Access to malaria diagnostic testing, anti-malarial treatment and long-lasting insecticidal nets among Immigrant workers in Yala province, southern Thailand

Miss Tinzar Naing

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การเข้าถึงการทดสอบวินิจฉัยโรคมาลาเรีย การป้องกันรักษาโรคมาลาเรียและความยั่งยืนในการใช้มุ้งชุบสารเคมี ในกลุ่มแรงงานอพยพในจังหวัดยะลาภาคใต้ของประเทศไทย

น.ส.ทินซ่า ไนล์

วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาวิทยาศาสตรดุษฎีบัณฑิต
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ทินซ่า ไนล์ : การเข้าถึงการทดสอบวินิจฉัยโรคมาลาเรีย การป้องกันรักษาโรคมาลาเรียและความยั่งยืนในการใช้มุ้งชุบสารเคมี ในกลุ่มแรงงานอพยพในจังหวัดยะลาภาคใต้ของประเทศไทย. (Access to malaria diagnostic testing, anti-malarial treatment and long-lasting insecticidal nets among Immigrant workers in Yala province, southern Thailand) อ.ที่ปรึกษาหลัก : นรินทร์ หิรัญสุทธิกุล, อ.ที่ปรึกษาร่วม : ธนะภูมิ รัตนานุพงศ์

ความเป็นมา: ในภูมิภาคเอเชียตะวันออกเฉียงใต้ การย้ายถิ่นข้ามพรมแดนจากประเทศเพื่อนบ้านมายังประเทศไทยเป็นปรากฏการณ์ที่ทุกคนคงคุ้นเคยกันเป็นอย่างดี ทั้งนี้ การเคลื่อนย้ายประชากรและการย้ายถิ่นเป็นปัจจัยที่มีนัยยสำคัญต่อการแพร่กระจายของโรคติดต่อนำโดยแมลง

วัตถุประสงค์: งานวิจัยนี้มีวัตถุประสงค์เพื่อประเมินการเข้าถึงการวินิจฉัยและการรักษาโรคมาลาเรียของแรงงานอพยพในจังหวัดยะลาที่มีไข้ในช่วงเวลา 3 เดือนที่ผ่านมา และเพื่อประเมินความครอบคลุมและการใช้ประโยชน์ของมุ้งเคลือบสารป้องกันยุง (Insecticidal Nets: ITNs)

วิธีดำเนินการวิจัย: ดำเนินการสำรวจในกลุ่มแรงงานอพยพ 414 คน เพื่อสืบหาข้อมูลเกี่ยวกับลักษณะทางสังคม - ประชากรศาสตร์ ประวัติอาการเป็นไข้ พฤติกรรมการแสวงหาบริการสุขภาพ การเป็นเจ้าของและการใช้ประโยชน์จากมุ้ง แล้วจึงวิเคราะห์ผลการสำรวจ

ผลการวิจัย: จากข้อค้นพบที่สำคัญพบว่าร้อยละ 36.5 ของแรงงาน (166 คน) มีไข้ในช่วง 3 เดือนที่ผ่านมา ร้อยละ 51.3 (89 คน) เข้ารับการรักษาพยาบาลที่สถานบริการสาธารณสุข ร้อยละ 44.9 (80 คน) ได้รับการตรวจสอบโรคมาลาเรีย ร้อยละ 19.1 (36 คน) เป็นโรคมาลาเรีย ร้อยละ 60.3 (22 คน) ได้รับการรักษาเพื่อต้านโรคมาลาเรีย เมื่อไปใช้บริการสาธารณสุข ร้อยละ 48.3 (43 คน) ใช้บริการผ่านอาสาสมัครสาธารณสุขประจำหมู่บ้าน และร้อยละ 46.1 ของผู้อพยพ (41 คน) ไปยังที่ทำการรักษาโรคมาลาเรียและโรงพยาบาลส่งเสริมสุขภาพ ในส่วนของมุ้ง ร้อยละ 40.7 ของแรงงาน (181 คน) มีมุ้งเคลือบสารป้องกันยุง แต่มีเพียงร้อยละ 34.7 (57 คน) เท่านั้นที่ใช้มุ้งเคลือบสารป้องกันยุงทุกคืน จากการสำรวจพบว่าร้อยละ 23.6 (116 คน) เป็นผู้เดินทางเข้าป่า ร้อยละ 64.7 (75 คน) มีไข้ใน 3 เดือนที่ผ่านมาและร้อยละ 31.8 (24 คน) เป็นโรคมาลาเรีย ร้อยละ 50 (59 คน) ของผู้เดินทางเข้าป่ามีมุ้งเคลือบสารป้องกันยุงในครอบครอง แต่ร้อยละ 28.1 (33 คน) ใช้มุ้งเคลือบสารป้องกันยุงขณะอยู่ในป่า

สรุปผลการวิจัย: มากกว่าครึ่งหนึ่งของแรงงานอพยพสามารถเข้าถึงการวินิจฉัยและการทดสอบโรคมาลาเรียได้ แม้ว่าการใช้มุ้งเคลือบสารป้องกันยุงยังอยู่ในระดับต่ำ แรงงานอพยพส่วนใหญ่เข้าตรวจวินิจฉัยและรักษาผ่านบริการรักษาโรคมาลาเรียประจำชุมชนภายใต้โครงการกำจัดมาลาเรียแห่งชาติ ดังนั้น จึงจำเป็นต้องทำให้กิจกรรมการสื่อสารเพื่อปรับเปลี่ยนพฤติกรรม (Behaviour Change Communication: BCC) ดียิ่งขึ้นเพื่อพัฒนาพฤติกรรมของแรงงานอพยพเนื่องจากมีเพียงหนึ่งในสามของแรงงานอพยพที่มีมุ้งเคลือบสารป้องกันยุงในครอบครองและใช้มุ้งเป็นประจำทุกคืน

สาขาวิชา	เวชศาสตร์คลินิก	ลายมือชื่อนิสิต .....
ปีการศึกษา	2562	ลายมือชื่อ อ.ที่ปรึกษาหลัก .....
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Tinzar Naing : Access to malaria diagnostic testing, anti-malarial treatment and long-lasting insecticidal nets among Immigrant workers in Yala province, southern Thailand. Advisor: NARIN HIRANSUTHIKUL Co-advisor: THANAPOOM RATTANANUPONG

Background: In Southeast Asia, trans-border migration from neighboring countries into Thailand is a well-known phenomenon. Population movement and migration is a factor having significant implications for vector-borne disease transmissions.

Objectives: This study aims to assess migrants' access to malaria diagnosis and treatment in Yala province who have had fever in the previous three months and to evaluate the coverage and utilization of ITNs (insecticidal nets).

Methodology: A survey was conducted among 414 immigrant workers, in which information was sought on socio-demography, history of fever, health seeking behaviours, net ownership and utilization. Survey analysis was employed.

Results: As key findings, 36.5% (166) migrants got fever in the last 3 months, 51.3% (89) sought healthcare at health facilities, 44.9% (80) got tested for malaria, 19.1% (36) were malaria positive and 60.3% (22) could receive anti-malarial treatment. When seeking healthcare, 48.3% (43) were through village health volunteers and 46.1% (41) migrants went to malaria posts and health promoting hospitals. Regarding nets, 40.7% (181) owned ITNs, but only 34.7% (57) used ITNs every night. Of the surveyed population, 23.6% (116) were forest-goers, 64.7% (75) had fever in the last 3 months and 31.8% (24) were malaria positive. Fifty percent (59) forest goers owned ITNs, but 28.1% (33) used ITNs while in the forest.

Conclusions: More than half of migrants could access to malaria diagnosis and testing though ITN utilization was low. Most of the migrants sought diagnosis and treatment via community-based malaria services under National Malaria Elimination Program. BCC (Behaviour Change Communication) activities need to be enhanced to improve migrants' behaviours since only one-third of migrants who owned ITNs used ITNs every night.

Field of Study: Clinical Sciences Student's Signature .....

Academic Year: 2019 Advisor's Signature .....

Co-advisor's Signature .....

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Regarding the movement characteristics, 68.4% of migrants moved to the current locations from places inside the same province. Only 30.4% were in other countries prior to the current location. Majority of migrants, 66.9% came into Thailand for the reason of finding jobs. Similar findings were seen in a previous qualitative study which had found that migrants along the Thai-Cambodia border were more inclined to move within the same district or province because there were enough jobs in economic farming such as fruit orchard and rubber plantation for the MMP to be able to rotate jobs (19). These variations in migration characteristics reflect the socio-cultural differences, economic opportunities and mobility patterns of migrants in Yala province. 77

1. Access to Malaria Diagnosis and Treatment 77

The results from the study pointed out that there were malaria suspects (those with fever) among the migrant population in Yala and the proportion that sought health care services when they got fever. More than one-third of the population surveyed answered that they experienced fever in the last three months during their stay in Thailand, but only half of those with fever went to health facilities to get diagnosis and treatment. Another half seeking healthcare services for fever, one-fifth reported they were malaria positive. There can be malaria positive cases from the group who did not seek healthcare when they got fever. Most of the people who did not go to health facilities for fever did self-medication and 30% used traditional medicines. Apart from self-medication, other drugs that migrants used to relieve fever were not asked under this survey, but it should be included in further studies. Misuse of drugs can lead to drug-resistant cases which are indeed big challenges when moving towards malaria elimination (18, 19). Hidden positives among the migrant

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Chapter 1

Introduction

1. Background

1.1. Migration

We live in a very mobile world. Migration is a moving process, crossing an international border, or within a state. It is a population movement of any kind, not depending on the duration, causes and composition. Migration can be long-term or short-term, internal or international. Nearly one billion or one out of seven people throughout the world are migrants. The most significant migration can be seen within or between developing countries in Asia and Africa (1, 3, 6).

Trans-national migration of workers in search of better economic return is an unavoidable consequence of unequal wealth among the world's nations. Behind this social phenomenon, there are several factors, such as poverty, conflict and war, policies of structural adjustment and also globalization. Developing countries are predominantly impacted by migration (5). A certain number of families in the Mekong Region have moved across borders to have decent work and income as a way to move out of poverty as well as to gain benefit themselves in terms of acquiring skills from their labour migration. When the process goes well, additional resources can be obtained for families to spend on education, healthcare and basic necessities (6).

1.2. Migrants' access to healthcare

Migrants come from different backgrounds and situations. Their nature of living changes dramatically when they have migrated. Different categories of migrants may have very different experiences. Factors that influence the access to healthcare of migrants may depend on their previous experiences and situations in the countries of origin. Being a migrant can make a person more vulnerable to negative influences on their health. Migrants often experience certain challenges

and barriers to accessing health and social services, especially if they do not have any legal document (7, 8).

1.3. Migration and Malaria

Population movement and migration is one of the factors having significant implications for vector-borne disease transmission including malaria. Migration could increase the risk of transmission and reintroduction of malaria in areas where it has previously been eradicated. Imported malaria cases among migrants coming from endemic countries can play an important role in the non-vectorial transmission out of endemic areas through other mechanisms of transmission such as blood transfusions, congenital transmission or occupational exposure (12, 13).

The poor living conditions and inadequate health care among migrant workers who are employed as daily labourers could worsen the problem of malaria. Temporary migrant workers often bring the parasites to the malaria-free areas and subsequent local transmission can be readily established if personal protection and vector control measures are not well established (9, 10). Many of those communities could support vector breeding. If sporadic epidemics occur, it could affect large number of local people especially in malaria free areas as the population there is generally non-immune (14).

Migrants coming from areas with high caseload can introduce or reintroduce malaria into areas that are malaria free and, in some situations, can spread drug-resistant malaria (18). On the other hand, migrant populations can be at a higher risk of getting sick and are vulnerable to malaria because they may not have proper housing; camps are near water bodies that serve as mosquito breeding sites and are likely to have malnutrition which can worsen the malaria problem (19, 20).

Chapter 2

Literature Review

2.1. Malaria situation in Thailand

Thailand has made good progress in reducing malaria transmission. The Ministry of Public Health, via the Department of Disease Control has developed the National Malaria Elimination Strategic Plan for Thailand (2017-2026) with the vision that Thailand will be malaria free by 2024. There are 4 Strategies: **Strategy 1.** Scale-up malaria elimination in Thailand; **Strategy 2.** Develop technology, innovation, measures and models that are appropriate for malaria elimination; **Strategy 3.** Develop partnership among stakeholders at national and international level in order to enable malaria elimination**; Strategy 4.** Promote/empower community in protecting themselves from malaria (1). Eliminating malaria is also a target of the Sustainable Development Goals (SDGs) according to the direction of the United Nations.

To drive the Strategic Plan and monitor progress of implementation requires key mechanisms at national level, i.e. the Committee on Sustainable Development, the Steering Committee on Malaria Elimination and the Administrative Committee on Malaria Elimination. Regarding the mechanism at provincial level, the Office of Public Health Inspectors, the Office of the Permanent Secretary and the Department of Disease Control are responsible for transferring the policy, guidelines and interventions through the Provincial Communicable Disease Committees in order to push the Communicable Disease Control Units, health facility units of both public and private sectors, civil society organizations to implement malaria elimination according to the local contest of each area (2, 3, 4).

There have been satisfactory achievements in the global malaria control programmes during the past decades. Malaria was on decline during 2000-2017. Global malaria cases reduced by 47% and there were 55 countries that reported 75% of reduction of malaria cases. In the Greater Mekong

Sub-region (GMS) malaria is decreasing significantly. However, *P. falciparum* malaria in this region is resistant to several drugs such as chloroquine, sulfadoxine/pyrimethamine, mefloquine and artemisinin-based combination therapy which is the most efficacious antimalarial drug. The resistant parasites (to artemisinin) may cause malaria epidemics if they further spread to other regions of the world (5, 11).

In Thailand, malaria morbidity and mortality showed decreasing trends. Looking at the malaria situation in Thailand, over 2000 to 2017, the Annual Parasite Incidence (API) [2000: 2.61 per 1,000 population; 2016: 0.17 per 1,000 population] and the Malaria Positivity Rate (MPR) [2000: 3.13; 2017: 0.75] have shown a steady decline. There was a 31% reduction in malaria cases from 2015 to 2016 and a 41.5% reduction again from 2016 to 2017 according to the updated data at the Malaria Information System of the Bureau of Vector-Borne Diseases (BVBD), Department of Disease Control (DDC), Ministry of Public Health (1, 4).

During January to October 2018, there occurred 5,862 malaria cases, 42% reduced from the same period of 2017. Of those cases, 72% were Thai and 28% non-Thai migrants from the neighboring countries. In 2018, districts with highest malaria caseload are in Tak, Yala, Srisaket and Ubon Ratchathani provinces which are at the international border (1).

2.2. Drug resistant situation

P. falciparum resistance to antimalarial drugs is a major problem in the Greater Mekong Sub-region (GMS). There were reports confirming falciparum malaria resistance to several drugs, e.g., Chloroquine, Sulfadoxine/Pyrimethamine and Mefloquine. At present, P. falciparum started to be resistant to artemisinin-based combination therapy which is the most efficacious drug in several countries in this region such as Thailand, Cambodia, Lao PDR, Myanmar and Viet Nam. There has been a fear that if these resistant parasites spread to other parts of the world, it will result in malaria epidemics that hamper malaria control (5, 19). Cross-border migration, use of substandard

drugs, and people's inappropriate behavior in seeking medicines deteriorate the situation and cause epidemics and further spreading of resistant parasites (17).

2.3. Vector control operation and entomological surveillance

Primary malaria vectors in Thailand are *Anopheles dirus* complex and *Anopheles minimus* group. Effective vector control contributes to interruption of malaria transmission. It is essential to apply vector control measures based on epidemiology, entomology, demography and socio-economic status of each area. Vector control through application of indoor residual spraying (IRS) is not fully accepted by the population and has achieved low coverage. Using long-lasting insecticidal net (LLIN) that was financially supported by the Global Fund to Fight Against AIDS, Tuberculosis and Malaria (GFATM) has reached the coverage of 75% of population in transmission areas (3). Treating of nets (insecticide treated net – ITN) is financially supported (but to a relatively limited extent) by the royal Thai government budget. A malaria survey conducted in 2015 revealed that 38.5% of people living in malaria transmission villages slept under insecticide treated net of all types. Approximately 17% of population in malaria transmission areas worked or stayed overnight in forests, orchards or farms (4). GFATM project promoted the use of long lasting insecticide hammock net (LLIHN) also but this could cover only 8-10% of these malaria-risk population (4). In addition, this group of population was encouraged to use mosquito repellents but supplies of repellents remained inadequate.

Entomological surveillance is done to assess the distribution of mosquito species, densities, breeding places, biting and resting behaviors. It also includes monitoring of vector susceptibility to insecticides. Results will be used to choose appropriate vector control measures. Currently, it is found that vectors have changing behaviors – from indoor to outdoor biting. Regarding insecticide resistance, it is found that vectors remain susceptible to pyrethroids which are being applied in Thailand (1).

2.4. Capacity in Malaria Elimination Management in Thailand:

There were significant achievements of malaria control programmes around the world during 2011-2013. Malaria morbidity reduced by 30% and malaria mortality reduced by 47%. However, malaria remains a public health problem in some countries especially countries in Africa continent. WHO has set goals on malaria elimination that at least 35 countries should achieve malaria elimination by 2030. Six GMS countries, i.e., China (only Yunnan Province), Thailand, Lao PDR, Myanmar, Cambodia and Viet Nam also jointly set the regional goal that they aim to achieve malaria elimination by 2030. Malaria control in Thailand remains a semi-vertical programme, under the Department of Disease Control. The Bureau of Vector-Borne Diseases has a major role in formulating national policy (i.e. National Malaria Programme). The network of the Offices of Regional Disease Prevention and Control (Regions 1-13) is responsible for field operation along with the provincial health offices under the General Public Health. Majority of the budget was from GFATM (The Global Fund against AIDS, TB and Malaria)-Malaria project (1, 2). However, there has been an attempt to expand networking of health services and related institutions to join prevention and control of malaria. The past implementation resulted in steady reduction of malaria incidence. In 2015, malaria morbidity rate was 0.38/1,000 pop. There were 632 malaria-free districts/regions (including 50 Regions in Bangkok Metropolitan) out of a total of 928 districts/regions (68.1%). This showed that Thailand has potential to implement malaria elimination operation according to WHO policy. Moreover, at present *P. falciparum* becomes resistant to artemisinin and Thailand has started eliminating artemisinin resistant falciparum in some areas. Therefore, reprogramming was carried out and "National Malaria Control Programme (NMCP)" was changed to the National Malaria Elimination Programme (NMEP) (1).

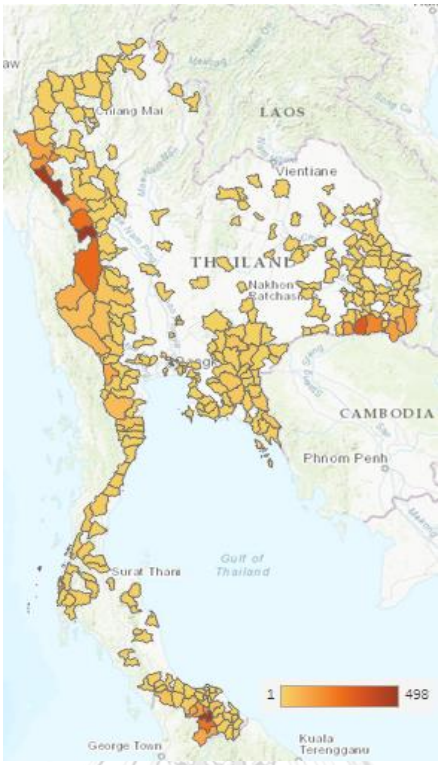


Figure 1. Malaria situation at district level in Thailand (as of 30 September 2019)

In the Figure 1, as Thailand is leading towards malaria elimination, it can be seen that central Thailand is almost free of malaria while districts along and near to the international borders have malaria cases and malaria transmission. National Malaria Elimination Program (NMEP) of the Bureau of Vector-Borne Diseases (BVBD) has faced difficulties in interrupting malaria transmission at the border areas. The most probable reason is human mobility and migration along the international borders. There are four international borders: to the west is Thailand-Myanmar border, to the east are Thailand-Laos and Thailand-Cambodia borders and to the south is Thailand-Malaysia border.

National Malaria Elimination Program (NMEP) had conducted three nationwide household surveys to monitor key performance indicators related to malaria prevention and control: the Thailand Malaria Survey (TMS) 2012 (2), the Knowledge, Attitudes and Practices (KAP) Survey 2015 (3), and the Endline Survey 2016 (4). The results of these surveys show an increase in household

ownership of long-lasting insecticidal nets (LLINs), with significantly more households owning a sufficient number of LLINs (defined as one LLIN per two people in the household) in the Endline Survey compared to the other two surveys (4).

Though prevention measures showed good coverage according to the survey results, malaria caseloads along the international borders are still high with active transmission. On the other hand, those surveys do not sufficiently represent migrant populations, a key group considered to be at high-risk for malaria transmission. Despite being of relatively large scale[1], the surveys did not capture many migrants. It is likely that migrant populations differ to other groups and were missed by a conventional household survey design in their socioeconomic status, registration status, access to healthcare, and higher coverage of interventions by local authorities (5, 6).

In fiscal year 2015, Thai cases accounted for 57.7% and Non-Thai cases accounted for 43.4% of total cases (Myanmar 14.2%, Laos 1.0% and Cambodian 0.9%). Majority of cases were working-age population (15-60 years of age) who worked at night time in forests, orchards, farms (>58%). Top-ten leading provinces that reported highest cases were Tak, Yala, Ubonratchathani, Kanchanaburi, Mae Hong Son, Sir Saket, Narathiwas, Songkhla, Surat Thani and Surin. Cases reported in these 10 provinces are counted for 87.7% of the total country cases (1).

The challenge of addressing malaria in migrant and mobile populations is central to any strategy of elimination of malaria. It would become even more of a challenge as malaria specific funding decreases and service delivery and financing integrates with general health services. Thailand has one of the most robust provisioning and financing strategies for general health services. Furthermore, much of the work amongst migrants was done with the Global Fund support through government and non-government organizations which were willing and had the capacity to work cross border (11). Recognizing that migrant workers bring certain types of vulnerability as defined

[1] Sample sizes of the surveys were: TMS = 3,292 households and 10,834 people; KAP = 1,658 households and 6,326 people; Endline = 2,125 households and 8,231 people

by occupation (e.g. migrants in rubber plantations in the south of Thailand, or by social group (e.g. Karen tribes in the north-west) or by geography (Mekong riverine forests in the north west), migrant specific strategies and working cross-border would continue to be important (9, 10).

Types of migrants:

There are many types of migrants, including internal migrants. However, for the purposes of this survey, migrants are classified using the Thailand NMEP definition:

Static = **individuals that have been residing in Thailand for more than six months and are not Thai nationals**

Mobile = **individuals that have been residing in Thailand for less than six months and are not Thai nationals**

There has been only a small number of migrant focused studies. Thailand Malaria Survey which is the baseline survey conducted in 2013 found that cross-border migration, use of substandard drugs, people's wrong behavior in seeking medicines deteriorate the situation and cause epidemics and further spreading of resistant parasites (2). Evaluation of malaria prevention measures among populations at risk of malaria in Thailand in 2016 by the Malaria Consortium concluded that migrants were considered to be a high-risk group for malaria infection, and information on this group was required to guide the implementation of targeted interventions (4). They also pointed out there were key differences in the behaviours of migrants compared to the resident populations.

Results from these studies on coverage and malaria prevention practice including malaria-risk factors showed that 91.6% of the population were aware that malaria transmission was caused by forest mosquitoes and anopheles. There were some people who believed that malaria was caused by drinking forest water. This belief was more common in low malarious areas as compared to high malarious areas. People in malaria transmission areas were well aware that they were at risk of malaria (61.5%) and fever was one symptom of malaria (69.5%). They perceived that using net is a method of personal protection against malaria (83.5%). Majority of population (62.8%) in

malaria transmission areas received information especially regarding importance of sleeping under insecticide-treated net. They received information on having their blood checked and post-treatment follow-up from health volunteers and community malaria clinic (Malaria Post) staff in high malarious areas. Regarding personal protection against malaria, it was found that 85.1% slept under nets of all kinds, 38.5% slept under insecticide–treated net. Having those who had forest-related activities applied long sleeve clothing (61%) and mosquito repellents (29%). Survey results showed that population in transmission areas stayed overnight in forest (17%) but less than 10% protected themselves from malaria by using net, hammock net. The main reason was that it was not convenient to bring net along with them and there were no places to hang up the nets (2, 3, 4).

However, over 96% of people surveyed in those studies were Thai nationals, while only 1.9 - 3.6% had resided in Thailand for more than six months but were not Thai nationals (static groups), and 0.1 - 0.7% were mobile migrants. Because the survey contained small sample sizes of migrant populations[2], the migrants that were included may not be representative of the wider migrant populations, particularly because they were accessed at their households in permanent settlements (2, 3, 4).

Some studies showed that uptake of services among migrants could also vary depending on the type of migrants. For example, one study along the Thai-Cambodia border found that a higher proportion of mobile Cambodian migrants did not seek treatment for their last episode of fever compared to static Cambodian migrants (5). There were also differences between the two groups in terms of what the barriers were to seeking treatment. According to that study, knowledge, perception, practice and treatment seeking behaviors were different even between local ethnic groups.

The Silk Road Health Project conducted a study in 2016 assessing the influence of mobility and migration status on HIV risks among migrant workers in central Asia. It advised that there should

[2] In the Endline survey sample sizes were: static = 292 and mobile = 4

be appropriate survey design to identify differences between migrant groups as well as geographic locations to increase knowledge and improve targeted interventions (6).

Another study along the Thai-Myanmar border in 2009 focused on malaria risk factors among migrants. It found out that many of the migrant workers did not complete the malaria treatment course and stopped taking medicines when they felt better, keeping half of the medicines for the future malaria episodes (7). This kind of behavior and non-compliance to treatment can lead to drug resistance.

In 2017, Jacobson et al. tried to learn surveillance and response of HIV programmes for high-risk populations to apply in malaria programmes. They concluded that it was necessary to provide clear guidance for case management among migrant populations and in cross-border areas, including specific recommendations on harmonization of drug use and individual cross-border follow up procedures in order to guide malaria case management in an elimination setting (8). Based on the studies, attention should focus also on how these messages are best delivered, especially for the populations at highest risk.

The Department of Disease Control, MOPH Thailand conducted Malaria Program Review in 2015 with the technical assistance from the World Health Organization. The review recommended to focus on southern provinces of Thailand as increasing caseload occurred there. However, the program review did not see any correlation between the degree of violence and the malaria burden in the southern provinces. During the review, malaria outbreaks were documented in either conflict and non-conflict areas of southern provinces areas within or close-by the forest where most farmers, migrants and villagers were regularly spending nights or even setting-up on a longer-term basis with their families for economic reasons. It was suggested to target migrant workers along the international borders who were employed officially and unofficially in southern provinces.

There is no clear information yet about migrants' access to malaria services and malaria prevention measures in the southern provinces. As the government responds to the broader health and social

needs of up to four million migrants from Myanmar, Cambodia and Laos living in Thailand (9), such as by providing free primary education, enrolling migrant workers in a Social Security Fund and providing better access to healthcare, the findings of a survey on migrants will inform the national malaria programme on the best approaches to target migrants in Thailand to support malaria elimination efforts (1, 10).

Therefore, a study specifically designed to target migrant groups in southern Thailand is needed. This study should gather data on key indicators related to migrants' access to malaria treatment and diagnosis, use of vector control measures particularly insecticide-treated nets, their healthcare seeking behaviours, their knowledge and attitudes towards malaria, forest-going behaviors, and barriers they experienced when accessing healthcare services and practising vector control measures. To gather better information on migrants, an alternative sampling method should also be considered rather than the conventional cross-sectional household design. Household surveys are not effective to reach migrants they are either highly mobile or not living in or accessible via registered households.

2.5. Malaria situation in southern Thailand:

Seven southern provinces (Yala, Narathiwat, Songkhla, Pattani, Satun, Patthalung and Trang) are managed by the Office of Disease Prevention and Control (ODPC) 12. In Figure 2, the proportion of the total malaria caseload over country compared to caseload in the southern provinces under ODPC 12 can be seen by year from 2012 to 2019. Though malaria cases in southern provinces were in the range of 7-19% from 2012 till 2015, southern provinces occupied more than half (52%) of total caseload over Thailand in 2016, having malaria outbreaks in Yala province. Yala became the province with highest malaria caseload in Thailand in 2016. In 2018 and 2019, the proportion of malaria cases in the southern region was one-third of the country's caseload with Yala being the province with second highest number of malaria cases in Thailand (http://malaria.ddc.moph.go.th/malariaR10/index_newversion.php) .

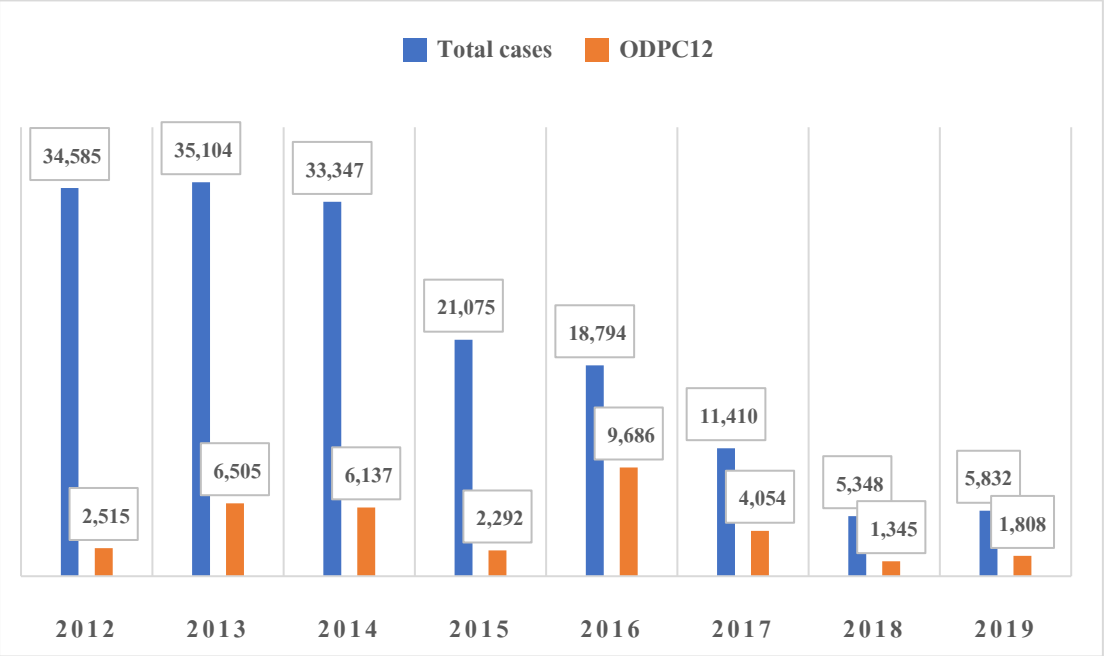
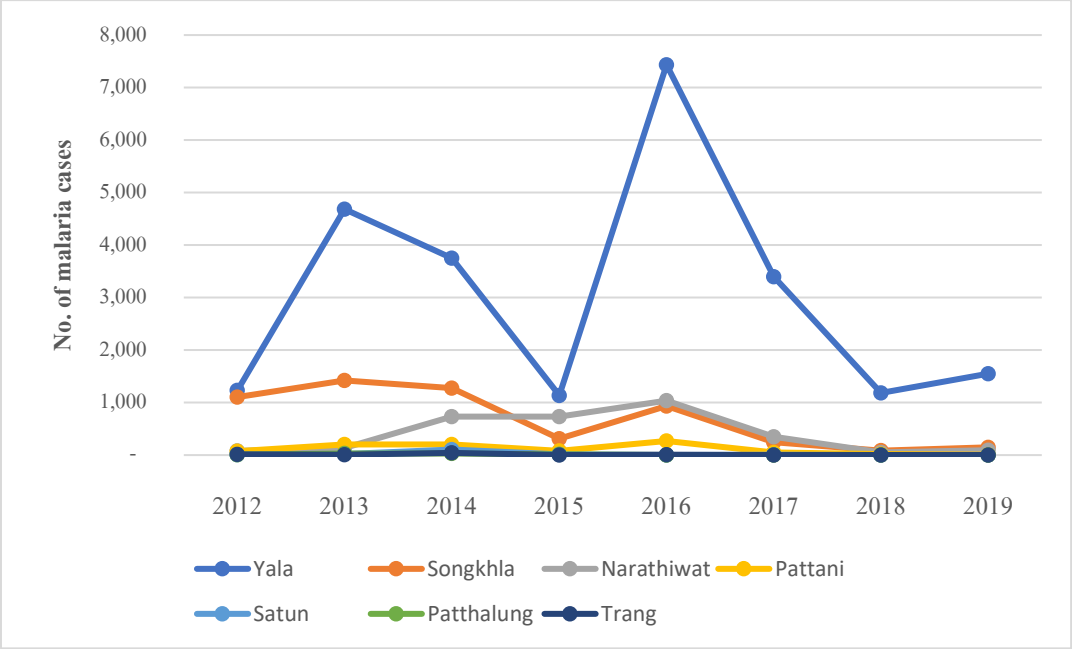


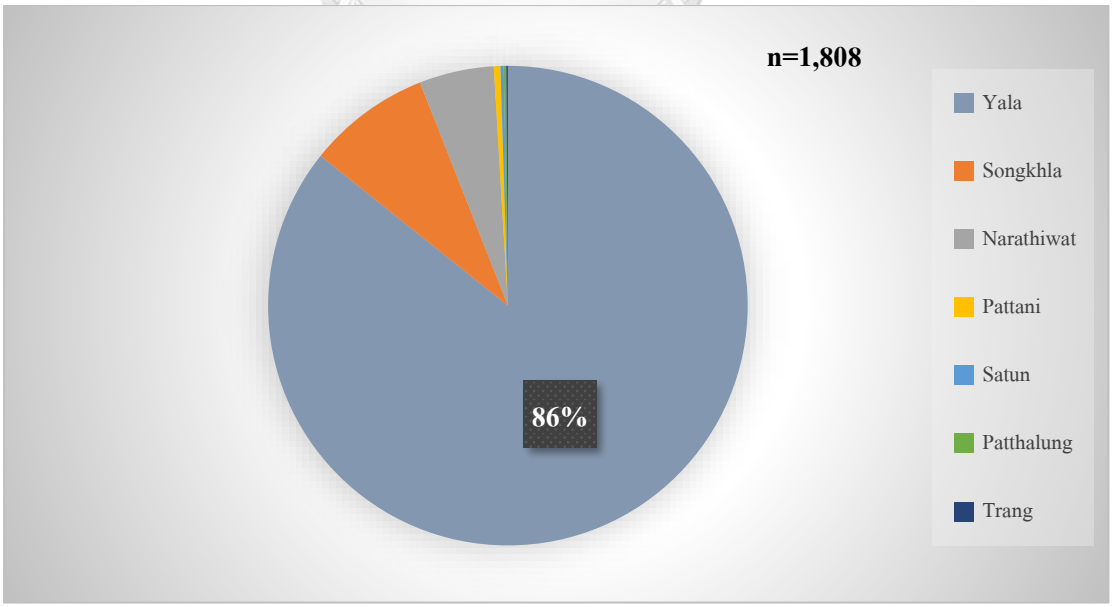
Figure 2. Proportion of malaria caseload in southern provinces under ODPC 12 to total caseload all over Thailand (Data source: Malaria Information System as of 30 September 2019)

Looking at malaria situation by province of southern Thailand under the Office of Disease Prevention and Control 12 (ODPC 12), Figure 3 shows clearly that of 7 southern provinces, Yala has had the highest caseload followed by Songkhla and Narathiwat every year. It can also be seen in the Figure 4 that Yala occupied 86% of total malaria caseload in Thailand in the fiscal year 2019 (http://malaria.ddc.moph.go.th/malariaR10/index_newversion.php).



Source: http://malaria.ddc.moph.go.th/

Figure 3. Malaria caseload in southern provinces over 2012 to 2019 (Data source: Malaria Information System as of 30 September 2019)



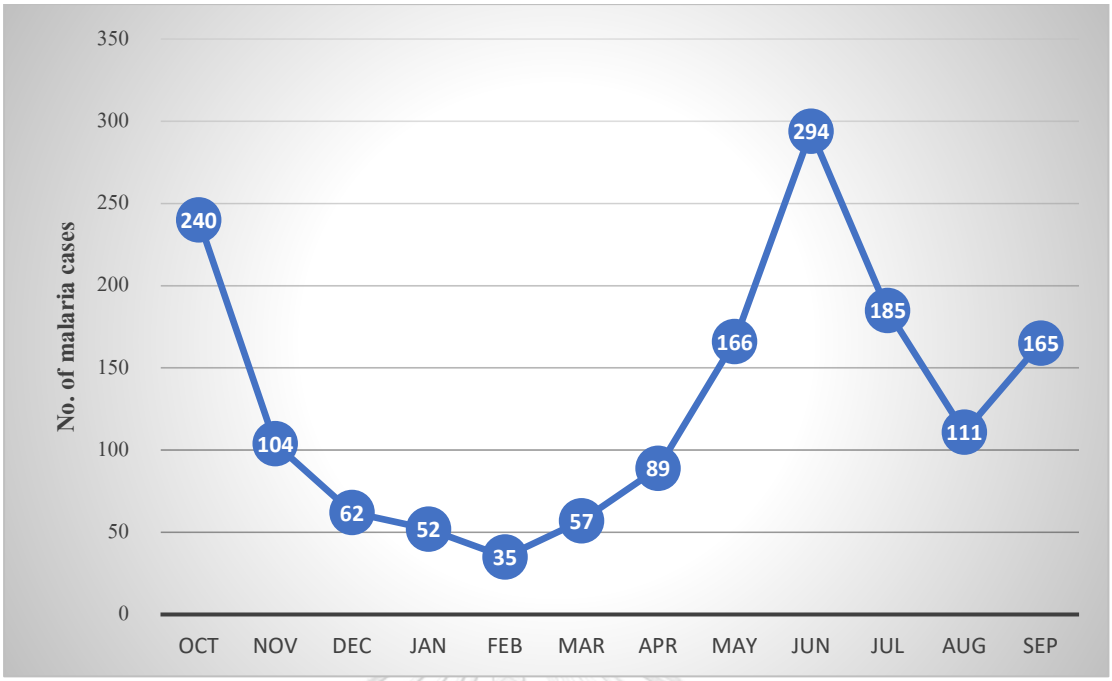
Source: http://malaria.ddc.moph.go.th/

Figure 4. Proportion of malaria caseload in southern provinces (2019)

According to the Thailand Malaria Program Review 2015 conducted by World Health Organization, the malaria strategy in southern Thailand does not differ from that in other provinces in Thailand. ODPC 12 is implementing the national strategy in 7 provinces. Those provinces and districts have been the most affected by armed conflicts since 2004. There was no correlation between the degree of violence and the malaria burden in the southern provinces. Malaria is, as everywhere in the Mekong region, confined to villages/hamlets close to heavily forested mountains and dense forests which are highly prevalent in districts bordering Malaysia (11).

Pattani province, which is considered as the epi-centre of the cultural conflict, has not recorded any indigenous malaria case for decades mainly due to the absence of forest and forest-fringe zone contrary to Trang province, which is free from armed conflict in the upper part but where sporadic outbreaks are documented. A significant proportion of health personnel in the deep south are Muslim under Office of Disease Prevention and Control (OPDC) 12 attending ODPC, Vector Borne Disease Centre (VBDC) and Vector Borne Disease Unit (VBDU) meetings and being trained to implement malaria guidelines. Buddhist counterparts are generally acquainted to villagers and communities. Access to outbreak areas by control teams is also not a major problem.

It should also be noted that malaria control is persistently considered by local and provincial authorities as a high priority activity even in the most conflict affected province of Yala. Both governors and local administrative authorities are mobilized and provide funds to support control and preventive activities. However, there are certain endemic villages which are designated as a "No-go zone". In such situation, the strategy, as suggested in all endemic villages all over Thailand, is to install local malaria posts (MPs) managed by trained community staff who can operate, go in and out without any problem and who are being selected and supported by their own communities and taking part of regular meetings organized by vector-borne disease services. However, as usual, installation and training of these MPs is decided mainly after the outbreak is almost over (2).



Source: http://malaria.ddc.moph.go.th/

Figure 5. Malaria situation in Yala from October 2018 to September 2019 (Data source: Malaria Information System as of 30 September 2019)

In the Figure 5, trend of malaria cases during fiscal year 2019 can be seen. There were 2 peaks in October and June with 240 malaria cases and 294 malaria cases respectively.

2.6. Migrants in southern Thailand

According to statistics from the Ministry of Labour, there were 2,062,807 migrants who held work permits in 2017. Of those workers, 42% were women while 58% were men, a proportion which has been relatively constant for the last few years. There were also significant differences between six regions. Bangkok and the greater metropolitan area were the largest destination region for migrant workers. The fastest growing region for migrants during the last four years was the southern region, which more than doubled during the period with an additional 229,712 migrant workers (10). Figure 6 below shows migrant population over the period of 2014-2017 by gender and by region of Thailand.

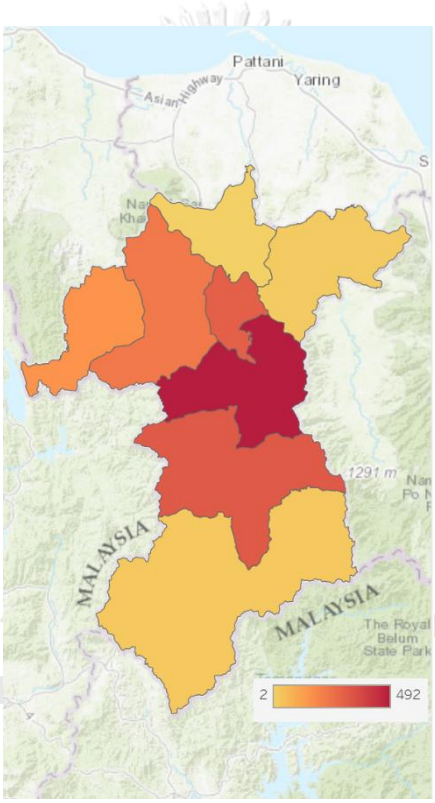
REGION	WOMEN				MEN				TOTAL			
	2014	2015	2016	2017	2014	2015	2016	2017	2014	2015	2016	2017
Bangkok	33,388	59,870	90,344	135,841	87,248	138,563	165,888	205,070	120,636	198,433	256,232	340,911
Greater Bangkok	151,967	189,464	224,572	317,507	214,717	268,147	306,945	420,707	366,684	457,611	531,517	738,214
Central Region	130,280	111,674	109,711	158,296	197,767	165,312	156,079	223,963	328,047	276,986	265,790	382,259
Northern Region	88,177	88,226	64,933	89,643	88,981	94,102	70,104	97,306	177,158	182,328	135,037	186,949
North-East	10,409	12,157	11,150	20,013	12,684	14,241	11,437	20,060	23,093	26,398	22,857	40,073
Southern Region	129,950	120,660	105,974	144,689	194,266	181,058	159,704	229,712	324,216	301,718	265,678	374,401
Total	**544,171**	**582,051**	**606,684**	**865,989**	**795,663**	**861,423**	**870,157**	**1,196,818**	**1,339,834**	**1,443,474**	**1,476,841**	**2,062,807**

Source: Department of Employment (2018)

Figure 6. Migrants holding work permits in Thailand by sex and region (2014-2017)

2.7. Rationale

Through the literature review and based on the recorded data, southern Thailand is one of the international borders where districts having active foci (villages or hamlets having indigenous malaria cases for at least 6 months in a year) exist. Significant increases in malaria caseloads have occurred in southern provinces over recent years (2016-2018) despite having case management interventions and vector control measures through National Malaria Elimination Strategies.



Source: http://malaria.ddc.moph.go.th/

Figure 7. Malaria transmission in districts of Yala 2019

Yala has increasing malaria cases though the National Program provided intensive case detection and preventive measures. Of all malaria cases in southern Thailand during 2018, 88% were from Yala, and malaria cases existed in all the eight districts of Yala as shown in Figure 5. According to the recorded data at the Malaria Information System, Banang Sata district had the highest caseload

with 531 malaria positive cases during January to October 2018, followed by Than To district with 250 cases and Krong Pinang district with 176 cases. Mueang Yala had the lowest caseload with only 7 cases occurring during the period of January to October (http://malaria.ddc.moph.go.th/malariaR10/index_newversion.php).

Malaria Program Review (2015) Thailand conducted by the Department of Disease Control, MOPH with the technical assistance from the World Health Organization (WHO) pointed out the need to focus on southern provinces and target the migrant populations along international borders who employed either officially or unofficially at factories, construction sites, rubber plantations and other work sites when moving towards malaria elimination in Thailand (11).

Studies on migrants along the Thai-Cambodia and Thai-Myanmar borders concluded that unrecorded or undocumented people who are not accessing malaria services and protection measures could be at the origin of unidentified active malaria. It is crucial to directly address innovative strategies related to malaria elimination among migrants and mobile populations who currently harboured the largest reservoir of malaria infection (18).

The underlying reasons of malaria outbreaks and increasing caseloads in southern Thailand, especially in Yala are not yet understood either by the National Programme or the WHO. It can be multifactorial, and there is a need for data on migrant populations in the southern provinces to inform the National Malaria Elimination Program (NMEP) on the best approaches to be able to eliminate malaria in Thailand by 2024 as targeted (11).

There is a lack of evidence-based information among migrant populations in Yala, southern Thailand regarding access to malaria treatment and diagnosis, and coverage of vector control measures. There is no study based in Yala having representative samples on migrants to answer the information gap. Migrant health status and issues do matter for the Thai population as well as for communicable disease control and malaria elimination achievements in particular.

2.8. Objectives

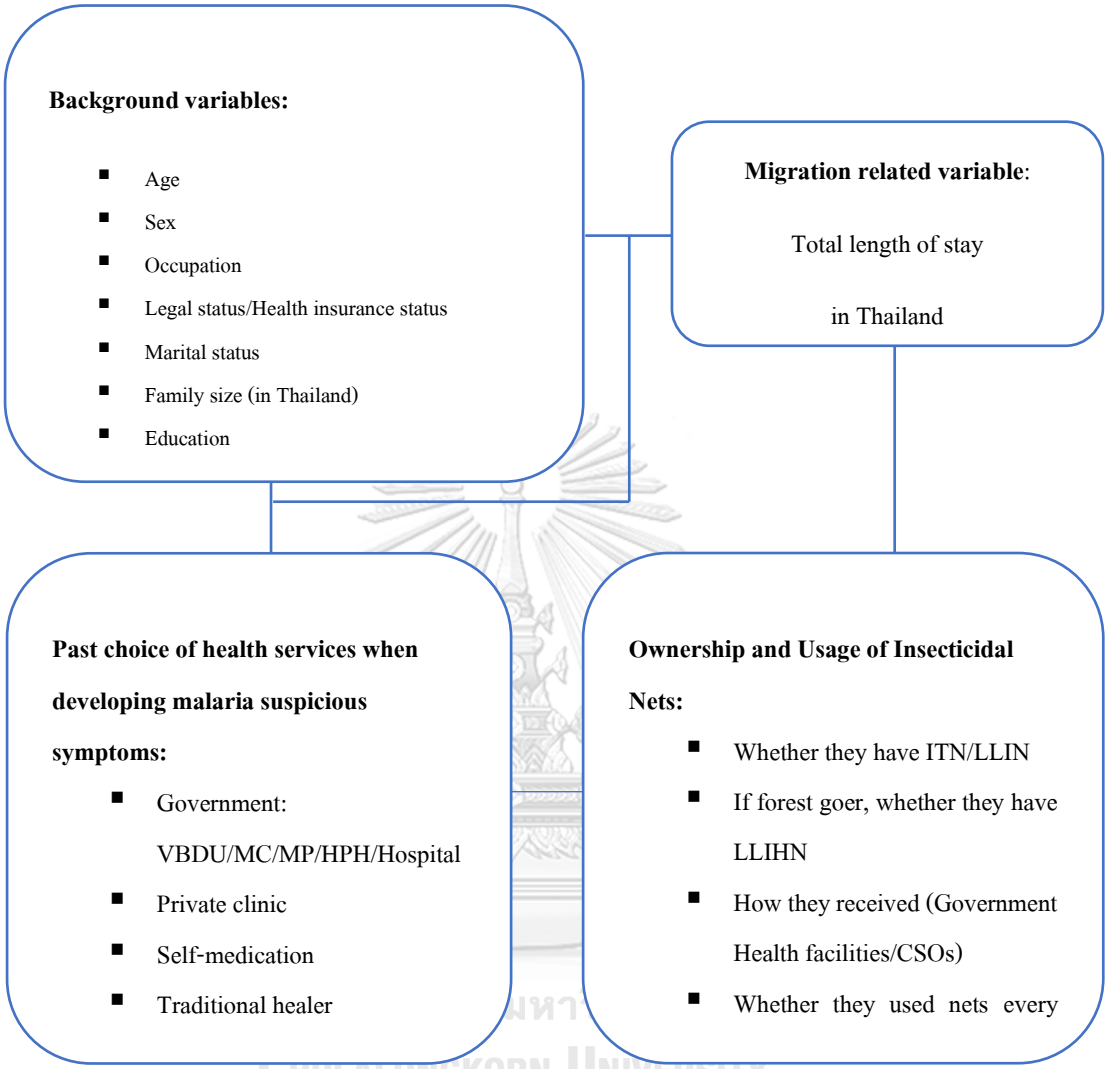
Primary objectives

- To assess migrants' access to malaria diagnostic testing and anti-malarial treatment who have had fever in the previous three months and
- To evaluate the coverage and utilization of long-lasting insecticidal nets among migrant workers in Yala province.

Secondary objectives

- Of malaria suspects, to estimate the percentage of their seeking healthcare services;
- Of malaria suspects, to estimate the percentage of having had malaria testing;
- Of malaria suspects, to estimate the percentage with positive malaria tests;
- Of migrants with positive malaria tests, to estimate the percentage who received anti-malarial treatment;
- To estimate the percentage of migrants that own insecticide-treated net;
- To estimate the percentage of migrants that used insecticide-treated net;
- To estimate the proportion of forest-goers among migrants; and of those, the percentage who have had fever in the last three months;
- To estimate the proportion of forest-goers among migrants; and of those, the percentage who have had positive malaria tests;
- To estimate the proportion of forest-goers among migrants; and of those, the percentage who used a long-lasting insecticidal hammock net the last time they slept in the forest;

2.9. Conceptual framework



2.10. Glossary of terms

Term/Acronym	Operational Definition
Access	The percentage of MMP in the risk areas with fever in the last 3 months utilizing parasite-based diagnosis and treatment
Active foci area	A defined and circumscribed area where locally acquired case(s) or indigenous case(s) have been detected every month for 6 months within the current calendar year
BVBD	Bureau of Vector Borne Disease
Coverage of ITN	The percentage of non-Thai migrants in possession of an insecticide treated net
CSO	Civil Society Organization
Forest goer	Someone who has spent time between 6 PM to 6 AM in the forest/ plantation/ garden/ farm at least once in the previous 6 months
GF	Global Fund
GF-ATM	Global Fund to fight AIDS, TB and Malaria
HICS	Health Insurance Card Scheme
HIS-PCP	Health Insurance for People with Citizenship Problems
IRS	Indoor Residual Spraying
ITC	Insecticide-Treated Clothing
ITN	Insecticide-Treated Nets defined as LLIN or LLIHN < 3 years old or a conventional net dipped in insecticide in the last 12 months.

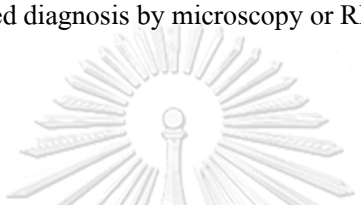
LLIHN	Long-Lasting Insecticidal Hammock Nets
LLIN	Long-Lasting Insecticidal Nets
Malaria Case Management	Diagnosis of Malaria using tools such as rapid diagnostic test (RDT) and blood microscopy (slide); and antimalarial drug therapy according to National guidelines of Thailand Ministry of Public Health.
Malaria Preventive Measures	ITN and other preventive measures like Indoor Residual Spray and personal protection (repellent, spray, covering clothes etc.)
Malaria Transmission Area	Malarious area in borders of Thailand that contains the epidemiological and ecological factors necessary for malaria transmission in this fiscal year.
MoPH	Ministry of Public Health
MMP	Mobile Migrant Population
PHO	Provincial Health Office
Utilization of ITN	The percentage of non-Thai MMP using an ITN the last time they slept in the transmission area
VBDU	Vector Borne Disease Unit

Chapter 3

Materials and Methods

3.1. Measurement of variables

Access to malaria services was measured by asking participants if they had received diagnosis and treatment at any health facilities inside Thailand when they got fever in the last six months. Malaria services refer to parasite-based diagnosis by microscopy or RDT (Rapid Diagnostic Test) at health facilities.



Microscopic Test

The microscopic tests involve staining and direct visualization of the parasite under the microscope. For more than hundred years, the direct microscopic visualization of the parasite on the thick and/or thin blood smears has been the accepted method for the diagnosis of malaria in most settings, from the clinical laboratory to the field surveys. The careful examination of a well-prepared and well-stained blood film currently remains the “gold standard” for malaria diagnosis.

Rapid Diagnostic Test

Rapid Diagnostic Test (RDT) is a way of quickly establishing the diagnosis of malaria infection by detecting specific malaria antigens in a person's blood. RDTs assist in the diagnosis of malaria by providing evidence of the presence of malaria parasites in human blood. RDTs are an alternative to diagnosis based on clinical grounds or microscopy, particularly where good quality microscopy services cannot be readily provided.

Health facilities include Malaria Posts (MPs), Malaria Clinics (MCs), Vector-Borne Disease Units (VBDUs), Health Promoting Hospitals (HPHs), public hospitals and private clinics. MPs, HPHs and public hospitals are under the supervision of Provincial Health Offices (PHOs) which are under the Permanent Secretory Office of Ministry of Public Health. MCs and VBDUs are supervised by

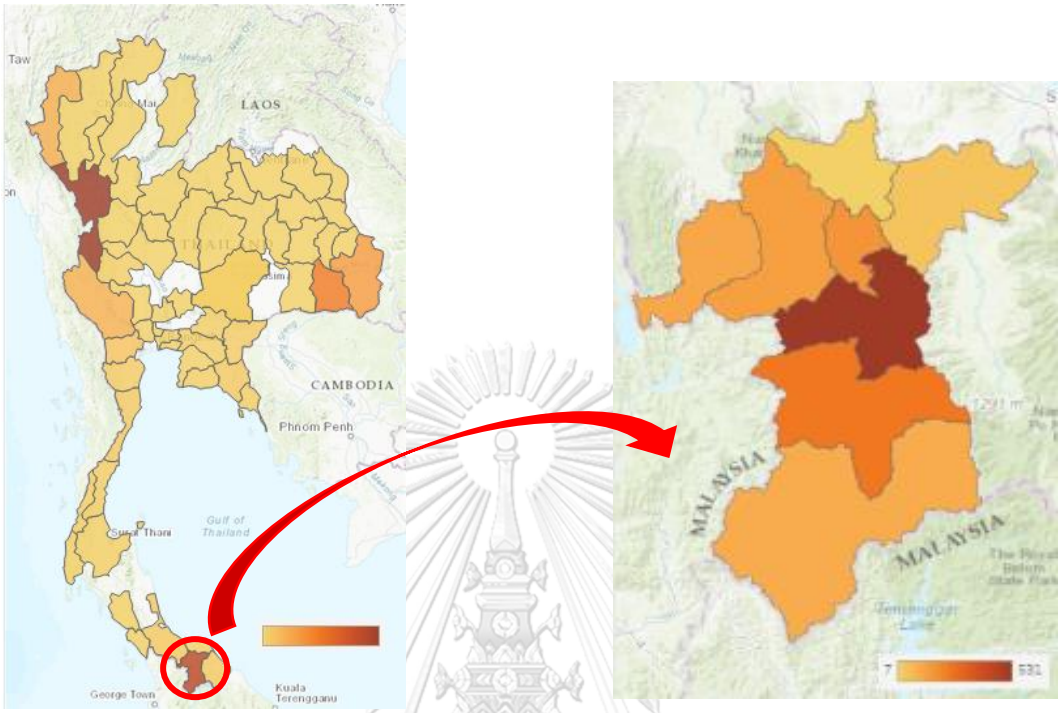
Offices of Disease Prevention and Control (ODPCs) under Department of Disease Control, Ministry of Public Health.

Firstly, if the participants had fever or not in the last 6 months was assessed and if they had, how many times they got in the last 6 months, whether or not they sought diagnosis and treatment when they had fever, whether or not they arrived at health facility on the first day of fever, whether or not they received treatment on the same day of diagnosis, their compliance with treatment and types of health facilities (MPs, MCs, BVDUs, HPHs, public hospitals and private hospitals) they went to was investigated.

For evaluating the coverage of vector control measures, in this study, only net coverage (Insecticide Treated Net (ITN)/ Long Lasting Insecticide Treated Net (LLIN)/ Long Lasting Insecticide Treated Hammock Net (LLIHN)) was assessed. Since the assumption of one net per person is applied for distributing nets under NMEP to the migrant population, population-based study can directly measure the net coverage for this population. The participants were asked if they had any ITN or LLIN, how they received it (when seeking treatment at health facilities or through mass campaigns or other sources) and how many times they did reimpregnation if the net they have is just ITN. The usage rate was also assessed by asking if they used the net every night or not and how often they used. For those who did not use the net though they had and those who used the net but not every night, their reasons for not using nets will be evaluated.

To know the percentage of forest goers in the population, the participants were asked if they have stayed overnight (6pm to 6am) in the forest/ plantation/ garden/ farm for work or for other reasons at least once in the previous six months. If they were forest goers, whether or not they had LLIHN and how they received it were assessed. Same as LLIN, usage rate of LLIHN was measured by asking how often they used it. The reasons for not using or not liking to use LLIHN were also assessed.

3.2. Study area: Yala Province, southern Thailand



3.3. Study design and approach

Cross-sectional survey design with two-stage cluster sampling was used for this study. Within Yala province, districts having highest malaria caseload and malaria transmission foci served as clusters or primary sampling units, and sites of migrant individuals in selected districts as secondary sampling units.

Major sites of migrants in the study areas were identified with the help of key informants from among the migrant population who were well acquainted with the migrant population in Yala province and could provide information on occupations in which migrants were working, places of work and residence, approximate population sizes and their lifestyles.

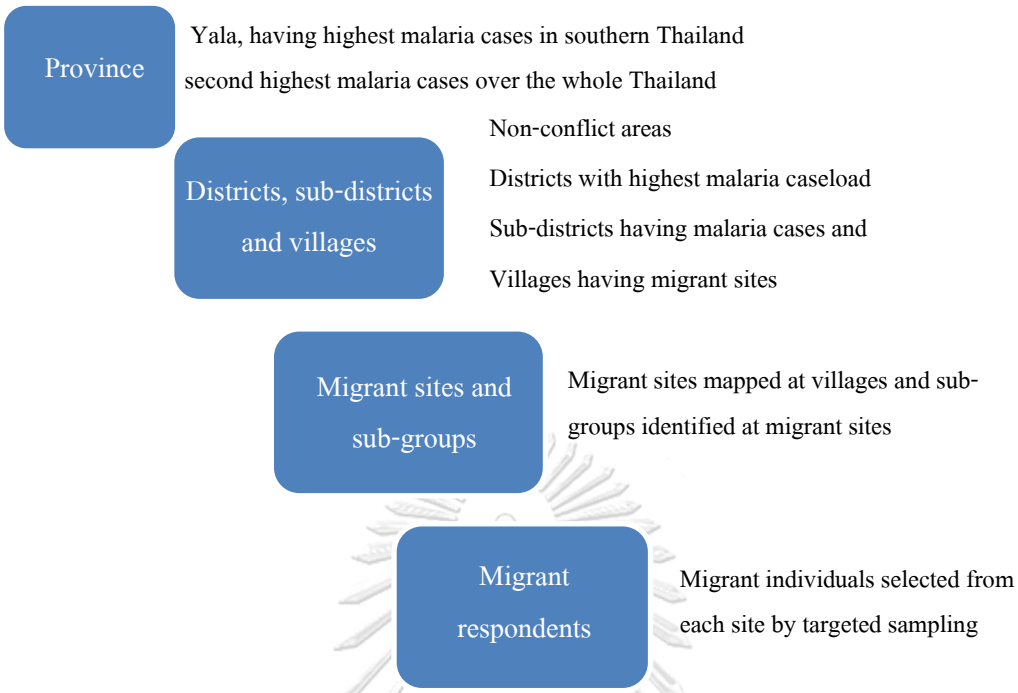


Figure 8. Flow chart of sampling migrants

3.4. Inclusion and exclusion criteria

Respondents for the survey had to meet the following inclusion and exclusion criteria.

Inclusion:

1. Male and female migrants
2. 18 years of age or older
3. Ability to provide informed consent or assent to participate in the survey
4. Residing or spending time in active foci (having malaria transmission for 6 months) areas between 6pm-6am within a radius of 3 kilometres.

Exclusion:

1. Individuals with limitations to communication

2. Those who cannot speak or understand any of the common local languages but can only speak very peculiar ethnic language beyond the scope of the skilled interviewer and translator.

Participants could discontinue their participation in the survey if: 1) the participant could not spend time to complete the questionnaire, and 2) the participant withdrew consent to participate in the interview. During the interview process, if any local situation or conditions occurred that might harm the participant and/or the interviewer, the interview could be stopped for the safety purposes of participant and/or interviewer.

3.5. Sample size

According to the previous national surveys, the proportion of migrants that had each of the following indicators was:

1) Fever (in previous two weeks[3]) = 3.5%
2) Fever cases that had accessed treatment = 100%
3) Used an ITN the previous night = 55.0% (static) and 5.7% (mobile)

Considering the above indicators, which are the key indicators to be estimated in the migrant survey, the following standard formula was used for calculating the minimum sample size:

$$n = \frac{z^2 \alpha/2 \; p(1-p)}{d^2}$$

Here, p = proportion of the indicator of interest, z = 1.96 (95% confidence interval) and d (margin of error) = 5% or half of the proportion if it is less than 10%. The initial sample size was then

[3] The indicator required by the study is fever in previous three months, but this data has not been captured before. Therefore, use of two weeks is used as proxy. Since this should be a lower proportion than fever in three months, it should give a conservative estimate that is able to answer the proportion with fever in three months.

estimated assuming a design effect of two (as it assumes variation between the clusters). Using this methodology, the three indicators give the estimated sample sizes shown in Table 1.

Table 1. Sample size estimation from each of the three indicators

Indicator	**Initial sample size**
1. Proportion of migrants who had fever - 3.5%	848
2. Proportion of migrants who used ITN - 5.5%	529

Taking the largest estimate to ensure all indicators can be calculated, the estimated sample size is 848. To have the representative sample size for study in Yala province, the following adjustment is made applying the finite population correction. If n0 is the estimated sample size from the equation (which is based on a non-finite population), then the actual sample size, n, from a finite population that has the same power etc. as the calculated size for a non-finite population is:

$$n = (n0*N)/(n0 + (N - 1))$$

where N is the population size.

The estimated migrant population in Yala is around 800 (actual migrants only as a combination of static and mobile), then the actual sample size required would be:

$$(849*800)/(849+(800-1))=412$$

It is noted that sample sizes should be rounded up to the next integer and estimated sample size of 848 from a non-finite population was estimated as 849. According to the adjustment from the equation, the required sample size of migrant population in Yala province is 412.

3.6. Sampling approach

Of 8 districts in Yala province, 4 districts with highest malaria transmission foci were selected. According to proportion of foci in each district, sample quota was calculated based on required sample size. It was expected to have 15 migrants per hamlet and planned to recruit 5-10 migrants per migrant site.

Figure 9. Malaria Foci distribution in Thailand during fiscal year 2018

Malaria transmission foci (hamlets) were listed in each selected district, and required number of hamlets were randomly selected from the list applying the sampling interval (total foci divided by required foci). A preliminary mapping of migrant sites was done in the selected hamlets, followed by targeted sampling in those areas based on quotas established.

3.7. Sampling Distribution

Of 8 districts in Yala, 4 districts were covered by the survey, giving a priority to the villages having malaria transmission foci and migrant populations. Selected districts were Bannang Sata, Kabang, Than To and Yaha, and there were altogether 8 sub-districts and 30 villages surveyed to reach 414 participants. The targeted sample size of 412 could have been met. Mapping of migrant sites was done by R studio 1.2.5019 using GPS data from the survey (Figure 10).

Table 2. Distribution of migrant sites

Districts selected	No. of sub-districts	No. of villages	No. of migrants	Proportional allocation
Bannang Sata	3	12	165	39.86%
Kabang	1	5	96	23.19%
Than To	2	6	84	20.28%
Yaha	2	7	69	16.67%

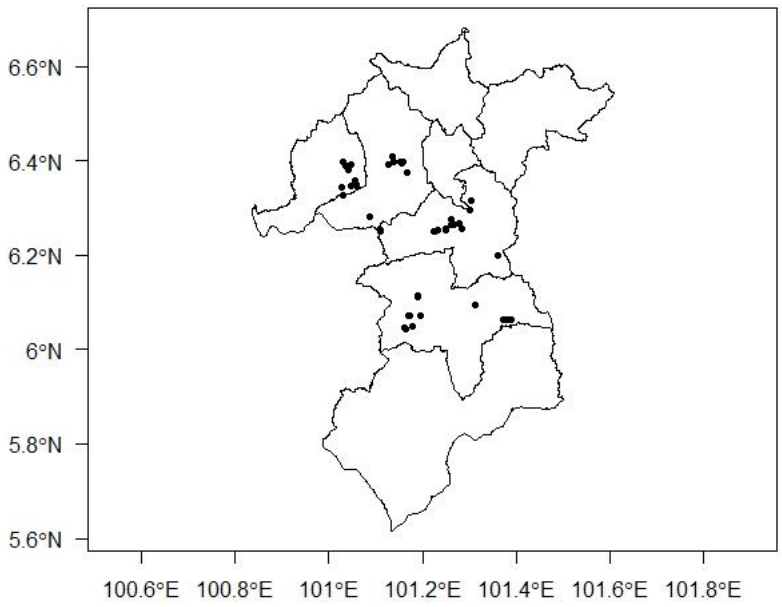


Figure 10. Geographical distribution of migrant sites in the study

3.8. Survey approach

Mapping and site selection

Sites where migrants reside and congregate were mapped in order to form the sampling frame. A review of the current literature and available data on migrants, settlements, work sites and crossing points was conducted. The sites of interest included those where migrants were known or thought to be congregating, particularly locations deemed at risk of malaria. These included ethnic minority villages, border villages and villages close to/in forested areas, plantations, farms and work sites: construction sites, factories, rubber plantations, etc.

Focused group discussions among migrant populations prior to quantitative data collection

Focus group discussion (FGD) is a good way to gather together people from similar backgrounds or experiences to discuss a specific topic of interest. FGD will be conducted prior to data collection to have more background information about the population of interest (15).

At the selected districts, the key informants among migrant populations were invited and discussions were held with them to understand the nature of the study populations more. The ideal number of between six and eight participants was maintained. Two FGD per district were held and there were 8 FGDs in total.

The group of participants was guided by a moderator (or group facilitator) who introduced topics for discussion and helped the group to participate in a lively and natural discussion amongst themselves.

FGD sessions were prepared carefully through identifying the main objectives of the study, developing key questions, developing an agenda and planning how to record the sessions.

This qualitative part is the essential component of this survey as migrants are the hidden populations, especially the undocumented ones. Without having rapport with the key informants from the targeted populations, it is impossible to conduct the interviews for having the reliable information (16).

Field preparation

Concurrent to the mapping phase, survey tools were developed including standard operating procedures, questionnaire, informed consent forms and field manuals. The questionnaire was pilot-tested pre-tested for validity and reliability in a cluster not selected for the survey. Modifications to the questionnaire were made according to the pilot study.

Field team was recruited and trained on the survey objectives, procedure and data collection process. Interviews with the participants were done by the trained skilled interviewers of the field team using the questionnaires approved. Interviewers included those who could speak or understand any of the common local languages and languages of majority of migrants (Thai, Yawe, Myanmar, Karen, Shan).

3.9. Data collection

Sampling methods for hidden populations

Cross-sectional household surveys are often not suitable for picking up populations that are hard-to-reach or “hidden”. These surveys typically make up a small proportion of the total population and often frequent or reside in places away from the fixed household setting (8,14). Other methods for surveying these populations exist, including in the malaria community, and have been used extensively in recent years. Three popular methods are targeted sampling, time-location sampling (TLS), and respondent-driven sampling (RDS). Each method has relative merits and drawbacks:

Targeted sampling:

This involves the selection of locations where the population of interest is known to congregate, also referred to as venue-based sampling. It requires a preliminary mapping phase of all target venues, followed by sampling in those areas based on quotas established to approximate the make-up of the population. If population sizes are known in each site, this can be made more robust by using proportional sampling in the target areas. Targeted sampling has previously been used in malaria research in Ethiopia to target migrants (15), and is useful when available data does not allow comprehensive mapping of all sites. It is also beneficial if there are specific sub-groups within the population to be investigated – for example different types of migrants, or sites at different distances from health facilities. However, it potentially introduces a lot of bias into the sample and may not be representative of the wider population as a whole.

Time location sampling (TLS)

TLS is a modified form of targeted sampling that is suitable for capturing hard-to-reach and 'hidden' population groups when a comprehensive set of identifiable locations where individuals of interest congregate can be mapped. The technique has been often used in the field of HIV research (14, 16) and was previously used in Namibia for malaria (9). TLS constructs a sampling frame of locations and randomly samples from those as if they were clusters, possibly with probability proportionate to size if estimated population sizes are known. Once sites are selected, randomized surveying will take place for each site when the population of interest is most accessible.

TLS reduces selection bias and approximates probability sampling and random cluster sampling. However, a comprehensive sampling frame of all sites of interest is required and it may not be useful if the intention is to capture specific sub-groups in the survey.

Respondent driven sampling (RDS)

This involves selecting 'seeds' from within target population groups and incentivizing them to recruit other individuals that meet the eligibility criteria. Similar to *snowball sampling*[4], this form reduces bias as it only allows each person to recruit typically three other people. The new recruits then go on to recruit others, thereby widening the population reached. RDS has previously been used in Thailand to target migrant workers in Ranong (17) and on the Thai-Cambodia border (5). RDS is good for reaching hidden populations, but it is resource and time intensive (18, 19, 20). Several rounds of recruitment must be completed before the population reaches saturation, and people within the population of interest must all be connected to avoid only reaching a specific sub-group from which the seeds are drawn.

Since RDS is resource and time-consuming, it is considered to use either targeted sampling or TLS sampling (21). TLS is the preferred method since it reduces sampling bias and can provide an overall indicator for the migrant population in southern provinces.

However, since the most appropriate method depends on 1) the amount of readily available data on migrants' sites and sizes, and 2) the time and resources available for data collection, the alternative option, targeted sampling design was selected as it did not require as full a sampling frame as TLS and operationally easier in the field where available data do not allow comprehensive mapping of all sites.

Total duration of data collection was around four and half months starting from time of file visits, pilot testing the questionnaire, training for interviewers till complete data collection. The interviewers included village health volunteers and migrant health volunteers who were supervised under the staff from local healthcare services (VBDCs, VBDUs) and also volunteers working with Civil Society Organizations (CSOs). There were 2 teams for data collection; one group had 8 members and another 7 members. Data collector teams went to different districts for collecting data. A standard questionnaire was developed in English based on standard WHO questionnaires

[4] Snowball sampling involves the selection of seeds as recruiters in the same way but does not have a cap on how many people each seed can recruit. This is more likely to mean you reach only a sub-group of the population that your initial few seeds know.

for difficulties to reach population. The questionnaire was structured to gather information on demographics, movement and living conditions, knowledge, attitudes and practices related to malaria and its prevention, and access to malaria case management. Questions related to attitudes towards malaria and ITN were based on the Health Belief Model (HBM) which includes five constructs that influence health behaviors, namely perceptions of susceptibility, severity, barriers, benefits, and cues to action (22). The HBM posits that people are likely to exhibit disease prevention behaviors (such as sleeping under ITNs) if they perceive that they are susceptible to the disease, the disease is severe, the behavior is beneficial, and barriers are minimal (22). In addition, external cues to action, such as health messages or recommendations of healthcare workers, family or friends or other influential people can affect behaviors.

Questions pertaining to access to malaria services were based on "5A" dimensions of access by Penchansky and Thomas (23) who conceptualize access to healthcare is affected by availability - the extent to which the health facility has the requisite resources, such as personnel and technology, to meet the needs of the patients; accessibility - the geographic accessibility of the facility in terms of time and distance; accommodation - the extent to which health facility's operations are organized in ways that meet the constraints and preferences of the patients; affordability – the financial and incidental costs; and acceptability - the extent to which the patient is comfortable with the more immutable characteristics of the provider, and vice versa. A sixth dimension of awareness of availability of services was added recognizing that effective communication about the service is particularly important for migrant populations in rural and remote communities (24, 25). The questionnaire was then translated into Thai by certified translators and pre-tested for validity and reliability in Sadao district, Songkhla province which was not to be sampled under the survey.

Field team was deployed to each district according to the sampling schedule, in the identification of fever cases and gaps in net usage. Once at the target location, team leader worked with local authorities to engage with the gatekeepers of migrant communities in each location (community leaders, employers, landowners, etc.) and obtained their consent to enter the site to conduct the

survey. The population size of migrants and times when they congregate could be better estimated based on the knowledge of the key informants in charge of the sites.

At the scheduled time, field team surveyed migrants congregating at the site who met the eligibility criteria and were available for an interview. Depending on the nature of the site, this involved inviting migrants to visit a survey post which was set up for the interviews, or field teams actively approaching migrants throughout the site to recruit them for the survey. The approach applied was suitable to the context and approved by site leaders.

The field teams enrolled migrant individuals according to the plan developed during the mapping process for various subtypes of migrants congregating at the site in their workplaces or accommodation. Each eligible migrant was asked to participate. Participation was entirely voluntary and after being fully informed, written consent was obtained. Interviews were conducted with participants who met the eligibility criteria and gave consent for the interview. If the migrant agreed to participate, a questionnaire on their knowledge, attitudes and practices toward malaria and malaria prevention was administered in a language and at a level that was understandable for the participant. Questions were asked to gather quantitative data to obtain the key objectives of the survey. Information collected included demographic characteristics, net ownership and usage, fever cases within the previous three months and healthcare seeking behaviour, malaria knowledge and attitudes, and practices of forest-goers. Healthcare-seeking behaviours covered the type of facility or healthcare provider accessed for fever, including government hospital, health-promoting hospital, government malaria services (such as malaria clinics, vector-borne disease units, malaria posts), community-based services by trained village heath volunteers, civil society organizations' services, private clinics, traditional healer, self-medication and "others" to be specified. Their choices did not need to be mutually exclusive. Their reasons of attending or not attending healthcare services were also investigated to understand their perception of the difficulties in seeking healthcare. Once all available migrants had been surveyed in the allotted time, the field team moved to another study site.

3.10. Monitoring and evaluation processes

Routine monitoring and evaluation (M&E) was done and several tiers of quality assurance checks and processes were put in place to ensure high quality of data collection and data management. Supervision to data collection team at sites was held throughout the first two weeks of data collection to ensure correct procedures were in place. Unannounced field visits were also done to monitor teams' data collection timeliness, methodology and quality.

3.11. Data Management and analysis

Data were entered into ODK and imported to excel and responses in Thai were translated to English. STATA software version 13.0 (StataCorp LP, College Station, TX, USA) was used to clean and analyse the data.

Descriptive statistics included calculation of proportions, means and standard deviations on demographic variables and specific indicators. For each key objective, summary tables were computed. Cross-tabulations were done to examine how responses differed according to socio-demographic information.

The proportions and their 95% confidence intervals (CIs) were calculated using the SURVEY (SVY) command in STATA to account for clustering by migrant site and stratification by district. Rao-Scott chi-square tests were used, considering the sampling design to compare categorical variables among migrants from different districts, sub-districts and villages in Yala. The level of significance was kept at 0.05.

Socio-demographic variables and perceived knowledge factors potentially related to migrants' health seeking practices when they got fever as well as net ownership and utilization were identified with univariate and multivariable analyses.

3.12. Ethical consideration

The final survey protocol and associated documents such as translated information sheets and consent forms in migrants' languages (Thai, Yawee, Myanmar, Karen and Shan) were submitted to the ethical review committee, Institutional Review Board (IRB), Faculty of Medicine, Chulalongkorn University on 9 April 2019 (IRB No. 245/62)) for ethical clearance and approval was granted on 18 July 2019 (COA No. 777/2019).

Informed consents were obtained from all study participants. The field staff explained the study to the potential participants verbally in their local language, and ensured the participant was clear about relevant information (background, objective, procedures, alternatives to participate, time to be spent, risks and benefits, etc.). They also provided the participants with the participant information sheets in their dialects. The participants were allowed enough time to ask any questions to the staff and informed that their participation was entirely voluntary, they could withdraw/refuse to participate in the study at any time without any effect on their rights, legal status, or medical services.

Upon ensuring the participant understand the necessary information about the study, he/she was provided with the information sheet and informed consent form in his/her language and given sufficient time to decide whether or not to participate. The study staff also explained the information in the informed consent form section by section and provided the contact information of the ethics committee should they felt their rights violated during the study and needed a channel to complain. Contact information of the principal investigator and the study team supervisor were included.

After allowing the potential participant to ask clarifying questions until they fully understood, the field staff asked him/her to provide their written or witnessed consent. The informed consent process was performed by someone that did not have a conflict of interest with the participants, to avoid excising authority for forced consent. The consent document had to be signed and dated. A copy of the signed informed consent was also given to the participant. If the participant refused to keep it, the field staff marked the form and kept it along with the original signed consent.

Withdrawal was permitted at any time without incurring responsibility and punishments.

3.13. Privacy and confidentiality

Privacy and confidentiality were assured to all the participants, and this was recorded on the questionnaires and read out to participants prior to data collection. The questionnaire was administered face-to-face with no other person within hearing distance other than the interviewer and the survey participants.

The identification numbers for all participants were assigned and recorded on the questionnaires and informed consent form. At no point were names recorded on any study materials that were retained by field staff. All data generated by the study were kept strictly confidential and accessible only to relevant authorized staff and only used for purposes related in this protocol. Paper-based study related documents were kept in locked cases until the end of the study till data entering.

3.14. Risks to participants

There were very few, if any, risks (physical, social or psychological) that may have occurred from participation in the study, as only information was being collected – the questions were asked to understand participants' knowledge, attitudes and practices regarding malaria. No blood was taken, and no physical examination or activity was required to participate in the study. This study did not involve those under 18.

While the participant may not directly benefit, the study findings will be used to target efforts to decrease malaria risk to migrants and facilitate elimination of malaria in Thailand.

3.15. Benefits to participants

Suitable small gifts of commodities such as soap, rice, etc. of value less than 100 baht were provided to every participant. The interview was entirely voluntary and only lasted approximately

40 minutes. While participants may not directly benefit otherwise, the study findings will be used to target efforts to decrease malaria in migrant communities.

Chapter 4

Results

A total of 414 migrants participated in the study, recruited from recruited from 30 villages under 8 sub-districts of 4 selected districts; Bannang Sata district (39.9%), Kabang district (23.2%), Than To district (20.3%) and Yaha district (16.7%). It was quite challenging migrant sites in some areas, facing difficulties in transportation. Due to limited time for data collection at each cluster, it was

also difficult for field interviewers to locate and enroll enough highly mobile and hidden migrants by snowballing. However, participants could be recruited as targeted after extending the period of data collection.

4.1. Key findings

A summary of key findings pertaining to the study objectives is presented in the following Table 3. Regarding key findings pertaining to objectives, it is found that 36.5% got fever in the last 3 months, 51.3% of those who had fever sought healthcare at health facilities, 44.9% with fever got tested for malaria, 19.1% were malaria positive and 60.3% could receive anti-malarial treatment. Looking at the ITNs (insecticidal nets) coverage and utilization, 40.7% owned ITNs, 96.5% of them used ITNs and 34.7% used ITNs every night. It was also detected that 23.6% of the population surveyed were forest-goers (risk group for malaria) and 29.5% of forest goers got fever in the last 2 weeks and 64.7% had fever in the last 3 months. Of forest goers who experienced fever in the last 3 months, 60.5% went to health facilities for diagnosis and treatment, 57.6% could be tested for malaria and 31.8% were detected as malaria positive. It could be concluded from the key findings that current malaria services could cover more than half of the migrant population surveyed despite their mobile nature. Overall ITN coverage was also almost half among the migrants; however, only 32.7% of migrants who owned ITNs used ITNs every night.

Table 3. Summary of key findings pertaining to the objectives

Objectives	Indicator	n	Weighted proportions	95%CI
Access to malaria diagnosis and treatment	Migrants with fever in the last three months	166	36.5	27.4-46.7
	Migrants with fever in the last three months who sought diagnosis and treatment	89	51.3	36.7-65.7
	Migrants with fever in the last three months who had a malaria test	80	44.9	28.7-62.3

	Migrants with fever in the last three months who had positive malaria test	36	19.1	10.2-33.2
	Migrants with positive malaria test who received anti-malarial treatment	22	61.5	25.9-87.9
Insecticidal net coverage and utilization	% of migrants having ITN (ITN coverage)	181	40.7	23.4-60.6
	% of migrants using ITNs	175	96.5	79.7-99.5
	% of migrants using ITN every night (Utilization of ITN)	57	34.7	16.5-58.9
	% of migrants using ITN more than 5 days (Utilization of ITN)	64	32.7	17.4-52.9

Table 4. shows that of forest goers with malaria, 62.6% got anti-malarial treatment. Fifty percent of forest goers owned ITNs and 28.1% of them used ITNs when they were in the forest. On the other hand, 28.1% forest goers owned LLIHNs (Long-lasting insecticidal treated nets) and 7.6% of those used LLIHNs while in the forest. According to the key findings, it was found that access to diagnosis and treatment was quite good among all the migrants and forest goer sub-group while ITN utilization was quite low overall as well as in forest-goers.

Table 4. Summary of key findings pertaining to the objectives among population at risk

Indicator	n	Weighted proportions	95%CI
Access to malaria diagnosis and treatment			
Migrants who are forest-goers	116	23.6	10.8-44.2
Forest goers with fever in the last 2 weeks	34	29.5	23.7-36.1
Forest goers with fever in the last three months	75	64.7	56.3-72.2
Forest goers with fever in the last three months who sought diagnosis and treatment	45	60.5	36.4-80.3

Forest goers with fever in the last three months who had a malaria test	43	57.6	35.0-77.4
Forest goers with fever in the last three months who had positive malaria test	24	31.8	21.3-44.7
Forest goers with positive malaria test who received anti-malarial treatment	15	64.4	26.0-90.3
ITN coverage and utilization			
% of forest goers having ITNs	59	50.0	21.5-78.5
% of forest goers having LLIHNs	15	12.7	5.6-26.5
% of forest-goers using ITNs in the forest	33	28.1	13.1-50.4
% of forest-goers using LLIHNs in the forest	8	7.6	5.2-10.9

In the figure 11 below, the main findings among all the migrants under the survey and forest goer migrants subgroup on having had fever in the last 3 months, seeking healthcare services for fever, got tested, being malaria positive and having had treatment can be compared by their percentages. For all the migrants surveyed (the left one in the figure), the percentages shown are based on the total participants of 414, and for the forest goers, the percentages are of the total number of 116 forest goers.

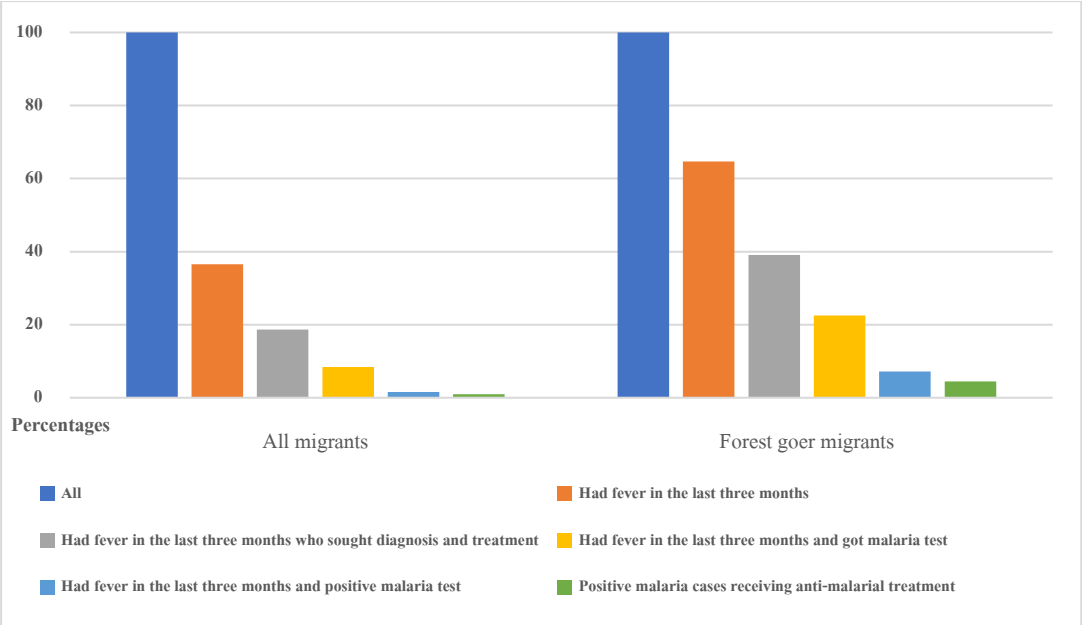


Figure 11. Key Findings on access to health care services for fever

4.2. Socio-demographic Characteristics (Sample proportions, non-weighted)

Of 414 migrants surveyed, 67.2% were males and 32.9% were females. Mean age was 30-44 with standard deviation of 9.26. Of 4 districts, Bannang Sata district had 39.9% migrants recruited, Kabang had 16.6%, Than To had 23.2% and Yaha 20.3% migrants. There were 44.2% Myanmar migrants, 20.3% Karen, 12.5% Shan, 11.4% Malaysian and 11.6% Sakai under the survey. Forty percent of migrants had received only primary school level education followed by 31.6% secondary education and 24.4% just able to read and write. However, Thai language skill among the migrant workers was quite high with 56% able to speak Thai and 33.3% able to read Thai. Occupational types comprised construction workers 30.9%, wage labourer 21.3%, those working in the forest 15.7%, rubber tappers 12.3% and the rest of 19.8%. Almost 70% of the migrants in the study had been living in Thailand for more than 6 months and 30% had been living for less than 6 months. For health insurance status, 61.6% migrants had migrant health cards, 8.7% had HIS-PCP, 6.5% held passports and temporary passports while the rest 23.2% migrants did not have health insurance.

Table 5. Socio-demographic Characteristics of the samples (n=414)

Characteristic	N	non-weighted %
Age (years)		
Mean: 30.44; SD: 9.26		
Age groups:		
18-24	122	29.5
25-44	263	63.5
45-64	26	6.3
65 and above	3	0.7
Gender		
Male	278	67.1
Female	136	32.9
Geographical region (District)		
Bannang Sata	165	39.9
Kabang	69	16.7
Than To	96	23.2
Yaha	84	20.3
Nationality		
Malaysian	47	11.4
Myanmar	319	77.0
No citizenship	48	11.6

Table 5. Socio-demographice characteristics of the samples (n=414) (Continuous)

Characteristic	N	non-weighted %
Ethnicity		
Burmese	183	44.2
Karen	84	20.3
Shan	52	12.5
Malaysian	47	11.4
Sakai (Maniq)	48	11.6

Religion		
Buddhism	228	55.1
Christian	65	15.7
Islam	56	13.5
No religion	24	5.8
Don't know	41	9.9
Educational level		
read and write	101	24.4
primary school	167	40.3
secondary school	131	31.6
vocational school/certificate	12	2.9
bachelor degree	3	0.7
Thai language skill		
Can speak	232	56.0
Can read	138	33.3
Occupation		
Market seller	17	4.1
Wage labourer	88	21.3
Paddy farmer	15	3.6
Rubber tapper	51	12.3
Construction workers	128	30.9
Working in the forest	65	15.7
Others (Dependents, Visitors, In transit)	50	12.1

Table 5. Socio-demographice characteristics of the samples (n=414) (Continuous)

Characteristic	N	non-weighted %
Migration status		
Migrants having lived in Thailand for less than 6 months	126	30.4

Migrants having lived in Thailand for more than 6 months	288	69.6
Status of health insurance		
No health insurance	96	23.2
Migrant health insurance/HICS	255	61.6
HIS-PCP	36	8.7
Others (Visitors)	27	6.5

4.3. Movement Characteristics and Living Characteristics (Sample proportions, non-weighted)

From the information obtained from the survey, it was noticed that 30.4% of migrants had been living in Thailand for less than 6 months, and they were assumed to be quite mobile. Forty-nine percent of migrants have been living in Thailand for 6 months to 5 years, and 20.3% of migrants living for more than 5 years. Those can be assumed as static. Details on mobility and movement characteristics are shown in Table 6. It can be seen in Table 6 that more than half, 66.9% of migrants came to Thailand for the reasons of finding jobs. Around 10% of migrant workers were in Yala during their transit to another country, probably Malaysia. It was also found that almost half, 46.4% migrants arrived at Thailand crossing through unofficial crossing points.

Assessing the living characteristics of migrants, the survey reported that 59.4% migrants stayed alone while 32.6% were with family and the rest 8% were not with family but staying with other migrants in the same house. Most migrants lived in thatched houses, 79.2%, of those, less than half, 40% had roofs and all walls at houses. Table 6 shows the details.

Table 6. Movement and Living Characteristics (n=414)

Characteristic	n	non-weighted %
Length of stay in Thailand (Years)		

Characteristic	n	non-weighted %
<6 months	126	30.4
6 months to 5 years	204	49.3
> 5 years	84	20.3
Residence prior to the current location		
Within this district	197	47.6
Within this province	86	20.8
Abroad	126	30.4
No answer	5	1.2
Reasons for migration to the current location		
Work opportunity	277	66.9
Family reason	12	2.9
Religious purpose	21	5.1
Leisure	13	3.1
In transit	43	10.4
Others	43	10.4
No answer	5	1.2
If they migrated into Thailand within previous 6 months (n=125), crossed the border by		
Regular checkpoint	49	39.2
Temporary checkpoint	19	15.1
Unofficial crossing point (river/forest)	58	46.4

Table 7. Movement and Living Characteristics (n=414) (Continuous)

Characteristic	n	non-weighted %
Frequency of visit to home country		
Never	205	49.5
Every 2 Weeks	4	1.0

Characteristic	n	non-weighted %
Monthly	15	3.6
Every 2-3 months	7	1.7
Twice per year	0	0.0
Once per year	37	8.9
< Once a year	146	35.3
Have plans to relocate in next 6 months		
No	182	44.0
Yes	104	25.1
Not sure	128	30.9
Next planned migration location within next 6 months (n=104)		
Back home	23	22.1
Within the same area/same district	8	7.7
Within the same area/province	8	7.7
To another province	8	7.7
To another country	43	41.4
Not known yet	14	13.5
Living with		
Live with my family	135	32.6
Live alone	246	59.4
Live with others but not family	33	8.0
Family members less than 5	90	66.7
Family members more than 5	45	33.3
Type of accommodation		
Farm shelter	7	1.7
Hut/tent	141	34.0
Camp	180	43.5
Adjoining apartments	67	16.2
Dormitory	19	4.6
Thatched	328	79.2
Tiled	45	10.9
Mixed	41	9.9

In Table 7, proportions of migrants that could answer correctly regarding malaria knowledge related questions and malaria preventive measures are reported. Most of the migrants 76.1% had heard of malaria (in local terms as well) and it was 76.1%. Half of the migrants, 51.7% had known malaria preventive methods such as using nets, ITNs, repellents, etc.; 67.2% had correct answers on malaria

signs and symptoms, and 64.5% migrants had knowledge on severe malaria signs and symptoms. It was found that migrants had known malaria services through village health volunteers, 28.7% and also at malaria posts and health promoting hospitals, 29.2%.

Table 8. Correct responses for knowledge of Malaria and its prevention (n=414)

Knowledge	n	non-weighted %
1. Having heard of Malaria	315	76.1
2. Malaria Transmission		
Mosquito/ Anopheles bites	30	7.3
3. Malaria Prevention Methods (any one of the following)		
Sleep under a mosquito net /ITN/ LLIN/, use repellent, insecticide spray, make smoke, wear long-sleeved clothes	214	51.7
4. Malaria sign and symptoms (any one of the following)		
Fever, chills, headache, fatigue, nausea, vomiting	278	67.2
5. Sign and symptoms of severe malaria (any one of the following)		
Unconscious, Convulsions, Fast breathing, High fever/high body temperature, Pale skin, Frequent vomiting, Shivering, Digestive system (Poor appetite, nausea and vomiting)	267	64.5
6. Points of care they would go for malaria diagnosis and treatment if they get fever (any one)		
Community-based services via village health volunteers,	119	28.7
Community-based services at government MP/BMP, HPH	121	29.2
Private health facilities: Private clinic /hospitals	12	2.9
Drug store/Local vendors	47	11.4
Traditional medicines/Healers	10	2.4

In addition, it was found that the percentage of perceived susceptibility regarding malaria was 72.2% from knowing that malaria could make them sick and 45.1% from knowing that staying overnight in forest was a risk factor. Regarding perceived severity, 59.4% knew that malaria could lead to death 59.4% knew that malaria would need treatment. Perceived benefit for having ITNs

was better than conventional nets was 30.8% and perceived barrier for using ITNs accepting that ITNs could cause skin rashes was 30.1%. Table 8 summarizes perceptions based on the health belief model.

Table 9. Perceptions of migrants related to malaria and malaria prevention methods (n=133)

Health belief model construct	Item	Agree response	
		n	non-weighted%
Perceived Susceptibility	Probable to get sick from malaria	96	72.2
	People who stay overnight in the forest have high risk of malaria infection	60	45.1
Perceived Severity	Severe malaria can lead to death	73	54.9
	Malaria infected patients need treatment as it is not a self-cured disease	79	59.4
Perceived Benefits	ITNs/LLINs can prevent malaria better than conventional net/non ITN	41	30.8
Perceived Barriers	Sleeping under LLINs might cause allergy and rash	40	30.1

4.4. Malaria Prevention Practices

Following the assessment on migrants' malaria knowledge, the survey could collect their practices regarding malaria prevention. Sixty-two percent of migrants said they slept under mosquito nets (any net) to prevent mosquito bites, but when asked about prevention practices when sleeping

outside the home, 31.4% of migrants did not take any preventive measures from mosquito bites (Table 9).

Table 10. Malaria prevention practices (n=414)

Characteristic	n	non-weighted %
Primary action taken to prevent mosquito bites		
Sleeping under mosquito net (any net)	258	62.3
When outside home and not sleeping in the nets		
Nothing	130	31.4
Mosquito coils	79	19.1
Mosquito repellents	48	11.6
Insecticide spray	20	4.8
Making smoke	67	16.2
Using herbs (Spray/Burning)	37	8.9
Wearing long sleeved clothes	9	2.2
Joss sticks	11	2.7
Fan	47	11.4
Interior walls of accommodation were sprayed against mosquitoes in the past 12 months	98	23.7

4.5. Health-seeking behaviours of migrants when they experienced fever

As reported in the key findings above, migrants' health-seeking behaviours are summarized in Table 10 below. However, percentages shown in Table 10 are from descriptive analysis (i.e. non-weighted) whereas those presented in the key findings are weighted ones from survey analysis in

STATA. It can be seen in Table 10 that almost half, 45.5% of migrants who did not seek any healthcare services when they got fever performed self-medication and 29.9% of migrants were treated with traditional medicine. Among those who sought diagnosis and treatment, 48.3% were through village health volunteers and 46.1% of migrants went to malaria posts or health promoting hospitals. However, most of the migrants, 43% with fever sought treatment 3-4 days after the onset of fever.

Table 11. Health seeking behaviours of migrants when they experienced fever

Characteristic	n	non-weighted %
Having had fever in the last 3 months (n=414)	166	40.1
Sought healthcare for fever (n=166)	89	53.6

Characteristic	n	non-weighted %
Reasons/barriers for not seeking healthcare (n=77)		
Self-treated	35	45.5
Treated with traditional medicines	23	29.9
Do not know where services are	18	23.4
Far from healthcare services	22	28.6
Free time is not enough to go and seek for healthcare	7	9.1
No health insurance	5	6.5
Healthcare facilities of choice for fever (n=89)		
Community-based services via Village health volunteers,	43	48.3
Community-based services at government MP/BMP, HPH	41	46.1
Private health facilities: Private clinic /hospitals	4	4.5
Drug store/Local vendors	1	1.1
Reasons of seeking healthcare at particular places of choice (n=89)		
Convenience	76	85.4
Having insurance	54	60.7
Free of charge	74	83.2
Staff speaking same language	15	16.9
Good quality of drugs	1	1.1
Friendly service	35	39.3
Taken by employer	4	4.5
Suggested by others	2	2.3
Interval between fever onset and seeking healthcare (n=89)		
Within 24 hours	11	12.4
Within 48 hours	35	39.3
Three or more days	39	43.8
Do not remember	4	4.5

4.6. Malaria testing and treatment among those who had fever

Table 11 shows more details on malaria testing and treatment among migrants who had fever in the last 3 months. Those were reported under the key findings above with weighted proportions while

percentages in Table 11 are just descriptive findings. It was found that 82.5% of migrants tested for malaria were by RDTs and this finding was in line with health seeking behaviours since most of migrants with fever went to community-based services where RDTs were used for malaria testing. Though the intervals between the onset of fever and going to health services of most migrants were not within one day, 63.6% of those who were found malaria positive at community services received anti-malarial treatment within 24 hours.

Table 12. Malaria testing and treatment among those who had fever

Characteristic	n	non-weighted %
Had a blood test for malaria (n=166)	80	48.2
Type of malaria test done (n=80)		
RDT	66	82.5
Do not remember	14	17.5
Healthcare facilities where malaria test was done (n=80)		
Community-based services via Village health volunteers	39	48.8
Community-based services at government MP/BMP, HPH	38	47.5
Private health facilities: Private clinic /hospitals	3	3.8
Migrants who reported positive malaria test (n=80)	36	45.0
Migrants who received treatment for malaria (n=35)	22	62.9
Healthcare facilities where treatment was received (n=22)		
Community-based services via Village health volunteers,	6	27.2
Community-based services at government MP/BMP, HPH	16	72.7
Interval between positive result and malaria treatment (n=22)		
Within 24 hours	14	63.6
Within 48 hours	8	36.4

Table 11. Malaria testing and treatment among those who had fever (Continuous)

Characteristic	n	non-weighted %
Those who went for follow-up visits (n=22)		

Went for all visits	6	27.3
Went for some visits	11	50.0
Not at all	5	22.7
Those relieved from fever after treatment (n=22)		
No fever at all after treatment	12	54.5
Relieved from fever after treatment but relapsed and continued treatment (4 went for all follow-up visits and treated, 3 went for some visits and treated and 1 dd not go for follow-up and treatment at all)	8	36.4
Not relieved from fever after treatment (all went for all follow ups and treated)	2	9.1

Suggestions to enhance access to healthcare services from the migrants who could not go to health facilities because of their working hours are summarized in Table 12.

Table 13. Suggestions to get more access to healthcare services by those who could not go to health facilities because of their working times (n=113)

To improve	n	%
Mobile clinic	29	25.7
Having migrant health volunteers in the community	75	66.4
Longer opening hours	26	23.0
Worksite health provisions	23	20.4

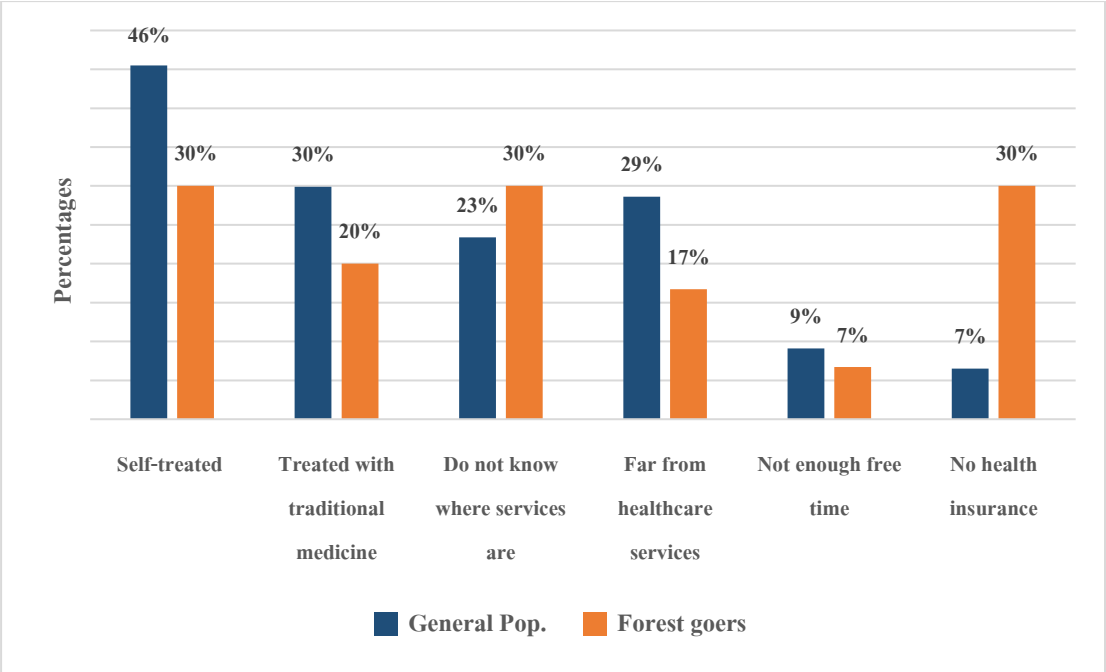


Figure 12. Reasons/barriers for not getting treatment (Population in general vs. Forest goers)

The figure 12 compares reasons/barriers for not getting treatment between the surveyed population in general and the forest goer group. Self-treatment as a reason is high in both groups with 46% and 30% respectively; however, migrants without health insurance is much higher in forest goer group with 30% compared to the population in general group with 7%.

4.7. Ownership and utilization of ITN

ITN ownership (coverage) and utilization is one of the main objectives and is reported under the key findings above as well. Like findings on access to diagnosis and treatment, ITN coverage and utilization results were presented with weighted proportions above; however, they are described in descriptive fashion in Table 13 below. It was found that 50.8% migrants received ITNs from village health volunteers and 85.6% migrants received ITNs from public health staff free of charge. Findings in details on owned nets of migrants are also reported in Table 13 and reasons why migrants did not like to use mosquito nets/ITNs as well as those for using mosquito nets/ITNs are included in Table 14.

Table 14. Ownership and utilization of ITN

Characteristic	n	non-weighted %
Own a mosquito net (n=414)	269	65.0
Own any ITN (ITN coverage) (n=269)	181	67.3
Insecticide treated nets (ITN)	59	21.9
Long lasting insecticide treated nets (LLIN)	103	38.3
Long lasting insecticide treated hammock nets (LLIHN)	21	7.8
Source of nets (any nets) (n=269)		
Free from VHVs	128	47.6
Free from public health staff	186	69.1
Free from employer, relatives, community leaders	11	4.1
Purchased from shop/market	13	4.8
Source of ITNs (n=181)		
Free from VHVs	92	50.8
Free from public health staff	155	85.6
Free from employer, relatives, community leaders	8	4.4
Purchased from shop/market	4	2.2
Length of net being used (n=269)		
<6 months	90	33.5
6 months to 1 year	74	27.5
>1 year to 2 years	58	21.6
> 2 year to 3 years	26	9.7
> 3 years	19	7.1
Do not remember	2	0.7
Length of any ITN being used (n=181)		
<6 months	65	35.9
6 months to 1 year	44	24.3
>1 year to 2 years	40	22.1
> 2 year to 3 years	20	11.1
> 3 years	12	6.6

Table 13. Ownership and utilization of ITN (Continuous)

Characteristic	n	non-weighted %
Frequency of washing any net (n=269)		
Once a month	7	2.6
Every 2-3 months	84	31.2
Twice a year	129	48.0
Once a year	45	16.7
Not a regular	4	1.5
Frequency of washing ITN (n=181)		
Once a month	3	1.66
Every 2-3 months	45	24.9
Twice a year	101	55.8
Once a year	29	16.0
No a regular	3	1.7
Current Condition of net (n=269)		
Good and not having any hole	128	47.6
Having holes	133	49.4
Not sure	8	3.0
Current Condition of ITN (n=181)		
Good and not having any hole	88	48.6
Having holes	89	49.2
Not sure	4	2.2
Frequency of net usage (n=269)		
Every night in the last week	81	30.1
More than 5 days in the last week	90	33.5
3-4 days in the last week	47	17.5
1-2 in the last week	40	14.9
Never	11	4.1
Frequency of ITN use (n=181)		
Every night in the last week	57	31.5
More than 5 days in the last week	64	35.4
3-4 days in the last week	31	17.1
1-2 in the last week	23	12.7
Never	6	3.3

Table 15. Reasons for net practices

Reasons	n	non-weighted %
For not using nets every night (n=188)		
Feeling hot & uncomfortable	128	68.1
Net is not in good condition	47	25.0
Keeping for visitors for further use	12	6.4
Rash/Irritation/Burning sensation	16	8.5
Because of chemical smelling	16	8.5
For not using ITNs every night (n=124)		
Feeling hot & uncomfortable	85	68.6
Net is not in good condition	26	21.0
Keeping for visitors for further use	9	7.3
Rash/Irritation/Burning sensation	13	10.5
Because of chemical smelling	14	11.3
For using nets (n=258)		
Prevent malaria	124	48.1
Repel mosquitoes	217	84.1
Kill mosquitoes	159	61.6
Kill other insects	16	6.2
Prevent other diseases	16	6.2
Privacy	16	6.2
For using ITNs (n=175)		
Prevent malaria	87	49.7
Repel mosquitoes	149	85.1
Kill mosquitoes	118	67.4
Kill other insects	11	6.3
Prevent other diseases	10	5.7
Privacy	12	6.9

4.8. Differences on key socio-demographic characteristics across 4 districts

To be able to inform the local health care services on migrants in Yala province specific to each district under the survey, some key socio-demographic characteristics were analysed over 4 districts. In Table 15, it can be seen that socio-demographic characteristics among migrant workers were more or less the same in 4 districts though male populations in Yaha district was significantly higher than in the other 3 districts (p-value=0.031) when assessed using survey analysis.

Table 16. Differences on key socio-demographic characteristics across 4 districts (weighted survey analysis)

Indicator	Bannang Sata (n=165)			Yaha (n=69)			Kabang (n=96)			Thanto (n=84)			p-value#
	n	%	95% CI	n	%	95% CI	n	%	95% CI*	n	%	95% CI	
Age groups:													0.870
18-24	47	28.7	26.8-30.7	28	43.0	36.9-49.2	27	28.1	-	20	23.7	18.4-29.9	
25-44	108	62.8	55.0-70.0	39	53.3	45.1-61.4	61	63.5	-	55	65.6	62.4-68.6	
45-64	10	8.5	3.5-19.3	2	3.7	2.1-6.5	8	8.3	-	6	7.3	4.0-13.0	
65 and above	0	0.0	-	0	0.0	-	0	0.0	-	3	3.5	2.2-5.6	
Gender:													**0.031**
Male	115	70.1	68.2-71.9	58	89.6	64.6-97.6	55	57.3	-	50	59.7	55.1-64.1	
Female	50	29.9	28.1-31.8	11	10.4	2.4-35.4	41	42.7	-	34	40.1	35.9-44.9	
Ethnicity:													0.138
Myanmar	70	35.6	16.6-60.6	25	34.1	28.7-39.9	57	59.4	-	31	36.6	26.9-47.6	
Shan	45	23.0	11.4-40.8	15	11.1	0.8-67.0	19	19.8	-	5	5.7	1.1-24.5	
Karen	24	21.9	7.5-49.2	8	5.9	0.5-46.8	20	20.8	-	0	0.0		
Malaysian	18	10.7	7.1-16.0	15	44.4	6.9-89.6	0	0.0	-	14	16.6	14.2-19.3	
Sakai	8	8.8	2.1-30.9	6	4.4	3.5-38.4	0	0.0	-	34	41.1	21.9-63.4	
Thai language skill													
Can speak Thai	84	51.8	42.1-61.3	35	34.8	8.0-76.7	68	70.8	-	45	53.2	40.3-65.7	0.149
Can read Thai	43	22.9	14.5-34.2	23	19.3	2.2-71.4	46	47.9	-	26	30.5	16.7-49.0	0.212

Table 17. Differences on key socio-demographic characteristics across 4 districts

(weighted survey analysis) (Continuous)

Indicator	Bannang Sata (n=165)			Yaha (n=69)			Kabang (n=96)			Thanto (n=84)			p-value#
	n	%	95% CI	n	%	95% CI	n	%	95% CI*	n	%	95% CI	
Occupation:													0.078
Market seller	49	37.3	15.4-66.0	12	24.4	10.7-46.5	9	9.4	-	35	41.7	40.4-43.0	
Paddy farmer	8	3.9	1.8-8.3	0	0.0		6	6.3	-	1	1.1	0.2-5.4	
Construction workers	67	33.2	14.5-59.3	14	10.4	0.7-64.8	31	32.3	-	16	19.0	16.7-21.5	
Forest goers including rubber tappers	21	13.6	6.4-26.5	27	20.0	1.1-84.7	46	47.9	-	22	25.9	17.7-36.4	
Others (Dependents, Visitors, In transit)	20	12.0	10.2-14.0	16	45.2	7.6-89.2	4	4.2	-	10	12.2	4.3-30.5	
Migration status													0.053
< 6 months	51	30.1	25.2-35.3	37	71.9	19.8-96.4	26	27.1	-	12	14.2	11.7-17.2	
> 6 months	114	69.9	64.5-74.8	32	28.2	3.7-80.2	70	72.9	-	72	85.8	82.9-88.3	
Health insurance status													0.280
No health insurance	36	20.6	15.6-26.5	17	21.5	14.4-30.8	29	30.2	-	14	16.4	8.6-29.1	
Migrant health insurance/HICS	109	62.3	50.2-73.0	31	29.6	5.9-73.8	67	69.8	-	48	57.0	49.8-63.8	
HIS-PCP	8	8.8	2.1-30.9	6	4.4	3.5-38.4	0	0.0	-	22	26.7	13.1-46.7	
Others (Passports/Temporary passports)	12	8.3	4.6-14.6	15	44.4	6.9-89.7	0	0.0	-	0	0.0		

#Pearson Chi-square test

**95%CI does not have width in Kabang district since migrants under the survey were within one sub-district of Kabang.*

4.9. Migrants' access to malaria diagnosis and treatment across 4 districts

Across 4 districts, migrants who sought diagnosis and treatment when they got fever were significantly higher in Kabang district than other districts (p-value=0.009). The possible explanation is that most of the migrants in Kabang district, 70.8% could speak Thai and almost half, 47.9% could read Thai as well comparing to other 3 districts though not significantly different on language skill across 4 districts. Kabang district also showed the highest proportion of migrants with fever who were tested for malaria with 65.9% across 4 districts. It also owned the highest malaria patient proportion with 31.7% among all districts surveyed.

Table 18. Migrants' access to malaria diagnosis and treatment across 4 districts (weighted survey analysis)

Indicator	Bannang Sata (n=165)			Yaha (n=69)			Kabang (n=96)			Than To (n=84)			p-value#
	n	%	95% CI	n	%	95% CI	n	%	95% CI*	n	%	95% CI	
Migrants having	65	36.6	28.4-45.8	30	33.3	13.3-62.0	41	42.7	-	30	35.6	30.9-40.6	0.525
Migrants with fever in the last three months who sought treatment	32	47.9	37.4-58.5	16	48.9	34.4-63.6	29	70.7	-	12	39.9	37.8-42.1	**0.009**
Migrants with fever in the last three months who were tested for malaria	29	44.6	34.0-55.7	14	37.8	14.5-68.6	27	65.9	-	10	33.2	29.7-36.9	0.072
Migrants who got malaria in the last 3 months	13	19.4	10.3-33.4	5	11.1	1.8-45.6	13	31.7	-	5	16.6	14.9-18.5	0.135
Migrants with malaria in the last 3 months who got treated	11	94.0	74.4-98.8	2	40.0	-	8	61.5	-	1	21.1	2.5-73.3	0.470

 # Pearson chi square test

**95%CI does not have width in Kabang district since migrants under the survey were within one sub-district of Kabang.*

4.10. Insecticidal net coverage and utilization among migrant workers across 4 districts

Though there was no significant difference on ITN utilization and coverage across 4 districts, Table 17 provides net ownership and utilization specific to each district under the study. Kabang district had higher proportion of migrants who owned ITNs, 63.5% among all districts while Yaha had the migrant population with highest ITN utilizations every night, 51.1%. However, when assessing those who used ITNs more than 5 days a week, Kabang got the highest proportion again with 42.6% of migrants.

Table 19. Insecticidal net coverage and utilization among migrant workers across 4 districts (weighted survey analysis)

Indicator	Bannang Sata (n=165)			Yaha (n=69)			Kabang (n=96)			Than To (n=84)			p-value#
	n	%	95% CI	n	%	95% CI	n	%	95% CI*	n	%	95% CI	
Owning any ITNs	51	32.2	24.3-41.3	32	34.8	12.5-66.7	61	63.5	-	37	43.2	16.7-74.2	0.110
Using any ITNs every night	24	46.0	41.7-50.2	12	51.1	13.8-87.2	17	27.9	-	4	10.6	4.5-23.0	0.301
Using any ITNs more than 5 days a week	22	41.3	32.2-50.9	13	34.0	15.8-58.7	26	42.6	-	3	7.9	3.4-17.5	0.301

 # Pearson chi square test

**95%CI does not have width in Kabang district since migrants under the survey were within one sub-district of Kabang.*

4.11. Key findings among forest goers

Since forest goers (people who spent overnight during 6 pm to 6 am in the forest) have been identified as a risk group for malaria, the proportion of forest goers among migrant population was estimated. Altogether there were 2 of forest goers under the survey, of those, 94% were males and 6% were females. As shown in Table 18, among all forest goers, half of those, 52.6 were Myanmar; 67.2% had been living in Thailand for more than 6 months; 57.8% did not have migrant health insurance while 36.2% did not have any documents; 39.7% were rubber tappers; and 52.6% went into forest every night for working.

Table 20. Demographic Characteristics of forest-goers (n=116)

Characteristic	n	non-weighted %
Age (years)		
Mean: 31.46; SD: 8.76		
Age groups:		
18-24	28	24.1
25-44	79	68.1
45-64	9	7.8
Gender		
Male	109	94.0
Female	7	6.0
Geographical region (District)		
Bannang Sata	37	31.9
Kabang	23	19.8
Than To	37	31.9
Yaha	19	16.4

Table 18. Demographic characteristics of forest goers (n=116) (Continuous)

Characteristic	n	non-weighted %
Ethnicity		
Myanmar	61	52.6
Shan	26	22.4
Karen	17	14.7
Sakai	12	10.3
Migrantion status		
Migrants having lived in Thailand for less than 6 months	38	32.8
Migrants having lived in Thailand for more than 6 months	78	67.2
Health insurance status		
No health insurance	42	36.2
Migrant health insurance/HICS	67	57.8
HIS-PCP	7	6.0
Reasons for going to the forest/plantation/garden/farm and staying overnight		
Rubber planting/tapper	46	39.7
Picking forest products/hunting	24	20.7
Accommodation is in the forest	71	61.2
Gardening/farming	3	2.6
Logging	10	8.6
Visiting friends staying in the forest	7	6.0
Frequency of going to the forest at night		
Every day/night	61	52.6
Every week	19	16.4
Every month	5	4.3
< once/month	31	26.7

Among forest goers, 29.3% experienced fever in the last 2 weeks and 64.7% experienced fever in the last 3 months. Regarding health seeking behaviours of forest goers who had fever, 60% sought diagnosis and treatment. Table 19 shows more details on the behaviours. Because of the nature of their work, 68.9% of forest goers sought healthcare after 3-4 days from the fever onset, and they approached village health volunteers and went to community-based services (malaria posts/HPHs) for having diagnosis and treatment.

Table 21. Healthcare seeking behaviours among forest goers who experienced fever

Characteristic	n	non-weighted %
Having had fever in the last 2 weeks (n=116)	34	29.3
Having had fever in the last 3 months (n=116)	75	64.7
Reported malaria experience in the last 3 months (n=116)	24	20.7
Sought healthcare for fever (n=75)	45	60.0
Reasons/barriers for not getting treatment among those not seeking healthcare (n=30)		
Self-treated	9	30.0
Treated with traditional medicines	6	20.0
Do not know where services are	9	30.0
Far from healthcare services	5	16.7
Free time is not enough to go and seek for healthcare	2	6.7
No health insurance	9	30.0
Healthcare facilities of choice for fever (n=45)		
Community-based services via Village health volunteers,	23	51.1
Community-based services at government MP/BMP, HPH	22	48.9
Interval between fever onset and seeking healthcare (n=45)		
Within 24 hours	2	4.4
Within 48 hours	9	20.0
Three or more days	31	68.9
Do not remember	3	6.7

As presented in Table 20 below, 57.3% forest goers who had fever in the last 3 months were tested for malaria and 76.7% reported that blood testing was by RDTs. Forest goers who received treatment for malaria were 62.5% and malaria positives not receiving treatment did not go to malaria services after referral from volunteers.

Table 22. Malaria testing and treatment among forest goers who experienced fever in the last 3 months

Characteristic	n	non-weighted %
Had a blood test for malaria (n=75)	43	57.3
Type of malaria test		
RDTs	33	76.7
Do not remember	10	23.3
Forest goers who received treatment for malaria (n=24)	15	62.5
Healthcare facilities where treatment was received (n=24)		
Community-based services via Village health volunteers,	3	20.0
Community-based services at government MP/BMP, HPH	12	80.0

As indicators of interest, ITN ownership and utilization as well as prevention practices were assessed among forest goers as well. They are presented in Table 21; 50.9% of forest goers reported that they owned any ITNs; 19% had LLINs; and 12.9% owned LLIHNs. It was assessed that 30.2% used any ITNs in the forest; 12.9% used LLINs in the forest; and 6.9% used LLIHNs when they were in the forest. However, of those who owned nets (any net), 61.6% (45) forest goers answered they used nets sometimes only and 32.9% never used nets in the forest. It pointed behavioural gap among forest goers.

As other preventive measure apart from using nets, 30.8% of forest goers used mosquito coils while in the forest and 44.8% reported they did not apply any preventive measures

Table 23. Net ownership, utilization and malaria preventive measures among forest goers (n=116)

Characteristic	n	non-weighted %
Type of nets owned by forest goers		
Conventional net	33	28.5
Any ITN (ITN, LLIN, LLIHN)	59	50.9
ITN only	22	19.0
LLIN only	22	19.0
LLIHN only	15	12.9
Type of nets used in the forest		
Conventional net	17	14.7
Any ITN (ITN, LLIN, LLIHN)	35	30.2
ITN only	12	10.3
LLIN only	15	12.9
LLIHN only	8	6.9
Frequency of net use in the forest among forest goers who own a net (n=73) (Behavioural Gap)		
Every time/night	4	5.5
Sometimes	45	61.6
Never	24	32.9
Frequency of any ITN used in the forest among those who own any ITN (n=59) (Behavioural Gap)		
Every time/night	4	6.8
Sometimes	35	59.3
Never	20	33.9

Table 21. Net ownership, utilization and malaria preventive measures among forest goers (n=116) (Continuous)

Characteristic	n	non-weighted %
Frequency of using LLIHN in the forest among those who own LLIHN (n=15)		
Every night	0	0.0
Sometimes	6	40.0
Never	9	60.0
Reasons for using nets in the forest (n=49)		
Prevent malaria	24	49.0
Repel mosquitoes	34	69.4
Kill mosquitoes	23	46.9
Kill other insects	2	4.1
Prevent other diseases	3	6.1
Privacy	4	8.2
Reasons for not using nets in forest (n=67)		
Feeling hot and uncomfortable	26	38.8
Net is not in good condition	6	9.0
Keeping nets for visitors and future use	1	1.5
Having rash, irritation and burning sensation	2	3.0
Because of chemical smell	1	1.5
Do not own a net	43	64.2
Other preventive measures used in the forest (n=116)		
Nothing	52	44.8
Mosquito coil	35	30.2
Mosquito repellent	7	6.1
Insecticide spray	2	1.7
Making smoke	9	7.8
Herbal spray/Burning herbs	5	4.3
Wearing long-sleeved clothes	3	2.6
Joss sticks to repel mosquitoes	3	2.6

Data on forest goers were also analysed across 4 districts to have more information specific to district. Referring to Table 22, Bannang Sata district had significantly higher forest goers with fever in the last 2 weeks (p-value=0,020) while Yaha district had higher in proportion with fever in the last 3 months (p-value=0.017). Kabang district also showed significantly higher forest goer proportion for seeking healthcare when having fever (p-value=0.031) as well as higher proportion of testing for malaria (p-value=0.043).

Table 24. Access to malaria diagnosis and treatment among forest goers across 4 districts (weighted survey analysis)

Indicator	Bannang Sata (n=37)			Yaha (n=23)			Kabang (n=37)			Than To (n=19)			p-value#
	n	%	95% CI	n	%	95% CI*	n	%	95% CI*	n	%	95% CI	
Forest goers having experienced fever in the last 2 weeks	12	34.1	27.1-41.9	7	30.4	-		29.7	-	4	20.8	13.9-30.1	**0.020**
Forest goers having experienced fever in the last 3 months	23	62.3	54.2-69.7	17	73.9	-		64.9	-	11	57.9	57.0-58.8	**0.017**
Forest goers with fever in the last three months who sought treatment	9	41.2	17.0-70.5	12	70.6	-		75.0	-	6	55.2	31.7-76.6	**0.031**
Forest goers with fever in the last three months who were tested for malaria	9	41.2	17.0-70.5	12	70.6	-		70.8	-	5	45.6	40.3-51.0	**0.043**
Forest goers with malaria in the last three months	7	32.0	18.4-49.6	5	29.4	-		41.7	-	2	18.4	11.6-27.8	**0.031**
Forest goers with malaria in the last three months who got treated	6	100.0	-	2	40.0	-		70.0	-	0	0.0		0.434

 # Pearson chi square test

**95%CI does not have width in Yaha and Kabang districts since forest goers surveyed were within one sub-district of the respective province.*

As per results in Table 23, though there was no significant difference among forest goers in regard to ITN ownership and utilization, it was found that migrants in Kabang district had more ITNs over other districts, reporting 70.3%, while Yaha district showed highest proportion who used ITNs, 43.5% among all districts.

Table 25. Insecticidal net coverage and utilization among forest goers across 4 districts (weighted survey analysis)

Indicator	Bannang Sata (n=37)			Yaha (n=23)			Kabang (n=37)			Than To (n=19)			p-value#
	n	%	95% CI	n	%	95% CI	n	%	95% CI	n	%	95% CI	
Forest goers who own any ITNs	9	22.5	6.4-55.1	12	52.2	-	26	70.3	-	12	61.6	11.9-95.0	0.070
Forest goers who own hammock nets (LLIHNs)	3	8.6	1.5-35.9	2	8.7	-	8	21.6	-	2	10.7	6.9-16.1	0.112
Forest goers using any ITNs in the forest	5	12.1	4.1-30.6	10	43.5	-	12	32.4	-	6	30.6	6.9-72.3	0.073
Forest goers using any LLIHNs in the forest	1	2.9	0.5-13.7	1	4.4	-	3	8.1	-	1	5.1	1.4-16.5	0.480

 # Pearson chi square test

**95%CI does not have width in Yaha and Kabang districts since forest goers surveyed were within one sub-district of the respective province.*

4.12. Univariate analyses

Table 24 shows results from univariate analyses in socio-demographic factors against seeking healthcare services when having fever as well as ITN utilization. Some factors showed significant p-values (in bold).

Multivariable analyses were performed for both seeking healthcare and net utilization including variables of interest based on hypothesis (Hypothesis-driven analysis). Backward elimination was applied; however, no socio-demographic factor significantly influenced migrants' seeking healthcare for fever and ITN utilization. While performing the backward elimination, variables not

significant with biggest p-values were dropped one by one, and nationality was the variable left at the last stage of elimination. However, it was also not significant with p-value 0.210 after the regression.

Table 26. Univariate analysis on socio-demographic factors against seeking healthcare services when having fever and ITN utilization (weighted survey analysis)

Variable	Category	Seeking healthcare services when			ITN utilization		
		OR	95%CI	P-value#	OR	95%CI	P-value#
Age group	18-24	1.00	Ref.		1.00	Ref.	
	25-44	0.88	0.34-2.31	0.709	0.79	0.27-2.30	0.533
	45 and above	0.25	0.02-2.76	0.165	0.32	0.06-1.65	0.114
Gender	Male	1.00	Ref.		1.00	Ref.	
	Female	0.89	0.26-3.07	0.780	1.63	0.76-3.50	0.137
Nationality	Myanmar	1.00	Ref.		1.00	Ref.	
	Malaysian	0.61	0.18-2.14	0.302	0.06	0.00-1.60	0.072
	Others (Sakai)	0.21	0.03-1.42	0.081	0.29	0.07-1.22	0.071
Education	Read & write	1.00	Ref.		1.00	Ref.	
	Primary school	2.15	0.45-10.20	0.215	1.71	0.56-5.26	0.225
	Secondary school	2.04	0.32-12.99	0.307	1.56	0.36-6.72	0.401
	Graduated	0.36	0.02-5.92	0.329	0.22	0.01-4.48	0.207
Occupation	Market seller	1.00	Ref.		1.00	Ref.	
	Construction worker	2.51	0.38-16.98	0.223	1.38	0.41-4.77	0.466
	Forest goer/Rubber	3.63	0.83-15.83	0.832	1.85	0.65-5.25	0.156
	Dependent/Those in	2.18	0.83-5.73	0.827	0.07	0.00-2.43	0.096
Insurance status	No health insurance	1.00	Ref.		1.00	Ref.	
	Migrant health	0.62	0.24-1.57	0.199	0.10	0.63-1.60	0.998
	HIS-PCP	0.11	0.01-1.38	0.069	0.36	0.09-1.46	0.103
	Passport/Temporary	0.48	0.26-0.93	**0.039**	Omitted by STATA svy: logit analysis.		
Migration status	Less than 6 months	1.00	Ref.		1.00	Ref.	
	More than 6 months	1.11	0.52-2.39	0.45	1.29	0.44-3.81	0.512
Thai Language skill	Can speak Thai	1.14	0.56-2.31	0.599	1.34	0.79-2.26	0.179
	Can read Thai	0.83	0.36-1.89	0.518	1.83	0.77-4.35	0.113

 # Wald Statistics; Rao-Scott chi squared test

Univariate analyses were also performed on perceived knowledge factors against seeking health services for fever and ITN utilization (Table 25). Significant P-values are shown in bold. However, after multivariable analyses considering all perceived knowledge factors applying backward elimination, only the perceived susceptibility that migrants knew malaria could make them sick was significantly associated to their seeking healthcare services when having fever with the p-value of 0.014, and it can be concluded that migrants who knew they could get sick of malaria were 14.27 times more likely to seek healthcare services when they experienced fever.

Table 27. Univariate analysis on perceived knowledge against seeking healthcare services when having fever and ITN utilization (weighted survey analysis)

Variable	Category	Seeking healthcare services when having fever			ITN utilization		
		OR	95%CI	p-value#	OR	95%CI	p-value#
Perceived susceptibility	Can get sick from malaria	14.27	2.8-71.9	**0.014**	1.79	0.4-8.0	0.305
	Staying overnight in the forest is a risk factor	4.29	1.5-12.2	**0.021**	1.29	0.6-2.8	0.370
Perceived severity	Severe malaria can lead to death	3.15	0.6-17.3	0.122	0.93	0.4-2.2	0.811
	Malaria needs treatment	1.41	0.8-2.4	0.125	1.16	0.8-1.7	0.319
Perceived benefit	ITNs are better than convectional nets	0.60	0.3-1.4	0.156	0.95	0.2-4.6	0.930
Perceived barrier	ITNs can cause allergies	2.20	0.3-17.8	0.316	0.98	0.4-2.4	0.942

 # Wald Statistics; Rao-Scott chi squared test

Multivariable analysis was also done including perceived knowledge factors. Since hypothesis driven analysis was done, all perceived knowledge factors were included in analysis applying backward elimination, dropping the insignificant variables with biggest p-value. Perceived severity was the variable left at the last, but it was also not significant with p-value 0.811 after regression.

Chapter 5

Discussion

This survey is the first survey in Yala focusing exclusively on non-Thai migrant populations and their health seeking behaviours regarding fever as well as their ownership and utilization of ITNs. It was aimed to generate population-averaged estimates in Yala using clusters. It has helped to understand the prevailing situation of migrants in different districts of Yala where malaria transmission foci exist and provides data on migrants on key indicators targeted for malaria elimination.

5.1. Socio-demographic Characteristics

Most of the MMP in our survey were in the working age group of 25-64 years, with a median age of 30 years. The survey participants were predominantly those who have been living in Thailand for more than 6 months (static), probably because most of these migrants had settled in their current location in Thailand for more than 5 years which made them easier to locate via key informants in the local mapping process. In comparison to static group, those staying in Thailand for less than 6 months were more likely to be undocumented and frequently mobile – in line with the official MOPH definition of M1 (static) and M2 (mobile) migrants (1). Male to female ratio of 2 among migrants under the study was also in line with data from Social Security office. According to Social Security office, there were 3.524 documented migrants in Yala and male to female ratio was 1.8.

Regarding the movement characteristics, 68.4% of migrants moved to the current locations from places inside the same province. Only 30.4% were in other countries prior to the current location. Majority of migrants, 66.9% came into Thailand for the reason of finding jobs. Similar findings were seen in a previous qualitative study which had found that migrants along the Thai-Cambodia border were more inclined to move within the same district or province because there were enough jobs in economic farming such as fruit orchard and rubber plantation for the MMP to be able to rotate jobs (19). These variations in migration characteristics reflect the socio-cultural differences, economic opportunities and mobility patterns of migrants in Yala province.

1. Access to Malaria Diagnosis and Treatment

The results from the study pointed out that there were malaria suspects (those with fever) among the migrant population in Yala and the proportion that sought health care services when they got fever. More than one-third of the population surveyed answered that they experienced fever in the last three months during their stay in Thailand, but only half of those with fever went to health facilities to get diagnosis and treatment. Another half seeking healthcare services for fever, one-fifth reported they were malaria positive. There can be malaria positive cases from the group who did not seek healthcare when they got fever. Most of the people who did not go to health facilities for fever did self-medication and 30% used traditional medicines. Apart from self-medication, other drugs that migrants used to relieve fever were not asked under this survey, but it should be included in further studies. Misuse of drugs can lead to drug-resistant cases which are indeed big challenges when moving towards malaria elimination (18, 19). Hidden positives among the migrant populations should be considered as reasons why Yala had increased caseloads during the past 4 years (2016-2019) in addition to other possible underlying causes (10).

Department of Employment also reported the doubled increase of migrant workers in the southern region since 2014. Those were only the registered ones, not accounting for the unregistered migrants. Also, the findings from this study do not represent all the migrants in Yala since finite population correction of sample size calculation was based on the number of registered migrants in Yala.

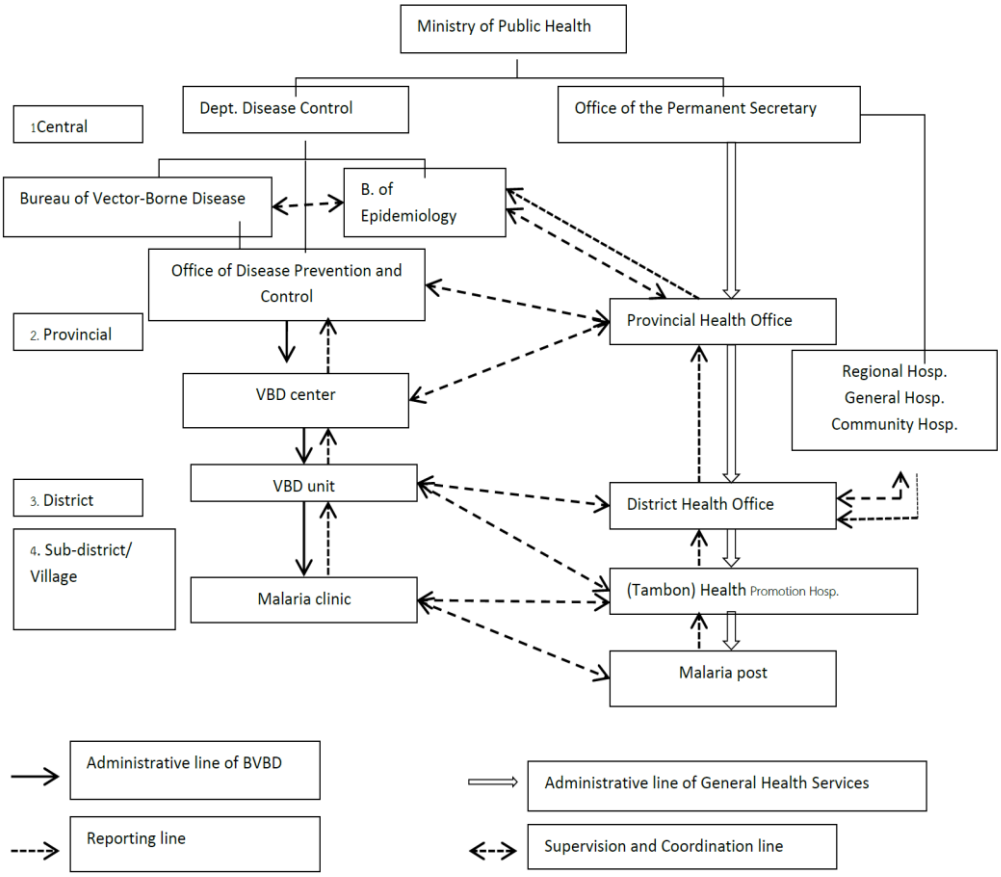


Figure 13. Administrative structure of Bureau of Vector-Borne Diseases (BVBD) under the Ministry of Public Health (MOPH)

It was detected under the study that among those who sought diagnosis and treatment, 48.3% were through village health volunteers and 46.1% of migrants went to malaria posts and health promoting hospitals. It indicates that community-based malaria services under the National Program could

reach the migrant populations despite their hidden nature. In Figure 13, health services by the national program BVBD under the supervision of MOPH can be seen.

Treatment-seeking among migrants with fever cases was lower than that reported by the populations in border areas in 2016 (52.5% vs 67.5%) (4). Treatment-seeking within 24 hours of fever occurrence was also lower among the migrants than among the local population in 2016 (41.3% vs 26.1%) (4). Most of the migrants, 43%, with fever sought treatment 3-4 days after the onset of fever.

Long-term resident migrants (>5 years) and those with external cues to action (having heard health messages) were more likely to seek treatment, while religious minority and low knowledge of malaria were significant barriers to seeking treatment. However, since most migrants have limited school-education, health education via printed BCC/IEC materials should be simpler to be suitable for inducing behavior change. In addition to low literacy approach such as theatre parties and verbal messaging through loudspeakers, radio and TV, strategies that empower the migrants with interactive cognitive and social skills, are needed to improve their ability to obtain, process, and understand basic anti-malaria information and services needed to make appropriate health decisions (26).

One such strategy could be increasing health literacy of migrants, which goes beyond a narrow concept of health education and individual behaviour-oriented communication, and addresses the environmental, political and social factors that determine health (26). Health literacy can be improved by methods that stimulate interaction, participation and critical analysis, such as community engagement events, community dialogues, drama, role-plays, having peer educators and culturally competent healthcare providers (28). Participatory drama has been shown to be feasible in promoting awareness and understanding of malaria in Cambodia (29) and could also be considered as part of the community engagement for malaria elimination in Thailand. Improving

Thai language literacy among migrants from Myanmar will also help in increasing their health literacy.

It is encouraging that a majority of migrant healthcare seekers visited community-based services, and the proportion visiting the private sector was quite low (<5%), which can result in most of the cases being included in the national surveillance system. Malaria posts were the first choice of healthcare provider for most of the migrants due to convenience and/or accessibility. Provision of mobile clinics and having a migrant health worker at worksite may increase accessibility and promote awareness of free malaria diagnosis and treatment services and increasing the coverage of health insurance may reduce concerns of affordability. These strategies require close collaboration with and support from the employers. Employers could also be engaged during health promotion activities and distribution of nets to provide advice on health seeking.

The malaria test rate was relatively higher among migrants in this survey compared to the survey in 2016 (44.9% vs 18.8%) (4), but the malaria positivity rate were similar (19.1% vs 11.2%) (5). Among the malaria positive 36 persons, 60.3% could receive anti-malarial treatment, and malaria positives who did not receive treatment included those not going to nearby malaria services after being referred by village health volunteers and those detected at private clinics. Of all fever cases, 45.5% were self-treated, which is a concern as some of these may have been missed cases of malaria and there may be a potential misuse of drugs sold by local vendors from the migrant population. No data was gathered on what drugs people used for self-treatment or whether any were antimalarial drugs. Self-treatment of fever among migrants warrants a separate investigation to ascertain what kind of drugs people use to self-treat and examine whether there is misuse of anti-malarial drugs that may contribute to artemisinin resistance (18).

5.1. ITN coverage

Overall ITN coverage was estimated at 40.7%, which is well below the targeted coverage of 90% among people living in malaria transmission areas of Thailand (1). In line with the findings among Thai population in malaria endemic areas in 2016 (4) the ownership of mosquito nets was high

among the migrants at 94%, but less than half of those nets could be considered to be effective ITNs. This ownership gap could be attributed to the gaps in free LLIN distribution among migrants under the Global Fund regional malaria grant especially in Bannang Sata and Yaha provinces, where the ITN coverage was around one -third of migrant population. However, ITN coverage was found almost the same between static and mobile migrants. This may be due to the National Malaria Elimination Program and the Global Fund regional malaria grant strategically targeting mobile migrants attending public health facilities and CSO health facilities for ITN promotion. While targeting mobile migrants seem to be working, findings may be limited by the low number of mobile migrants in the study. Nevertheless, since the overall ITN coverage was low, both static and mobile migrants living in the high malaria transmission areas should be given equal priority (27).

Although access to these groups is challenging, more concerted efforts are needed to improve the ITN coverage among migrants. Screening migrants at border crossings (both official and unofficial) and providing them with a free net may be effective to target highly mobile migrants, especially at the Thai-Malaysian border where mobile migrants are known to cross more frequently. It was reported under this study that 46.4% of mobile migrants came into Thailand through unofficial crossing points (river/forest) during the previous 6 months. For long-term settled migrants, free LLIN distribution needs to be continued to systematically increase ITN coverage. In addition to distributing new LLINs, treating existing nets with an insecticide solution may be a viable way to increase coverage of ITNs among migrants as 65% of migrants under the study already owned a net. Treating plain nets with insecticides annually is in the strategic plan of NMCP (1). A specific guideline of timing and location of re-treatment of nets should be developed to facilitate maximum of nets from migrants to be treated with insecticidal solution.

Furthermore, BCC and health education messages around ITN should focus on benefits of sleeping under an ITN and on reducing concerns of allergies or other negative perceptions associated with ITN. Information on recommended number/timing of washing of treated nets should also be emphasized. The WHO recommends that conventionally treated ITNs be retreated with non-binder

insecticide after every three washes, while LLINs and ITNs treated with WHO Pesticide Evaluation Scheme (WHOPES) approved kits remain effective for up to 20 washes (27).

5.2. ITN utilization

ITN utilization was around 96.5% among those who owned ITNs; however, only 34.7% of migrants used ITNs every night which was less than the target of 55% by 2018 (1). This indicates the behavioral gap of migrants. Other determinants/barriers of ITN use were found to be different in different districts of Yala province under the study. Higher proportions of migrants slept under ITNs in Kabang district comparing to other districts. Additionally, it was analysed that majority (around 75%) of migrants in Kabang district who used ITNs were static (more than 6 months) and could speak Thai. In contrast, less migrants in Than To district reported to sleep under an ITN. In this district also, around 60% of migrants who used ITNs were static in nature and could speak Thai. A strong preference for LLIN among migrants has been noted previously in a province in Thai-Myanmar border region (18, 20). Long-term settlers who travel less may benefit from being available during the health promotion activities of government health workers and CSOs which gives them higher chances of developing better attitudes regarding use of ITN and receiving more free nets.

Thai speaking migrants were found to be living in villages in Yala, who might have understood more health messages regarding malaria from the health promotion activities. These findings are in line with a previous study which also showed that short-term Cambodian migrants were less likely to have received health messages from healthcare workers in the Thai-Cambodia border region (5).

5.3. Other vector control measures

Aside from nets, other household vector control measures were infrequently used. Only 1.5% of all migrants under the study reported having wire screens on any windows or doors in their house. Considering that 79% of migrants were living in thatched houses, wire screens may not be a feasible strategy for them.

5.4. Forest goers

Almost thirty percent of the sample were forest-goers, one-third of those got fever in the last 2 weeks and around 65% had fever in the last 3 months. Of forest goers who experienced fever in the last 3 months, 61% went to health facilities for diagnosis and treatment, more than half were tested for malaria and one-third was detected as malaria positive. Among forest goers with malaria, 62.6% got anti-malarial treatment, and malaria positives not receiving treatment did not go to malaria services after referral from volunteers. Regarding ITN ownership and utilization, half of the forest goers owned ITNs and 28.1% used ITNs when they were in the forest. On the other hand, 12.9% of forest goers owned LLIHNs (long-lasting insecticidal treated nets) and 7.6% of forest goers used LLIHNs while in the forest. Migrants who worked in the forest less used an ITN, simply because they worked all night. Rubber tappers and other forest-goers who work at night are unable to use nets and thus need to be targeted with personal protection that can be worn while they work (21, 27). Forest going migrants were found to use locally modified methods, such as mosquito coils tucked into a headband or belt buckle during night-time work. While mosquito coil's efficacy in preventing malaria infection is still not clear (30), keeping the coil burning near the body surface for extended hours may pose health risks. Some of this sub-group used repellent, but there was likely to be poor compliance to reapplying the repellent regularly enough for it to be effective (21).

A more tailored personal protective tool for rubber plantation can be insecticide treated clothing (ITC) such as insecticidal jacket nets, which has been shown to reduce the risk of malaria infection by 50% in settings where ITN roll out is not possible according to a recent Cochrane review (30).

ITC has been found to have high acceptability and non-inferiority among rubber tappers in Myanmar (21). Likewise, ITC could be an appropriate strategy for forest going migrants in Thailand as they are already accustomed to wearing long sleeves/trousers while working in the forest. However, more research is needed into the feasibility and protective efficacy of ITC before it can be considered for roll-out to all forest going migrants. Different strategies are needed to target different types of forest-going migrants for malaria prevention (28). Similar to previous assumptions that forest goers were exclusively male, more than 90% of forest goers in the study were males. However, strategies such as effective malaria messaging will be needed to tailor for both male and female forest-goers.

Chapter 6

Conclusion

6.1. Strength and Limitation

One of the strengths of this survey is the inclusion of ethnic minority group such as the Maniq, who have not been captured in previous studies. Maniq are a primitive, hard to reach, socio-economically disadvantaged tribe living in remote forests near the Thai-Malaysia border. They may be at a higher risk of malaria given their forest-dwelling nature and non-use of ITN due to their traditional culture of hunting-gathering. As the Maniq who live closer to the mainland have accepted modern attire like t-shirts and trousers, they may also find ITC acceptable. However, for those who hunt deep in the forest, the smell of the ITC may alert the animals to escape faster. Any intervention effort among this tribe, though, will require special coordination with local governmental officials who speak a common language and the tribe leader. The tribe leader should be consulted and involved in development and implementation of suitable and acceptable malaria protective strategies for this vulnerable group, giving due respect to their way of life.

There are some limitations of this study that need to be considered. First, even though use of targeted sampling enabled enrolling of many migrants, the sample could not capture many mobile migrants, especially those who may be participating in illegal activities such as wood logging, hunting, and sex work at the border region. This was mainly due to a lack of information about these hidden groups and limited time for data collection in each migrant site for snowballing to be effective in locating enough of these migrants. Understanding of malaria risk among these types of migrants will require more qualitative and time-sensitive study designs that focus exclusively on these sub-groups such as prospective ethnographic research. Nevertheless, the study was able to include more undocumented (without any health insurance lacking legal status) migrants and provide reasonable estimates of migrants at least for Yala province.

Second, since there was no sampling frame of migrants, clusters were sampled according to the presence of malaria transmissions in districts as a proxy for malaria risk among migrants. However,

some of the clusters selected were found to have restricted access due to security concerns or contained no or very few migrants and needed to be replaced to maintain statistical power of the study. This might have created some selection bias as there may have been oversampling in these clusters. A valuable thing got via this study is an updated mapping of migrants in Yala to better utilize limited resources for future survey purposes. It can be baseline mapping, but as the locations of migrants are affected by seasonal variation, economic opportunities, and security concerns, it is essential to conduct a mapping process before designing the sampling frame.

Third, the survey relied on interviews with the migrants who may have given socially desirable answers due to their vulnerable status as migrants. There is also a possibility of recall bias, especially in fever cases as they might have had problems recollecting their history of the last three months. Use of local translators who spoke the same language as the ethnic minority made their inclusion possible, but there is a possibility that the local translators might not have interpreted some of the questions correctly. This was minimized by giving a briefing to the translators before conducting the interviews and utilizing local health staff who were experienced with malaria prevention as translators whenever possible.

Fourth, finite population correction at the sample size calculation was based on the number of registered migrants in Yala, and thus, the study findings may not be able to represent all the migrants in Yala especially the unregistered migrants.

6.2. Summary and Implications

In conclusion, the survey conducted was comprehensive, representative of the migrants within each district surveyed, and has provided data on key indicators that would help assist malaria elimination in targeting this vulnerable group. The study has highlighted that half of the malaria suspects among migrants in survey did not go seek diagnosis and treatment. There can be hidden malaria cases in that group not seeking diagnosis and treatment despite having fever and it was possibly one of the reasons of increased malaria caseload in Yala. Majority of migrants who sought healthcare services

relied on community-based malaria services via village health volunteers, at malaria posts and health promoting hospitals. Migrants malaria positives did not receive treatment since they did not go to malaria services after referral from volunteers. Living support to targeted/client population approach when referring patients to health centres can be applied to make sure that referred patients reach the health centres (31).

Rapid scaling up of ITN coverage, novel approaches to behaviour change and strong community engagement are needed among the migrants in Yala to continue progress in malaria elimination. ITN coverage could be increased by community-based re-dipping campaigns in addition to LLIN distribution.

Culture and gender sensitive strategies that enable migrants to improve their cognitive, social skills and critical thinking may improve their health-seeking behavior and access to malaria case management. BCC efforts should be directed towards improving interpersonal communication skills of healthcare providers, community/religious leaders and employers. The skills of these influential groups of people should be equipped with accurate malaria health messages.

As migration is time sensitive, it would be beneficial to the healthcare system by periodically updating the mapping and health profiles of migrants by close collaboration among the local health officials, community leaders, CSO staff and migrant gatekeepers such as employers. An updated migrant mapping will be crucial to ensure precise sampling and planning of future study designs. Studies that utilize appropriate qualitative designs should be further conducted to gain a better understanding of malaria risk and preventive practices among highly mobile and hidden migrants who may participate in illegal activities such as wood logging and sex work along the border region.

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Annex1. Questionnaire

Access to Malaria Diagnostic testing, anti-malarial treatment and long-lasting insecticidal nets among Immigrant workers in Yala province, southern Thailand

ID: ___ ___	Sub-group: ___ ___	Enrollment number: ___ As assigned for each migrant site
Initial of interviewee	Village /cluster name	

_____			
Sub-district:	District:	Province: Yala	Post code:
GPS location of migrant site (If possible): _____			
Inclusion criteria ☐ 1. Non-Thai citizen ☐ 2. Male and female migrant ☐ 3. Age 18 years of age or older ☐ 4. Ability to provide informed consent or assent to participate in the survey ☐ 5. Residing or spending time in active foci area (within estimated radius of 3 km of the village) between 6pm-6am in this area			
Does the participant need a translator? ☐Yes ☐No Translator name : _____			
Informed consent ☐written consent ☐verbal consent ☐witnessed assent			
Survey date _ _/_ _/_ _ _ _ Interviewer's name:_____ Interviewer's code: _____ Result codes: **(**Code*1- 4**)** _____ 1 = Completed, 2 = Refused, 3 = Not completed interview, 4 = Others, specify_____			
Summary of visit			
Reviewed by Field Supervisor	Reviewed by Data Collector Team Representative or Researcher	Data entry #1	Data entry #2
Signature:…… Name:……..… Code:……	Signature:…...… Name:……..…… Code:……..……	Signature:……..… Name:……..…… Code:……	Signature:…… Name:……..… Code:……..……

Date:……	Date:……..……	Date:……..……	Date:……..……

SECTION 1: Migrant demographic Information

We would like to ask a few questions about you as a mobile or migrant person. None of these data will be attached to your name or shared with anybody.

No.	Questions	Answer choices	Skip
Q 1.	Sex	Male .....1 Female 2	
Q 2.	What is your age?	Age in year _____ Cannot remember 98	
Q 3.	What is your nationality?	Myanmar .....1 Malaysian .....2 Others .....97 Specify _____ No answer .....98 Don't know 99	
Q 4.	What is your ethnicity?	Myanmar .....1 Shan.....2 Karen .....3 Malaysian .....4 Others .....97 Specify _____ No answer .....98 Don't know 99	
Q 5.	**What are the languages you can verbally**	Myanmar .....2 Shan.....4 Karen .....8 Yawee 16	

No.	Questions	Answer choices	Skip
	communicate in? **Multiple responses are possible.**	Thai .....32 Others .....97 Specify _____ No answer .....98 Don't know 99	
Q 6.	**What are the languages you can read?** **Multiple responses are possible.**	Myanmar ..... .2 Shan.....4 Karen .....8 Yawee .....16 Thai .....32 Others .....97 Specify _____ No answer .....98 Don't know/read 99	
Q 7.	**What is your religion?**	Buddhism .....1 Christian .....2 Islam.....3 Ancestor worship/Spirit .....4 No religion .....5 Others .....97 Specify _____ No answer .....98 Don't know 99	

No.	Questions	Answer choices	Skip
Q 8.	**What is your education?**	Read and Write .....1 Primary school .....2 Secondary school .....3 Vocational school /certificate.....4 Bachelor degree.....5 Higher than bachelor degree .....6 Others .....97 Specify _____ No answer .....98 Don't know 99	
Q 9.	**What is your main occupation?** Main occupation: earning the highest income	Market seller .....1 Wage labourer.....2 Paddy farmer.....3 Rubber tapper.....4 Construction worker .....5 Working in the forest .....6 Factory worker.....7 Others .....97 Specify _____ No answer .....98 Don't know 99	
Q 10.	**What is your health insurance?**	No health insurance.....1 Migrant health insurance/HICS .....2 HIS-PCP ……3	

No.	Questions	Answer choices	Skip
		Universal Coverage Scheme .....4 Social security Scheme .....5 Others .....97 Specify _____ No answer .....98 Don't know 99	
Q 11.	Have you been in Thailand continuously for 6 months?	No.....0 Yes 1	
Q 12.	How long have you been in Thailand?	_____Year_____Month Since born 1	

Section 2: MALARIA KNOWLEDGE AND AWARENESS

We are going to ask you some questions about your knowledge of malaria to help improve services for migrants.

Section 2.1 Malaria knowledge

No.	Questions	Answer choices	Skip
Q 13.	What are the main health issues affecting most people in this area? In your work site **[DO NOT PROMPT]** **Multiple responses are possible.**	Dengue .....2 Malaria .....4 Respiratory illness (e.g. Pneumonia, flu).....8 Non-communicable diseases (e g. diabetes, hypertension, cancer etc.) .....16 Others.....97 Specify Other 1 _____ Specify Other 2 _____ No answer .....98 Don't know 99	
Q 14.	Have you ever heard of Malaria? **If person says no, rephrase question once, "when I say Malaria I mean " (insert 1 or 2 accurate terms for malaria)"– have you heard of these?"** **If person has heard of (other terms only), please**	No …….....0 Yes (Malaria) ..... 1 Yes (after alternative word probe) 2	**If 0 ➔ Q 36**

	clarify that it is the same thing as malaria		
Q 15.	Do you think you could become sick from malaria?	No.....0 Yes .....1 Don't Know.……. .....….99	**If 99 ➔ Q18** **If 0 ➔ Q16, then 19** **If 1 ➔ Q17**
Q 16.	Why do you think you might **not** become sick from malaria? **Multiple responses are possible.**	No mosquito.....2 I am very healthy .....4 I and my family never had malaria .....8 I never heard of malaria in this area .....16 Malaria is not severe disease .....32 I always sleep under a net .....64 I take traditional medicine to prevent malaria .....128 Others (Specify below) ……... 97 Specify Other 1 _____ Specify Other 2 _____ No answer .....98 Don't know 99	
Q 17.	Why do you think you might become sick from malaria?	Jungle mosquito bites (Anopheles).....2 Aedes bites.....4 Unknow type of mosquito bites .....8 Drinking dirty water in the jungle.....16	

	Multiple responses are possible.	Stay overnight in the forest. ..... 32 Working hard ..... 64 Working under hot sun ..... 128 Malaria patient living in the same house ..... 256 Others (Specify below) ..... 97 Specify Other 1 _____ Specify Other 2 _____ No answer ..... 98 Don't know 99	
Q 18.	How do people get malaria? **Do not suggest/lead.** **Let his/her make own response.** **Multiple responses are possible.**	Mosquito bites..... 2 Mosquito bites (Day time) ..... 4 Mosquito bites (Night time)..... 8 Mosquito bites (Evening)..... 16 Drinking dirty water in the jungle..... 32 Visit and stay overnight in the forest. ..... 64 Work hard ..... 128 Work in hot sun ..... 256 Malaria patient living in the same house ..... 512 Others (Specify below) ……97 Specify Other 1 _____ Specify Other 2 _____ No answer ..... 98 Don't know 99	
Q 19.	What are the methods to prevent malaria?	Sleep under a mosquito net..... 2 Sleep under a treated - net 4	

	Do not suggest/lead an answer. **Let his/her make own responses.** **NOTEL if they say "mosquito net", ask about type of net to assess if they know about treated nets or not** **Multiple responses are possible.**	Sleep under LLINs ..... 8 Mosquito coils ..... 16 Mosquito repellent ..... 32 Insecticide spray ..... 64 Make smoke ..... 128 Wear covered clothes ..... 256 Traditional medicine ..... 512 Others (Specify below) ..... 97 Specify Other 1 _____ Specify Other 2 _____ No answer ..... 98 Don't know 99	
Q 20.	What are the benefits of a net treated with insecticide compared to an untreated net? **Do not suggest/lead an answer.**	Prevent malaria ..... 2 Repel mosquitoes ..... 4 Kill mosquitoes ..... 8 Kill other insects ..... 16 Privacy ..... 32 Prevent other diseases ..... 64 Others (Specify below) ..... 97 Specify Other 1 _____	

	Multiple responses are possible.	Specify Other 2 _____ No answer .....98 Don't know 99	
Q 21.	What are the signs or symptoms of malaria? **Do not suggest/lead an answer, let his/her make own responses and multiple responses are possible.**	Fever .....2 Chills.....4 Headache.....8 Body ache .....16 Sweating.....32 Fatigue .....64 Nausea vomiting .....128 Others (Specify below) ……97 Specify Other 1 _____ Specify Other 2 _____ No answer .....98 Don't know 99	**If 99 ➔ Q 23**
Q 22.	What signs and symptoms make you decide the illness is serious? **Do not suggest/lead an answer.**	Unconscious.....2 Convulsions .....4 Fast breathing.....8 High fever/high body temperature.....16 Yellow eye colour.....32 Pale skin.....64 Frequent vomiting.....128 Diarrhoea .....256 Others (Specify below) ……	

	Let him/her give own responses. **Multiple responses are possible.**	97 Specify Other 1 _____ Specify Other 2 _____ Specify Other 3 _____ No answer .....98 Don't know 99	
Q 23.	If you suspect you or someone in your household might have malaria, where would you/they go get a test to find out if it is really malaria **in Thailand**? **Do not suggest/lead an answer** **Let his/her make own responses.** **Multiple responses are possible**	Village Health Volunteer .....2 Malaria Clinic .....4 MP/BMP ..... … 8 HPH ..... … 16 Public Hospital..... … 32 Private Clinic /hospital..... … 64 Drug store ..... … 128 Local vendor ..... … 256 Traditional health practitioner/Spiritual healer……512 Others (Specify below) …….. 97 Specify Other 1 _____ Specify Other 2 _____ No answer .....98 Don't know 99	

Q 24.	What makes you sure that you have malaria ?	Previous experience ..... 2 Symptoms ..... 4 Going to see a doctor ..... 8 Going to see public health worker ..... 16 Traditional health practitioner ..... 32 Blood test ..... 64 Others (Specify below) …… 97 Specify Other 1 _____ Specify Other 2 _____ No answer ..... .98 Don't know ..... .99	
Q 25.	Have you heard/seen any malaria message in the last 6 months **in Thailand**?	No..... 0 Yes 1	**If 0 ➔ Q36**
Q 26.	What messages or information related to malaria did you see or hear in the last 6 months? **Multiple responses are possible**	Sleeping under an insecticide treated net ..... 2 Use insecticide treated hammock when staying overnight in forest..... …4 If suspected of malaria, go for blood testing ..... 8 If having malaria, antimalarial treatment must be completed..... 16 Allow of indoor residual spray ..... 32 Let the ITNs dry flat in the shade ..... .64	**If could not remember or 99 ➔ Q 28**

		Use mosquito repellent .....128 Others (Specify below) …….97 Specify Other 1 _____ Specify Other 2 _____ No answer .....98 Don't know 99	
Q 27.	Where did you hear the message? **Do not suggest/lead an answer** **Multiple responses are possible.**	VMW/VHV/migrants health volunteer .....2 Malaria Clinic/VBDU staff …….……4 MP/ BMP, HPH staff.....8 Private Hospital.....16 Public hospital…… ……32 Employer.....64 Family/friends/neighbours .....128 Leaflets/brochures/Posters .....256 Non-government Organizations.....512 Others (Specify below) ……97 Specify Other 1 _____ Specify Other 2 _____ No answer .....98 Don't know 99	

Q 28.	Have you heard about anti-malarial drug resistance?	No.....0 Yes .....1 No answer 98	
Q 29.	Do you know that if you had malaria and did not complete treatment, you will transmit malaria to others?	No.....0 Yes .....1 No answer 98	

Section 2.2 Malaria awareness/perception

	Do you agree or disagree with this statement	Level of agreement				
		Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
Q 30.	People who stay overnight in the forest have high risk of malaria infection.	1	2	3	4	5
Q 31.	People infected with malaria might develop severe malaria that resulting in death.	1	2	3	4	5
Q 32.	The primary sign of malaria is fever	1	2	3	4	5
Q 33.	Malaria infected patient does not need treatment as it is self-cured disease.	5	4	3	2	1
Q 34.	Sleep under ITNs/LLINs might have allergy and rash.	5	4	3	2	1
Q 35.	ITNs/LLINs can prevent malaria better than conventional net/non insecticide treated net.	1	2	3	4	5

Section 3: Living arrangements and net utilization

Some people are more at risk of malaria than others, so we want to ask some questions about your living arrangements and use of malaria preventive measures.

No.	Questions	Answer choices	Skip
Q 36.	What type of your accommodation ?	Farm shelter..... 1 Hut/Tent…….2 Camp .....3 Adjoining apartments…….4 Dormitory.....5 Single house……6 Others .....97 Specify 1 :_____ Specify 2 :_____ No answer .....98 Don't know 99	
Q 37.	Is your accommodation thatched or tiled?	Thatched/Wood..…… ……1 Tiled.…….…… …….2 Mixed…… ……3 No answer ……98	
Q 38.	Does your accommodation have all walls?	Yes, all walls .....1 No, partial.....2 None 3	

No.	Questions	Answer choices	Skip
		No answer 98	
Q 39.	Does your accommodation have roof?	Yes, with roof.....1 No, partial.....2 None .....3 No answer 98	
Q 40.	Do you own a mosquito net?	Yes .....1 No.....0	**If 0** ➔ **Q 49**
Q 41.	If yes, what type of net you own? **Multiple responses are possible.**	Conventional net……2 Insecticide treated net……4 LLIN……8 LLIHN……16 Others (specify).....97 Specify 1 :_____ Specify 2 :_____ No answer .....98 Don't know 99	
Q 42.	Where did you get the net? **Multiple responses are possible.**	Free by VHV .....2 Free by public health staff.....4 Free by local government staff .....8 Free by CSOs .....16 Free from employer.....32 Purchased from Shop/Market.....64 Others 97	

No.	Questions	Answer choices	Skip
		Specify 1 :_____ Specify 2 :_____ No answer .....98 Don't know 99	
Q 43.	How old is the net?	<6 months.....1 6 months to 1 year.....2 1 year to 2 years.....3 2 year to 3 years.....4 > 3 years.....5 Other.....97 Specify 1 :_____ Specify 2 :_____ No answer .....98 Don't know 99	
Q 44.	How often has this net been washed since you received it?	Never.....0 Weekly .....1 Every 2 Weeks .....2 Monthly.....3 Every 2-3 months.....4 Twice per year.....5 Once a year.....6 < Once a year .....7 No answer .....98 Don't know 99	
Q 45.	Has this net ever had any holes? /	No.....0 Yes 1	

No.	Questions	Answer choices	Skip
	Does this net have any cracks?	Don't know 99	
Q 46.	Do you use a net every night?	Every night .....1 >5 days/week.....2 3-4 days/week .....3 1-2 days/week .....4 Never.....5 No answer .....98 Don't know 99	**If 5 ➔ Q48**
Q 47.	Why do you **use** the net? **Multiple responses are possible.**	Prevent malaria .....2 Repel mosquitoes .....4 Kill mosquitoes .....8 Kill other insects .....16 Privacy .....32 Prevent other diseases……64 Other reasons……97 Specify_____ No answer .....98 Don't know 99	
Q 48.	Why **don't** you **use** a net?	Feeling hot & uncomfortable .....2 Net is too small .....4 Net is too big.....8 Net is too short .....16 No mosquitoes.....32 Net not in good condition.....64	

No.	Questions	Answer choices	Skip
	Multiple responses are possible.	Keeping for visitors or future use .....128 Rash/irritation/burning sensation .....256 Do not like chemical smell .....512 Other.....97 Specify 1 :_____ Specify 2 :_____ No answer .....98 Don't know 99	

Section 4: Prevention measures

We need to know what methods you use to prevent malaria during your time outside home or at home but not sleeping in the mosquito net.

No.	Questions	Answer choices	Skip
Q 49	What do you do to prevent yourself from mosquito bites when you are outside home or at home but not sleeping in the net?	Nothing..... 2 Mosquito coils..... 4 Mosquito repellent ..... 8 Insecticide spray..... 16 Make smoke ..... 32 Herb (spray, burn, eat) ..... 64 Wear covered clothes ..... 128 Joss stick repel mosquito..... 256 Using electric fan/fan ..... 512 Other..... 97 Specify 1 :_____ Specify 2 :_____ No answer ..... .98 Don't know ..... .99	
Q 50	Does your accommodation use a mosquito wire screen?	No…… …….0 Yes, all windows and doors ..... 1 Yes, on some windows and doors..... 2	
Q 51	During the past 12 months, has anyone sprayed	No..... 0 Yes ..... 1 Don't know ..... ……99	

No.	Questions	Answer choices	Skip
	the interior walls of your accommodation against mosquitoes?		

Section 5: Family members and Net use

"We would first like to ask you some information about the members with whom you share your sleeping place."

No.	Questions	Answer choices	Skip
Q 52.	Are you staying alone ?	Yes.....1 No.....0	**If 1** ➔ **Q58**
Q 53.	If no, are you with your family?	Yes.....1 No.....0	**If 0** ➔ **Q58**
If accompanied by family member, can we ask about your family members?			
Q 54.	How many family members with you here ?	……..persons	
Q 55.	Do you have enough nets (2 persons per one net) for all family members to sleep under?	**Yes.....1** No.....0	
Q 56.	Is any of your family members pregnant?	No.....0 Yes.....1 No answer.....98 Don't know 99	
Q 57.	Do children age under 15 work with you?	No.....0 Yes.....1 No answer.....98 Don't know 99	

Section 6: Information about mobile and migrant population and family members who goes and spends time in the forest, plantation, garden, farm during 6pm -6 am in the last 6 months

People who spend time in the forest are more at risk of malaria, so we want to ask some questions about time you spend in the forest.

No.	Questions	Answer choices	Skip
Q 58.	Did you spend the night from 6pm-6am in the forest/plantation/garden/farm at night (for work or other reasons) in the last 6 months?	No ..... 0 Yes 1	**If 0 - ➔ Q 68**
Q 59.	Reasons for going to the forest/plantation/ garden/farm and stay overnight **Multiple responses possible**	Picking forest products/hunting.....2 Gardening/farming .....4 Rubber tapping .....8 Fruit farming.....16 Accommodation in the forest areas .....32 Logging .....64 Visiting friends staying in the forest…….128 Other.....97 Specify 1 :_____ Specify 2 :_____ No answer.....98	

No.	Questions	Answer choices	Skip
		Don't know 99	
Q 60.	How frequently did you go to the forest/plantation/garden /farm?	Every day .....1 Every week.....2 Every month .....3 < than once/month.....4 Don't know.....99	
Q 61.	How many nights did you stay overnight in the forest in the last visit?	Number: _____nights Accommodation in the forest areas ……..97 Can't remember.....99	
Q 62.	When you go to the forest do you **use** a net ?	Every time/night .....1 Sometimes .....2 Never .....3 No answer.....98	**If 3 ➔ Q 65**
Q 63.	What type of net do you use?	Conventional net……2 Insecticide treated net……4 LLIN……8 LLIHN……16 Others (specify)……..97 Specify 1 :_____ Specify 2 :_____	

No.	Questions	Answer choices	Skip
		No answer…… ……98 Don't know ……99	
Q 64.	Reason for **<u>using net</u>** in the forest	Prevent malaria …… 2 Repel mosquitoes …… 4 Kill mosquitoes …… 8 Kill other insects ……16 Privacy …… ……..32 Prevent other diseases …… 64 Other reasons…… …… 97 Specify_____ _ No answer…… ……98 Don't	

No.	Questions	Answer choices	Skip
		know…… ……..99	
Q 65.	Reason for **not using net** in the forest	Feeling hot & uncomfortable ..... 2 Net is too small..... 4 Net is too big ..... 8 Net is too short ..... 16 No mosquitoes..... 32 Net not in good condition..... 64 Keeping for visitors for future use ..... 128 Rash/irritation/burning sensation ..... .256 Do not like chemical smell ..... .512 Do not own a net ..... 97 No answer..... .98 Don't know ..... .99	
Q 66.	Did you take any other action to avoid getting mosquito bites? **Multiple responses are possible.** **PROBE: Any other way apart from answer choices?**	Nothing..... 2 Mosquito coil ..... 4 Mosquito repellent ..... 8 Insecticide spray..... 16 Make smoke ..... 32 Herb (spray, burn, eat) ..... 64 Wear covered clothes ..... 128 Joss stick repel mosquito..... 256 Using electric fan/fan ..... 512 Other..... 97 Specify 1 :_____ Specify 2	

No.	Questions	Answer choices	Skip
		:_____ No answer..... .98 Don't know …..…..99	
Q 67.	Did you ever get fever within 2 weeks of visiting the forest?	Yes.....0 No.....1	

Section 7: Fever and health seeking behaviour

In order to improve services for mobile and migrants who get malaria, we need to understand where you get treatment when you become sick.

No.	Questions	Answer choices	Skip
Q 68.	Have you been ill with **fever** during **last 3 months**?	**No ..... 0** Yes (fever) 1	**If 0 - ➔ Q 84**
Q 69.	What type of fever? **Do not suggest/lead an answer**	Malaria (local terms) ..... 1 Flu ..... 2 Pneumonia ..... 3 Tonsillitis ..... 4 Dengue ..... 5 Other ..... 97 Specify 1 :_____ Specify 2 :_____ No answer ..... .98 Don't know ..... .99	
Q 70.	Did you go to get any treatment or advice for this fever?	**No ..... .0** Yes 1	**If 0 - ➔ Q 72** **If 1 - ➔ Skip Q 72**
Q 71.	What signs or symptoms that made you go and get treatment?	Unconscious ..... 2 Convulsions ..... 4 Fast breathing ..... 8 High fever/high body temperature..... 16 Yellow eye colour..... 32 Pale skin..... 64	

No.	Questions	Answer choices	Skip
		Frequent vomiting ..... 128 Diarrhoea ..... 256 Others (Specify below) …….. 97 Specify Other 1 _____ Specify Other 2 _____ No answer ..... .98 Don't know ..... .99	
Q 72.	Why did you **not** go to get treatment or advice for this fever? **Multiple responses are possible.**	Self-treated ..... 2 Traditional medicine ..... 4 No money ..... 8 Don't know where to go ..... 16 Health care facilities are too far ..... 32 Not severe ..... 64 No time ..... 128 No health insurance ..... 256 No documentation ..... 512 Other ..... 97 Specify 1 :_____ Specify 2 :_____ No answer ..... .98 Don't know ..... .99	
Q 73.	Where did you seek treatment or advice for fever? **(1st facility/ provider)**	Village Health Volunteer ..... .1 Malaria Clinic ..... .2 MP/BMP ..... … 3	

No.	Questions	Answer choices	Skip
	PLEASE SELECT ONLY ONE ANSWER	HPH ..... … 4 Public Hospital ..... … 5 Private Clinic /hospital ..... … 6 Drug store ..... … 7 Local vendor ..... … 8 Traditional doctor ..... 9 Spiritual healer..... 10 Religious leader (monk/priest)……. 11 Others (Specify below) ……97 Specify Other 1 _____ Specify Other 2 _____ No answer..... .98 Don't know ..... .99	
Q 74.	Why did you go to get treatment or advice for this fever at this place? **Multiple responses are possible.**	Convenient..... 2 Having insurance ..... 4 Free ..... 8 Staff speak same language..... 16 Variety of drugs..... 32 Good quality of drugs ..... 64 Friendly service ..... 128 Taken by employer ..... 256 Suggested by others..... 512 Other ..... 97 Specify 1 :_____ Specify 2 :_____ No answer..... .98 Don't know ..... .99	

No.	Questions	Answer choices	Skip
Q 75.	How many days after the fever started did you go for treatment or advice?	Within 24 hours ..1 Within 48 hours ..2 Three or more days ..3 Don't know ..99	
Q 76.	Did you have a blood test for fever?	No ..0 Yes ..1 Don't know/remember ..99	**If 0 OR 99 ➔ Q84**
Q 77.	What type of blood test did you have?	RDT ..1 Slide ..2 Don't know/remember ..99	
Q 78.	Did the result of the blood test show malaria ?	No ..0 Yes ..1 No answer ..98 Don't know ..99	**If 0 OR 99 ➔ Q84**
Q 79.	Did you receive anti-malarial treatment ? - Showing anti-malarial drugs and specifying the duration of treatment	No ..0 Yes ..1 No answer ..98 Don't know ..99	**If 0 OR 99 ➔ Q84**
Q 80.	Where did you get antimalarial drugs for the first time? ***Please select only ONE answer.***	Village Health Volunteer ..1 Malaria Clinic ..2 MP/BMP ... 3 HPH ... 4 Public Hospital ... 5 Private Clinic /hospital ... 6	

No.	Questions	Answer choices	Skip
		Drug store ..... … 7 Local vendor ..... … 8 Traditional doctor ..... 9 Spiritual healer..... 10 Religious leader (monk/priest, Imam)……. 11 Others (Specify below) …….. 97 Specify Other 1 _____ Specify Other 2 _____ No answer..... .98 Don't know ..... .99	
Q 81.	How many days **after malaria blood testing** did you get the antimalarial treatment at the first time?	Within 24 hours ....1 Within 48 hours ....2 Three or more days..... ..3 Cannot remember 99	
Q 82.	Did you go to follow up/another appointment visit?	Not at all ..... 0 Went for some visits..... 1 Went for all visits ..... 2 Don't remember..... 99	
Q 83.	Did the fever go away after completing all	No ..... 0 Yes, but repeated and continue drugs..... 1 Yes, no fever 2	

No.	Questions	Answer choices	Skip
	drug treatment from **the first facility/ provider**?	Do not know 99	

Section 8: Movement pattern

In order to improve services for migrants, we need to understand how and why you became a migrant and some information about the places you live and work.

No.	Questions	Answer choices	Skip
Q 84.	What is the most important reason that you come to this location? **Multiple responses are possible.**	Work opportunity ..... 1 Family reason ..... 2 Health care ..... 3 Better life ..... 4 Political reason ..... 5 Religion purpose ..... 6 Leisure ..... 7 In transit ..... 8 Other ..... 97 Specify 1 : _____ Specify 2 : _____ No answer ..... .98 Don't know ..... .99	
Q 85.	Where did you from before coming to this location (within previous 6 months)?	Within this district ..... 1 Within this province ..... 2 From abroad ..... 3 No answer ..... .98	**If 1,2,98 ➔ Q88** **If 3 ➔ Q86**
Q 86.	With whom did you come here from abroad ?	Family/Relatives ..... 1 Friends ..... 2 Worker groups ..... 3 Agency ..... 4 Employer ..... 5 Other ..... 97 Specify 1 : _____	

No.	Questions	Answer choices	Skip
		Specify 2 :_____ No answer ..... .98 Don't know ..... .99	
Q 87.	From which point did you enter Thailand?	Airport ..... 1 Checkpoint..... 2 Temporary Checkpoint..... 3 Unofficial crossing point (river/forest)..... 4 Born in Thailand..... 5 Others ..... 97 Specify 1 :_____ Specify 2 :_____ No answer..... .98	
Q 88.	How often do you change your place of work in one year?	Never ..... 0 Weekly..... 1 Every 2 Weeks..... 2 Monthly ..... 3 Every 2-3 months ..... 4 Twice per year..... 5 Once a year..... 6 < Once a year..... 7 Not sure 99	
Q 89.	How often do you go home while you have been here ?	Never ..... 0 Daily ..... 1 Weekly..... 2 Every 2 Weeks..... 3 Monthly ..... 4 Every 2-3 months ..... 5 Twice per year..... 6 Once per year..... 7	

No.	Questions	Answer choices	Skip
		< Once a year..... 8 Other..... 97 Specify 1 :_____ Specify 2 :_____ No answer..... .98	
Q 90.	What type of job do you have in a year (for those who have changed work more than one time a year) ? (For answers 1, 2, 3, 4 & 5 at Q88) **Multiple responses are possible.**	Market seller..... .2 Wage labourer ..... .4 Paddy farmer ..... .8 Rubber tapper ..... .16 Construction worker ..... .32 Working in the forest ..... .64 Factory worker ..... 128 Others ..... .97 No answer..... .98 Don't know ..... .99	
Q 91.	What are your working hours? **Multiple responses are possible.**	Early morning (6 am to 9 am) ..... 2 Daytime (9 am to 6 pm) ..... 4 Evening time (6 pm to 12pm)..... 8 After midnight (after midnight to 6am)..... 16 Staying at home (dependent)……32 Other..... .97 No answer..... .98 Don't know ..... .99	
Q 92.	Do you think your working hours affect	Yes..... 0 No ..... 1 No answer..... .98	

No.	Questions	Answer choices	Skip
	your access to healthcare?		
Q 93.	If yes, what would improve your access to healthcare? **Multiple responses are possible.**	Longer opening hours..... 2 Mobile clinic..... 4 Having migrant health workers ..... 8 Transportation support ..... 16 Worksite health provisions ..... 32 Other..... .97 No answer..... .98 Don't know ..... .99	
Q 94.	Do you plan to move to other area in the next 6 months ?	No ..... 0 Yes..... 1 No answer..... .98 Don't know/Not sure ..... .99	
Q 95.	Where do plan to go?	Back home ..... 1 Within the same area/same district ..... 2 Within the same area/same province ..... 3 To another province ..... 4 To another country ..... 5 Other..... .97 No answer..... .98 Don't know ..... .99	

Annex 2. Information Sheet

Study title:

(ไทย) การเข้าถึงการทดสอบวินิจฉัยโรคมาลาเรีย การป้องกันรักษาโรคมาลาเรียและความยั่งยืนในการใช้มุ้งชุบสารเคมี ในกลุ่มแรงงานอพยพในจังหวัดยะลาภาคใต้ของประเทศไทย

(English) Access to malaria diagnostic testing, anti-malarial treatment and long-lasting insecticidal nets among Immigrant workers in Yala province, southern Thailand

Principal investigator: Tin Zar Naing, PhD student

Address: Clinical Science Program, Faculty of Medicine, Chulalongkorn University

Mobile: 0969240677

Email: Tinzar.nd@gmail.com

Background to this study:

Thailand aims to eliminate malaria by 2024 and Yala province is the province with second highest malaria caseload in Thailand during 2017 and 2018. In order to ensure that the national malaria elimination program helps people most in need especially migrant workers who are considered as a high-risk group, we are conducting a survey to assess access to malaria services among migrant

workers as well as vector control coverage in Yala province. You and your colleagues were selected appropriately to participate in this study.

Objectives:

This study is being conducted to learn what mobile and migrant populations including short term and long stay migrant of all nationalities know about malaria, how they prevent themselves from getting malaria, where they seek care when they are sick. This information will then be used to improve the services offered in communities that are affected by malaria, and ensure that fewer people get malaria.

What the survey involves and study duration:

The study procedure is a questionnaire survey: The study team will visit selected migrant or mobile populations in places where they work or live and interview. This study will be conducted in Yala province and there will be 412 people interviewed using a standard questionnaire. This will take approximately 45 minutes per interview.

Benefit to you and others:

The study finding will be used to improve access to malaria diagnosis, treatment and prevention among migrant workers in Yala province as well as in similar settings. The result will help us to improve the malaria services and preventive measures while moving towards malaria elimination.

Risk to You and others:

In this study, you will only be asked questions from the standard questionnaire. All the data collected will not contain your name or address and will be stored safely. The data will be used to improve prevention and treatment of malaria. However, if you feel uncomfortable at any time or believe that it is too time-consuming, you may end the interview. Participation in this study will

not cost you or your family anything but the result means the threat of malaria to you and your family will be reduced.

Confidentiality:

You or your family will not be identified with any information that we collect from you. The information will only be disclosed as part of overall study results. In this way, no one person's information can be identified. All data generated from your interview will be kept strictly confidential and accessible only to relevant authorized staff

Refusal/withdrawal:

You are completely free to participate, or not participate, in this study. After you receive all information about the study, you are free to make that decision, with no risk or harm to you. You can ask question at any time during the interview.

If you decide to participate in the study, the study staff will ask you to consent to interview you, and you will be given a copy of information sheet and informed consent form. Additionally, if you change your mind during the interview and no longer want to participate in the study, you can stop at any time without any risk of harm to you or your family.

Contact person:

Tin Zar Naing, PhD student, Clinical Science Program, Faculty of Medicine, Chulalongkorn University, Mobile: 0969240677, Email: Tinzar.nd@gmail.com

If you have completed the survey, please thank the participant for their cooperation.

"Thank you very much for your kind cooperation**"**

Please take 5 minutes to review the questionnaire before leaving and complete the interviewer checklist and declaration below.

Note: Please check your answers before leaving

No.	Item	Please sign to confirm	Remark
		Signature	
1	Have you got answers for all nets, all forest workers and all people with fever		
2	Please check you skip codes.		
3	Please check you have written neatly and clarify anything you need to before leaving		
4	Ensure ID is on every page and is legible on every page, including		

	these one and any additional pages you have used.		
5	Please attach all pages of this questionnaire together and check they are all there.		
6	Make any notes here about problems with this questionnaire/respondent/household		

Visual Aids

LLINs (Long Lasting Insecticidal Nets)		
		
LLIN – Royal sentry®	**LLIN – Yorkol®**	**LLIN - Olyset®**
		
LLIN - Permanet®	**LLIN – DawaPlus 2.0®**	
LLIHNs (Long Lasting Insecticidal Hammock Nets)		
		
LLIHN – Netprotect®	**LLIHN – Olyset®**	**LLIHN -Yorkool LN®**
		

LLIHN - Dawaplus LN ®	Sample of LLIHN	Sample of LLIHN

Annex 3. Consent Form

Study title:

(ไทย) การเข้าถึงการทดสอบวินิจฉัยโรคมาลาเรีย การป้องกันรักษาโรคมาลาเรียและความยั่งยืนในการใช้มุ้งชุบสารเคมี ในกลุ่มแรงงานอพยพในจังหวัดยะลาภาคใต้ของประเทศไทย

(English) Access to malaria diagnostic testing, anti-malarial treatment and long-lasting insecticidal nets among Immigrant workers in Yala province, southern Thailand

Date of consent _____Month_____Year_____ Time_____

The survey has been explained to me and I have understood the above-given information regarding the study objectives, method and benefit of it in detail. The investigator/study team has answered all of my questions clearly and I am satisfied with the answers. I give my consent to implement the questionnaire.

The investigator assures me that he/she will keep my personal information confidential and it will not be disclosed as part of the study results or disclosed to the people who support or monitor the study.

The investigator ensures that if I have any questions, I can contact: Tin Zar Naing, PhD student, Clinical Science Program, Faculty of Medicine, Chulalongkorn University, Mobile: 0969240677.

☐ I, have read or listened to the study description, including the consent form, and I have had all my questions answered and I have understood all the information clearly. I sign this form voluntarily for interview by using questionnaire.

☐ I cannot read so I have listened to the translator about the survey description, including the consent form in my language of choice. I have had all my questions answered and have understood all the information clearly. I sign this form voluntarily for interview by using questionnaire.

Signature/thumbprint……Person giving consent Date …..……..

(……) Name (typed or print)

Signature ……Investigator Date …..……..

(……) Name (typed or print)

Signature ……Assigned staff Date ……...…..

(……) Name (typed or print)

Signature ……Witness Date ……...…..

(……) Name (typed or print)

VITA

NAME	Tin Zar Naing
DATE OF BIRTH	16 April 1977
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PUBLICATION	Migrant workers' occupation and healthcare-seeking preferences for TB-suspicious symptoms and other health problems: a survey among immigrant workers in Songkhla province, southern Thailand, BMC Int Health Hum Rights. 2012; 12: 22. Published online 2012 Oct 2. doi: 10.1186/1472-698X-12-22