

# Fever and health-seeking behaviour among migrants living along the Thai-Myanmar border: a mixed-methods study

**Napat Khirikoekkong** (✉ [napat@tropmedres.ac](mailto:napat@tropmedres.ac))

Mahidol Oxford Tropical Medicine Research Unit

**Supa-at Asarath**

Mahidol Oxford Tropical Medicine Research Unit

**Mayreerat Munruchaitrakun**

Shoklo Malaria Research Unit

**Naw Blay**

Shoklo Malaria Research Unit

**Naomi Waithira**

Mahidol Oxford Tropical Medicine Research Unit

**Phaik Yeong Cheah**

University of Oxford

**François Nosten**

Shoklo Malaria Research Unit

**Yoel Lubell**

University of Oxford

**Jordi Landier**

Institut de Recherche pour le Développement

**Thomas Althaus**

Mahidol Oxford Tropical Medicine Research Unit

---

## Research Article

**Keywords:** Health-seeking behaviour, fever, migrants, Thai-Myanmar border

**DOI:** <https://doi.org/10.21203/rs.3.rs-266642/v1>

**License:**   This work is licensed under a Creative Commons Attribution 4.0 International License. [Read Full License](#)

---

# Abstract

The decline of malaria in Southeast Asia has complexified how fever is perceived and what actions are taken towards it. Using a mixed-methods design, we investigated the concept of fever and the determinants influencing health-seeking behaviour among migrants on the Thai-Myanmar border, where rapid economic developments collide with precarious political and socio-economic conditions. Fever corresponded with a high diversity of terms, symptoms and believed causes. The qualitative analysis identified distance and legal status as key barriers for accessing health care. The quantitative analysis further investigated determinants influencing health-seeking behaviour: living near a town where a cost-free clinic operated was inversely associated with seeking care at health posts (adjusted odds ratio [aOR], 0.40, 95% confidence interval [95% CI] [0.19-0.86]), and public hospital attendance (aOR 0.31, 95% CI [0.14-0.67]). Living further away from the nearest town was associated with health posts attendance (aOR 1.05, 95% CI [1.00-1.10] per 1 km). Having legal status was inversely associated with cost-free clinics attendance (aOR 0.27, 95% CI [0.10-0.71]), and positively associated with private clinic (aOR 2.56, 95% CI [1.00-6.54]) and public hospital attendance (aOR 5.15, 95% CI [1.80-14.71]). Fever conception and believed causes are context-specific and should be investigated prior to any intervention.

## Introduction

Fever is one of the most frequent reasons for seeking health in Southeast Asia, particularly at the community-level<sup>1-4</sup>. Its burden is illustrated by repeated bacterial and viral outbreaks, as well as the emergence of severe infections such as melioidosis or multi-drug resistant tuberculosis<sup>5-9</sup>, and these are frequently reported amongst migrants, mainly because of limited healthcare access<sup>10-12</sup>. In parallel, the burden of malaria has reduced substantially over the past decade, through wide access to point-of-care tests providing a clear therapeutic guidance<sup>13</sup>. Presently, most febrile patients will have a negative malaria test result, and this trend might affect their *a priori* choice of health service to seek care with<sup>14-16</sup>. A growing diversification of health services has been reported in Southeast Asia, including public and private hospitals, research institute or humanitarian based clinics, drug stores, private clinics, as well as itinerant and often unqualified health workers<sup>17,18</sup>. The journey to care is further complexified by the importance of traditional medicine<sup>19</sup>.

Understanding health-seeking behaviour is at the cornerstone of public health strategies. First, it is necessary to understand how the medical concept of fever translates into the understanding, representations and practices of a given population. Although fever may appear as a very simple concept and is widely used in policy-making strategies, it lacks consensus in its definition, even within the medical community, and often includes a myriad of clinical manifestations<sup>20,21</sup>. Second, believed and actual causes of fever may differ in space and time: in countries with a marked decline of malaria like in Southeast Asia, malaria persists in being considered the main cause of fever<sup>22</sup>. Third, investigating the journey to care during fever and identifying its determinants are critical for designing relevant strategies addressing public health gaps.

The Thai-Myanmar border is an exemplary setting to study these issues: in 2019, the monthly number of migrants crossing the Thai-Myanmar border was estimated at around 200,000<sup>23</sup>. These migrants have either been displaced by political instability and/or military conflict, or more recently, attracted by intensive economic development in special economic zones<sup>24</sup>. The Karen state along the border is in fact more connected to the Thai area than to inside Myanmar, which leads populations to regularly cross the border to seek health. Migrants in this area are defined by a high diversity of ethnicities and religions<sup>25,26</sup>, while socio-economic determinants point towards low education, limited income, illegal status, as well as drug and alcohol addictions<sup>27</sup>.

The determinants influencing a journey to care -although acknowledged to be decisive- remain understudied: on the Thai-Myanmar border, a single survey compared access to governmental health facilities between Myanmar migrants and Thai citizen in 2001<sup>19</sup>. Unfortunately, this survey was limited to the southern part of the border where most migrants are documented, and no causal association between migrants' determinants and health-seeking behaviour was demonstrated. Moreover, this survey described the journey to care for any kind of illnesses, while the pattern of health-seeking behaviours is known to vary according to the type of disease<sup>28</sup>.

Using a mixed-method approach combining qualitative and quantitative analyses, we aimed to understand the concept of fever and its believed causes amongst migrants alongside the Thai-Myanmar border, and explore the association between migrants' determinants and health-seeking behaviours.

## Methods

### Study context

This study was conducted in Tak province, on the border between Thailand and Myanmar with Moei river as the borderline. Tak province includes Mae Sot, Mae Ramat, Phob Phra, and Tha Song Yang districts, with a population over 650,000 inhabitants. The climate is tropical with a monsoon season running from May to October, followed by a dry cool season from November to January, and a dry hot season from February to April.

This region has a well-mixed culture with several ethnic minorities mainly composed of Burmese and Karen, as well as religions, including Animism, Buddhism, Christianity, and Islam. The main industries in the region are agriculture, textile and construction sectors.

Health care is provided by different actors in the region:

- Health posts, managed by community health workers (CHWs), provide community care, including malaria test; Artemisinin-based combined therapy (ACT); and antipyretic.
- Primary care units (PCUs), managed by Thai medical doctors, provide primary care, including oral and intra-venous antibiotics; frontline disease control and screening unit; promotion and follow-up on health and hygiene; and antipyretic. Rural PCUs only offer consultation without treatment.

- Private clinics, managed by Ministry of Public Health, operated by medical doctors, provide primary care. Services include oral and intra-venous antibiotics; and antipyretic.
- Cost-free clinics, managed by medical doctors from Shoklo Malaria Research Unit (SMRU) clinics and Mae Tao Clinic (MTC), provide secondary-level care. These clinics offer malaria test; ACT; Dengue and chikungunya virus rapid test; oral and intra-venous antibiotics; antipyretic; maternal & child health; vaccination; and inpatient ward.
- Public hospitals, managed by Ministry of Public Health, operated by Thai medical doctors, provide secondary-level care. Services include malaria test; ACT; blood culture; oral and intra-venous antibiotics; antipyretic; maternal & child health; vaccination; and inpatient ward;

## Study design

We used a mixed-methods design consisting of two distinct phases: Phase I used a qualitative approach, out of which findings were then used to inform Phase II which was based on a quantitative approach.

Phases I and II took place in four districts covering 6,039 square-kilometres: Mae Sot, Phob Phra, Mae Ramat and Tha Song Yang, as shown on Figure 1. All data were collected between August-December 2019.

### *Phase I*

Phase I included in-depth interviews (IDIs) and focus group discussions (FGDs), enrolling community members aged 21 years old and above, CHWs, village health workers (VHWs), primary care staff, and members of the Tak-Province Community Advisory Board (T-CAB)<sup>29,30</sup>. The breakdown of participants by group is detailed in Supplementary table 1.

Phase I participants were contacted when coming to, or already attending community, primary and secondary health centres, and mainly in the area where they are living, or commuting to regularly. Prior to any visits, the study staff carried out a reconnaissance visit of the sites, with the objective to explain and introduce the study to the healthcare staff and community representatives. Following individual participant information and informed consent, IDIs and FGDs were conducted in local languages, mostly Karen and Burmese, and some in Thai. Data analysis relied on a thematic analysis, to formulate and derive patterns of health-seeking behaviour in case of fever<sup>31</sup>.

To complement Phase I, a participatory visual method (PVM) workshop was carried out, and included key informants chosen among villagers and CHWs (a voluntary role). The objective of the workshop was to engage focusing on villagers' conceptions of fever, its believed causes and symptoms, and on the corresponding journey to care. This engagement emphasised on drawing activities, showing visual conceptions rather than the sole use of verbal communication. We engaged with eight VHWs to support them in creating visual outputs, and the whole process was carried out in local language (Karen). The PVM workshop was carried out at a migrant community centre, within walking distance from the Moei river, in Mae Ramat district. A [video](#) of this PVM was made and showed to the VHWs, as part of the engagement activity.

## *Phase II*

Based on Phase I findings, Phase II used a quantitative approach with the objective to identify potential associations between migrant's determinants and health-seeking behaviour in the occurrence of fever. Community members aged 21 years old and above living on both sides of the border were enrolled in several locations: in the four districts described above; on the Thai side of border crossing points; and in various levels of care including community, primary, and secondary healthcare centres. Recruitment was based on a convenient sampling method in all the field sites described above. Establishing a sampling frame in the context of unregistered and mobile population is challenging and cannot rely on any national demographic census<sup>32</sup>: therefore, enrolment was carried out in field sites where migrants are commonly live and work<sup>10,33,34</sup>.

Phase II data was collected electronically using tablets with a close-ended questionnaire. Online written consent was obtained from each participant, as well as ticking boxes giving consent on the tablet. Questionnaires were programmed using the Open Data Kit (ODK) software. Research assistants were trained by an on-site researcher regarding how to collect data with a pilot phase aiming to identify any ambiguity prior to collection. In the collection process, research assistants would be reading out questions in local language, then enter responses from participants onto the tablets. The study team then checked the collected forms on the tablets on a weekly basis, to correct any language issues, including spellings and translations, prior to finalising the forms and sending to storage in a central server.

## *Sample size*

We assumed that approximately 50% of our Phase II participants would use cost-free, humanitarian-based health services (i.e., SMRU clinics and Mae Tao Clinic). To obtain a 95% confidence interval of 15% (precision of +/- 7.5%), a minimum of 171 participants was required, rounded at 200.

## *Primary outcome*

Our primary outcome was the attendance at each of the five health services present on the Thai-Myanmar border in case of fever persistence: health posts, private clinics, primary care units (PCU), cost-free clinics or hospitals.

## *Secondary outcome*

The secondary outcome was the health-seeking behaviour at fever onset, categorised in four groups: "Wait & See"; self-medication; seek health in a regulated or in an unregulated health facility.

## *Statistical analysis*

Descriptive statistics of continuous variables with normal distribution used means and standard deviation (SD) and medians with interquartile range (IQR) for non-normally distributed variables.

Socio-demographic determinants included were age, sex, marital status, ethnicity, religion, household size, education level, main activity, main and secondary source of income and legal status. Geographical determinants were included in regards to health service accessibility: country of residence (Thailand/Myanmar), distance to the nearest town (in Myanmar or in Thailand) equipped with a public hospital, and whether the nearest town included a cost-free clinic and a public hospital or a public hospital only.

First, we used a classification and regression tree (CART) model to identify the determinants associated with each outcome, testing geographic and socio-demographic determinants independently<sup>35,36</sup>.

Second, a logistic regression model included determinants associated with at least one primary outcome in the separate CART model, to quantify these associations. Univariate and multivariate analyses were conducted, and crude and adjusted odds ratio (aOR) with 95% confidence interval (95% CI) were calculated. For the secondary outcome, with four categories, multinomial regression was not conducted as no determinants could be identified by the CART approach. In detail, aOR were adjusted by the country of residence, presence cost-free clinic nearby participant's household, legal status and monthly income. Presence of clinic nearby the participant's household included SMRU clinics and Mae Tao Clinic. Legal status was classified as "unstable" for participants owning documents preventing them from healthcare entitlement and freedom of movement. These documents included Myanmar identification card, or a community card, or a hospital card or commuting card. Legal status was classified as "stable" for participants owning documents allowing them to healthcare entitlement and freedom of movement. These documents included work permit, certificate of identity (CI) card, ten-year resident card, Thai identification card, birth certificate.

Statistical analysis was performed using STATA version 15 (College Station, Texas, USA) and R 4.0 software (packages FactoMinR, party and mgcv).

All methods were carried out in accordance with relevant guidelines and regulations.

## **Ethics approvals & Funding**

Prior to study implementation, we engaged with the T-CAB to ensure that the ethical aspect of the study was acceptable from the perspective of the community, and to ensure that the study was relevant to the local context.

The study was reviewed by Ethics Committees of Tak Province Public Health Office (PHO), under the administration of Ministry of Public Health (MPH), Thailand (Tor-Kor 0032.010.1/14), the Oxford Tropical Research Ethics Committee (OxTREC 517-19) and the Tak Province Community Ethics Advisory Board (T-CAB) (TCAB201812). This work was funded by the Wellcome Trust "Provision for Public Engagement; Engagement for the Thailand Major Overseas Programme 2015-2020", Award reference: 106698/Z/14/K. This research was funded in whole, or in part, by the Wellcome Trust 220211. For the purpose of Open Access, the author has applied a CC-BY public copyright licence to any Author Accepted Manuscript version arising from this submission.

# Results

## Concept of fever

The term “fever” was mainly referred to as “Ta Nya Ghoe” in local Karen language, which can also mean “malaria” because malaria was prevalent and represented a common issue in the area for decades, according to the qualitative analysis. “Fever” was also used to describe a high temperature as an early symptom of any infection. Another description of the term “fever” referred to hot body, warm skin and feeling discomfort. Contextually, the population in the area used the perceived symptoms related to fever when referring to the term “fever”.

Hence, there were no direct translation to the word itself for some participants.

The Supplementary Fig. 1 illustrates the diversity of terms referring to “fever” on the Thai-Myanmar border.

The quantitative analysis confirmed the diversity of terms referring to “fever”, with 39 out of 202 (19.3%) participants citing two to three different terms, “Ta Nya Ghoe”, “Malaria”, “Oh Ta Sut”, “Nay Ma Kao Pu” and “Dengue”.

The majority of our participants did not use the term “fever” (109/202, 54.0%), and rather described a physical complaint such as “being sick” (69/202, 34.2%) or symptoms such as muscle pain or cough (17/202, 8.4%).

We also found significant differences in the terminology of fever between Karen and non-Karen ethnicities (Supplementary table 2).

*037: “most of them when they get fever, they understand that they have got some kind of bug [virus/parasite]. They understand the most about malaria, as for other diseases, they do not understand much. Mostly because they are told [health knowledge] about malaria for many times, and when they get fever, they would say that it’s Ta Nya Ghoe [malaria].” FGD, male cross border HW*

## Symptoms & Believed causes

Symptom’s participants described as relating to fever included low or high temperature, shivering along with body aches, headache, runny nose and fatigue. The believed causes and symptoms of fever broadly varied from one participant to another, as illustrated in the following quotes.

*007: “Fever is when we feel that our body is warm, it’s hot in our skin and having headache, also body pain, and do not feel comfortable when our body temperature is high.” – IDI, female participant*

*009: “when having fever/feeling feverish, it’s because of working [outdoor] in the rain and become feverish. Having fever with headache, sometimes with pain on arms and legs. Some with pounding heart, shaking body, cold hands and cold feet.” – IDI, female participant*

The quantitative analysis confirmed that most participants associated fever with body ache (151/202, 74.8%), or hot body (142/202, 70.3%). Fever was associated with a broad spectrum of localising symptoms,

such as headache (148/202, 73.3%), respiratory (48/202, 23.8%), digestive or urinary complaints (22/202, 10.9%).

Fever was commonly believed to be caused by seasonal change and being exposed to hot or cold weathers. Some shared that having been in the rain, taking shower late in the evening or getting mosquito bites could also cause fever. Key informants and well-respected elders in villages cited spirits as a common cause of fever as well. One of the reasons commonly cited during FGD explaining the importance of traditional belief was the lack of health education and culture inherited from participant's elders and ancestors.

*037: "Because they do not have health knowledge, when they have fever, they believe that they are being punished by spirits. For the ones living near the city, they know that they have to get their fingers pricked but they do not neglect their traditional belief. They follow both things [modern treatment and traditional/spiritual treatment]" – Group discussion, male cross border HW*

The quantitative analysis found environmental factors as the main believed cause of fever, including walking in the rain, taking a shower late in the evening or hard working (115/202, 56.9%). A pathogen such as dengue, chikungunya or influenza virus and a mosquito bite were believed to cause fever among 20% (40/202) of participants. A respiratory, digestive or urinary tract symptom was believed to cause fever among remaining participants (35/202, 17.3%). Spirits were not cited as a believed cause of fever in the quantitative analysis.

## **Health-seeking behaviour at fever onset**

The strategy for seeking health was composed of two distinct steps in the occurrence of fever: what migrants do at fever onset; and what else do they in case of fever persistence?

Figure 2 illustrates the steps undertaken.

At fever onset, four different strategies were identified in the qualitative analysis: 1) "Wait & See"; 2) Self-treatment 3) Seeking care in unregulated health services including unqualified health workers or traditional healers or 4) Regulated health services including health posts or CHWs.

Self-treatment was a common behaviour at fever onset, and included taking left-over medicines such as paracetamol, or buying poly-pharmaceutical packs from a grocery shop nearby, or taking herbal medicine. Self-treatment also included body rubbing with a soaked towel or taking a shower in hope to cool down the body temperature. Finally, a few participants declared seeking care nearby their home, and cited health post, unqualified health workers, while some would seek care from a traditional healer, particularly when living in remote area.

*013: "Sometimes when have high fever, I rub [my body] with a soaked towel and it cooled down. Sometimes go to buy medicines also. Sometimes... I drink [herbal] water and sometimes I drink raw betel leaf juice that also helps." – IDI, male participant*

For all these different behaviours, the waiting period before seeking higher levels of care was usually between one to three days, in case of fever persistence.

*005: "After two days and I came here [MKT clinic]. If got better then [I] don't come, only if not better then I come [to MKT clinic]." – IDI, male participant*

The qualitative analysis highlighted factors influencing participants' rationale for seeking care at fever onset: living far away from a healthcare facility was one of the most frequent reasons for participants to stay home wait and see, or self-medicate. Participants cited long traveling hours with high costs, as well as lack of transports to reach higher levels of healthcare centres.

*005: "[I] live far away from the clinic and [I] could not come. For that reason, I gave him [child] medicines based on my own understanding [on medicines]. Only if he did not feel better, we would come here [MKT clinic]. If the medicines he took made him better, we would not come here. Because [we live] far away from clinic, for that reason we don't come. But, if he is not better, we would come [to clinic] with bicycle, we would rent other people's motorbike, or we would come on foot early in the morning." – IDI, male participant*

Nevertheless, being ill and absent from work resulted in loss of income, especially for men, who are head of household, and responsible to provide financial security to their family. Qualitative data indicated that adult males chose to self-treat and buy sets of polypharmacy from nearby grocery shops, while several preferred injections by unqualified health workers. Some male participants sought care from private clinics even if the cost is high, because of a perceived faster recovery than going to other facilities, such as public hospitals or health posts.

Fast recovery was critical according to the qualitative analysis, especially because being absent from work means losing jobs and loss of income.

*035: "A lot of people selling medicines and a lot of people buying taking and injecting without understanding. They do not go to hospital/clinic." – FGD, cross border HWs*

*011: "Yes, [name of private] clinic. When I get treatment there, I have to pay but I get well, I recover fast, too. The doctor is also nice. There are quite a lot of people at the [public] hospital. If [I am] not severe, I won't go to [public] hospital. If I want to get and injection, I go to [private clinic]. Just one injection and I get cured." – IDI, male participant*

The quantitative analysis was consistent with Phase I findings regarding participants' strategy at fever onset: self-medication was the commonest strategy (123/202, 60.9%), mainly through a grocery shop (71/123, 57.7%), and left-over drug from home (52/123, 42.3%). The second most frequent strategy was to attend regulated healthcare such as a health post, cost-free clinic, PCU or hospital (31/202, 15.3%), followed by unregulated healthcare (29/202, 14.4%), such as traditional healers (22/29, 75.9%) or *Mor kapao* (unqualified health worker, 7/29, 24.1%). The least chosen strategy at onset fever was to "Wait & See" whether fever could resolve by itself (17/202, 8.4%).

Among participants choosing self-medication at fever onset, exclusive paracetamol intake was the most preferred option (126/202, 62.4%), followed by herbal medicine and *Ya chood* (equally chosen in 29/202, 14.4% each). Taking an antibiotic or an antimalarial was the least chosen option at fever onset (9/202, 4.5% and 2/202, 1.0%, respectively), while the rest of our participants did not report what drug they were taking (3.3%).

None of the geographical, demographic and socio-economic determinants were found to be associated with health seeking behaviour at fever onset using the CART model. The details of all participants' determinants by health seeking behaviour at fever onset are detailed in the Supplementary table 3.

## Health-seeking behaviour in case of fever persistence

The qualitative analysis revealed that only SMRU and Mae Tao clinics provided free health care for both documented and undocumented migrants on the Thai-Myanmar border (Table 2). Apart from cost-free services, these clinics offer a broad range of diagnostic and therapeutic tools for febrile patients. Undocumented migrants face challenges when accessing care at hospitals and PCUs as they would be charged, and such cost can be doubled when attending a private clinic. Most undocumented migrants in this area are earning under USD90 per month, and face unstable employment: as a result, affording health services at facilities which are not free of charge is a challenge.

Indirect cost due to distance to care was also highlighted in the qualitative analysis, representing an additional burden, especially for undocumented migrants. However, for some, they were able to afford hospital insurance, which reduces the cost of future care.

*007: "Before, when I didn't have any documents, I paid quite a lot, for example when I came to [PCU for] antenatal for the first time, I paid 300 baht, then the second time around 100 baht, because a doctor told me to get a card at [district] hospital. The hospital issued me a card, then I paid 30 baht for medicine each time." – IDI, female villager*

Table 2  
Health services available in case of fever persistence on the Thai-Myanmar border

Health service provider	Services provided for febrile patients	Costs in relation to legal status when accessing care		Language
		Undocumented	Documented or with health card/ health insurance	
Health post	Community care	Free	Free	Burmese, Karen
Private clinic	Primary care	\$\$\$	\$\$\$	Thai and Translator
Primary care unit (PCU)	Primary care	\$\$	Covered	Thai and some translation service
SMRU & MTC clinic	Secondary-level care	Free	Free	Burmese, Karen
*cost-free clinics				
Thai public hospital	Secondary-level care	\$\$	Covered	Thai and some translation service

Both documented and undocumented migrants faced several challenges in accessing healthcare, but the qualitative analysis revealed the importance of legal status as a key factor, especially Thai health services, such as PCUs or hospitals. Health options available to migrants without legal status were reduced to health posts and cost-free clinics. Most migrants living in rural areas described additional difficulties because of transportation, as reaching an official healthcare facility may require several hours and different modes of transports. We identified a double burden when traveling to healthcare facilities – even to free-of-charge facilities: being arrested, fined, and deported by absence of legal status; and travel costs because of living in remote area. The qualitative analysis also revealed communication issues when attending Thai health services, since most migrants only speak Karen and/or Burmese. On the contrary, health posts and cost-free clinic staff belong to the local community.

040: *“they come here; they don’t want to go to the Thais’. They have a weakness on not being able to speak the language [Thai], for some and for others its financial issues.” – IDI, female HW*

007: *“Before, when I didn’t have any documents, I paid quite a lot, for example when I came to [PCU for] antenatal for the first time, I paid 300 baht, then the second time around 100 baht, because a doctor told me*

*to get a card at [district] hospital. The hospital issued me a card, then I paid 30 baht for medicine each time.” – IDI, female villager*

The qualitative analysis also included health workers from cost-free clinics, Thai PCUs, and CHWs living on both side of the Thai-Myanmar border area. Barriers to care related to legal status were frequently mentioned, particularly when referring a patient to a high facility level, such as hospital. The quote below summarises the challenges encountered by cross border health workers.

*035: “For us to refer patients, we also have difficulties. There are three difficulties. First, there is no transportation fees to travel. Second, to refer to Thai hospital, they do not understand the language. Third, they do not have any kind of documents/IDs. So, one is financial issue, one is language issue, and another one is the absence of documents and guarantee [for safety], which is a major problem.” – Group discussion, male cross border HW*

In the quantitative sample, the most attended facility in case of fever persistence was cost-free clinics by 45.5%, 95% CI (38.5%-52.7%), followed by private clinics (43.1%, 95% CI [36.1%-50.2%]), health posts (36.1%, 95% [CI 29.5%-43.2%]); public hospitals (33.7%, 95% CI [27.2%-40.6%]), and PCUs (14.9%, 95% CI [10.2%-20.5%]). The geographical distribution of attendance to each type of health service in case of fever persistence is presented in Supplementary Fig. 2.

The quantitative analysis investigated all demographic, geographical and socio-economic determinants with regards to health seeking behaviour in case of fever persistence (Supplementary table 4). Determinants selected by the CART model as significantly associated with health services attended in case of fever persistence are presented in Table 3, and illustrated in Supplementary Fig. 3. If the town nearest to where they lived had a cost-free clinic, participants were less likely to attend health posts and public hospitals (aOR 0.40, 95% CI [0.19–0.86] and aOR 0.31, 95% CI [0.14–0.67], respectively) and more likely to attend a cost-free clinic with an aOR 2.72, 95% CI (1.28–5.77). Living far from any town increased health post attendance, with an aOR 1.05 (1.00-1.10) per 1km further away from the nearest town. Participants with a stable legal status were less likely to attend cost-free clinics compared to those without any legal status (aOR 0.27, 95% CI [0.10–0.71]), and attended private clinics and hospitals more often (aOR 2.56, 95% CI [1.00-6.54] and 5.15, 95% CI [1.80-14.71], respectively). Participants earning > USD180 per month were less likely to attend health posts compared to those earning < USD 90 (aOR 0.24, 95% CI [0.06–0.96]).

Phase II participants were also questioned about their main criteria for choosing a given type of health service in case of fever persistence. Consistently with the determinants identified, access to care was declared as the most important criterion for choosing a health service, over direct cost, quality of care, force of habit, word of mouth or management quality (Supplementary table 5).

**Table 3.** Health-seeking behaviour in case of fever persistence according to selected determinants on the Thai-Myanmar border

	Health post		Private clinic		Primary care unit		Cost-free clinic		Hospital	
	n (%)	aOR (95%CI)	n (%)	aOR (95%CI)	n (%)	aOR (95%CI)	n (%)	aOR (95%CI)	n (%)	aOR (95%CI)
<i>Geographical determinants</i>										
Country	p<0.001		p=0.008		p=0.858		p=0.416		p=0.071	
• Thailand (n=97)	20 (20.6)	1	51 (52.6)	1	15 (15.5)	1	47 (48.5)	1	26 (26.8)	1
• Myanmar (n=103)	53 (51.5)	2.05 (0.92-4.55)	35 (34.0)	0.69 (0.33-1.42)	15 (14.6)	0.96 (0.35-2.62)	44 (42.7)	1.76 (0.81-3.84)	40 (38.8)	1.41 (0.61-3.21)
Cost-free clinic nearby	<0.001		p=0.127		p=0.337		p<0.001		p<0.001	
• None (n=76)	42 (55.3)	1	26 (34.2)	1	14 (18.4)	1	23 (30.3)	1	38 (50.0)	1
• Presence (n=119)	28 (23.5)	0.40 (0.19-0.86)	57 (47.9)	1.53 (0.74-3.17)	16 (13.5)	0.68 (0.25-1.84)	68 (57.1)	2.72 (1.28-5.77)	26 (21.9)	0.31 (0.14-0.67)
Distance to nearest town (per +1km)	p<0.001		p=0.043		p=0.195		p=0.005		p=0.001	
	1.05 (1.00-1.10)		0.97 (0.92-1.01)		0.94 (0.87-1.02)		0.96 (0.91-1.00)		0.99 (0.95-1.04)	
<i>Socio-economic determinants</i>										
Legal status	p=0.559		p=0.090		p=0.572		p=0.017		p=0.004	
• None (n=41)	14 (34.2)	1	12 (29.3)	1	5 (12.2)	1	25 (61.0)	1	8 (19.5)	1
• Unstable (n=115)	45 (39.1)	1.37 (0.57-3.28)	51 (44.4)	1.84 (0.82-4.15)	16 (13.9)	1.03 (0.34-3.19)	53 (46.1)	0.46 (0.20-1.05)	36 (31.3)	1.70 (0.66-4.35)
• Stable (n=46)	14 (30.4)	0.94 (0.33-)	24 (52.2)	2.56 (1.00-6.54)	9 (19.6)	1.41 (0.40-4.92)	14 (30.4)	0.27 (0.10-)	24 (52.2)	5.15 (1.80-14.71)

	2.64)			0.71)						
Monthly income (in USD)	p=0.001	p=0.820	p=0.950	p=0.107	p=0.613					
• Under 90 (n=109)	52 (47.7)	1	45 (41.3)	1	16 (14.7)	1	44 (40.4)	1	40 (36.7)	1
• Between 90-180 (n=70)	17 (24.3)	0.56 (0.26-1.20)	31 (44.3)	0.84 (0.42-1.68)	11 (15.7)	1.03 (0.40-2.69)	39 (55.7)	1.53 (0.75-3.10)	21 (30.0)	0.99 (0.45-2.16)
• Over 180 (n=23)	4 (17.4)	0.24 (0.06-0.96)	11 (47.8)	0.76 (0.28-2.08)	3 (13.0)	1.21 (0.28-5.19)	9 (39.1)	0.94 (0.32-2.75)	7 (30.4)	1.10 (0.36-3.33)

## Discussion

Our study brings in-depth understanding of fever conception and its believed causes, and identifies determinants associated with health-seeking behaviour amongst migrants from the Thai-Myanmar border where the burden of fever is high<sup>5-12</sup>. The only comparable study in the region was carried out in the early 2000s, whereas the economic context has dramatically changed since then, with a USD15 billion China-Thailand-Myanmar Special Economic Zone, and over USD25 billion-a-year gaming industry constructed on the Myanmar side of the border since 2019<sup>37</sup>.

The main barriers on migrant's journey to care were distance to care and legal status. These two determinants may play a combined role in exposing migrants to a high risk of precarity: distance worsens safety through impractical and flooded tracks and leads to high travel-related costs, while absence of legal status raises security concerns when travelling in areas surrounded by various military and paramilitary groups<sup>38,39</sup>. In addition, having no legal status is a barrier to secure stable employment, and undocumented migrants are not protected by law nor able to exercise their rights while living and working in Thailand<sup>40</sup>. Health services were apparently diverse on the Thai-Myanmar border but their distribution heterogeneous. In our study, community-level care (i.e., health posts) were only chosen among migrants who were far from all other options. Hospitals were more likely to be attended in areas without cost-free clinics. This confirms distance as a critical factor for choosing the journey to care, dominating other criteria; this finding was consistent elsewhere in rural Asia and Africa<sup>41,42</sup>.

In addition to distance to care and legal status, income was identified as a significant determinant, but only influencing a single type of health service, namely health posts, which are mainly present on the Myanmar side. This lesser role of income level contrasts with the literature<sup>43,44</sup>, and may be related to the particular environment of the Thai-Myanmar border, where cost-free clinics provide free-of-charge care regardless of

legal status<sup>45</sup>. In our context, the risk of job loss may overcome income level, as not owning a stable legal status represents a non-negotiable barrier to employment and social protection. On the contrary, income level may be compensated by alternative levers, particularly in rural areas where land, social participation or material possession can provide an economic support<sup>46</sup>.

In our study, education-level was not identified as a significant determinant influencing health-seeking behaviour: on the Thai-Myanmar border, governmental and non-governmental organisations (which include Thai public health office, research institute's running and humanitarian based clinics, ethnic-based health organisations) have been serving the local community for decades, recruiting staff from the same ethnicities and community, therefore disseminating public health messages on illness prevention and detection<sup>47</sup>. Interestingly, a literature review encompassing evidence from both high- and low-to-middle income countries has shown that individual education alone may not be sufficient to change behaviour, and should be accompanied by the concept of "social capital", as the presence of supportive social groups cooperating to maximise individual's determinants such as education or even health<sup>48</sup>. It is firmly established in the behaviour change literature that knowledge deficits alone are only a minor driver of behaviour, contributing less than 20% to decision-making process<sup>49,50</sup>. Nevertheless, a 2019 mixed-methods study carried out collective educational activities, with repeated supervision in three northern-Thai villages on the risk of antibiotic use on antimicrobial resistance (AMR)<sup>51</sup>. Villagers living in a precarious environment were unlikely to change their behaviour even after attending educational sessions, indicating the importance of other factors than education *per se*.

Our study also highlighted the diversity of language terms referring to fever and its believed causes: such complexity should be investigated prior to any intervention aiming at illness prevention and control. Several surveys highlighted large misunderstandings regarding the terminology related to AMR, both in high- and low-to-middle income countries<sup>52,53</sup>. In rural northern Thailand, a public health campaign aiming to limit antibiotic use was followed by a drastic reduction of general medicine availability in informal shops, pressurising villagers to seek health in hospital, 9–10 kilometres away from their village, even for mild symptoms such as headache<sup>51</sup>. Ignoring the language terminology and population beliefs may, therefore, worsen symptom identification and response, while being irrelevant to alleviate the burden of both febrile illness and AMR in Southeast Asia<sup>5–8, 54</sup>.

We acknowledge several limitations in our study: the Thai-Myanmar border offers a particular context with substantial health, social and economic inequalities, which limits generalisation of our findings. Our objective, however, was to encourage future behavioural research to incorporate quantitative components for identifying key determinants of health. As a limitation, we could not implement FGD with community members but only with CHWs and community representatives, due to logistical reasons. Only benefiting from community member's perspective in IDIs may have limited our understanding of the diversity of terminology for fever, the corresponding believed causes, and the actions taken towards it. Furthermore, the design of the quantitative part of the study did not include an explicit spatial sampling scheme to ensure representativity across locations.

We adjusted for spatial determinants in our analysis regarding the type of health services, but this adjustment might have not been sufficient to remove all confounding effects related to the complexity of the local context.

In addition, the number of “nearest towns” where health services could be accessed was limited (six towns, two in Myanmar and four in Thailand), corresponding to four Thai public hospitals and three cost-free clinics. Our analysis did not explore the differences between towns, hospitals or cost-free clinics. For example, public hospitals were regrouped in a unique health service category but are not identical, with local management decisions including hiring Karen-speaking staff or conducting outreach programs. This suggests a more complex relationship between migrants’ determinants and hospital attendance. Finally, a longitudinal approach with repeated interviews and questionnaires may have strengthened data reliability, incorporating seasonal variations and thus potential changes in health seeking behaviours. Our study took place during the dry season with a concomitant chikungunya outbreak, which probably impacted transport conditions and participant’s risk perception towards their health, therefore influencing their journey to care.

## Conclusion

Combining a qualitative and quantitative approach, our study provides evidence on the determinants influencing health-seeking behaviour in case of fever on the Thai-Myanmar border. We showed the combined importance of multiple factors, ranging from individual representations to availability of health services and geographical, legal and economic barriers. Our findings may guide public health interventions in this region where the burden of fever is substantial: in rural and hard-to-reach areas, health posts are often the only existing structure. Their limited medical skills and treatment options other than testing and treating for malaria may lead to population disinterest, and subsequent emergence of private and often unregulated healthcare. As for migrants living nearer to towns, the apparent larger choice of health services is in fact constrained by multiple non-geographical barriers. Absence of legal status is a major barrier for accessing regulated public healthcare, and initiatives such as migrant health insurance schemes should be encouraged. The importance of cost-free clinics in migrant’s journey to care illustrates how the public health system lacks inclusiveness, especially for those contributing to the region economic development.

## Declarations

**Authors’ contributions:** NK, YL, and TA conceived the study. NK, SA, MM and NB conducted the IDIs, FGDs, the PVM and the quantitative data collection, under the supervision of FN and PYC. SA, NW, JL and TA supported the statistical analysis plan. JL and TA analysed the data. TA wrote the first draft of the manuscript. All authors critically revised the report for intellectual content and approved the final version. TA is the guarantor of the paper.

**Acknowledgments:** We thank Nattapat Jatupornpimol, Arjun Chandna, Atthanee Jeeyapant, Ladda Kajeewiwah and May Myo Thwin for advising the project strategy. The authors would also like to thank Myo Chit Minh for his contribution to the study sites and villages mapping, as well as Patrick Hannay for his support in the project budget management. More than anywhere else, time is an essential resource on

the Thai-Myanmar border, and we would like to present our sincere thanks to all our participants for being part of this study.

**Competing interest:** None declared

## References

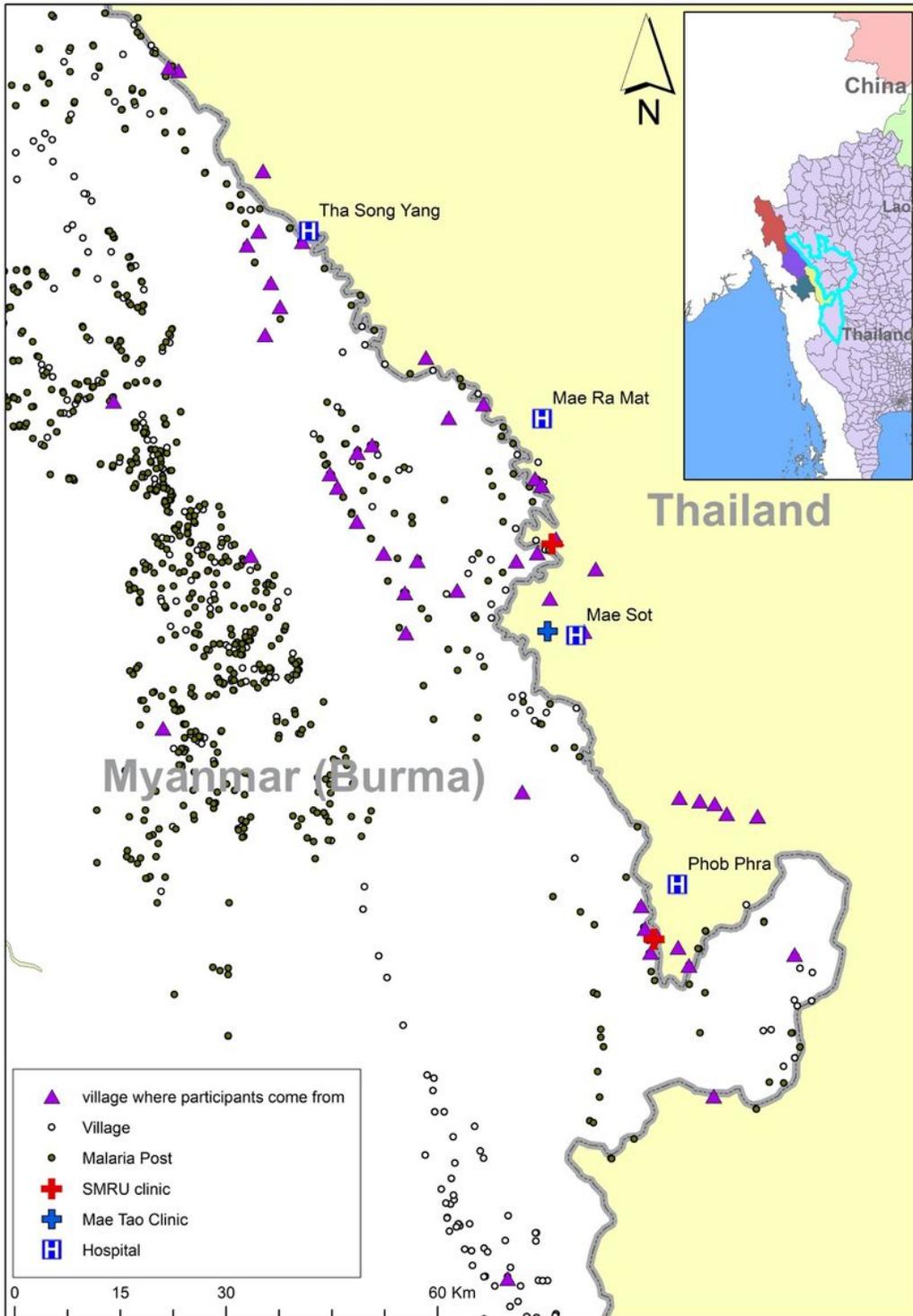
1. Phuong, H. L. *et al.* Acute undifferentiated fever in Binh Thuan province, Vietnam: imprecise clinical diagnosis and irrational pharmaco-therapy. *Tropical Med. Int. Health.* **11**, 869–879 (2006).
2. Greer, R. C. *et al.* Retrospective review of the management of acute infections and the indications for antibiotic prescription in primary care in northern Thailand. *BMJ open.* **8**, e022250 (2018).
3. Althaus, T. *et al.* Causes of fever in primary care in Southeast Asia and the performance of C-reactive protein in discriminating bacterial from viral pathogens. *International Journal of Infectious Diseases*(2020).
4. Wangdi, K. *et al.* Diversity of infectious aetiologies of acute undifferentiated febrile illnesses in south and Southeast Asia: a systematic review. *BMC infectious diseases.* **19**, 577 <https://doi.org/10.1186/s12879-019-4185-y> (2019).
5. Swaddiwudhipong, W., Ngamsaithong, C., Peanumlom, P. & Hannarong, S. An outbreak of cholera among migrants living in a Thai-Myanmar border area. *Journal of the Medical Association of Thailand = Chotmaihet thangphaet.* **91**, 1433–1440 (2008).
6. Wichmann, O. *et al.* Dengue in Thailand and Cambodia: an assessment of the degree of underrecognized disease burden based on reported cases. *PLoS neglected tropical diseases***5** (2011).
7. Chu, C. S. *et al.* Two fatal cases of melioidosis on the Thai-Myanmar border. *F1000Research* **3**(2014).
8. Thi, S. *et al.* Migration histories of multidrug-resistant tuberculosis patients from the Thailand-Myanmar border, 2012–2014. *The International Journal of Tuberculosis and Lung Disease.* **21**, 753–758 (2017).
9. Swaddiwudhipong, W., Hannarong, S., Peanumlom, P., Pittayawonganon, C. & Sitthi, W. Two consecutive outbreaks of food-borne cholera associated with consumption of chicken rice in northwestern Thailand. *Southeast Asian Journal of Tropical Medicine & Public Health.* **43**, 927–932 (2012).
10. Tschirhart, N., Nosten, F. & Foster, A. M. Access to free or low-cost tuberculosis treatment for migrants and refugees along the Thailand-Myanmar border in Tak province, Thailand. *International journal for equity in health.* **15**, 100 (2016).
11. Tschirhart, N., Thi, S. S., Swe, L. L., Nosten, F. & Foster, A. M. Treating the invisible: Gaps and opportunities for enhanced TB control along the Thailand-Myanmar border. *BMC health services research.* **17**, 1–11 (2017).
12. Tschirhart, N., Nosten, F. & Foster, A. M. Migrant tuberculosis patient needs and health system response along the Thailand–Myanmar border. *Health policy and planning.* **32**, 1212–1219 (2017).
13. World Health Organization. World Malaria Report, 2018.

14. Saita, S. *et al.* Spatial heterogeneity and temporal trends in malaria on the Thai–Myanmar border (2012–2017): a retrospective observational study. *Tropical medicine and infectious disease*. **4**, 62 (2019).
15. Shrestha, P. *et al.* Non-malarial febrile illness: a systematic review of published aetiological studies and case reports from Southern Asia and South-eastern Asia, 1980–2015. *BMC medicine*. **18**, 1–14 (2020).
16. Landier, J. *et al.* Effect of generalised access to early diagnosis and treatment and targeted mass drug administration on *Plasmodium falciparum* malaria in Eastern Myanmar: an observational study of a regional elimination programme. *Lancet (London, England)*. **391**, 1916–1926 [https://doi.org/10.1016/s0140-6736\(18\)30792-x](https://doi.org/10.1016/s0140-6736(18)30792-x) (2018).
17. Nepal, G. & Bhatta, S. Self-medication with Antibiotics in WHO Southeast Asian Region: A Systematic Review. *Cureus*. **10**, e2428 <https://doi.org/10.7759/cureus.2428> (2018).
18. Anuphongphat, N. *et al.* Histories of health in Southeast Asia: Perspectives on the long twentieth century (Indiana University Press, 2014).
19. Isarabhakdi, P. Meeting at the crossroads: Myanmar migrants and their use of Thai health care services. *Asian and Pacific Migration Journal*. **13**, 107–126 (2004).
20. Bhaskaran, D. *et al.* Diagnostic tools used in the evaluation of acute febrile illness in South India: a scoping review. *BMC infectious diseases*. **19**, 970 (2019).
21. Mackowiak, P. A. Concepts of Fever. *Archives of Internal Medicine*. **158**, 1870–1881 <https://doi.org/10.1001/archinte.158.17.1870> (1998).
22. Hertz, J. T., Munishi, O. M., Sharp, J. P., Reddy, E. A. & Crump, J. A. Comparing actual and perceived causes of fever among community members in a low malaria transmission setting in northern Tanzania. *Tropical Med. Int. Health*. **18**, 1406–1415 (2013).
23. IOM Flow Monitoring Points (FMPs). FLOW MONITORING: IN-/ OUTFLOWS OF MYANMAR NATIONALS TO AND FROM THAILAND. (2019).
24. Smith, M. Ethnic politics in Myanmar: a year of tension and anticipation. *Southeast Asian Affairs*. **2010**, 214–234 (2010).
25. Caouette, T. M. & Pyne, H. H. Sexuality, reproductive health and violence: Experiences of migrants from Burma in Thailand (Institute for Population and Social Research, Mahidol University at Salaya, 2000).
26. Martin, P. Thailand: Improving the management of foreign workers (ILO Geneva, 2004).
27. Chantavanich, S. *et al.* Cross-border migration and HIV/AIDS vulnerability in the Thai-Myanmar border: Sangkhlaburi and Ranong. Report No. 9743335226, (Chulalongkorn University, 2000).
28. Zhang, Q. *et al.* A population-based study on healthcare-seeking behaviour of persons with symptoms of respiratory and gastrointestinal-related infections in Hong Kong. *BMC public health*. **20**, 1–10 (2020).
29. Cheah, P. Y. *et al.* Community engagement on the Thai-Burmese border: rationale, experience and lessons learnt. *International health*. **2**, 123–129 (2010).
30. Lwin, K. M. *et al.* Motivations and perceptions of community advisory boards in the ethics of medical research: the case of the Thai-Myanmar border. *BMC Medical ethics*. **15**, 1–10 (2014).

31. Haenssger, M. J. *Interdisciplinary Qualitative Research in Global Development: A Concise Guide*(Emerald Group Publishing, 2019).
32. Wild, H. *et al.* Making Pastoralists Count: Geospatial Methods for the Health Surveillance of Nomadic Populations. *The American journal of tropical medicine and hygiene.* **101**, 661–669 (2019).
33. Grundy-Warr, C., Wong, S. & Yin, E. Geographies of Displacement: The Karenni and The Shan Across The Myanmar-Thailand Border. *Singapore Journal of Tropical Geography.* **23**, 93–122 (2002).
34. Loong, S. The neoliberal borderscape: Neoliberalism's effects on the social worlds of migrants along the Thai-Myanmar border. *Political Geogr.* **74**, 102035 (2019).
35. Speybroeck, N. Classification and regression trees. *International journal of public health.* **57**, 243–246 (2012).
36. Thanh, P. V. *et al.* Epidemiology of forest malaria in Central Vietnam: the hidden parasite reservoir. *Malaria journal.* **14**, 86 (2015).
37. Tower, J. & Clapp, P. Myanmar's Casino Cities: The Role of China and Transnational Criminal Networks. (2020).
38. Archavanitkul, K. & Hall, A. Migrant workers and human rights in a Thai context. *Thailand Migration Report.* **2011**, 63 (2006).
39. Huguet, J. W. & Chamrathirong, A. *Thailand migration report 2014.* (United Nations Thematic Working Group on Migration in Thailand Bangkok, 2014).
40. Khirikoekkong, N. *et al.* Research ethics in context: understanding the vulnerabilities, agency and resourcefulness of research participants living along the Thai–Myanmar border. *International health.* **12**, 551–559 (2020).
41. Awoyemi, T., Obayelu, O. & Opaluwa, H. Effect of distance on utilization of health care services in rural Kogi State, Nigeria. *Journal of human Ecology.* **35**, 1–9 (2011).
42. Shaikh, B. T. & Hatcher, J. Health seeking behaviour and health service utilization in Pakistan: challenging the policy makers. *Journal of public health.* **27**, 49–54 (2005).
43. Nasrin, D. *et al.* Health care seeking for childhood diarrhea in developing countries: evidence from seven sites in Africa and Asia. *The American journal of tropical medicine and hygiene.* **89**, 3–12 (2013).
44. Senarath, U. & Gunawardena, N. S. Women's autonomy in decision making for health care in South Asia. *Asia Pacific Journal of Public Health.* **21**, 137–143 (2009).
45. Shoklo Malaria Research Unit (SMRU). <https://www.shoklo-unit.com>.
46. Tiwari, S., Kumar, A. & Kumar, A. Development & standardization of a scale to measure socio-economic status in urban & rural communities in India. *Indian Journal of Medical Research.* **122**, 309 (2005).
47. Gilder, M. E. *et al.* "I can't read and don't understand": Health literacy and health messaging about folic acid for neural tube defect prevention in a migrant population on the Myanmar-Thailand border. *PLoS one.* **14**, e0218138 (2019).
48. MacKian, S. A review of health seeking behaviour: problems and prospects. *Health Systems Development Programme*(2003).

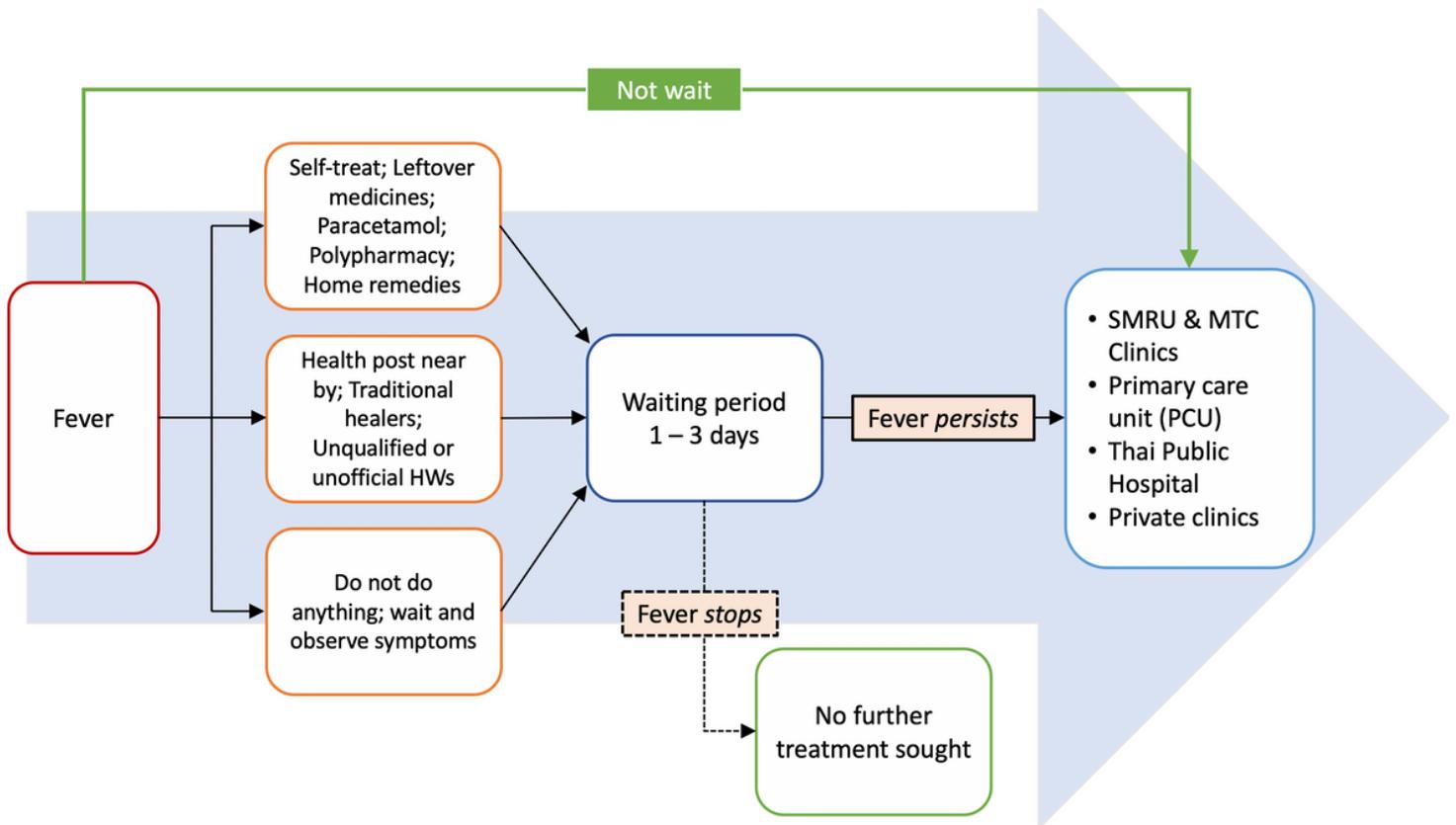
49. Dolan, P., Hallsworth, M., Halpern, D., King, D. & Vlaev I. MINDSPACE: influencing behaviour for public policy. (2010).
50. Kollmuss, A. & Agyeman, J. Mind the gap: why do people act environmentally and what are the barriers to pro-environmental behavior? *Environmental education research*. **8**, 239–260 (2002).
51. Charoenboon, N., Haenssger, M. J., Warapikuptanun, P., Xayavong, T. & Zaw, Y. K. Translating antimicrobial resistance: a case study of context and consequences of antibiotic-related communication in three northern Thai villages. *Palgrave Communications*. **5**, 1–24 (2019).
52. World Health Organisation. WHO ANTIBIOTIC RESISTANCE: MULTI-COUNTRY SURVEY & Geneva November 2015. Available at <http://apps.who.int/medicinedocs/documents/s22245en/s22245en.pdf> (2015).
53. Wellcome Trust. Exploring Consumer Perspectives on Antimicrobial Resistance. Available at <https://wellcome.ac.uk/sites/default/files/exploring-consumer-perspective-on-antimicrobial-resistance-jun15.pdf>. (2015).
54. O'Neill, J. Tackling drug-resistant infections globally: Final report and recommendations. 2016. *HM Government and Wellcome Trust: UK* (2018).

## Figures



**Figure 1**

Mapping of study sites and villages. Note: The designations employed and the presentation of the material on this map do not imply the expression of any opinion whatsoever on the part of Research Square concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. This map has been provided by the authors.



**Figure 2**

Types of health seeking behaviour in case of fever on the Thai-Myanmar border

## Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [BEFITReportSupplFinal.pdf](#)