with malaria programme implementers indicated existing level of malaria service integration and a strong potential for expansion of roles beyond malaria. Options for implementation should consider formal integration of MPs into PCUs in some communities and strengthening the participations of VHVs and MHVs in the malaria programmes and service provision, particularly in malaria testing and vivax case management. A growing demand for migrant health services, particularly for pregnancy care and tuberculosis treatment, was also observed among newly arrived migrant populations. Findings suggested that role expansion is feasible within Thailand's decentralised health system and holds significant

potential for sustaining community-based malaria care, especially to address the ongoing transmission from cross-border malaria in the sub-region.

PART 3 Translating evidence into practice through engagement

The following two chapters present the results of two stakeholder engagement studies that aimed to inform the key stakeholders identified in the formative research of evidence of MP roles expansion and malaria service integration and collaborate with them to translate this evidence into practice at the community and policy levels. The design, implementation, and evaluation of the engagements were informed by the research results of the regional-level landscape and the country-level analysis in different endemic settings in Thailand. The stakeholder engagements were conducted in two settings: a community-led action in low endemic communities along northeast border presented in Chapter 7, and another with key implementers of malaria activities in a high-transmission setting in western border presented in Chapter 8.

Chapter 7 Public engagement to sustain community-based malaria services in Thailand: Findings from a low transmission case study

Summary

In low malaria transmission settings, maintaining community awareness of malaria and utilisation of malaria prevention measures and services are crucial and enable malaria post workers (MP) to detect and treat cases early. Based in our low-endemic site in northeastern area of Thailand, my team and I engaged with local stakeholders to collaboratively identify ways to maintain the community awareness, despite declining cases, and integrate MP roles and their services with broader community health priorities. Using a co-creation framework and a theory of change, we designed 36 engagement activities involving around 550 participants to co-produce locally-owned health education materials that combined malaria information with other pressing health issues. The process revealed that aligning the malaria activities with local concerns was key to a sustainable approach and integrating health communication campaigns for malaria and dengue offered one entry points for service integration. The evaluation suggested that future sustainable integration requires careful planning amid shifting policies on MPs and securing local funding for community-based malaria services.

Highlights

- The co-creation design enabled MPs and local stakeholders beyond malaria programme to adapt and use an integrated health information and communication material to promote proactive health education in the communities.
- By taking a bottom-up approach to advancing malaria service integration, the project provided an example of how community members, MPs, and health programme staff can jointly identify local health needs, highlighting the social determinants contributing to malaria and poor health outcomes that have not been sufficiently captured or prioritised by current public health programmes.

- These efforts highlight potential entry points for integrated resources and capacity building initiatives to secure additional funding and encourage local stakeholders to commit to sustaining MP roles or integrating their services into primary care in low-burden context.
- The project faced challenges in gaining traction due to changes in higher-level health programme management and the discontinuation of MPs, limiting its sustainability and broader impact; future initiatives should carefully consider a more sustainable alternative and adaptive strategies.

7.1 Introduction: Community-led actions to maintain malaria awareness and advocate for service integration

In low malaria transmission setting, maintaining community awareness of malaria and utilisation of malaria prevention measures and services are crucial and enable malaria post workers (MP) to detect and treat cases early. Although malaria is declining in parts of Thailand and in east Greater Mekong Subregion (GMS), capacity in communities is still essential to capture remaining infections and respond to outbreaks. The formative research in previous chapters suggested that malaria services performed by village malaria workers (VMWs) should be integrated into primary care, whereby services would be provided by frontline health providers closest to the communities (187, 207). Ideally, local primary care programmes, such as the primary care units (PCUs), in endemic areas would champion this strategy and assume responsibility for MPs, a cadre of VMWs in Thailand, and potentially assign them additional roles addressing other local health needs. Local integration is however highly context specific and cannot be taken for granted, with primary care facing competing priorities and a limited healthcare workforce that must allocate time and budget to other pressing matters. Additionally, community-based malaria services provided by MPs may not be sustained in settings where malaria programmes and funding are downsized.

Discontinuing these services could reduce the uptake of malaria testing and preventive measures, weakening surveillance and increasing the chance of outbreaks.

To explore potential entry points to integrate malaria services and maintain local awareness of the disease, community-led action is crucial to develop a local strategy focusing on their priorities. The active participation of key stakeholders involved in the delivery and uptake of malaria services, especially the MPs and the communities they serve, is crucial for exploring integration options in a local context. To operationalize this community-led action in our project, co-creation offers one approach to facilitating active participation. Embedded in a participatory process, it encourages relevant stakeholders to take part in defining problems and identifying solutions through ongoing dialogue and collaborative action (259). The approach has become popular for solving complex problems in healthcare whereby potential co-creators often include end-users, such as patients or intervention target populations, stakeholders or those interested or involved in the health programme, and academic or researchers generating scientific evidence to support programme design (260). In resource-limited setting, however, challenges in terms of equity (261, 262) and systemic barriers embedded in implementing contexts (263) have been identified as challenges to co-creation.

In Ubon Ratchathani Province, Thailand, where malaria incidence is low, we worked with local stakeholders to identify approaches for integrating malaria services into primary care. The aim of this community-led action project is to collaborate with the MPs, their communities, and the local stakeholders in the formative research, to promote integration of malaria services provided by the MPs in the context nearing elimination. In doing so, we worked closely with the MPs to (1) map their past, current, and future roles in malaria and beyond, and with the communities and healthcare workers to (2) identify local health concern in addition to malaria, and (3) co-develop information, education, and communication (IEC) materials that can be used by MPs and others to promote the malaria and other health priorities awareness.

In this chapter, I described the design and implementation of co-creation process involving the MPs, the communities, and others stakeholders and the results of the engagement activities, and highlighted the key lessons and insights from community-led malaria actions that will inform the enablers and challenges to local malaria service integration in near elimination setting. This pilot process and result can be used to inform a bottom-up approach for sustaining MP roles and local malaria integration that may be scaled-up across remote villages approaching or achieving local malaria elimination in Thailand.

7.2 Methods

Engagement project design

In designing this stakeholder engagement project which focused on community-led action and participation, my team and I adopted and followed a co-creation conceptual framework, which outlines a process of knowledge creation between academics and other stakeholders that could lead to translation of knowledge into practice. In public health, co-creation has been utilised to design intervention and knowledge creation by focusing the process on human experience of patients, service users, and practitioners, and the management of their dynamic relationships in complex health systems (264). The approach has often been used in implementation studies targeting the development of health services for patients and capacity building for providers, or improvement of services for specific population groups. Our project adopted the definitions and terminologies of co-creation to guide our co-design and co-production activities (259). To facilitate the evaluation of these activities, we adapted the concept of co-learning from the collaborative learning process by identifying enablers and barriers to achieving the outcomes of co-creation (265). With this framework, our engagement process was classified in three phases - co-designing, co-producing, and co-learning - enabling an interactive process where interim outputs build on each other.

Context of engagement

This stakeholder engagement was conducted in Buntharik district, Ubon Ratchathani Province; the main study site for the preceding investigation of malaria and primary care programmes (Chapter 4 and 5). As previously described, forest-going activities are often associated with agricultural work, timber trade and patrol along the border areas, and high cross-border population movement (10, 26). Although malaria incidence has reduced substantially (266), the area is still prone to outbreaks as forest-going activities create potential hot spots of ongoing transmission (267). In addition, human and drug trafficking associated with cross-border migration remain pressing social issues in these border communities (268). This not uncommon among communities along international borders in Thailand where income generating activities are more limited than in other areas (269).

Mapping the key stakeholders

To co-design the engagement activities and the locally created integrated health calendar (For full calendars of the project, please see <https://doi.org/10.5281/zenodo.15775272>). In our formative research, the stakeholders were mapped based on their roles in the malaria programme and the primary care programme at different levels of implementation. These include the MPs in all endemic villages in the district, the programme managers at the district and provincial levels, and the relevant health workers at the PCUs at sub-district level and Buntharik hospital. Additional local representatives were also selected to join the collaboration group, namely a malaria programme lead from Raks Thai Foundation, a local civil society organisation (CSO), and vector-borne disease leads from the vertical malaria programme and district dengue surveillance and response team. Representatives of at-risk populations such as forest goers, and members of the malaria endemic communities within the catchment areas of the selected MPs, including village leaders, village health volunteers (VHVs), and a local school, were also involved directly in the co-creation activities. These key stakeholders were approached using the contact information

from the previous studies and individually consulted to confirm their participation. Subsequently, a larger group of government officials, local residents, and general public were gradually invited to participate in a series of engagement activities targeting a wider audience. These secondary stakeholders included representatives from the local administration office (LAO) at sub-district level, community representatives and general members from non-endemic communities in Buntharik. Table 7.1 summarised the stakeholders and collaborators, along with their roles in public health and in our co-creation activities.

The engagement was led by me and two local female residents of Buntharik district based at a research office in Buntharik hospital, a community-district hospital in the centre of town. The office is embedded in a clinic delivering services for HIV and tuberculosis patients, referred to as a “special clinic” and separated from the main hospital buildings. The initiation of this project was informed by our previous studies highlighting the emphasis on tailoring malaria integration into primary care to the local context. To explore these options, the team initiated this public engagement initiative, with Buntharik hospital, a public referral hospital providing general health services, including treatment for malaria patients, in Buntharik, and Ubon Ratchathani provincial health office (PHO), the supervisors of MPs in the district and the province, as key stakeholders, and with the support of the Bioethics and Public Engagement department at Bangkok-based MORU.

Table 7.1 Characteristics of our collaborators and roles in public health and co-creation

Stakeholders	Roles in public health	Roles in engagement
Key stakeholders		
Research team	Four research team members with two local research assistants and members of the Buntharik communities working closely with healthcare workers at PCUs and community hospitals, and with malaria programme to map endemic villages and malaria patients in the province.	<ul style="list-style-type: none"> - Lead the consultation, brainstorm and dissemination activities - Co-implementing public campaigns - Prepare funding - Conduct the evaluation - Produce project report

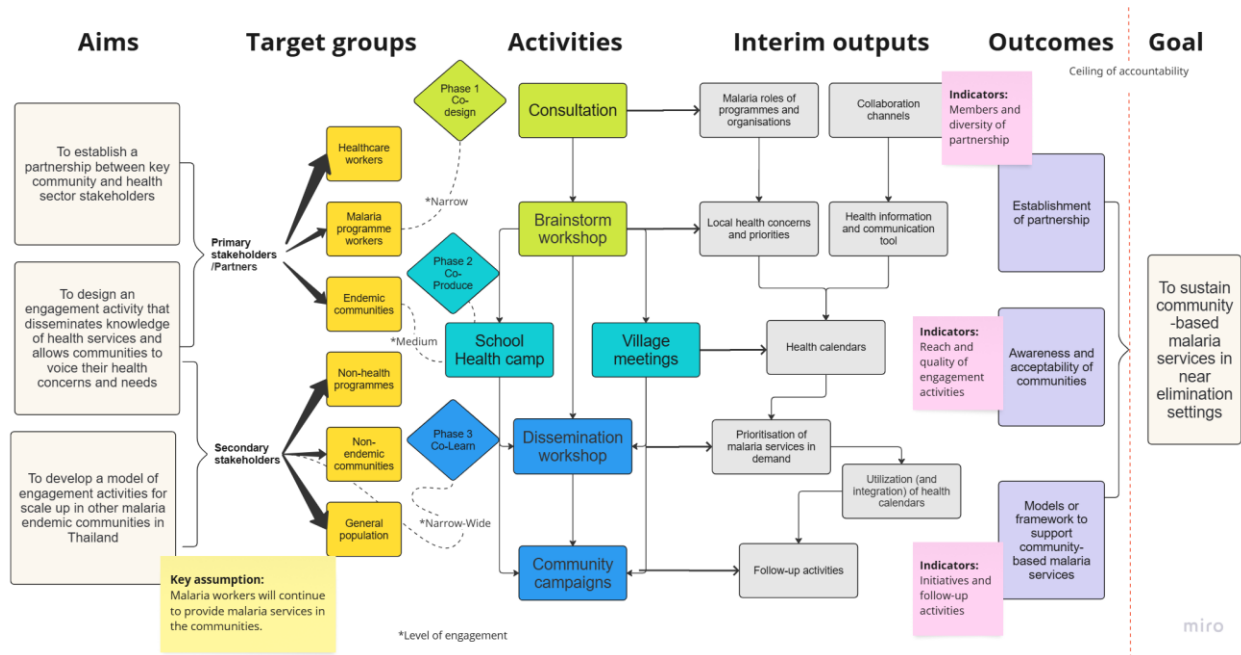
Stakeholders	Roles in public health	Roles in engagement
Malaria programme workers	MPs and malaria programme staff and managers at multiple implementation levels have direct roles in providing and overseeing malaria services and interventions including testing and treatment, surveillance and response, and control activities. CSOs directly implementing malaria programme are also included.	<ul style="list-style-type: none"> - Consultation on project design - Participation in brainstorming and dissemination meetings
Healthcare workers	Medical professionals, nurses, PCU staff in public health facilities have direct roles in providing and overseeing primary health care including outreach and facility-based services	<ul style="list-style-type: none"> - Co-implementing public campaigns - Direct evaluation and feedback to the project
Endemic communities	Member of malaria endemic communities including at-risk populations such as forest goers and their family members, farmers, VHVs, village leaders, village committee members, teachers, students	
Secondary stakeholders / audience		
Non-health programme	Government staff and representatives of local organisations overseeing public services and welfare	<ul style="list-style-type: none"> - Participation in dissemination meeting
Non-endemic communities	Members of communities beyond endemic areas, adult patients at community hospitals, teachers, students	<ul style="list-style-type: none"> - Participation in public campaigns - Direct and indirect evaluation of the project via an online platform
General population	Members of the public with interest public health and the project	

Designing and implementing the activities

Figure 7.2 illustrates how the co-creation process was designed with each component building on each other and leading to the desired outputs and outcomes, as well as the activities implemented at different phases, indicating the breadth of engagement with our target population: from key stakeholders (narrow level of engagement) to larger groups of community members (wide level of engagement). To measure the extent to which we achieved our aims, we developed the following sets of key indicators: for our first aim of partnership establishment, our key indicators

were the number and diversity (e.g. by gender, level of implementation, and type of organisations) of members in the collaboration group. Secondly, we aimed to evaluate the awareness and acceptability of malaria care through the reach and quality of our engagement activities, including the utilisation of and feedback on the project's outputs. Lastly, by compiling the interim outputs of the co-creation process, including follow-up activities that were initiated by our collaborators, we used the lesson learnt from co-creation and its enabling factor that can inform an engagement approach aiming to pilot and scale integration efforts in other settings.

Figure 7.2 Illustration of co-creation process, activities, and expected outcomes



In the first phase of our co-creation process, the team identified and consulted with our key stakeholders on the design of the engagement activities through consultation meetings and brainstorming workshops. The interim outputs were the identification of MP's malaria and non-malaria roles, local health concerns and priorities, and potential engagement channels in the communities (see Figure 7.3a). With embedded roles of MPs as (former) VHVs, communication on health information were frequently identified as their strength and activities MPs frequently

engaged in. Past malaria health education materials used or produced by the malaria programme tended to focus on a single disease, and were used to inform at-risk populations when they sought care with MPs or when MPs performed active screening within the communities. This was identified as one entry point to broaden the scope of their roles, by utilising IEC tools that integrate information on malaria and other local health priorities to raise awareness and promote preventative behaviours in their communities. IEC tools integrating information about multiple disease can help both at-risk populations and a wider group of community members stay informed on health issues they may be at risk of and how to prevent and recognise them at critical times, for example, prior to their forest travel. From initial consultation, this entry point also presented an opportunity to expand the funding sources for malaria from local authorities interested in using or adapting the tool further with other existing disease programmes, such as dengue. Considering the seasonal epidemiology of diseases and their associated risks with local socioeconomic activities, the engagement team and our collaborators decided on compiling and delivering health information in the form of a yearly calendar. Inputs on seasonality and local risks were gathered from the participants in the brainstorm workshop (see Figure 7.3b).

In the second co-producing phase, local endemic communities, specifically those within the catchment areas of MPs, were invited to re-evaluate the list of identified health priorities and the IEC template in order to ensure the comprehensiveness and usability of the calendar. This was conducted through townhall meetings comprising of primarily village chiefs, members of the village committee, VHVs, and adult members of the communities. We subsequently co-hosted a one-day school health camp at Baan Nhong Mek school in one of the villages, which later also became our key collaborator, to co-produce health information materials on malaria with dengue; the disease which were highly prioritised for surveillance among school children at the time. A local artist was engaged to design and produce the calendar, incorporating inputs from the school and the targeted villages.

At the third co-learning phase, we facilitated a series of evaluation activities to extract the learnings to inform follow-up initiatives onsite and potential scale-up in other settings. The first co-learning activity took place at a one-day dissemination workshop and began with information sharing on the updates on the malaria situation by our key collaborators in the malaria programme, including MPs and direct implementers of the malaria programme at local and national levels, to engage non-malaria stakeholders on malaria elimination strategy. This was followed by a co-prioritisation activity where participants identified and prioritised malaria-related activities they perceived should be continued onsite. Printed calendars were also disseminated to be used and shared within their organisations and communities at the workshop and at several subsequent campaigns at the hospital and the local market. Through feedback from our key collaborators, the calendars were also produced and shared online along with monthly health information via a popular and locally used communication platform - Line - an online messaging application - to engage with audiences beyond our collaborators and the participants in the in-person activities. Additional online activities that were conducted through Line aimed to engage and inform a wider audience of the monthly health issues, such as by hosting online quizzes featuring monthly health information. Over a period of 6 months, we tracked engagement with this online platform along with feedback and observations collected by our local team during the follow-up visits in the communities and with the collaborators (see Figure 7.3d-f)

Figure 7.3a-f. Images from co-creation, dissemination and evaluation activities

(a) mapping the roles of MPs and identifying local health needs at brainstorming workshops, (b) students producing and presenting the co-created IEC materials at a public school, (c) our stakeholders working together to prioritise locally-demanded malaria activities during the dissemination workshop, (d) setup and utilisation of health calendars in a community and health centre, (e) public campaigns at a communal market, hospital, school, and online platform via Line application, and (f) follow-up initiatives led by our collaborators using the IEC tool during health education sessions in classrooms and among MPs and VHVs.



Evaluating the co-creation process

Throughout the project, data was recorded in the form of engagement logs, meeting minutes, observation notes, and participant evaluation through questionnaire-based surveys and interviews. During engagement activities, photographs and results outputs from groupwork were documented and incorporated in our reflection and debriefing sessions. Throughout the project period, the engagement team met on a weekly basis to plan and review the project's progress. Table 7.2 describes data sources collected from each activity and throughout the project, incorporating qualitative data derived from observational records, and quantitative data from engagement logs and participant evaluations (details on the activities and the evaluation results are outlined in [appendix 6](#)).

Our initial reflective exercise focused on brainstorming on designing and tailoring the activities to engage with each of the key stakeholders to ensure that, regardless of their background, they can fully participate in each step of co-creation. Data was primarily extracted to measure the predetermined indicators and evaluate the extent to which we were able to achieve our desired

outcomes. We later extended the analysis to examine these outputs and outcomes were meeting the aims of the engagement. Subsequently, the team reviewed these evaluation results and extracted key learnings and enablers of successful co-creation activities. This reflective exercise also facilitated our recognition and analysis of the challenges arising from the co-creation process, the contextual health system conditions, and the policy issues at play throughout the project implementation. However, our reflexivity through team debriefs, fieldnotes, and self-documented records, was shaped by our position as embedded researchers. While this insider perspective brings contextual insight, it also introduces limitations. Consequently, our findings reflect an interpretive analysis of the activities in relation to the broader goals of community-led action and stakeholder engagement.

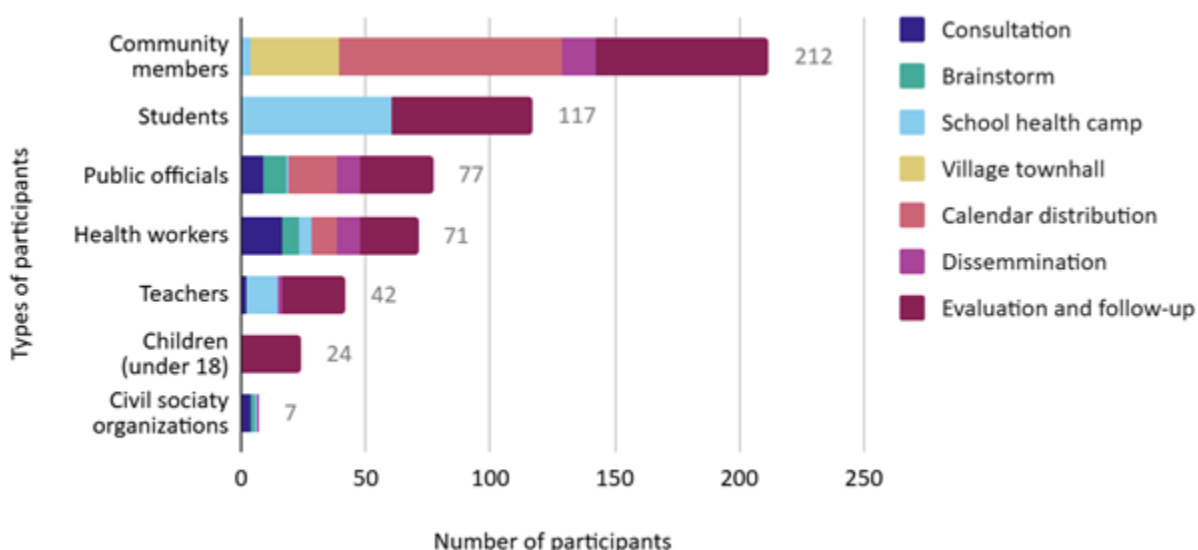
Table 7.2 Data sources from the engagement activities

Data source	Type of data	Activity
Engagement logs	Records of participant characteristics (number, gender, organisations) and context of activities (locations, settings)	All activities
Observation notes	Records of research teams' observation on the activities, key discussions and questions from participants, enabling factors, and problems or challenges	All activities
Meeting minutes	Written notes from the meetings at various stages of the project including formal and informal meetings with the stakeholders	<ul style="list-style-type: none"> - Consultation meetings - Brainstorming workshop - Dissemination workshop - Village meetings
Participant evaluation	In-person and online surveys and interviews to collect the level of participation, changes in knowledge and attitudes, and general feedback on selected activities	3 main co-creation activities: <ul style="list-style-type: none"> - Brainstorm workshop - Dissemination workshop - School health camp

7.3 Results

In total, we conducted 36 in-person engagement activities with 550 individuals participating in 3 main co-creation activities, 13 consultation meetings, and 20 public campaigns, dissemination and evaluation activities. Of all participants, 310 were women and 240 men. Our key collaborators, namely the health workers and public officials involved directly in malaria or relevant health programmes, participated in all the activities. The largest groups of participants were community members and students participating in our public campaigns. In addition, during the dissemination phase, 42 online engagement activities had participation of 139 individuals via a Line application channel.

Figure 7.4 Participant numbers in different engagement activities.



Interim outputs: MP roles, local health issues, and malaria service priorities

During the brainstorming workshop with the MPs, they were asked to reflect on the malaria services they provided and non-malaria roles they performed over the course of their careers and to visualise them along with the roles they performed beyond malaria in a timeline. This activity underscored our formative research findings that the majority of MPs had been recruited among VHVs, a role many of them still perform concurrently, linking them with primary care programmes

and highlighting their pivotal role as health communicators and bridges to the formal health sector in their communities. An example of a timeline depicting an MP's roles over time is presented in Figure 7.5a. These visual diagrams were presented to a wider audience in the subsequent workshops to highlight the embedded roles of MP, providing basis for the discussion on how to formally support the integration of their malaria roles and services with use of health education material in the communities.

The second activity of the brainstorm workshop focused on the identification of local health concerns. Participants were asked to identify health issues and diseases that were critical in the communities, writing down their submissions individually before placing them on a whiteboard for further discussion and voting. They were also asked to identify at-risk groups, risk behaviours, and their time at risk for each health concern. Figure 7.5b presents the visual diagram of an annual timeline with seasonality and socio-economic activities contributing to increased risks of certain health issues and diseases among specific population groups; these inputs were subsequently used to design the health calendar.

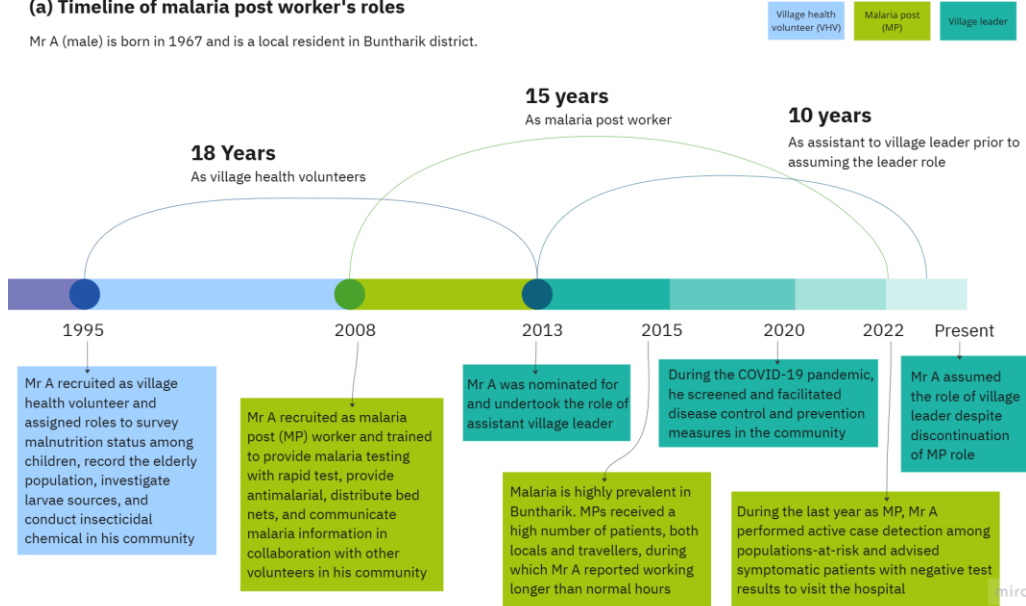
At the subsequent dissemination workshop, a co-prioritisation activity was designed to engage the participants in brainstorming and prioritising the future of malaria services in Buntharik district. Firstly, participants individually wrote down on cards the three most important malaria services that should be maintained in their communities, shared them within their group, and placed the cards on the table. Each group then rotated to review and discuss another group's cards before selecting nine cards they perceived as most important. Lastly, groups rotated again, discussed the selected cards, and ranked them by priority. Figure 7.5c visualises each rotation step and shows the results from the prioritisation among three groups of participants, highlighting the priority to maintain MPs and community-based malaria activities.

Figure 7.5a-c. Diagrams showing example results from the activities

(a) MP life story and roles timeline, (b) identification of local health concerns by months, and (c) prioritisation of malaria activities during dissemination workshop in order of priorities (high-priority activities are placed at the top). The actual results were recorded on whiteboard/flipchart in Thai.

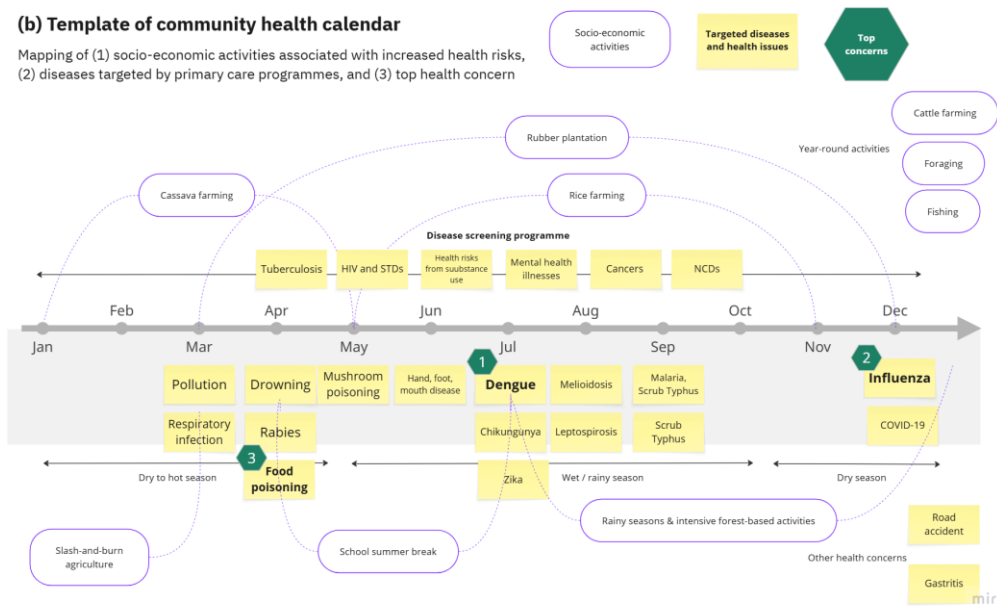
(a) Timeline of malaria post worker's roles

Mr A (male) is born in 1967 and is a local resident in Buntharik district.



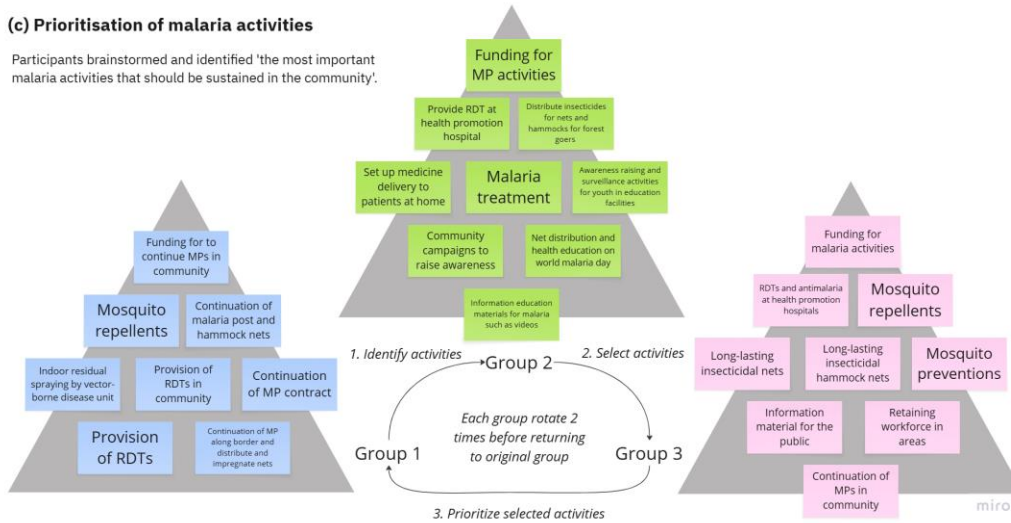
(b) Template of community health calendar

Mapping of (1) socio-economic activities associated with increased health risks, (2) diseases targeted by primary care programmes, and (3) top health concern



(c) Prioritisation of malaria activities

Participants brainstormed and identified 'the most important malaria activities that should be sustained in the community'.



Engagement outcomes: enablers, barriers, and feedback

Following the three key aims previously outlined in figure 7.2, we have created with a set of indicators showcasing the extent to which the co-creation process was able to produce the interim outputs and desired outcomes. Enablers and barriers to achieving each outcome was extracted and summarised in Table 7.3. Additionally, we documented participant feedback on the engagement activities, followed up on their use of the calendars, and gathered their perspectives on the future of community-based malaria services. Feedback from our collaborators and the wider participants of the project reflected on the integration of local health concerns and the extent to which the calendars can be utilised to communicate these concerns in the communities. Table 7.4 summarises the key reflections from the collaborators and the participants on the engagement activities and the co-created IEC tool.

Table 7.3 Engagement outcomes, enabling factors, and barriers

Desired outcome	Interim output	Indicator and result	Enabler and barrier
1. Establishment of partnership between community and key stakeholders	<u>Malaria roles of programmes and organisations:</u> identification and involvement of programmes and organisations who provide malaria	Established working group among 26 key collaborators: <ul style="list-style-type: none"> - 3 malaria post workers - 6 primary care and hospital staff 	We were able to establish and sustain a good level of participation among co-creation partners throughout the duration of project implementation. This

Desired outcome	Interim output	Indicator and result	Enabler and barrier
	<p>services and primary care services to advocate for community-based malaria care</p> <p><u>Collaboration channels:</u> establishment of collaborative network beyond malaria-related stakeholders to implement engagement activities</p>	<ul style="list-style-type: none"> - 6 local, 4 provincial, 2 national malaria and health programme staff - 4 researchers <p>Expanded collaborators: 16 individuals including village health volunteers, village leaders, and from schools and government offices</p>	<p>network was also expanded to include non-malaria stakeholders; however, discontinuation of MPs at sites and re-assignment of malaria programme managers challenged the sustainability of this collaboration.</p>
2. Community awareness and acceptability of the designed engagement activities and dissemination of knowledge regarding health services that correspond with local demands	<p><u>Engagement tools:</u> identification of preferred engagement activities (e.g., meetings, workshops, campaigns, including in-person and online engagement channels) and their target audiences</p> <p><u>Local health concerns and priorities:</u> identification of health issues that were perceived as priorities by communities and local health providers</p> <p><u>Information, education and communication material (IEC) or the co-produced health calendar:</u> utilisation and feedback on the IEC materials integrating information about malaria and other local health priorities in the form of the calendar (physical and online versions)</p>	<p>Involvement of 550 participants in 36 in-person engagement activities:</p> <ul style="list-style-type: none"> - 3 primary co-creation activities in each phase - 13 consultation meetings - 20 public campaigns, dissemination and evaluation activities <p>Expanded the dissemination online engaging 139 Line Official Account followers from 42 online engagement activities</p>	<p>The project leveraged the key stakeholders to organise multiple rounds of engagement activities that reached endemic communities and the general public. Positive feedback on the health priorities incorporated into the health calendars reflected the effectiveness of co-creation in identifying health risks perceived at the local level. Level of engagement among school students and participants in the dissemination meeting could be improved.</p>
3. Model or framework to	<u>Prioritisation of malaria services in</u>	Locally owned health calendar 2024:	Co-creation activities were able to address

Desired outcome	Interim output	Indicator and result	Enabler and barrier
support scaling up	<p><u>demand:</u> co-identification of malaria services that the local implementers and community representatives, including the key and expanded collaborators, perceived as necessary and should be maintained in the communities</p> <p><u>Follow-up activities:</u> Additional activities or new initiatives taken by our collaborators beyond the end of the project</p>	<ul style="list-style-type: none"> - 100 calendars distributed; with 36 tracked, observed, and followed-up in-person for feedback (14 among collaborators and 22 among expanded network) - 2 MPs utilised the calendar as an IEC tool in their VHV roles - 4 schools adapted calendar materials and used them to conduct health education sessions in classrooms 	<p>power asymmetry among volunteers and professionals by using techniques such as anonymity and co-reviewing of results. MPs were able to advocate for their roles among local implementers and national programme staff; however, there were limited follow-up initiatives from the provincial and district health programmes.</p>

Table 7.4 Summary of evaluation, feedback and stakeholder views regarding the engagement activities and co-created outcomes

Evaluation question	Feedback	Views of collaborators and participants
How was your experience and participation in co-creation?	<ul style="list-style-type: none"> - More time allocation for the smaller group activities and series of activities over time could be designed to encourage more participation from the school students and dissemination workshop participant - More ice-breaking and introduction of participants will provide opportunities for networking among extended groups of stakeholders 	<p><i>“I think the students will benefit from participating in these activities [dissemination workshop] and apply what they learn when they are back at school.” Local schoolteacher describing her experience from the dissemination workshop and potential to involve students’ participation in these activities in the future.</i></p> <p><i>“I like the idea of engaging with the schools but one-time activity might be too limiting and lead to low level of participation from the students. Two days or more are better for learning activities and provide them opportunity to present their work.” Community hospital staff</i></p>
What are your learnings and advice for our project and future health communication and malaria campaigns?	<ul style="list-style-type: none"> - Forest going is still common among the communities who are familiarity with malaria from past experience but have minimal concern about the disease. - High level of advocacy for dengue and activities related to dengue. Health education sessions or material should focus on a combination of febrile illnesses - Suggestions from key collaborators to organise a series of meetings (e.g. 2-3 times/year) to share learnings and updates on malaria at community level - Suggestions to create a shared online folder or repository for the project to collect and share updated documents regarding malaria information and activities 	<p><i>“Follow-up activities could be design in collaboration with the hospital. We can look at clinical case records and suggest the disease or health issues that we should inform the communities about in a timely manner [...] This will make them more active and aware of the diseases.” Community hospital staff</i></p> <p><i>“Currently if the hospital receives patients with forest travel history they will be diagnosed for malaria with microscopy. But we have seen more patients with dengue and experienced delayed treatment for this group. What we need is a faster referral process [...] I suggest future health communication to focus on febrile illnesses such as leptospirosis, dengue, COVID, influenza, scrub typhus, and malaria.” Community hospital staff</i></p> <p><i>“Our work focuses mostly now on dengue surveillance in transmission areas, actually the same areas as we conducted malaria surveillance, but malaria activities are more limited [...] Meetings are now mostly hosted by the national programme.” Vector-borne disease unit staff</i></p> <p><i>“I initiated a new project on dengue prevention in schools and referred to the school activity we organised together and the content</i></p>

Evaluation question	Feedback	Views of collaborators and participants
		<p><i>in the calendar. The project will focus on eliminating foci sources in school area. There will be a cleaning day by village health volunteers and students. Drowning is also an important issue which we requested for funding from the local administration each year to train students across ten schools in our sub-district. [...] We also shared the information from the calendar among schools, teachers, and parents in our network. Our teachers also used the information provided in the calendar to create quizzes and test questions.” Local schoolteacher</i></p>
<p>Where are the calendars located?</p>	<ul style="list-style-type: none"> - Many calendars are placed on support columns in homes and/or on the walls in indoor setting or office space - Convenient for use in providing mobile health education and in group settings - Preference for other types of calendars such as desk calendar especially among facility-based staff - Suggestions from local residents and general public for adapting IEC materials in calendar as larger posters placed in communal spaces 	<p><i>“I like the calendar. I think I would use it more if they are produced in as a desk calendar. We also shared the invitation to follow the online calendar to the Line groups of village health volunteers and village leaders in our community. The physical one we placed at the area where if patients come to see us and get their blood pressure and weight measurement, they can read it and we inform them about health issues of the month.” Health promotion hospital staff</i></p> <p><i>“If it is a desk calendar I would be able to use it when I am tending to patients like pregnant women and elderly patients while they are sitting and receiving the services. I think what can be added is information about first aid and injury treatment such as insect bites or bee stings. Locals often got bitten when they forage for honey in the forest” Health promotion hospital staff</i></p>
<p>What do you think about the design and function of the calendar?</p>	<ul style="list-style-type: none"> - The design was well-perceived overall - Suggested to enlarge the infographics, fonts, and size of the calendar - Date grids are most utilised for users, particularly when placed within a facility-based spaces - Suggested to add details of public holidays and lunar calendar details 	<p><i>“The information and the graphics are well designed but if I place the calendar high on the wall or far from the tables in the shop I think people would not be able to read them properly.” Calendar recipient, shop owner, and a member of general public</i></p> <p><i>“The content about health is very useful. But I normally also look for Buddhist Lent days in a calendar and this one does not have information about the Moon’s Phases [such as in lunar calendar] so I could not tell which day is full moon or new moon [the dates when</i></p>

Evaluation question	Feedback	Views of collaborators and participants
	<p>because these are important for most communal activities especially for Buddhist events</p> <ul style="list-style-type: none"> - Little attention paid to the background page; many suggested that general public may not be aware of the malaria background of this project 	<p><i>residents often gather for merit-making activities at temples and organise other celebrations in the communities].” Calendar recipient and a member of general public</i></p>
<p>What do you think about the list of local health priorities?</p>	<ul style="list-style-type: none"> - The most popular content was on mushroom poisoning, dengue, rabies, PM2.5, and RSV - Many interested in children-related health issues such as drowning, and hand, foot, mouth disease - Suggestions to add IEC on diarrhoea, food poisoning, conjunctivitis, first aid and treatment of basic injuries 	<p><i>“I really like the information about health concerns targeting children like drowning or hand, foot, and mouth disease because we often visit schools to conduct health education. This is helpful because we can use it directly to communicate with students. The volunteers can use them as well.” Health promotion hospital staff</i></p>
<p>How was the calendar used?</p>	<ul style="list-style-type: none"> - Teachers and MPs used the calendar as a health education tool in classroom and school activities - Appropriate size for outreach health education sessions; but not in a large classroom (with over 15-20 students) 	<p><i>“The calendars received a fair amount of attention from my neighbours, when they come to see me they read and look at the pictures from the activities at the local school. Every Thursdays the village health volunteers will meet at my place to conduct our routine household visit for foci investigation (dengue) and I usually inform them then about what health issues we should be looking out for each month”Former MP</i></p> <p><i>“Dates and Buddhist Lent days are what I looked for most in the calendar. Currently there is interest in mushroom poisoning as it is seasonal. I brought the calendar to the monthly village meeting to inform the communities about the health issues each month. The material is useful and appropriate for when I need to travel and take it with me. The hanging calendar is good because people can still read the text, especially for older people. The desk calendar is not suitable for health education activities.” Former MP</i></p>

Key lessons on the integration of community-based malaria services

This section highlights key lessons and insights based on the feedback of our stakeholders and collaborators, and the reflection of the research team on the co-creation process. We have conceptualised these into three key considerations for programme implementers looking to implement a sustainable approach to supporting community-based malaria care in endemic communities with low transmission of and priority for the disease, while some of these lessons may also apply to a high-transmission setting.

1) Responsiveness to local communities and stakeholders is crucial in building trust and sustainability of the engagement despite facing policy changes

In this project, we conceptualised responsiveness as to how the project react or responds to the needs and concerns of the stakeholders, including the communities, we worked with. Responsiveness was crucial in building trust and sustainability of our engagement. The project was designed to respond to local needs in the communities we worked with, however, a national policy change limited our ability to achieve its goal. We found responsiveness to be a recurring challenge when engagement was operating under a changing policy context, requiring adaptive strategies and reflexivity in responding to these changes while managing the stakeholders' expectations.

During our implementation, we established a network of diverse stakeholders in terms of positions - from volunteers to professional workers who were directly and indirectly involved in the provision of malaria services. The collaboration facilitated our ability to respond to their expectations on the co-created the health IEC material, and formed a shared value of community-based malaria services as well as a vision for the future of malaria activities. However, no formal partnership or leadership was established beyond the implementation of this project. Several reasons underpinned this result: the involved MPs were withdrawn towards the end of the project due to

national policy changes discontinuing community-based testing and treatment, followed by the re-assignment of the malaria programme manager. Understanding and planning for unexpected changes, such as in the case the removal of key community-based and programme-based collaborators, could enable the engagement to better cope with challenges in sustaining the collaboration, as well as, to optimally respond to and align the engagement approaches with the transition of MP's community-based services to facility-based services provided by the health centres and hospitals.

“Patients still come to see me and ask for a malaria test and I had did already informed them that I am no longer providing the services as MP [...] It is hard to refuse them because they are my neighbours and we live in the same community. I only can advise them to visit the hospital.” Former malaria post worker

“I think the health promotion hospital can contribute by recruiting a local person who is suitable for the malaria role in the community or we can also offer a place for MP to provide their service in our facility but we do not have funding for this and will need to collaborate with the provincial health office for budget and other support.” Primary care unit worker

2) Co-created integrated health education material is crucial for maintaining malaria awareness but ideally should be followed by capacity building activities.

With the decline of malaria cases and perceived risk of the disease, the importance of the prolonged awareness and acceptability of malaria services among the remote communities, as well as the implementers, cannot be understated. In building the local health calendar as the key output of the co-creation, a consideration was made that the IEC materials for malaria would only be able to maintain this discussion among the audience and enhance their attention when integrated with other local health concerns. This option could strategically pave way for other

malaria activities to also be integrated with other public health campaigns that target similar at-risk population or diseases.

Additionally, our participants in the brainstorming workshops emphasised the need for integrating information and services related to other vector-borne diseases and local illnesses - such as dengue, influenza, and food poisoning - to maximise the awareness campaigns and increase the acceptability of potential service users. Our experience with the calendar co-creation showcased potential for local implementers to integrate such interventions from the bottom-up, such as by conducting health education sessions and raising public awareness about malaria and other local health concerns together. However, the project was unable to secure local funding to continue or expand on this strategy and sustain related activities beyond the project's completion. Future attempts should explore this alongside capacity building activities or interventions; for example local distribution or provision of long-lasting insecticide treated bed nets (LLINs) and topical repellents as part of an integrated prevention measure with dengue programme.

“It will be difficult to apply for funding to conduct malaria-only activities because it is not perceived as important enough in the community. Funding requests need to be made in combination with other diseases like dengue [...] we recently reported 17 dengue patients and some of them presented severe conditions because they purchased medication by themselves and sought care late. One patient is non-Thai and discouraged to visit the hospital because of the cost. The person also went to MP for malaria test but the test was negative, then went to a private clinic vomiting blood and was only then referred to the hospital [...] Activities for malaria should be matched with local problems like this to justify for funding.” Primary care unit worker

“In the short-term I believe the MPs that may be discontinued should continue their roles as village health volunteers and leverage that role to continue providing malaria services together with the health promotion hospitals. It also depends on the MPs if they volunteer to do so especially if they are not an incumbent VHV [...] In the long-term, it is best to transfer their roles to the (health promotion) hospital who should receive the rapid diagnostic test and will be able to screen patients in the community and refer cases to the district hospital for diagnosis [...] I also think the community will benefit from having Abate sand and chemicals for impregnated bed nets sold in the community itself rather than only depending on distribution of such preventive equipment from the programme.” Malaria programme manager

3) New champions could emerge from involving stakeholders beyond key malaria implementers

Co-creation is a collaborative process of brainstorming, designing, and learning, and in our case, of approaches to inform community-based malaria care, which naturally would focus the action and attention on the direct implementers of malaria services. However, effective integration of these approaches needs to look beyond the usual stakeholders of malaria programmes that were facing challenges from limited resources and competing local mandates. Following the engagement activities with wider audience, local schools and teachers emerged as key actors, taking the initiative further and using the co-created IEC tool to raise awareness of health risks and prevention measures among youth populations. There are several reasons for this active participation. Knowledge and practice of malaria prevention not only benefits the population at risk for malaria but also those susceptible to other vector-borne diseases in the community. This was particularly the case for dengue control, with at-risk school children as the main target population for the local implementers. Leveraging school-specific interventions (such as

preventative health education for dengue, flu vaccination, dental care) can help broaden the scope and the scale up of malaria integration efforts by building comprehensive ecosystem of IEC strategy for local health issues and involving the parents and the relevant organisations including primary care providers and local administrative organisations at sub-district levels. Involvement of new stakeholders, and local health priorities, could potentially progress the integration of malaria care into the broader community landscape.

7.4 Discussion

Throughout the co-creation and learning process, we have identified some key considerations for local implementers to take into account as they design or adopt co-creation approaches to sustain community-based malaria care that best suits their implementation contexts. This includes responding to local needs and engaging in subsequent communication and advocacy with decision makers or extended network of stakeholders beyond the initiative. Co-producing IEC materials was a feasible and viable option, and in our case, an entry point for integration from the bottom-up. However, there are more opportunities to utilise co-creation techniques to better respond to local demands in other settings. For example, a review of participatory research and community engagements in dengue control have documented co-creation activities that enabled community mapping of potential mosquito breeding sites, organising clean-up campaigns, mobilizing bulk purchase of preventive materials, and developing guideline for safe larvicide use in the communities (270). These various examples could offer potential entry points for programmes that aim for additional resource mobilisation and capacity building such as purchase of prevention equipment or development of guideline for malaria and dengue preventions. Learning from the contextual challenges of this engagement, we propose that future co-creation strategy should also tailor their strategy to focus on securing additional funding sources as a way

to persuade relevant stakeholders to take more actions on local malaria situation and continue the funding for MPs or integrate their services into primary care.

It was also evident that participatory approaches appeared to perform well when the discussions among participants were open and exploratory. As previously noted, co-creation is most meaningful when a diverse group of stakeholders is engaged; thus, involving the key stakeholders, from community members to service providers, was imperative to this approach. We were able to gain their attention and acceptance by co-producing IEC materials that addressed local health needs and were collectively usable regardless of their positions. Similarly, a co-creation project in Ghana used co-creation to design a board game and brochures that address local needs, and fostered the relationship and sense of inclusion in health service delivery among a network of caregivers and healthcare providers (271). The project however faced challenges in terms of securing more support from top-level health programmes to boost its sustainability and expand its impact to a broader audience. Our project faced similar challenges that limited the follow-up initiatives from the direct malaria implementers. However, through learning from participant feedback, we gained support from local schools enthusiastic to further adapt and utilise the material to support proactive health education in classrooms and through online platforms to reach adult family members in the community.

Ensuring fair and equitable contributions to co-creation activities was vital from project onset: participants were encouraged to voice their opinions and actively participating in the activities regardless of their work positions and social norms. Our project stakeholders included individuals that were likely to be familiar with each other through their residence in the communities and professional network with embedded social and professional hierarchies, introducing potential bias and engagement challenges. To ensure fair contributions by our stakeholders we attempted to set up the scene for meaningful and equitable exchange by tailoring the brainstorming activities into small groups of MPs, reflected on these results to a larger group of stakeholders, and

subsequently created a platform for anonymous contribution in a group setting during the dissemination workshop, which involved an extended group of community members. This allowed the MPs, health volunteers, and community members to fully participate in the co-creation activities as the anonymity provided an opportunity to review ideas, such as in the malaria services prioritisation activity, with minimal external influence from local health workers and programme staff with whom they shared supervisory relationships. This design also provided a rare opportunity for bottom-up feedback mechanisms between frontline workers and programme managers.

Through this engagement project, we have made a case for a bottom-up approach to advance malaria service integration. As previously mentioned, integration is complex and by no means a novel issue; integration of vertical disease programmes has been heavily discussed, and recently restated with continuing advocacy for universal health coverage (37) and health for all policies (41). Recent recommendations on the integration of service delivery for malaria have argued for more research and implementation with the communities to co-create and foster ownership of the strategies that linked malaria services or integrated them with existing and highly valued services among the beneficiary communities (30). Suggestion was also made for such integration to reframe malaria as an equity issue and underscore the priority for disease elimination and intersectionality of malaria risks with other health concerns (30). In our project, the co-identification of local health needs and how they are linked with increased risks for malaria among endemic communities provided an evidence-based illustration of the social determinants of malaria and other health burdens among the vulnerable population, offering one example. Nevertheless, this proved to be a challenge amid the context of changing nationally priorities that discontinued MPs in at the study sites. Although the project yielded satisfactory results in producing and disseminating an integrated IEC tool, piloting this co-creation strategy to promote integration at the local level was insufficient for securing the continuation of MP programme when

there were changes in both funding and policy at the national level. Careful thoughts about how engagement can be leveraged to identify entry points for integration and act on them were thus crucial for planning strategies that are sustainable and responsive to unexpected changes.

Sustaining community motivation is crucial for malaria elimination efforts, and maintaining the participation for such efforts is a challenging endeavour when malaria is not a perceived priority health concern for local authorities or in community members' daily lives. Rather than trying to solely promote malaria awareness, our project used these opportunities to address other health issues that directly impacted the community. This required the engagement team to understand the sociocultural environment and motivations of the community to participate in the health interventions (272-274). Recent studies have showcased such engagement outcomes by measuring their coverage and costs to provide evidence of health outcomes (275, 276), evaluate the public's motivations to participate in citizen science project for malaria control (277), and co-create tailored trial implementation based on local knowledge and community-set goal (278). Unfortunately, we could not measure the uptake of community-based malaria services provided by the MPs involved in our project as their role was discontinued despite receiving feedbacks from the MPs that their patients and clients still visited them for their services. We attempted to capture the quality and reach of the project by defining outcome indicators through the established partnership, awareness and acceptability, and tracking of follow-up activities. In addition, these evaluations were a step towards measuring the degree to which the project had supported a bottom-up approach to co-creating sustainable malaria elimination efforts. Indeed, this evaluation could be strengthened by measuring community integration and community relationship with the malaria programme to explore an optimal and context-appropriate approach that would ensure the engagement's retention and sustainability (279).

Strengths and limitations

We acknowledged the power asymmetry among our stakeholders, and between the stakeholders and the engagement team due to their work positions, professional relationships and social norms. In order to minimise the asymmetry, multiple series of evaluation and feedback sessions were conducted by the two local researchers who were members of the community and spent a large amount of time with our stakeholders. We attempted to ensure a fair contribution of the stakeholders by tailoring these activities and using anonymity of inputs at several stages of co-creation. Through these activities, the contributions from all levels of stakeholders, regardless of their backgrounds, were recorded and used for the development of IEC materials and evaluation.

7.5 Conclusion

Co-creation has strong potential for ensuring the sustainability of community-based health care in the context of declining awareness and advocacy of vertical disease programmes, such as in the case for malaria elimination. The process promoted local collaborative partnerships to co-create an integrated community-informed health IEC material aiming to raise awareness of malaria and various local health concerns, as well as maintain the roles of the key malaria workers - MPs - as community mobiliser and the first point of contact for malaria patients in their communities. Future attempts to sustain community-based malaria services should explore such opportunities to integrate local health needs into existing malaria interventions, or vice versa, and consider leveraging locally sourced funding and leadership as an entry point to advocate and initiate such integration.

Chapter 8 Entry point to malaria service integration in Thailand: Findings from workshops and case studies in a high-transmission setting

Summary

Efforts to translate the research evidence from this thesis into practice continued in this high-transmission case study. In this engagement project, my team and I established a network of 41 individuals advocating for the integration of community health workers (CHWs), including malaria post workers (MPs), village health volunteers (VHVs), and migrant health volunteers (MHVs), for the sustainability of community-based malaria services. This network included key six partners—MORU researchers and regional civil society organisation (CSO) platform—as well as four malaria programme managers from the government and non-government organisations. The network expanded to Kanchanaburi, the site for high transmission case study, involving 29 local implementers and community representatives in the engagement, and piloting the community-led monitoring (CLM) initiative in the villages with highest malaria burden along the Thai-Myanmar border. Throughout the project, stakeholders participated in multiple rounds of engagement to identify and prioritise local approach the CHW role expansion and malaria service integration in their implementing contexts. Using a co-creation approach, the team and the participants collaboratively documented case studies demonstrating how malaria programme integration can support long-term sustainability.

Highlights

- The case studies documented through this engagement project emphasised opportunities for integration through a national-level policy advocacy for an integrated vector-borne disease implementation package, local public-private partnerships, collaborative capacity building for multiple cadres of workers, and a health insurance scheme providing integral access to broader care tailored for undocumented populations in high-burden areas.

- The team succeeded in getting feedbacks and insights on the evidence of the formative research and the practicality of integration from the stakeholders in Thailand, offering lessons and examples of collaborative efforts in driving actions from the direct malaria programme implementers and their implementing partners with examples and strategies that can be taken forward to inform the next RAI grant proposals and activities.
- One of the entry point in action was the development of a CLM pilot, a participatory action initiative then went beyond role integration to focus entirely of the empowerment and capacity-building of the communities - including the MPs and other volunteers - to identify and advocate for local health services that can improve their malaria and health outcomes.

8.1 Introduction: Policy engagement and co-creation

In Chapter 6, we have already learned of the situation where reappearance of malaria along Thai western border has threatened Thailand and the regional progress towards elimination. The recruitment of additional MPs and intensified malaria activities showed a positive outlook of the role expansion in the context where malaria services continued to be locally demanded especially among the vulnerable populations. This matching of demand and available resources, previously unobserved in a low-transmission setting, has yielded practical examples of the malaria service integration and potential role expansion of MPs, for example, through the formal employment of MPs in the primary care units (PCUs), or through the locally-funded vector control activities where VHV were actively involved in. Against this backdrop, there is now an ideal policy window to integrate MPs and their malaria services into the primary care system and explore novel approaches to sustain community-based malaria care in the last mile towards elimination.

Following the outbreak case study and learnings from the stakeholder engagement in low transmission case study, a subsequent engagement project was conducted to collaborate with

key stakeholders of the malaria programmes in a high-transmission setting: programme implementers, service providers, and community representatives in the provinces along Thailand-Myanmar border. The objectives of the engagement project were to (1) document evidence on enabling factors and entry points to sustain the malaria roles of CHWs, (2) coordinate actions and advocacy for community-based malaria care in vulnerable and at-risk populations, and (3) strengthen the collaboration among policymakers, practitioners, and researchers. In addition, through this engagement, I aimed to disseminate and receive feedbacks directly on the formative research results, primarily the Regional Artemisinin-resistance initiative (RAI3E) operational project, from the direct sub-recipients and implementers of RAI grants in provinces along the Thai-Myanmar borders, such as Tak, Kanchanaburi, Mae Hong Son, Ratchaburi, and Prachuapkirikhan.

This chapter presents the engagement activities and outcomes of two co-creation workshops that documented approaches and best practices of sustaining community-based malaria care with local and national malaria programme implementers, as well as the key local stakeholders in Kanchanaburi province, our case study for high malaria transmission area.

8.2 Methods

This engagement project was funded by Oxford Policy Engagement Network (OPEN) Seed Fund to strengthen the collaboration among researchers and policymakers and enable both partners to share evidence and support its used in policymaking. Through this series of stakeholder engagement, I incorporated the opportunities to disseminate such findings directly with the key stakeholders for their feedback, and to continue the dialogue stemmed from the formative research among the programme implementers in Thailand. Based on the regional landscaping results and conceptual framework presented in Chapter 2-3, I updated the framework with the

context-specific factors and considerations for role expansion and service integration strategy from Thailand case studies presented in Chapter 4-6. This updated framework was used to provide a key summary of the research findings, outline the design of the sustainability board , and guide the subsequent discussion among the workshop participants.

Engagement design

Similar approach to the engagement project in low transmission case study (in Chapter 7) was used to design the co-creation activities and engage with the stakeholders, with the emphasis on the value of diverse perspectives and balancing the power dynamics. The activities were adapted to match this project’s particular objectives, the characteristics of the participants, and other logistical factors such as time and environment of the venue. In this project, evaluations were conducted primarily through the reflection of the engagement team against the expected outputs and outcomes. Table 8.1 provides the outline of the activities, outputs and outcomes that respond to the objectives of the engagement. Detailed information on the co-creation process and engagement activities, including mapping of patient’s journey and CHWs’ roles (280), and co-prioritisation and brainstorming activities with a shared physical platform (281), and development of the conceptual framework into one of the key co-creation sessions, ‘sustainability board’, are provided in [appendix 7](#).

Table 8.1 Objectives, activities, expected outputs and outcomes of the engagement

Objectives	Activities	Expected outputs	Expected outcomes
1. Document evidence on enabling factors and entry points to sustain the malaria roles of CHWs	<ul style="list-style-type: none"> ▪ Mapping of CHW roles and malaria patients’ journey to understand the diverse roles CHWs perform beyond malaria, and the pathway to malaria care among at-risk populations ▪ Panel discussion and perspectives sharing 	This includes identification of pathway for integration at the community level such as engagement and awareness campaigns, as well as entry points for integration at the implementation level such as training, funding, selection of CHWs. Participants were asked	Evidence of best practice and approaches, and case studies from malaria programme managers and implementers

Objectives	Activities	Expected outputs	Expected outcomes
	on the examples, enabling factors, and entry points for sustainability	to share their experiences and way forward for their respective programmes.	
2. Coordinate actions and advocacy for community-based malaria care in vulnerable and at-risk populations	<ul style="list-style-type: none"> ▪ Identification of immediate and long-term priorities to maintain community-based malaria services ▪ Identification of local health issues and development of proposed actions among local implementers 	To actualise the identified pathways and entry points, participants described what actions and considerations needed to be taken for their respective programmes.	Policy options and action points to inform programme managers and implementers
3. Strengthen the collaboration among policymakers, practitioners, and researchers	<ul style="list-style-type: none"> ▪ Dissemination of research outputs and engagement outputs to key stakeholders for their feedback and suggestions ▪ Mapping local network of implementers and needed actions ▪ Piloting, monitoring, and evaluation of a collaborative initiative at site 	Participants were informed of the formative research results and provided their feedback and updates based on their current programme implementation. Participants maintain communication and share information of CHWs and their services that could be leveraged for new and/or existing initiatives.	Established network and resources for implementation

Characteristics of the engagement team

The engagement team consisted of the same researchers and research assistant team in Chapter 8, with an additional national malaria programme (NMP) coordinator at MORU Epidemiology team. The team and I also worked closely with our key partner at the CSO Platform (previously known as the Malaria CSO Platform in the Greater Mekong Subregion), a network of more than 60 CSOs and community groups from the Global Fund RAI implementing countries: Myanmar, Thailand, Cambodia, Lao PDR, and Vietnam (www.cso-platform.org). The Platform plays a key role in fostering collaboration between CSOs networking and stakeholders, enhancing capacity through different activities and providing technical support in programme design and advocacy of

malaria grant implementation. The team co-applied and received funding from Oxford Policy Engagement Network (OPEN) at the University of Oxford to conduct this project. The activities conducted in Kanchanaburi province were co-funded and led by our partners and local implementers team at ALIGHT and vector-borne disease unit, and the CSO Platform.

The stakeholder engagement meetings were led primarily by two MORU staff (myself and my colleague) and with the support of the CSO platform staff in the follow-up workshop in Kanchanaburi. Research assistants and coordinators assisted in the notetaking and observations of the activities. Supervisions of the design and implementation of the engagement activities were provided by two programme managers. All engagement activities were conducted in-person and in Thai language.

Characteristics of the participants

Building from the key stakeholders mapping from the formative research, we invited the representatives of relevant organisations in the malaria programme at multiple levels of implementation to participate in the workshops (Table 8.2). Participants include the NMP staff and vector-borne disease programmes at the national and sub-national levels, CSO and non-governmental organisations (NGO) programme managers and implementers, primary care health programme managers and implementers at PCUs and health promotion hospitals (HPH), and the MPs, VHVs and MHVs representing their communities in endemic areas. Many of the participants were familiar with each other based on their professional relationships and collaborations in the malaria programmes, for example, among programme managers across government and non-government organizations. Among participants from Kanchanaburi province, many of them worked closely in their implementing areas, for example among different cadres of workers (MPs, MHVs, and other healthcare providers). In these workshop activities, a flexible approach was applied to allow and allocate time for the participant to engage in the conversations and group

activities. We purposively allocated participants from various backgrounds to work in groups, and facilitated the group discussion to the participants were able to present and/or contribute to their group and overall activities.

Table 8.2 Organisations represented and the number of engagement participants
BKK: Participants in the Bangkok workshop; KB: Participants in the Kanchanaburi workshop

Stakeholder	Organisation	Participant
Malaria programme	Ministry of Public Health: Division of Vector-Borne Disease (DVBD) at national level, Vector Borne Disease Control Center (VBDC) and unit (VBDU) at sub-national level	BKK: 3 1 DVBD & 2 VBDC KB: 4 2 VBDC & 1 VBDU
Primary care programme	Ministry of Public Health: Provincial Health Office (PHO), District Health Office (DHO) Ministry of Interior: Health Promotion Hospital (HPH), Local Administrative Office (LAO)	BKK: 1 1 HPH KB: 8 1 PHO, 4 DHO & 3 HPH
CSO/NGO implementers	ALIGHT South East Asia Program Raks Thai Foundation (RTF) World Vision Foundation Thailand (WVFT) M-FUND, Dreamlopmnts Foundation	BKK: 6 2 ALIGHT, 2 RTF, 1 WVFT & 1 M-FUND KB: 5 ALIGHT
Community representatives	Malaria Post Workers (MP) Migrant Health Volunteers (MHV) Village Health Volunteers (VHV) Community leaders (CL)	BKK: 3 1 MP/VHV & 2 MHV KB: 6 3 VHV/MHV & 3 CL

Implementing the engagement activities

Two 1.5-day workshops were conducted during July and August 2024. The first workshop took place in Bangkok and were joined by key malaria programme implementers at multiple level and community representatives. A follow-up workshop was conducted with key local stakeholders in Kanchanaburi province. Box 8.1 summaries a series of activities throughout the project period. In addition to the summarised key activities summarised, the engagement partners met on a monthly basis and joined the post-workshop debriefs to discuss work progress and opportunities to collaborate beyond the project, which made space for learning and reflections of the co-creation activities and our engagement outcomes.

Box 8.1 Project timeline throughout 2024

Project set-up (January – June)

1. MORU and the CSO platform outlined the agenda of the co-creation workshop, and invited the participants, targeting multi-level stakeholders involved in the management and implementation of malaria programme.

Engagement activities (June – August)

2. MORU and the CSO platform co-hosted the 1.5-day co-creation workshop in BKK with 24 participants with the following co-creation activities:
 - Mapping of CHW roles and malaria patients to understand the diverse roles CHWs perform beyond malaria, and the pathway to malaria care among Thai and migrant populations;
 - Panel discussion on sustainability and way forward for the malaria programme with representatives from the government and non-government actors to share their perspectives on the examples, enabling factors, and entry points for sustainability;
 - Co-identification of immediate and long-term priorities to maintain community-based malaria services.
3. MORU joined a 1-day training session co-organized by VBDC and ALIGHT on the integration of malaria activities with the community-based services and capacity building for CHWs, with 29 participants. The training included interactive information sessions, refresher training, and practical demonstrations on:
 - CHWs and volunteers as health educators and communicators as well as knowledge on and awareness of malaria situation in Kanchanaburi province
 - Demonstration sessions on malaria testing, treatment and control including the use of malaria rapid diagnostic tests, patient treatment follow-up and consultation, long-lasting insecticidal net impregnation and indoor residual spraying.
4. MORU and the CSO platform outlined the agenda of the reconvening co-creation workshop and dissemination meeting, targeting communities and implementers in Kanchanaburi province.
5. MORU and the CSO platform co-hosted a 1.5-day reconvening co-creation workshop in Kanchanaburi province with 19 participants (16 were new participants who did not join the first workshop), with the following co-creation activities:
 - Mapping of network and stakeholders and key support needed to maintain early testing and treatment of malaria in the province;
 - Introduction to community-led monitoring (CLM) and identification of key issues related to the 4 core elements of CLM (service availability, service accessibility, human rights, and gender) that need to be addressed regarding malaria and health services in the province;
 - Identification of local health issues by community representatives
6. The CSO platform and ALIGHT set up the first CLM team in the pilot province.

Monitoring and evaluation (September – December)

7. Monitoring and evaluation of CLM activities
8. Dissemination and reporting of engagement activities and findings

Figure 8.1a-e. Photos from the engagement activities

(a)-(c) CHWs and programme implementers presented their group's discussion on CHW roles, malaria journey, and priorities for malaria services in their settings, (d) the sustainability board showcasing 5 enabling factors and 6 entry points to CHW role expansion and sustainability of community-based malaria care. Participants used sticky notes to add their thoughts and examples of integration practices they observed in their work, and e) a flipchart collecting brainstorming ideas on key public health issues in malaria endemic communities in Kanchanaburi province.



8.2 Results

The result section presents findings from the participatory activities based on the three expected outcomes on: (1) evidence of best practices and approaches; (2) policy options and action plans,

and; (3) established network and resources that could be leveraged to support community-based malaria care.

1. Evidence of best practices and approaches for malaria role and service integration

Through the expanded roles of CHWs: what roles beyond malaria do workers perform?

We documented the diverse malaria and non-malaria roles of CHWs, including MPs, VHVs, and MHVs. The presence of CHWs in the workshop has allowed for the opportunity to describe their malaria-related roles in detail and also highlighted their community representation roles as community leaders and volunteers. In total, there were 32 malaria roles and 30 other health and non-health roles performed by these workers who were community-embedded human resources recruited to perform activities assigned by various health programmes (see Figure 8.2a). Their diverse roles also extended beyond other health-related activities and covered general communal roles such as conducting household surveys or visits, to addressing broader wellbeing issues such as fire control and community-safety surveillance. Key learning among the participants was the reflection on the role integration which have already happened organically and presented an opportunity to strengthen their capacity beyond malaria.

Through the lens of the malaria patients: what enables and blocks patients to access care?

Patient journey mapping was designed into co-creation activity to outline three malaria patient's journeys to access malaria care based on the national malaria elimination strategy's classification of confirmed cases: Thai nationals, non-Thai populations residing in Thailand for over than 6sixmonths (M1), and those residing in Thailand for less six months (M2). After the maps were completed by participants in each group (see Figure 8.2b), they rotated to review others and identify what gaps and enablers to services they can observe and add to each journey. The co-created maps characterised malaria patients with different legal statuses and identified four gaps in malaria care that could be addressed, and five four enabling factors to improve access to, and quality of, malaria care for these populations. Enabling factors included: (1) the provision of

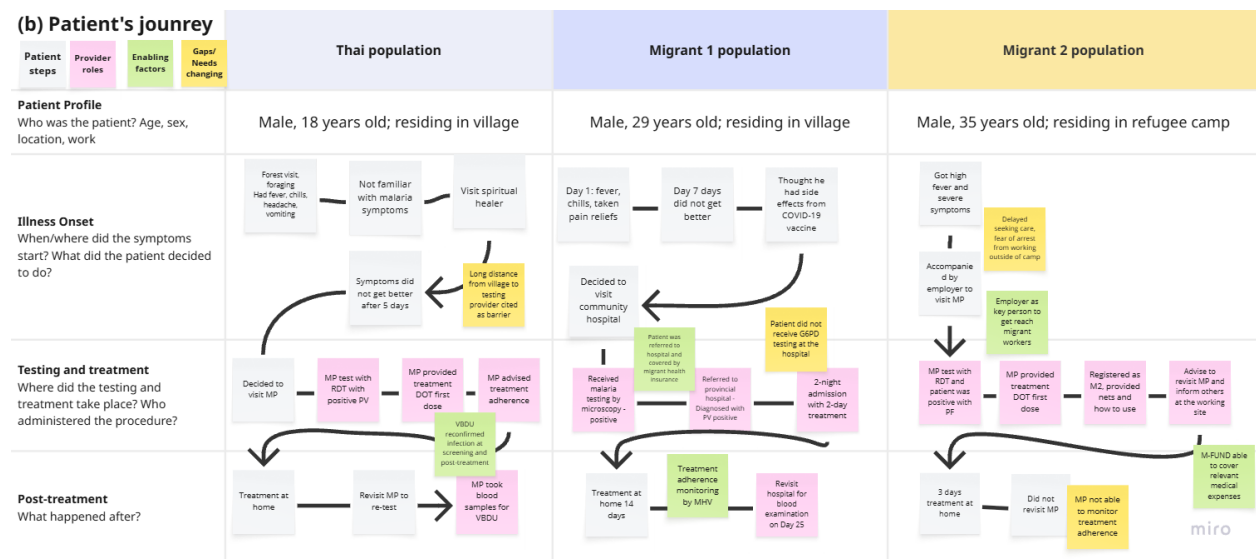
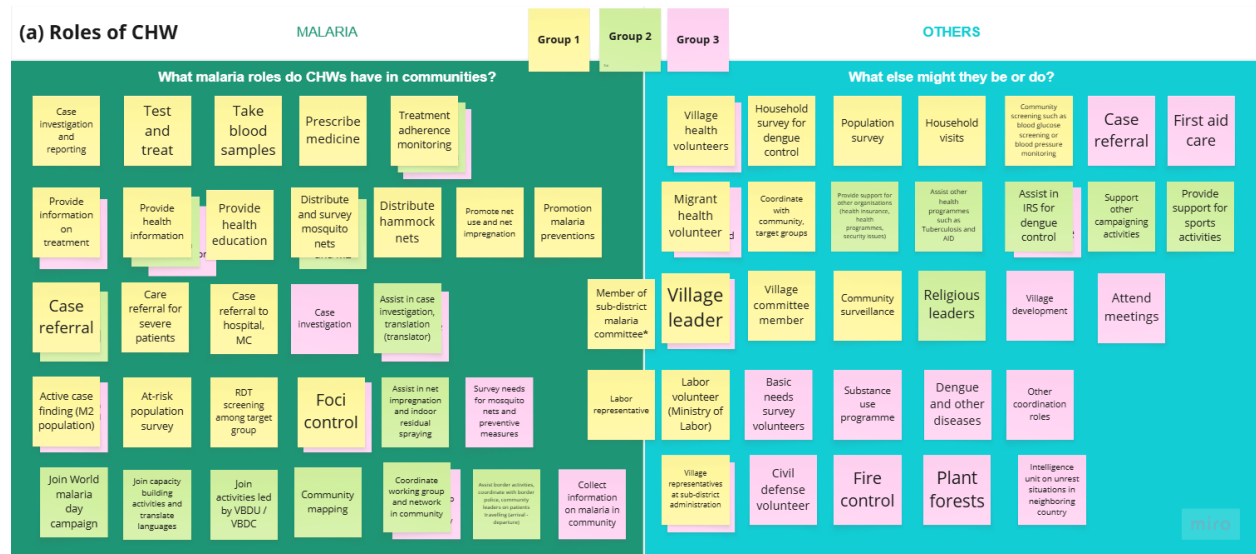
malaria diagnosis by microscopy at the vector-borne disease unit's malaria clinics as a tool to confirm test results and ensure treatment completion, followed by (2) community-based monitoring of treatment adherence by CHWs, (3) the availability of two migrant health insurance schemes to cover related medical expenses, one through the government migrant health insurance scheme for registered migrant and another through private health insurance (M-FUND) targeting undocumented migrants, and (4) private employees as key contact persons for migrant workers. The following barriers to accessing malaria care were identified: (1) distance from many of the border communities to nearest health facilities, (2) delayed decision in seeking help among migrant workers, (3) limited ability to monitor treatment adherence among mobile populations, and (4) unavailability of G6PD testing at local health facilities.

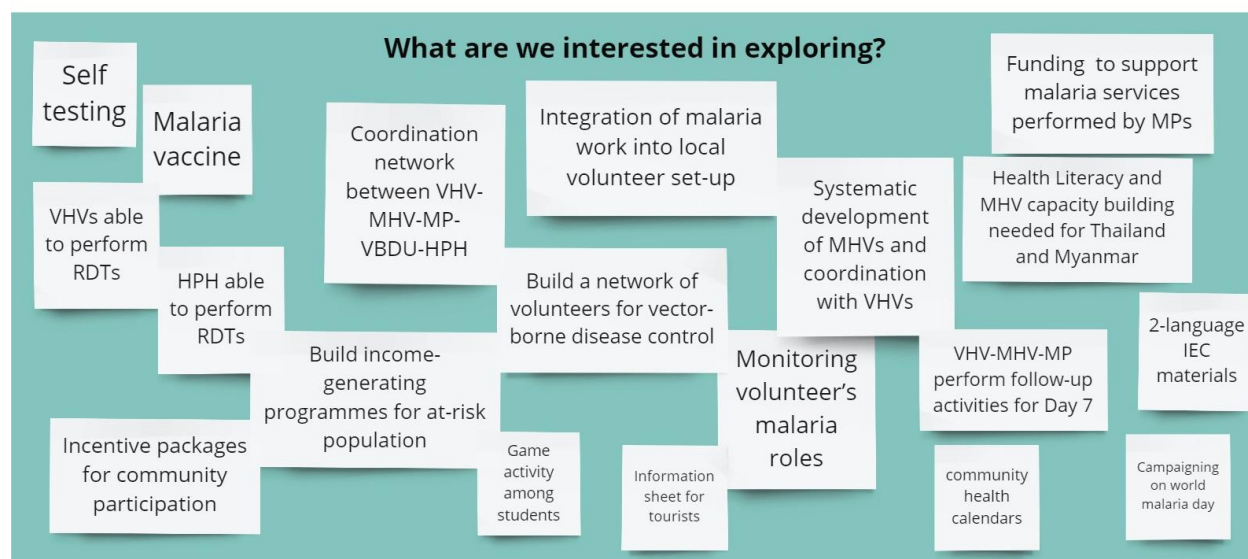
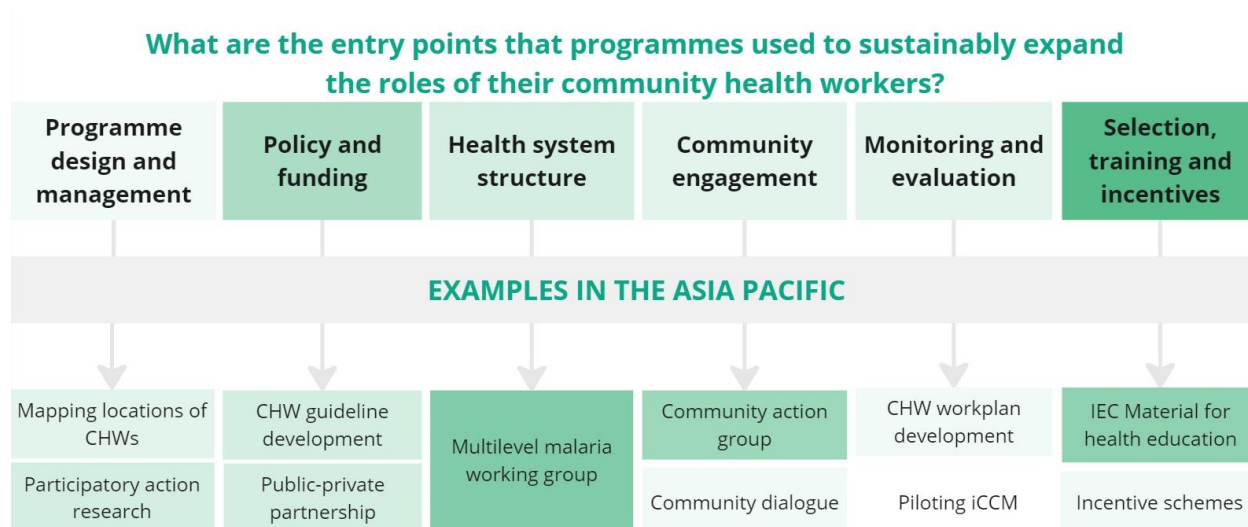
Through the lens of implementers: Entry points to integrate community-based malaria services

Our panel discussion gathered insights from the participants on the key factors influencing the integration and sustainability of community-based malaria services and the entry points to take further actions on. At the onset, participants were invited to review the 'sustainability board' (see [appendix 7](#) and Figure 8.2c), which featured enabling factors and entry points extracted from the formative research, along with considerations and suggestions based on Thailand contexts. Among the highlighted examples and ideas anonymously proposed by the participants, the recruitment/selection and training of CHWs was a popular choice of an entry point for role integration, emphasising opportunities for future training and capacity-building initiatives that integrate various CHW groups and disease programmes within their implementing areas. Additionally, participants recommended establishing a working group—involving multi-level implementers and led by the community—to enhance collaboration in implementing community-based malaria initiatives, with the potential to address other local health needs. Figure 8.2c presents the key findings from the sustainability board.

Figure 8.2a-c. Diagrams of the co-creation activity results

(a) Mapping of CHW roles. Each group identified the diverse roles of CHWs with multiple sticky notes in the same category represent frequency of responses for the respective roles; and (b) Malaria patient journey mapping was made for three cases as examples of at-risk populations comprising a Thai national and patients with two different migration statuses: M1 which refers to migrants living in Thailand for 6 months or more, and M2 population for those residing in Thailand for less than 6 months. The color-coded sticky notes in white, pink, green, and yellow, depict the patient's journey, services they received, enablers and barriers to malaria care respectively, and (c) Approaches to integrate community-based malaria services. From left to right: the shades of green identifying entry points and examples represent the numbers of votes received for the respective topics: the darker the shade, the higher the votes received. We received a total of 125 votes, with each participant allowed up to 5 votes. The top three priorities identified were: (1) entry points through the workers' recruitment, training and incentives (22 votes); (2) community involvement in malaria activities (15 votes); and (3) policy (12 votes) as well as financial (11 votes) support for workers. Examples of activities (what are we interested in exploring?) submitted by participants are presented in white text boxes.





Four case studies on malaria-health service integration and implications on sustainability

In addition to collecting their views and experiences, we also documented unique examples of practices, highlighting how the implementers approached service integration in practice and the extent to which they may contribute to overall sustainability of malaria services in the context of high malaria transmission. Table 8.3 provides a key summary of the following four case studies: (1) M-FUND insurance scheme that ensures access to malaria and broader health services among undocumented migrant population, (2) integrated training on malaria and capacity building activity for multi-cadre CHWs including MPs, VHVs and MHVs, (3) policy-level advocacy for an integrated package of vector-borne disease control measures, and (4) public-private collaboration

to financially support the distribution of malaria preventive measures in areas with high demand. These examples showcased various approaches to integration at different entry points: from ensuring the access and coverage of health services in the endemic communities, to engaging with local government and private sector for policy and funding advocacies. Full details of each case study are described in [appendix 7](#).

Table 8.3 Summary of four case studies and their implications on malaria service integration

Case study	Description
M-FUND insurance scheme to support access to quality healthcare for migrant populations	<ul style="list-style-type: none"> • Malaria is a disease covered by the Migrant Fund or M-Fund insurance scheme for medical expenses in places or communities where there are no government agencies or CSOs supporting healthcare costs for undocumented migrant groups. • M-Fund works with different implementing partners in various provinces particularly those along international borders, each managing its budget and service coverage differently. • In areas where their members experienced malaria, M-Fund volunteers will refer suspected patients under the scheme, with World Vision Foundation Thailand (WVFT) as an implementing partner, covering the cost of malaria treatment, for example in Tak (bordering Myanmar) and Sa Kaeo (bordering Cambodia). In Chiang Rai and Kanchanaburi, WVFT will support the cost related to malaria screening and the patient's transportation, but not the treatment which is instead absorbed by the scheme. • The scheme presents a unique entry point for integration through a non-profit community-based health insurance that directly addresses gaps in access to care among undocumented migrant populations; an under-served group of vulnerable populations at increased risk of malaria.
ALIGHT-VBDC's integration of malaria activities with community-based services and capacity building	<ul style="list-style-type: none"> • ALIGHT and VBDC in Kanchanaburi province collaborated to build capacity for 10 VHVs and 10 MHVs working in one of the most endemic communities along the Thailand-Myanmar border. • The training succeeded to (1) develop volunteers' capacity to provide community-based malaria services, (2) share experiences and learnings from the tasks and work implementation of VHVs and MHVs, and (3) integrate the work plans of different CHW cadres as part of the Regional Artemisinin Resistance Initiative 3 (RAI3E) project. • The integrated training demonstrated the local implementers acknowledgement and preparation towards the long-term goal of transitioning malaria testing and treatment responsibilities from Mos to VHVs and MHVs in the future.

Case study	Description
DVBD's coordinating top-down policy support for localised integration of vector-borne diseases	<ul style="list-style-type: none"> • Preliminary discussions have now begun to explore potential support for malaria control efforts in border areas, prepare the communities and their health volunteers to take on a more active role in malaria prevention and surveillance, and explore their expanded roles in testing the local residents in remote communities. • DVBD has collaborated with LAOs in many sub-districts to raise awareness for malaria elimination and advocate for community-based malaria interventions to be funded locally through LAOs; some of which could be transition to the PCUs under LAO's management. • Among the key advocated areas, a service package combining multiple vector-borne diseases, including malaria services and control measures with other local public health priorities such as dengue, chikungunya, and scrub typhus, were introduced as a crucial entry point to advocate for service integration at the policy level. • Alongside policy advocacy, DVBD has revitalised a repository of information and resources on multiple vector-borne disease to further engage their LAO stakeholders, the local health network, and the general public on the relevance of controlling and monitoring these diseases.
Rotary's contribution to malaria services with public-private partnership	<ul style="list-style-type: none"> • In 2023, a public-private partnership (PPP) in Kanchanaburi province, supported by Rotary International, raised malaria awareness and provided preventive tools to at-risk populations. This collaboration showcased a co-financing model uniting government and NGO implementers to strengthen community-based malaria services. • The partnership included the VBDC, which led malaria control efforts; the Kanchanaburi PHO, which provided administrative support; ALIGHT, which engaged hard-to-reach communities; Rotary International, which supplied and distributed insecticidal nets; and the President's Malaria Initiative (PMI) USAID, which contributed financial and technical support. • This PPP model demonstrated the potential to secure new funding and expanded resources for malaria control in high-risk areas and addressed increasing malaria risks among most underserved populations effectively.

2. Policy options and action points to inform policymakers and implementers

Building on CHWs' roles, malaria patients' experiences, and integration discussions, the session on the second day of the Bangkok workshop focused on identifying key malaria interventions for integration across implementing contexts that should further be considered and taken actions on

by the relevant programmes. Once immediate actions and long-term priorities were outlined, the local stakeholders were engaged in the follow-up meeting in Kanchanaburi to discuss the practical steps and actions needed for implementation.

Expanded roles and integrated services: Where can we start?

Participants were divided into three groups, each with 6-7 members representing public health (MoPH or LAO), CSOs, CHWs, and community representatives, to brainstorm on immediate actions and long-term goals that would strengthen the efforts and ensure the sustainability of community-based malaria services. Figure 8.3 presents the prioritisation pyramid, highlighting immediate actions and long-term priorities, with detailed description in Table 8.4. Additionally, 21 other ideas emerged out of the brainstorming but were not prioritised for action; these were compiled with integration best practices into our engagement reports and shared in dissemination meetings to inform a wider audience.

Figure 8.3 Co-prioritisation of immediate actions and long-term goals.

Sticky notes represent the 29 ideas/action points proposed by the participants working in groups; 28 of which points were selected from ideas/action points on each groups' final priority pyramid, with one (pink sticky note outside of the above pyramid) selected from the ideas that were set aside by another group during the exercise. Blue circles depict the selected immediate action points as a follow-up activity to implement after the workshop. Red circles depict each group's long-term goals perceived as necessary for achieving sustainability of their malaria programmes.



Table 8.4 Immediate actions and long-term goals to support malaria activities by groups

Immediate action	Long-term goal
Group 1: 1 government (NMP), 3 CSO, and 2 community representatives	
Expand malaria training to cover existing VHVs in A1 communities and involve them in the planning of local malaria activities to better reach target populations, and identify opportunities for MHVs to be more involved in malaria services including testing and treating patients	Involve community and sub-district committee in the design and implementation of the malaria programme, and enable potential scale up of these malaria working groups from pilot community to sub-district level
Group 2: 2 Government (VBDC), 2 CSO, and 2 community representatives	
Provide capacity building, including training on health literacy and consultation skills, for existing and new MHVs to be recruited in communities where malaria cases have emerged	Advocate for the local network to implement indoor residual spraying (IRS), and coordinate malaria control and surveillance activities at the community level
Group 3: 1 Government (LAO), 4 CSO, and 2 community representatives	
Build the partnership between the CSOs and local government to align local malaria activities and enable more effective implementation of tailored interventions in the communities particularly where migrants were key at-risk groups	Strengthen cross-country collaboration on malaria control at the Thailand-Myanmar border

Network mapping and priority setting of malaria activities: Who is doing what?

At the first session in the subsequent workshop in Kanchanaburi, we continued the discussion by engaging the new and some old participants to (1) identify key health issues in endemic communities (Figure 8.4a), (2) map local stakeholders who were directly involved or needed to be involved for malaria service integration (Figure 8.4b) and (3) outline necessary actions from each stakeholder to maintain and ensure early testing and treatment services, which was ranked as the most critical component of the current malaria programme implementation in Kanchanaburi (Table 8.5). Ensuring that early testing and treatment for malaria is accessible and available within the communities were (anonymously) voted as top priority among the participants, among other malaria interventions such IRS and LLIN distribution. Many proposed actions to sustain this service were directed at LAOs and PCUs under their management, particularly for (1) prospective

funding for local malaria activities, (2) management and supervision of the CHWs by the PCUs, and (3) ensuring provision of testing and treatment services, and disease surveillance activities. Public health and disease control programmes, namely the VBDC and PHO/DHO, were identified as key leads in: (1) the training to the relevant LAO staff, service providers, and CHWs, (2) ensuring that essential malaria commodities, especially RDTs and antimalarial, were available at these providers, and (3) facilitating government and CSO collaboration at the community and provincial levels.

Improving quality of and access to care: What role can communities take lead on?

In addition to early testing and treatment services, participants were also encouraged to discuss about broader local health issues that affected poor health outcomes in the malaria endemic communities. From gathering all the inputs from the local stakeholders and participants in the workshop, key issues to improve community-based malaria care and health services in general were identified and categorised into the following five initial themes: human rights, gender equality or gender-based violence, health concerns, access and availability of health services. These key themes provided deeper insights into the context of endemic communities and depicted several barriers commonly experienced by the local residents and migrants. Many of these challenges were also raised in response to the recent surge in migrant population in the communities, the situation and challenges of which we already investigated in Chapter 6, leading to serious public health and well-being problems such as sanitation and waste management in some overpopulated villages.

The workshop concluded with an introduction to pilot community-led monitoring (CLM) initiative, led by the local ALIGHT team in selected initial communities, to address the current gaps in the access to and quality of malaria services. CLM was recognised as a key entry point for integrating malaria services into the routine health system by monitoring access and quality of care and advocating for improvements. Box 8.2 summarises the potential that CLM brings to fill the gaps

in informing which potential (new or existing) roles CHWs should perform or improve on with the local (health) needs that the communities themselves identified and advocated for.

Figure 8.4a-b. Network mapping and priority setting of malaria activities

(a) what are the key health issues in malaria endemic communities? (b) Who are our local stakeholders involved in the integration of malaria services into the general health system? The bubbles depict diverse sectors and actors in the malaria integration strategy. The size of the bubbles represents the amount of the stakeholders in our network. Majority of our workshop participants were from the community, followed by implementers from public health, disease control, and local administration. Grey bubbles represent ungrouped stakeholders from other sectors, who, as well as those from regional administration, although were not part of our session, were suggested to be more involved in the future activities.

(a) Key health issues in malaria endemic communities



(b) Key stakeholders in the implementation and integration of malaria services

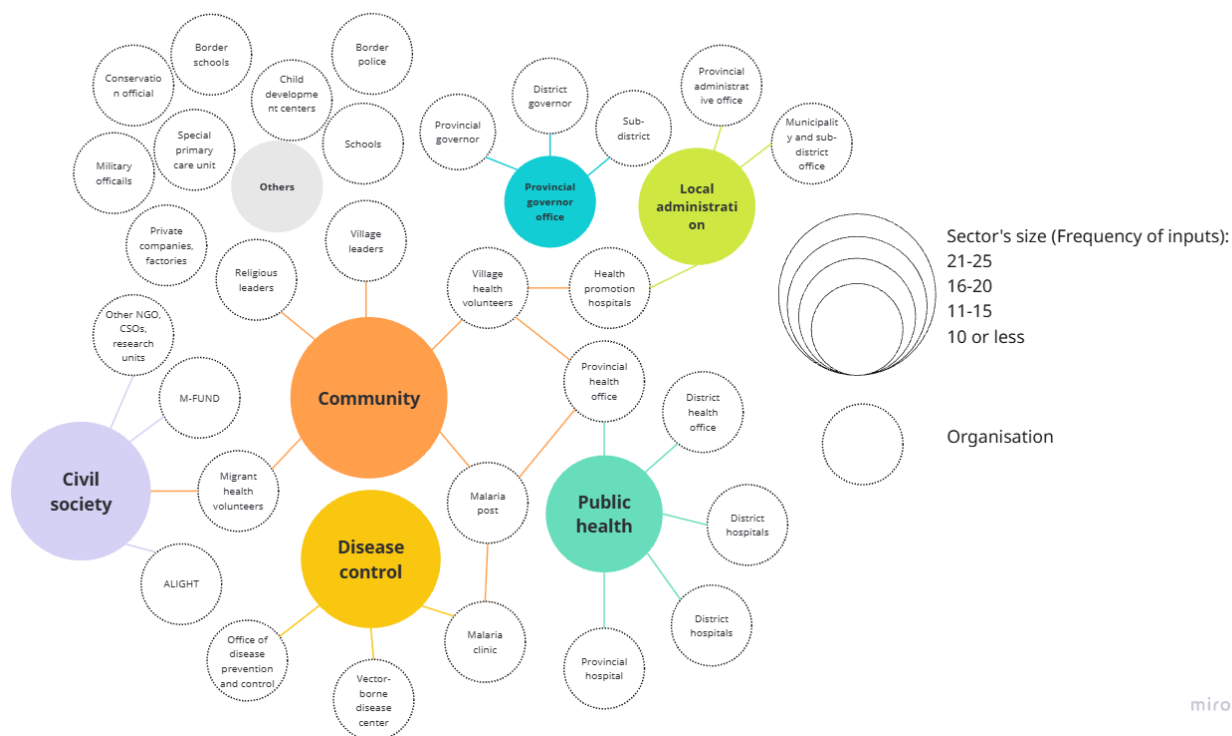


Table 8.5 Description of key local stakeholders and actions required from each stakeholder to support the implementation and integration of malaria services

Network	Representative/ Organisation	Actions needed (numbers of proposed actions if received more than one input)
Community	MP, VHV, MHV, village chiefs, community leaders, and religious leaders	<ul style="list-style-type: none"> Mobile MP services VHV's ability to test and treat malaria MHV's ability to test, monitor treatment adherence Inform and mobilise communities about disease prevention to control transmission
Public Health	District and provincial hospitals; district and provincial health offices	<ul style="list-style-type: none"> Steer policy advocacy and collaboration between malaria working group and community (3) Provide financial resources (3) Provide RDTs and antimalarials (2) Recruit staff and build capacity for malaria treatment for PCU, VHV, MHV, and MP (2)
Civil Society	ALIGHT, M-FUND, other NGOs/CSOs, MORU	<ul style="list-style-type: none"> Provide MHV's compensation Provide training for VHVs in all villages to test for malaria using local funding Conduct research to identify problems and solutions
Disease control	MC, VBDU, VBDC	<ul style="list-style-type: none"> Perform IRS Document case report and outbreaks Inform practical and updated information about the disease and situation

Network	Representative/ Organisation	Actions needed (numbers of proposed actions if received more than one input)
		<ul style="list-style-type: none"> ▪ Provide RDTs ▪ Provide antimalarials to all units that perform case screening
Local administration	PCUs and health promotion hospitals, LAO including provincial and sub-district organisations, Municipalities	<ul style="list-style-type: none"> ▪ Provide financial support for human resources and disease control activities, incorporate malaria workplan at all implementing level (4) ▪ Get more engaged in malaria work, set work performance indicators for public health tasks, monitor and evaluate performance (4) ▪ Perform IRS ▪ Transition MP to PCU and/or LAO's supervision and management
Regional administration	Sub-district, district, and provincial governors	Not specified
Others	Border school, border police, forest officials, military officials, child development centre, private sector	<ul style="list-style-type: none"> ▪ Coordinate and communicate malaria transmission control along the border ▪ Inform communities of malaria and disease prevention

Box 8.2 About community-led monitoring (CLM)

Community-led monitoring (CLM) is an approach to data collection and advocacy where the community gathers information on the problems that affect their community directly. The approach aims to empower communities to monitor the services provided and use the data to inform the improvement of service delivery by:

- Providing a practical guidance to the communities in selecting, monitoring, and evaluating key indicators beyond those in routine health reporting systems, and;
- Enabling communities to drive improvements in service delivery and outcomes by identifying and tracking gaps over time, thus holding providers accountable for addressing these issues.
- Therefore, CLM may help support and sustain community-based malaria services by promoting local involvement and ensuring that services remain relevant to community needs.

Although the CLM approach has been implemented in the HIV and Tuberculosis programmes in Thailand, this is the first time CLM is expanded to the malaria programme by malaria CSO implementers and sub-recipients of the RAI grant in the country. This initiative will also be taking place in other GMS countries in 2025.

3. Established network and resources for implementation

In this project, we built a network of 41 individuals interested in and advocating for integration of CHWs and the sustainability of community-based malaria services. This network included the key project partners comprising 6 MORU researchers and 2 CSO platform staff. Our network comprised of malaria programme managers: 2 national programme staff and 4 CSO representatives involved with the formulation of malaria-related policy and management of malaria programmes at the regional/national level. Building on the co-identified activities prioritised for immediate implementation, we expanded this network to the case study site in Kanchanaburi bringing in 29 implementers and community representatives: 5 CSO field staff, 4 malaria programme staff, 5 provincial and district health programme staff, 3 primary care unit staff, and 3 CHWs. From our CLM pilot, the network has been further expanded to include the CLM team of 3 community representatives and 2 CSO representatives working directly with the communities and the service providers.

8.4 Discussion

Throughout the project, multiple rounds of engagement activities were conducted with stakeholders across various levels, including policymakers at the national level, to determine and prioritise community-based malaria interventions. Our method of engagement is co-creation which was applied throughout our workshops and engagement activities. We focused on

documenting case studies of malaria programme integration and its contribution towards sustainability. The co-creation workshop identified these case studies and highlighted some key entry points for implementers in Thailand and elsewhere to consider when expanding the roles of CHWs and sustainably integrating malaria services into primary care. Additionally, we co-identified the setup of community malaria working group as one of the key entry points to integrate malaria activities with the local health initiatives and collaborated to pilot the CLM initiative in Kanchanaburi. A network of local implementers and public health priorities, including of malaria, was subsequently mapped out in one pilot site to guide an inclusive entry point towards integration in the context of high malaria transmission. Table 8.6 summarises these key entry points, relevant case studies, and suggestions for how co-creation or engagement activities could help to initiate the discussion.

Table 8.6 Key entry points and case studies documented from the co-creation activities

Entry points	Where to start/What co-creation offers	Case study
1. Integrate capacity building activities for multiple cadres of CHWs	Map the various (malaria and non-malaria) roles of CHWs including MPs, VHVs, and MHVs. Tips: Beyond their roles, documenting whether volunteers are taking on more than one positions, or other volunteering tasks in the communities. This will help to reduce redundancy and increase collaboration when approaching integration.	Case study 2 Integration of malaria activities with community-based services and capacity building
2. Ensure access to comprehensive health services among the vulnerable population	Map patients' journey to malaria care to identify gaps in services and opportunities to broaden their access to health services. Tips: Beyond identifying patient types based on the case classification (Thai, M1, M2), collecting patients' demographic information such as age, gender, or other sociocultural statuses can help identify and address potential inequities experienced by certain populations when accessing care. Consider using GEDSI (gender equality, disability and social inclusion) approach to characterise specific groups experiencing compounded barriers	Case study 1 M-FUND insurance scheme to support access to quality healthcare for migrant populations

Entry points	Where to start/What co-creation offers	Case study
<p>3. Advocate for local implementation of vector-borne disease control and services</p>	<p>Map the networks of local health implementers and identify their actions needed for future malaria service provision, surveillance activities, and tailored interventions such as G6PD testing and radical cure case management.</p> <p>Tips: Engage with participants from multiple sectors beyond those directly involved in malaria, such as LAOs, schools, military officials. Broaden the scope of the discussion to include other vector-borne diseases advocated for by the NMP or local implementers, such as dengue.</p>	<p>Case study 3 Coordinating top-down policy support for localised integration</p>
<p>4. Leverage public-private partnership to expand funding sources for malaria interventions</p>	<p>Prioritisation exercise among expanded groups of implementers to identify gaps in funding for malaria activities and target populations.</p> <p>Tips: Invite new partners such as local private organisations or implementers in other local health programmes to join the discussion and encourage considerations for potential joint collaborations.</p>	<p>Case study 4 Strengthening malaria services with public-private partnership</p>

Organising the second workshop in Kanchanaburi was not initially included in our engagement plan. At the end of the first co-creation session, the team saw the opportunity to maximise this engagement outcome by disseminating our co-creation results and engaging further with the local stakeholders in the high malaria transmission case study site to collect additional project inputs and endorsement of the community malaria working group, later formed into the CLM initiative, from key local stakeholders. The second co-creation workshop gave our partner and local collaborators the endorsement needed to pilot CLM, and the opportunity for the research team to contextualise further how CLM may approach help fill the gaps between role expansion and service integration strategy with locally identified health issues. In the GMS and other high burden countries, community-based monitoring (CBM) for malaria has been implemented by NMPs and the relevant programmes, presenting an opportunity to consider adopting the CLM approach (282). However, implementing the community-led activity would not go unchallenged, especially

when ‘monitoring’ of public services could be negatively perceived by local authorities. For implementing programmes, considerations could be made to adapt the existing CLM models that have translated monitoring to participatory actions shown to be effective in other contexts, such as ‘citizen scorecards’ or community-based ‘observatories’ that enabled the community representatives to track quality of health services (283) and provide suggestions for improvement that best suit the specific needs of their communities, while being mindful of limitations with regards to the ownership, commitment, and data collection and advocacy observed elsewhere (284).

The malaria CHW role and patient mapping exercises enabled the participants from various implementing levels to reflect on the challenges of service delivery at the community level and to explore opportunities for expanding the role of malaria CHWs based on their current responsibilities. However, giving limited time in the workshops, we were unable to guide the discussion to explore and review the ideas that were brought up and voted for by the participants in details, the process of which would better yield an in-depth conceptualisation of sustainability, particularly with regards to CHW role integration in their malaria programmes contributed to the sustainability of their programmes and/or the services they provided. More elaborated samples of such case studies have been identified by the multi-country case studies presented by UCSF and APMEN, as well as country case studies from Bhutan (163) and Malaysia (178). Here, co-creation approach could also be leveraged to get active inputs from the participants by identifying their own case studies and elaborating how the case studies they selected could be scaled up in their own implementing contexts or even to other settings.

8.5 Conclusion

Drawn from insights and practices of the key malaria programme implementers in high transmission context, the entry points to malaria role and service integration shown in this stakeholder engagement project highlights to pressing needs to ensure the adequate capacity building of CHWs and access to broader care among most vulnerable populations in greatest needs. By bringing together diverse stakeholders and prioritising local needs, this collaborative approach offers key learnings from the local approaches to national efforts to address this complex issue. Rooted from the sustainability framework for role expansion and malaria elimination, case studies highlighted the opportunities to enter integration by policy and funding advocacies through the vector-borne disease control package and public-private partnership, and by expanding the capacity of frontline workers and services to undocumented populations in high burden areas. We hope that the lessons and evidence documented can offer malaria programme implementers and interested partners the examples and ideas on how to engage their stakeholders and initiate the role and service integration strategy that fit the CHWs and the communities they worked with best.

Chapter 9 Discussion: Reimagining malaria care in the Greater Mekong Subregion

Stories of malaria and poverty continue to dominate the lived realities of endemic communities along Thailand border. My most recent trip in 2025 to multiethnic town of Mae Sot in western Thailand – a borderland province with the highest number of malaria cases in the past decade, highlighted this linkage even further. The intersection of malaria and poverty inherent among migrant populations and border communities is characterised by the daily livelihoods, whereby farming and cross-border activities increase exposure to malaria not only among male workers but also women and children in very marginalised areas. Nearly every migrant worker I interviewed described their recent experience with malaria and other illnesses, and the associated costs that came with getting their conditions treated. Village malaria workers (VMWs) are their primary source of testing and treatment; without these workers, these migrants may risk be arrested or fined from authorities on their journey to the hospitals or town centres, potentially paying an extra 500-2,000 THB for transports (and/or bribes), an amount equivalent to their current monthly wages. Nevertheless, malaria was the least of their concerns; economic hardships and other life-threatening conditions from physical disabilities to not having enough to feed their children were the struggles of their daily life. In these circumstances, basic health care is not a potential add-on service for a targeted few but a necessary one that could profoundly affect the lives of this population.

This thesis sets out to answer the question: How can community-based malaria services be sustained through expanding the roles of VMWs to provide health services that are additional to their existing roles in malaria? It is concerned with the role of VMWs in providing for the needs of at-risk populations in remote endemic communities in the Greater Mekong Subregion (GMS), the values and expectations of the extended services of VMWs to maintain (access to and quality of) malaria services and broader care, and the potential for the integration of malaria with primary

care programme to transition vertically-managed malaria services to a broader and more comprehensive health services. The emphasis on prospects means that the study aimed to examine the dynamics of this interaction between the VMWs, policy, and community, as well as the opportunities and gaps in implementation of the malaria programme both in the recent past and into the future.

The thesis is divided into three parts to answer the three main research questions. The sequential approach taken to respond to these questions is deliberate efforts to systematically outline the prospects of this role expansion and service integration strategy from the regional to local levels, and to develop and operationalise the conceptual framework that guided the analysis of the design and implementation of the strategy. Firstly, it identifies existing programmes in the Asia Pacific that have implemented the strategy by design (i.e. adding more expanded roles to their workers in their programmes) or organically integrated malaria roles into other health services based on the programme functions and implementation (i.e. embedding the workers in primary care/horizontal programme) in Chapter 2-3. This is followed by the assessment of the implementation of existing programmes and the perspectives of the multi-level stakeholders on the strategy across transmission settings in Thailand along the north, northeast, and western regions bordering GMS countries including Laos, Cambodia, and Myanmar in Chapter 4-6. In Chapter 7-8, the formative research results are subsequently disseminated and developed into stakeholder engagement projects in order to translate the research evidence into participatory actions of the communities and implementers. Through these engagements, I investigate the value added of role expansion and integration to the sustainability of the community-based malaria services amid policy changes and various transmission settings.

This concluding chapter reviews the findings presented in the thesis in relation to the research questions mentioned above and discusses the more general implications on the VMW roles and the programmes alongside the current situations in Thailand and the GMS. I discuss the overall

reflection on the methodologies, and finally conclude with the challenges of applying social science research methods to health policy analysis, and the strategies to overcome them.

9.1 What is the current state of VMW programmes in the GMS?

The malaria programmes and the VMWs in Thailand and the subregion are undergoing changes as this research was being conducted (2021-2024). The current Regional Artemisinin-resistance Initiative or RAI4E (2024-2026) continues to allocate funding based on each country's disease burden and capacity to respond, supporting the efforts of the stakeholders—including governments, health professionals, policymakers, scientists, development partners, and private-sector actors—to work toward malaria elimination, as well as driving the extensive community-level network of approximately 35,000 VMWs to deliver services directly within the communities (38). Nevertheless, as countries and the subregion move towards to elimination goal (P. *Falciparum* by 2026 and all human malaria by 2030), the national malaria programmes (NMPs) will still require stronger country ownership, more domestic funding, and reduced reliance on international donors (38), in order to sustain the progress towards this last mile of elimination. Community-based malaria services continue to be instrumental by offering timely and effective surveillance and diagnostics, particularly through the VMWs who have the potential to expand their responsibilities to other diseases and provide broader care for their patients. In Thailand, the integration of malaria post workers (MPs) into primary care has been partly organic through the recruitment of MPs from a wider cadre of village health volunteers (VHVs) who were embedded in the endemic communities. However, deliberate efforts to integrate MPs into primary care, or train VHVs to perform malaria services (specifically the malaria testing roles), were not observed in low transmission scenarios presented in Chapter 4-5, while, as revealed in Chapter 6, this has been initiated to a certain extent by the local implementers in high transmission communities. But

this transition in Thailand moves relatively at a much slower pace than the eastern GMS counterparts.

The landscaping studies presented in Chapter 2-3 identifies examples of the prompt actions in the GMS. The RAI3E operational studies in Cambodia showed that the local malaria programme implementers kept a tighter grip on the strategy as it moved towards elimination. National strategies have been placed by NMP to integrate VMWs into the health system and expand their tasks to include other vector-borne diseases, maternal and child health, health education and health promotion (96). Evidence from the operational research supported the feasibility of implementing these additional tasks by training VMWs to perform selected health education packages (165), measure G6PD with biosensors (285), and use point-of-care tests to diagnose febrile illnesses including dengue (164). Coupled with the ongoing focused interventions, including targeted drug administration (TDA), active fever screening (AFS), and intermittent preventive treatment for forest goers (IPTf), Cambodia demonstrated a positive outlook to achieve elimination by 2025 (286), five years in advance of the subregion's target. Additionally, there was a well-advocated plan to upgrade VMWs into multi-purpose health workers and integrate them into existing community health structures, namely the Village Health Support Group (VHSG), a wider cadre of CHWs in Cambodia (185). The key enabling factor to sustainability of their strategies was perhaps the need to make use of localised resources from the local communes who managed the VHSGs to allocate budget for community health services that included those for malaria.

Similar strategies to control and elimination the remaining transmission have been accelerated in Laos. The country's Prevention of Re-establishment (PoR) strategy has also declared the integration of VMWs in low transmission areas into the broader health system targeting their expanded roles in pneumonia, diarrhoea and nutrition. In communities where VMWs served, dengue, diarrhoea, influenza, skin infections, and tuberculosis were additionally identified as top

health concerns and potential valuable extension to community-based primary care (287). Additionally, recent assessment has identified the roles of wider cadre of VHVs in Laos in treating minor illnesses and managing sanitation to supporting COVID-19 response and malaria services, while some even went beyond their official duties, offering treatments like intravenous infusions or selling antibiotics, despite legal restrictions (134). Additionally, civil society organisation (CSO) programmes, such as Health Poverty Action (HPA) in Laos have actively engaged their VMWs to scale up the malaria case management with other diseases through the implementation of integrated community case management (iCCM), including tasks related to tuberculosis, diarrhoea, and dengue in southern provinces of the country (288, 289). Supportive national and provincial policy environment for the programme implementation that reduces the gaps between community expectations and VMW/VHV roles and integrate their malaria services with their primary care activities will be the key enabler for the upgraded programme in Laos.

Prior to the 2021 coup that refuelled the ongoing political conflict, active malaria programmes in Myanmar had shown consistent evidence on integrating local health burdens into multiple cadres of CHWs. Compared to other GMS countries, the landscaping studies revealed that the nature of these programmes were less centralised and more fragmented based on the implementing states/regions and local partners. As observed in Chapter 2-3, the notable programme implementers, frequently in partnership with Myanmar's NMP were Burnett Institute in Kayah and Kayin States (290), Malaria Consortium (MC) in Sagaing region (92, 173), Medical Action Myanmar (MAM) in Mon state (6), SMRU's Malaria Elimination Task Force (METF) in Karen state (144), and the extensive implementing networks in multiple states/regions including Sun Primary Health (SPH) (291), Backpack Health Worker Team (BPHWT) (292), Better Health Project (BHP) (293), Mobile Obstetric Maternal Health Workers (MOM) (294), and Save the Children (SC). Upon reflection on all these successful attempts, NMP's guidelines on iCCM and upgrading malaria workers into integrated community malaria volunteers/workers (ICMV and ICMW) opened the

window for different implementers to pilot designated additional services. Indeed, the adaptation of such community-delivered model based on the changing epidemiology of diseases in rural areas was key to its sustainability and well-articulated for in this recent comprehensive stakeholder analysis (295). While the NMP still functioned in some regions, the most important challenges were security threats and health system collapses, resulting in the limited access to essential malaria supplies faced by many local health providers and community volunteers themselves. This has led to an increase in undetected malaria cases as well as population displacement and onward transmission both within the country and across the borders to Thailand, India, Bangladesh, Laos, and China (296).

Vietnam is the GMS country where the malaria programme has, arguably, the closest profile to Thailand's. Although intensified malaria elimination strategies, including the implementation of targeted interventions (such as TDA, MDA, and Reactive surveillance and Response or RASR that were similarly implemented in Laos and Cambodia) were conducted in selected sites where their malaria post workers were assigned tasks aligning with the interventions (38, 297), the integration and expansion to other diseases of the malaria workers role were not as accelerated. In our RAI3E Vietnam study, upgrades of malaria services and potential expansion were recommended for well-trained and funded CSO-supported workers under the Vietnam Civil Society Consortium for Malaria Control Initiative or VietMCI, namely malaria elimination volunteers (MEVs) (298), community malaria action teams (CMATs) (299), and mobile outreach teams (MOTs) (300), within which MPWs operated (184). Similar to Thailand, barriers regarding the legal framework limited non-medical professionals to engage in many diagnostic or treatment activities (184). Despite an ongoing decentralisation of public health programmes from the central to provincial level, it was still difficult for the current vertical programmes to make an investment case for the public health programmes to finance the integration in multiple cadres of workers mentioned into the wider community health programme, particularly to fill in the funding gap as the Global Fund support

was anticipated to decrease (301). Immediate concerns were raised regarding financial compensation to VMW cadres and supports for local malaria surveillance and control activities in both areas close to elimination in the eastern border and areas with high mobility of undocumented populations in the western ones.

To summarise the subregional progresses, Table 9.1 provides an updated overview of the CHW/VMW programmes in the GMS, along with their suggested and expanded roles of their various VMW and CHW cadres in each country and the programmes that demonstrated and/or initiated the implementation identified in Chapter 2-3, with updated from recent reports cited above. For Thailand, these followed the summary presented in Table 4.5 from Chapter 4 and expanded to include summarised updates presented in the subsequent chapters.

Table 9.1 The current status of VMW programmes, cadres of workers, expanded roles and identified programmes in the GMS

Country	CHW/VMW cadre	Expanded (and suggested) role beyond malaria	Identified programmes/focuses
Cambodia	<ul style="list-style-type: none"> ▪ VMW ▪ MMWs ▪ VHSG 	<ul style="list-style-type: none"> ▪ Vector-borne diseases ▪ Maternal and child health ▪ Point-of-care tests to diagnose febrile illnesses including dengue ▪ Health education and health promotion on the topics of: <ol style="list-style-type: none"> 1. Hygiene and sanitation, 2. Disease surveillance, 3. Management of mild illness, 4. Vaccination and antenatal care. 	<ul style="list-style-type: none"> ▪ NMP's VMW mapping and policy advocacy ▪ Burnett Institute's operational research ▪ MORU's operational research
Laos	<ul style="list-style-type: none"> ▪ VMW ▪ MMW ▪ VHW 	<ul style="list-style-type: none"> ▪ Diarrhoea ▪ Dengue ▪ Influenza ▪ Nutrition ▪ Pneumonia ▪ Skin infections ▪ Tuberculosis ▪ iCCM (malaria plus tuberculosis, diarrhoea, and dengue) 	<ul style="list-style-type: none"> ▪ CSO programme management ▪ HPA's iCCM setup and scale-up
Myanmar	<ul style="list-style-type: none"> ▪ MV ▪ MP ▪ MMP ▪ ICMV 	<ul style="list-style-type: none"> ▪ iCCM (malaria plus treatment for febrile illness, childhood pneumonia and diarrhoea) 	<ul style="list-style-type: none"> Operation research and programme management (integrated training),

	<ul style="list-style-type: none"> ▪ ICMW 	<ul style="list-style-type: none"> ▪ ICMV model (malaria plus dengue, lymphatic filariasis, tuberculosis, HIV/AIDS and leprosy) ▪ Many other common illnesses for example: <ol style="list-style-type: none"> 1. BPHWT: diarrhoea/dysentery, acute respiratory infections, anaemia, and worm infestation 2. MOM: basic emergency obstetric care plus blood transfusion, antenatal care and family planning 3. MAM: respiratory tract infections, diarrhoea, and skin infections, acute malnutrition, tuberculosis and referral of complicated and severely ill patients 	<p>multiple CSO coordination:</p> <ul style="list-style-type: none"> ▪ Burnett Institute's ICMV ▪ BHT's ICMV ▪ MC's iCCM ▪ MAM's CHW ▪ MTC and partners to the MOM project ▪ SMRU's ICMW ▪ SPH's private sector iCCM ▪ SC's iCCM
Thailand	<ul style="list-style-type: none"> ▪ MP ▪ BMP ▪ VHV ▪ MHV 	<ul style="list-style-type: none"> ▪ Basic care to alleviate symptoms such as fever, diarrhoea, pain/ache, anaemia, skin rashes ▪ First aid such as for wounds, burns, animal bites ▪ Provision of household common drugs, herbal infusions, or medicine ▪ Blood testing for malaria ▪ Glucose test for diabetes ▪ Dengue foci management ▪ Bedridden and elderly care including house visits and medicine delivery ▪ Health information provision for common illnesses ▪ Tasks assigned by PCUs and relevant health programmes for local health priorities such as NCDs, COVID-19 ▪ Examples from MHVs: community mobilisation, tasks related to tuberculosis and HIV, assistance in translation and transport of migrant workers 	<p>Transition of MP roles to primary care service providers:</p> <ul style="list-style-type: none"> ▪ PCU performing malaria services ▪ PCU's employment of MPs <p>Targeting vulnerable populations through multi-cadre workers:</p> <ul style="list-style-type: none"> ▪ VBDC-CSO Integrated training for MP-VHV-MHV
Vietnam	<ul style="list-style-type: none"> ▪ VMW/MPW ▪ VHW <p>who are members of</p> <ul style="list-style-type: none"> ▪ CMAT ▪ MEV 	<ul style="list-style-type: none"> ▪ Health information provision for tuberculosis, COVID-19, drug use, and social protection scheme ▪ Tasks assigned by PCUs and relevant health programmes for local health priorities such as NCDs, COVID-19 	<p>CSO collaboration under VietMCI consortium</p> <ul style="list-style-type: none"> ▪ HPA's MOT ▪ SCDI's CMAT ▪ VPHA's MEV

<ul style="list-style-type: none"> ▪ MOT 	<ul style="list-style-type: none"> ▪ Glucose test for diabetes ▪ Community initiative organisation (unspecified for which topics) ▪ Fever screening for both malaria and COVID-19 and referral of suspected COVID-19 cases to local facilities 	PSI's GEMS project collaboration with private sector
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9.2 What are the implications of VMW programme implementation and outcomes?

With the current malaria situations and VMW programme development outlined above, the next question to ask is therefore about the implications: how VMW programme implementation and outcomes may change; will role expansion and service integration be formally endorsed and implemented in Thailand and Vietnam; and what implications are there on the transition from vertical malaria programme to fully integrated malaria service into primary care? The findings of the empirical and engagement work carry one consistent message. The foundation of the potential for role integration is based on the organic expanded roles of MPs due to their recruitment from the wider VHV pool (whose original duties are to the primary care programme) or MP themselves already undertaking several other extended positions that were either representative of their communities to various authorities or in service to health and social programmes led by the government or local NGOs and CSOs. Such multiple roles have mostly been strengthening the MP position and their acceptance in the communities. With deliberate support from the key vertical programmes, the MP positions and their malaria services may arguably be sufficiently integrated to maintain the indispensable services despite the decline in external funding. The key consideration for implementing this, thus, was to articulate on the technical and financial assistance needed by the implementing (horizontal) programmes in practice, namely the local organisations/providers who will fully take on the supervision roles of MPs and/or absorb their services, at least at the initial stage of transition. Compensation, training,

supervision, commodities were among the costs as well as key features of the MP performance and the programme's functionality; they were also the key enabling factors observed from wider programmes in the Asia Pacific throughout Chapter 2-3. To practically implement this, these costs will need to be absorbed by either the current Global Fund RAI grant, the provincial units who were the current supervisory body of the MPs, or by the local governments who had shown potential but yet be engaged in the malaria elimination strategy. Co-funding and co-training programmes should be explored in conjunction with local (health) programmes in the implementers' portfolios, particularly dengue which has been identified as high priority disease for surveillance across sites. The local health priorities and disease burden identified in these case studies are one source of information about which health programmes can the malaria services can be integrated with and/or can MPs be trained to perform complementary tasks. In areas reaching elimination, the prospects for such integration may therefore depend increasingly on the actions of the local implementers to link their human and financial resources with other potential health programmes to keep close monitoring and surveillance in outbreak-prone border communities.

Indeed, the attempts made by local implementers to integrate MPs with primary care in high transmission areas depicted in Chapter 6 are evidence that such scenarios were possible and happened because there were actually demands for health services MPs can provide. NMP was aware of this necessity and utilised the malaria information system to guide resource allocation for setting up MPs to provide malaria testing and treatment to cross-border migrants and other at-risk vulnerable populations (302). During 2004-2017, MPs tested over 828,000 people and treated nearly 69,000 cases, with nearly half of those treated were cross-border migrants—more than double the proportion treated in public hospitals (302). Maintaining MPs in communities where these population groups resided was thus well justified for, because, without MPs in such settings, case finding and treatment activities would have to rely on hospitals and their staff, which along

the Thai-Myanmar border, were significantly overstretched with post-pandemic and post-conflict influxes of care-seeking migrants. For the NGOs and CSOs implementing multiple programmes targeting this population group, this provided a basis of possibility to streamline their activities combining care and assistance package targeting the populations unreachable by the NMP and other government units. Collaborators in our engagement workshop have indicated several critical public health needs, including non-Thai language translation services, health insurance among undocumented migrants, sanitation and hygiene management in overcrowded villages, that have not been sufficiently met. In fact, in the 2024 International Organisation for Migration (IOM) report, stigma, discrimination, language barriers, and the lack of migrant-friendly information were major obstacles preventing migrants in Thailand from enrolling in health schemes and accessing health services (303). Additionally, although malaria, tuberculosis and HIV have been the most invested programmes targeting such populations, the impact of COVID-19 pandemic and political instability in Myanmar, resulting in social isolation and unstable employment conditions especially in border provinces such as Tak and Kanchanaburi, have led to more demand in mental health among migrant workers (303, 304). Leveraging MPs and MHVs who played a vital role in connecting migrant communities with the health system will strengthen malaria care among migrant populations, and expand the coverage of broader services to remote border communities lagging both physical and psychosocial care (303). A case to create an inclusive health package for migrant population at-risk of malaria in the border area can be compelling to not only the Thai public health authorities aiming to advance the universal health coverage (UHC) but also to regional bodies advocating for inclusive and holistic development assistance schemes.

On the whole, this scenario of this transition offers one implication on the vertical vs horizontal programme debate: programme integration may need not to happen all at the same time across the country. In Thailand, there appears to be reasonable opportunities for MPs and other cadres of volunteers - VHV and MHV - to undertake new roles in these gradual programme changes.

In border areas where their services were needed most, the role expansion/integration prospects should be considered in relations to cross-border screening and treatment and integrated services that address the increased risks migrant workers encountered when engaging in occupational activities, most notably labour exploitation, mental health, and accessing health care such as language and discrimination (305). A previous study integrating HIV services with primary care showed positive results in reducing stigma among patients; but whether this will translate to malaria care, especially among the migrants, is still unclear. Additionally, fully integrated services for migrant populations raise further debate regarding use of domestic resources for populations who may not be taxpayers or covered by public insurance in the country. Expanding health care services beyond malaria for this population, hence, undeniably, does hands in hands with ensuring the rights to health among underserved ethnic communities, undocumented individuals and refugees, as well as (re-)allocating public health resources from the city centres to under-invested health facilities along the border.

In other GMS countries, although the importance of including MMPs in malaria elimination efforts has been uniformly recognised, large gaps remain in achieving UHC and ensuring that the current health and social protection regulations address migrants' access to health service in their countries. Considerations made for cross-border collaboration and migrant health will significantly contribute to the sustainability of the integrated services and future VMW programme in the subregion. In Table 9.2, I attempted to update these extended considerations against the developed framework conceptualising the implementation and sustainability of expanded VMW programme introduced in Chapter 2, combined with six programme entry points from UCSF's RAI3E research component and updated key considerations for Thailand previously outlined in Chapter 4.

Table 9.2 Factors enabling effective implementation and sustainability of VMW programmes with updated considerations for the role expansion and integration strategy

Factors	Entry points	Updated considerations for role expansion and integration strategy
1) Programme design and management	Planning and research	<ul style="list-style-type: none"> ▪ Packaging malaria under vector-borne disease health for local programme design and management ▪ Mapping of all MP/VHV/MHV set-up for opportunities to integrate and complement other health programmes beyond vector-borne diseases
2) Financing or funding	Policy and financing	<ul style="list-style-type: none"> ▪ Funding for MP compensation through decentralised PCU employment ▪ Funding for local integrated activities (malaria and non-malaria) using local funding for local health priorities and/or emergency response
3) Support system	Health system structure and enabling factors	<ul style="list-style-type: none"> ▪ Promoting access to care and health insurance scheme for migrant populations ▪ Cross-border collaboration to address malaria and migrant's health
4) Community ownership and engagement	Community engagement and hard-to-reach communities	<ul style="list-style-type: none"> ▪ Promote MPs as mobiliser of local health network and expand their collaborators beyond direct malaria implementers ▪ Adopt/adapt community-led monitoring (CLM) approach to identify and advocate local health issues especially among vulnerable groups
5) Capacity building and human resource management	Selection, training, motivation	<ul style="list-style-type: none"> ▪ Selection of MPs with VHV/MHV roles for role expansion ▪ Integrated training for malaria and health programmes by VBDC and CSO collaboration
	Management, supervision, monitoring	<ul style="list-style-type: none"> ▪ Supervision and accreditation from PHO to continue testing role with malaria RDT by MPs and selected VHVs, ideally former MPs if they were previously discontinued ▪ Supervision from PCUs to add new (screening) services based on their prioritised primary care programme

9.3 How would (or did) stakeholder engagement contribute to translating research evidence to policy and practice?

The stakeholder engagement projects presented in Chapter 7 and 8 built upon the findings from the formative research to design a locally tailored public and policy engagement activities. Beyond specific objectives outlined in the respective chapters, the engagements provided critical opportunities for me to (1) make dissemination of research more participatory and to receive direct feedback from the study participants as well as the wider community members who did not participate in the studies, (2) minimise the gaps in implementation by taking action on the role expansion and service integration strategy through the 'bottom-up' and 'participatory' approaches which were proposed by the study participants, and; (3) bring researchers, policymakers, and practitioners together to participate in the discussion to address such gaps and learn from them.

When the RAI3E operational research was completed, the research team had the opportunities to disseminate the key results to representatives of NMPs through individual consultation, and to a wider audience through RAI regional steering committee meeting, as well as in several conferences and online talks. However, these disseminations only targeted audience at national and international levels and they were mostly, if not all, conducted in English, which left out many audiences, including many study participants in Thailand. This led the local team and me to begin our engagement with several consultation sessions to disseminate the formative research results with the key representatives in the communities and the local malaria programme staff. In Chapter 7, I intentionally select one of the research sites for the engagement work to build upon the presence of the local staff who were embedded in the endemic communities we studied and were familiarised with the MPs and programme staff we aimed to collaborate with. We also experienced directly, upon interactions with and observations of the programme implementation, that the transition of malaria services from MPs to PCUs was happening at a slower pace in comparison the progress made in a high-transmission setting. Additionally, upon consultation with the key local CSO in malaria engagement, Raks Thai Foundation, I was informed that their RAI3E funding was reallocated, and the team did not continue their malaria engagement activities in the province,

usually tailored the most vulnerable groups in endemic communities. Hence, I intended for our engagement project to fill this gap and drive the conversations and actions regarding the transition forward among our local stakeholders. Additionally, exploring co-creation as an approach allowed me to complement the written-text dissemination with verbal and visual languages which offered alternatives for our participants to comprehend the research findings and contribute their feedback more effectively.

Secondly, the recommendations from the key stakeholders in our formative research that had left strong impression on to me and to the analysis was that this VMW role expansion and malaria service integration strategy could be attempted through the 'bottom-up' and 'participatory' approaches. Referring back to the health policy triangle I outlined in Chapter 1, our formative research findings were able to address primarily the questions regarding the first three components of the VMW role expansion and service integration strategy (i.e. the content - what potential roles can VMWs perform, the context in which they would best suit local needs and priorities, and the actors that should be involved), but the 'process' of how this would actually happen were not clearly laid out, specifically on what the potential entry points to implement the strategy are and how to operationalise them. Based on the landscaping studies and Thailand case studies, I have outlined the current and potential enablers and barriers to the strategy as policy and implementation considerations in the relevant chapters, complemented by the UCSF RAI3E component, but these were often contextualised and difficult to be translated to a particular setting. My takes to answer the question on process were thus made through two engagement projects; one which my team and I had a direct 'take' on the strategy by actively engaged in co-producing an integrated health information and communication material with MPs and our stakeholders at site, and the other we collaborated closely with active local implementers to document their 'takes' on this strategy and learn from them, in order to offer a package of implementation options or 'entry points' for future actions. Additionally, what we found from the

engagement challenged the concept about the role 'expansion vs integration' strategy which was, every so often, limited to discussion about adding more tasks for VMWs to maintain their relevance. While this addition of roles are crucial in many settings and dependent on the needs of the respective programmes (e.g. the expansive roles of VMWs in Myanmar and Cambodia), the lessons extracted from the experience in Chapter 7 and entry points in Chapter 8 reflected on the formative research results in Thailand that the key implementation challenge was more about how to integrate VMW services sustainably, and there are many ways to make this possible (e.g. adding new roles to VMWs, adding malaria roles to other cadres of volunteers, maintaining VMWs and supporting their other non-malaria roles, or integrate malaria with other disease programmes or primary care services). Moreover, although some of the observed entry points were context-specific or especially advocated for which may be difficult to replicate (e.g. the locally-produced calendar or public-private partnership to support malaria activities), I hope that that they offer an adaptable model offering examples of how to advocate for community awareness of malaria along with other local health priorities, or for alternative funding channels to address gaps in implementation coverage. Ideally, combing these with other integration activities such as MP-VHV-MHV integrated training by government and CSO's malaria programmes, future initiatives could be led by CSO-led malaria programmes who were able to reach the most vulnerable communities, leveraging support from the local and/or national government policy and funding. Careful consideration should be made, however, if additional reliance were to be put on donors or external funding sources, these initiatives may cause reverse effect on the programme's sustainability without the government's buy-in and investment.

Lastly, the outlines of the learnings and the examples of entry points would not be possible without engaging the policymakers and practitioners together to better understand the process and potential gaps. The engagement projects were a good reminder that policy implementation does not always result from the conventional hierarchical, 'top-down' process which, every so often,

overlooks the crucial role that front-line staff play in determining whether, and how, policies created at higher levels are actually put into practice. By collaborating with the practitioners, the engagement broadened the focus of the role expansion and service integration strategy to consider other alternatives, such as the CLM initiative, the M-FUND health insurance for undocumented migrants, and cross-border collaboration for malaria and other health priorities. It is possible that these alternatives may offer more integrated and equitable (and perhaps sustainable) actions to sustain the access to malaria services and broader care. Although our engagement in a low-transmission setting in Chapter 7 did not result in a long-term solution to sustain the MPs and their malaria services at sites, close collaboration with the local stakeholders provided us the opportunity to conduct a robust evaluation of activities and outcomes, reflect on the ethical challenges in doing engagement, and learn about what have worked and what have not worked.

9.4 Challenges, ongoing complementary studies, and directions for future research

Almost all policy analysis involves researchers analysing policy options and their impacts and informing stakeholders and policymakers in order to guide their decision making. Policy analysis can either be retrospective or prospective and may be based on evaluation of existing and potential policies to identify areas for improvement and potential policy windows. For the research presented in this thesis, it involved working with the healthcare providers, the patients, and groups of implementers and decision makers, to analyse the key components of health policy triangle (context, content, actors, and process) that are relevant to the policy under investigation. Although past social science research has demonstrated its contribution to policymaking, specifically making suggestions for improving the research impact into the policy process, there are a few limitations of its application.

First, although in total this study outlined evidence from over a hundred qualitative interviews and group discussions (and more participants in the engagement projects), this is still a small number and self-reported accounts of the participants, which limited the transferability of the evidence to practices in other settings. However, because the policy evidence is always contextual and partial to the views of its stakeholders, the complexity to how the evidence can or should be translated into different contexts is thus arguably the contribution of policy research. Such investigation into contextual influences was enabled by the purposive selection of diverse cases, within each respective study and across settings in Thailand, the triangulation of different data sources, and extensive reviews of programmes in the GMS countries, in order to, not generalise, but to draw a more nuanced understanding on the similarities and comparisons from the subregion and country contexts. The understanding of VMW roles expansion and malaria service integration with primary care can thus be significantly enriched in future research by including the other eastern GMS countries where, as previously discussed in this chapter, the recent progress towards elimination has been significant and so has the necessity for integration. In this way, the subregion can provide a useful context for understanding the extent to which VMWs are embedded within the network of wider CHWs and how the progress of primary care decentralisation and UHC would affect the role expansion and integration outcomes. This can also help to identify the conditions under which malaria programmes led by NMPs and CSOs can grow, just as this thesis has attempted based on Thailand as a case study.

Selecting Thailand among other GMS countries as the main case study in this thesis was a deliberate choice to investigate the health system with which I am most familiar and embedded in. This allowed me to partly address the limitation to stakeholder engagement which is a time-intensive process and requires continuous collaboration with policymakers and practitioners by growing this network of collaborators over time. That said, this collaboration would not be possible without the presence of local units and partners based at multiple sites in the country, providing

opportunities to transition from formative research activities into participatory dissemination and engagement projects. However, as mentioned in the introduction chapter, my position is slightly of an outsider in the world of malaria and also in the communities where I worked. I would argue that this allowed for is the flexibility to construct a narrative that tried to make sense of the proposed policy and maps the connections between stakeholders, ideas, and positions from a relatively intermediary viewpoint, which minimised the tendencies to give unproportionate weight to a particular story (or evidence). The downside was that this also minimised the power to manoeuvre and own the narrative; the quality that direct implementers of malaria programme or the communities can harness to empower their evidence-based insights and influence the policy.

Beyond the focus on role expansion and service integration, the findings from this thesis have possible implications for the other aspects of public health programmes, particularly on the transition from vertical to horizontal health delivery, cross-border collaboration and migrant health. Expanded malaria services provided by VMWs and their integration with primary care would not only contribute to sustaining the uptake of malaria services but may also involve upgrading care for the most vulnerable groups. The recent malaria case surges along the Thai-Myanmar border, along with an increased number of patients among women and children, raise the malaria and other relevant programmes' concerns about the factors influencing the malaria risks and poorer health outcomes in border communities. This affects the overall quality of life among these populations. Unlike the general Thai populations where the cost of healthcare is mainly covered by the UHC or other social security schemes, medical and hospitalisation cost for documented and undocumented migrants engaged in informal economy are paid at their own expenses, unless subsidised or absorbed by non-profit organisations. With the high intensity of cross-border mobility, NMPs and CSOs may face greater difficulties in managing cases and controlling transmission in these areas. These wider aspects of cross-border collaboration for malaria

elimination and their connections with integrated health care programmes for border communities and migrant populations are important topics for future research.

Some of the most memorable challenges I encountered while conducting this research which I discussed briefly in Chapter 7 were when the MPs whom we engaged with were discontinued from the malaria programme during the project period. Although we were able to elicit the perceptions of the MPs themselves and the local stakeholders towards this policy direction, an in-depth post-discontinuation evaluation of the former MPs and their patients may yield more empirical evidence on whether and the extent to which the policy change affected the access to and quality of malaria services in communities that remained endemic. Difference-in-differences analysis offers one methodological approach that can estimate such causal effect; for example, by comparing the difference in outcomes before and after the discontinuation of MPs and the difference in outcomes between the communities where MPs were active and no longer active. Collection of observational data on care-seeking behaviours, such as the number of people who came to see the (former) MPs and/or visited public health facilities for malaria services, would be needed; however, this was not attempted as part of this thesis and, to the best of my knowledge, such data is not being collected by the relevant programmes at our study sites.

Another set of analysis that may yield more empirical evidence on the effect multi-cadre MPs (MPs who also performed other roles such as VHVs) in Thailand, and VMWs in other GMS countries, have on the uptake of malaria services by their patients and the performance. In this thesis, undertaking of multiple roles have been described as the positive nature of CHWs; at our study sites, many MPs were strengthened by their linkage with the PCUs and also were accepted by their patients. Such evidence could potentially support programmes to not only tailor the role expansion and service integration that yields an optimal service package for their remaining MPs, but also to advocate for expanding the malaria services to the wider cadre of volunteers/workers

such as VHVs and MHVs where MPs were not present. Future work, some of which were mentioned here, is required to verify these outcomes and further explore these assumptions.

Finally, it is extremely important to also learn from policy ideas and implementation that did not work. There would be value in knowledge from and the robust evaluation with the policymakers, the implementers, and the beneficiaries. In addition to identifying enablers, barriers, and entry points to the implementation of expanded programmes in the Asia Pacific, investigation into case studies of programmes where their expanded roles were no longer active or did not successfully expand their CHW/VWW roles, or an unsuccessful transition of vertical to horizontal programme would offer valuable insights about practical considerations and potential steps to avoid the blockages or to overcome them.

9.5 Conclusion

In the borderlands of Thailand and GMS countries, the development of VMWs has redrawn the health landscape and strengthened malaria elimination efforts while broadening access to care. The results in this thesis are drawn from multi-disciplinary operational research and smaller multi-site projects, partly conducted in response to the time-sensitive health policy under investigation. Upon reflection, this chapter presents the overall discussion regarding current malaria situations and VMW programmes in Thailand and the GMS in comparison to the findings presented in this thesis. The updated discussions have shed new light on the prospects of VMW role expansion for each country and indicated possible ways forward to navigate the integration of vertical community-based malaria services into primary care throughout the varied operating contexts. Lastly, I reflected on the limitations of the research presented in this thesis and recognised the steps taken to address such limitations, as well as other valuable approaches that may strengthen the capacity of this social science research to contribute to policy making.

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Appendix

1. Systematic review supplementary information

1.1 PRISMA Checklist

Section and Topic	Item #	Checklist item	Page
TITLE			
Title	1	Identify the report as a systematic review.	P1
ABSTRACT			
Abstract	2	See the PRISMA 2020 for Abstracts checklist.	P1
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	P1-2
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	P2
METHODS			
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	P4
Information sources	6	Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	P4, S1 Appendix
Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	S1 Appendix
Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	P4
Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	P4
Data items	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	Table 1, Table 2
	10b	List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	S1 Appendix
Study risk of bias	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of	P5

Section and Topic	Item #	Checklist item	Page
assessment		automation tools used in the process.	
Effect measures	12	Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results.	n/a
Synthesis methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)).	P5
	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	n/a
	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	n/a
	13d	Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.	P5
	13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analysis, meta-regression).	n/a
	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesized results.	n/a
Reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).	n/a
Certainty assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.	n/a
RESULTS			
Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram.	Figure 1
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	Figure 1
Study characteristics	17	Cite each included study and present its characteristics.	S1 Appendix, S2 Appendix =
Risk of bias in studies	18	Present assessments of risk of bias for each included study.	S1 Appendix

Section and Topic	Item #	Checklist item	Page
Results of individual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots.	Figure 2-4, S2 Appendix
Results of syntheses	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.	n/a
	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect.	n/a
	20c	Present results of all investigations of possible causes of heterogeneity among study results.	n/a
	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.	n/a
Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	n/a
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	n/a
DISCUSSION			
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	P22-25
	23b	Discuss any limitations of the evidence included in the review.	P25-26
	23c	Discuss any limitations of the review processes used.	P25-26
	23d	Discuss implications of the results for practice, policy, and future research.	P25-26
OTHER INFORMATION			
Registration and protocol	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	P3
	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	P3
	24c	Describe and explain any amendments to information provided at registration or in the protocol.	n/a
Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	P37
Competing interests	26	Declare any competing interests of review authors.	P37
Availability of data, code and other materials	27	Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review.	P37

1.2 Extracted literature, types of document, methodologies, and eligibility assessments by programme

Programme	Title	First author, year	Search channel	Types of document	QA tool / Type of literature or methodology	Eligibility assessment ¹						QA Score ² (meets the criterion)
						1	2	3	4	5	6	
AFG	The Community-Based Health Care System of Afghanistan	Aitken, 2020	Google search	Programme report	AACODS / report	✓	✓	✓	✓	✓	✓	11
	Community health worker service delivery for maternal and child health: an observational study from Afghanistan	Kelly, 2022	Google search	Published article	MMAT / Quantitative nonrandomized	✓	✓	✓	✓	✓	✓	3
BNG	HNPP at a glance - 2013	BRAC, 2013	Org website	Programme brief	AACODS / grey literature	✓	✓	✓	✓	-	-	8
IND-I	ASHA Which way forward...? Evaluation of ASHA Programme	NHSRC, 2011	Org website	Programme report	AACODS / report	✓	✓	✓	-	✓	-	12
	Assessing community health workers' performance motivation: a mixed-methods approach on India's Accredited Social Health Activists (ASHA) programme	Gopalan, 2012	Citation search	Published article	MMAT / Mixed methods	✓	✓	✓	-	✓		6
	Strengthening malaria service delivery through supportive supervision and community mobilization in an endemic Indian setting: an evaluation of nested delivery models	Das, 2014	Database	Published article	MMAT / Quantitative randomized	✓	✓	✓	✓	✓	✓	6
	India's Auxiliary Nurse-Midwife, Anganwadi Worker, and Accredited Social Health Activist Programs	Scott, 2020	Google search	Programme report	AACODS / report	✓	✓	✓	✓	✓	✓	12
	ASHAs: The changing face of malaria control	Sonal, n.d.	Org website	Programme report	AACODS / grey literature	✓	✓	✓	✓	✓	-	17
IND-II	Study design and operational framework for a community-based Malaria Elimination Demonstration Project (MEDP) in 1233 villages of district Mandla, Madhya Pradesh	Rajvanshi, 2020	Citation search	Published article	MMAT / Quantitative Descriptive	✓	✓	✓	-	-	✓	4
	A model for malaria elimination based on learnings from the Malaria Elimination Demonstration Project, Mandla district, Madhya Pradesh	Rajvanshi, 2022	Citation search	Published article	MMAT / Quantitative Descriptive	✓	✓	✓	-	-	✓	7
	Assessment of ASHA for knowledge, diagnosis and treatment on malaria in Mandla district of Madhya Pradesh as part of the malaria elimination demonstration project	Rajvanshi, 2022	Citation search	Published article	MMAT / Mixed Methods	✓	✓	✓	✓	-	✓	3
	Assessment of frontline health workers in providing services for malaria elimination in the tribal district of Mandla, Madhya Pradesh	Rajvanshi, 2022	Google search	Published article	MMAT / Quantitative nonrandomized	✓	✓	✓	✓	-	-	7

Programme	Title	First author, year	Search channel	Types of document	QA tool / Type of literature or methodology	Eligibility assessment ¹						QA Score ² (meets the criterion)
						1	2	3	4	5	6	
IND-III	Involvement of Mitanins (female health volunteers) in active malaria surveillance, determinants and challenges in tribal populated malaria endemic villages of Chhattisgarh, India	Chourasia, 2017	Database	Published article	MMAT / Mixed Methods	✓	✓	✓	-	-	✓	3
	Knowledge Attitude and Practices of Mitanin's (Community Health Workers) in Chhattisgarh: Malaria Elimination Perspective	Ranjha, 2021	Database	Published article	MMAT / Quantitative nonrandomized	✓	✓	✓	✓	-	✓	7
IND-IV	India's National Village Health Guides Scheme	Strodel & Perry, 2020	Google search	Programme report	AACODS / report	✓	✓	✓	✓	✓	✓	12
IND-V	Changing roles of grass-root level health workers in Kerala, India	Nair, 2001	Database	Published article	MMAT / Mixed Methods	✓	✓	✓	-	✓	✓	7
IDN-I	Improving maternal and newborn health services in Eastern Indonesia: Findings from an external review	USAID-UNICEF, 2017	Org website	Programme report	AACODS / report	✓	✓	✓	-	✓	✓	12
IDN-II	Knowledge, attitudes, and practices of Anopheles mosquito control through insecticide treated nets and community-based health programs to prevent malaria in East Sumba Island, Indonesia	Bandzuh, 2022	Database	Published article	MMAT / Qualitative	✓	✓	✓	✓	✓	✓	5
IRN	Iran's Community Health Worker Program	Rahbar, 2020	Google search	Programme report	AACODS / report	✓	✓	✓	✓	✓	✓	11
KHM- I	Scale-up of community-based malaria control can be achieved without degrading community health workers' service quality: the Village Malaria Worker project in Cambodia	Yasuoka, 2012	Database	Published article	MMAT / Quantitative descriptive	✓	✓	✓	✓	✓	✓	7
	Integrating child health services into malaria control services of village malaria workers in remote Cambodia: service utilization and knowledge of malaria management of caregivers	Hasegawa, 2013	Database	Published article	MMAT / Quantitative descriptive	✓	✓	✓	✓	✓	✓	7
	Improving access to health care amongst vulnerable populations: a qualitative study of village malaria workers in Kampot, Cambodia	Liverani, 2017	Database	Published article	MMAT / Qualitative	✓	✓	✓	✓	✓	✓	7
KHM- II	In Search of the Last Malaria Cases: Ethnographic Methods for Community and Private-sector Engagement in Malaria Elimination in Vietnam, Laos, and Cambodia	Masunaga, 2021	Google search	Published article	MMAT / Qualitative	✓	✓	✓	-	-	✓	6
KHM-III	Glucose 6 Phosphate Dehydrogenase (G6PD) quantitation using biosensors at the point of first contact: a mixed method study in Cambodia	Adhikari, 2022	Database	Published article	MMAT / Mixed methods	✓	✓	✓	-	-	✓	5.5

Programme	Title	First author, year	Search channel	Types of document	QA tool / Type of literature or methodology	Eligibility assessment ¹						QA Score ² (meets the criterion)
						1	2	3	4	5	6	
KHM-IV	Potential for community based surveillance of febrile diseases: Feasibility of self-administered rapid diagnostic tests in iquitos, Peru and Phnom Penh, Cambodia	Morrison, 2021	Database	Published article	MMAT / Quantitative nonrandomized	✓	✓	✓	-	-	✓	6.5
KHM-V	Expanding the role of village malaria workers in Cambodia: Implementation and evaluation of four health education packages	Betrian, 2023	Database	Published article	MMAT / Qualitative	✓	✓	✓	-	✓	✓	7
	Expanding the roles of community health workers to sustain programmes during malaria elimination: a meeting report on operational research in Southeast Asia	Dysoley, 2024	Database	Published article	AACODS / report	✓	✓	✓	✓	✓	-	13
LAO-I	An assessment of early diagnosis and treatment of malaria by village health volunteers in the Lao PDR	Phommanivong, 2010	Citation search	Published article	MMAT / Quantitative nonrandomized	✓	✓	✓	✓	✓	✓	6
	Evaluating vertical malaria community health worker programs as malaria declines: learning from program evaluations in Honduras and Lao PDR	Napier, 2021	Database	Published article	MMAT / Mixed methods	✓	✓	✓	-	✓	✓	6
	Perspectives of health and community stakeholders on community-delivered models of malaria elimination in Lao People's Democratic Republic: A qualitative study	Oo, 2022	Database	Published article	MMAT / Qualitative	✓	✓	✓	-	✓	✓	6.5
	Prospects for the development of community-based care in remote rural areas: a stakeholder analysis in Laos	Liverani, 2024	Database	Published article	MMAT / Qualitative	✓	✓	✓	✓	✓	✓	7
LAO-II	In Search of the Last Malaria Cases: Ethnographic Methods for Community and Private-sector Engagement in Malaria Elimination in Vietnam, Laos, and Cambodia	Masunaga, 2021	Google search	Published article	MMAT / Qualitative	✓	✓	✓	-	-	✓	6
LKA	Are large-scale volunteer community health worker programmes feasible? The case of Sri Lanka	Walt, 1989	Google search	Published article	MMAT / Mixed methods	✓	✓	✓	-	✓	✓	4
MMR-I	Improving the quality of paediatric malaria diagnosis and treatment by rural providers in Myanmar: an evaluation of a training and support intervention	Aung, 2015	Org website	Published article	MMAT / Qualitative	✓	✓	✓	-	-	✓	7
	7 iCCM Programs Highlight Diverse Approaches to Reduce Top Child Killers	PSI, 2020	Org website	Programme brief	AACODS / grey literature	✓	✓	✓	-	-	✓	11
MMR-II	Malaria elimination in remote communities requires integration of malaria control activities into general health care: an observational study and interrupted time series analysis in Myanmar	McLean, 2018	Database	Published article	MMAT / Quantitative nonrandomized	✓	✓	✓	✓	✓	✓	7

Programme	Title	First author, year	Search channel	Types of document	QA tool / Type of literature or methodology	Eligibility assessment ¹						QA Score ² (meets the criterion)
						1	2	3	4	5	6	
	Successful elimination of falciparum malaria following the introduction of community-based health workers in Eastern Myanmar: A retrospective analysis	Zaw, 2023	Database	Published article	MMAT / Quantitative nonrandomized	✓	✓	✓	✓	✓	-	6.5
MMR-III	iCCM in Myanmar: Lessons from Sagaing region	MC, 2018	Org website	Programme brief	AACODS / report	✓	✓	✓	✓	✓	✓	12
	Training malaria volunteers to deliver integrated community case management: Lesson Learnt from Rural Myanmar	MC, 2020	Org website	Programme brief	AACODS / report	✓	✓	✓	✓	✓	✓	12
MMR-IV	Myanmar's Community-Based Health Workers	Davis, 2020	Google search	Programme report	AACODS / report	✓	✓	✓	✓	✓	✓	10
	Assessment of Knowledge and Performance of Village Health Volunteers after Expanding Their Responsibilities in Bago Region, Myanmar, 2017	Than, 2020	Google search	Published article	MMAT / Qualitative	✓	✓	✓	✓	-	✓	6
	Optimizing Myanmar's community-delivered malaria volunteer model: a qualitative study of stakeholders' perspectives	Oo, 2021a	Database	Published article	MMAT / Qualitative	✓	✓	✓	-	✓	✓	7
	Community demand for comprehensive primary health care from malaria volunteers in South-East Myanmar: a qualitative study	Oo, 2021b	Database	Published article	MMAT / Qualitative	✓	✓	✓	-	✓	✓	7
	Sustainability of a mobile phone application-based data reporting system in Myanmar's malaria elimination program: a qualitative study	Oo, 2021c	Database	Published article	MMAT / Qualitative	✓	✓	✓	-	-	✓	7
MMR-V	Longitudinal trends in malaria testing rates in the face of elimination in eastern Myanmar: a 7-year observational study	Rae, 2021	Database	Published article	MMAT / Quantitative nonrandomized	✓	✓	✓	✓	-	✓	7
MMR-VI	Quality of Malaria Treatment Provided under 'Better Health Together' Project in Ethnic Communities of Myanmar: How Are We Performing?	Minn, 2019	Database	Published article	MMAT / Quantitative nonrandomized	✓	✓	✓	-	-	✓	5.5
MMR-VII	Multi-level partnerships to promote health services among internally displaced in eastern Burma	Mahn, 2008	Citation search	Published article	MMAT / Qualitative	✓	✓	✓	✓	✓	✓	6
	BPHWT 10 Years Report 1998-2009. Life, Liberty and the Pursuit of Health: A decade of providing primary health care in Burma's displaced and vulnerable communities	BPHWT, 2010	Org website	Programme report	AACODS / report	✓	✓	✓	✓	✓	✓	12

Programme	Title	First author, year	Search channel	Types of document	QA tool / Type of literature or methodology	Eligibility assessment ¹						QA Score ² (meets the criterion)
						1	2	3	4	5	6	
	BPHWT Annual Report 2018 Provision of Primary Healthcare among the Internally Displaced Persons and Vulnerable Populations of Burma	BPHWT, 2019	Org website	Programme report	AACODS / report	✓	✓	✓	✓	-	✓	12
MMR-VIII	Impact of Community-Based Maternal Health Workers on Coverage of Essential Maternal Health Interventions among Internally Displaced Communities in Eastern Burma: The MOM Project	Mullany, 2010	Citation search	Published article	MMAT / Quantitative descriptive	✓	✓	✓	✓	-	-	6.5
	Community-based delivery of maternal care in conflict-affected areas of eastern Burma: Perspectives from lay maternal health workers	Teela, 2009	Citation search	Published article	MMAT / Qualitative	✓	✓	✓	-	-	✓	7
	The MOM Project: Delivering Maternal Health Services among Internally Displaced Populations in Eastern Burma	Mullany, 2008	Citation search	Published article	AACODS / report	✓	✓	✓	-	-	✓	13
NPL	Integrating Case Detection of Visceral Leishmaniasis and Other Febrile Illness with Vector Control in the Post-Elimination Phase in Nepal	Banjara, 2019	Database	Published article	MMAT / Quantitative randomized control trial and Quantitative nonrandomized	✓	✓	✓	-	-	✓	5
	A review of the maternal iron and folic acid supplementation programme in Nepal: Achievements and challenges	Paudyal, 2022	Google search	Published article	MMAT / Mixed methods	✓	✓	✓	✓	-	-	5.5
PAK	Pakistan's Lady Health Worker Program	Lassi, 2020	Google search	Programme report	AACODS / report	✓	✓	✓	✓	✓	✓	11
	Perceptions of lady health workers and their trainers about their curriculum for implementing the interventions identified for essential package of health services for Pakistan	Sohail, 2021	Database	Published article	MMAT / Qualitative	✓	✓	✓	-	-	✓	7
PNG-I	Reaching the unreachable: leveraging lessons learned from malaria service delivery programs to expand integrated community case management in remote areas of Papua New Guinea	Gheen, 2018	Org website	Programme brief	AACODS / grey literature	✓	✓	✓	-	-	✓	18
PNG-II	Village health volunteers' individual social capital and caretakers' health service utilization for febrile children in Malaria-endemic villages in Papua New Guinea	Inoue, 2017	Google search	Published article	MMAT / Quantitative descriptive	✓	✓	✓	-	-	✓	7
PHL	Diagnosis of malaria in a remote area of the Philippines: comparison of techniques and their acceptance by health workers and the community.	Bell, 2001	Database	Published article	MMAT / Quantitative nonrandomized	✓	✓	✓	✓	-	-	5.5

Programme	Title	First author, year	Search channel	Types of document	QA tool / Type of literature or methodology	Eligibility assessment ¹						QA Score ² (meets the criterion)
						1	2	3	4	5	6	
	Operational efficiency and sustainability of vector control of malaria and dengue: descriptive case studies from the Philippines	van de Berg, 2012	Database	Published article	MMAT / Qualitative	✓	✓	✓	✓	✓	✓	7
	Governance of community health worker programs in a decentralized health system: a qualitative study in the Philippines	Dodd, 2021	Google search	Published article	MMAT / Qualitative	✓	✓	✓	-	-	✓	7

Note: ¹ Referring to eligibility criteria no. 1-6; all included literature are eligible for no.1-3; 22, 26, 36 of included literature are eligible for no. 4-6 respectively

² Quality assessment scores indicated counts “yes” responses to meeting criteria of respective assessment methodologies out of total criteria scores 7 for MMAT, 32 for ACCORDS grey literature, and 14 for ACCORDS report

1.3 Search term and search strategy

The search strategy was developed for use with Medline, and was translated and modified for use in the other databases (309), using controlled vocabulary (MESH terms) as appropriate. Reference lists of included papers were searched for potentially relevant papers. In addition to the above database, we also conducted web searches for grey literature on organisations working with malaria programmes in the Asia Pacific region, including reports from government agencies and development agencies.

We follow the WHO definition of CHWs: “Community health workers should be members of the communities where they work, should be selected by the communities, should be answerable to the communities for their activities, should be supported by the health system but not necessarily a part of its organization, and have shorter training than professional workers.” (310) This definition embraces a broader group of CHWs to capture a diverse group of CHWs in different countries.

No restriction was placed on language of publication (although English was used in data extraction). The last search was conducted on 26th February 2024 in order to capture the most recent findings working within the time and resources available. Databases and search dates

- OVID MEDLINE (<http://www.ovid.com/product-details.901.html>) on 26/02/2024
- PUBMED (<https://pubmed.ncbi.nlm.nih.gov>) on 22/02/2024
- EMBASE (<https://libraryguides.mayo.edu/c.php?g=280102&p=1868117>) on 26/02/2024
- Global Health (<https://www.ebsco.com/products/research-databases/global-health>) on 26/02/2024
- Cochrane Central Register of Controlled Trials (CENTRAL) (<https://www.cochranelibrary.com/advanced-search>) on 26/02/2024
- WHO Global Index Medicus database (<https://www.globalindexmedicus.net/>) on 26/02/2024
- Google Scholar (<https://scholar.google.com/>) on 04/03/2024

Database: Medline (Ovid MEDLINE® Epub Ahead of Print, In-Process & Other Non-Indexed Citations, Ovid MEDLINE® Daily and Ovid MEDLINE®) 1946 to present

Link to search history:

https://ovidsp.ovid.com/ovidweb.cgi?T=JS&NEWS=N&PAGE=main&SHAREDSEARCHID=6LrLKIWIjtZs_G2eEaLVtkyJg6YAKiSkbpk0KXOvusvWN7rz24nrdX4c9RmWhhh1wl

Search Strategy:

- 1 exp Malaria/ (75799)
- 2 exp Plasmodium/ (53024)
- 3 (malaria or plasmodium).ti,ab. (110369)
- 4 1 or 2 or 3 (120349)
- 5 Community Health Workers/ (6749)
- 6 exp Volunteers/ (38599)
- 7 ("community health worker*" or "community health aide*" or "village health worker*" or volunteer* or "village malaria worker*" or "mobile malaria worker*" or "community malaria agent*" or "basic health staff" or "barefoot doctor*" or "lay health worker*" or "lay health advisor*" or "lay health educator*" or "community health agent*" or "lady health worker*" or "voluntary collaborator*" or "health committee member*" or "community health promoter*" or "health assistant worker*" or "health surveillance assistant*" or "community care giver*" or "community caregiver*" or "accredited social health activist*" or ASHA or mitanin or "traditional midwi*" or "family health team*" or "family health program*" or "community health promotion*" or "home based care*" or "home community based care*").ti,ab. (232131)
- 8 exp Community Health Services/ (334961)
- 9 ("community health service*" or "community healthcare" or "integrated community case management" or ICCM or "integrated health service*").ti,ab. (3544)
- 10 exp "Delivery of Health Care, Integrated"/ (14593)
- 11 5 or 6 or 7 or 8 or 9 or 10 (598425)
- 12 (Afghanistan or "American Samoa" or Armenia or Australia or Azerbaijan or Bangladesh or Bhutan or Brunei or Cambodia or China or "Cook Islands" or Fiji or "French Polynesia" or Georgia or Guam or "Hong Kong" or India or Indonesia or Iran or Japan or Kazakhstan or Kiribati or Kyrgyzstan or Laos or Macau or Malaysia or Maldives or "Marshall Islands" or Micronesia or Mongolia or Myanmar or Nauru or Nepal or "New Caledonia" or "New Zealand" or Niue or "Northern Mariana Islands" or Pakistan or Palau or "Papua New Guinea" or Philippines or "Republic of Korea" or Russia or Samoa or Singapore or "Solomon islands" or "Sri Lanka" or Tajikistan or Thailand or Timor-Leste or Tonga or Turkey or Turkmenistan or Tuvalu or Uzbekistan or Vanuatu or "Viet Nam" or Vietnam).tw. (1089872)
- 13 afghanistan/ or iran/ or turkey/ (83254)
- 14 exp samoa/ or tonga/ (1113)
- 15 exp Transcaucasia/ (4877)
- 16 exp Australia/ (174168)
- 17 bangladesh/ or bhutan/ or exp india/ or nepal/ or pakistan/ or sri lanka/ (174167)
- 18 brunei/ or cambodia/ or indonesia/ or laos/ or malaysia/ or myanmar/ or philippines/ or singapore/ or thailand/ or timor-leste/ or vietnam/ (109097)
- 19 china/ or hong kong/ or macau/ or exp japan/ or exp korea/ or mongolia/ (490873)
- 20 Polynesia/ (2036)
- 21 exp Melanesia/ (7209)
- 22 exp Micronesia/ (2175)
- 23 exp Asia, Central/ (8101)
- 24 Indian Ocean Islands/ (843)
- 25 New Zealand/ (44811)
- 26 exp Russia/ (56626)

27 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 (1619055)

28 4 and 11 and 27 (569)

Database: Embase 1974 to present

Link to search history:

<https://ovidsp.ovid.com/ovidweb.cgi?T=JS&NEWS=N&PAGE=main&SHAREDSEARCHID=7GSgkaPM19juQvJE3N7BbSKBvrrll4CCHGCPeN2VZydQ09yglyj6EhiZXQ8LCpUbo>

Search Strategy:

1 exp malaria/ (104065)

2 exp Plasmodium/ (69772)

3 (malaria or plasmodium).ti,ab. (125759)

4 1 or 2 or 3 (148667)

5 health auxiliary/ (9995)

6 volunteer/ (60955)

7 ("community health worker*" or "community health aide*" or "village health worker*" or volunteer* or "village malaria worker*" or "mobile malaria worker*" or "community malaria agent*" or "basic health staff" or "barefoot doctor*" or "lay health worker*" or "lay health advisor*" or "lay health educator*" or "community health agent*" or "lady health worker*" or "voluntary collaborator*" or "health committee member*" or "community health promoter*" or "health assistant worker*" or "health surveillance assistant*" or "community care giver*" or "community caregiver*" or "accredited social health activist*" or ASHA or mitanin or "traditional midwi*" or "family health team*" or "family health program*" or "community health promotion*" or "home based care*" or "home community based care*").ti,ab. (313422)

8 exp community care/ (133411)

9 ("community health service*" or "community healthcare" or "integrated community case management" or ICCM or "integrated health service*").ti,ab. (4571)

10 integrated health care system/ (13861)

11 5 or 6 or 7 or 8 or 9 or 10 (470370)

12 (Afghanistan or "American Samoa" or Armenia or Australia or Azerbaijan or Bangladesh or Bhutan or Brunei or Cambodia or China or "Cook Islands" or Fiji or "French Polynesia" or Georgia or Guam or "Hong Kong" or India or Indonesia or Iran or Japan or Kazakhstan or Kiribati or Kyrgyzstan or Laos or Macau or Malaysia or Maldives or "Marshall Islands" or Micronesia or Mongolia or Myanmar or Nauru or Nepal or "New Caledonia" or "New Zealand" or Niue or "Northern Mariana Islands" or Pakistan or Palau or "Papua New Guinea" or Philippines or "Republic of Korea" or Russia or Samoa or Singapore or "Solomon islands" or "Sri Lanka" or Tajikistan or Thailand or Timor-Leste or Tonga or Turkey or Turkmenistan or Tuvalu or Uzbekistan or Vanuatu or "Viet Nam" or Vietnam).tw. (1472394)

13 exp south asia/ (281761)

14 exp Pacific islands/ (62516)

15 armenia/ or exp azerbaijan/ or exp "georgia (republic)"/ or exp russian federation/ (71840)

16 exp "Australia and New Zealand"/ (268791)

17 exp Southeast Asia/ (162928)

18 exp China/ (341993)

19 iran/ or "turkey (republic)"/ (110244)

20 japan/ or exp korea/ or philippines/ (295045)

21 ussr/ or kazakhstan/ or kyrgyzstan/ or tajikistan/ or turkmenistan/ or exp uzbekistan/ (42495)

22 maldives/ (475)

23 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 (2042239)

24 4 and 11 and 23 (814)

Database: Global Health <1973 to 2024 Week 08>

Link to search history:

<https://ovidsp.ovid.com/ovidweb.cgi?T=JS&NEWS=N&PAGE=main&SHAREDSEARCHID=13CUxzs8cS72M0wmJTZtv0HdbW0TqeFHciBfkVSCG6uh3ITG5gitUrQjtvdfCJiC>

Search Strategy:

- 1 exp malaria/ (70489)
- 2 exp Plasmodium/ (91584)
- 3 (malaria or plasmodium).ti,ab. (97390)
- 4 1 or 2 or 3 (100692)
- 5 exp community health workers/ (1978)
- 6 volunteers/ (2656)
- 7 ("community health worker*" or "community health aide*" or "village health worker*" or volunteer* or "village malaria worker*" or "mobile malaria worker*" or "community malaria agent*" or "basic health staff" or "barefoot doctor*" or "lay health worker*" or "lay health advisor*" or "lay health educator*" or "community health agent*" or "lady health worker*" or "voluntary collaborator*" or "health committee member*" or "community health promoter*" or "health assistant worker*" or "health surveillance assistant*" or "community care giver*" or "community caregiver*" or "accredited social health activist*" or ASHA or mitanin or "traditional midwi*" or "family health team*" or "family health program*" or "community health promotion*" or "home based care*" or "home community based care*").ti,ab. (42196)
- 8 community health services/ (5560)
- 9 ("community health service*" or "community healthcare" or "integrated community case management" or ICCM or "integrated health service*").ti,ab. (1433)
- 10 5 or 6 or 7 or 8 or 9 (47947)
- 11 (Afghanistan or "American Samoa" or Armenia or Australia or Azerbaijan or Bangladesh or Bhutan or Brunei or Cambodia or China or "Cook Islands" or Fiji or "French Polynesia" or Georgia or Guam or "Hong Kong" or India or Indonesia or Iran or Japan or Kazakhstan or Kiribati or Kyrgyzstan or Laos or Macau or Malaysia or Maldives or "Marshall Islands" or Micronesia or Mongolia or Myanmar or Nauru or Nepal or "New Caledonia" or "New Zealand" or Niue or "Northern Mariana Islands" or Pakistan or Palau or "Papua New Guinea" or Philippines or "Republic of Korea" or Russia or Samoa or Singapore or "Solomon islands" or "Sri Lanka" or Tajikistan or Thailand or Timor-Leste or Tonga or Turkey or Turkmenistan or Tuvalu or Uzbekistan or Vanuatu or "Viet Nam" or Vietnam).tw. (840856)
- 12 afghanistan/ or kazakhstan/ or kyrgyzstan/ or mongolia/ or tajikistan/ or turkmenistan/ or uzbekistan/ (9377)
- 13 exp polynesia/ (4491)
- 14 ussr/ or armenia/ or azerbaijan/ or kazakhstan/ or kyrgyzstan/ or "republic of georgia"/ or russia/ or tajikistan/ or turkmenistan/ or uzbekistan/ (29490)
- 15 australia/ or new zealand/ (73378)
- 16 exp south asia/ (189483)
- 17 brunei darussalam/ or indonesia/ or malaysia/ or myanmar/ or philippines/ or singapore/ or thailand/ (78214)
- 18 exp indochina/ (15428)
- 19 exp china/ (256457)
- 20 exp melanesia/ (5831)
- 21 iran/ (66849)
- 22 exp japan/ (60880)
- 23 exp micronesia/ (1043)
- 24 maldives/ (287)
- 25 korea democratic people's republic/ or korea republic/ (34888)
- 26 east timor/ (392)

27 turkey/ (44688)

28 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 (880708)

29 4 and 10 and 28 (518)

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#1 (malaria or plasmodium):ti,ab,kw

7597

#2 (("community health" NEXT worker*) or ("community health" NEXT aide*) or ("village health" NEXT worker*) or volunteer* or ("village malaria" NEXT worker*) or ("mobile malaria" worker*) or ("community malaria" NEXT agent*) or "basic health staff" or (barefoot NEXT doctor*) or ("lay health" NEXT worker*) or ("lay health" NEXT advisor*) or ("lay health" educator*) or ("community health" NEXT agent*) or ("lady health" NEXT worker*) or (voluntary NEXT collaborator*) or ("health committee" NEXT member*) or ("community health" NEXT promoter*) or ("health assistant" NEXT worker*) or ("health surveillance" NEXT assistant*) or ("community care" NEXT giver*) or (community NEXT caregiver*) or ("accredited social health" NEXT activist*) or ASHA or mitanin or (traditional NEXT midwi*) or ("family health" NEXT team*) or ("family health" NEXT program*) or ("community health" NEXT promotion*) or ("home based" NEXT care*) or ("home community based" NEXT care*)):ti,ab,kw

86851

#3 (("community health" service*) or "community healthcare" or "integrated community case management" or ICCM or ("integrated health" NEXT service*)):ti,ab,kw

3450

#4 #2 or #3

89198

#5 (Afghanistan or "American Samoa" or Armenia or Australia or Azerbaijan or Bangladesh or Bhutan or Brunei or Cambodia or China or "Cook Islands" or Fiji or "French Polynesia" or Georgia or Guam or "Hong Kong" or India or Indonesia or Iran or Japan or Kazakhstan or Kiribati or Kyrgyzstan or Laos or Macau or Malaysia or Maldives or "Marshall Islands" or Micronesia or Mongolia or Myanmar or Nauru or Nepal or "New Caledonia" or "New Zealand" or Niue or "Northern Mariana Islands" or Pakistan or Palau or "Papua New Guinea" or Philippines or "Republic of Korea" or Russia or Samoa or Singapore or "Solomon islands" or "Sri Lanka" or Tajikistan or Thailand or Timor-Leste or Tonga or Turkey or Turkmenistan or Tuvalu or Uzbekistan or Vanuatu or "Viet Nam" or Vietnam):ti,ab,kw

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#6 #1 and #4 and #5

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World Health Organization Global Index Medicus

https://pesquisa.bvsalud.org/gim/?output=&lang=en&from=&sort=&format=&count=&fb=&page=1&index=tw&q=%28tw%3A%28malaria+or+plasmodium%29%29+AND+%28tw%3A%28%28%22community+health+worker%22+or+%22community+health+aide%22+or+%22village+health+worker%22+or+volunteer*+or+%22village+malaria+worker%22+or+%22mobile+malaria+worker%22+or+%22community+malaria+agent%22+or+%22basic+health+staff%22+or+%22barefoot+doctor%22+or+%22lay+health+worker%22+or+%22lay+health+advisor%22+or+%22lay+health+educator%22+or+%22community+health+agent%22+or+%22lady+health+worker%22+or+%22voluntary+collaborator%22+or+%22health+committee+member%22+or+%22community+health+promoter%22+or+%22health+assistant+worker%22+or+%22health+surveillance+assistant%22+or+%22community+care+giver%22+or+%22community+caregiver%22+or+%22accredited+social+health+activist%22+or+ASHA+or+mitanin+or+%22traditional+midwi%22+or+%22family+health+team%22+or+%22family+health+program%22+or+%22community+health+promotion%22+or+%22home+based+care%22+or+%22home+community+based+care%22+or+%22community+health+service%22+or+%22community+healthcare%22+or+%22integrated+community+case+management%22+or+ICCM+or+%22integrated+health+service%22%29%29%29

or

(tw:(malaria or plasmodium)) AND (tw:(("community health worker*" or "community health aide*" or "village health worker*" or volunteer* or "village malaria worker*" or "mobile malaria worker*" or "community malaria agent*" or "basic health staff" or "barefoot doctor*" or "lay

health worker*" or "lay health advisor*" or "lay health educator*" or "community health agent*" or "lady health worker*" or "voluntary collaborator*" or "health committee member*" or "community health promoter*" or "health assistant worker*" or "health surveillance assistant*" or "community care giver*" or "community caregiver*" or "accredited social health activist*" or ASHA or mitanin or "traditional midwi*" or "family health team*" or "family health program*" or "community health promotion*" or "home based care*" or "home community based care*" or "community health service*" or "community healthcare" or "integrated community case management" or ICCM or "integrated health service*"))

Google Scholar Screen the first 10 pages or 100 results for each set:

(malaria|plasmodium)("community health worker*"|"community health aide*"|"village health worker*"|volunteer*"|"village malaria worker*")(Afghanistan|Armenia|Australia|Azerbaijan|Bangladesh|Bhutan|Brunei|Cambodia|China|Cook Islands|Fiji|French Polynesia")

(malaria|plasmodium)("community health worker*"|"community health aide*"|"village health worker*"|volunteer*"|"village malaria worker*")(Georgia|Guam|"Hong Kong"|India|Indonesia|Iran|Japan|Kazakhstan|Kiribati|Kyrgyzstan|Laos|Macau|Malaysia|Maldives|"Marshall Islands"|Micronesia)

(malaria|plasmodium)("community health worker*"|"community health aide*"|"village health worker*"|volunteer*"|"village malaria worker*")(Mongolia|Myanmar|Nauru|Nepal|"New Caledonia"|"New Zealand"|Niue|"Northern Mariana Islands"|Pakistan|Palau)

(malaria|plasmodium)("community health worker*"|"community health aide*"|"village health worker*"|volunteer*"|"village malaria worker*")("Papua New Guinea"|Philippines|"Republic of Korea"|Russia|Samoa|Singapore|"Solomon islands"|"Sri Lanka"|Tajikistan)

(malaria|plasmodium)("community health worker*"|"community health aide*"|"village health worker*"|volunteer*"|"village malaria worker*")(Thailand|Timor-Leste|Tonga|Turkey|Turkmenistan|Tuvalu|Uzbekistan|Vanuatu|"Viet Nam"|Vietnam)

(malaria|plasmodium)("mobile malaria worker*"|"community malaria agent*"|"basic health staff"|"barefoot doctor*"|"lay health worker*"|"lay health advisor*"|"lay health educator*")(Afghanistan|Armenia|Australia|Azerbaijan|Bangladesh|Bhutan|Brunei|Cambodia)

(malaria|plasmodium)("mobile malaria worker*"|"community malaria agent*"|"basic health staff"|"barefoot doctor*"|"lay health worker*"|"lay health advisor*"|"lay health educator*")(China|Cook Islands|Fiji|French Polynesia"|Georgia|Guam)

(malaria|plasmodium)("mobile malaria worker*"|"community malaria agent*"|"basic health staff"|"barefoot doctor*"|"lay health worker*"|"lay health advisor*"|"lay health educator*")("Hong Kong"|India|Indonesia|Iran|Japan|Kazakhstan|Kiribati)

(malaria|plasmodium)("mobile malaria worker*"|"community malaria agent*"|"basic health staff"|"barefoot doctor*"|"lay health worker*"|"lay health advisor*"|"lay health educator*")(Kyrgyzstan|Laos|Macau|Malaysia|Maldives|"Marshall Islands"|Micronesia)

(malaria|plasmodium)("mobile malaria worker*"|"community malaria agent*"|"basic health staff"|"barefoot doctor*"|"lay health worker*"|"lay health advisor*"|"lay health educator*")(Mongolia|Myanmar|Nauru|Nepal|"New Caledonia"|"New Zealand"|Niue)

(malaria|plasmodium)("mobile malaria worker*"|"community malaria agent*"|"basic health staff"|"barefoot doctor*"|"lay health worker*"|"lay health advisor*"|"lay health educator*")("Northern Mariana Islands"|Pakistan|Palau|"Papua New Guinea"|Philippines)

(malaria|plasmodium)("mobile malaria worker*"|"community malaria agent*"|"basic health staff"|"barefoot doctor*"|"lay health worker*"|"lay health advisor*"|"lay health educator*")(Korea|Russia|Samoa|Singapore|"Solomon islands"|"Sri Lanka"|Tajikistan)

(malaria|plasmodium)("mobile malaria worker*"|"community malaria agent*"|"basic health staff"|"barefoot doctor*"|"lay health worker*"|"lay health advisor*"|"lay health educator*")(Thailand|Timor-Leste|Tonga|Turkey|Turkmenistan|Tuvalu|Uzbekistan|Vanuatu)

(malaria|plasmodium)("mobile malaria worker*"|"community malaria agent*"|"basic health staff*"|"barefoot doctor*"|"lay health worker*"|"lay health advisor*"|"lay health educator*")("Viet Nam"|Vietnam)

(malaria|plasmodium)("community health agent*"|"lady health worker*"|"voluntary collaborator*"|"health committee member*"|"community health promoter*")(Afghanistan|Armenia|Australia|Azerbaijan|Bangladesh|Bhutan|Brunei|Cambodia|China|Cook Islands|Fiji)

(malaria|plasmodium)("community health agent*"|"lady health worker*"|"voluntary collaborator*"|"health committee member*"|"community health promoter*")("French Polynesia"|Georgia|Guam|"Hong Kong"|India|Indonesia|Iran|Japan|Kazakhstan)

(malaria|plasmodium)("community health agent*"|"lady health worker*"|"voluntary collaborator*"|"health committee member*"|"community health promoter*")(Kiribati|Kyrgyzstan|Laos|Macau|Malaysia|Maldives|"Marshall Islands"|Micronesia|Mongolia|Myanmar|Nauru)

(malaria|plasmodium)("community health agent*"|"lady health worker*"|"voluntary collaborator*"|"health committee member*"|"community health promoter*")(Nepal|"New Caledonia"|New Zealand|Niue|Northern Mariana Islands|Pakistan|Palau)

(malaria|plasmodium)("community health agent*"|"lady health worker*"|"voluntary collaborator*"|"health committee member*"|"community health promoter*")("Papua New Guinea"|Philippines|Korea|Russia|Samoa|Singapore)

(malaria|plasmodium)("community health agent*"|"lady health worker*"|"voluntary collaborator*"|"health committee member*"|"community health promoter*")("Solomon islands"|Sri Lanka|Tajikistan|Thailand|Timor-Leste|Tonga)

(malaria|plasmodium)("community health agent*"|"lady health worker*"|"voluntary collaborator*"|"health committee member*"|"community health promoter*")(Turkey|Turkmenistan|Tuvalu|Uzbekistan|Vanuatu|Viet Nam|Vietnam)

(malaria|plasmodium)("health assistant worker*"|"health surveillance assistant*"|"community care giver*"|"community caregiver*"|"accredited social health activist*")(Afghanistan|Armenia|Australia|Azerbaijan|Bangladesh|Bhutan|Brunei|Cambodia|China)

(malaria|plasmodium)("health assistant worker*"|"health surveillance assistant*"|"community care giver*"|"community caregiver*"|"accredited social health activist*")("Cook Islands"|Fiji|"French Polynesia"|Georgia|Guam|"Hong Kong"|India)

(malaria|plasmodium)("health assistant worker*"|"health surveillance assistant*"|"community care giver*"|"community caregiver*"|"accredited social health activist*")(Indonesia|Iran|Japan|Kazakhstan|Kiribati|Kyrgyzstan|Laos|Macau|Malaysia|Maldives)

(malaria|plasmodium)("health assistant worker*"|"health surveillance assistant*"|"community care giver*"|"community caregiver*"|"accredited social health activist*")("Marshall Islands"|Micronesia|Mongolia|Myanmar|Nauru|Nepal|"New Caledonia")

(malaria|plasmodium)("health assistant worker*"|"health surveillance assistant*"|"community care giver*"|"community caregiver*"|"accredited social health activist*")("New Zealand"|Niue|Northern Mariana Islands|Pakistan|Palau)

(malaria|plasmodium)("health assistant worker*"|"health surveillance assistant*"|"community care giver*"|"community caregiver*"|"accredited social health activist*")("Papua New Guinea"|Philippines|Korea|Russia|Samoa|Singapore|"Solomon islands")

(malaria|plasmodium)("health assistant worker*"|"health surveillance assistant*"|"community care giver*"|"community caregiver*"|"accredited social health activist*")("Sri

Lanka|Tajikistan|Thailand|Timor-Leste|Tonga|Turkey|Turkmenistan|Tuvalu|Uzbekistan|Vanuatu|Viet Nam|Vietnam)
(malaria|plasmodium)("health assistant worker*"|"health surveillance assistant*"|"community care giver*"|"community caregiver*"|"accredited social health activist*")(Vanuatu|Viet Nam|Vietnam)

(malaria|plasmodium)(ASHA|mitanin|"traditional midwi*"|"family health team*"|"family health program*"|"community health promotion*"|"home based care*"|"home community based care*")(Afghanistan|Armenia|Australia|Azerbaijan|Bangladesh|Bhutan|Brunei|Cambodia)

(malaria|plasmodium)(ASHA|mitanin|"traditional midwi*"|"family health team*"|"family health program*"|"community health promotion*"|"home based care*"|"home community based care*")(China|"Cook Islands"|Fiji|"French Polynesia"|Georgia|Guam)

(malaria|plasmodium)(ASHA|mitanin|"traditional midwi*"|"family health team*"|"family health program*"|"community health promotion*"|"home based care*"|"home community based care*")("Hong Kong"|India|Indonesia|Iran|Japan|Kazakhstan|Kiribati)

(malaria|plasmodium)(ASHA|mitanin|"traditional midwi*"|"family health team*"|"family health program*"|"community health promotion*"|"home based care*"|"home community based care*")(Kyrgyzstan|Laos|Macau|Malaysia|Maldives|"Marshall Islands"|Micronesia)

(malaria|plasmodium)(ASHA|mitanin|"traditional midwi*"|"family health team*"|"family health program*"|"community health promotion*"|"home based care*"|"home community based care*")(Mongolia|Myanmar|Nauru|Nepal|"New Caledonia"|"New Zealand"|Niue)

(malaria|plasmodium)(ASHA|mitanin|"traditional midwi*"|"family health team*"|"family health program*"|"community health promotion*"|"home based care*"|"home community based care*")("Northern Mariana Islands"|Pakistan|Palau|"Papua New Guinea"|Philippines)

(malaria|plasmodium)(ASHA|mitanin|"traditional midwi*"|"family health team*"|"family health program*"|"community health promotion*"|"home based care*"|"home community based care*")(Korea|Russia|Samoa|Singapore|"Solomon islands"|"Sri Lanka"|Tajikistan)

(malaria|plasmodium)(ASHA|mitanin|"traditional midwi*"|"family health team*"|"family health program*"|"community health promotion*"|"home based care*"|"home community based care*")(Thailand|Timor-Leste|Tonga|Turkey|Turkmenistan|Tuvalu|Uzbekistan|Vanuatu)

(malaria|plasmodium)(ASHA|mitanin|"traditional midwi*"|"family health team*"|"family health program*"|"community health promotion*"|"home based care*"|"home community based care*")("Viet Nam"|Vietnam)

(malaria|plasmodium)("community health service*"|"community healthcare*"|"integrated community case management"|ICCM|"integrated health service*")(Afghanistan|Armenia|Australia|Azerbaijan|Bangladesh|Bhutan|Brunei|Cambodia|China|"Cook Islands"|Fiji)

(malaria|plasmodium)("community health service*"|"community healthcare*"|"integrated community case management"|ICCM|"integrated health service*")("French Polynesia"|Georgia|Guam|"Hong Kong"|India|Indonesia|Iran)

(malaria|plasmodium)("community health service*"|"community healthcare*"|"integrated community case management"|ICCM|"integrated health service*")(Japan|Kazakhstan|Kiribati|Kyrgyzstan|Laos|Macau|Malaysia|Maldives|"Marshall Islands"|Micronesia|Mongolia)

(malaria|plasmodium)("community health service*"|"community healthcare*"|"integrated community case management"|ICCM|"integrated health service*")(Myanmar|Nauru|Nepal|"New Caledonia"|"New Zealand"|Niue|"Northern Mariana Islands")

(malaria|plasmodium)("community health service*"|"community healthcare"|"integrated community case management"|ICCM|"integrated health service**")(Pakistan|Palau|"Papua New Guinea"|Philippines|Korea|Russia|Samoa|Singapore)
(malaria|plasmodium)("community health service*"|"community healthcare"|"integrated community case management"|ICCM|"integrated health service**")("Solomon islands"|"Sri Lanka"|"Tajikistan"|Thailand|Timor-Leste|Tonga|Turkey|Turkmenistan|Tuvalu|Uzbekistan)
(malaria|plasmodium)("community health service*"|"community healthcare"|"integrated community case management"|ICCM|"integrated health service**")(Vanuatu|"Viet Nam"|Vietnam)

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((((malaria[Title/Abstract] OR plasmodium[Title/Abstract]) OR (("Malaria"[Mesh]) OR "Plasmodium"[Mesh])) AND (((("community health worker**"[Title/Abstract] or "community health aide**"[Title/Abstract] or "village health worker**"[Title/Abstract] or volunteer* or "village malaria worker**"[Title/Abstract] or "mobile malaria worker**"[Title/Abstract] or "community malaria agent**"[Title/Abstract] or "basic health staff"[Title/Abstract] or "barefoot doctor**"[Title/Abstract] or "lay health worker**"[Title/Abstract] or "lay health advisor**"[Title/Abstract] or "lay health educator**"[Title/Abstract] or "community health agent**"[Title/Abstract] or "lady health worker**"[Title/Abstract] or "voluntary collaborator**"[Title/Abstract] or "health committee member**"[Title/Abstract] or "community health promoter**"[Title/Abstract] or "health assistant worker**"[Title/Abstract] or "health surveillance assistant**"[Title/Abstract] or "community care giver**"[Title/Abstract] or "community caregiver**"[Title/Abstract] or "accredited social health activist**"[Title/Abstract] or ASHA or mitanin or "traditional midwi**"[Title/Abstract] or "family health team**"[Title/Abstract] or "family health program**"[Title/Abstract] or "community health promotion**"[Title/Abstract] or "home based care**"[Title/Abstract] or "home community based care**"[Title/Abstract]))) OR ((("community health service**"[Title/Abstract] OR "community healthcare"[Title/Abstract] OR "integrated community case management"[Title/Abstract] OR ICCM[Title/Abstract] OR "integrated health service**"[Title/Abstract])) OR (((("Community Health Workers"[Mesh]) OR "Volunteers"[Mesh]) OR "Community Health Services"[Mesh]) OR "Delivery of Health Care, Integrated"[Mesh]))) AND (Afghanistan or "American Samoa" or Armenia or Australia or Azerbaijan or Bangladesh or Bhutan or Brunei or Cambodia or China or "Cook Islands" or Fiji or "French Polynesia" or Georgia or Guam or "Hong Kong" or India or Indonesia or Iran or Japan or Kazakhstan or Kiribati or Kyrgyzstan or Laos or Macau or Malaysia or Maldives or "Marshall Islands" or Micronesia or Mongolia or Myanmar or Nauru or Nepal or "New Caledonia" or "New Zealand" or Niue or "Northern Mariana Islands" or Pakistan or Palau or "Papua New Guinea" or Philippines or "Republic of Korea" or Russia or Samoa or Singapore or "Solomon islands" or "Sri Lanka" or Tajikistan or Thailand or Timor-Leste or Tonga or Turkey or Turkmenistan or Tuvalu or Uzbekistan or Vanuatu or "Viet Nam" or Vietnam)

1.4 Countries in the Asia Pacific and list of organisations

Countries in the Asia-Pacific	List of organisations searched for in grey literature
Afghanistan	1. Aga Khan University
American Samoa	2. American Refugee Committee,
Armenia	Myanmar
Australia	3. American Refugee Committee,
Azerbaijan	Thailand
Bangladesh	4. Armed Forces Research Institute of
Bhutan	Medical Science (AFRIMS), Bangkok
	39. Malaria Unit, Pasteur Institute in Cambodia
	40. Medical Anthropology Unit, Institute of Tropical Medicine (ITM), Antwerp
	41. Medicine for Malaria Venture (MMV)

Countries in the Asia-Pacific	List of organisations searched for in grey literature	
Brunei Cambodia China Cook Islands Democratic People's Republic of Korea Fiji French Polynesia Georgia Guam Hong Kong India Indonesia Iran Japan Kazakhstan Kiribati Kyrgyzstan Laos Macau Malaysia Maldives Marshall Islands Micronesia (Federation states of) Mongolia Myanmar Nauru Nepal New Caledonia New Zealand Niue Northern Mariana Islands Pakistan Palau Papua New Guinea Philippines Republic of Korea Russia Samoa Singapore Solomon island Sri Lanka Tajikistan Thailand	5. Asia Regional, U.S. Agency for International Development 6. Asian Collaborative Training Network for Malaria (ACTMalaria), Manila 7. Australian Defence Force Malaria and Infectious Disease Institute, Brisbane 8. Australian Institute of Tropical Health and Medicine (AITHM), James Cook University, Cairns 9. Bill and Melinda Gates Foundation 10. BRAC, Bangladesh 11. Burnet Institute, Melbourne 12. Catholic Relief Service (CRS), Cambodia 13. Center for Tropical Medicine, Faculty of Medicine, Public Health and Nursing, Universitas Gadjah Mada 14. Centers for Disease Control and Prevention (CDC), Atlanta 15. Central Department of Microbiology, Tribhuvan University 16. Clinton Health Access Initiative (CHAI) 17. Community Partners International (CPI) 18. Department of Entomology, Faculty of Agriculture, Kasetsart University, Bangkok, 19. Department of Foreign Affairs and Trade (DFAT) 20. Eijkman-Oxford Clinical Research Unit (EOCRU), Jakarta 21. Environmental Science APAC, Crop Science Division, Bayer Pte Ltd 22. Foundation for Innovative New Diagnostics , Geneva 23. Health Poverty Action (HPA), multiple countries 24. Institute for Global Health Sciences, University of California, San Francisco 25. Intellectual Ventures/ Global Good 26. International Centre for Diarrhoeal Disease Research (icddr,b), Dhaka 27. International Organization for Migration (IOM)	42. Menzies School of Health Research 43. MESA Alliance 44. Minister of Public Health, Indonesia 45. National Vector Borne Disease Control Program (NVBDCP), India 46. Nossal Institute for Global Health, University of Melbourne, Melbourne 47. Papua New Guinea Institute of Medical Research (PNG IMR) 48. Parasitology Department, Research Institute for Tropical Medicine (RITM) 49. PATH, Seattle 50. Pattanarak Foundation, Thailand 51. Pilipinas Shell Foundation, Inc. (PSFI), Puerto Princesa City 52. Population Education and Development Association (PEDA), Laos 53. Population Services International 54. Population Services Khermer (PSK), Cambodia 55. QIMR Berghofer Medical Research Institute (QIMR Berghofer), Brisbane 56. Raks Thai Foundation, Thailand 57. Research School of Population Health, Australian National University, Canberra 58. Roll Back Malaria Partnership (RBM) 59. Save the Children- Bangladesh 60. Scaling Up Nutrition Civil Society Alliance (SUN CSA) 61. School of Public Health, Postgraduate Institute of Medical Education and Research, Chandigarh, India

Countries in the Asia-Pacific	List of organisations searched for in grey literature	
Timor-Leste	28. Jiangsu Institute of Parasitic Diseases (JIPD)	62. Stella Maris Seafarer's Center
Tonga	29. Karolinska Institute	63. Sumitomo Chemical
Turkey	30. Khmer Women Welfare Association (KWWA)	64. THINKMD,
Turkmenistan	31. London School of Hygiene & Tropical Medicine (LSHTM)	65. UNICEF Indonesia
Tuvalu	32. Mahidol Oxford Tropical Medicine Research Unit	66. University Research Co., LLC (URC)
Uzbekistan	33. Mahidol Vivax Research Unit (MVRU), Faculty of Tropical Medicine, Mahidol University	67. Walter and Eliza Hall Institute (WEHI), Melbourne
Vanuatu	34. Malara Free Mekong	68. WHO, Global Malaria Program (GMP)
Viet Nam	35. Malaria Atlas Project , Oxford	69. WHO, South-East Asia Regional Office (SEARO)
	36. Malaria Consortium, London	70. WHO, Western Pacific Regional Office (WPRO)
	37. Malaria No More (MNM) India	71. World Vision Foundation of Thailand
	38. Malaria Research Centre, Universiti Malaysia Sarawak (UNIMAS)	72. WorldWide Antimalarial Resistance Network (WWARN), University of Washington, Seattle
		73. Young Muslim Association of Thailand

1.5 Extracted information and characteristics of documents

- Title of the study/literature
- Country where the program/intervention was implemented
- Institution implementing the programme/intervention
- Objective(s) of the study/programme
- Type of study/literature
- Study design/methodology (if applicable)
- CHW cadres
- Malaria and non-malaria services provided by CHW cadre
- CHW compensation for malaria services (if any)
- Source and duration of funding of the programme
- Implementation period
- Implementation scale (the number of CHWs)
- Implementation location (national level, or village/region specific)
- Evidence for impact/success on malaria/other outcomes
- Evidence for impact/success of expanded role programme (including training, supervision, logistics, monitoring, financial costs of implementation and funding)
- Facilitators of and barriers to effective implementation
- Strategies used/recommended to ensure sustainability (Community engagement and stakeholder collaborations, training and supervision, financing, other programme design features)

2. Scoping survey supplementary information

2.1 Online scoping survey design and questions

Log-in page
<p>Survey URL: https://oxford.onlinesurveys.ac.uk/survey-on-expanded-roles-of-malaria-chws-in-the-asia-pacific [launched 30 September 2021]</p> <p>Please access the survey using the password in the invitation email.</p> <p>If you have any questions or trouble accessing this survey, please contact:</p> <ul style="list-style-type: none">▪ Massaya Sirimatayanant [massaya@tropmedres.ac]▪ Monnaphat Jongdeepaisal [monnaphat@tropmedres.ac] <p>Survey password: [MORU2021]</p>
P. 1 Introduction
<p>General Information</p> <p>This survey is being conducted by Mahidol-Oxford Tropical Medicine Research Unit in collaboration with the Asia-Pacific Malaria Elimination Network. This study comprises of this scoping survey of community health worker (CHW) programmes followed by interviews with implementers of selected programmes. We aim to answer the following questions: (1) which organisations provide village malaria worker or equivalent services in the Asia-Pacific; (2) what expanded roles have been used (if any) and which have been rolled out beyond initial pilots; (3) what strategies were used to sustain the programmes and what evidence is there for impact. “Malaria CHWs” in this study are any type of community health worker, village health worker, village malaria worker or health volunteer who provides any services for malaria in a community setting. “Expanded roles” refers to any services these same health workers provide for a health condition other than malaria.</p> <p>This survey aims to identify implementations of programs in which CHWs provide health services for malaria alongside other health services in the Asia-Pacific region. The evidence generated will be used to inform efforts to sustain VMW networks in the Greater Mekong Subregion. You have been invited to participate in this survey because of your organizations’ affiliation with the Asia-Pacific Malaria Elimination Network (APMEN) and/or its involvement in managing VMWs in this region.</p> <p>Malaria CHWs have played an important role in providing diagnosis and treatment of malaria in remote/rural areas. They may be established as a key component of a malaria elimination programme externally sponsored by a donor or as an extension of national public health programmes through expanding the roles of CHWs to include malaria services.</p> <p>This survey is a part of the landscaping analysis for a research priority on VMWs under the Regional Artemisinin-Resistance Initiative (RAI3E). Programmes identified in this landscaping survey that fit the research criteria will be selected for further interview by a team of researchers from our partner organization, the Global Health Group, University of California, San Francisco (UCSF). Representatives of the selected programs will then be contacted and asked to voluntarily participate in implementer interviews to explore more about your programmes and organisations.</p> <p>Participation</p>

Participation in this survey is completely voluntary. If you decide to participate, you may withdraw at any point for any reason before submitting your answer by closing the browser. If you wish to withdraw from the study after the submission or completion of the survey you can contact the research team.

Data usage

We will only ask you to identify the name of the organization/country which you are responding on behalf of. We will not collect any data that could directly identify you. Your IP address will not be stored. The research team will maintain the confidentiality of the research records or data, all data will be stored in an encrypted and secure database at MORU and stored for a minimum of 10 years after we publish the results. As this survey is being conducted on a third-party website, the research data may be stored on backups or server logs beyond the timeframe of this research project (1 August 2021 – 30 June 2022). Although every reasonable effort has been taken, confidentiality during communication via the internet cannot be guaranteed.

Data Access

The research team at MORU is the data controller, and will determine how your response data is used in the study. We will process the data you provide for the purposes of the research outlined above.

Your data may be shared with other investigators taking part in this study, the APMEN Secretariat and a team of researchers at the Global Health Group, UCSF Institute for Global Health Sciences.

Study Review

This research project has been reviewed by, and received ethics clearance, from the University of Oxford Tropical University Research Ethics Committee [534-21].

Who do I contact if I have a concern or I wish to complain?

If you have a concern about any aspect of this study, please contact

- Massaya Sirimatayanant [massaya@tropmedres.ac]
- Monnaphat Jongdeepaisal [monnaphat@tropmedres.ac]

We will do our best to answer your query. We will acknowledge your concern within 10 working days and give you an indication of how it will be dealt with. If you remain unhappy or wish to make a formal complaint, please contact the Chair of the Research Ethics Committee at the University of Oxford who will seek to resolve the matter as soon as possible:

- The Chair, Oxford Tropical Research Ethics Committee;
Email: oxtrece@admin.ox.ac.uk; Address: Research Services, University of Oxford, Wellington Square, Oxford OX1 2JD

This survey is composed of about 30 questions. Participation will take about 15 – 20 minutes. **Please note that you may only participate in this survey if you are 18 years of age or over.**

1. Are you 18 years or above?
 - a. Yes

P.2 Consent

I have read the information above and I agree to participate in the understanding that the data (any information you provide about your organisation/country's malaria CHW programme) I submit will be processed accordingly.

2. I consent to participate in this survey
- a. Yes
 - b. No / *redirect to screen out message*

[Screen out message]

You have been screened out of the survey either because you are below 18 years old and/or did not give your consent to participate in this survey.

Please contact Massaya Sirimatayanant (massaya@tropmedres.ac) or Monnaphat Jongdeepaisal (monnaphat@tropmedres.ac) if you have further questions, concerns or would like to provide feedback about the survey or the RAI3E VMW research project.

P.3 About your organisation

3. What type of organization do you work for?
- a. Government/National Malaria Programme
 - b. Academic/Research institution
 - c. NGO/INGO
 - d. Donor
 - e. Private sector
 - f. International organisations (e.g. UN, WHO)
 - g. Other, please specify.
4. In which Asia-Pacific countries does your organisation work? Select all that apply.
- a. Afghanistan
 - b. Bangladesh
 - c. Bhutan
 - d. Cambodia
 - e. China
 - f. DPR Korea
 - g. India
 - h. Indonesia
 - i. Lao PDR
 - j. Malaysia
 - k. Myanmar
 - l. Nepal
 - m. Pakistan
 - n. Papua New Guinea
 - o. Philippines
 - p. Republic of Korea
 - q. Solomon Islands
 - r. Sri Lanka
 - s. Thailand
 - t. Timor-Leste
 - u. Vanuatu
 - v. Viet Nam
 - w. Other, please specify.
5. What is the name of your organisation?
6. What is your position/job designation?
7. Does your organisation have any programmes that manage CHWs who provide malaria services?
- a. Yes

- b. No / skip to P.10 Recommendations

Note: Please note that malaria CHWs in this survey refer to any type of community health worker, village health worker, village malaria worker or health volunteer who provides any services for malaria in a community setting.

P.4 About your organisation (2)

8. Do these CHWs who provide malaria services also provide other health services?
- Yes
 - No / skip to P.10 Recommendations

P.5 About your organisation (3)

9. Can you provide more detail about this programme?
- Yes
 - No / skip to P.10 Recommendations

Note: If you wish for your co-worker(s) to fill in the responses for this programme(s), you are welcome to forward the invitation email to them.

P.6 About CHWs and their roles

Note: We are interested to know more about the CHWs who provide malaria as well as other services in your programme.

- Please respond to the following questions to reflect what is happening right now in the programme.
 - Please type in or select 'Don't know' to questions that you do not know the response for.
10. What is the name of this programme?

11. In which Asia-Pacific country (or countries) does it operate?

(Please note that our definition of programme is country specific; if your programme operates in multiple countries, you may choose to respond individually about the programme in each respective country. The survey will allow you to respond about another programme after you have completed to this set of questions about the programme in the first country.)

- (List of countries as in no.5)
- Don't know

12. Who manages the programme? Select all that apply.

- Government/National Malaria Programme
- Academic/Research institution
- NGO/INGO
- Donor
- Private sector
- International organisations (e.g. UN, WHO)
- Don't know
- Other, please specify.

13. Is there more than one type of malaria CHW with different sets of roles who work with this programme? *(If you select "yes" you will be shown a set of questions for each type of CHW)*

- Yes
 - What is the name of the first type of malaria CHWs?
 - What malaria service(s) do CHWs provide in this programme? Select all that apply.
 - Testing with rapid diagnostic test (RDT)

- Testing with microscopy
 - Treatment with antimalarials
 - Vector control activities e.g. distribution of mosquito nets
 - Referral of malaria patients to health facilities
 - Health promotion/education for malaria
 - Don't know
 - Others, please specify.
- iii. What non-malaria service(s) do CHWs provide in this programme?
Select all that apply.
- Referral of patients to health facilities
 - Health promotion/education for other disease/topics
 - Non-malarial febrile illness diagnosis
 - Non-malarial febrile illness treatment
 - Activities related to tuberculosis
 - Activities related to pneumonia
 - Activities related to diarrhoea
 - Activities related to Covid-19
 - Activities relating to specific infectious diseases
 - Family planning, child health services, maternal health care
 - Activities related to nutrition and/or malnutrition
 - Activities related to the treatment of other non-communicable disease
 - Health services for bed-ridden patients
 - Substance abuse
 - Mental health services
 - Don't know
 - Others, please specify.
- iv. Have any of these roles changed due to COVID-19, if so how?
- v. What is the name of the second type of malaria CHWs?
- vi. What malaria service(s) do CHWs provide in this programme? Select all that apply.
- (list of services)
- vii. What non-malaria service(s) do CHWs provide in this programme?
Select all that apply.
- (list of services)
- viii. Have any of these roles changed due to COVID-19, if so how?
- ix. Is there a third type of CHWs that provide malaria and other services?
- Yes
 - (repeat sub-questions i - v)
 - If there are more than 3 types of CHWs that provide malaria and other services, please give their names and briefly describe their roles in the space below?
 - No
- b. No
- i. What is the name of the malaria CHWs?
- ii. What malaria service(s) do CHWs provide in this programme? Select all that apply.
- (list of services)
- iii. What non-malaria service(s) do CHWs provide in this programme?
Select all that apply.
- (list of services)

iv. Have any of these roles changed due to COVID-19, if so how?

P.7 Programme-specific questions

Note: We are interested to know more about how the CHWs are managed.

- Please respond to the following questions to reflect what is happening right now in the programme.
- Please type in or select 'Don't know' to questions that you do not know the response for.

14. How are the CHWs selected? Select all that apply.

- a. Elected by the community
- b. Recruited by the managing organisation
- c. Don't know
- d. Other, please specify.

15. Do CHWs receive training for their service provision?

a. Yes

i. For which service(s)? Select all that apply.

- (List of services in no.13)
- Don't know

ii. What kind of training? Select all that apply.

- Introductory training
- On-the-job training
- Refresher training in groups
- Refresher training one-on-one
- Online training
- Don't know
- Other, please specify.

iii. How often do they receive training?

- Monthly
- Quarterly
- Biannually
- Annually
- Don't know
- Other, please specify.

iv. From whom do the CHWs receive training? Select all that apply.

- Government/National Malaria Programme
- Academic/Research institution
- NGO/INGO
- Donor
- Private sector
- International organisations (e.g. UN)
- Don't know
- Other, please specify.

b. No

16. What are the factors, if any, that limit the provision of training? Select all that apply

- a. None
- b. Lack of funding
- c. Lack of available trainers
- d. Lack of updated training materials (e.g. guidelines)
- e. Lack of interest from CHWs

- f. Don't know
 - g. Other, please specify.
17. Has CHW training changed due to COVID-19, of so how?
18. Do CHWs receive supervision?
- a. Yes
 - i. Where do CHWs meet with their supervisors? Select all that apply.
 - At the community where CHWs work
 - At nearest health facility
 - Don't know
 - Others, please specify.
 - ii. How often do CHWs meet with programme supervisors/coordinators?
 - Monthly
 - Quarterly
 - Biannually
 - Annually
 - Don't know
 - Other, please specify.
 - iii. Who supervises/coordinates the CHWs? Select all that apply.
 - Government/National Malaria Programme
 - Academic/Research institution
 - NGO/INGO
 - Donor
 - Private sector
 - International organisations (e.g. UN)
 - Don't know
 - Other, please specify.
 - b. No
19. What are the factors, if any, that limit the provision of supervision? Select all that apply.
- a. None
 - b. Lack of funding
 - c. Lack of access to/from village
 - d. Lack of available supervisor/coordinator
 - e. Lack of interest from CHWs
 - f. Don't know
 - g. Other, please specify.
20. Has CHW supervision changed due to COVID-19, if so how?
21. Has your organization partnered with other organizations to implement this programme?
- a. Yes
 - i. What roles do these partner organizations perform? Select all that apply.
 - Provision of funding
 - Provision of training
 - Provision of supervision
 - Provision of materials or supplies
 - Don't know
 - Other, please specify.
 - ii. Which organisation(s)?
 - b. No
22. How is this programme financed? Select all that apply

- a. Self-funded through payment from patients to CHWs
 - b. Government funding
 - c. Donor funding
 - d. Don't know
 - e. Other, please specify.
23. How are the CHWs compensated? Select all that apply
- a. CHWs receive payment for service provision from their clients/patients
 - b. Monthly salary or income
 - c. Financial incentives based on performance (e.g. incentive per number of RDT done)
 - d. Rewards or other non-financial contributions
 - e. No compensation
 - f. Don't know
 - g. Others, please specify.
24. Who provides CHWs compensation and relevant equipment to perform their duty?
Select all that apply.
- a. Government/National Malaria Programme
 - a. Academic/Research institution
 - b. NGO/INGO
 - c. Donor
 - d. Private sector
 - e. International organisations (e.g. UN, WHO)
 - f. Don't know
 - g. Other, please specify.
25. For how long has this programme been implemented?
- a. Less than 6 months
 - b. 6 months to less than 1 year
 - c. 1 to 5 years
 - d. More than 5 years
 - e. Don't know
26. How many CHWs are currently involved in the programme?
27. How many health facilities/health posts are involved in the programme?
28. Is the programme evaluated for its implementation?
- a. Yes
 - i. On which dimensions is the programme evaluated? Select all that apply.
 - Impact on malaria incidence
 - Impact on malaria testing
 - Impact on malaria treatment
 - Impact on malaria prevention (e.g. use of mosquito nets)
 - Community knowledge and/or awareness of malaria
 - Other impact on malaria
 - Impact on another disease/health condition
 - Data quality
 - Patient/client feedback
 - Knowledge of CHWs
 - Skills of CHWs
 - Don't know
 - Other, please specify.
 - ii. Who evaluates the programme? Select all that apply.
 - By your organization

- By an external organization
 - Don't know
 - Other, please specify.
- iii. Could you share where we could read more about it if the evaluation is publicly available? (e.g. URL of website, published articles, programme report)
- a. No
 - b. Don't know
 - c. Other, please specify.
29. Is this programme still active?
- d. Yes
 - i. What do you think makes this program sustainable? Select all the apply.
 - Ongoing funding
 - Political commitment
 - Community engagement
 - Stakeholder collaboration
 - CHWs performance (e.g. quality of service)
 - Demand for CHWs (e.g. ongoing uptake of the services)
 - Don't know
 - Other, please specify.
 - e. No
 - ii. Why is this programme no longer active? Select all that apply.
 - Lack of funding
 - Lack of political commitment
 - Lack of community engagement
 - Lack of stakeholder collaboration
 - High attrition rate of CHWs (i.e. CHWs leave the programme)
 - Replaced by another programme
 - Programme no longer relevant (e.g. lack of malaria cases or community interest in the services)
 - Don't know
 - Other, please specify.
30. Has CHW programme been impacted in any other ways than services provided, supervision or training by the COVID-19 pandemic (e.g. funding, monitoring and evaluation, partnership, etc.)?
- a. Yes
 - iii. How? Please describe.
 - b. No

Note: Thank you for your responses about this programme.

Following the completion of this survey, the study team will be conducting interviews with implementers of selected programmes. We are interested in interviewing individuals who are involved in your organisation at the managerial level and able to provide an overview of the implementation process of the programme.

31. Could you please identify an individual(s) in your organization we should invite to be interviewed further about the programme? (i.e. name and contact information)

Note: If you would like describe another programme in your organisation that work with CHWs, please select 'Yes' in the question below.

32. Can you identify another specific programme implemented by your organisation in which malaria CHWs provide other health services in addition to those for malaria?
- a. Yes / *repeat program-specific questions (up to additional 2 times)*

b. No / go to P.15 Recommendations

Note: Please note that if you select yes, you will be asked to fill out a set of responses for each programme that you identify.

You will be able to fill in the responses for up to 3 programmes in total.

If you wish for your co-worker(s) to fill in the responses for another programme, you are welcome to forward the invitation email to them.

P. 10 Recommendations

33. Can you recommend other organizations that have CHWs providing malaria and/or other health services in the Asia-Pacific region? Please specify the name of the programme(s) as well if you know.

P. 11 Final page

Thank you for taking the time to complete this survey. Your responses will be analysed by the research team; if your program fits the study criteria we may contact your organization to request setting up a voluntary implementer interview soon.

Please contact Massaya Sirimatayanant (massaya@tropmedres.ac) or Monnaphat Jongdeepaisal (monnaphat@tropmedres.ac) if you have further questions, concerns or would like to provide feedback about the survey or the RAI3E VMW research project.

--- End of Survey ---

2.2 Description of 'other' responses selected in the survey

Category	Programme	CHW cadre(S)	'Other' free text response
Malaria services provided by CHWs	IND1	Malaria Field Coordinators	Supervision and supply chain management of commodities for Village Malaria Workers
	LKA	Public Health Inspectors	Training of newly appointed Public Health Inspectors (refresher courses)
	MMR6	Community Health Workers/ Integrated Community Health Worker	Mass screening and treatment for high transmission areas
	VNM1	Village Health Worker	Follow up patients to ensure treatment adherence with antimalarial
Non-malaria services provided by CHWs	IND1	Malaria Field Coordinators	Training of Government Health Staff towards other health programmes
	LKA	Public Health field officer	Other mosquito-borne diseases - dengue, filariasis etc.
Training Frequency	AFG	N/A	Depends on the report and recommendation of CHWs supervisors,

Category	Programme	CHW cadre(S)	'Other' free text response
			annual plan of the health services provision contracted NGOs and availability of funding
	MMR5	N/A	In addition to monthly, quarterly and annual, training is also provided when needed
Training Provider	THA1	N/A	Community based organisations
Supervision Frequency	IND1	N/A	Every week
	LKA1	N/A	Every week/less than monthly
	MMR1	N/A	Frequency depends on area
	MMR5	N/A	Frequency depends on local situation (security, weather and road condition, availability of mobile network etc.)
	NPL1	N/A	Supervision is not time bound, organised when needed
	THA1	N/A	Daily
Supervision Provider	THA1	N/A	Community based organisations
Limitations to providing training	AFG	N/A	Coordination and collaboration among managing organizations
	IND2	N/A	Lack of local language training material, trainers who can provide training in local dialogs, education standard to received technical key points
	KHM1	N/A	Dropout rate
	LAO	N/A	COVID-19 lockdown restriction
	LKA	N/A	Physical training opportunities lost due to COVID-19. Online trainings were conducted but not effective. e.g. training for malaria microscopy through online sessions is not practical, etc.
	MMR1	N/A	Accessibility to remote conflict zones
	MMR2	N/A	COVID-19 restrictions
	MMR4	N/A	COVID-19 restrictions and Arm Conflicts
	MMR5	N/A	Formal in-person group trainings were avoided in some implementing townships to avoid gathering in this year 2021 because of coup and COVID.
	Limitations to providing supervision	AFG	N/A
BNG		N/A	COVID-19 lockdown
KHM2		N/A	Travel restriction of local health authority due to the COVID-19 pandemic

Category	Programme	CHW cadre(S)	'Other' free text response
	LAO1	N/A	COVID-19 lockdown
	LKA	N/A	Lack of time, cumbersome reporting procedures
	MMR1	N/A	Access and motivation
	MMR2	N/A	COVID-19 travel restriction, CHW attritions, lack of time availability from CHW side as well as supervisor side, supervisors are not properly trained for supportive supervision, quality of supervision being conducted
	MMR4	N/A	Travel restriction due to COVID-19 and Arm Conflict
Programme Evaluation	IND1	N/A	Impact of fever prevalence rates in the study area amidst declining malaria in the region
	MYS	N/A	Number of reported malaria cases
	THA1	N/A	Research network

3. VMW and malaria programme study supplementary information

3.1 Interview and focus group guides by respondent types

Interview guide for policy makers and implementers

Aim of the interview: to identify and describe the perspectives of policy makers and implementers on expanding the roles of malaria post workers (MPs) and/or village health volunteers (VHVs) and community-based health programmes implementation.

1. Introduction and background questions

Thank you very much for participating in this interview. To begin with, could you tell me something about your background and current work?

2. Health sector gaps

As part of this project, we would like to gain a better understanding of challenges to health care delivery in remote rural communities. What are your views?

Probes:

Focus on the management of febrile illness, including diagnosis, referral, and treatment (with examples)

- Consider barriers in access to services across different dimensions: geographic accessibility, availability, affordability, and acceptability
- Encourage discussion of challenges associated with specific population groups (e.g. ethnic minorities, women) and health concerns

3. Policy prospects

What is the current policy framework to address these gaps? What are the plans for the future?

Probes:

- Focus on different stages in the policy cycle: prioritisation, policy formulation, and policy implementation
- Discuss potential policy challenges but also opportunities (such as upcoming rounds of donor funding)

4. Expanding the role of village health workers

[If not mentioned earlier]. Do you think MPs and/or VHVs could be used to address these challenges? If so, how, in what capacities?

Probes:

- Encourage retrospective analysis of previous experiences with village health workers, particularly for the management of malaria and TB
- Encourage a reflection on specific challenges to, and opportunities for, the expansion of VHVs, including policy and operational challenges
- Mention specific issues such as financing and sustainability, integration in the wider health sector, and motivation

5. Feasibility of rapid diagnostic tests and micro-technologies for community-based interventions

As part of this project, we envisage the introduction of low-cost, rapid tests which can be used to diagnose and manage non-malarial febrile illness and other diseases in the communities. For example, [SHOW PHOTO OR SLIDES]. What do you think? Do you think this could be a good idea? Can we discuss potential challenges and opportunities?

Probes:

- Direct the discussion around the key issues of sustainability, usability, procurement, acceptability, feasibility and integration into the wider health system
- Encourage a reflection on past experiences with rapid diagnostic tests for malaria

6. Conclusions

Thank you very much. Would you have anything to add? Do you have any questions? Would you have any suggestions about specific areas of investigation we should consider in future interviews? Could you name other informants we should talk to?

Interview guide for malaria post workers

Aim of the interview: to identify and describe the perspectives of MPs (and/or village health volunteers) on expanding their roles and support needed to implement the extended services.

1. Background information

- 1.1 Place of residence: Where do you live? With who? How long have you lived in the village?
- 1.2 Occupation: Are you currently working? What do you do for a living?
- 1.3 MP/VHV: For how long have you been a MP and/or VHV? How many years?

2. Current tasks and experience working as MPs

- 2.1 Current role and service(s)
 - Can you tell me about your role as a MP? What do you do?
 - What service(s) do you provide?
 - What kind of activities do you do?
 - Where do you provide the service(s)?
 - When do you provide the service(s)?
- 2.2 Clients
 - To whom do you provide the service(s)?
 - Who comes to see you? How many? How often?
 - When do they come to visit you?
 - If they do not come to visit you, where do they go? To whom?
- 2.3 Recruitment, training, and supervision
 - How did you become a MP? Were you recruited? By who?
 - How much are you paid for the role/task? By whom? How often?
 - Do you receive any training for the job? How often?
 - What is the training for? What is your opinion about it?
 - Do you receive any supervision for the job? How often?
 - What is the supervision for? What is your opinion about it?
- 2.4 Main benefits and drawbacks or work challenges

- What do you think about your experience as a MP?
- What do you like about it?
- What do you dislike about it?
- Are there any benefits from your work? What are they?
- Are there any drawbacks/disadvantages from your work? What are they?

2.5 Work challenges

- What do you think are the main challenges for you to perform your role?
- How do you cope with them?
- Are there any problems for you to complete your work? What are they?
- How do you fix them?
- Is there anything you think could be improved?

2.6 Future plan and motivation

- Would you like to continue your MP role in the community? Why (not)?
- For how long do you think you will be a MP?
- If you could change anything about the role, what would it be?
- Where do you see yourself in 10-20 years?

3. Perception of expanded roles and additional services beyond malaria

3.1 Expanded roles

- What do you think about expanding your role as a MP beyond malaria?
- What do you think could be the benefits for the expansion?
- What do you think could be the drawbacks for the expansion?

3.2 Additional service(s)

- What additional service(s) do you think should be provided in your community? (Probe with list of additional services) (e.g. antenatal care, family planning, vaccination)
- For which disease do you think the service(s) should be provided? (e.g. tuberculosis, pneumonia, diarrhoea, malnutrition, HIV/AIDS, cancer, diabetes)
- What kind of activities do you think could be provided? (Probe with list of activities e.g. prevention, diagnosis, treatment, follow-up, referral, health education)
- What are the main health concerns among your community members?
- Are there specific groups the services should target?

3.3 Feature of expanded role(s) and additional service(s)

- Would you like to provide those service(s)?
- How do you think those service(s) should be provided?
- Where do you think the service(s) should be provided?
- What are your preferred working hours?
- What do you think about payment for the service(s)?

4. Necessary support to implement extended services

4.1 Types of support

- What support do you think is needed for you to implement these additional roles?
- What do you think you will need to provide the additional service(s)?
- What skills/training do you think are important for you? How often should they be?
- What supervision do you think is important for you? How often should they be?
- What tools/supplies do you think are important for you to have?
- How would you like to be compensated for the additional service(s)?
- Are there other types of support you need?

4.2 Available health services in the community and partners

- Who are the other healthcare providers in your community?
- For which services do the community members visit the other providers?
- Do you work with those providers for any of your tasks/roles/services? On what aspects?
- With whom do you collaborate to perform your tasks?
- What collaboration would be beneficial for you to provide the additional service(s)?

Interview guide for community members

Aim of the interview: to identify and describe community members' experiences with, and expectation of, health services provided by MPs and other health care providers.

1. Background information

- 1.1 Place of residence: Where do you live? With who? How long have you lived in the village?
- 1.2 Occupation: Are you currently working? What do you do for a living?
- 1.3 Health concern: Do you have any health concern? For what disease(s)? Do you have an illness? Do your family members have an illness?

2. Experience with available healthcare services in the community

- 2.1 Awareness and uptake of health service providers
 - Do you visit other health services provider? (e.g. traditional healer, health centre, hospital, clinic, pharmacy)
 - For what reason/service do you visit the provider(s)?
 - How often do you visit the provider(s)?
 - What is your experience visiting the provider(s)?
 - What do you like about them?
 - What do you dislike about them?
 - Where are these services? How far are they from your house?
 - Do you have any problems accessing the service(s)?
- 2.2 Cost
 - How much do you pay for healthcare now? In a month? In a year?
 - For what services do you pay? How much do they cost?
 - How do you pay for the service(s)?
 - Are there other costs from the service(s)? (e.g. transportation, work loss)
 - Do you have/receive any health benefits scheme? Can you tell me about it?

3. Current experiences of MP services

- 3.1 Awareness and uptake
 - Do you know a MP in your community? Who is s/he? Where does s/he live?
 - What services does the MP provide?
 - How many MPs are there in your community? Do they provide different services?
 - Have you ever visited the MP? For what reason/service?
 - How often have you visited the MP? How many times?
 - Has your family visited the MP? For what reason/service?

3.2 Access

- How far is the MP from your place? How long do you take to get there?
- What time do you usually visit the MP?
- Are there times when the MP was not available?
- Do you have to pay for the services?
- Are there other costs from visiting the MP? (e.g. transportation)

3.3 Satisfaction

- Are you satisfied with the service(s) provided? Why is that?
- What do you like about the services?
- What do you dislike about the services?

3.4 Acceptability

- What is your experience with the MP?
- What is your experience with the services?
- Are you comfortable to receive the services from the MP?
- Do other people in the community visit the MP? For what reason/service?
- If not, who or where do you/they visit?

4. Expectations on current and expanded MP services

4.1 Benefits/drawbacks

- Do you think the services benefit your community? In what way?
- Do you think the MP services are needed in your community? Why do you think so?
- Are there any drawbacks about the services?

4.2 Quality of service

- What you think about the quality of the services you received?
- Do you feel better after you received the services?
- What could be improved?

4.3 Preferences for other additional services and MP to pay

- What other health services do you think the MP can provide to your community?
Probe with list of potential services
- What other health services do you think will be beneficial? Why do you think so?
- How much do you think you would pay for the additional services provided by the MP?

Community focus group topic guide

Aim of the focus group discussion (FGD): To explore local health concerns in the community and how the expanded malaria post workers (MPs) and/or village health volunteers (VHVs) roles could be developed and implemented to better reach specific groups of community members.

1. Introduction and overview of activities (approx. 5-10 mins depending on the group size)

- Welcome, introduction of staff and project, introduction of FGD participants

- Purpose of the FGD
- Ground rules

2. Local health concerns and population-at-risk in the communities (approx. 20 mins)

- What are your biggest health concerns for yourself?
- What are your biggest health concerns for your children?
- What disease(s) are you and/or the community concerned about?
- Who are the population at risk for this/these disease(s)? Who experiences it/them the most?
- Where do community members go to get treatment for the disease(s)?
- Which health services are already provided to the community?
- Are there difficulties accessing these services in your community?
- Do you have to pay for the services? How much?

These questions can be discussed for a quite a long time, about 20 minutes, so that the participants can recall their experience and make comments.

At this point they may mention some “health problems”, “target population”, “health service providers” spontaneously → note-taker will note the ideas mentioned on the board/on a piece of paper, and discuss them later.

- Can you think of anything else? Try to think of as many things as possible.
- What do you think about this problem/disease? *use list of possible health problems/diseases*

If the lists of “health problems” is exhausted, we can ask about the concerns in more detail:

- Which concerns/diseases do you think are the most important for your community? Please rank the concerns/diseases in terms of importance
- Does everyone agree to this ranking? What do you think should differ?

3. Expectations on and preference for additional services provided by MPs (approx. 20 mins)

- How is the malaria situation in your community?
- What do you think about the current services provided by MPs?
- How could they be improved?
- Do you have any complaints about the services? Did anyone else?
- Are there other health services in addition to malaria that could be added?

→ Note down “health problems” and “target population” again

→ Add “health services” to the board/note.

- Can you think of anything else? Try to think of as many things as possible
- What do you think about this service? *Use list of possible health services*

If the list of “health services” is exhausted, we can ask about the services in more detail, e.g.

- Which services do you think are the most important for your community? Please rank the services in terms of importance

E.g. Person A, you said you think “service X” is the most important. Can you tell us more about it? Why do you think so?

- Does other people agree with this ranking?

- What do you think should be different?

4. Design and feature of implementation of expanded MP roles (approx. 30 mins)

Sum up the health concerns and additional health services you have noted down on the board/paper.

The aim is to discuss the most important additional health service in depth, or all the services if possible. Choose a specific service and ask about its implementation in more detail:

→ Note down “target population” again

→ Add “activities” to the board/note

→ Add “community”

- For this service, what kind of activities do you think should be provided to the community?
- Is there a specific group the service should target or be provided to?
- How do you think the service should be provided? (e.g. home-based delivery, by MPs, referral)
- Would you be willing to receive this service from a MP?
- What do you think are the advantages if a MP providing this service?
- Are there any disadvantages? What are they?

Community engagement and sustainability of the services:

- Do you think the community could contribute to the service provision? How? In what way?
- For how long do you think the services should be provided?
- If you need to pay for the service, would you be willing to pay and how much?
- How do you think the services could be sustained in your community?

5. Conclusion (approx. 10 mins)

Sum up what has been discussed, mention the positive aspects, and thank the participants.

- How did you like talking about the topics with us?
- Is there anything important to you we have not mentioned?
- If you want to follow any issues you have talked about, you can contact us. (We will be at during this period ... or contact us at ...)
- The participants will be told that if they want to withdraw from the study, their data will not be used.

3.2 Interim outputs on features and implementers of community-based malaria programmes

Overview of malaria and community-based malaria programmes. Source: 2011 World Health Organization (WHO)'s Thailand National Malaria Control Programme's review report; 2014 Ministry of Public Health's primary health care division report; 2021 Division of Vector-Borne Diseases (DVBD)'s RAI3E Implementation Plan; additional web searches on government websites were conducted. Data from the interviews are used to supplemented the extracted information.

Key features	Implementers (stakeholders identified)
<p>Thailand’s national malaria programme (NMP)</p> <ul style="list-style-type: none"> • NMP is semi-vertical programme under Division of Vector-Borne Diseases (DVBD), Department of Disease Control (DDC), and implemented through Office of Disease Prevention and control (OPDC) in coordination with Provincial Health Offices (PHOs) under general public health system. • The malaria programme is primarily funded by the national government. The programme is also part of and receives funding from the Regional Artemisinin Initiative 3 Elimination (RAI3E). DVBD and the Global Fund management office under the DDC is Co-Principal recipient; DVBD is sub-recipient; ODPCs are sub-sub recipients of RAI3E grant. • There are 7 modules under RAI3E implementation plan: <ul style="list-style-type: none"> (1) Vector Control which includes: entomological monitoring; support for Long-lasting Insecticidal Net (LLIN) and Long-lasting Insecticidal Hammock Net (LLIHN); Information Education Community (IEC)/Behavioural Change Community (BCC); and Indoor Residual Spraying (IRS) (2) Case Management which includes: Active Case Detection (ACD) and Investigation; Facility Based Treatment; Integrated Community Case Management (ICCM); Private Sector Case Management; Therapeutic Efficacy Surveillance; and IEC/BCC-Case Management (3) RSSH: Laboratory Systems which includes Information Systems and Integrated Specimen Transport Networks; and Quality Management Systems and Accreditation (4) Community Systems Strengthening which includes Social mobilization, building community linkages and coordination; and Community Based Monitoring (5) Specific Prevention Interventions which includes IEC/BCC (6) RSSH: Health Management Information System and M&E which includes Program and Data Quality; and Routine Reporting (7) Program Management which includes Grant Management. • Malaria clinic (MC) staff were a mix of programme staff and government employees with expertise in microscopy diagnosis and vector control measure implementation; however many would soon be retired and the program would lose its workforce under its vertical programme. • According to 2016 National Malaria Elimination Strategy (2017-2026) focusing on achieving a malaria-free Thailand by 2024, key priorities include expansion of service coverage to at-risk population, effective surveillance system, adoption of new technology, capacity building of new staff, and integration of MP, MC and health promotion hospital (HPH). 	<p>National malaria programme: DDC, Global Fund management office; DVBD, 11 ODPCs, Vector Borne Disease Center (VBDC), Vector Borne Disease Unit (VBDU), 180 MCs</p>

Key features	Implementers (stakeholders identified)
<ul style="list-style-type: none"> DVBD outlined two-pronged integration approaches: transfer of malaria diagnosis and treatment activities to public hospitals (sub-district and district levels) and of vector control activities to local surveillance and rapid response team (SRRT); both with DVBD and respective PHO support 	
<p>Provincial health office (PHO) and malaria post worker (MP)</p> <ul style="list-style-type: none"> The programme was founded in 2004 and were managed by provincial health offices in respective provinces as part of a general health system. Many MPs were generally recruited from a pool of VHVs and/or other community-based programmes. Supervision of MPs is conducted on a monthly basis by PHO staff who may also oversee other control activities for other diseases beyond malaria; HPH director is responsible for the supervision of VHVs under general public health system. MPs receive introductory and refresher trainings on an annual basis; technical guidance and capacity building are provided by VBDC, while PHO facilitate training. Community-based volunteers generally receive monthly compensation (not salary) for their volunteer work; for example, MPs receive 3,000THB and VHVs 600-1,000THB. Accordingly to 1996 Ministry of Public Health (MoPH) Legislation on medical procedures (last updated 2013), non-medical professionals are not allowed to perform medical procedures, including blood testing, except under the supervision of medical professionals. This applied to MPs and VHVs under supervision of PHO and respectively. 	<p>General health system: 40 Provincial Health Offices (PHOs), 444 Health Promotion Hospitals (HPHs), 400 Malaria post workers (MPs), Village Health Volunteers (VHVs)</p>
<p>Local administrative offices (LAOs)</p> <ul style="list-style-type: none"> LAOs include provincial and sub-district administrative offices and local health network and are emerging actors in the malaria elimination program whereby surveillance and malaria prevention measures Future financing opportunities include local health funds to support disease outbreak prevention and control 2020 Guideline for Local Administrative Offices and health network on the implementation of malaria elimination strategy 2015 the Communicable Disease Act of the MoPH stipulates that local authorities are responsible for the surveillance and reporting of malaria cases 	<p>Non-MoPH departments: Provincial Administrative Office (PAO), Sub-district Administrative Office (SAO)</p>
<p>Civil Society Organizations (CSOs)</p> <ul style="list-style-type: none"> CSOs are sub-recipients of RAI3E grants. They also managed their own malaria programmes where they built their own health providers, volunteers and field workers, including leveraging existing providers (VHVs and MPs) in the communities to remote and hard-to-reach communities, especially along borders and forested areas home to mobile and migrant populations, illegal workers, ethnic groups, and marginalized populations. 	<p>CSOs: Alight, International Rescue Committee (IRC), Raks Thai Foundation (RTF), Shoklo Malaria Research Unit (SMRU), Young</p>

Key features	Implementers (stakeholders identified)
<ul style="list-style-type: none"> • Similar to general volunteers, CSO-based volunteers were not able to perform medical procedures. However, CSOs implemented alongside clinics (e.g. SMRU) were able to perform medical procedures and provide medical services including diagnosis and treatment. • Monthly salary and activity-based incentives were provided for workers and volunteers involved in specific programmes. 	Muslim Association of Thailand (YMAT)
<p>International organisations</p> <ul style="list-style-type: none"> • The Global Fund is the main donor that support the national program and implementing organizations • Technical assistance were provided by WHO Thailand, and other organizations that are representative in national malaria elimination management committee, including USAID, Armed Forces Research Institute of Medical Sciences (AFRIMS), United Nations High Commissioner for Refugees (UNHCR), and International Organization for Migration (IOM). 	<p>IOs: United Nations Office for Project Services (UNOPS), World Health Organization (WHO) Thailand, United States Agency for International Development (USAID)</p>

Characteristic of malaria post worker according to RAI3E Implementation Plan. Source: 2021 DVBD's RAI3E Implementation Plan

Eligibility
<ol style="list-style-type: none"> 1. Age 18-55 years old 2. Receive primary education at minimum, literate, and able to communicate in local language(s) 3. Are local to, live in, or able to work in community where the post is located 4. Well-prepared for the tasks and able to maintain the role for the project duration; accepted by the community and selected by the village committee
Roles and responsibilities
<ol style="list-style-type: none"> 1. Screen malaria patients with RDT and provide treatment 2. Explain correct use and adherence to malaria treatment, and follow up with all malaria cases 3. Monitor treatment adherence and provide consultation 4. Report malaria cases onto malaria information system (MIS) within one day 5. Notify or accompany all PF cases to attend follow-up visits on Day 3, 7, 28, 42 6. Notify or accompany all PV cases to attend follow-up visits on Day 14, 28, 60, 90 7. Refer all cases with severe symptoms, pregnant women, and children under one to HPH or hospitals 8. Perform behavioral change communication (BCC) to target population including at-risk group and community members; tailor content, message, and channel to communicate regarding infection risk, asymptomatic malaria, testing and treatment, treatment adherence, follow-up attendance, and self-prevention measures including promoting use of LLIN and repellent 9. Coordinate vector-control intervention implementation e.g. coverage of LLIN distribution

10. Supervise malaria treatment 11. Perform active case detection among population with outdoor infection risk e.g. forest goers and plantation workers using RDT 12. Complete relevant reports e.g. paper-based case notification report (EPI form-1, and mHealth application to report case online onto MIS		
Medical equipment and supply		Office equipment and supply
<ul style="list-style-type: none"> - Tissue paper (roll, box) - Pill counting or splitter tray - Height and weight scale - Sterile cotton - Digital thermometer - Permanent marker - Pill brown Zip-lock bags - Max-Min Thermometer 	<ul style="list-style-type: none"> - Ethyl alcohol 70% - Powder free latex gloves - Blood lancet - Microscope slides - Spreader slides - Infrared thermometer - Surgical mask - Bin - Bin for contaminated sharps 	<ul style="list-style-type: none"> - Desk, chair - Cupboard(s) - Clock - Whiteboard or notice board - Office sign - Stationary
<p><i>Note: MPs will be provided with RDTs and a cool box for storage, and with Artesunate-Pyronaridine for complicated PF cases and Dihydroartemisinin-Piperaquine (DHA-PIP) treatment for uncomplicated PF cases in Ubon Ratchathani and Sisaket.</i></p>		

Overview of the development of Thailand's malaria and primary care programme

<p>*NMP or malaria control programme *Primary health care programme CHW cadre development overtime</p> <p>1942 Established Ministry of Public Health (MOPH) 1943 Established Malaria Division within the Department of Health, MOPH 1945 Established Malaria Units to provide antimalarials and bite protection in epidemic areas 1949 Established a national Malaria Control Programme (vertical programme) with technical and financial support from the US government to perform IRS (DDT) and active case detection Formed Malaria Volunteers (MV) in rural communities with support from WHO, UNICEF, USAID 1961 Transferred Division of Malaria Control from Department of Health to Office of the Under-Secretary of Health 1965 Established formally the National Malaria Eradication Project (NMEP) supported by WHO and USAID to perform IRS, ACD, PCD, radical treatment, investigation and surveillance activities Established Malaria Clinics (MC) to perform vector-control activities, ACD, PCD, diagnosis/treatment 1966 <i>Piloted a study on public health care (PHC) at community level in Phitsanulok province</i> 1970 Terminated USAID assistance + Increasing access of population forest areas, deforestation, large-scale agriculture 1972 Re-established Malaria Control Programme with focus on remote areas and along international borders with intense deforestation and population migration</p>

- 1974 Transferred Malaria Control Division to under the Department of Communicable Disease Control (CDC) responsible for malaria control policy development, planning and evaluation, funds distribution, training, monitoring and supervision
- 1977 Created 4th Public Health Plan (1977-1981) to implement PHC projects and form village drug fund¹
- 1978 Alma-Ata Declaration on Primary Health care with goal of "Health for All by the Year 2000"
Established **village health communicators (VHC)** under the universal health development initiatives to perform 8 PHC elements at village level
- 1980 Launched a community-based primary health care project at Chiang Mai and Lampang (1980-1985) and further piloted in Nakhon Ratchasima and Khon Kaen
- 1981 Formed National Committee of Primary Health Care and Office of Primary Health Care Committee to serve the missions
Signed to commit to WHO's Charter for Health Development
- 1982 Created 5th Public Health Plan (1982-1986) to scale-up the VHCs to 10 volunteers per village, extend PHC essential elements, and integrate PHC with village development fund², and basic minimum need plan³, create health card project⁴ and training programme under the Trigonal Theory (man, fund, committee) plan
- 1984 Established 4 regional training centres for primary health care development (in Khon Kaen, Nakhn Sithammarat, Nakhon Sawan, Chonburi, and later Yala in 1997) → upgraded to Regional training center for people health care system in 2003
- 1986 Established ASEAN Training Center for Primary Health Care Development (ATC/PHC) to support PHC development among ASEAN countries with support of Japanese government → upgraded to ASEAN Institute of Public Health development → ASEAN Institute for Health Development (AIHD) in 2009
- 1987 Upgraded VHCs to **village health volunteers (VHV)** with expanded roles to perform 5 additional PHC elements
Established community's primary health care centres to address non-communicable diseases (shifted from infectious diseases)
Founded multi-level VHV clubs with support from OPHC and regional training centers⁵
Founded health care volunteer's day (later approved in 1994)
- 1991 Created 5 Malaria Divisions or Malaria Regional offices reporting to CDC Director
Revised guidelines for implementation of malaria control activities (classified areas into control, pre-integration, integration according to epidemiological situation)

¹ Village drug funds were formed as a 800 Baht support by the government, comprising 63 items of household drugs, which were provided by the Government Pharmaceutical Organization (GPO). The fund was held following joined administration by VHVs and VHCs. At the end of 1981, 1984 and 1987, numbers of village drug fund of 2,000, 2,200 and 26,977 were reported to formed.

² Several provisional funds were provided to perform PHC at village level e.g. nutrition fund and sanitation funds (1995). In 1986, they, including village drug funds were consolidated into community/village development fund in 53 provinces, administered jointly by village committee (VHV, VHC, village leader, sub-district chief), and c-supported by MOPH, and other Ministries.

³ Basic minimum need (BMN) was initiated in 1987 to promote life quality in every PHC village, administered jointly by village committee, and c-supported by MOPH and other ministry but later taken by department of community development, MOI

⁴ Health Card Project was initiated 1983 aiming to be expanded to all sub-district levels within 1987 but were discontinued.

⁵ VHV clubs aimed to 1) support, coordinate, promote villagers and PHC work, 2) used as knowledge/experience transferring center, 3) provide social welfare among VHVs

- 1996 Integrated with other vector-borne disease programmes into Bureau of Vector-Borne Disease (BVBD) within the Department of Disease Control (DDC), MOPH
 - Vertical structure in areas with malaria control operations from the central level
 - Integrated with the filariasis and dengue haemorrhagic fever control programmes
 Decentralized NMCP's malaria control and prevention operation by integrating them into General Health Services (GHS)
 Revised malaria control policies according to WHO's Global Malaria Control Strategy (1993) and external and internal reviews (1995)
- 1999 *Established Local Administrative Organisation (LAO) under the decentralisation to Local Government Organisations ACT of BE 2542 (following 1997 constitution and reformation) to provide public health services (and also support vector control activities at different administrative levels)*
- 2000 *Adopted Korat Agreement for Sustainable Health for all 2000-2010 to support VHVs for social roles/activities and support new PHC budget agenda (increase from 7,500 THB to 10,000 THB per village) to perform PHC work*
- 2001 *Introduced universal health care policy or UHC to provide universal coverage of free medical care*
Established Migrant Health Strategic Plan by MOPH in collaboration with other GO and NGOs to promote health insurance among migrant populations
*Established **Migrant Health Volunteers** (MHV) to support and facilitate border health prevention and promotion programs*
- 2002 Established and scaled up **Malaria Posts (MP)** under GHS with support from Global Fund to perform RDT, treatment, distribution of ITN and health promotion
 Received grants from GFATM (R2)
- 2003 *Replaced Office of Primary Health Care Committee (1981) with Primary Health Care Division to develop and implement approach to village health management and change VHVs responsibility from workers to community health manager*
VHVs play an important role in preventing and monitoring bird flu incidence (until 2006) and other locally transmitted diseases e.g. dengue, ill/dead poultry
- 2004 *Integrated PHC and VHVs to support MOPH's Thailand Strength Project (socio-economic development) and provide health development services e.g. mental health, cancer, hypertension, diabetes, heart diseases*
- 2007 *Established Sub-district hospital and connect with district hospital to strengthen PHC work towards village and sub-district health management*
Upgraded VHVs to Village Health Manager whose function is shifted to "leaders to change health behaviors" with awards/promotion for VHVs work and improved training/curriculum
- 2007 Received grants from GFATM (R7)
 Created National Malaria Strategic Plan 2007-2011
- 2008 *Initiated Sub-district health management project administered jointly by sub-district hospital, VHVs, village leaders, sub-district offices → upgraded to district level in 2013*
- 2009 *Provided monthly salary of 600 THB to VHVs*
- 2011 Received grants from GFATM (R10)
 Created National Malaria Strategic Plan 2011-2016
Provided essential materials needed for VHVs operations e.g. blood pressure measuring machine and blood collecting instrument
Established Border Health Master Plan to ensure better access to health care services and effective disease surveillance system for Thai and migrants communities in the border (need further investigation on implementation)
- 2015 Aligned the national plan with Global technical strategy for malaria 2016–2030 by WHO's Global Malaria Programme

2016 Created National Malaria Elimination Strategy, Thailand 2017-2026 to align with UN
SDG, NEDSB no.12-13 plan, 20-year national strategy plan
Created Malaria Elimination Operational Plan, Thailand 2017-2021

4. Primary care unit study supplementary information

4.1 Interview guides by respondent types

Interview guide for policy makers and implementers

Aim of the interview: to identify and describe the perspectives of policy makers and implementers on expanding the roles of malaria post workers (MPs) and/or village health volunteers (VHVs) and community-based health programmes implementation.

1. Introduction and background questions

Thank you very much for participating in this interview. To begin with, could you tell me something about your background and current work?

2. Health sector gaps

As part of this project, we would like to gain a better understanding of the local health concerns and the access to health services in the communities.

Based on your experience at the facility;

- What are the health concerns in your community?
- What services does the facility usually provide to the community?
- Where do community members visit when they're sick?
- Who comes to visit the facility?
- If they do not visit the facility, where do they go? What services do they provide?

Probes:

- Consider barriers in access to services across different dimensions: geographic accessibility, availability, affordability, and acceptability
- Encourage discussion of challenges associated with specific population groups (e.g. women, migrants, ethnic minorities) and health concerns

3. Current health priorities and the decision-making process

As part of this project, we would like to gain a better understanding of how to enhance health care delivery at primary health units. What are your views?

- How is the public health functions determined?
- How is the current health service prioritised?
- How are the resources to PCU allocated?
- To what extent is the PCU staff involved in the process?
- How is the community involved with the process?

Probes:

- Focus on the development of primary health care policy, including district and subdistrict health level

4. Expanding the role of village health workers

[If not mentioned earlier]. Do you think MPs and/or VHVs could be used to address these challenges? If so, how, in what capacities?

Probes:

- Encourage retrospective analysis of previous experiences with village health workers, particularly for the management of malaria and TB
- Encourage a reflection on specific challenges to, and opportunities for, the expansion of VHVs, including policy and operational challenges
- Mention specific issues such as financing and sustainability, integration in the wider health sector, and motivation

5. Feasibility of rapid diagnostic tests and micro-technologies for community-based interventions

As part of this project, we envisage the introduction of low-cost, rapid tests which can be used to diagnose and manage non-malarial febrile illness and other diseases in the communities. What do you think? Do you think this could be a good idea? Can we discuss potential challenges and opportunities?

Probes:

- Direct the discussion around the key issues of sustainability, usability, procurement, acceptability, feasibility and integration into the wider health system
- Encourage a reflection on past experiences with rapid diagnostic tests for malaria

6. Adoption of health interventions

To actualize the proposed technologies or interventions;

- What are the policy considerations to implement them?
- What steps are required to develop and implement the technologies/intervention?
- Who are involved in the process?
- Are there successful cases that has been introduced in the past?
- What are the factors that contribute to the successful case?
- Are there examples of the cases that failed?
- What are the topics of research that you think would be useful in the future
- What areas should be prioritized?
- What disease should be prioritized?

Probes:

- Focus on different stages of policymaking: prioritization, formulation, implementation
- Discuss potential policy challenges and opportunities such as financing, human resources; successful/unsuccessful cases

7. Conclusions

Thank you very much. Would you have anything do add? Do you have any questions? Would you have any suggestions about specific areas of investigation we should consider in future interviews? Could you name other informants we should talk to?

Interview guide for PCU workers

These additional topics to the above and are tailored to PCU workers based on their roles and experience at PCUs.

9. Experience with health services provision and linkage with VHVs for service delivery

As part of this project, we would like to gain a better understanding of how to enhance health care delivery at primary health units. What are your views?

- What are the challenges you faced when providing the services?
- What are the challenges you faced when performing your roles?
- Can you describe your decision making process when you address these challenges?
- How do you usually voice your concerns about health service delivery at the PCUs?
- Is there a mechanism through which you can provide your opinions?
- Is there a CHW(s) in your community?
- Do you work with CHWs to deliver any services?

Probe:

- Encourage a reflection on specific challenges at health facility: human resource (staff, personnel), medical supplies (diagnostic, treatment, laboratory), logistics, infrastructure, communication with patients, finance
- Focus the role of CHWs and the extent to which they are part of the facility; challenges and opportunities of health service delivery to the community

10. Perspective on use of technology or interventions to enhance the service and necessary support

We also want to understand if the use of technologies or interventions will improve the provision of health services in the communities. Do you think this could be a good idea?

- What service provision should be improved?
- What disease or health condition should be prioritized?
- Which kind of technologies or interventions are needed at the PCUs?
- What type of information should they provide?
- Who should use them?
- What support is needed to implement them?
- What do you think are the potential challenges and opportunities?

Probe:

- Direct the discussion around the types of technology or interventions: diagnostic test, disease surveillance, decision-support technology, referral system, telemedicine
- Mention specific supports such as tools, training, compensation, collaboration, infrastructure
- Give specific example of technology or intervention to lead to discussion such as predictor for diarrhea, decision support technology for dengue, diagnostic tool for melioidosis, telemedicine

4.2 Scoping survey questions for PCU workers

Questions	Responses
1. Age	<ul style="list-style-type: none"> ■ 18-20 ■ 21-30 ■ 31-40 ■ 41-50 ■ 51-60 ■ 61+
2. Gender	<ul style="list-style-type: none"> ■ Male ■ Female ■ Others, please identify ■ Prefer not to answer
3. Years as healthcare workers	<ul style="list-style-type: none"> ■ Less than 1 year ■ 1-5 years ■ 5-10 years ■ More than 10 years
4. Work position	
5. Size of PCU	<ul style="list-style-type: none"> ■ Small ■ Medium ■ Large
6. Work profiles of PCUs: What tasks do you perform the most at PCUs? Select all the apply.	<ul style="list-style-type: none"> ■ Disease prevention ■ Disease control ■ Health promotion ■ Treatment ■ Others. Please describe
7. Health priorities: Please describe up to 3 most important local health priorities in the communities that you provide services to.	
8. Utilisation of medical devices: Please describe medical device and equipment you used to perform your roles at PCUs.	
9. Utilisation of technological devices: Please describe technological device and equipment you used to perform your roles at PCUs.	
10. Challenges: Please describe up to 3 most important challenges you face from providing health services at PCU.	
11. What are your views regarding the adoption of health technology to improve the health service delivery at PCUs? Can you describe their benefits or potential contribution?	
12. What are the drawbacks? What might be the negative outcomes of the adoption?	
13. Do you have any recommendations or suggestions to improve the health service provision at PCUs? Example: skills and capacity, funding, human resources, availability of equipment, health interventions, adoption of health technologies	

4.3 Interim outputs on VHV and primary care programme

In Thailand, PHC has been consistently invested in for four decades, establishing a network of public health centers and hospitals that provide essential health services. This includes public health care facilities:

- Primary Care Units (PCUs)
- Health Centers (HCs) or;
- Tambon (sub-district) health promotion hospitals (HPHs)

Features of PCUs and primary care services. Source: Human Resources for Health Research and Development Office (HRDO) https://hrdo.org/wp-content/uploads/2021/07/HRDO-fact-sheet_9-ok.pdf;

PCU size and staff							
Size	Population coverage	Staff/PCU					
		Total	Director	Nurse	Public health staff	Dental staff	Others*
Small	<3,000	3	1	1	1-2	1	1
Medium	3,001-8,000	5	1	1	2-3	1	1-2
Large	>8,001	7	1	1	3-5	1	2
PCU main roles and prioritized health programs							
<ol style="list-style-type: none"> 1. Prevention 2. Promotion 3. Treatment 4. Rehabilitation 5. Consumer protection 				<ol style="list-style-type: none"> 1. First aid 2. Mother and child care 3. Non-communicable diseases (NCDs) 4. Preliminary dental care 5. Elderly, bedridden, disabled persons care 6. Thai traditional medicine 			

Top health priorities designated in Ubon Ratchathan and Chiang Rai by provincial health offices; Source: http://demo.phoubon.in.th/?page_id=319 (UB) https://cro.moph.go.th/moph/download/ssj_boss.pdf (CR)

Ubon Ratchathani (2022)	Chiang Rai (2021)
<ol style="list-style-type: none"> 1. Cholangiocarcinoma (CCA) and liver cancer 2. NCDs: diabetes, hypertension, kidney, heart diseases 3. Road accident 4. Drowning 5. Tuberculosis 6. Pneumonia (hospital setting) 7. Child development 8. Dengue 9. Suicide 10. Elderly, bedridden 	<ol style="list-style-type: none"> 1. Growth hormone 2. Falling in at-risk elderly 3. Tuberculosis 4. Chronic obstructive pulmonary disease (COPD) 5. NCDs: diabetes, hypertension 6. Suicide

Strong emphasis has also been put on preventive and promotive health through the community-based village health volunteers (VHVs). There are various types of VHVs and upgrades made to the cadre. The following table summarised the key features of each VHV cadre and associated programme.

Key features of VHV programmes, cadre of VHVs and their associated programmes

Source: http://phc.moph.go.th/www_hss/data_center/dyn_mod/2580.pdf; for malaria programme, see appendix 3

	Village health volunteers	Caregivers	Malaria volunteers
Abbreviations or other names	VHVs; formerly known as village health communicator (VHC) Upgrade: family health volunteers (FHV) Upgrade: ski 3-doctor programme	CG	MVs Upgrade: Malaria Post Worker (MPs)
Implementers	Ministry of Public Health (MoPH)	National Health security office (NHSO) and local health organisations (LAO)	Division of Vector-borne Diseases (DVBD) and Provincial Health Offices
Funding agency	MoPH through Department of Health Service Support (HSS)	NHSO through and Long-term care fund	MVs: Multiple programme MP: The Global Fund through DVBD and PHOs
Year established	1977 - piloted in several provinces and scaled up to national level 2017 - FHV 2019 - 3-doctor programme	2016	1930 under malaria programme 1949 WHO and UNICEF 1951 Malaria eradication programme 2002 onwards the Global Fund 2007 Malaria control programme and the RAI
Background of CHW	A person selected by residents from no fewer than 10 households in each community or neighborhood, who has completed training in accordance with the curriculum set by the MoPH	A person recruited or selected to provide public health and social services to meet the needs of individuals facing hardship due to chronic illness, accidents, or various forms of disability	A person recruited or selected to provide malaria services in areas with high malaria transmission rates, remote areas with difficult transportation access, or far from other public health services, such as health stations, vector-borne disease control units, and malaria clinics.
Eligibility	<ul style="list-style-type: none"> ▪ Age range: Must be at least 18 years old ▪ Must be Residence: registered in the household census and reside permanently in the village ▪ Minimum education: Must be literate (able to read and write) ▪ Must be willing and dedicated ▪ Must have a desire to participate and contribute to community development 	<ul style="list-style-type: none"> ▪ Minimum education: Must have completed at least Grade 6 of primary education ▪ Must undergo the Care Giver (CG) training course provided by the Department of Health 	<ul style="list-style-type: none"> ▪ Age range: 18-55 years old. ▪ Residence: Must reside in the village. ▪ Minimum education: At least primary school level. ▪ Language skills: Ability to read and write Thai and speak the local dialect. ▪ Work readiness: Must be willing and able to work continuously throughout

	Village health volunteers	Caregivers	Malaria volunteers
	<ul style="list-style-type: none"> Must have good conduct and be trusted by the community Must be in good physical and mental health Must have time to fulfill the responsibilities of the role 		<p>the project and be accepted by the community.</p> <ul style="list-style-type: none"> Status: Must be a current VHV or hold a similar position
Role and responsibility	<ul style="list-style-type: none"> Monitor and control disease prevention in the area Promote health and reduce chronic diseases, mental health issues, drug use, and accidents <p>For upgraded VHVs:</p> <ul style="list-style-type: none"> Utilise communication tools and health-related applications Act as leaders of health care networks and address health issues within families and communities, including patient referrals <p>For FHV:</p> <ul style="list-style-type: none"> Be a health role model who sets an example for their family and acts as the health caregiver for their household. Transfer knowledge to their family members and assist those who are dependent. <p>Coordinate household health development and collaborate with VHVs ensuring roles do not overlap</p>	<ul style="list-style-type: none"> The main task is to conduct home visits to assist and care for homebound or bedridden elderly individuals, often referred to as dependent elderly. This includes support with daily activities such as bathing, dressing, feeding, and administering medication. Screen, assess health problems, and provide basic health services based on an individual care plan, which is prepared by a health professional acting as the Case Manager (CM). Care for elderly individuals according to their daily routines. Observe behavioral changes in elderly individuals. Promote the overall health of the elderly, including managing their environment. Write a report on activities and submit it to the relevant authority. In cases where food is prepared for the elderly, prepare and cook meals, ensuring cleanliness and hygiene of cooking utensils and equipment. Properly manage waste and refuse generated from caring for the elderly. 	<ul style="list-style-type: none"> Screen clients for malaria diagnosis using RDT (Rapid Diagnostic Test) and provide treatment according to the treatment guidelines. Refer patients who are severely ill, children, or pregnant women, and advise those with negative malaria test results to visit a health station or hospital for further treatment, including those who did not undergo RDT testing. Follow up on patient treatment and advise them to complete the full course of medication as prescribed. Provide health education to patients and the general public. Distribute LLIN (Long-Lasting Insecticide-treated Nets) to all foreign patients (M2) who test positive for malaria. Coordinate malaria prevention and control efforts, such as net impregnation and distribution to ensure full coverage. Prepare reports.

	Village health volunteers	Caregivers	Malaria volunteers
		<ul style="list-style-type: none"> ▪ Refer elderly individuals in cases of emergencies or illness. ▪ Prepare monthly care reports for the elderly to be submitted to the Care Manager. 	
Training	8 core + 6 additional training sessions (32 hours) For FHV: 11 additional training session (18 hours) For upgraded programme: additional 6 additional training sessions (18 hours)	Core training sessions (70 hours) Upgrade with 30 hours of additional training	2-day training sessions for 7 core topics
Compensation	600 THB/month 1,000 THB/month	600 THB/month (for 1 - 4 cases) 1,500 THB/month (for 5 - 10 cases) 5,000 THB/month (completed all training sessions)	3,000 THB/month

5. Malaria outbreak case study supplementary information

5.1 Interview guide [updated from previous RAI3E component]

Integration of community-based malaria services into primary care system
<p>We want to learn about your views on integration of community-based malaria services onto primary care system. What do you think about integration of malaria services?</p> <ul style="list-style-type: none">- How is the integration approach/strategy designed?- Has it been implemented?- How does the recent increase of malaria incidence affect this approach? <p><u>Probes:</u></p> <ul style="list-style-type: none">- Direct the discussion around how this would affect the role expansion of village malaria workers and other types of community-based volunteers.- Encourage retrospective analysis of past experience with integration and decentralisation of malaria and other health programme- Focus on the malaria situation in the country along international border
Malaria situation along the Thai-Myanmar border
<p>As part of this project, we wanted to understand more about the current malaria situation along the border. Can you tell me about this?</p> <ul style="list-style-type: none">- What causes the outbreaks?- Who are the malaria patients? Who are at an increased risk of infection?- How have the situation been addressed?- Do you encounter any challenges from implementing malaria strategies? Please describe- What is your view on the current implementation of malaria programme in your contexts?- How can the programme be improved? <p><u>Probes:</u></p> <ul style="list-style-type: none">- Encourage characterisation of ethnic groups and mobile and migrant populations (MMPs), their care-seeking practices, access to malaria services and care, choices of health providers- Focus on malaria and health interventions tailored to this population, for example, migrant health, undocumented migrants, cross-border collaboration to address MMPs

6. Public engagement supplementary information

6.1 Co-creation activities and evaluation results

1. Brainstorm workshop - content evaluation results

Goal

- To reflect on the malaria situation in Thailand and the region, role of MPs and the contribution of various stakeholders in providing malaria services in the community, success of malaria control and elimination activities in Ubon Ratchathani, and alignment with national malaria elimination goals.

Target audience

- 12 participants of brainstorm meeting comprising of local health care stakeholders, including provincial, district, and sub-district level primary health care workers, and CSO (only 2 persons are/were involved in malaria program)

Tool

- Kahoot! quiz comprising of 7 questions: 6 questions with correct answers and 1 open ended

Results

- Performance range from 1 – 4 correct out of 6 questions, with overall 34.7% correct rate
- Question with highest correct rate– national elimination goal (mentioned during presentation prior to conducting activity)
- Only 5/12 participants were able to correctly identify malaria day despite this being observed at the provincial level annually
- Participants do not have an accurate picture of the malaria situation in the country, including about MPs beyond their community/district, and are most unaware of the malaria situation in Thailand and the region within the context of the world

# correct responses (out of 12)	Question
9	Thailand aims to eliminate malaria by what year? (ประเทศไทยตั้งเป้าหมายกำจัดมาลาเรียภายในปีไหน?)
5	Please rank the following provinces based on their malaria incidence over the past year, from highest to lowest (เรียงจังหวัดที่มีเคสมาลาเรียสูงสุดไปถึงน้อยสุดในปีที่ผ่านมา)
4	When is world malaria day? (วันมาลาเรียโลกตรงกับวันที่เท่าไร?)
3	How many MPs are currently working in Ubon Ratchathani? (ปัจจุบัน มี MP ทำงานอยู่ในจังหวัดอุบลราชธานีกี่คน?)
2	Between 2012 and 2023, which year recorded the highest number of malaria cases in Ubon Ratchathani Province? (ปีที่มีจำนวนเคสมาลาเรียสูงสุดในจังหวัดอุบลราชธานีตั้งแต่ปี 2555 ถึง 2566 คือปีใด)
2	Is the Asia-Pacific region the region with the highest malaria incidence? True or false? (ภูมิภาคเอเชียแปซิฟิกเป็นภูมิภาคที่มีมาลาเรียสูงสุด ใช่ หรือ ไม่ใช่)

Participants' past/current malaria related roles (free-text)



Evaluation and observation

- Kahoot! is a powerful quick knowledge assessment tool, suitable for conducting as first activity to energize participants and break the ice
- Main limitation with use: Kahoot! is in English, unfamiliarity with the platform including issues with logging in/accessing Kahoot! on the phone, and having to view questions on the projector but answering on the phone
- Challenges with use in this round:
 - Too many types of responses (MC, scale submission, ranking, open-ended)
 - Too short of time frame for some questions (main issue for ranking question, but also observed for questions that requires clicking on submit a response)

Note: This quiz will be repeated with the group of participants during the reconvening workshop at the end of the project.

2. Brainstorm workshop - activity evaluation result

Goal

- To receive evaluation and feedback from participants of brainstorm meetings

Target audience

- 15 participants of brainstorm meetings

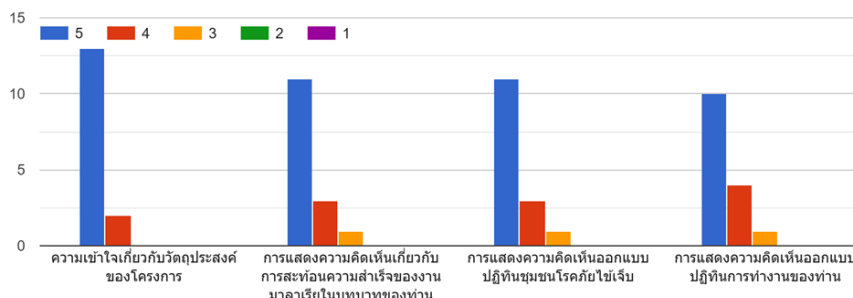
Tool

- Google Form (online) accessed by participants on their mobile phones. The same evaluation form was used for all three workshops.

Results

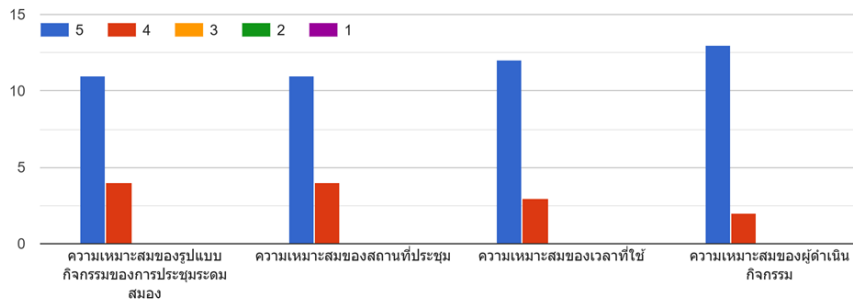
- Age profile: 8 participants aged 20-40, 6 aged 41-60, and 1 over 60
- 46.7% females, 53.3% males
- Participants' contribution

2. ความคิดเห็นของผู้เข้าร่วมต่อกิจกรรม (5=มากที่สุด 1=น้อยที่สุด)



▪ Participants' satisfaction

3. ประเมินความพึงพอใจ (5=มากที่สุด 1=น้อยที่สุด)



▪ Comments and feedback

- sharing materials for the workshop with participants

3. School health camp - content evaluation result

Goal

- To raise awareness of malaria situation and the role of malaria post workers among students in endemic communities in Buntharik district

Tool

- Short quiz comprising 3 questions with yes or no answers; students can choose right for yes answers and left for no answers. They were given 10-15 seconds to choose their answers before photographs were taken to evaluate the results.

Target audience

- 60 students in Grade 7-9 aged 11-15 years old at Baan Nhongmek school, Huay Kha subdistrict, Buntharik district.

Results:

Questions	Pre-test	Post-test
Can a person get malaria more than once? (Correct answer: Yes)	Yes 46 No 14	Yes 47 No 13
Currently there are MPs in each and every villages in Huay Kha subdistrict. (Correct answer: No, there are only 3 MPs in Huay Kha.)	Yes 24 No 36	Yes 54 No 6
Buntharik has the highest number of malaria cases this year. (Correct answer: Yes....there are currently 2 malaria cases in Buntharik (one indigenous, one imported), and Sirindhorn district also has 2 cases.	Yes 42 No 18	Yes 56 No 4

Evaluation and observation:

- Fun activity for students for ice breaker
- should have count the number of students immediately
- good that the students sit down after final answers
- peer pressure because everyone sees all answers (male and female student grouping)
- electricity cut limits post-test... (students may not hear the questions correctly)
- option is to raise hands instead of standing up and walk around (chaotic)

4. School health camp - activity evaluation result

Goal

- To receive evaluation and feedback from participants of school health camps

Target audience

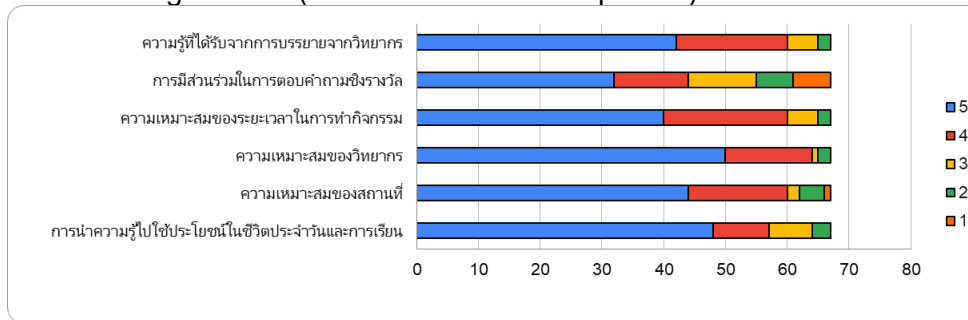
- 60 students and 24 adult participants in the event (teachers, speakers, etc)

Tool

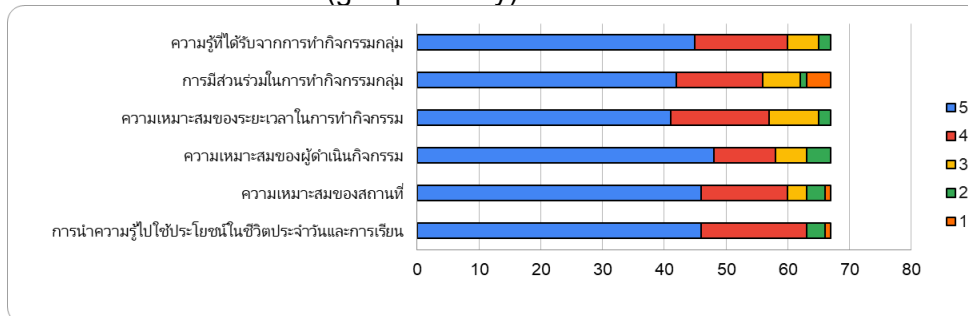
- Google Form (online and paper-based) accessed by participants on their mobile phones or provided by the staff. The same evaluation form was used for all participants.

Results

- 67 respondents (60 students, 3 teachers, 4 speakers and observers)
- 41 males, 25 females, 1 identified as others
- Age profile: 58 students aged 12-15, 3 and 4 adults aged 31-40 and 31-40 respectively, 2 not identified
- Morning session (health education and quizzes)



- Afternoon session (group activity)



Comments and feedback

- Majority did not identify or had no comments. Specified comments include issues regarding venue (too small), time (limited time for education session), reading (did not specify but might be related to presentation slides with texts during session).
- Most likes: role play, signing, group presentation activity, food boxes and snacks
- Most dislikes: reading and presentation, vegetables in food boxes

5. School health camp - group work evaluation result

Best scores from teachers and speakers: Group 4

Please provide score 1-5	G1	G2	G3	G4
Knowledge and information	4.5/5	4.7/5	4.4/5	4.7/5
Creativity and presentation	4.2/5	4.8/5	4.4/5	5/5
Time	4.5/5	4.7/5	4.5/5	4.7/5
Participation	4.7/5	4.5/5	4.7/5	4.8/5
Total	17.9/20	18.7/20	18/20	19.2/20

Popular votes from students/fellow classmates: Group 2 runner up

Each group has 1 hour to prepare and 10-15 minutes to present in front of class

Group 1 Symptoms of malaria and dengue (body mapping)

Group 2 Risks of malaria and dengue (location mapping)

Group 3 Prevention from malaria and dengue (singing)

Group 4 Testing and treatment for malaria and dengue (role play)



6. Overall evaluation results

Based on the evaluation we drafted in the proposal, here we report the overall expected outputs as of December 2024 (by qualitative* and quantitative# evaluation).

Establishment of partnership	Model for involving communities to support malaria activities	Reach of engagement activities	Quality of engagement activities
<p>26 partnership members: →3 volunteers, 6 HCWs →6 local govt, 4 provincial govt, 2 national govt →1 CSO, 4 researchers</p> <p>Expanded network: →16 individuals incl. volunteers, schools, HCWs, village leaders, public</p> <p>Follow-up initiatives: →Health awareness among youth/students →Capacity building for HCWs (Epi / no testing)</p>	<p>Buntharik health calendar 2024: →Locally owned →Identified 27 health concerns; grouped into 12 months →100 calendars distributed at: provincial (12) and district (4) level, hospital and PCUs (20), malaria clinics (4), malaria posts (8), communities (14), schools (4), general public (6), DVBD (6)</p>	<p>550 individuals from 36 engagement activities →13 one-on-one consultations →1 brainstorm workshops* →1 school health camp* →1 reconvening workshop* →3 village meetings →17 public campaigns</p> <p>* Participant evaluation</p> <p>139 Line OA followers from 40 online engagement activities (ongoing)</p>	<p>Quantitative and qualitative feedback collected after each one-time activity →Conversational/live, evaluation forms, ratings</p> <p>Quantitative and qualitative feedback from ongoing engagement activities →Observational, in-person evaluations, interviews, consultation meetings</p> <p>36 calendars observed, feedback for improvement</p> <p>End-of-project consultation with hospital team</p>

7. Interim outputs: Buntharik health calendar

- **Grouping** of diseases and health issues, aligning each group with seasonal and local events in the communities (as of August)
 - 1 Tuberculosis, sexually transmitted infections (STIs), HIV/AIDS - Screening
 - 2 Pregnancy in adolescent, mental health, substance abuse - Valentine's day
 - 3 Respiratory infections, pneumonia, PM2.5 - Agricultural burning
 - 4 Drowning, rabies, food poisoning - Summer break
 - 5 Mushroom poisoning - Early rainy season
 - 6 Foot, hand, mouth diseases - Semester starts
 - 7 Dengue, Chikungunya, Zika - Full rainy season
 - 8 Leptospirosis, melioidosis - Full rainy season
 - 9 Scrub typhus, malaria - Rainy - dry season
 - 10 Cervical and breast cancers, OVs - Screening
 - 11 NCDs, diabetes, hypertension, kidney, heart diseases - No specifics
 - 12 Influenza, COVID-19 - Dry season

- **Online form** for local organizations/our partners to fill details of their health programs in (as of September)
 - Title and implementation period of the health programs
 - Website, link, document, or QR codes to share details of the programs
 - Suggested infographics for the calendar
 - Suggested locations to place the calendars in the communities
 - Suggested channels to advertise the calendars e.g. Line group, Facebook, announcement

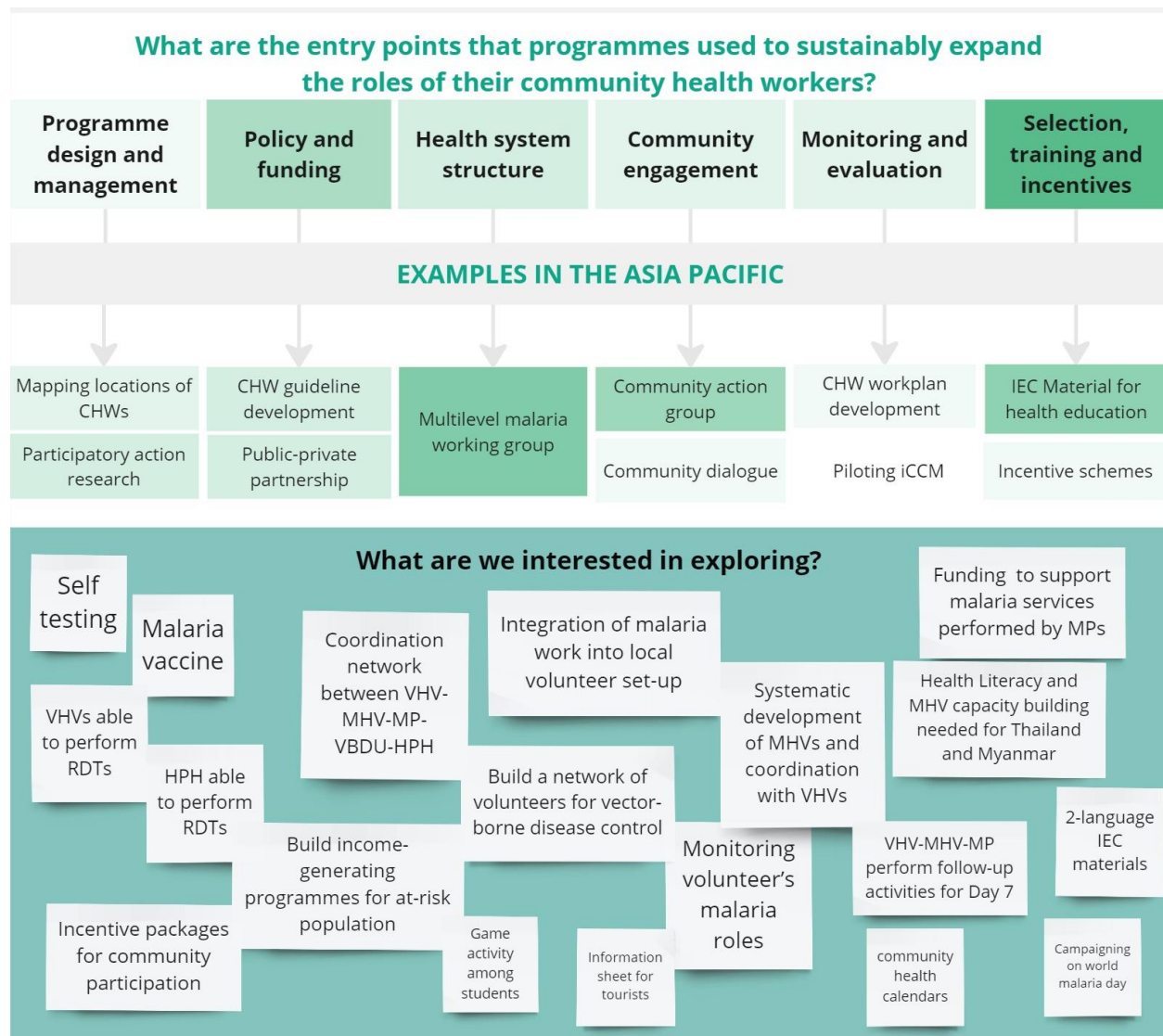
- **Village monthly meeting** to receive feedback from community members in 3 villages where MPs are located on (as of September):
 - Local health concerns
 - Suggested locations to place the calendars in the communities
 - Suggested channels to advertise the calendars e.g. Line group, Facebook, announcement

- **Example** of Buntharik health calendar 2024 comprising 12 groups of diseases and health concerns for 12 months, and information on relevant local health programs organized by local organizations/our partners

- **Production of the calendar**
 - Designed by local artists
 - 100 pieces, hanged calendar, colored printed, coated papers
 - Printed by December 2023; distributed early January 2024

7. Policy engagement supplementary information

7.1 Sustainability board



7.2 Full reports on case studies identified from the engagement project

Case study 1 M-FUND insurance scheme to support access to quality healthcare for migrant populations

What is M-FUND?

Although Thailand has achieved Universal Health Coverage for Thai citizens and allowed registered migrant workers to enroll in Social Security Scheme in the case of regular formal sector or the Migrant Health Insurance for those working in the informal economy, an estimated one million unregistered migrants remain ineligible for these programmes and lack health protection. In response, the social enterprise and foundation Dreamlopmnts (DLP)

launched the **Migrant Fund (M-FUND)** in September 2017. This not-for-profit, low-cost health access scheme is designed for migrants who are not covered by government health insurance through voluntary and community-based enrollment.

How it contributes to community-based malaria care

Malaria is a disease covered by the M-Fund project for medical expenses in places or communities where there are no government agencies or civil society organizations supporting healthcare costs for these population groups. M-Fund works with different implementing partners in various border provinces and bordering countries, each managing its budget and service coverage differently. For example, M-Fund volunteers will refer suspected malaria patients under the scheme, with **World Vision Foundation (WVF)** as an implementing partner, covering the cost of malaria treatment in Tak and Sa Kaeo provinces. In Chiang Rai and Kanchanaburi, WVF will support the cost related to malaria screening and the patient's transportation, but not the treatment which is absorbed by M-Fund.

Addressing gaps in care

In 2024, M-Fund partnered with 15 health facilities including 2 clinics, 3 district hospitals, and 10 active sub-district health promotion hospitals in Kanchanaburi province. To ensure continuous access to care, considerations have been made to:

- Map government agencies and civil society organizations involved in health programmes in order to collaborate with them to deliver quality care, and minimize the use of private income from the target population;
- Develop more information sessions on disease prevention and the importance of health insurance for M-Fund members.

Malaria disproportionately affects populations in hard-to-reach areas, and those experiencing socio-economic challenges and vulnerability, due to barriers such as limited access to health care and preventative measures. The scheme presents a unique entry point for integration through non-profit community-based health insurance that directly addresses gaps in access to care, including for malaria, among migrant populations. By ensuring continued access to malaria care as well as health services more broadly, M-FUND helps lower the barriers at-risk populations face in their most critical times of need regardless of their migration and economic statuses.

Case study 2 Integration of malaria activities with community-based services and capacity building

One day of training was co-organized by **ALIGHT** and the **Vector-Borne Disease Unit (VBDO)** in Kanchanaburi to build capacity for 10 VHVs and 10 MHVs working in one of the most endemic communities along the Thailand-Myanmar border. The training aimed to (1) develop volunteers' capacity to provide community-based malaria services, (2) provide a platform for the volunteers to share their experiences and learning from their roles related to health and malaria, and (3) integrate the work plans of different CHW cadres as part of the Regional Artemisinin Resistance Initiative 3 (RAI3E) project.

Integrating malaria with health communication skills

The training was designed to be interactive with material and information tailored to enhance the knowledge and skills of volunteers as health communicators. Examples of training topics included: Behavioural Change Communication (BCC) and Information Education Communication (IEC), and Protection from Sexual Exploitation, Abuse and Harassment

(PSEAH). Volunteers were also informed about the latest malaria situation and provided with refresher training on basic knowledge about malaria. Demonstration on the use and interpretation of malaria RDT kits, treatment regimens, and use of indoor residual spraying and insecticide for dipping nets was also provided as part of the training.

Whilst many of the volunteers had experience providing screening or testing services for other health programmes, VHVs and MHVs were not allowed to use RDTs for malaria testing. The integrated training demonstrated implementers acknowledgement of the needed expansion of malaria services and preparation towards the long-term goal of potentially transitioning malaria testing and treatment responsibilities to these volunteers if needed in the future.

Way forward

This collaborative training stemmed from discussions during the prioritisation activity in the workshop to align the efforts of VBDC and ALIGHT in preparing communities and health workers to take on a more active role in malaria prevention and surveillance. It addressed a key challenge raised during the workshop that MHVs have fewer opportunities to be trained or supervised to provide health services, compared to their VHV counterparts. Preliminary discussions have since begun to explore potential support for malaria control efforts in border areas, specifically to assist in testing and treating migrant populations which have recently increased due to cross-border movement along the western border of Thailand.

Case study 3 Coordinating top-down policy support for localised integration

Sustainable malaria elimination requires collaboration not only between multiple organizations across the health sector, but also with the local administrative organisations (LAO) who are closest to the endemic communities. In the past 5 years, the Division of Vector-Borne Disease (DVBD) has collaborated with LAOs in many sub-districts to raise awareness for malaria as a public health issue and advocated for community-based malaria interventions to be funded locally through LAOs. This proposed strategy is a key measure outlined in the DVBD's guideline on local collaboration towards malaria elimination, which recommends that LAOs, along with their local partners, lead malaria control activities in eliminating areas and drive the local certification process in malaria-free zones.

Integrating malaria with vector-borne disease services

In alignment with national policy to decentralise primary care from the Ministry of Public Health to Local Administrations, respective LAOs are gradually taking charge of the health promotion hospitals (HPH), the main frontline primary care providers in Thailand. As such, involving both HPHs and LAOs, as overseers is crucial to ensure the transition of malaria services from the vertical programme to primary care in a sustainable manner. DVBD is thus leading the discussion with LAO's public health offices under the Ministry of Interior to consider introducing a service package combining multiple vector-borne diseases, including malaria services and control measures with other local public health priorities such as dengue, chikungunya, and scrub typhus. The integration of a multi-disease service package into LAOs and HPHs portfolio is thus a crucial entry point to advocate for the integration of malaria services at the localised level through national policy changes.

Key local health network for malaria elimination:

- Malaria (vertical) programme implementers within the vertical malaria programme at the vector-borne disease unit and center (VBDC and VBDC) at sub-district and provincial levels, managed by DVBD under the MoPH

- General health (horizontal) programmes at community hospital and health offices at district and provincial levels, managed by PHO under the MoPH
- Primary care programme implementers at HPHs, managed by LAOs under the Ministry of Interior
- Community representatives and members including CHWs and community leaders
- Civil society and CSOs programme implementers
- Other government officers including border patrol, military officials and forest rangers.

Alongside policy-level advocacy efforts, the DVBD has also re-invigorated a repository of information and resources on multiple vector-borne diseases, including general information and infographics about the diseases and their weekly epidemiological updates, on their website: <https://sites.google.com/view/ruthan/พจนานุกรม>. This integrated platform is a central hub for raising awareness and engaging local network stakeholders and the general public on the relevance of monitoring these diseases. By providing up-to-date insights on disease status and trends, the DVBD can engage users to track progress, understand the burden of these diseases, and actively contribute to prevention and control efforts.

Case study 4 Strengthening malaria services with public-private partnership

In 2023, a public-private partnership was launched in Kanchanaburi province to raise awareness of malaria and distribute malaria preventive tools among at-risk populations. With the procurement of commodities supported by a private partner, namely Rotary International, this collaboration serves as a remarkable example of a partnership and funding model bringing together government and non-governmental implementers to co-finance activities that address gaps in community-based malaria services.

Who are the partners?

- Vector-Borne Disease Center: Implemented several malaria control measures including active case screening, health education on malaria, and indoor-residual spraying.
- Kanchanaburi Provincial Health Office: Endorsed the collaboration and provide administrative support for the activities
- ALIGHT: Mobilised communities and recruited at-risk groups from hard-to-reach population to participate in the campaign
- Rotary International: Procured and distributed LLINs
- President's Malaria Initiative (PMI) USAID: Provided financial and technical resources to support campaign activities and the collaboration.

What may a new partnership offer?

This model, shared by ALIGHT, has showcased the potential to advocate for and leverage new financing partnerships to strengthen malaria control and surveillance in high transmission areas. This campaign took place in communities characterised by cross-border activities and the presence of MMPs. The partnership not only expanded funding sources for malaria, but also addressed the increasing risks of malaria transmission in the most vulnerable areas in a timely manner.