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NetWorks

RESEARCH REPORT

Qualitative Study to Assess Consumer Preferences and Barriers to Use of Long-Lasting Insecticidal nets (LLINs) in Myanmar

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List of Abbreviations

ACTs	Artemisinin-based Combination Therapies
AMI	Aide Medical Internationale
ARI	Acute Respiratory Infection
BCC	Behaviour Change Communication
BVBD	Bureau of Vector Borne Diseases
CBOs	Community Based Organisations
CHWs	Community Health Workers
DMR	Department of Medical Research
HA	Health Assistant
IDPs	Internally Displaced People
IEC	Information, Education and Communication
IRS	Indoor Residual Spraying
ITMs	Insecticide Treated Materials
ITNs	Insecticide Treated Nets
KAP	Knowledge Attitude and Practice
LLIHNs	Long Lasting Insecticidal Hammock Nets
LLINs	Long Lasting Insecticidal Nets
MARC	Myanmar Artemisinin Resistance Containment
MC	Malaria Consortium
MCC	Myanmar Council of Churches
MMK	Myanmar Kyat
MoH	Ministry of Health
NMCP	National Malaria Control Programme
NGO	Non-Governmental Organisation
PMI	President's Malaria Initiative
PSI	Population Services International
RDT	Rapid Diagnostic Test
RHC	Rural Health Centre
SMO	Station Medical Officer
TMO	Township Medical Officer
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development

VBDC	Vector Borne Disease Control
VHW	Village Health Worker
WHO	World Health Organization
3MDG	Three Millennium Development Goal Fund

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Executive Summary

Background

Malaria Consortium (MC) was commissioned by Networks, a five-year project funded by PMI to conduct a behavioural study to assess consumer preferences and barriers to use of Long-Lasting Insecticidal Nets (LLINs) in Myanmar. MC Senior Research Officer, Alexandra Wharton-Smith travelled to Myanmar during May and June 2014 to lead the data collection along with Department of Medical Research (DMR) Lower Myanmar staff, Dr Myat Phone Kyaw and Dr Thae Maung Maung and support from Malaria Consortium Myanmar staff, Dr Htwe Htwe Htet, Dr Myo Win Tin and Dr Aung Naing Cho. Overall guidance was provided By Dr Thaung Hlaing from NMCP. Technical support was provided by Muhammad Shafique, with oversight from Leah Scandurra from Johns Hopkins University.

Methods

A maximum variation sampling approach was followed to include a range of participant perspectives sufficient to reach theoretical saturation. Focus Group Discussions (FGD) and Key Informant Interviews (KII) were conducted with a total of 339 participants, including community members, migrant workers, forest goers, health facility staff, community health volunteers, village health committee members, private vendors of malaria prevention materials, Non-Governmental Organisation staff, Community Based Organisation staff, community leaders and migrant worker supervisors. Interviews and FGDs were held in an equal number of rural (>10 km from a health facility) and urban (<5 km from a health facility) sites across three distinct geographical locations in Myanmar: Thanintharyi division (which borders Thailand), Kayah state and Sagaing division, (which borders India). The scope of the study focused on seven key themes:

1. Knowledge and perceptions of malaria
2. Prevention practices
3. LLIN accessibility
4. Acceptability of LLINs and general net preferences
5. Cost of preventions tools and willingness to pay
6. Communication channels
7. Barriers to net ownership and use

FGDs and KIIs were audio recorded and transcribed verbatim in Myanmar language, translated into English and then analysed using a content analysis Framework Approach. Informed verbal consent was obtained from all participants.

Key findings

Across the target groups (community members, migrant workers and forest goers) in the three regions malaria was perceived to be a common community health issue, although the mode of transmission was frequently misunderstood and associated with drinking or bathing in dirty water or eating bananas. According to the range of participants, forest goers were considered most at risk of malaria.

The majority of participants reported using LLINs, some of whom also owned or preferred ordinary nets that they had purchased. Migrant workers and forest goers commonly resorted to using bonfire smoke to deter mosquitoes as opposed to a bed net which some considered to be inconvenient to carry and

hang when working away from home or sleeping in the forest. Participants provided numerous reasons for why people might not sleep under a net; most commonly due to a lack of health knowledge. Repellent was generally referred to as expensive; it was also associated with a burning sensation when applied to skin. Mosquito smoke coils were commonly cited across target groups, however many participants related burning the coils to poor respiratory health, especially for children.

Community members reported the highest access to LLINs, although many across the regions commented there was an insufficient supply of LLINs for all households and/or all family members. Migrant workers and forest goers who were not recorded in household data lists used to allocate LLINs during distribution were either not eligible to receive LLINs or not present at the time of distribution. For these two groups, the cost of ordinary nets was widely perceived to be a significant barrier to net ownership and usage.

Although community members expressed gratitude for the free LLINs, a common theme discussed the hard, rough texture of the nets, strong odour, and alleged adverse effects, including burning, itching, rashes, dizziness, headache and a smothering sensation. Participants explained that these aspects of the LLINs affect usage. The most prominent feature of nets that was unanimously important to participants was the texture- specifically a soft material, followed by small holes that would prevent mosquitoes and where possible, sand flies. Migrant workers and forest goers generally preferred a single size net, whilst community members and those with children or large families preferred larger nets; most groups requested LLINs that were high enough to sit comfortably under. The ideal colour of the net was widely debated; mostly over whether the net should be white or a dark colour which shows up stains or dirt as easily. Most participants preferred LLINs compared to untreated nets due to the power of the insecticide to prevent malaria and kill mosquitoes and other small pests.

The price participants considered that they could afford or would spend on a net depended on their financial situation primarily, followed by the quality of the net; quoted prices ranged from 3,000 to 30,000 Myanmar Kyats (3 to 30 USD). Community members could generally afford to pay more for a net than migrant workers and forest goers.

The majority of the participants had heard about malaria through health talks delivered by health facility staff, doctors, nurses, midwives, NGO staff, community and religious leaders. Additional malaria communication channels included posters and pamphlets, and hearing health information on television or the radio. Migrant workers discussed consulting their co-workers for information on malaria, or receiving information from an on site health clinic, whilst community members and forest goers referred to parents, village elders, other people who have had malaria as sources of information. The most effective sources of health information were generally considered by all participants to be interpersonal communication through doctors and other health facility staff due to their level of education, experience in treating malaria and ability to explain concepts simply and clearly, which engendered trust. Other suggested methods included small to medium size discussion groups, peer educators, more frequent community health education sessions and targeting forest goers in remote areas and migrant workers in their place of work.

Recommendations

The knowledge gap around malaria transmission amongst community members, migrant workers and forest goers highlight the need to improve health awareness to further encourage the use of effective prevention tools. Expanding access to LLINs through accurate household data and net quantification in

addition to strategic outreach programmes targeting migrant workers and forest goers could positively impact LLIN coverage.

1. Referring to participants' preferences on the type of net which they prefer, specifically a net with a soft texture, small holes, tall height, appropriate size and attractive colour has the potential to enhance usage. However, procurement should not be based on qualitative study findings, but on large household survey data that demonstrates significantly improved net use for households that have their preferred type of net. Other studies have shown that not getting one's preferred type of net does not significantly affect net use rates.

2. Establishing interest free payment plans for poorer consumers that do not have access to LLINs or prefer to purchase could expand accessibility and thus, coverage.

3. Reducing the cost of repellent and developing a topical solution that has a subtle odour could also increase use of prevention materials.

4. Allocating funds to provide engaging health activities and dialogues with community members, migrant workers and forest goers would improve knowledge of malaria transmission and prevention.

5. Communicating messages in local terms and languages, developing culturally appropriate Information, Education and Communication (IEC) materials for low literacy groups would expand access to essential health messages.

Introduction

Background

NetWorks is a five year USAID-funded global project (2009-2014) that partners with country missions to improve and establish sustainable access to and use of Long Lasting Insecticidal Nets (LLIN). In early 2012, Malaria Consortium carried out a vector control assessment of malaria prevention activities, including LLINs and alternative personal protection options supported by NetWorks in the Greater Mekong Sub-region (GMS) in three countries, Thailand (borders areas), Cambodia and Myanmar.[1] One of the major information gaps identified during this assessment was the lack of evidence and understanding of consumer preferences for malaria prevention tools in Myanmar.

It was also evident from the assessment that many of the target segments (migrant and mobile populations) are most at risk of outdoor malaria transmission. Nets alone would not be sufficient to prevent malaria in these high-risk groups. Furthermore, the current literature does not provide sufficient information to decide on the most effective prevention tools to prevent outdoor transmission for migrant workers, forest goers and mobile populations in Myanmar[2][3][4] although similar studies have demonstrated how understanding consumer preferences can increase net usage.[5][6][7]

In this context, Johns Hopkins Bloomberg School of Public Health and Malaria Consortium, in collaboration with Department of Medical Research (Lower Myanmar) and the National Malaria Control Programme (NMCP) conducted a formative assessment to identify key consumer preferences for malaria prevention and the willingness to pay for these tools in the target communities in Myanmar. The consumer preference study also intended to identify any barriers to LLIN ownership and use, modification of specifications for LLINs, and preferred communication channels.

Study aims and objectives

To explore the preferences for LLINs and other prevention tools, including mosquito repellents, and treated materials, and understand key barriers to using LLINS among different consumer groups in Myanmar.
Specific Objectives:

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[1] USAID, Networks Project, Vector Control Assessment in Greater Mekong Sub-Region, May 2012
[2] Lelisa D Sena, Wakgari A Deressa and Ahmed A. Ali. Predictors of long-lasting insecticide-treated bed net ownership and utilization: evidence from community-based cross-sectional comparative study, Southwest Ethiopia
[3] NetMark Formative Qualitative Research on Insecticide Treated Materials (ITMs) In Nigeria
[4] Netta Beer, Abdullah S Ali, Helena Eskilsson, Andreas Jansson, Faiza M Abdul-Kadir, Guida Rotllant-Estelrich, Ali K Abass, Fred Wabwire-Mangen, Anders Björkman and Karin Källander. A qualitative study on caretakers' perceived need of bed-nets after reduced malaria transmission in Zanzibar, Tanzania
[5] Koen Peeters Grietens mail, Joan Muela Ribera, Veronica Soto, Alex Tenorio, Sarah Hoibak, Angel sas Aguirre, Elizabeth Toomer, Hugo Rodriguez, Alejandro Llanos Cuentas, Umberto D'Alessandro, Dionicia Gamboa, Annette Erhart. Traditional Nets Interfere with the Uptake of Long-Lasting Insecticidal Nets in the Peruvian Amazon: The Relevance of Net Preference for Achieving High Coverage and Use
[6] Jo-An Atkinson, Albino Bobogare, Lisa Fitzgerald, Leonard Boaz, Bridget Appleyard, Hilson Toaliu and Andrew Vallely. A qualitative study on the acceptability and preference of three types of long-lasting insecticide-treated bed nets in Solomon Islands: implications for malaria elimination
[7] Murari L. Das, Shri P. Singh, Veerle Vanlerberghe mail, Suman Rijal, Madhukar Rai, Prahlad Karki. Population Preference of Net Texture prior to Bed Net Trial in Kala-Azar–Endemic Areas

- To acquire in-depth qualitative information on knowledge, beliefs, and behaviours of the communities and migrants about malaria.
- To identify perceived barriers to accessing LLINs and ordinary nets faced by consumers in Myanmar.
- To determine preferred types of malaria prevention tools (LLINs, insecticide treated clothing, bedding) and characteristics (material, size, colour).
- To assess the cost that consumers across target groups are willing to pay for LLINs/ different malaria prevention tools.
- To identify preferred communication channels for accessing health information

Methods

Study design

Participants recruited for the study were fully informed of the study purpose and what was required in order to participate through an information sheet in the Burmese language. Only fully informed and consenting individuals were invited to participate. In cases of low-literacy, the information sheet and consent forms were read aloud by the data collector. For participants who needed clarification on a Burmese word used in the information sheet, local interpreters fluent in Chin language were present to aid comprehension. All investigators have undergone CITI training in human subject research.

Ethical approval was granted by the Johns Hopkins School of Public Health on 8 January 2014 (JHU IRB No. 5481) and by the Ethics Review Committee of the Department of Medical Research (Lower Myanmar) on 5 June 2014 No. 35/Ethics 2014.

Study population

Participants included 339 male and female adults aged 18 years and above living and/or working in Myanmar and its border areas. Participants comprised of migrant workers, rubber tappers, forest goers,[8] community members, community leaders, INGO staff, CBO staff, health centre staff, volunteers involved in LLIN distribution and shopkeepers/vendors of nets and personal protection products. See **Appendix 2** for the number of participants in each group. The following inclusion and exclusion criteria were applied in the selection of the respondents:

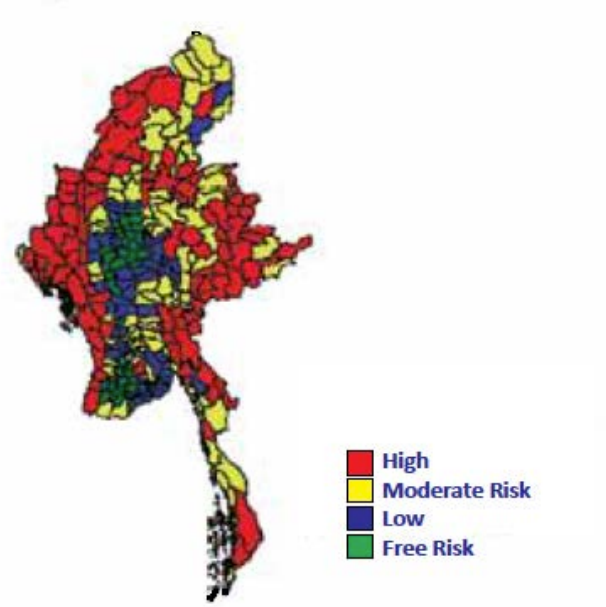
- Respondents who are close relatives (i.e. brothers, sisters or husband and wife etc.) will not be allowed to participate in the same focus group discussion
- Respondents who have participated in the KII will not be eligible for FGDs
- Respondents who have participated in the FGD will not be eligible for KIIs

The identifiers collected from participants included sex, age, occupation, ethnicity, religion, education level, township/state of origin and length of residency at current site.

Participants were sampled from areas of Myanmar which have varying levels of evident and suspected Artemisinin resistant *Plasmodium falciparum*, specifically referred to as Tier 1 (strong evidence of Artemisinin resistance, widespread ecological and social risk factors, intensive population movement), Tier 2 (unclear evidence of suspected resistance; located near suspected resistance areas in Myanmar, Thailand and China) and Tier 3 (rest of country).[9]

[8] For the purpose of this study, "forest goer" is defined as a person who sleeps in forested areas at night.
[9] WHO, Myanmar Artemisinin Resistance Containment, http://www.searo.who.int/myanmar/documents/MARCadvocacyfactsheetEnglish.pdf

Image 1. Area stratification for malaria risk and transmission[10]



The areas selected were Tanintharyi Division, Kayah state and Sagaing Division. The specific locations in these tiers were chosen as no previous studies have been conducted in these areas related to LLINs and net preferences. In each tier, two sites were selected, one close to (<5km) and one far from (>10km) a township/health facility.

Image 2. Map of Myanmar

[10] WHO, Myanmar Artemisinin Resistance Containment, http://www.searo.who.int/myanmar/documents/MARCadvocacyfactsheetEnglish.pdf

Sampling and recruitment approach

A maximum variation sampling approach was utilised to ensure a sufficient range of participants are included according to factors which are likely to represent a diversity of views. Convenience sampling was used to recruit participants who fit the selection criteria and were available for a KII or FGD on the day of data collection. The interviewers followed this selection approach in coordination with the village leader or community volunteers.

Sample size

At each site, two focus group discussions (FGDs) were held with forest goers, migrant workers and community members respectively to garner multiple views simultaneously and encourage discussion; six in total per site, twelve per Tier, thirty six in total.

Key Informant Interviews (KII) were held with stakeholders to explore experiences in more detail; depending on availability it is estimated that eight KIIs were conducted at each site, sixteen per tier, and forty-eight in total.

The number of interviews and FGDs was estimated based on what is required in order to reach data saturation, balanced with the time and resources available.

Two focus group discussions were conducted with each category of respondents to validate the findings. FGDs were held in an accessible yet private location in each community, such as a school or other community facility whenever possible.

Table 1. Number of KIIs, FGDs and participants per tier

Tier	Site location	Number of KIIs	Number of FGDs	Number of participants
Tier 1	Tanintharyi	16	12	110
Tier 2	Kayah	17	12	118
Tier 3	Sagaing	15	12	111
	Total:	**48**	**36**	**339**

Data collection

Prior to data collection, eleven experienced data collectors participated in a two day refresher training to familiarise themselves with the methods and tools to be used in the field. This also provided an opportunity to identify which of the data collectors excelled at moderating FGDs and any challenges associated with using the audio recorders.

Participants were invited to attend one interview lasting approximately one hour or one FGD lasting approximately 1.5 hours.

FGDs were held with forest goers, migrant workers and community members to garner multiple views simultaneously and promote active discussion. Key Informant Interviews (KII) were conducted with community leaders, health facility staff, community health volunteers, village health committee members, INGO staff, Community Based Organisation staff, private vendors and village health workers

to explore stakeholder perspectives in more detail and to encourage more direct responses relating to community beliefs and behaviour.

To ensure interactive and productive discussions, where possible, FGDs were homogenized with regard to age, gender and occupation of the respondents; age, as younger respondents may not speak if older respondents are present as a show of respect, gender, as it may not be socially acceptable for women to engage directly in discussion with men, and occupation as respondent similarities will stimulate a more informative discussion relevant to the respective groups.

KIIs and FGDs were audio recorded and transcribed verbatim in Burmese. An independent group of interpreters with a medical background translated the Burmese transcripts into English. DMR and MC Myanmar staff conducted spot checks to compare the English translations with the original Burmese versions to promote quality control in terms of accuracy and completeness of the data.

Data management

During transport, copies of data collection materials were kept in the team leader's possession. Hard copies of the data collection materials and transcripts have identifiers and were subsequently stored in a secured room with limited access by specified individuals. All hard copies of the data were destroyed after transcription. Audio files were erased once transcription was complete. Electronic versions of the data were stored on password-protected laptops in the possession of the research team. The data collection sheets and transcripts were redacted (de-identified) prior to the coding and analysis stage to confer anonymity. Electronic files and hard copies were only accessible by authorized study personnel. Analytic datasets were de-identified and accessed solely by the PI and co-investigators.

Data analysis

The Framework Approach[11] was used to analyse the data. This systematic method appreciates the iterative nature of qualitative data analysis and involves deriving themes related to the research objectives, whilst adding new themes that emerge during data collection to an evolving conceptual framework, under which the data is analysed and organised. Analysis followed four key stages:

- *Familiarisation* - key themes related to the study objectives were identified during a thorough review of the transcripts
- *Constructing a thematic framework* - themes originating from the study objectives and other key issues that emerged from the data were identified and used to assemble a coding/thematic framework in an Excel spread sheet for each geographically distinct set of data, which were then used to label and group the data in rows according to themes, sub-themes and strata.
- *Indexing* - the data were coded according to the thematic framework by target group and reorganised into sections under each theme. Emergent subthemes were added to the framework under the relevant overarching themes and the data was once again reviewed and re-sorted under relevant themes
- *Mapping and interpretation* - each thematic area was compared between target groups and contextualised, associations between themes were identified; the findings were explained and interpreted.

[11] Pope C, Ziebland S and Mays N., "Qualitative Research in Health Care: Analysing Qualitative Data," *BMJ* 2000; 320; 114-116

The results are presented below according to the seven key thematic areas discussed in the topic guide.

5.1 Knowledge and perceptions of malaria

5.1.1 Perceived community health issues

Across the three regions and target groups, malaria was generally considered to be the most common community health problem. Other secondary health issues mentioned (in order of frequency) included: unspecified fever, dengue (and dengue haemorrhagic fever), diarrhoea, Acute Respiratory Infections (ARIs), influenza, gastrointestinal complaints, high blood pressure, tuberculosis and dysentery.

"There are many types of fever. Mostly, malaria. And sometimes TB can be seen in the people who live on the Thai [Myanmar] border." Midwife, Rural Site, Tanintharyi

In Sagaing, most rural and urban participants community members commented that malaria was not as common as in previous years, however migrant workers and forest goers still considered malaria to be the most common disease in their communities.

"In Myanmar, Malaria is not common, very rare now. It is very rare due to bed nets. Last year, numbers of patients with malaria organism entering to brain [cerebral malaria] are common." Urban Community Member, Sagaing

A few participants in Sagaing also mentioned typhoid, arthritis, diabetes and cholera.

5.1.2 Other terms for "malaria"

Almost all of the participants used the Burmese term "*ngat phya"* for malaria, which literally translates to "bird fever". A few stated that malaria is also referred to as "chills and rigours fever."

A staff member from an NGO (urban site) in this region explained that malaria was referred to by the location where a person suffers the disease, using only the first word in Burmese (*"ngat"*), for instance, "*Sea malaria", "Forest malaria", "Hill malaria."* Similarly, migrant workers in Sagaing explained,

"If I go to Nan Daw area, they called 'Nan Daw Malaria'. We went to Homalin, it was called Homalin malaria. In Kalay, we call Kalay malaria. Come back from Myitkyina, we got malaria, then we call Myitkyina Malaria." Urban Migrant Worker, Sagaing

A rural Health Assistant in Tanintharyi stated that people also use the term A *Phyar O* for malaria, which directly translates to "long-term fever."

In Sagaing, ethnic Chin respondents used the terms:

- *"Sit sel"*
- *"Nat to."* [Translator] *"Nat to is in Chin language, it means malaria."*
- *"Nat to Kaw sit"*

- *"Nat to…means cold and shivering"*
- *"Kaw Sit means chills fever."*

"Here we call Kaw Si Nar Sit Sit, Kut Nat, Kaw Sit Nat, we call 3 names for malaria."
Urban Community Leader, Sagaing

"In their language, malaria is called as "Khoro nat " which means fever with chills and rigor. They have another different name "Khaw Sit". It means cold and chilly." Urban Village Health Worker, Sagaing

In Kayah, forest goers use the term *"Hnet Kite Tel*", whilst community members explained that "*sat-naung"* is the word for malaria in the Kayah language.

Other participants joked that they use the terms "hatred malaria" (*Rural Community Member, Sagaing)* and "the illness of the lazy man" because malaria affects one's ability to work (*Urban Forest Goer, Kayah).* A health assistant in Sagaing said that previously malaria had been called "*Wai Kai Dar"* which meant that they were haunted by intermittent fever. A few respondents in Sagaing said that the other name for malaria is "typhoid."

"Someone suffered the malaria that they can eat but can't work. It disappeared when they drank the medicine. When they went back to work, they suffered malaria again, so it was called 'hatred malaria.'" Rural Community Member, Sagaing

"We call [malaria] "the illness of lazy man". [Laughing] Because they pretend not to be able to work. They can work after the illness with chills and rigour fever is over." Urban Forest Goer, Kayah

5.1.3 Transmission

The majority of community members, migrant workers and forest goers across the three regions attributed malaria equally to two causes: mosquitoes and drinking/bathing in water.

"Aedes mosquito 'Chin Kyar' can cause malaria; large mosquitoes are in the forest. During the day time they come out from lake." Urban Migrant Worker, Sagaing

"Sometimes you can get malaria from stream water…drinking too much unboiled water." Rural Forest Goer, Kayah

These responses contrasted with health facility staff and community health volunteers who unanimously linked mosquito bites with malaria. Some health staff and volunteers explained that previously community members may have been confused about the cause of malaria however, in areas where health awareness campaigns had been led; they now understood that mosquitoes transmit malaria.

Community members, migrant workers and forest goers frequently mentioned a range of other causes they associated with malaria, which are presented in **Table 2** and explained in more detail.

Table 2. Perceived cause of malaria in order of frequency (most commonly mentioned listed first)

Perceived cause of malaria
Mosquito bite
Drinking, swimming in rain/stream/lake/cold/stagnant water
Eating bananas, papaya (both commonly discussed), mango, pork (less common), eating sour tasting food (Sagaing)
Unclean environment
Moving from one place to another / change in environment, foods
Weather changes in temperature, wind, cold weather, extreme heat
Hard manual labour
Working when it is too hot or too cold
Poor personal hygiene
Taking a bath, "wrong bathing"
Supernatural causes (spirits, devil, witchcraft, wizard's curse)
Gnat bites (one participant)
Passed *in utero* from mother to baby (one participant)
Blood transfusions (one participant)

Certain foods were considered to transmit malaria; particularly bananas, which was widely mentioned by the three aforementioned target groups across sites, also the less frequently cited, papaya. It is noted that the word for banana in Burmese is *"ngat pyaw thee"* which sounds very similar to the word for malaria "*ngat phya"*. The researchers hypothesise that it is due to this linguistic similarity that people may confuse malaria transmission with banana consumption. According to a few community members in Kayah, mango and pork were related to malaria illness, whilst in Sagaing, various participants described how sour tasting or pickled foods cause malaria.

Living in an unsanitary environment with litter and stagnant water was also considered by the range of respondents to cause malaria transmission, linked to mosquito breeding. Relocating from one location to another which may have a different climate was a strong theme amongst migrant workers across the three sites.

"Malaria can get changing temperature from hot to cold. Moving from other places [one] can also get [malaria]." Rural Migrant Workers, Tanintharyi

"I think, mosquito bite is [the] first [cause of malaria] and changing environment is second. The workers who work hard could not withstand the changing of environment…For migrants, they come from mountainous areas, the climate is different here, and they got sick when they moved here. The weather in mountainous area is very cold if they migrate here, they get sick. We are Chin people, we move from mountainous areas, in Chin [people], we get fever from changing from one place to another. One of my Chin friends died after moving here."
Urban Community Leader, Sagaing

A change in seasons or temperature was also associated with malaria transmission according to community members, migrant workers and forest goers.

"Local people think it is due to changing of climates, they are working in rainy season, too much working. Most of them think it is due to high heat of sun and raining, they got fever with shivering." Urban Community Leader, Sagaing

Along the same theme as temperature, taking a bath at certain times of day, when it is hot or cold or incorrect bathing method were other suggested modes of malaria transmission.

"We can get Malaria by having a bath. If I go out, I won't take a bath." Urban Forest Goer, Tanintharyi

"The average person thinks the cause of malaria is due to a mosquito bite. Moreover, some still presume that the malaria occurs by the drinking the stream water or wrong bathing." Health facility staff, Tanintharyi

Heavy manual labour and tiredness were also linked to falling ill with malaria, particularly amongst migrant workers and forest goers.

"Some are tired because of heavy work, and then they have a fever. Because of foods…some [people] are weak in body, immunity then they have sour taste food, not good for them." Urban Migrant Workers, Sagaing

"Weakness due to tiresome work, drinking unsafe dirty water, bitten by mosquitoes, not sleeping under the bed net the whole night…Some relapse malaria when they became weak." Rural Oil Manager, Sagaing

A less repeated theme was the role of witchcraft and spirits in causing malaria. Mostly this theme was referred in the context of an antiquated belief that was no longer generally accepted, usually discussed by health, NGO staff and volunteers, however in Tanintharyi, one community member attributed "incurable" malaria to a curse whilst a migrant worker in the same area remarked that malaria was caused by spirits.

"If it [malaria] cannot be cured with injectable medications and oral drugs, it is [caused by] a curse from devils. After recovery, nothing happens." Rural Community Member, Tanintharyi

"Yes, It is a saying that malaria is due to a curse from Chinese/Kayin Nat [Spirits]." Urban Migrant Worker, Tanintharyi

"All of the villagers know that Malaria is caused by mosquito bite. In the past, they believed in black-magic, they believed in gods." Urban VHW, Sagaing

Health facility staff, migrant worker supervisors and community health volunteers highlighted the impact of health education on awareness of how malaria is transmitted.

"The main cause is mosquito bite. Here mosquitoes bite a lot. They know malaria is due to mosquito bite. Now health information, from reading, watching TV, we changed the old beliefs like banana eating, drinking stream water and food. Villagers accepted malaria is due to mosquito bite." Rural Palm Oil Manager, Tanintharyi

"Formerly they don't have knowledge, they think it is due to food, eating pork and drinking cold water. After attending the health education sessions, they got the health knowledge about malaria. Then they understood." Urban VHW, Kayah

"Long ago, when they did not get health education, there were a few wrong beliefs such as Malaria is due to drinking spring water, eating bananas and eating bamboo shoots and other fruits. Further, there are a very few people who believe that malaria is due to curses from wizards. However, when they received the health knowledge, the message, 'the cause of malaria is due to a mosquito bite' is deeply rooted in their heads." Rural Health facility staff, Sagaing

"At first, we thought that it was due to the wrong way of taking a bath, irregularities of eating, and drinking stream water. However, because of health talks, quite frequent talks, had leaded to decrease such kind of beliefs! Yet, there would be around 30 out of 100 people who still believe in those superstations…they still believe that casual factors for malaria are drinking stream water, some specific fruits including bananas." Rural Health Assistant, Sagaing

5.1.4 Seasonality

Almost all participants thought that malaria occurred most in the monsoon "rainy" season. In Tanintharyi, many participants across target groups mentioned higher number of cases in May/June with responses ranging from March to October. In Kayah, some participants stated that cases peak later in the year, up to October, whilst in Sagaing several respondents said there were many malaria cases between June and September.

"It [malaria] is common in the period when the weather changes from hot to cold." Urban Forest Goer Tanintharyi

"At the end of rainy season and in the beginning of winter." Rural Forest Goer, Kayah

5.1.5 Populations considered most at risk

The range of responses highlighted several perceived risk factors associated with malaria incidence. Most common characteristics mentioned by participants included: going/working in the forests, followed by being male, being a child, being poor, being a migrant worker. A few community members in Tanintharyi and Sagaing acknowledged that villagers who do not sleep with bed nets are most at risk. Lastly, the concept of "immunity" to malaria was referred to in relation to who could be at risk of contracting malaria.

Almost every target group across the regions thought that people who spend time in the forests are most at risk of contracting malaria. Some participants specified that men are more at risk than women as they spend more time working outside the home and/or in the forests. Furthermore, people working in the forest are less likely to use a mosquito net, wear a shirt when working (to protect their body from mosquito bites) and usually drink stream water, eat fruit, which were considered causes of malaria. Multiple participants across target groups and sites explained that there are more mosquitoes living in forested areas.

"Malaria is common in men who go to find wood in the forest or work in the forest. Furthermore, Malaria is common among kids live in the town and men working in the forest." Urban Community Member, Tanintharyi

"Men are common [malaria sufferers] because they are working inside the forest and mountain and far remote areas. While women are working at home as a housewife so that they will not get malaria compared to men." Urban Migrant Worker, Tanintharyi

"Our husbands are working and going to the hill side and sleeping without mosquito net so they suffered malaria more." Rural Community Member, Sagaing
"The highest ones are men. As they are the ones who travel to the forest. The girls are at home cooking rice and eating." Urban Forest Goer, Kayah

"Those in the forest, after working and sweating, or hot, they take off their clothing. Then they were bitten by mosquitoes." Urban Forest Goer, Kayah

"Malaria is common in people who do not use bed nets." Urban Community Member, Sagaing

Poverty was also associated with a higher risk; according to several participants this was due to: (1) low net ownership for those who could not afford to buy enough nets, (2) parents working outside of the home and leaving children unsupervised which meant that net usage would not be enforced for children and children may play in dirty areas (as mentioned above, an unclean environment is considered to cause malaria), (3) poorer people were described as malnourished and have to go to the forest to find items to sell (4) poorer adults work harder which causes tiredness that leads to malaria infection.

"Malaria is common in children from poor families. When moms go for farming, they left children alone. Therefore, malaria is common in those kids because they sleep without net and stay where they like." Urban Community Member, Tanintharyi

After forest goers, children were also thought to be at a higher risk than adults for several reasons: spending time in the forest, playing in unclean areas, bathing too often and having lower immunity to malaria.

"Children, mosquito bite in the forest. They cut the trees in the forest. They drink stream water carelessly." Rural Forest Goers, Tanintharyi

"Some take bath a lot, 5 times a day…water is dirty." Urban Community Member, Sagaing

"There are more cases of malaria in the children. The children have very low resistance and cannot prevent mosquito bites not like adult. The children have low resistance." Rural Migrant Worker, Sagaing

Migrant workers were also deemed a high-risk group due to changing their environment, not using a bed net, labouring very hard and becoming hot and tired. In Tanintharyi and Sagaing, gold and lead mine workers in particular were highlighted as contracting malaria the most; one key informant explained that this was due to the length of time they spend in the forest.

"Migrant workers also get [malaria]. They move from other places, weather changes, previously they drink boiled water, here ordinary water. Changing environments can deteriorate health. They do not use bed net so they are bitten by mosquitoes. Then it occurs." Rural Forest Goers, Tanintharyi

"They work in the wood cutting area, and some are mobile and move here and there…near to Shan Border, the people sometimes live on the Shan side and sometimes in Kayah Side. So the cases are higher in those migrant who cross the border between Shan and Kayah." Rural Midwife, Kayah

"Men are more vulnerable. The gold mine workers also had higher prevalence. They are not from the village but stayed in the forest to search for gold." Urban Rubber Manager, Tanintharyi

"Those who are fatigued and work hard." Rural Forest Goer, Sagaing

Among a few participants, the perception of immunity to malaria was discussed; normally when explaining the distinction between local residents (who were considered to be immune to the 'local' type of malaria) and migrants who are new to the area who were not immune.

"Usually someone who has the low resistance can get [malaria] easily. Someone who isn't the local people can get more. The people who come to the other places will get the malaria. The local people haven't got malaria not much. The migrants suffer more." Urban Migrant Worker, Kayah

5.1.6 After relocation, length of time one is likely to suffer from malaria

The majority of participants in all three regions gave a variety of answers, even within focus group discussions. Most of the responses range from a few days of arriving in a new location spanning up to 2 years. An emergent theme referred to the concept of "immunity" to malaria that local residents acquired from long-term residency. Along a similar theme was the discussion of migration and change in climate, water and food as increasing one's chances, particularly migrant worker's of contracting malaria. One health worker explained that the transition from a malaria endemic to non-endemic part of Myanmar could result in infection.

"Long term residents have good immunity to malaria. People who move here suddenly have no resistance to malaria." Rural Community Member, Tanintharyi

"The people who were not from this area, they will suffer within months. The first month they arrive due to the changes of water and places. For example, someone who always lives in Kalay and they move to here for their job. The changes of the place, water and food will cause [them] to get malaria." Rural Migrant Worker, Sagaing

"The time of having Malaria can be varied. Some people get Malaria 2 to 3 months after being here. What we can guess is that these people came from the place which is not Malaria endemic area and where there are no Malaria mosquitoes." Rural Health Facility Staff, Sagaing

5.2 Prevention practices

Initially, when participants were asked about how they prevent malaria, almost everyone mentioned using a net. However further probing revealed that in practice, a range of other methods are utilized by different groups including bonfire smoke, long clothing, repellent, smoke coils, blankets and others. The

numerous prevention methods listed are presented in the sections below, in order of most to least frequently mentioned. A few participants commented that nets alone were not sufficient to prevent mosquito bites during the day or outside of sleeping hours. Forest goers referred to using smoke, long clothing and blankets more commonly than the other target groups.

The most frequently repeated method that forest goers were thought to use, and themselves reported using, was smoke from bonfires. Forest goers were often thought of by community members as a poorer group who resorted to travelling and sleeping in the forest to gather food, cut bamboo or firewood to sell. Participants explained that forest goers may not own LLINs as they are not at home during distribution, or if they do have a net in their household, would not carry it to the forest to use. Although a few forest goers said they used nets when sleeping in the forest, one forest goer observed that he would only take a net if he were to spend more than one or two nights in the forest. After using smoke, wearing long clothing was the second most common prevention method most frequently reported amongst this group. A few participants cited using repellent and blankets as other prevention tools used in the forest.

5.2.1 LLINs, conventional nets

Using nets, specifically LLINs and treated nets, was the most common response among the majority of both urban and rural community members across all regions. This reflects the anecdotal data that suggests that community members have much higher access to the free distributed LLINs compare to migrant workers and forest goers (see **Section 3**). Nevertheless, within the FGDs there was disagreement between those who reported sleeping under nets and others who explained that they did not use the nets. Migrant workers and forest goers also reported using nets, but cited more barriers to usage compared to community members, also more alternative prevention methods.

In terms of the type of bed nets used, across the three sites, community members reported using LLINs or impregnated nets more frequently than migrant workers and forest goers who described purchasing ordinary nets on the market. This difference was attributed by participants to the mobility of migrant workers and forest goers who described having less access to free LLINs compared to resident community members in local areas.

"The most favourite method is using LLIN they got from government. Their traditional habits are first some people use LLIN hanging [during the] day and use it for sleeping at night." Urban Health Facility Staff, Sagaing

"They use the distributed LLIN in the village." Rural Malaria Volunteer, Kayah

"Mainly they trust in bed nets, bed net is the most effective method for prevention. They prefer bed nets." Urban Community Leader, Sagaing

"I am so afraid of the mosquito bites. So, I use the bed nets every night." Rural Migrant Worker, Sagaing

A few participants across the sites linked net use to the perceived abundance of mosquitoes; when there were many mosquitoes either in certain sites or during the rainy season, more people would use nets.

"We used it [net] in the rainy season." -Rural Community Member, Sagaing

"There are many mosquitoes in this area so they use the bed nets now." Rural Health Assistant, Tanintharyi

"We stay on the mountain and we are afraid of mosquitoes so we sleep with bed nets." Rural Forest Goer, Sagaing

One private vendor explained that community members used the free LLIN while watching television before bed, then use an ordinary net to sleep under. A unique response from a forest goer discussed drinking tea under the cover of a bed net.

"We use [nets]. UNICEF bed nets, we do not use in bed, but we use while watching TV. When we go to bed, we already have bed nets [bought ones]." Urban Private Vendor, Kayah

"When we lived on the hill, we sleep in the bed net if the mosquitoes bite heavily. We even sit and drink the tea in the bed net." Rural Forest Goer, Sagaing

Migrant workers and their supervisors in Tanintharyi reported that workers not sleeping under a net at night would be fined, which encouraged widespread use. A challenge that emerged was bringing mosquito nets when sleeping in the forest. Some migrant workers reported using the net as a pillow or blanket.

"They [migrant workers] also use the mosquito net and sometime use [it] as a pillow. They only use LLIN and don't use anything else. But they don't carry it to the forest." Rural Malaria Volunteer, Kayah

"We covered the whole body with the mosquito nets using it like a blanket." Urban MW, Kayah

Only one participant mentioned hammock nets as an option for people who can afford it may use when they sleep in the forest.

"We use mosquito nets. Some people who can afford it use a hammock. There are hammocks that have mosquito nets. Here, at home, we are okay with mosquito nets. But if we are going to the forest, there is no place to hang mosquito nets. A hammock [net] is more appropriate." Urban Forest Goer, Kayah

5.2.2 Smoke

Making smoke by burning a variety of materials was widely reported as a way to deter mosquitoes by community members, migrant workers and forest goers. The latter group described this method the most for nights spent in the forest without access to other prevention tools. In Sagaing and Kayah, participants also mentioned adding turmeric powder to the fire. Sagaing participants also described burning incense sticks, old tires, clothes and guava leaves.

"When there is a bon-fire, smoke can prevent mosquitoes from coming." Urban Community Member, Tanintharyi

"We make the fire to produce smoke which push mosquitoes outwards. We make the fire using turmeric to produce smoke." Urban Migrant Worker, Kayah

"The burn the old clothes, mosquitoes do not come because of smell." Urban Community Members, Sagaing

"No, we don't bring bed net. We get Malaria because of mosquitoes bite since we do not bring it. Make fire. I wear long sleeve clothing. I hit mosquitoes when they bite me." Urban Forest Goer, Tanintharyi

"…they collect leaves and burn after work. It was their old custom. They do not sleep with bed nets. After that all received bed nets in my targeted areas. They said they use it. Urban NGO staff, Kayah

One urban forest goer in Kayah noted that he smoked "cheroot" to prevent mosquitoes.

5.2.3 Repellent

Repellent as a prevention method was more frequently cited amongst migrant workers and forest goers compared to community members. Although additional probing indicated that repellent was not as widely used as it was at first reported by participants. Often, later in the discussion participants would explain that there were several barriers associated with using repellent, including high cost, "strong smell", a hot sensation upon application and the short duration of effectiveness. Notwithstanding, health facility staff and other key informants advocated repellent as a suitable prevention tool for mobile populations and those working outside during peak biting hours.

"Some use cream. If we apply cream before sleep it can prevent from mosquitoes bite. People from our village applied cream all over the body and go to bed." Urban Community Members, Tanintharyi

"Some use mosquito repellent lotion, mostly migrants and road construction workers." Urban NGO staff, Kayah

"For forest goers, repellent cream. In the paddy field, build a hut, sleep there, if no bed net, use repellent cream." Urban Community Members, Sagaing

"Some work in the farm during the daytime. At night they are hunters. They wait on the lookout and use mosquito repellent lotion." Urban VHW, Kayah

"Here is the cause of health problems in our village. We cannot stay under the bed net all the time. So it is better to use cream while we go out into forest and mountain. It is better if we have cream when we go forest at day or night." Urban Forest Goers, Tanintharyi

"We use coil and cream. Anti-mosquito cream is hot on application. It can drive away the mosquitoes for a while but [it's] not long lasting." Urban Migrant Workers, Tanintharyi

"It can burn to the skin. So it shouldn't be used." Urban Forest Goer, Kayah

"Repellent is not advisable, because it lasts for three or four hours only, and it is costly also." Urban NGO staff, Sagaing

5.2.4 Smoke coils

Burning mosquito repellent coils was frequently repeated by community members, migrant workers and forest goers across sites, although many participants commented that the smoke smelled bad, had a negative effect on breathing, and especially children's health. Key informants reiterated coil use by communities. A few participants explained they would resort to burning coils if they did not have access to nets, or in combination with net use. Several respondents explained that coils were used during daytime or early evening hours when nets could not be used.

"We also use the mosquito coil and mosquito net. When we watch TV at night, we use the mosquito coil." Urban Community Member, Kayah

"We concerned for the children when using mosquito coil." Urban Migrant Worker, Kayah

"Some use mosquito repellent coils…Mostly they use Godzilla [brand]. Some do not like the smell of mosquito repellent coils. Some suffer difficulty in breathing." Urban Health Assistant, Kayah

"We use mosquito repellent coils before going to bed. It is not good for children's health." Urban Community Member, Sagaing

"I bought mosquito repellent coils, I got difficulty in breathing after inhaling the smoke…and then I do not use it any more. Long ago, we used mosquitoes' repellent coils; now do not use it because of difficulty in breathing." Urban Migrant Worker, Sagaing

"I can't bear the smell." Rural Community Member, Sagaing

5.2.5 Environmental sanitation

Numerous participants across target groups and regions described environmental measures to prevent mosquitoes from breeding such as: removing rubbish, improving drainage, pouring out standing water and cutting bushes. From the data it did not seem that participants always understood the purpose of these practices or confused these with getting rid of dirty water, which they perceived could cause malaria if consumed.

"Clean the environment, drink boiled water, and cover all containers and clear ponds and grasses around houses." Urban Migrant Worker, Tanintharyi

5.2.6 Long clothing

Mentioned by many participants from all target groups, long clothing was most popular with forest goers, particularly in Kayah and Sagaing. One participant in Tanintharyi commented that long clothing was not an effective method, as it does not completely cover all skin.

"So we have to wear long pants, stockings, boots and those which are thick enough to prevent mosquito bite." Urban Forest Goer, Kayah

"Mosquitoes make us weak and ill because they suck our blood, I think. We cannot do our work steadily because of the mosquitoes. But those who wear long pants and long sleeved shirts [get] relief from being bitten by mosquitoes." Rural Forest Goer, Sagaing

"We wore the long sleeves shirts and the long trousers, apply the mosquito repellent lotion when we went and worked in the forest. The mosquitoes can't come if we sleep in the forest." Urban Community Member, Kayah

5.2.7 Other methods

Due to the misconception that malaria is transmitted through water, multiple participants cited "drinking boiled water" as a prevention method; this theme was more prevalent amongst participants in Tanintharyi and Kayah.

In Tanintharyi, only two participants discussed using blankets to prevent malaria in the context of an alternative to nets when sleeping outside of the home. In Kayah and Sagaing, participants from FGDs comprised of community members, migrant workers, and forest goers all reported using blankets to avoid mosquito bites.

Electronic rackets were not discussed by participants in Tanintharyi and only by a private vendor in Kayah and a community member in Sagaing. One urban forest goer in Kayah and a few participants across target groups on Sagaing referred to hand fans as a way to prevent mosquito bites.

Indoor Residual Spraying (IRS) was reported as having occurred in previous years in the three regions and was favoured by the participants discussing this method; also recommended for future use.

An Urban Forest Goer in Kayah joked that he drank alcohol to prevent mosquito bites; this was reiterated by an NGO worker in Sagaing who commented,

"Especially in the rural areas, where there's less education. Some areas say that if you drink alcohol, you'll be protected from malaria. Because I think it's also a misconception…within the armies, because in army they have the army rum for the soldiers to prevent malaria…they think that drinking alcohol can prevent malaria." Urban, NGO staff, Sagaing

Unique methods only described in Sagaing included drinking traditional teas made of leaves and tree roots, applying shampoo, paracetamol and water or a lotion made of crushed flowers to the skin to prevent mosquito bites and taking chemoprophylaxis (Fansidar, Chloroquine and Quinine).

When asked which methods participants use to prevent malaria, several participants across all three sites including community members, migrant workers and forest goers, vendors and NGO staff observed that a minority of people do not use anything to prevent malaria. This theme was more prominent amongst forest goers. Generally, community members had access to nets but preferred "sleeping naturally", whilst for migrant workers and forest goers, poverty, a lack of awareness of malaria transmission and mobility (difficult to carry a net in addition to personal belongings) were linked to use of a prevention tool.

"Nothing, they [forest goers] store the bed nets." Rural Private Vendor, Tanintharyi

"We do not use mosquito repellent lotion and coils. We sleep naturally." Rural Forest Goers, Tanintharyi

"We also found they don't use mosquito nets though they were provided mosquito nets. They might sleep under the bed in the village but don't bring if they go to the forest." NGO staff, Tanintharyi

"I do not do anything. [Laughing], if got fever, test the blood and consult at clinic and take medicines. We don't know how to prevent mosquito bite, and I think we have to ask you for suggestions." Urban Forest Goers, Sagaing

"They sleep without anything as they are so poor in our area." Rural Migrant Workers, Sagaing

5.3 LLIN distribution and accessibility

5.3.1 LLIN distribution

The majority of participants across all target groups and regions explained that nets were delivered by a NGO, UNICEF or government health staff from a hospital, malaria control unit or general health department. The number of agencies distributing nets named by participants was highest in Tanintharyi (Tier 1), followed by Kayah (Tier 2) and Sagaing (Tier 3), see **Table 5** below. The net supply would often flow through a hospital, to a township administrative office or Rural Health Centre (RHC), then to a village leader, head of ward, block administrative leader or household leader who would alert community members through meetings, going door to door or by a loud speakerphone. Local health staff, midwives or Community Health Workers at village level reportedly facilitated net distribution/impregnation depending upon which of these individuals were willing and available to assist. According to many participants, particularly community members, leaders and NGO, health facility staff, household census data would be used to allocate nets during community level distribution.

For migrant workers, some companies reportedly provided nets for employees sleeping on site; the company in-charge approached the net distributor with a list of workers and would request a specific number of nets to give out at the plantation.

"Sayama [doctor] and village president have a list of household and families in their villages so that they check together before distribution and use microphone to shout name of household to come and take mosquito nets. Further, announcer of village also goes and calls the families by motorbike or cycle to bring the families." Urban Health Facility Staff, Sagaing

"They collect the list of people and depending on the population, they distribute." Urban Community Members, Kayah

Table 3. Net distributors (according to participants)

Tanintharyi (Tier 1)	Kayah (Tier 2)	Sagaing (Tier 3)
Health Department	UNICEF	MCC
UNICEF	Doctor, midwife, from clinic	UNICEF
CAP-Malaria	World Vision	PSI
Department of Health	Township Administration	Merlin
Red Cross	Ward	MCC

Doctors	Health Facility staff	
Health Facility staff	Health Department	
Tanintharyi Hospital	Hospital Malaria Prevention Centre	
Malaria prevention staff	Malaria Control Unit	
Malaria Control Health unit	Myanmar Artemisinin Resistance Containment	
PSI		
Aide Medicale Internationale (AMI)		
UMHCI		
3MDG		

Responses discussing when and how often nets would be distributed or impregnated varied among FGD participants within the same target groups and ranged from every six months to once a year, with the longest period observed being three years ago. In Tanintharyi, participants explained that distribution frequency depended on which NGO was providing nets. In Sagaing, participants reported that previously Merlin distributed nets every year, which would be treated by Myanmar Council of Churches (MCC), however MCC provided LLINs to communities in mid-2014. In Kayah, participants reported that nets were distributed once a year and treated every six months.

In terms of whom received free nets, the most common response from community members and health facility staff stated that the policy was one net per family, or two to three per household for large families. For example, one net would be given to 2 adults and would also be considered sufficient if they slept next to a small child. In households where older children reside who would not sleep next to their parents, an additional net (in theory) would be given to the older child.

In Tanintharyi, the range of participants explained that priority was given to poor households, children under five, pregnant women and registered households on the census list. In Kayah, according to several community members, NGO and health facility staff, migrant workers and their families were prioritised compared to ordinary community members (although this latter group reported receiving nets too during distribution). In this region, the nets donor only gave nets to those who attended health talks held by the distributor. Reponses from migrant workers did not reflect this prioritisation, for if they did not attend the health talks, or were not aware of these, migrant workers did not receive a net. In Sagaing, "high incidence sites" were targeted first, according to a specified strata outlined by several participants. A few participants suggested that migrants were targeted, however this was the opposite perspective given by migrant workers in the area who reported very little possession of LLINs or free nets and observed that the treated nets were being sold at the local market. Despite numerous comments that there were not sufficient nets procured for distribution, there was almost unanimous sentiment amongst all participants that nets were distributed fairly.

"Usually they distribute the migrant workers first priority. It's not for everybody. They distributed the participants upon the attendance of the health talk. Urban Migrant Worker, Kayah

"We have never seen it…we heard about LLIN only in this discussion." Rural Migrant Worker, Kayah

"The government didn't distribute [Laughing]. I have never received the ITNS that were distributed in the village. The ITNs are appropriated in the town but not in villages. They didn't come to here to the village.

The ITNs are sold in the market. It's about 3500 kyats. In the village, they got the distributed ITNs. But if we want we have to buy the bed nets in the markets." Rural Migrant Worker, Sagaing

"According to the Malaria department, there are strata: 1A, 1B and 1C. 1A is distributing bed nets, 1B is providing tablets [to treat nets] and 1C is under surveillance." Rural Health Facility Staff, Sagaing

5.3.2 Payment for LLINs

There was disagreement within and between different geographic areas as to whether people must make a donation or cash payment in exchange for nets that are supposed to be distributed free of charge.

In Tanintharyi, a few community level participants alluded to a voluntary donation in exchange for the free LLINs, ranging from 200-500 MMK. Participants explained the money went towards paying for transportation for the person distributing the nets.

"Donation is 500 MMK. If people do not have money, no need to pay." Rural Community Member, Tanintharyi

"We can pay as we wish…it is like a donation…500 [kyats]. This is our wish. They don't force us. We can put donation in the designated place if we wish but it is not compulsory. No problem for us." Urban Forest Goers, Tanintharyi

In Sagaing, although some participants said they did not pay any money towards the LLINs distributed, others explained that in exchange for a LLIN they had to donate 500 kyats per item which went towards a "village fund" which is used to pay for the construction of latrines, schools and wells despite the donor (Merlin) stipulating that the nets should be given for free.

"This only one time. We gave 500 kyats to the people who collect the list. We didn't use LLIN but we had to pay 500 kyats [says angrily]. It is not for them. It is for the funds of village." Rural Community Members, Sagaing

"Most villagers wanted to get bed nets because it was distributed free. Merlin told me to take a bed net free of charge even without providing any funding and I replied 'no' to them. I told them that everybody must contribute 500 MMK for village health's funding. Merlin did not want us to collect 500 MMK per bed net distributed to set up village health's funding. I told them, 'I am not going to accept those bed nets if you are not going to allow us to collect money for village funding.'" Rural Community Leader, Sagaing

"Village leaders ask donation money for doing development, building schools, pagodas and clinics and pagodas from the villagers during distribution of mosquito nets. They separated the category of household to rich and poor and ask 5000 kyats from the rich. We cannot stop them…we just request them to ask donation after we do distribution." Urban Health Facility Staff, Sagaing

Similarly in Kayah, participants mentioned a 500 kyat donation in exchange for a LLIN, which could be interpreted as a mandatory payment as respondents used words like "must" and "have to" when describing the donation. One migrant worker expressed fear about discussing payment for nets with the interviewer.

"We all have to donate 500 kyats." Urban Community Member, Kayah

"I must donate 500 kyats when I got the LLIN. We donate by ourselves. We donated 200 kyats in our village. They fixed the rate. We didn't tell about this as we are afraid of them." Urban Migrant Worker, Kayah

In Sagaing and Kayah, one forest goer and one migrant worker respectively referred to the free nets being resold at the market.
"There is some corruption that the LLINs were only given to relatives and there are also some cases who resell them at the market." Urban Forest Goer, Kayah

5.4 Acceptability of LLINs and general net preferences

5.4.1 LLIN acceptability

Although expressing a strong demand for LLINs when discussing net distribution, there were mixed opinions amongst community members, migrant workers and forest goers about whether they liked the LLINs. The aspects of the LLINs that were appreciated (see **Table 6**), which were remarked upon by a minority of respondents, included: the prevention of malaria, the power of the nets to repel and kill not only mosquitoes but other insects and lice, the long-lasting strength of the nets and that they were free of charge.

"*When we are in the forest, we can use LLINs. If so we are free from transmitting malaria and have good health." Rural Migrant Worker, Kayah*

"Even the bedbug is killed by LLIN. And [it] also kills lice. There are many lice on the heads of our villagers. So, they like it." Rural Migrant Worker, Kayah

"They use and like them." Rural Forest Goer, Kayah

Negative characteristics that the three target groups commented widely on included the rough texture of the nets (most commonly cited), net holes that were too large, short height of the net, inadequate size for families to sleep under, a burning sensation when touching the net, holes widening after washing, a strong smell and how the nets were easily damaged or torn (reported in Sagaing). Several participants commented that they found the nets acceptable whether or not they particularly liked the LLINs; they appreciated that they were free and prevented malaria.

"The previous bed net that Sayarma [doctor] gave us could be used as a fence for chicken farm…it is very hard. It is like a sieve to spread and clean the green salad." Urban Forest Goer, Tanintharyi

"Some people use and sleep with bed nets but hole sizes are large. The distributed bed nets from UNICEF with large hole size, we use for fishing purposes." Urban Migrant Worker, Sagaing

"Untreated [net] is better. Not suffer, feeling hot like spicy chillies." Rural Forest Goer, Tanintharyi

Since there is the odour of mosquito nets, the smell remained. When they brought the LLIN, they kept here once and the smell was quite terrible." Rural Community Member, Sagaing

"Some didn't like the smell as they became dizzy and [had a] headache from that odour." Rural Forest Goer, Sagaing

"Since it is free, we want to take whether we like it or not and take whether it is good or bad." Urban Community Member, Tanintharyi

"Yes, they accept. They live in the forest so they have to accept whether they like it or not." Rural Forest Goer, Tanintharyi

When participants were asked which type of net they preferred, LLIN compared to ordinary nets, responses discussed the advantages of the LLINs listed above, also characteristics of untreated nets that they preferred, such as the soft texture and perceived superior quality. A practice described by a private vendor in Sagaing explained how customers who could afford it would buy the ordinary nets and tablets to treat the nets. The general sentiment echoed throughout the data was that people who could afford to buy nets preferred to do so rather than use the LLIN.

"They like ordinary mosquito nets but not LLIN." Urban Community Member, Kayah

"Those who love fancy [nets] do not use the distributed ones. They use nets that they bought." Rural Community Member, Kayah

"The [LLIN] net's height is quite short and big lace holes. If that insecticide treated net is set up, it looks shabby and folded …therefore people do not like. People who go to the forest use these nets. People living in the towns usually use lace nets instead of using insecticide treated nets. People, who have medical knowledge, usually buy the lace bed nets. And then they buy the insecticide tables from the shops and impregnate the lace nets by themselves." Rural Private Vendor, Sagaing

Table 4. Comments from all participants on LLINs

Positive perceptions of LLINs	Negative perceptions of LLINs
Prevents mosquito bites, malaria	Too hard, rough
Kills lice, ants, cockroaches, other insects	Big holes
Long lasting	Too short in height
Free of charge	Not large enough for families
	Hot/burning sensation
	Becomes smaller, misshapen after washing
	Offensive odour/strong smell
	Easily damaged, torn after a short period

When asked why someone would buy a net rather than use a LLIN, participants reiterated the themes above and gave the following responses (in order of frequency, the most cited response listed first):

- Not enough LLINs distributed
- Hard texture
- Not large enough LLINs to cover whole family, size is too small
- Adverse effects (hot, burning, cannot breathe, itchy, rashes)

- Odour
- Easily torn, damaged

5.4.2 LLIN, ITN reported adverse effects

Diverse participants across the regions widely reported various side effects associated with LLIN or ITN use including a hot/burning sensation, itching, dizziness, rashes, hives, headache and "smothering." A few of the participants who commented on these issues explained that these symptoms posed a risk to children's health.

"If we don't keep it hanging for one week, it makes us dizzy when we sleep under it. LLIN makes us feel hot and feel itchy. It is not convenient for children. Yes, it makes children's skin damaged." Urban Forest Goer, Tanintharyi

"Some LLINs have hypersensitivity and are itchy." Urban Township Medical Officer, Tanintharyi

"Some people suffer from itchiness. They said the feeling is like touching chillies. They hang the nets after taking out from the packing." Rural Migrant Worker, Tanintharyi

"The new distributed LLIN is feeling hot and get allergy." Rural Health Assistant, Tanintharyi

"Among LLINs, some of them cause itching skin when it touches the body. When I went for fishing I used the insecticide for bed net soaking to paint on my skin. This made me itchy the whole night and I could not work fishing instead scratching the body." Urban Forest Goer, Tanintharyi

"It caused our skin to become damaged and injured. It causes our faces inflamed and itchy. It is very rough and it makes our face feel very hot like we applied "Galon Yazar say" [a traditional analgesic balm] when we sleep under this net. It can be happened if we touch and rub with net without caution. The net can kill mosquitoes but we cannot suffer any more hot and painful feeling." Urban Forest Goer, Tanintharyi

"Some use, but some feel itchiness at beginning of use of LLINs. Itchiness is like allergy." Urban Health Assistant, Kayah
"I can't sleep with it as I suffered the headache if I sleep with. People who suffer the hypertension can't sleep. If they sleep in that mosquito net, their face get a rash and suffer itchiness. They will be dizzy." Rural Forest Goer, Sagaing

"The ITNs is hot on the face and protuberance on the face due to the effect of the ITNs. We can suffer the heat when we sleep the face towards of the bed net." Rural Community Member, Sagaing

"Primarily, they complained feeling hot and itchy while they started using LLIN. Therefore, we give advice such as to spread LLIN under the shade but not place under direct sunlight which makes reduction of allergic and side effect they face. After giving such education, LLIN usage became higher as well." Rural Health Facility Staff, Sagaing

5.4.3 General net preferences

Overall, the most prominent themes around net preferences that emerged during discussions related to the texture, size and size of the holes in the nets. Preventing mosquitoes and mosquito bites was also

considered significant to multiple participants. Community members, migrant workers and forest goers requested "high quality" nets that were "long-lasting" yet did not have a strong smell. In Sagaing, participants explained that nets made of different materials (thick and thin) were appropriate dependent on season and whether the weather is hot or cool. Participants in Sagaing also observed that nets with bright colours and attractive patterns were popular. These specific preferences are presented in more detail below.

Texture

Participants unanimously preferred nets that have a soft texture, especially forest goers and migrant workers who considered that the soft texture makes nets easier to fold and carry outside of the home. Other reasons that participants gave for favouring a soft material included the ease with which the net hangs and can be arranged around the sleeping area, washed and dried. The range of participants expressed a strong dislike for a hard or rough texture net that a few participants explained scratched their skin.

"They like the soft fabric sheath of mosquito. Some say 'the hard ones can be used for fishing'. It is heavy for carrying to home. They don't like it. They don't want to accept it. They all like the soft mosquito net. Urban Township Medical Officer, Tanintharyi

"We [all] love soft ones. If it is soft, it can be easy in washing, folding etc…."Urban CM, Kayah

"Hard texture is not good for washing. It is not good for keeping in the cupboard." Rural Forest Goer, Tanintharyi

"We like soft ones. Tough one is rough and makes us hurt when we touch it." Rural Community Member, Kayah

Material

Material type was not mentioned by participants in Tanintharyi although this theme emerged in discussions with participants in Kayah and Sagaing. Most community members and migrant workers preferred cotton in Kayah, although one forest goer commented that cotton nets allow small insects to enter. In Sagaing, lace nets were considered more aesthetically pleasing, lighter, cooler (temperature wise) and easier to wash and dry; however migrant workers in this area observed that lace nets are not as durable and instead favoured CYC nets. In the summer, participants explained that they preferred to use whichever material was cooler, and in winter, warmer nets.

"Thin lace bed nets are easy to wash, just put on for drying." Urban MW Sagaing

"Long ago, local people mostly bought CYC but when they will get long-lasting, soft and good quality lace mosquito nets, village community will accept it as a way of preventing mosquito bites". Rural Health Facility Staff, Sagaing

"I change bed nets according to seasons, during the hot season; I do not use CYC cotton. I use lace bed net, CYC cotton in cold season." Urban Migrant Worker, Sagaing

Size

Single men and women, particularly single migrant workers and forest goers, preferred single size nets as these are easier to carry, convenient and take up less space when sleeping in communal areas. For community members, and the other groups that are married and/or have large families, double, triple, family or "whole room" size nets are preferred so that all family members can sleep side by side comfortably and covered without feeling that the net is too tight or too small. Most key informants suggested that generally people prefer double or family size nets. The majority of participants commented that longer, taller nets are ideal so that users can sit up under the net without touching the top.

"It is ok to get single and double bed net to carry it for working in the forest." Urban Forest Goer, Tanintharyi

"Two people size for them [migrants]. They will be tired to bring family size." Rural Migrant Workers, Tanintharyi

"All family members can sleep in a large family sized ones. The size should cover for the families." Urban Private Vendors, Tanintharyi

"We like the taller height, since we have many children, it is easy to turn here and there." Urban Community Member, Kayah

"Size for only one person is better." Rural Migrant Worker, Kayah

"I want family size because I have family. For a married one like me, I want family size. Unmarried one wants the single size." Rural Migrant Worker, Kayah

"We need the single size whenever we go to the forest. They need the family size if there are the families in the household. The family size is for the family and the single size for the migrant." Urban Forest Goer, Kayah

"The smaller the mosquito net, better for them [migrant workers]. The single size is better for them." Rural Community Member, Sagaing

Colour

There was much debate over which colours participants preferred. A range of colours were proposed as ideal; participants frequently mentioned that white nets may not be practical as they become visibly dirty easily, especially for forest goers whose nets may become muddy. Pink was considered appropriate for married couples by some as in Myanmar this colour is associated with weddings. Black was described as preferential by some as the dark colour provides privacy for the people sleeping inside the net. Participants disagreed about whether white versus different colours are more appropriate.

"Blue is clean and white colour net is easily get dirty. Black is better because it can accommodate the dirt." Urban Community Member, Tanintharyi

"For migrants, black colour is better, can't stain." Rural Forest Goer, Tanintharyi

"Colour doesn't matter. Protect from mosquito bite is important." Rural Community Member, Tanintharyi

"When we are going to the forest, the stronger colour are not stained or dirty fast. Some LLIN are white colour and we are afraid of being dirty. Don't want to use. It become easily dirty. It was worse in the area without water. If it was stained dirty, it was not very attractive. It makes less happy. Urban Forest Goer, Kayah

"Newlywed couple like pink [Laughing]. For white, it can dirty easily with children and not easy to wash. Blue, it cannot get dirty easily." Urban Migrant Worker, Sagaing

"We don't the white because we are dirty as we stayed in the forest. Normally, the men didn't wash their legs after they worked in the oil well. So, the colour one is appropriate." Rural Migrant Worker, Sagaing

Hole size of nets

Almost all of the participants unanimously agreed that nets with tiny holes are better. In Kayah and Sagaing, participants requested even tinier holes than the current size used in LLINs to prevent sand flies, aphids and other insects entering the net; this was a common request amongst forest goers. There were also concerns mentioned by a few community members that after washing nets, the holes in LLINs become larger.

"We like small hole…if holes are large, we are scared of mosquitoes entering. We also scared of hole the hole getting bigger when washing." Urban Community Member, Tanintharyi

"They prefer small mesh size. In their mind, large mesh size can let the mosquitoes get into the bed net. And also the small mesh size is good looking and has a soft consistency. They like it better." Rural Migrant Worker, Tanintharyi

"The sand-flies can enter when they are wide. So, the small holes will be better as the mosquitoes can't enter." Urban Community Member, Kayah

Seasonality

"During hot time, it is lace, during cold time, we use CYC cotton." Urban Migrant Worker, Sagaing

Pattern, attractiveness

"Some want fancy. So, if you make LLIN fascinating and charming, everyone will use it. Women love beauty. So, they want beautiful LLINs. Everybody will use charming and soft LLINs." Rural Community Members, Kayah

5.5 Cost and price willing to pay for nets

The reported price of different types and sizes of nets varied substantially between regions, ranging from 2,500-30,000 MMK (Approximately USD 2.50 – USD 30), depending on the type of material and size. The costs that participants felt were affordable also differed between target groups, with

community members generally able to spend more on nets compared to migrant workers and forest goers. Not many participants were able to comment on the price of repellents across regions; the few that did reported low usage and undesirable aspects of use, for instance, that repellents were not long lasting and caused a "hot" sensation when applied. Several participants mentioned the cost of smoke coils, naming the most popular brands as *Jumbo* and *Godzilla.*

5.5.1 Standard price of a net from a private vendor

Not all of the participants were able to name the price of an ordinary net for sale in their community. For the costs that were reported, net price related to the size of the net, specifically single, double or family size net (see **Table 7**).

Table 5. Average reported cost of conventional net (MMK) by region

Size	Tanintharyi (Tier 1)	Kayah (Tier 2)	Sagaing (Tier 3)
Single	3,700	4,600	4,700
Double	5,700	7,000	7,800
Family	8,400	10,400	12,800

Many participants explained that the cost depends on the quality of the net, specifically the type of material used such as lace, cotton, CYC (100% 2-ply cotton).

"Price changes depending on the net's quality." Rural Community Member, Kayah

"It will be depending on the texture of bed net." Rural Migrant Worker, Sagaing

In Kayah and Sagaing, some participants referred to a credit payment scheme, which allowed customers to own nets and make subsequent payments in instalments; however the cost of nets purchased using credit was increased compared to if customers were able to pay all at once in cash.

"Some don't have the money, they exchange with the paddy and sesame in advance. So that they also paid 10,000 kyats when the normal price of the bed net is 8000 kyats. [Laughing]. We had to buy them at the end though we can't afford." Rural Community Member, Sagaing

"We must buy with the credit system as we are poor. If we bought it in June, you will be pay back money in December. They sold 8000 kyat per one bed net in cash but in credit system they increase 15000 kyat for that item…they double the price for credit system." Rural Forest Goer, Sagaing

In Sagaing, a few participants reported that ITNs were available for sale at the local town market for 3,500 MMK.

Private vendors observed that net sales increased during the rainy season.

"When it becomes raining and time of mosquitoes breeding, people used to buy the net. It is better only during rainy season but net sales goes down in winter when there is a few mosquitoes. The good time for mosquito's net selling is from June to October and during rainy season from June to July is the most." Urban Private Vendor, Sagaing

5.5.2 Affordability

Nets

The price participants considered that they could afford or would spend on a net depended on their financial situation primarily followed by the quality of the net. Community members could generally afford to pay more for a net than migrant workers and forest goers.

In Tanintharyi, community members discussed a range of 6,500 to 7,000 MMK for a family size net, whilst migrant workers considered 2,500-5,000 MMK affordable, although they did not specify a size. Other participants stated from 3,000 to 15,000 for a variety of net sizes and qualities.

"If I have money, I will buy the good quality one." Rural Community Member, Tanintharyi

In Kayah, most of the prices for nets averaged lower compared to Tanintharyi; community members quoted 3-6,000 MMK with migrant workers and forest goers commonly considering that they could afford either slightly less or slightly more than 3,000 MMK for a net. Key informants echoed these costs as appropriate for the three target groups, with the exception of an urban private vendor who remarked that 7,000 or up to 10,000 MMK would be affordable to most.

"Here, they can pay 2000-3000 Kyats. Some can't buy with this amount because they have financial problems and many members. Some have 8 family members and some have 16 family members. At least one family has 5 children. They struggle for their income mainly for food and shelter not or bed nets." Urban NGO staff, Kayah

"Yes they can buy, 10000/15000. The type of bed net is CYC Cotton. Above 10000, a few can buy. Around 7000 everybody can buy. In our block they use bed net, 4000/5000/6000 type. Yes, everybody can buy with the price 7000." Urban Private Vendor, Kayah

"2000, 3000 Myanmar kyats, they can buy. Due to mosquito bite, they will get disease, then the cost of treatment is high." Urban Health Assistant, Kayah

"We can afford 2000-3000 kyats for single size, 3500-4000 for double size and 7000-8000 for family size." Rural Community Member, Kayah

In Sagaing, community members could generally afford to pay more (range 7-15,000 MMK) than migrant workers (range 3,000-15,000 MMK) and forest goers (500-10,000 MMK). Key informants commonly estimated that these target groups could afford around 3-5,000 MMK) for a net. An urban private vendor speculated that urban residents could afford to spend more then people living in rural areas.

"The amount of spending will depend on their economic status. I think they can spend not more than 4000 to 5000 kyats." Urban Health Facility staff, Sagaing

"City dwellers mostly buy our net since it is expensive, rural people have not bought much." Urban Private Vendor, Sagaing

"The choice of nets also depends on their home income status and they buy nets related to their own use, like a short net for forest goer." Urban Private Vendor, Sagaing

Repellent

Many participants were not aware of the price of repellents, did not use them or said that they could not afford to buy repellent creams or sprays. Nevertheless, more participants in Sagaing were aware of the price and types of repellent for sale than the other two regions. The brand names mentioned by participants included *Jumbo* (also referred to as "Elephant") *Odoma* and *Godzilla.* In Kayah, participants stated that some of the repellents were from China, whilst in Sagaing several participants said that the repellent brand they had seen was from India. There was a wide range of prices quoted by participants within and between regions, from 300 MMK up to 2,000 MMK. The repellent spray item was reported as more expensive than the repellent cream sold in a tube. Participants considered that they could afford 200 to 2,000 MMK although not many seemed interested in using repellent generally.

"For mosquito repellent, they can buy with 1000 – 2000 Myanmar kyats. They will use mosquito repellent when mosquitoes are abundant." Urban VHW, Kayah

"We didn't use it. It's hot." Rural Migrant Worker, Sagaing

"…mosquito repellent spray is not that long lasting. Lotions are not available and difficult to buy. I have never bought mosquito repellent spray." Rural Health Assistant, Sagaing

"I applied mosquito repellent lotion and went for collecting bamboo shoots in the forest. I was bitten by mosquitoes! In addition, the price is more than 1,000 MMK." Rural Oil Manager, Sagaing

Smoke coils

Data on the price of smoke coils was only provided in Tanintharyi and Kayah. Brands listed included *Jumbo (Elephant), Godzilla* and unnamed Thai brands. The reported price for a box of smoke coils (containing different numbers of coils) varied greatly, from 300 to 1000 MMK.

5.6 Communication channels

5.6.1 Main sources of health information

Participants discussed a wide variety of ways that they received and disseminated health information (see **Appendix 3** for the full range reported). According to nearly all of the participants who commented on this theme, the main conduit for health messages was health facility staff, including doctors, nurses, midwives, doctors from the health department, community health committee members and health volunteers during consultations or community health talks. Information Education and Communication (IEC) materials were also frequently mentioned, usually in the form of posters and pamphlets, followed by health talks with NGO staff. Some community level participants, migrant workers and forest goers reported sourcing information about malaria from co-workers, peers, family members, village elders or other people in their community. Television (*Skynet* and Thai channels) and radio, although included as communication channels were seen as sub-optimal methods for disseminating health messages; either due to weak network coverage, particularly in remote areas, or because viewers/listeners would simply

change the channel to avoid listening to health messages. Nonetheless, a few participants commented that they had heard about malaria from both of these sources. Film clips and short videos shown during health talks were also mentioned by a minority of participants. Key informants suggested that community members received health information from community and religious leaders and in churches, temples and schools. A few migrant workers and forest goers commented that they had never received health information on malaria.

Migrant workers and forest goers across the three regions generally reported receiving less health information from fewer sources compared to community members. Urban community members, migrant workers and forest goers discussed more similar information sources and experiences with health talks than their rural counterparts.

For migrant workers, several participants stated that health information is provided by their employer, such as via a factory health clinic or during health talks at break time. Also, by health facility staff who liaise with employers to provide information about malaria, testing and treatment on site. However, a few key informants acknowledged that there is not a current communication strategy devoted to migrant workers or forest goers, who are either to busy working to attend health talks, or residing deep in the forest which may be hard to reach logistically.

"We know from the health talks in the village arranged by the health care practitioners and basic health care staff. They often come and arrange health talks on dengue, malaria and diarrhea." Urban Community Leader, Tanintharyi

"We all preferred to get health messages from sayars [doctor] because we satisfied with clear messages from sayars. We got messages from TV as well." Urban Migrant Worker, Tanintharyi

"They got from health education sessions of health facility staff. For migrant people, they get from health information from their colleague." Rural Community Leader, Tanintharyi

"UNICEF provided training. Other [people] also told us. We never get from health department. We don't have TV, Sky net and radio so we do not get it from these sources." Rural Forest Goer, Tanintharyi

"I have seen about it on the posters with tiger. I'm afraid of tigers but not mosquitoes. We have never seen and heard about malaria education." Rural Migrant Worker, Kayah

"World Vision. They called us for the meeting like this. They invited everybody including forest workers." Urban Forest Goer, Kayah

"Listening radio, watching TV, I got from these sources. From these sources, I know, it is due to mosquito." Urban Private Vendor, Kayah

"When we go to the village, those medical teams accompanied with me. They provided health education together with me. These medical teams are composed of Kayah tribes, they know the local language. Community is more afraid of them than us." Rural HF Midwife, Kayah

"We got [information] from each other during fever attack." Urban Migrant Worker, Sagaing

"Yes, I live in the forest, no one come here for health talk." Urban Forest Goer, Sagaing

5.6.2 Most effective communication sources

The majority of participants who commented on this theme across the target groups considered that health facility staff including doctors, nurses, midwives and health assistants was the most effective sources of health information. A strong sense of trust towards these individuals and their ability to clearly explain health information were two key factors that participants cited as an explanation for their effectiveness. Furthermore, community members and migrant workers explained that because health staff are educated, have health experience and prevent and cure malaria, they are respected, trusted and therefore people are more willing to follow their advice.

"They have more education than we have. They have also experience. We believe what more educated people said. They show practical so that we believe what they said." Urban Community Member, Tanintharyi

"We trust more on sayars because they can explain what we want to know if health messages were not clear." Urban Migrant Worker, Tanintharyi

"Higher authority told us so we need to follow." Urban Community Member, Sagaing

"We believe the personnel from malaria prevention and control [unit]." Rural Migrant Worker, Sagaing

In all three areas, "health talks" were frequently described as an effective way to disseminate information. Small group discussions with peers which facilitated question and answer sessions on malaria were deemed to be a preferred and effective way to share information.

In Tanintharyi, participants commented that visual aids such as flip charts, cartoons and humour were effective ways to inform communities about malaria; especially during vaccination days and net distributions. In Kayah, small group discussions, a peer system (where individuals ask their peers for information), health committee home visits, IEC materials, TV and radio broadcasts and gifts (to incentivise attendance to health talks) were suggested by participants. In Sagaing, posters, radio, television (where it can be accessed), videos, pamphlets and talks given by religious leaders were common responses. There was disagreement over whether television and radio were effective sources; as discussed above, several key informants reported that people simply change the channel if they are not interested in the health messages. Nonetheless, radio was highlighted as an effective method for low literacy groups.

"We got knowledge by watching TV. We are also interested in listening to what health staff explained to get knowledge. Health education provided by health facility staff is the most effective way. Any sources used by health facility are effective. Staff from health facility come here one time per month." Urban Forest Goer, Tanintharyi

"We prefer to Sayar who come and give health knowledge. We like the method of giving knowledge by person. It is easy to understand for us. We can ask the health staff if we want to know the points, so we like this method." Urban Forest Goer, Tanintharyi

"Provision of health education together with distribution of bed nets is the most effective." Rural Health Assistant, Tanintharyi

"We turn off the radio if program is not interesting while sayars may explain a variety of health knowledge for us" Urban Migrant Worker, Tanintharyi

"Small group discussion is the main and more effective. Peer group will be more effective." Urban NGO staff, Kayah

"Health talks are effective and showing VCD [videos] are also effective methods in delivering health messages. More effective way, would probably be, rather than showing VCDs, Merlin sayarmas [health staff] could come here and explain more." Rural Community Leader, Sagaing

"The main important fact about our village is that religion really has an influential role. If the venerable monks say what to do, it would be more effective to promote their knowledge. They don't know much, but accept whatever related to their religion. Otherwise, they would not accept it." Rural Health Assistant, Sagaing

5.6.3 Challenges

The range of participants discussed multiple challenges associated with accessing health information. Despite previously mentioned that health staff were trusted by communities, acceptance of health messages was considered one of the key communication challenges. A lack of interest or motivation to attend and participate in health talks was another commonly cited issue. Migrant workers and forest goers were considered by some key informants to be challenging populations to reach due to their long working hours and unknown location respectively.

Several key informants, including NGO staff, health volunteers, community leaders and health facility staff remarked upon the difficulties of behaviour change and encouraging people to take up new health practices, such as using a bed net when it is not their habit to do so. This theme was even more prominent in Sagaing, where health facility staff and migrant workers described the reluctance of community members to use nets, or even receive vaccinations due to traditional beliefs. One participant remarked that community members forget health messages after the health education session.

Low literacy was highlighted as another reason why it may be a challenge to reach everyone in the community; rendering some IEC materials such as pamphlets and posters ineffective. Similarly, participants commented on language barriers for ethnic minorities who do not speak Burmese; specifically Kayah and Chin. Health facility staff observed that a lack of funding and transport hampered their efforts to provide health education to communities. One health worker observed that if health talks are aimed at encouraging people to use nets, then nets should be provided alongside the health education sessions, otherwise providing advice without the means to follow health practices may not be as effective.

"The main cause for not to reach to migrants is transportation. It is very difficult; we need permission. They will not get their daily income for listening to our health talk. During their leisure time, they are very tired so they don't want to listen. Some migrants work in the deep forest, cutting the trees. We can't reach to them. We can't reach to border areas as well." Urban Health Facility, Kayah

"Regarding it, we have to look at the HE sessions. One point one of our supervisors explained to us that if we want to change people's behaviour, we need to provide materials near their environment for them to use for intended behaviour…the price of LLIN should be around 1000 or 2000 which is affordable for most of them. The LLIN must be easily available around the environment." Urban Health Facility Staff, Sagaing

"I think it would be very challenging to change the adults. In order to change their habits, it is possible to do sharing information through religious channel, or giving information through village authorities, last point is to use our health staff giving health education at an appropriate time." Urban Health Facility Staff, Sagaing

"However, it is a big challenge to change their behaviour. There is a deeply rooted belief that even pregnant mother want to go receiving immunization, her husband does not allow. Further, if husband allows her, but her mother-in-law does not allow since their ancestors did not take any vaccination when we asked the reason. It could be due to side effect. It is difficult to change their culture." Urban Midwife, Sagaing

"People who have to work in the forests couldn't come. Moreover, the timing for health talks does not coincide with their free time." Rural Health Assistant, Sagaing

"There is communication barrier among them. They do not understand Myanmar language well. I have to explain with their local language." Urban VHW, Kayah

5.7 Barriers to net ownership and use

5.7.1 Net distribution challenges

A few community members were content with the current distribution method, however several strong themes discussing challenges associated with net distribution emerged in discussions with the full range of participants. In order of frequency these included:

1. The insufficient number of nets provided for communities (not enough nets for every household, not enough nets for each family member who sleeps separately)
2. Missing out households if family members are working/travelling outside of the home or not included on the household list,
3. Difficulties distributing to mobile populations and migrants
4. Costly or difficult transportation of the nets to community level, and lastly,
5. Challenges experienced by NGOs coordinating net distribution with local authorities.

These themes are explored in more detail below.

Not enough nets for all households or all people residing in the household

This issue was highlighted by community members and in multiple Key Informant Interviews across regions. The challenge of insufficient nets for large families particularly was more prominent in Sagaing and Kayah than in Tanintharyi.

"The main difficulty is not getting enough mosquito nets." Urban, Rubber Plantation Manager

"Previously they did not distribute with enough numbers." Urban Community Member, Sagaing

"But some families are really big…and we could not provide to each and every person…that's the problem. We couldn't provide one bed net per one person. We could only provide one bed net per one household." Rural Community Leader, Sagaing

"The distributed bed nets are not sufficient in number for some families. They have many family members. No distribution now and they do not sleep with bed nets." Urban VHW, Kayah

Absent during distribution

If community members, forest goers or migrant workers were not at home or did not attend health talks during which nets were distributed, participants explained they missed receiving a net until the next annual distribution. In Tanintharyi, where many community members travel to Thailand for work as day labourers, this was a significant issue. Also in Kayah and Sagaing where community members often went into the forests for days at a time for food, bamboo or to collect items for sale. Migrant workers discussed scenarios of travelling for work only to miss distribution at different sites. Multiple participants recommended establishing a mechanism whereby if they are absent during distribution they can collect their household's net at a later time.

"Among 1500 households, 200-300 households do not have bed nets because they are working at the time of distribution." Rural Forest Goers, Tanintharyi

"We couldn't present all the meetings. I think those who attend the meeting will receive LLIN." Urban Forest Goer, Kayah

"They made a meeting call for whole village and give one bed net per one household. The people who didn't come didn't get the bed nets." Rural Migrant Worker, Tanintharyi

"If we go out for work, there is no one to explain and receive net so that we want distributor to send net directly to our home to sort out the issue of some families did not get the net and some did." Urban Forest Goers, Tanintharyi

Inaccurate census data also led to households receiving zero or too few nets; although participants did not specify how often the household list is updated, individuals must reside in the village for at least six months to be eligible for registration. If family members are absent during the household count, which was considered by migrant workers to be an issue, they will not be included in the list. Even for long-term migrants, those staying in guesthouses are not counted and therefore ineligible to receive a net.

"Does not capture if more than one family living in one household." Urban Migrant Worker, Sagaing

"Newcomers do not get bed nets." Rural Migrant Worker, Tanintharyi

"Sometimes new families are not included in the distribution list. Some are not at home during counting the numbers of families in the community." Urban NGO staff, Kayah

For migrant workers, a lack of access to freely distributed nets was considered a significant issue due to their mobility, exclusion on household lists, and absence of any mapping or agreed distribution strategy.

"We have never received the order to distribute/ reach migrant workers. If we want to promote Insecticide Treated Nets coverage to migrant workers, we have to go to crude oil mines (Hmaws) to collect the data in detail, the exact people who are living in the forests, etc. If Hmaw has leader (Hmaw President), we can contact him." Rural Health Facility staff, Sagaing

"I don't know where migrants are…it is hard to distribute." Urban Health facility staff, Kayah

Although a few health facility staff explained ways that newly arrived families and migrant workers could access nets, these options were not reflected in the data from migrant workers who mostly lamented their exclusion during distribution of free nets.

"People are mobile in this community. Hundred households' leaders and ten household's leaders organize the bed nets distribution. For new comers, they can take the bed nets with households' leader recommendation letters." Rural Health Assistant, Tanintharyi

Transporting nets from health facility to village

For those responsible for distributing the nets, such as community leaders, NGO staff, midwives and health facility staff, several remarked upon the challenges of transporting the LLINs to community level; either due to the cost of transportation, the difficulties of navigating poor roads and waterways or both, especially during the rainy season.

"There are some difficulties since the LLIN is worth of 3000 kyats but the travel cost is around 5000 to 6000 kyats." Urban Township Medical Officer, Tanintharyi

"We have difficulty when we carry LLINs because we have huge quantity. We have no cars." Rural Forest Goer, Kayah

"Another difficulty is transportation cost, we provide per diem and travel allowance…but some areas, the transportation cost is too high. In Kayah, some areas cannot be accessed by motorbike; it needs to carried by men and horses. Rental charges for one horse are more than 10,000 Kyats." Urban Health Facility Staff, Kayah

Challenges for NGOs associated with obtaining local approval for distribution

Only one participant commented on this issue.

"X [name of NGO] distributes once a year. First we collect the population data and then distribute LLINs. We notified them through the Head of village. After we organized the community at the Village Head's home, we distributed them at there. One item was distributed for each household. There is not any distribution of LLIN from the health department in this area. [Laughing] We have to request the permission of authority for distribution. We have to consult with Village Head and Chairman of the township to distribute LLINs. There was difficulty to get permission and approval from authority." NGO Staff, Tanintharyi

Barriers to conventional net access

In addition to the aforementioned distribution issues described above, participants and key informants across the regions and target groups discussed how the cost of bed nets negatively affected net ownership. This theme was particularly prominent for low socioeconomic groups such as migrant workers and forest goers, some of whom who remarked that feeding and clothing their families took precedent over spending money on nets, even when individuals were aware of the risk of malaria. Nevertheless, migrant workers recounted how they would utilise credit mechanisms with local private vendors to pay for nets in instalments in cases when they were unable to pay in full initially.

"The one who can't buy, he doesn't use. Because they didn't get the oil and can't afford to buy [a net]. There are many members of family and they got the income just enough for the food." Rural Migrant Worker, Sagaing

"Some household does not have a bed net before distribution from NGO. They sleep without bed nets. It is due to their financial problem." Urban Community Leader, Sagaing

"The distribution is not enough and cannot afford to buy the net." Rural Forest Goer, Kayah

"Some poor people can't sleep under the mosquito nets. Since they can't afford to buy, they can't use." Urban Community Member, Kayah

"We can't buy because of poverty." Rural Community Member, Kayah

"Some can afford to buy bed nets but some can't. That's not fair. It is very difficult for the ones who can't buy a net. So, those sleep without nets. They [are] bitten by mosquitoes because they cannot afford to buy nets." Rural Migrant Worker, Kayah

"They are daily workers; they can't afford to buy bed nets. They think it is extra cost. They think bed nets are not important. Some people want bed nets but they can't afford to buy." Urban VHW, Kayah

"We can't use bed nets because we do not have and can't afford to buy. Because of poverty, food is more important. I can't buy bed net." Rural Community Member, Tanintharyi

"No money, so they can't buy. Their income is not good, fighting for their food and shelter." Rural Forest Goer, Tanintharyi

"Yes, this is mainly due to poor economy of the family. Since, the communities here are general labourers surviving on daily wedges solving the problems of eating rice and food, they couldn't prioritize health." Urban Community Member, Tanintharyi

5.7.2 Net use

Factors influencing net use (LLINs and ordinary nets)

"Whoever doesn`t want a bed net is a fool." Rural Migrant Worker, Sagaing

Participants provided a host of factors which were considered to affect LLIN and ordinary net usage; the most prominent of which commented on the initial barrier to owning a net, i.e. if one does not own a net, one cannot use a net. The range of factors are presented below in **Table 3** and explored in more detail in the following sections.

Table 6. Factors influencing net use

General barriers to using any type of net	LLINs
• Low levels of health education and malaria awareness • Difficulties in carrying the net when travelling • Leaving behind the net for family to use • Too hot to sleep under a net • Difficult to hang net • Too tired to hang up net • Too tired to hang net at night • Perception that there are not many mosquitoes in the area • Apathetic towards prevention/not interested • Net "too beautiful to use", store instead or save for guests • Using a net is not part of a routine • Want to sleep in the open air, "naturally" • Alcohol use • Divine protection	• Adverse side effects associated with LLINs: burning, itching, choking, rashes • Texture • Holes too big (Sagaing) • Smell • Re-sell net for money • Use net for fishing instead

These reasons were spread randomly across the target groups, key informants and regions, however a few barriers were discussed in relation to specific groups, notably, that for forest goers and migrant workers, nets were described as inconvenient to carry during travel so were not used as frequently. For LLINs, the perceived adverse side effects of using the net and the rough texture were the principal barriers to net use described by participants. Generally, low levels of malaria awareness was the most prominent factor influencing use of ordinary nets, closely followed by the range of other reasons described above.

Adverse side effects

The range of reported side effects associated with using LLINs included a burning sensation, rash, itchiness and difficulty breathing.

"It's too hot when we start to use. The mouth touch it, the mouth feel too hot. Due to the drug of the LLIN. Don't touch skin with the cover sheet. How can sleep without touching?" Rural Community Member, Sagaing

"That odour is that the mosquitoes can't come near the bed net but the people feel hot when they touch [the net]." Rural Migrant Worker, Sagaing

"*The texture of the bed nets are too hot for skin. It will cause rashes on the face." Rural Forest Goer, Sagaing*

"They said it was hot…another house doesn't use anymore due to face flashing and hypersensitive reaction." Rural Midwife, Kayah

"Some said they suffer feeling of heat on face. Do not use LLIN, use another [type of] bed net. LLIN can get feeling of heat." Rural Community Member, Tanintharyi

"They cannot breathe well and also feel hot." Rural community leader, Tanintharyi

"Once I didn't read the instructions but used though I know there was instruction inside. After using for 5 minutes, I got choking and put it out away and then I could breathe well." Rural Community Member, Sagaing

"I can't sleep in the bed net. My children use that bed nets and I sleep outside of bed net. I feel it was smothering." Rural Forest Goer, Sagaing

"Some people think they feel uncomfortable under mosquito net, when I asked them about it, they said that they cannot breathe under ordinary mosquito net. For LLIN, some people mentioned about allergic to insecticide. There was a rumour about one died due to allergic suffocation. But it could be allergic but it can cause only itchiness." Urban Health Facility Staff, Sagaing

"There are some people who experience difficult breathing or heat by sleeping under the mosquito nets. It is rare but there are such cases. Some cases, they have mosquito nets but don't use." Urban Forest Goer, Kayah

"Some don't want to sleep under the mosquito net because it was difficult to breathe inside the mosquito nets." Urban Community Member, Kayah

"I don't sleep with mosquito net because it is suffocating." Urban Migrant Worker, Kayah

"They are not used to sleep under the mosquito nets. It was difficult to breathe while sleeping under mosquito nets." Urban Forest Goer, Kayah

Texture

The rough texture of the LLINs was considered to deter use; a few participants commented that the texture of the net is hard enough to be used for fishing.

"Because they don't like it, it is hard texture and can't fold for storage. They bought from market, all are cotton. They will buy want they like – cotton and nylon. It is due to hard texture of last one [that they do not use]." Urban Community Leader, Sagaing

"They don't like the distributed mosquito nets because the cover fabric sheath is too hard and looks like the fishing net. We distribute LLIN in the area of public health and we also use them. But they don't use them. They use them to catch the fish like the fishing net. It's not comfortable and don't want to use by communities." Urban Health Facility staff, Sagaing

"Some say that they cannot use LLINs because it is rough. So they buy other nets." Rural Community Member, Kayah
"They do not use because of hard texture." Rural Forest Goer, Tanintharyi

"Some said that they can use for fishing purpose with LLIN because of hard texture." Rural Midwife, Tanintharyi

"Yes, there are few who don't use due to hard consistency. If it was soft, there will be more utilization of nets." Urban Midwife, Tanintharyi

Holes are too large

This theme was common in Sagaing; community members, migrant workers and forest goers commented that the LLIN holes became large, allowing mosquitoes and sand flies to enter.

"Holes become large, mosquitoes enter." Urban Community Member, Sagaing

"We didn't carry it because there are many sand flies in the forest. Yes, the sand flies and mosquitoes enter so much." Rural Forest Goers, Sagaing

Smell

"Some don't listen to the urge of using LLINs. They complain that [the net] makes them choke, cannot sleep with net and they cannot bear the scent of LLIN. But those kind [of people] are few; most use and sleep with LLINs." Rural Forest Goer, Kayah

Re-sell, use for fishing

"During distribution in migrant communities, problem is, migrants sell LLINs to the shops. Some take for other purpose, not to sleep with distributed bed nets. Some come and take for fishing." Urban Health Facility Staff, Kayah

Although there were several references in the data mentioning the use of bed nets to catch fish (more so among migrant workers), an NGO staff member denied that net would be used for this purpose.

"…we are not like African people [using mosquito nets to catch fish]." Urban NGO staff

Lack of awareness

Participants across target groups and key informants considered that people who lack knowledge about health and malaria transmission and prevention are less likely to use nets.

"How to prevent [malaria]? It is like shooting a gun, I don't know how to at all." Urban Community Member, Sagaing

"Some men can smoke cigarette but cannot buy mosquito nets and some women can buy lottery but they cannot buy mosquito nets. It indicates their low knowledge and education therefore they do not consider their own health." Urban Health Facility Staff, Sagaing

"Yes, they don't know about how to prevent [malaria]." Rural Oil Manager, Sagaing

"[Why might someone not use a net?] Because they do not have health knowledge. Not because they do not like [the nets]. Lack of knowledge won't let them to think what would be the consequences of illness, malaria." Rural Health Facility staff, Sagaing

"It is 1 out 10 households [who don`t use a bed net]; they don't know how to get these diseases. They are sick due to that. They don't know, this [malaria] is due to mosquitoes. Urban Community Member, Sagaing

"They didn't use it as they are weak education. Some are poor and some doesn't have the health knowledge." Urban Migrant Worker, Kayah

"They don't know about the advantages of sleeping with bed nets." Urban VHW, Kayah

"Some do not know the danger of being bitten by mosquito. So they do not use it." Urban Private Vendor, Tanintharyi

Inconvenient to carry; leave behind for family to use

Forest goers and migrant workers commented that it was not convenient to carry a net when travelling for work or into the forest. Some of these participants explained that in addition to inconvenience, other reasons they would not bring a net outside the home included:

- Forest goers/migrant workers already had to carry multiple items and prioritised rations and tools over a net
- Forest goers/migrant workers would leave the nets they own at home for their family to use
- Forest goers/migrant workers might be "lazy" to carry the net.

A few participants linked the reluctance to travel with a net to a lack of understanding about malaria knowledge and prevention although forest goers stated that despite knowing about the risks of malaria they chose not to carry a net.

"I didn't take it as it is not easy to carry." Urban Migrant Worker, Kayah

"We have to carry many things such as a bed net, blanket and rations. So, we carry the rations first and we leave behind things like the bed net and other little things. That's why we have malaria the most.

Even though we know that mosquitoes cause malaria. But we cannot bring or carry bed nets." Rural Forest Goer, Kayah

"The bed net should be portable, easily carry, long lasting. This one is hard in texture. When people go to the forest, they can't bring, hard to carry. They do not complain about texture. Hammock [net] is also better one." Rural Palm Oil Manager, Tanintharyi

"It is not comfortable to carry bed net while we go forest." Urban Forest Goer, Tanintharyi

"They have no health knowledge, they work for a while, some of them think it is not convenient to carry bed net, some think it is heavy to carry bed nets." Urban Migrant Worker, Tanintharyi

"Some of them do not know how to prevent Malaria, others who know do not want to carry bed nets since it is a burden for them to carry." Urban Migrant worker, Tanintharyi

"We also used the bed nets. The new workers have the bed nets but some don't have. They left it for their wife and family." Rural Migrant Worker, Sagaing

"The local people can't use them as they have no bed nets to bring to the forest." Urban Forest Goer, Kayah

"We cannot bring net when we go out to forest because we have only one net at home. If he bring, the rest of us have no net to use." Urban Migrant Worker, Tanintharyi

"Actually we are lazy for carrying it [the net]." Urban Forest Goer, Kayah

Hot temperature

Participants disagreed over whether hot weather deterred net use.

Participant 1: "He doesn't want because he feels hot if he uses bed net. [Disagreement] Participant 3: "I use bed net whether the weather is hot or humid." Urban Community Members, Sagaing

"Some people do not use maybe it is due to hot temperature. They sleep without bed nets." Urban Forest Goer, Sagaing

"Some people don't use mosquito nets because it was hot. There are some who feel hot don't use mosquito nets." Urban Midwife, Tanintharyi

Difficult to hang net

This theme was more commonly cited for/by forest goers and migrant workers; some of whom suggested that hammock nets would be more appropriate for these populations.

"It was not possible to use mosquito nets in the forest. We have to build long hut if we build 10 hammock. For moving frequently, the hammock with mosquito nets was the best solution." Urban Forest Goer, Kayah

"Because of the nature of venues; e.g. the hut was small but there were many people inside. If each person receives one mosquito net, there is no space to hang the net. The problem of narrow space venues, the space is narrow but many people inside, it is impossible to hang the mosquito nets." Urban Midwife, Tanintharyi

"Some of them who carried bed net only used it as a pillow since it was difficult to find four stands to hook the bed net ready." Urban Migrant Worker, Tanintharyi

Other factors

Other factors that participants mentioned in relation to this theme included:

- Too tired to hang net at night
- Perception that there are not many mosquitoes in the area
- Apathetic towards prevention/not interested
- Net "too beautiful to use", store instead or save for guests
- Using a net is not part of a routine
- Want to sleep in the open air, "naturally"
- Alcohol use[12]
- Divine protection

"Some people fall asleep as they were very tired. Mosquito bed nets may be set up, but usually in the folded up". Rural Oil Manager, Sagaing

"If you provide beautiful one [net], they will keep at home. They store it because it is a beautiful one, they will provide with it when the visitors come to their house." Urban Migrant Worker, Sagaing

"When the guest came to our house, we gave them the mosquito net. We keep it in the box. We have never used it. We used army mosquito nets for the guest and keep it when the guest comes back." Rural Community Member, Sagaing

"Some have habit that they cannot sleep with net. Some think that it's not necessary and unwanted duty to sleep with a net, especially, they are drunk." Rural Migrant Worker, Kayah

"I didn't use the bed net as I sleep after drinking [alcohol]." Rural Migrant Worker, Sagaing

***"…**There was one incident…there was one village, when we give them just nets, they all give them back to us. The village was not happy…because they believe in God they said, God will protect [us] from malaria…So they gave us back all the mosquito nets." Urban NGO staff, Sagaing*

[12] Migrant workers across the regions linked alcohol use to an unwillingness to sleep under a net.

Discussion

This assessment of consumer preferences and barriers to the use of LLINs in Myanmar explored the experiences of a range of stakeholders with the aim of capturing the variety of preferences and challenges faced by different target groups in three distinct geographic regions. The overall findings are discussed here around the key themes, followed by specific recommendations for future programmes.

Although a few participants observed decreased malaria incidence in their areas, participants still listed malaria more than other diseases as a problem in their communities, suggesting that preventing malaria may be a key priority in most regions.

As demonstrated by participant responses, the concept that malaria is transmitted through dirty water, changing climate or relocation demonstrates the lack of awareness around how malaria is contracted. This is contrary to the views of key informants who commented that community members were generally well informed and aware of malaria prevention and transmission. The knowledge gap discussed by community members, migrant workers and forest goers in the data could affect the tools and approaches individuals use to prevent malaria; for instance boiling water to prevent malaria rather than relying on nets and repellent. The data demonstrates that the current health education provided to communities across the regions could be significantly improved in order to encourage the acceptance and use of LLINs.

Whilst many respondents reported net usage, when probed, participants described an array of different methods that they use to deter mosquitoes and prevent malaria, many of which are ineffective. Strengthening communities' understanding of how malaria is transmitted and which prevention tools protect against malaria could positively affect uptake and usage of nets. This is supported by the data that most frequently associated low levels of malaria transmission awareness with lower net use.
By tailoring LLINs to meet consumers' preferences and scaling up net distribution, whilst prioritising the poorest households, net use could potentially be increased. Developing prevention materials for mobile populations that are: lightweight, portable, compact, inexpensive, single size (net) and easy to hang in forests or huts, (such as hammocks) may provide appropriate alternatives for these most at risk groups. Affordable, acceptable repellents and Insecticide Treated Clothing are potential solutions, especially for those working during dusk and at night.

Forest goers and migrant workers commented that they were often unaware of LLIN distribution and lacked access to free nets. Forest goers and migrant workers also reported financial barriers to net ownership more than community members. These challenges to both LLIN and conventional net ownership for these groups increases the risk of malaria infection, particularly during travel or nights spent in the forest. The data underscores the importance of expanding LLIN accessibility to these two groups in new and innovative ways to increase coverage. By ensuring that the families of mobile individuals also possess sufficient nets, migrant workers and forest goers may be more likely to carry a net on their travels.

For community members across regions, LLINs were reportedly generally available, despite some gaps for households that were not on the household census list. Nevertheless, there were still complaints that there were not sufficient nets for all family members sleeping in separate beds. For migrant workers and forest goers, accessibility to LLINs was highlighted as a significant issue; due to their mobile nature often these potentially most at risk groups were absent during net distribution or not entitled to a net in cases where they were not considered permanent residents. Unfortunately, these groups also

most frequently cited cost as a barrier to owning ordinary nets- underscoring the importance of targeting these groups with malaria prevention information and free LLINs that are appropriate to their needs, as stated above. Poorer populations, for instance migrant workers, forest goers and rural community members who may not be able to afford to buy nets should be prioritised during net distribution, in addition to children under five and pregnant women. Household census data needs to be updated more frequently (every 6 months) and more accurately, capturing even short-term residents so that maximum coverage is achieved.

Community leaders asking for donations, an observation triangulated by health facility staff, presents another barrier to ownership for those who cannot afford to or do not want to donate money for a LLIN. External (health department or NGO) supervision of the distribution and raising community awareness that the nets should be free of charge may discourage this practice in communities.

At first participants expressed gratitude for the LLINs and explain that due to the power of the insecticide, they preferred LLINs to untreated, ordinary nets. However, several characteristics of the net were disliked, in some cases to the extent that participants would not want to use the net at all, or buy an untreated net to use instead. In order for LLINs to be liked and used by consumers, it is essential to take into consideration their preferences and offer more acceptable types of LLIN. Specifically, a soft LLIN with small holes (ideally that would prevent sand flies from entering), tall in height, in a variety of sizes (single, double, family, whole room) for consumers to choose from. If possible, offering nets in a few different colours- white, pink, blue, grey or black would also be appreciated by recipients.

Alongside the distribution of LLINs, regular health education sessions should be held with consumers to address community perceptions of adverse side effects, such as the burning, itching and choking associated with the use of insecticidal nets. These perceived side effects may have implications for the introduction of Insecticide Treated Clothing in terms of acceptability, particularly for children.

For consumers who cannot afford to buy nets at current prices, those with a lower income could be offered a payment plan that does not charge such high interest rates, as described by migrant workers in Sagaing and Kayah. If these groups are already at a higher risk of malaria and have been left out of the free of charge LLIN distribution, facilitators, such as payment plans, micro loans or subsidisation of net cost could be introduced to improve access to nets for migrant workers and forest goers. Offering a range of nets that are attractive to different income levels would be ideal to encourage use.

From the data on information sources, there appear to be wide gaps within and between target groups on malaria transmission and prevention information, particularly in rural areas compared to the data from urban sites. Also, an unwillingness to attend community health education sessions due to disinterest or long working hours. In order to improve net use, it is essential to engage consumers and provide accessible information to encourage behaviour change, targeting both urban and rural areas, with a focus on individuals who are unable to participate in community gatherings.

As forest goers and migrant workers miss out on health education sessions when they are absent or working, alternative strategies such as peer mentors or allocating work time to raising health awareness may be an effective strategy. Producing materials in local languages to target ethnic minorities, pictorial IECs for low literacy groups could also improve access to health information. Based on the data, facilitating small to medium size group discussions, Q&A sessions with trusted health professionals may promote attendance, especially in areas where there is low interest in accessing health information. It is essential to allocate more funding for BCC, transport and logistics to provide information platforms for

different target groups. Combining health education with other activities such as immunisation, net distribution and antenatal care could complement other health awareness activities, provide an additional point of contact for information sharing between individuals and health professionals and serve as an incentive to increase participation.

Study limitations

The study was limited by the time available for data collection, which meant that there were only two days allotted to training the data collectors and that it was not possible for the same researcher to supervise data collection at all of the sites.

Recommendations

The documented experiences of consumers sourced from the 339 individuals included in this study provide insight into how LLIN access and use could be improved and malaria information and communication channels could be strengthened. Furthermore, which characteristics and net price ranges are acceptable to different populations. Key programmatic recommendations to enhance malaria knowledge, use of prevention tools and development of appropriate prevention materials are highlighted below. These recommendations combine practical suggestions from participants described in the Results section with proposed recommendations from the research team.

Knowledge and perceptions of malaria

- Improve malaria awareness through health education and community engagement activities specific to different populations, focussing on malaria transmission and prevention; which methods are effective

Prevention practices and challenges

- Dispel beliefs of ineffective prevention tools through interpersonal communication as part of a Behaviour Communication Change initiative
- Increase access to LLINs (see below)
- Develop materials for mobile populations (migrant workers and forest goers) that are: lightweight, portable, inexpensive, single size (net) and easy to hang in forests or huts, (such as hammocks)

LLIN accessibility

- Regularly collect accurate household data, conduct local mapping exercise of migrant workers and forest goers to inform net quantification and distribution
- Prioritise most at risk groups (migrant workers, forest goers, impoverished families) in addition to pregnant women and children under five
- Distribute LLINs annually, prior to rainy season when roads are most accessible
- Facilitate community involvement through key stakeholders (community and religious leaders, teachers, health volunteers) and mobilise prior to and during distribution and net treatment, raise awareness on distribution date and site

- Store spare nets at local health post for newly arrived residents, current residents who are travelling and migrant workers who miss the annual distribution
- Conduct distribution outreach to individuals living in sparsely populated forest areas

General net preferences

- Soft texture
- Small holes (to prevent mosquitoes and sand flies)
- Tall in height
- Odourless
- Available in a variety of sizes (single, double, family, whole room)

Cost of preventions tools and willingness to pay

- For consumers that have low incomes, offer interest free payment plans for nets

Communication channels

- Revise key messages adapted for different populations, highlighting how malaria is transmitted and the advantages of using nets
- Develop IEC materials for low literacy groups and in other languages
- Use visually attractive IEC materials, distribute in communal areas
- Engage religious leaders, and migrant worker supervisors to disseminate information and encourage attendance to health awareness activities
- Engage community members through interpersonal communication such as active dialogues with local health staff, role plays, street theatre, contests
- Combine health awareness sessions with other activities such as immunisation, antenatal care, net distribution
- Disseminate health messages through trusted sources, specifically doctors, nurses, midwives and health department and facility staff
- Train, support peer mentors to provide health information to forest goers and migrant workers
- Health discussions should be conducted in the language used by participants

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Appendices

Appendix 1. Topic guide for FGD with adult community members

Key topics/ themes	***QUESTIONS AND PROBES***
Generic question	1. What are the common health problems in this community? • If not mentioned, ask about malaria
Knowledge of Malaria	2. What do people call malaria in this community? Probe for the local terminology for malaria 3. According to your opinion how do people get malaria? Probe for cause of malaria? (Explore all existing beliefs i.e. bad spirit, bathing in the stream etc.) 4. In which months of the year are people most likely to get malaria? 5. Which groups of people are most likely to get malaria? Why? 6. When people move to this area for the first time, how soon afterwards are they likely to get malaria?
Communication Channels	7. What are the main sources of information/communication about health for people in the community? (Probe: volunteers, facility staff, local media, radio, TV etc.). 8. Which sources are the most effective? Why? 9. Which sources of information do they trust most? Why 10. Any recommendations on how to improve?
Malaria Prevention	11. What kinds of things do people in this community <u>usually</u> do to protect themselves from malaria? Probe for the following: 12. Mosquito nets, types of nets (treated/untreated)? Repellents, boots, clothing, smoke coils, teas..? Who provides? When and where obtained? 13. What are the most preferred products? 14. For nets, what kind are the most popular? Why? *Probe: Colour? Brand? Texture? Fabric/material? Size? Hole size?* 15. Why might some people buy nets rather than use the bed nets that are freely distributed? 16. If people do not use bed nets, what do they use instead and why? 17. What are the reasons people may not be able to get a net? 18. What do people do when they sleep outside in the forest or farm to protect them from malaria? Probe for hammock nets, repellents and other traditional methods etc.
Accessibility	19. How are nets distributed by the health facility/NGOs in practice? *Probe: How often? Who receives the nets? Are nets distributed equally or are some people prioritized? Why?* 20. What are challenges faced during net distribution? 21. How can these be overcome? 22. How could net distribution be improved?

Acceptability	23. What do people think about the nets that have been distributed by the health facility/NGO? *Probe: What do people like/not like about the nets?* 24. How are the health facility distributed nets used by community members/mobile populations/migrant workers? 25. How could the nets be improved? *Probe: Texture, size, colour?*
Cost	26. What is the price for a standard bed net from a private vendor? 27. What is the price you usually pay for repellent? (size and brand name) 28. What would you be willing to pay for a net / repellent that you like?
Barriers	29. What might stop someone from being able to own a net? 30. Why might someone not want a net?
Other	Before we finish, is there anything else you would like to raise or share with me? Or do you have any questions for me?

Appendix 2. Sample size, participant breakdown

Tier	**1. Tanintharyi**		**2. Kayah**		**3. Sagaing**	
Site	Urban	Rural	Urban	Rural	Urban	Rural
CMs	18	19	17	18	16	16
MWs	16	14	22	13	15	17
FGs	12	15	16	15	16	16
Community leaders	1	1	0	1	2	1
Midwives	1	2	0	2	1	
HF staff	2	2	4	2	1	3
Community health volunteers	0	0	1	1	1	1
Private vendors	1	2	1	0	2	1
Migrant worker managers	1 (Rubber)	1 (Palm)	1 (hydropower)	2 (construction)	0	1 (oil)
NGO staff	2	0	0	2	0	1
Total by urban/rural site	54	56	62	56	54	57
Total by tier	110		118		111	
Total sample size:	**339**					

Appendix 3. Range of communication sources mentioned by all participants (by region)

Tanintharyi	Kayah	Sagaing
• Own experience of having malaria • "Others" (people) • Village elders • Television • Doctors from Dept of Health • Doctors during consultation, antenatal appointment, immunisation, during home visits • People who had malaria • Health education sessions (doctors, • HF staff • Malaria organisation • Anti-malaria volunteers • Poster • Reading "journals" • From family members • Co-workers • EPI immunisation programme tour, when in remote areas • Schools • Mobile health unit • Community leaders • UNICEF	• Health assistants • Midwives • Nurses • Radio • Health centre • Pamphlets • NGOs • Books from the clinic • People who have had malaria • Road signboards • Co-workers • Parents • TV • Vector Borne Disease Unit • VHW • Health Dept • Religious organisations • NGOs • Health staff • Volunteers • Health talks in schools • Community health education sessions • Magazine • Backpack mobile health team	• Health talks (at church, home, school, by doctors, nurses) • Pamphlets • Health assistants • During consultations • Malaria control committee volunteers • Volunteer Health Worker, Community Health Worker • Pastor • NGO • TV • Videos • Radio broadcasts • Co-workers • Health centre • Village president • Village health committee