

Rapid Assessment of Malaria in Pregnancy in the Greater Mekong Sub-Region Cambodia, Thailand and Myanmar (Burma)

Prudence Hamade and Mitra Feldman, Malaria Consortium, March 2013



This report is dedicated to the health workers and pregnant women of
Cambodia, Myanmar and Thailand



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List of Abbreviations

ACTs	Aretmesinin-based Combination Therapy
AIDS	Acquired Immune Deficiency Syndrome
An	Anopheles
ANC	Antenatal Care
AUSAID	Australian Agency for International Development
BCC	Behaviour Change Communication
BVBD	Bureau of Vector Borne Diseases, Thailand
CAP	Control and Prevention
CDC	Centers for Disease Control and Prevention
CHWs	Community Health Workers
CNM	Centre for Parasitology, Entomology and Malaria Control, Cambodia
DFID	Department for International Development, UK
DOT	Directly observed treatment
FANC	Focused antenatal care
FFH	Friends for Health
FGDs	Focus Group Discussions
G6PD	Glucose-6-phosphate dehydrogenase deficiency
GDP	Gross Domestic Product
GFATM	Global Fund to fight AIDS, TB and Malaria
GHAP	Global Health Access Programme
GMS	Greater Mekong Sub-region
HF	Health Facility
HIV	Human Immuno-deficiency Virus
ICCM	Integrated Community Case Management
IDPs	Internally displaced peoples
IMR	Infant mortality rate
IPD	In-Patient Department
IPTp	Intermittent Presumptive Treatment in pregnancy
ISTp	Intermittent Screening and Treating in pregnancy
ITNs	Insecticide Treated Nets
IUGR	Inter Uterine Growth Retardation
JICA	Japanese International Cooperation Agency
LLINs	Long Lasting Insecticidal Nets
MAM	Medical Action Myanmar
MCH	Maternal and Child Health
MDA	Mass Drug Administration
MIP	Malaria in Pregnancy
MMA	Myanmar Medical Association
MMR	Maternal Mortality Ratio
MMWs	Migrant Malaria Workers
MSF	Medicins sans Frontieres
MTCT	Mother to Child Transmission

NGOs	Non-Governmental Organisations
NMCP	National Malaria Control Programme
NTDs	Neglected Tropical Diseases
OB	Obstetric
Ods	Operational Districts
PCR	Polymerase chain reaction
PDR	People's Democratic Republic
<i>Pf</i>	<i>Plasmodium falciparum</i>
PMI	President's Malaria Initiative
PMTCT	Prevention of Mother to Child Transmission
PNC	Post Natal Care
<i>Pv</i>	<i>Plasmodium vivax</i>
PPH	Post Partum Haemorrhage
RBM	Roll Back Malaria
RDTs	Rapid Diagnostic Tests
RH	Reproductive Health
RHAC	Reproductive Health Association of Cambodia
SEA	South East Asia
SEARO	South East Asia Region (WHO)
SMRU	Shoklo Malaria Research Unit
TBAs	Traditional Birth Attendants
UNICEF	United Nation's Children's Fund
UNOPS	United Nation's Office for Project Services
USAID	United States Agency for International Development
VBDC	Vector-Borne Disease Control, Myanmar (Burma)
VBDU	Vector-Borne Disease Unit
VMVs	Village Malaria Volunteers
VMWs	Village Malaria Workers
WHO	World Health Organisation
WPRO	Western Pacific Region (WHO)

Executive Summary

The United States Agency for International Development's (USAID) Regional Development Mission for Asia has provided support for malaria control in the GMS for several years, and in 2011 support began through PMI. PMI is considering supporting effective programmes for MIP in the region to reduce its adverse effects on women and unborn infants.

Malaria Consortium has been active in the GMS since 2008, working closely with the NMCPs in Cambodia, Thailand, Myanmar, Lao People's Democratic Republic (PDR), Viet Nam, and Yunnan Province (China).

Malaria infection during pregnancy is a serious public health problem, with substantial risks for the mother, foetus and neonate. Pregnant women are especially prone to severe attacks of malaria which may cause death of the mother and / or foetus, abortion, premature labour and still-birth. However, current WHO recommendations are based upon the available literature, most of which refers to Africa, where transmission is more intense than in South East Asia (SEA). Approximately 50.3 million women in the Asia Pacific Region are at risk of *Plasmodium falciparum* malaria and 85.4 million at risk of *Plasmodium vivax*. Many of these women live in remote mountainous and poorly accessible border areas where they face geographical, socioeconomic, cultural and linguistic constraints to accessing care.

Woman's role as migrants has also been underestimated. Small studies done by CAP Malaria in Myanmar found more than 50% of the migrants were woman and among those women 12 were pregnant.

Artemisinin resistance has been detected in the Thai Cambodian and Thai Myanmar border areas and is suspected in some areas of Vietnam. The role of pregnant women as carriers of resistant parasites both as residents and migrants and the management of resistant malaria in pregnant women has not been addressed. In the artemisinin resistance containment zones in Cambodia and Thailand, malarone +/- primaquine is the treatment of choice. There does not seem to be any specific policy with regard to treatment of malaria in pregnant women in the containment zones although primaquine is contraindicated in pregnancy and the early lactation period. Quinine which is no longer fully effective in Asia is the treatment of choice in pregnant women in the 1st trimester. Pregnant women and infants who are incompletely cured may remain a reservoir of infection as was found in Mass Drug Administration (MDA) pilots in the Comoros Islands (Personal communication Professor Li). The contemplation of Mass Screening and Treatment (MSAT) or MDA (Mass Drug Administration) interventions need to include advice on how to handle drugs to be given to pregnant women and infants.

Despite concern about the high risk of MIP to both the mother and unborn child, the significance as a health problem in the SEA Region may be underestimated. In light of this, Malaria Consortium was commissioned by PMI through a cooperative agreement with the Centers for Disease Control and Prevention (CDC) to carry out a rapid assessment within the Greater Mekong Sub-region (GMS) into the policy environment, the burden and practices surrounding the prevention and management of malaria in pregnancy, with particular focus on Cambodia, Myanmar (Burma) and Thailand. An

assessment team visited the three countries between October 2012 and January 2013. In all field site visits, contact was made at provincial and district /township level. This included meeting managers and policy makers of both the Maternal and Child Health (MCH) and NMCP and, in Myanmar (Burma), with the School Health services. Visits were also made to health facilities. Input was also sought from pregnant women attending antenatal clinics (ANC) as well as those who did not attend ANC.

Comprehensive data on burden of malaria in pregnancy were difficult to find. In 2011-2012, 272 cases of malaria in pregnancy were documented in Cambodia, but this data was only recorded by Village Malaria Workers of the 1025 pregnant women tested 20% were found to be positive and higher rates of positivity were found in the more remote provinces eg 33% positivity in Ratinakiri. In Myanmar/Burma a 0.6 % point prevalence rate in asymptomatic women screened in Rahkine Province was found. Screening among Karen Refugees in Thailand found a 0.6 % point prevalence rate which increases to 36 % over the course of the pregnancy.

Across all three countries, major factors, which appeared to affect risk of malaria in pregnancy (MIP) were found to be: gestation and stage of pregnancy, epidemiology, deforestation and changing environments, vulnerable communities, accessibility and asymptomatic malaria, leading to low levels of malaria testing among pregnant women. Limited coordination between the maternal and child health (MCH) and malaria control departments within the ministries of health, as well as limited training of MCH staff on MIP are also major hurdles.

MCH, Reproductive Health (RH) and disease control programmes (including the NMCPs) often do not produce integrated policies, guidelines or training materials for health staff. WHO has advised integrated Focused Ante Natal Care (FANC), but reproductive health programmes often focus more on the obstetric side of the programmes, and disease prevention, detection and management are secondary considerations. Some NMCPs in the SE Asia region are vertically organised programmes. In Thailand malaria clinics are widespread and more easily accessible than general health clinics, village health workers trained to detect and treat malaria only are being deployed in all the countries of the region. However, because of the perceived severe nature of malaria in pregnancy, most VMWs and low level health facilities are not encouraged, or in some cases, not allowed to treat pregnant women with malaria. Instead pregnant women must be referred to higher centres. It is not known how many women referred from basic levels of care actually reach higher levels of care or resort to traditional or private facilities, which may be more accessible.

In all the countries visited there is restricted access to care in areas of highest malaria transmission, and multiple languages and cultures of the at risk population. In Cambodia knowledge of malaria causes and prevention among pregnant women is good where there are Village Malaria Workers, but women at greatest risk live in remote locations with poor infrastructure, lack of affordable and suitable transport and lack of highly qualified fully trained staff. In Thailand primary level public health facilities do not have facilities for testing for diseases or anaemia. All suspected cases of MIP have to be referred to hospitals often inaccessible to marginalised people due to cost and distance to travel as well as language barriers.

Women at risk of malaria infection during their pregnancies are often the most isolated by virtue of their location and ethnicity. Their pregnancies and the outcome of their pregnancies are often not recorded therefore the burden is underestimated. The serious consequences of malaria infection in pregnancy are largely ignored by policy makers and in spite of the acknowledgment that malaria in pregnancy is an issue that has not been fully addressed by policy makers including WHO and the Roll Back Malaria Partnership very little change has taken place. Cambodia has introduced a recommendation in its treatment guidelines to screen and treat pregnant women but outside of that most national polices have not introduced any change.

Recommendations

- MIP should not be addressed through a vertical approach but be part of focused FANC and comprehensive newborn and child care.
- Stratification of malaria risk needs to be updated frequently in order to focus appropriate preventive, diagnostic and case management services for pregnant women
- In spite of concern expressed by the WHO and the MIP working group of RBM in 2011 little has moved forward in managing MIP in the region. All partners now need to make a concerted effort to develop and implement more focused preventive, diagnostic and treatment programmes for at risk pregnant women especially in remote areas where malaria transmission is highest. Coordination is needed between the various disease control branches of WHO and the department of making pregnancy safer both at headquarters and in the countries.
- Policies and practices need to be rapidly adapted to the changing epidemiological situations. This will be affected by malaria control measures, changing patterns of migration, changing agricultural practices and forest cover. As malaria declines interest from national MoHs and donors may also decline.
- Specific policies need to be made to address the control of MIP in the resistance containment areas in Cambodia Thailand and Myanmar to ensure detection and complete cure of patients in all trimesters
- Given the decreasing prevalence of malaria in the Asia region, and increasingly in Africa, a 'one-size-fits-all' policy for prevention, diagnosis and case management of malaria in pregnancy is no longer be appropriate. FANC policies may need to be area specific.
- Data related to the burden of malaria in pregnancy are unreliable and there needs to be more focus on accurate data. Pregnancy status of all female malaria patients should be recorded at all levels of the health system including VMWs, outreach workers, HC and Hospitals. This will assist with directing scarce resources towards prevention, detection, correct treatment and ultimately elimination of both *Pv* and *Pf* parasites in pregnant women.
- The increasing number of women as migrants need to be addressed. Growing commercial activity in Lao PDR and Myanmar (Burma) as in most countries in the GMS will cause migration patterns to change and inward migration to these areas may increase, posing a greater risk to non-immune populations and the possibility of epidemics. Large tracts of indigenous forests have been cut down but are rapidly being replaced by rubber and fruit plantations. There is also a large reforestation programme (with teak trees) taking place in central Myanmar (Burma).
- Prevention activities should continue and be strengthened including ensuring coverage and usage of LLINs by pregnant women. The safety, efficacy and cost effectiveness of personal

protection methods including use of repellents and treated clothing could be explored with the possibility of price support of commodities for pregnant women.

- In view of the difficulties associated with the introduction of ITPp (Intermittent Preventive Therapy) in the region screening and treatment (ISTp) of pregnant women should be implemented where malaria transmission remains relatively high
- Health Education, BCC and advocacy should be coordinated between the various MoH departments (e.g. NMCP/MCH/RH/disease control/nutrition /school health), and all should be produced where needed in local languages or be adapted for non-literate audiences
- Training materials for MCH/ANC cadre and midwifery schools should be developed in coordination with various NMCPs in each country
- Services for pregnant women (ANC), delivery and postnatal care (PNC) as well as for neonates and infants at primary health centres and villages should be coordinated and should include integrated management of childhood illnesses (IMCI), ICCM and nutrition programmes Pre pregnancy counselling should be offered.
- *Pv* is now equally likely to be the cause of infection in pregnant women, if not more so than *Pf*. Different approaches need to be developed to ensure the prevention, diagnosis and case management of *Pv* malaria. These might include pre-pregnancy or post pregnancy radical treatment for clearance of hypnozoites and determination of an effective treatment during pregnancy to completely clear parasites where chloroquine is no longer fully effective. Where Chloroquine remains effective weekly prophylaxis might be introduced possibly using village level health workers to deliver the intervention and ensure compliance.
- Findings from regional research into the dangers of malaria for pregnant women and the foetus need to be taken on board by both Reproductive Health and NMCPs. Perhaps a workshop for interested parties from the countries should be held to look at how policies could be developed and implemented at the country level
- Access to care for remote populations remains the greatest challenge in all countries of the region. The risk of malaria infection in pregnancy is highest in areas that are least accessible in all ways to services for prevention diagnosis and case management novel approaches to improve access need to be explored, including the development of village based finance/insurance schemes and transportation programmes

Several possible operational solutions are suggested for consideration:

- Introduction of ISTp in malaria endemic areas to detect and treat asymptomatic infections and ensure adequate clearance of parasites causing increased morbidity and risk of mortality for both mother and foetus and the new born. *(Particular focus on high transmission zones and areas where resistant malaria may make complete cure problematic)*
- Incentive schemes for women to attend ANC and deliver in the health facility one (example the RHAC scheme in Cambodia)
- Development of ethnically appropriate BCC materials directed to the prevention and early treatment seeking for malaria and the need for regular testing
- 6 monthly coordination meetings between MCH/Departments of Disease control, Nutrition and School Health to review data and refine policies
- Cooperation during training of midwives between RH and NMCPs to ensure midwives have a high level of awareness of the need for testing pregnant women for malaria and anaemia

- Pre pregnancy counselling to include radical treatment of Pv malaria to eliminate hypnozoites before conception. PNC to include primaquine where pv infection has occurred during pregnancy
- VMW/CHW/malaria clinics to be allowed to treat simple malaria in pregnant women
- Coordinated training of midwives by RH and disease control programmes
- Community mobilisation schemes to develop methods of improving geographical and financial access to care for pregnant women and children

Several research gaps were identified, including:

- The feasibility and acceptability of the introduction of routine screening during pregnancy
- Defining the true risk of malaria in pregnancy by screening pregnant women during the nine months of pregnancy, to determine the cumulative prevalence in different transmission settings.
- Feasibility of the introduction of IPTp with different drug regimens in areas where infection rates may be high.
- Further research into the effects on the development of the foetus
- Determining if the combo RDT used is sensitive and specific enough in pregnant women to detect low parasitaemia caused by both *Pf* and *Pv*
- The development and testing of a mobile, bedside PCR/LAMP machine to detect low parasitaemia in asymptomatic pregnant women and newborn infants
- The feasibility and effectiveness of education of adolescent girls in pre-pregnancy planning
- Feasibility and impact of pre-pregnancy screening and treatment for *Pv*
- Feasibility and impact of introduction of tools and community based interventions to introduce pre-referral treatment for severe cases.
- Models of community based transport referral systems for pregnant women.
- Migrant patterns affecting women
- Role of malaria on maternal and neonatal anaemia in the GMS (especially Myanmar (Burma), where maternal anaemia is as high as 70%)

Introduction

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This report is based on the findings from interviews and review of literature.

Report Findings

Malaria infection during pregnancy is a serious public health problem, with substantial risks for the mother, foetus and neonate. Pregnant women are especially prone to severe attacks of malaria which may cause death of the mother and / or foetus, abortion, premature labour and still-birth. However, current WHO recommendations are based upon the available literature, most of which refers to Africa, where transmission is more intense than in South East Asia (SEA). Approximately 50.3 million women in the Asia Pacific Region are at risk of *Plasmodium falciparum* malaria and 85.4 million at risk of *Plasmodium vivax*. Many of these women live in remote mountainous and poorly accessible border areas where they face geographical, socioeconomic, cultural and linguistic constraints to accessing care.

Woman's role as migrants has also been underestimated small studies done by CAP Malaria in Myanmar found more than 50% of the migrants were woman and among those women 12 were pregnant.

Artemisinin resistance has been detected in the Thai Cambodian and Thai Myanmar border areas and is suspected in some areas of Vietnam. The role of pregnant women as carriers of resistant parasites both as residents and migrants and the management of resistant malaria in pregnant women has not been addressed. In the artemisinin resistance containment zones in Cambodia and Thailand, malarone +/- primaquine is the treatment of choice. There does not seem to be any

specific policy with regard to treatment of malaria in pregnant women in the containment zones although primaquine is contraindicated in pregnancy and the early lactation period. Quinine which is no longer fully effective in Asia is the treatment of choice in pregnant women in the 1st trimester. Pregnant women and infants who are incompletely cured may remain a reservoir of infection as was found in Mass Drug Administration (MDA) pilots in the Comoros Islands(Personal communication Professor Li). The contemplation of Mass Screening and Treatment (MSAT) or MDA(Mas Drug Administration) interventions need to include advice on how to handle infection in pregnant women and infants.

Chloroquine is used to treat *Pv* malaria in all trimesters but increasing evidence of declining efficacy in the region has led to a search for alternatives. In Cambodia all species are now treated with ACTs. A recent study from Thailand has demonstrated that the efficacy and pharmacokinetics of amodiaquine in pregnant women, making it a suitable alternative²².

More background information can be found in Annex 1.

Table 1: Demographics of countries¹ included in this rapid assessment

	Cambodia	Thailand	Myanmar (Burma)
Population	14,431,777 (Est. 2012)	67,091,089 (Est. unknown)	56,000,000 (Census, 1983)
Population growth rate	2.0	0.3	0.6
Fertility rate	2.6	1.6	2.0
ANC 1 (%)	89	99	80
ANC 4 (%)	27	80	73
Start of ANC in 1 st trimester	59%	N/D	N/D
Skilled attendant at birth (%)	63	100	99
Institutional delivery (%)	61	23	64
Life time risk of maternal death ratio 1:∞	110	1200	180
Contraceptive prevalence	51	80	41
Low Birth Weight (LBW)(%)	9	7	9
MMR /100,000 live births	206	48	136-527 [†]
NMR/1000 live births	22	8	32
IMR /1000 live births*	87-43	26-11	79-50
<5MR/1000 live births*	121-51	32-13	112-66
Anaemia rate	44	N/D	61
Took iron tabs for 90 days	57%	85.7%±	N/D
Birth registration %	66	99	72

[†] Nationwide Cause specific Maternal Mortality Survey 2004-2005. Range is from different areas of the country
ANC 1: attended first ANC visit

¹ From UNICEF State of the World's Children/Mothers report, except where indicated

ANC4: attended four ANC visits, as advised by WHO

N/D: no data

∞ Life time risk of maternal death is the probability that a 15-year-old female will die eventually from a maternal cause assuming that current levels of fertility and mortality (including maternal mortality) do not change in the future, taking into account competing causes of death.

\pm Thai National Reproductive health survey 2009

*1990-2010

Table 2: Comparative pregnancy risks in high and low transmission areas

	low transmission	medium to high transmission
Severe malaria	+++	+
Mortality	+++	++
Primigravida at risk	+++	+++
All pregnancies at risk	+++	+
Increased risk of PPH	++	+++
Severe anaemia	++	+++
Foetal loss	+++	++
Still birth	+++	++
IUGR	++	+++
Prematurity	+++	++
Placental malaria	++	+++
Anaemia of new born	++	+++

Factors impacting malaria control in pregnancy

a. Gestation and stage of pregnancy

In many studies, primigravida and adolescent mothers appear at higher risk of infection than later pregnancies²⁶ although the difference is not so marked in low transmission areas. Human immuno-deficiency virus (HIV) infection positive women are at risk in all pregnancies. Parasitaemias are at the maximum in the second trimester, which means that infection may commonly occur in the first trimester even when IPTp is not recommended. Placental malaria in the 3rd trimester, when nutrient demand of the foetus is at its maximum, may cause nutrient deficiency in the baby and IUGR, as well as prevent the passage of immunoglobulin, which confers passive immunity on the neonate and prevents infection in the early days of life. Malaria at the time of delivery increases the likelihood that there will be parasites in the cord blood and that the baby will be at higher risk of congenital malaria or malaria in the first four months of life²⁷.

b. Epidemiology of the main vectors in the region²⁸

Vectors in SEA exhibit different habits than those found in Africa, including the tendency to bite in the early evening and early morning when women may be outside of the house, also rendering the use of ITNs as less effective. See Annex V for characteristics of local vectors

c. Deforestation and changing mosquito epidemiology

Changes in the distribution and type of forests and the impact of this on the vector species and burden of malaria are not yet clearly understood. This is especially true in areas where native forests have been replaced with large tracks of rubber trees and fruit plantations, as well as crops such as maize and cassava. Large reforestation projects may influence the transmission of malaria in the future. Migrants coming to work in these places and in areas of development such as dam building and road/rail construction may have little immunity. A recent outbreak of malaria in the Veal Veng Dam construction project in Cambodia described by the NMCP in Cambodia and an outbreak of malaria in Southern Laos among Vietnamese migrants demonstrates this risk. Entomological studies in Myanmar have demonstrated the presence of *An. Dirus* in rubber plantations (personal communication from Daw Mar Mar Win, Senior Entomologist at Myanmar NMCP).

d. Malaria, HIV and Acquired Immune Deficiency Syndrome (AIDS) ²⁹⁻³²

Malaria and HIV/AIDS are two of the most important infectious diseases, which affect millions of people across overlapping geographic distributions. Pregnant women suffer particularly serious consequences when infected with both HIV/AIDS and malaria. HIV/AIDS can increase the adverse effects of malaria, including anaemia and placental malaria infection. Pregnant women with both malaria and HIV are at higher risk of developing severe anaemia than are women with either infection alone, and also have a higher risk of delivering a premature or LBW infant. Several observations have implicated malaria as a potential risk factor for mother to child transmission (MTCT) of HIV. Malaria infections can increase HIV loads in peripheral blood and greater viral loads enhance the risk for MTCT of HIV. In addition mothers co-infected with placental malaria are at an increased risk of transmitting HIV to their infants, thus improved malaria management during pregnancy becomes an urgent priority.

e. Maternal and child health services

The health of women and girls in childhood and adolescence affects their ability to undergo a trouble free pregnancy and deliver a healthy baby. Child Health and School Health services need to take a more integrated approach. In Myanmar, at Township level, the MCH person in charge is also responsible for school health but adolescent teaching programmes do not address menstruation and preparation for pregnancy.

f. Lack of integration of services

Women are also largely responsible for accessing care for infants in the post natal period. Persons responsible for delivery of post natal care for the mother, an often neglected area, need to also be trained to deliver nutritional supplements such as vitamin A, breast feeding support and delivery of early immunisation for the infant as well as examination of the infant to detect correctable abnormalities and early signs of disease.

The planning and delivery of services that deal with disease control are not always well integrated into the services that provide RH and MCH. This includes other departments of government with interest in maternal health, such as nutrition and education departments. According to Dr Thung Rathavy, Director of the MCH services in Cambodia, formal meetings with the Centre for Parasitology, Entomology and Malaria Control (CNM) and other departments within the Ministry of Health (MoH) do not happen frequently. In Myanmar, where midwives take a major role in delivering outreach to remote communities, there is a lot of informal contact between RH and infectious disease control personnel at director level and a yearly meeting of the Technical Advisory Group. The NMCP regularly trains midwives in malaria prevention and control. Specialist doctors in tertiary hospitals sometimes do not receive updated training in malaria care.

g. Vulnerable communities

Rural women, ethnic minorities, refugees, Internally Displaced People (IDPs) and illegal migrants who often live and work in the mountainous, forested border areas of the region have reduced access to care both for disease control and reproductive health services. Information with regard to the prevalence of malaria in these groups is dependent for the most part on organisations that work with those groups such as American Refugee Committee, Medical Action Myanmar (MAM), SMRU, MSF, Health Poverty Action and Global Health Access Programme (GHAP). In general the available evidence points to a much higher level of malaria infection, less access to malaria preventive tools, a higher prevalence of moderate and severe anaemia, reduced access to comprehensive antenatal care and delivery by skilled attendants, as well as limited access to health education and birth spacing tools than in the general population of the country. These groups are also associated with earlier marriage and higher fertility and therefore at greater risk of malaria in pregnancy and its severe and life threatening consequences.

A 2008 survey³³ financed by the Mobile Obstetric Maternal health workers project among populations residing in remote areas of Eastern Myanmar showed that at the time of the survey 7.4% (n=171) of women were positive for *P. falciparum* malaria. This differed between pregnant (n=40, 10.4%) and non-pregnant women (n=117, 6.5%) (OR=1.67, 95% CI 1.11–2.51). Approximately 61.1% (1,403/2,297) were estimated to have haemoglobin levels <11.0 g/dl; such levels were associated with malaria parasitaemia (OR=2.59 [1.70–3.95]) but were not significantly different between pregnant and non-pregnant women. Ethnic minority communities may be further excluded from services due to cultural and language barriers as well as, in some areas, by conflict and discrimination. This includes such communities as the Rohingya in Western Myanmar, unregistered migrants in Thailand and ethnic minority groups in Northern

and Eastern Cambodia. The same holds true in other countries of South and SE Asia including India, Yunnan Province (China), Lao PDR and Vietnam.



Karen ethnic household in unofficial village just outside of Mae Sot, Tak Province, Thailand

h. Accessibility

Pregnant women need to access care for the management of their pregnancy and for the proper case management of illness during the ante-natal and post-natal period, when they are most vulnerable. Access to ANC, disease prevention services and safe delivery, especially for vulnerable populations, is often limited geographically, financially, culturally and linguistically. Many communities are cut off from services especially during the rainy seasons due to poor infrastructure and lack of transport. Transport designed to take pregnant women in trouble or seriously ill to hospital is especially limited.

Cost of care is another barrier to access. For example, an ambulance in NE Cambodia cost 150,000 Riels (approximately USD\$40) to travel 50km and a normal delivery in the hospital cost 40,000 Riels, with 20,000 Riels extra for additional complications.

In some communities permission needs to be obtained from husbands, mother in laws and even village elders before care can be accessed. Language problems mean that when a women needs to access care in a health facility there is often no one who can talk to her in her own language.



The 'road' from Nhang Health Post to Andong Meas Health Centre in Ratanakiri Province, Cambodia

The Mao Tao Clinic, in Mae Sot Thailand (close to the Thai-Myanmar border) has a large number of ethnic minority health staff, as do the clinics operating in the border camps. Many women migrate to the camps in the last months of pregnancy, possibly bringing malaria parasites with them, to obtain care in these clinics as they are unable to access care within Myanmar's borders. Thai district hospitals near the Thai-Myanmar border also have staff who can translate for ethnic minorities, but if the patient is not a registered migrant they are liable to pay for these services, although many are exempted. Health education materials are often not written in the relevant ethnic minority languages, even where this is possible. In Cambodia, for example CARE Australia has attempted to produce a written form of the main ethnic languages. However there has been no coordination to date between CARE and the MoH departments to use such a form to produce health education materials. In Myanmar the health education materials and antenatal record cards are all written in the main Myanmar language (Burmese) and are very wordy, making them less accessible to ethnic minorities and women with a low level of literacy. In Cambodia there is a lack of money at the central level to develop materials directed to the management of pregnancy/post-partum period and prevention of malaria.

Some innovative schemes have sought to address some of these access issues. The Reproductive Health Association of Cambodia (RHAC) has promoted attendance at ANC by providing women who attend four ANC visits with free delivery in the health centre. However, this is limited to the 18 operational districts in which RHAC operates, the majority of which are in non-malarious areas. In some areas of Cambodia midwives are paid USD\$15 per delivery in a health centre,

some of this payment (USD\$1-\$2) is supposed to be given to TBAs to encourage them to bring women to the health centre for delivery. In line with WHO guidelines, Cambodia strongly discourages delivery by TBAs; therefore they are no longer provided with clean delivery kits and are advised to bring pregnant women to the health centre for all deliveries. While this is an admirable policy, the de-skilling of TBAs may be dangerous, particularly in remote and hard to reach areas where access to health centres and formal health care providers is limited. During the course of interviews we found that in Thailand, among the unregistered migrants on the Thai-Myanmar, border delivery by TBA is the norm. Home delivery is most common in Myanmar, where midwives deliver the women at home. Delivery by TBAs/auxiliary village-based midwives occurs mostly in inaccessible places.

i. Women and migration

Women are increasingly taking part in the migrant workforce: as rubber tappers, in fruit plantations and even in construction work, often without access to basic health care services, let alone ANC. Despite repeatedly being told that the majority of migrant workers are men, women do in fact often accompany their husbands when they migrate for labour, meaning they are vulnerable to malaria yet without access to ANC or malaria diagnosis and treatment. The Control and Prevention (CAP) Malaria project found that in Thanyathiri Division out of 1,200 migrant workers [and their families] screened for malaria, 611 were women of child bearing age. Of these, 12 were pregnant and five tested positive for malaria (personal correspondence from Dr May Aung Lin, Country Programme Director, CAP Malaria).

j. Low suspicion of infection in pregnancy

In all three countries, the detection of malaria is not carried out routinely among pregnant women in spite of the evidence that malaria may be asymptomatic, even in low transmission zones. Pregnant women are only tested if they have fever and even then only if the health worker suspects that the fever is malaria. Women delivering in malaria endemic areas are routinely screened for malaria when they attend clinics supported by NGOs such as MSF, or those in the border camps and the Mae Tao clinic in Thailand: positivity ranges from 2% in Rakhine State, Myanmar to 0.6 % in SMRU-supported camps in Thailand.

Regional policy environment

Despite concern about the high risk of MIP to both the mother and unborn child, the recognition that it is a significant health problem in the SEA Region has been under-estimated by policy makers and health care providers alike. A recent malaria programme review in Cambodia stated that malaria in pregnancy is not a problem, although the report confirms that very little specific data is collected on the burden of malaria in pregnant women³⁴. This is despite USAID funded research from 2011, which showed a malaria prevalence of 6% among pregnant women in Ratanakiri Province³⁵. Relationships between MCH/RH departments and vector borne disease control programmes have been limited and although many training programmes for providers of care in pregnancy and the

post-partum period contain references to malaria, it is a minor part of the training programmes. Myanmar appears to have the most integrated programme to deliver care, midwives are trained to do RDTs and treat malaria positive cases with artemisinin based combination therapies (ACTs) both in rural health centres and on outreach visits to the communities. Recent policies to train a cadre of CHWs to focus on child health will include neonatal interventions, growth monitoring and nutritional advice as well as well as ICCM. In many of the countries in the region, malaria is seen to be a problem only affecting adults over the age of 15 and then mostly men who go into the forests for work. However, anecdotal evidence from the various people interviewed by the assessment team (including pregnant women) suggests that women are increasingly involved in the work force, in all the countries we visited.

The focus of attention of international bodies on *Pf* malaria in the high transmission zones of Africa, the lack of a suitable drug for IPTp³⁶⁻³⁷ and the fact that malaria is limited in its distribution within countries has meant that there has been a lack of attention to the problems of SEA pregnant women and their infants. Malaria control and reproductive health programmes, when developing nationally appropriate policies, guidelines and training materials have to bear in mind that there may be specific interventions needed in the malaria endemic areas. WHO and its partners in the region have been focusing their attention on containment of artemisinin resistance and malaria elimination. MCH programmes concentrate on more universal problems such as identification of sexually transmitted infections, including HIV, and obstetric complications. Since young males and migrant populations are seen to be most at risk, malaria training materials and related behaviour change communication (BCC) tools do not specifically target pregnant women.

Assessing the burden of malaria in pregnancy

Reliable data related to the burden of malaria infection among pregnant women is difficult to obtain even from public sector sources and WHO, as the pregnancy status of infected women is often not recorded. Women access care when they are ill from various levels of private providers, such as village shops, traditional healers and private health practitioners and, since data collection tools are not standardised and private sector data isn't captured in the national health management information system much data is lost. This was the case in all three countries visited. Many women in malaria endemic areas have poor access, both geographical and financial, to publically provided health care and thus are not included in the national figures. In areas with village malaria workers, they are trained to ask women whether or not they are pregnant before administering treatment and refer all pregnant women who test positive to a health facility as they are not supplied with the appropriate drugs to treat malaria in the first trimester. It was felt among many that male village level workers might not feel comfortable asking women whether or not they were pregnant. At all levels of the health system, data on referrals do not record pregnancy status.

The most reliable data collection on malaria in pregnancy comes from the facilities that serve displaced persons in the Thai-Myanmar border areas but these only serve certain groups of women, largely from deprived ethnic minority populations within Thailand or those able to cross the borders. Reporting of data from public facilities is often incomplete although great efforts are underway by all

countries to improve data collection from the village level to the central level with greater computerisation of reports. In the course of these strengthening activities, it will be increasingly important that the data from disease control programmes and maternal and child health/reproductive health programmes and if possible private sector sources are shared. This will enable joint planning and improve the provision of care for pregnant and post-partum women and their new born infants with the long term aim of reducing maternal, neonatal and infant mortality.

Table 3:

Data source	Myanmar	Cambodia	Thailand
Malaria clinics	Record those who attend	None	Do not record MIP
WHO	Collects records from HMIS	pregnant women screened in Ratanakiri showed 4% prevalence	Does not record data
Private sector	None	None	None
VMW	None	Only source of data 1, 528 VMWs in the country, (17 provinces) all provinces report cases; 2011 1086 pregnancies (20%)	Malaria clinics and malaria post do not record pregnancy status
NGOs	2% in Rakhine province(MSF) JICA Bago 0.05 OPD, 0.17 IPD CAP mal 1,200 migrant workers screened for malaria, 611 were women 12 pregnant 5 tested positive for malaria MOM (2007) 10.6% prevalence E. Myanmar	CAP malaria 7 provinces positivity rate 16% (81 women tested)	Mae Tao clinic (Karen women) only test symptomatic women. SMRU only serves ethnic minorities from Myanmar. Point prevalence 0.6% cumulative prevalence 36%
Hospitals and health centres	Report to township level .	Do not record pregnancy status	Data not recorded by electronic system
Data source	Myanmar	Cambodia	Thailand
Malaria clinics	Record those who attend	None	Do not record MIP
WHO	Collects records from HMIS	pregnant women screened in Ratanakiri showed 4% prevalence	Does not record data
Private sector	None	None	None
VMW	None	Only source of data 1, 528 VMWs in the country, (17 provinces) all provinces report cases; 2011 1086 pregnancies (20%)	Malaria clinics and malaria post do not record pregnancy status

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Hospitals and health centres	Report to township level .	Do not record pregnancy status	Data not recorded by electronic system

Research from the region on malaria in pregnancy

There is extensive literature on malaria in pregnancy, with major funding directed towards research and programmes, such as the MIP Consortium. However, much of that research is directed to the high transmission zones of sub-Saharan Africa and the role of *Pf.* Low transmission zones and the role of *P. vivax* have been relatively neglected. In Cambodia, only two pieces of unpublished research are available on the prevalence of MIP in Ratanakiri Province in the North East.^{35, 36} A considerable amount of research has been carried out in Myanmar but it has not been published in high impact journals and is indeed a lost resource to the international community. At a recent meeting in Yangon of the 41st Myanmar Health Research Congress in January 2013, two papers were presented with mention of malaria in pregnancy and four research projects are planned for next year.

The most comprehensive research in the countries visited comes from the Thai-Myanmar border camps by Dr Rose McGready and the team from SMRU. Extensive, definitive work on the prevalence of MIP has been carried out including on *Pv* and its effects on the mother and foetus, as well as the safety and pharmacokinetics of drugs to use in pregnancy³⁷⁻³⁸. India has also produced many research papers however these have largely had no effect on policy making. There is on-going research from the MIP Consortium into the feasibility and effectiveness of intermittent screening and treating in pregnancy (ISTp), for malaria in India and some African settings. This research will be all the more relevant as malaria transmission declines in Africa and low transmission becomes the norm. Further exploration is warranted of the evidence available from NGOs, such as MSF, who have included malaria screening and treating for pregnant for some time in India, and Burundi (where Sulphadoxine/Pyramethamine and chloroquine were banned from use in 2004 following the adoption of ACTs for treatment). MSF and MAM are also screening patients in Rakhine and Mon States in Myanmar and results should be shared with the national Vector Borne Disease Control.

Interview with Dr Rose McGready of SMRU (in Chiang Mai)

Dr McGready has supported a good deal of research into the effects of MIP among the refugee and migrant population on the Thai-Myanmar (Burma) border. The main conclusions of these researches is that in areas where malaria is endemic, even in very low transmission zones, the severe and often unacknowledged effects of malaria in pregnancy need to be addressed. In SMRU-supported facilities (the majority of which are in camps) pregnant women are screened for malaria very frequently - ideally once a week, from as early in the pregnancy as possible. Research has shown that when tested regularly, the point prevalence of malaria of 0.6 % translates as a cumulative prevalence of 36% among pregnant women. *Pv* has been show to also have major adverse effects on the pregnant women and her child. *P. vivax* is more difficult to treat as primaquine cannot be given during pregnancy or when breastfeeding. Dr McGready suggests pre-pregnancy preparations should include radical cure of *P. vivax* with primaquine in the months leading up to conception. Primaquine safety studies are planned and sensitivity and specificity tests for G6PD deficiency are to be evaluated.

WHO in the SE Asia region

During the course of this investigation we met with representatives of WHO in the region including a representative of the Department of Making Pregnancy Safer. Understandably much of WHO's efforts are directed towards containment of artemisinin resistance which is a serious threat to not only this region but all the malaria endemic countries of the world. However all expressed interest in the outcomes of this investigation. The MIP working group of Roll Back Malaria (RBM) had a meeting in Geneva in 2011 when the issues of malaria in low and unstable transmission areas was discussed

The main conclusions of the meeting were:

- In low to moderate transmission settings, MIP is associated with high morbidity and mortality to both mothers and their babies.
- There are good political and financial momentums in scaling up MIP intervention programmes in the Asia Pacific region. MIP intervention strategy should be included in national policies.
- There are still gaps in evidence of the most effective intervention methods in low to moderate malaria transmission settings or in places where malaria is declining.
- Early detection and prompt treatment could be the best option available to save lives.

- Integration and coordination between RH/MCH unit and NMCP is central to ensure program implementation.
- ANC is the focal point for the delivery of MIP intervention programmes.
- Global Fund to Fight AIDS, TB and Malaria (GFATM) and other funding opportunities would supplement the efforts to scale up MIP intervention programmes.
- Community participation plays a major role in achieving universal coverage of the programme.³⁹

In spite of this advice very little has changed in the provision of care for pregnant women with malaria in SE Asia

Country Profiles and Findings

1. Cambodia

In Cambodia, Malaria is a key contributor to anaemia, complications during pregnancy, low birth weight and poor child growth. Cambodia has around 14,431,777 people (estimated in 2011) with 3,040,000 million of the population at risk of malaria in 20 out of 24 provinces².

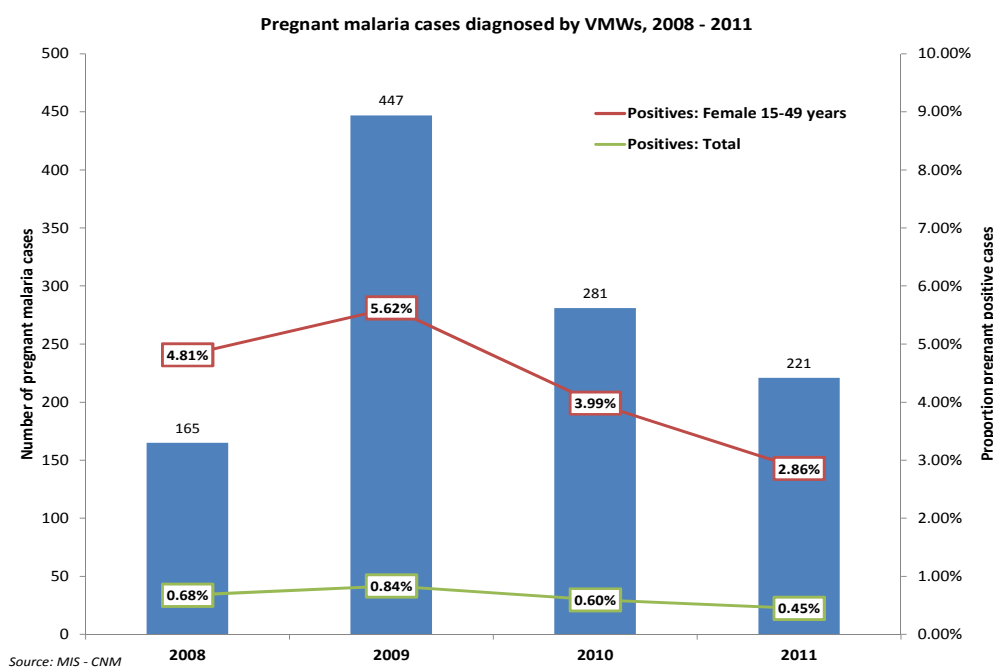


Map 1: Provinces of Cambodia

²Annual report of national centre for Parasitology entomology and malaria control, 2011

Table 4: Burden of malaria in Cambodia³

Number of cases	2010	2011
Total cases	102,473	108,988
No. Of severe cases	6498	4347
Malaria deaths	154	96
Incidence /1000 pop	26.08	25.82

Figure 1: VMW diagnosed malaria in pregnancy cases from 2008-2011 (NMCP Programme Review Report 2011)³⁴

The only data available is from the VMWs whose data reports malaria cases by sex and woman's data by pregnancy, but the actual filling in of this data is erratic. Data from hospitals and health centres is not disaggregated by pregnancy status but only by sex.

To date, there are a total of 1,528 VMWs in the country, covering approximately one million people at risk of malaria in 17 provinces and 34 operational districts. Data taken from VMWs in seven operational districts, including those covered by the Control and Prevention (CAP) Malaria project, from January-August 2012 recorded 81 pregnant women tested with 13 of them positive: a positivity rate of 16%.

³ Malaria Bulletin

In 2011-2012, 272 cases of malaria in pregnancy were documented. The provinces with the most cases were Siem Reap (76), Preah Vihear (39), Stung Treng (34), Ratanakiri (29), Kampong Thom (19) Kratie (15), Battambang (14) and Kampong Speu (11). All of the other provinces reported less than 10 cases during this period. These provinces are those most likely to remain forested, where access to care is the most restricted and where mobile populations and ethnic minorities are most commonly found. They are also the provinces VMWs are most likely to operate and therefore record cases. In 2011 of 1086 symptomatic pregnant women tested by VMWs 20% were positive and in some areas such as Ratanakiri 33% of symptomatic pregnant women were positive .

Interestingly, several of these provinces fall into Zone 2 of the containment of artemisinin resistance. The role of pregnant women who travel from remote villages to towns for delivery and who may carry resistant parasites has not been evaluated. It should be noted that record keeping in relation to pregnancy may not be comprehensive - even at VMW level, as many patients seek help in the private sector, and data from health centres and hospitals are not included.

a. National strategies and guidelines

Cambodia has a National Malaria Strategy (2011-2015), as well as a Strategy for Elimination of Malaria and a Maternal and Child Health Strategic document.

Cambodia has new treatment guidelines for malaria (issued in May 2012) and Safe Motherhood Clinical Management Protocols from the MoH National Reproductive Health Programme (issued in July 2010), which is presently undergoing revision.

The National Malaria Treatment Guidelines are widely available in both English and Khmer and include a specific section on malaria in pregnancy that lays out quite clearly the management of simple and severe malaria in pregnant women

Screening is advised for all pregnant women during each antenatal visit in health facilities located in malaria endemic areas (20/24 provinces.) Screening is advised by VMW in villages where they are deployed.

This policy is not yet implemented in most of the country, and the revised guidelines were not available in any of the facilities visited by the assessment team in NE Cambodia.

Safe Motherhood Clinical Management Protocols were only found in the Provincial Health District (PHD) office in Ratanakiri. The other PHD visited (in Pailin) did not have copies of this guideline and none were found in health facilities visited. Even at the PHD level, the references to management of malaria in pregnancy were not clearly understood.

Prevention of malaria in pregnancy

- Pregnant women are advised to sleep under an LLIN.

- At every antenatal visit women should be screened for malaria by microscopy or RDT and treated when positive.

The Health system in Cambodia is coordinated by the MoH. Commodities are distributed through the Central Medical Store. Malaria control falls under the Vector Borne Disease Control Department. Policy and governance is the role of the MoH. Operational decisions are devolved to Provincial level. There is usually a provincial hospital offering specialist services. District and former District Hospitals offer lower levels of care for inpatients. Health centres offer general diagnostic and curative services including facility-based delivery and diagnosis of malaria, HIV and TB.

Health posts are found in more remote areas and are able to treat malaria and other infectious diseases. They do not offer preventive services although they assist in vaccination activities or MDA treatments for neglected tropical diseases (NTDs) at community level. They also have RDTs for the diagnosis of malaria. Additionally, in the containment zone, and many of the malaria endemic areas, there are VMWs who can diagnose and treat malaria, however this cadre of staff are not trained to treat malaria in pregnant women and have no drugs to treat malaria in the first trimester. When the area is very remote, or access limited during the rainy season, they may treat pregnant patients in the second or third trimester. They also have rectal artesunate for pre-referral. They can treat *Pv* malaria with chloroquine in all trimesters. In some areas, where there are a large number of migrants, there are also migrant malaria workers (MMWs) to cater specifically for migrant workers.

Midwives are available for ANC in the health centres, but the level of training appears to be low. There are only two midwifery training schools in Cambodia and many midwives are secondary midwives whose training is only for six to nine months and they are often ex-Khmer Rouge 'barefoot doctors'. or trained in the border refugee camp during the long civil war. Laboratory services are still not strong enough to ensure diagnosis by quality assured microscopy or by RDT. The trigger to test for malaria is low as malaria is not often suspected in pregnant women. Women themselves are quite open to testing, even if they have no fever, but health staff feels that this would increase their workload and that there would be insufficient time to test by microscopy, or even RDTs. Stock out of RDTs, it was felt, would rapidly ensue if all pregnant women were tested. This would also be very expensive.

b. Field visits

The assessment team visited the NMCP, WHO and various implementing partners in Phnom Penh; as well as Ratanakiri Province in the North East (where the population demonstrated the problems encountered by pregnant women residing in areas where access to care is extremely limited, but where they also have one of the highest risk of contracting malaria infection), and Pailin Province in the West, along the Thai border, where malaria transmission is extremely low, but where resistant malaria is focused.

For details of field visits See Annex 3.

2. Thailand



Map 2: Provinces in Thailand

Thailand has a National Malaria Control Strategy (2011-2015), and plans to eliminate malaria over the next 20 years.

During the assessment team's visit we were not able to make contact with the MCH department at the national level, in spite of several attempts.

Confirmed malaria cases dropped from 140,500 in 2000 to 67,263 in 2009 and malaria deaths from 826 in 1996 to 70 in 2009. *Pv* is the predominant species, but *Plasmodium malariae* causes 1% of cases and *Plasmodium knowlesi* has also been found. Malaria risk is stratified according to

transmission levels into A1, A2, B1 and B2 villages, with A1 being the highest areas of transmission. Malaria clinics are sited in areas where transmission is found.

Table 5: Malaria stratification in Thailand

Areas	Stratification levels
A -Control area with transmission	A1 - perennial transmission area (transmission reported for at least 6 months per year).
	A2 - periodic transmission area (transmission reported but for less than 6 months per year)
B -Elimination area without transmission:	B1 - high and moderate receptivity (transmission not reported within the last 3 years but primary and secondary vectors present).
	B2 - low and no receptivity (transmission not reported within the last 3 years and primary and secondary vectors absent, suspected vector may be present).

Malaria transmission is confined to the border areas and areas where there are a large component of legal and illegal migrants and refugees from Myanmar and other surrounding countries. As with Cambodia, malaria in pregnancy is not seen as a major problem although there is very little data to illustrate the real burden.

a. National Malaria Control Programme

Malaria control in Thailand is a vertical programme and operates through a system of 329 malaria clinics, mostly situated in the border areas where malaria diagnosis and treatment is free for all including unregistered and illegal migrants. In some communities there are also malaria posts, manned by village volunteers who have been trained to diagnose and treat malaria using RDTs. Malaria clinics report directly to the Vector Borne Disease Units (VBDUs) at District level and Vector Borne Disease Centres at Provincial level. CHWs also operate at community level and are used to promote malaria prevention, early treatment seeking behaviour, and follow up cases, especially in the artemisinin resistance containment areas. Malaria post and clinic personal can diagnose but not treat pregnant patients with malaria. These women have to be referred to hospitals, so no record is held of the number of pregnant patients diagnosed with malaria.

In Thailand, regular clinics (that provide ANC) are not equipped to test for or treat malaria. Instead, all malaria cases are dealt with by the special malaria clinics or posts. However, these clinics are also not allowed to treat pregnant women, and all pregnant women who test positive for malaria must be referred to hospitals. Therefore, pregnant women with a fever who attend ANC in Public Health Promotion Clinics are referred to malaria clinics for testing, where, if they test positive for malaria, they are then referred again to a hospital for treatment.

b. Field visits

The assessment team visited the NMCP, WHO and the Australian Agency for International Development (AUSAID) in Bangkok, as well as field visits to Tak and Chantaburi Province. Tak Province is in the west of the country and borders Myanmar. It has a large Myanmar population (official and unofficial) living both in and outside of formal camps and is considered an A1 area in Thailand as far as malaria stratification goes.

The team also visited Chantaburi in the South East, along the Cambodia border. Although this area has a low level of malaria transmission, there is a high percentage of migrant workers who cross the border from Cambodia in search of work on the many fruit plantations and farms.

For details of field visits See Annex 3.

3. Myanmar (Burma)



Map 3: States and Divisions in Myanmar (Burma)

The Myanmar NMCP is aiming to reduce the 2000 level of malaria morbidity and mortality by 50% by increasing access to quality diagnosis and appropriate treatment and scaling up the distribution of LLINs.

Out of 325 townships across the country, 284 are located in malaria endemic areas, and the total population at risk 63% (2010 data). Re-stratification of risk was carried out in 2007 in 80 endemic townships (ref: UNICEF) and again in 2011 in another 50 endemic townships. Within each township, areas of high and low endemicity are mapped and stratified as 1a high risk (22% of population), 1b medium risk (25% of population), 1c low risk (16% of population), and no transmission (37% of population). The stratification depends on number of cases reported as well as on the remoteness of the location. Personnel from the NMCP make supervisory visits to townships and hold frequent refresher training events for health personnel. However, doctors working in tertiary hospitals are not always included in these trainings.

a. Policy environment

The government of Myanmar, has placed a major emphasis on the reduction of mortality and, with very limited resources, has so far managed to reduce significantly many mortality indicators but is not expected to achieve the Millennium Development Goal targets for maternal and child health.

The Five Year Strategic Plan for Reproductive Health 2009-2013 is currently being revised and updated and a National Strategic Plan for Malaria Control in Myanmar covers 2010-2015. The document [Health in Myanmar 2012](#) places particular emphasis on the improvement of maternal and child health, with a focus on accessing hard-to-reach populations by promoting interventions at community level and through the use of community based volunteers. Birth spacing, safe delivery and reduction of neonatal deaths are also given significant attention. There is a National Strategic Health Plan covering the period till 2015 and a 'Vision for Health' which spells out the strategies up to 2030. Health spending for 2013 will be doubled to 3% of gross domestic product (GDP) with the aim to spend 5% by 2030.

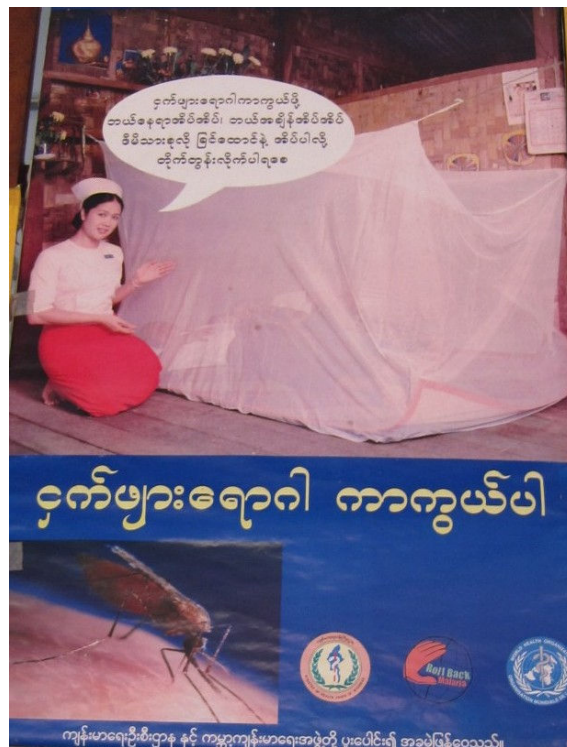
All malaria data is shared with WHO, which provided an estimation of the malaria burden based on 2010 data, using a formula supplied in the World Malaria Report 2008. The number of cases reported to the MoH is adjusted by taking into account the following factors:

1. Incompleteness of reporting systems
2. Patients seeking treatment in the private sector, self medicating or not seeking treatment
3. Potential over diagnosis through lack of laboratory confirmation.

The Maternal and Child Health Department has strong leadership and a well-developed strategic plan. There is a major emphasis on pre-service training for midwives, with training institutions operating in all states and divisions of the country. Midwives are found in all rural health centres and auxiliary midwives operate at health posts and the community level. Midwives are trained to provide malaria diagnosis and treatment and also are able to administer a limited number of injectable medications, including IM artesunate and artemether for pre-referral treatment, as

well as some antibiotics and vaccination programmes. All rural health staff are trained in Integrated Management of Childhood Infections. The majority (almost 100% in rural areas) of deliveries occur at home, many with the assistance of a midwife. TBAs are also still active and there are well developed training materials for them, which include the prevention of malaria for pregnant women by sleeping under an ITN.

At country level there are occasional meetings between the heads of departments to coordinate activities and, although the departments of disease control (including malaria) and the MCH department are not on the same site, there are many formal and informal links between the two departments at director level. The training materials for MCH include only one page on malaria but the malaria programme includes three hours of training in the pre-service training of midwives and regular refresher training. CHWs are beginning to be deployed and are taught to weigh babies at birth, visit in the postnatal period, do growth monitoring and diagnose and treat malaria, pneumonia and diarrhoea. The Myanmar Medical Association (MMA) is training CHWs in Mon State and the township authorities are training them in Shan State. The training materials focus heavily on the effects of *Pf* malaria and may need to expand these to include the increasingly better understood deleterious effects and management of *Pv* malaria in pregnancy.



IEC material for midwives, promoting the use of insecticide-treated mosquito nets

Infectious disease control in pregnancy is a focus of the programme and all patients are screened for HIV infection although the incidence is very low in pregnant women in Myanmar (0.6%). The prevention of mother to child transmission (PMTCT) has been an important element

of the programme. The severe effects of malaria in pregnancy on the mother, her foetus and newborn child are underestimated and only those women who have symptoms of malaria are routinely screened. In spite of the high levels of anaemia discovered during surveys (up to 70% of pregnant women⁴), it is not tested for routinely except on clinical grounds. A colour matching card was available in the facilities visited by the assessment team in Shan State and Bago Division.

Structures of the health programme in Myanmar (Burma)

There is a strong sense of service in all the levels of the health service visited. The health service is led by the MoH and the NMCP is seated in the communicable disease control section. Once a year all the sections, including MCH and NMCP, meet in a Technical Advisory Committee which tries to improve coordination across specialities.



Midwives and health staff from a rural health centre in Bago Division

Provincial capitals have a specialist hospital. Staff at this level of facility appeared to be the least trained in the latest management regimes for malaria. Townships have township and/or district hospitals, which vary with respect to the number of medical staff available. There are also station hospitals where difficult deliveries can be attended to. These station hospitals are at the

⁴ Personal communication from Dr Theingi Myint, Director of MCH Department, Myanmar

same level as rural health centres but, as well as providing general medical services, are staffed with doctors who are able to perform surgery.

Urban health centres provide general medical services and have a few inpatient beds (unless they are next to the township hospital, as was the case in Bago). The urban health centres are manned by medical officers or doctors, in some cases. Rural health centres are staffed with medical assistants, Lady Health Visitors and midwives, as well as public health technicians. In addition, rural health centres and sub-centres have public health technicians whose role is to review data and investigate outbreaks of disease, and have a full complement of staff that performs outreach to remote communities. The most striking feature of the services provided in the health system in Myanmar is the red skirted midwives and the lady health visitors who supervise them.

Rural midwives are based in rural or sub health centres and also conduct outreach activities and carry out home visits. These midwives are responsible for providing their own personal transport to visit remote villages. National midwifery training includes three days specifically covering malaria among pregnant women, so these are well trained and dedicated women. All pregnancies are identified and monitored either in the community or at the health centre. However, there are few ethnic minority midwives who are able to reach or communicate with ethnic minority populations.

Each province has a malaria clinic where fever cases are recorded and diagnosed using microscopy and they could act as surveillance sites to monitor trends.



Malaria clinic in Shan state

Information Systems

Data on the burden of malaria in pregnancy is collected by WHO. Data from the last three years has shown relatively little change and is acknowledged to be incomplete: there were 4,252 recorded positive cases from inpatient and outpatient sources, the case fatality rate has dropped from 1.10 in 2009 to 0.63 in 2012 but, again, the data is very incomplete. The NMCP sees that MIP is a neglected area but as yet no clearly defined policies are in place to deal with it beyond the use of mosquito nets and treatment guidelines. The research community will undertake further research programmes next year. Data from Southern Shan State malaria clinic showed that confirmed outpatient malaria cases reduced from 1,563 (5.4% positive) to 748 (2.1% positive) in 2012. Confirmed malaria in pregnant women fell from 92 (0.3% positive) to 30 (0.1% positive).

b. Field visits

Meetings were held in the capital, Nay Pyi Taw, with the NMCP and MCH department, as well as in Yangon with a number of implementing partners. In addition, interviews were conducted with the regional MCH and NMCP offices, pregnant women and health facility staff in Bago Division, Shan State (Tanuggi Township) and Sagaing Division. The assessment team was able to visit rural and urban health centres, sub-health centres, a specialist hospital, a neonatal unit, a district hospital and a station hospital.

For details of field visits see Annex 3.

Table 6: Comparisons of countries found in the investigation

Countries	Pop at risk	Prevention	BBC specific to pregnancy	Treatment	Data	Polices	Coordination between NMCP and MCH	Training of midwives on malaria	Barriers
Cambodia	20/24 provinces Remote areas Ethnic minorities Migrant and military personal	LLINs Mass campaigns covered country ISTp not implemented Good knowledge of malaria causes and prevention among pregnant women through VMWs	No resources for development of materials	Quinine 1 st trimester DHA/pip for all malaria 2 nd and 3 rd trimester	Some data from VMWs . None from hospitals or health centres	Active case management of symptomatic cases VMWs should refer Policy on IST Lack of joint policy development in different departments of MoH	Very little	Small section in guidelines for midwife training but no coordinated activity between MCH and malaria	Remote locations Poor infrastructure Lack of affordable and suitable transport Lack of highly qualified fully trained staff Cost of hospital care No quinine in community care Language and cultural barriers
Myanmar	Mainly in border areas which are remote and poor and inhabited by ethnic minorities	LLINs/ITNs Midwives on outreach can diagnose and treat malaria low suspicion that fever is	Some BCC directed to MIP Midwives trained to deliver BCC and care	Quinine +clindamycin 1 st trimester ACT 2 nd and 3 rd trimester	Data from WHO incomplete as most reliable data comes from non-malarious	Active case management of symptomatic cases Midwives can treat in	Good at all levels	Yes	Restricted access to areas of main focus of malaria Multiple languages and cultures Lack of knowledge of pregnant women around

Countries	Pop at risk	Prevention	BBC specific to pregnancy	Treatment	Data	Polices	Coordination between NMCP and MCH	Training of midwives on malaria	Barriers
		malaria in pregnant women			areas Limited data from NGOs working in remote areas indicate a bigger problem than expected	villages and give pre-referral treatment Some cooperation between MCH and NMCP through midwives training and operations			malaria prevention and treatment
Thailand	In A1, A2 villages Legal and illegal migrants Non Thai ethnic minority population in border areas	LLINs	No BCCdirected specifically at pregnant women or ethnic minorities	Quinine 1 st trimester ACT in 2 nd and 3 rd trimester Malarone in containment area?	No specific data collected	MIP not treated in malaria clinics Suspected cases referred to hospitals	None	None	Public health facilities do not have facilities for testing for diseases or anaemia. All suspected cases have to be referred to hospitals often inaccessible to marginalised people due to cost and distance to travel, as well as language barriers

Discussion and summary

Approximately 50.3 million women in the Asia Pacific Region are at risk of *Pf* malaria and 85.4 million at risk of *Pv*. Many of these women live in remote mountainous and poorly accessible border areas where they face geographical, socioeconomic, cultural and linguistic constraints to accessing care.

MCH, RH and disease control programmes (including the NMCPs) often do not produce integrated policies, guidelines or training materials for health staff. WHO has advised integrated FANC, but reproductive health programmes often focus more on the obstetric side of the programmes, and disease prevention, detection and management are secondary considerations. Many NMCPs in the SEA region are extremely vertical programmes. Malaria clinics are widespread and more easily accessible than general health clinics, village health workers trained to detect and treat malaria are being deployed in all the countries of the region. However, because of the perceived severe nature of malaria in pregnancy, most VMWs and low level health facilities are not encouraged, or in some cases, not allowed to treat pregnant women with malaria. Instead pregnant women must be referred to higher centres. It is not known how many women referred from basic levels of care actually reach higher levels of care or resort to traditional or private facilities, which may be more accessible. At the donor level, since the advent of the Global Fund and the verticalisation of funding for the control of malaria, TB and HIV, the aspects of these diseases which relate to pregnancy, at least in SEA, have been perceived to be less important. The one exception may be HIV where PMTCT has been a priority and has been well integrated into other health services.

Given the decreasing prevalence of malaria in the Asia region, and increasingly in Africa, a one-size-fits-all policy for prevention, diagnosis and case management of malaria in pregnancy may no longer be appropriate.

Policies and practices need to be rapidly adapted to the changing epidemiological situations. This will be affected by malaria control measures, changing patterns of migration, changing agricultural practices and forest cover. As malaria declines interest from national MoHs and donors may also decline. Growing commercial activity in Lao PDR and Myanmar as in most countries in the GMS will cause migration patterns to change and inward migration to these areas may increase, posing a greater risk to non-immune populations and the possibility of epidemics. Large tracts of indigenous forests have been cut down but are rapidly being replaced by rubber and fruit plantations. There is also a large reforestation programme (with teak trees) taking place in central Myanmar.

Women at risk of malaria infection during their pregnancies are often the most isolated by virtue of their location and ethnicity. Their pregnancies and the outcome of their pregnancies are often not recorded therefore the burden is underestimated. The serious consequences of malaria infection in pregnancy are largely ignored by policy makers and in spite of the acknowledgment that malaria in pregnancy is an issue that has not been fully addressed very little change has taken place. Cambodia has introduced a recommendation in its treatment guidelines to screen and treat pregnant women, but beyond that most national policies have not introduced any change.

MIP represents a significant cause of morbidity and mortality to the pregnant woman, her foetus and newborn infant⁴²⁻⁴³. However a sharp focus on malaria should not detract from the fact that

ANC, PNC and newborn care should take an integrated approach to prevention, diagnosis and treatment of all conditions which affect the health of the pregnant woman and her child. MIP should, in other words, not take a vertical approach but be part of FANC.

Recommendations

1. Regional and WHO level

- Better coordination between the various disease control branches of WHO and the department responsible for making pregnancy safer both at headquarters and in the countries.
- The development of FANC strategies and policies needs to emphasise the care of malaria in pregnancy (prevention, detection and treatment) when ANC takes place in different epidemiological settings and in settings where no malaria occurs e.g. one size does not fit all.
- In spite of concern expressed by WHO and the MIP working group of RBM in 2011, little has moved forward in managing MIP in the region. All partners now need to make a concerted effort to develop and implement more focused preventive diagnostic and treatment programmes for at-risk pregnant women, especially in remote areas where malaria transmission is highest.
- Specific policies need to be made to address the control of MIP in the resistance containment areas in Cambodia Thailand and Myanmar

2. General recommendations for all countries at national level

Better coordination between departments in the MoH

- Coordination of policies and guidelines to focus on management of malaria in pregnancy should be encouraged at all levels within a country with particular emphasis on the need for malaria focused programmes of ANC/PNC, neonatal care, child and adolescent health in malaria endemic areas. Lessons can be learned from the HIV/ PMTCT programmes and the integration of HIV activities into all health interventions.
- Prevention activities should continue and be strengthened including ensuring coverage and use of LLINs by pregnant women.. The safety, efficacy and cost effectiveness of personal protection methods, including use of repellents and impregnated clothing, could be explored with the possibility of price support for commodities for pregnant women⁴⁰.
- Health education, BCC and advocacy should be coordinated between the various MoH departments (e.g. NMCP/MCH/RH/disease control/nutrition /school health)

- Training materials for MCH/ANC cadre and midwifery schools should be developed in coordination with various NMCPs in each country
- Services for pregnant women (ANC), delivery and post partum (PNC) care as well as for neonates and infants at primary health centres and villages should be coordinated and should include integrated management of childhood illnesses (IMCI), ICCM and nutrition programmes

Other recommendations

- All health education/BCC materials should be produced where needed in local languages or be adapted for non-literate audiences
- Pre pregnancy counselling for
 - Young girls 14-20 before first pregnancy, in schools and community youth groups
 - Older women planning another pregnancy in clinics and women's groups

3. General recommendations

- Improved collection of data related to malaria in pregnancy. Data related to the burden of malaria in pregnancy is unreliable and there needs to be more of a focus on accurate data. Pregnancy status of all female malaria patients should be recorded at all levels of the health system including VMWs, outreach workers, health centres and hospitals. This will assist with directing scarce resources towards the prevention, detection, correct treatment and ultimately the elimination of both *Pv* and *Pf* parasites in pregnant women.
- Findings from regional research into the dangers of malaria for pregnant women and the foetus need to be taken on board by departments/programmes responsible for reproductive health and NMCPs. Perhaps a workshop for interested parties from the countries should be held to look at how policies could be developed and implemented at the country level.
- Stratification of malaria risk needs to be updated frequently in order to focus appropriate preventive, diagnostic and case management services for pregnant women.
- *Pv* is now equally likely to be the cause of infection in pregnant women, if not more so than *Pf*. Different approaches need to be developed to ensure the prevention, diagnosis and case management of *Pv* malaria. These might include pre-pregnancy or post-pregnancy radical treatment for clearance of hypnozoites and determination of an effective treatment during pregnancy to completely clear parasites where chloroquine is no longer fully effective. Where chloroquine remains effective, weekly prophylaxis might be introduced possibly using village level health workers to deliver the intervention and ensure compliance.

- Access to care for remote populations remains the greatest challenge in all countries of the region. The risk of malaria infection in pregnancy is highest in areas that are least accessible in all ways to services for prevention diagnosis and case management. Novel approaches to improve access need to be explored, including the development of village based finance/insurance schemes and transportation programmes.

Possible operational solutions

Introduction of ISTp in malaria endemic areas to detect and treat asymptomatic infections and ensure adequate clearance of parasites causing increased morbidity and risk of mortality for both mother and foetus and the newborn. *(This would include a particular focus on high transmission zones and areas where resistant malaria may make complete cure problematic)*

Incentive schemes for women to attend ANC and deliver in the health facility one (e.g. the RHAC scheme in Cambodia)

Development of ethnically appropriate BCC materials to support the prevention and early treatment seeking for malaria and the need for regular testing

Six monthly coordination meetings between MCH/Departments of disease control, nutrition and school health to review data and refine policies

Cooperation during training of midwives between departments/programmes responsible for RH and NMCPs to ensure midwives have a high level of awareness of the need to test pregnant women for malaria and anaemia

Pre-pregnancy counselling to include radical treatment of *Pv* malaria to eliminate hypnozoites before conception. PNC to include primaquine where *Pv* infection has occurred during pregnancy

VMW/CHW/malaria clinics to be allowed to treat simple malaria in pregnant women

Coordinated training of midwives by RH and disease control programmes

Community mobilisation schemes to develop methods of improving geographical and financial access to care for pregnant women and children

Research Gaps Identified

- The feasibility and acceptability of the introduction of routine screening during pregnancy, including the optimal frequency of screening, at what level of transmission and who should undertake the screening, and how much such an intervention would cost.

- Defining the true risk of malaria in pregnancy by screening women during the entire period of pregnancy to determine the cumulative prevalence. In FGDs, pregnant women often report their pregnancies very early (e.g. within 1-2 months), therefore weekly screening with RDTs is an option. VMWs have been trained in Cambodia to make slides and take samples for PCR, which could later be transferred for more in-depth testing. Village based workers in Thailand have also been trained to take slides and this could also be done in Myanmar by auxiliary midwives or CHWs.
- Feasibility of the introduction of IPTp in areas where infection rates may be high, as demonstrated by the active screening of women, to determine high cumulative prevalence of malaria. Delivery systems could be employed using village based workers. Different drugs regimes such as fixed dose combinations of artesunate/mefloquine or artesunate/amodiaquine could be explored in remote areas.
- Further research into the effects on the development of the foetus in different transmission zones could emphasise the risks to child development and future health of adult population in the region of malaria infection during pregnancy and increase the advocacy for its proper control, even in areas where the number of cases is limited.
- RDTs are the most common form of diagnosis used at peripheral levels where malaria infection of pregnant women is most likely. It needs to be shown that the combo-RDT used is sensitive and specific enough in pregnant women to detect low parasitaemia caused by both *Pf* and *Pv*.
- At present, detection of MIP is done by using RDTs and or microscopy. It needs to be determined whether or not these methods are able to detect the very low parasitaemias levels common in the region and the effect of these low/asymptomatic parasitaemias in pregnant women on maternal and infant outcomes.
- The development and testing of a mobile, bedside PCR/LAMP machine to detect low parasitaemia in asymptomatic pregnant women and newborn infants.
- The feasibility and effectiveness of education of adolescent girls in pre-pregnancy planning including the methods of reducing to the risk of malaria infection.
- Feasibility and impact of pre-pregnancy screening and treatment for *Pv*.
- Feasibility and impact of introduction of tools and community based interventions for pre-referral treatment either with injectables or rectal artesunate, for severe malaria.
- Models of community based transport referral systems for pregnant women, including emergency preparedness, insurance based schemes and transport.
- The relative effectiveness of LLINs/ITNs versus conventional nets in preventing malaria in pregnancy and during the newborn period.
- Analysis of migrant patterns affecting women: who they are, what they do, whether they access health services and if so where, and whether they are planning pregnancy.
- Role of malaria on maternal and neonatal anaemia in the GMS, especially Myanmar where maternal anaemia is as high as 70%.

The CDC and WHO, along with many partners, have developed The Rapid Assessment Toolkit for assessment of the burden of malaria in pregnancy.

This toolkit is a CD-ROM based resource designed to help countries obtain the information they need to assess the burden of malaria during pregnancy, develop a policy or programme, assess programme implementation, and evaluate impact.

ANNEXES

Annex 1: Background information

Malaria infection during pregnancy is a serious public health problem, with substantial risks for the mother, foetus and neonate. Pregnant women are especially prone to severe attacks of malaria which may cause death of the mother and/or foetus, abortion, premature labour and still-birth.

WHO recommends a package of interventions for the prevention and control of malaria during pregnancy which includes: the use of insecticide treated nets (ITNs) to prevent infection; intermittent preventive treatment in pregnancy (IPTp) to prevent infections among pregnant women living in areas of moderate or high transmission of *Plasmodium falciparum* (Pf); and effective case management for malaria illness and anaemia. However, these recommendations are based upon the available literature, most of which refers to Africa, where transmission is more intense than in SEA.

Despite concern about the high risk of MIP to both the mother and unborn child, the recognition that it is a significant health problem in the SEA Region may be underestimated.

The overall aim of the Rapid Assessment of Malaria in Pregnancy in the GMS was: 'To determine the present state of programmes and policies to prevent and manage malaria in pregnancy in order to define best practice, where programmes can be strengthened and areas where more research is needed to develop context specific, evidence based recommendations for optimal management of malaria in the context of reproductive health programmes.'

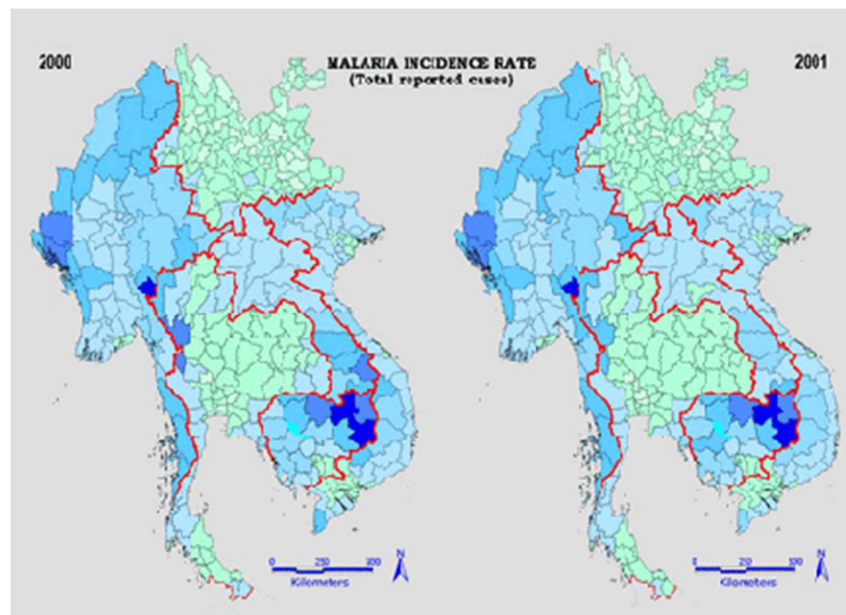
Methodology

- Literature review on current interventions for malaria in pregnancy
- Desk review of current NMCP and RH programme policies and strategies in relation to malaria in pregnancy
- Field visits to Cambodia, Thailand and Myanmar: meetings with national malaria control and reproductive health programme staff, relevant civil society partners, health facilities and villages in all three countries to gather information on present ANC practices, including:
 - Current interventions for pregnant women regarding malaria
 - MIP activities routinely included as part of ANC visits
 - Coordination efforts between the two programmes (NMCP and RH)
 - Opportunities to further integrate services and increase access to pregnant women
- Review of existing regional and national supervision guides and training curricula, materials and programmes
- Identification of programmatic and operational research gaps

In all field site visits, contact was made at provincial and district/township level. This included meeting managers and policy makers of both the MCH and NMCP and, in Myanmar, with the School Health services. Visits were also made to health facilities, including provincial and specialist hospitals, district hospitals, health centres, sub centres/health posts, malaria centres and communities where access was possible. The providers of malaria and MCH care, including doctors,

medical assistants, lady health visitors, midwives, auxiliary midwives, village malaria workers/village malaria volunteers, TBAs, public health practitioners and lab personal were interviewed. Input was also sought from pregnant women attending ANC as well as those who did not attend ANC. In Myanmar, we were also able to see midwife training in action and also the training of village health volunteers/community health workers (CHWs) who were being trained to monitor neonatal health, perform growth monitoring and integrated community case management (ICCM).

The interview process was for fact-finding and did not constitute operational research, although a set of standard questions was developed and used for data collection (see Annex 1).



Map 4: Malaria incidence rate in Myanmar

This map shows the number of cases reported from different area of the region in 2000 and 2001. The situation continues to be dynamic as malaria control interventions increase. However, the main areas of risk varying from dark blue to pale blue persist.

Overview of Malaria in Pregnancy

Malaria infection during pregnancy is a serious public health problem, with substantial risks for the mother, foetus and neonate. The response of a pregnant woman to malaria infection largely depends on her level of premunition¹. Pregnant women, especially in low transmission areas, are prone to severe attacks of malaria which may cause abortion, premature labour and still birth.^{2,3}. In these settings, the risk of maternal mortality is 2-10 times higher than that of non-pregnant women. In high transmission zones primagravidae and adolescent pregnancies are most at risk of malaria infection but in areas of unstable transmission all pregnancies may be at risk due to lack of acquired immunity. In areas where transmission is higher, the mother may have some pre-existing immunity and therefore not show the symptoms normally associated with infection in anon-immune

individual. However, in all cases there is an increased risk of both maternal and neonatal severe anaemia, resulting in a greater risk of maternal, neonatal and infant mortality and intra uterine growth retardation (IUGR) with subsequent delivery of low birth weight (LBW) babies and foetal stunting, leading to generational growth problems and obstetric complications associated with small stature. *Pf* associated LBW deliveries are common in low-transmission settings however preterm delivery is likely to be a more important contributing factor than IUGR³⁻⁷.

Single and pauci-symptomatic infections with *Plasmodium vivax* (*Pv*) are also known to result in increased risk of maternal anaemia and LBW babies, with the subsequent increased risk of infant anaemia, early malaria disease and infant mortality.⁸ Recent research in Cambodia and Myanmar has demonstrated a large number of asymptomatic cases with low parasitaemia undetected by rapid diagnostic tests (RDTs) and microscopy which have been found by **polymerase chain reaction (PCR)** around index malaria cases (evidence from recent focused screening and treatment investigations in Pailin, Cambodia). Research from Thailand has indicated that even when the point prevalence of malaria infection in pregnant women is very low e.g. less than 1%, cumulative prevalence over the term of the pregnancy may be as high as 36% (personal communication Dr Rose McGready Shoklo Malaria Research Unit (SMRU)).

A recent review article in the Lancet has presented evidence about the immediate effects on the mother, the foetus, the newborn and the long term effects on the developing child of maternal malaria infection¹⁰. It describes a review of mostly treatment studies from south and South East Asia and attempts to quantify some of the burden of malaria in pregnancy in areas of varying endemicity in this region. Surprisingly, the overall percentage of maternal deaths attributed to malaria from direct (severe/cerebral malaria) and indirect causes (anaemia, co-infections with HIV, increased risk of pre and post-partum haemorrhage (PPH)) in low transmission areas outside of Africa (0.6-12.5%) is not substantially different from the estimates derived for high transmission areas (0.5-23%).¹¹

Table 2 shows the associated risk of various outcomes from malaria during pregnancy in low versus medium/high transmission settings.

The increased relative risk of LBW associated with placental parasitaemia ranges from 1.88 in Thailand to 4.3 in low-transmission sites in Africa, whereas the risk of stillbirths and pre-term delivery, where studied, was reported to be four times higher among women with placental parasitaemia. Interestingly, despite the difference in aetiology and regardless of the number of episodes of parasitaemia, the magnitude of the reduction in birth weight in grams (which may range from 35–310g) and the population attributable fraction of malaria-related low birth weight are comparable in areas of low and high malaria transmission¹². Recent evidence using ultrasound from Tanzania and from SMRU in Thailand has shown that malaria infections in pregnancy in both high and low transmission settings were associated with delays in foetal growth¹³. The study in Tanzania was carried out in an area where malaria transmission has declined considerably and the results highlight the importance of developing interventions which can protect women during early pregnancy even in low transmission settings¹⁴.

Long term effects of malaria and anaemia on child development

It is well known that LBW is associated with increased risk of infant mortality. Most recent global estimates place complications arising from preterm birth as the single most important direct cause of the world's 3.6 million neonatal deaths¹⁵; As well as the increased risk of neurological disorders, preterm infants carry increased risk of behavioural problems, school learning difficulties, chronic lung disease, retinopathy of prematurity, hearing impairment, and lower growth attainment.¹⁶ Stunting is associated with increased risk of mortality and poor academic performance.¹⁷

Placental malaria affects the transfer of nutrients and maternal antibodies and so susceptibility, both to malaria and other diseases such as measles, may be affected.^{18, 19}

It has been shown in studies from the developed world that nutritional deficits during pregnancy can be associated with greater risks of diabetes, metabolic syndrome and cardiovascular problems in later life²⁰. The evidence of malaria affecting the development of the placenta in the first trimester and the delay in growth of the foetal head may be associated with developmental delay. Anaemia has been shown to affect concentration and learning in school aged children²¹.

Prevention, early detection and effective treatment of malaria should be essential components of ANC in all endemic areas. Recrudescence after drug treatment is more common during pregnancy, the efficacy and the pharmacokinetics of drugs used to treat pregnant women are not completely known due to the difficulty of gaining ethical approval for studies in pregnant women, particularly in the first trimester and whether this changes over the course of pregnancy with the changing physiological status of the pregnant women and her foetus. Pharmacokinetic studies have been done for some drugs by the Malaria in Pregnancy Consortium (Liverpool and London Tropical Schools and in country partners)²².

Pv and *Plasmodium ovale* malaria can be recurrent from untreated hypnozoites in the liver. *Pv* is now the predominant species in Thailand²³ and increasing in terms of percentage of cases in Cambodia and Myanmar. Radical treatment with primaquine for both *Pv* and *Pf* malaria is not possible due to safety concerns both during pregnancy and during the early post natal period when breastfeeding is taking place. Medecins sans Frontieres (MSF) and Dr Kevin Baird are planning safety and dosage studies of primaquine in Myanmar and Cambodia respectively but they will not be conducted among pregnant women. The effect of mixed infection on the outcome of pregnancies is not well understood although there is some evidence that infection with *Pf* and *Pv* together gives less likelihood of severe disease.²⁴ The effect of infections with *Plasmodium ovale* and *Plasmodium malariae*, which occur more commonly in SEA than elsewhere (*Plasmodium malariae* 1% of infections in Thailand) are not well researched especially in pregnant women.

Mass screening and treatment and Mass Drug Administration (MDA) are planned in some areas of SEA, where malaria elimination is being considered. Pregnant women will have to be excluded from these trials and may continue to be a source of infection as was shown by Prof Li (personal communication) in his MDA intervention in the Comoros Islands where pregnant women and children less than six months old were not allowed to take primaquine.

Distribution of malaria and number of pregnancies at risk

Population at risk

A recent demographic study by Delicour *et al*²⁵ demonstrated that the number of pregnancies at risk in the Asia Pacific region (50.3 million pregnancies at risk of *Pf* malaria and 80.5 million at risk of *Pv* infection) outnumbered those at risk in sub-Saharan Africa (32.0 million) where the main focus of control has been directed by the WHO and its partners.

As can be seen from figures 1 and 2, at least 24.5 million pregnant women live in unstable transmission areas and 19.7 in stable transmission areas in the Western Pacific (WPRO)/South East Asia Regions (SEARO). The situation with regard to malaria transmission is very volatile with recent dramatic decreases in incidence and prevalence of malaria in all transmission areas.

Figure 1: Distribution of the number of pregnancies with *Pf* in stable and unstable transmission areas

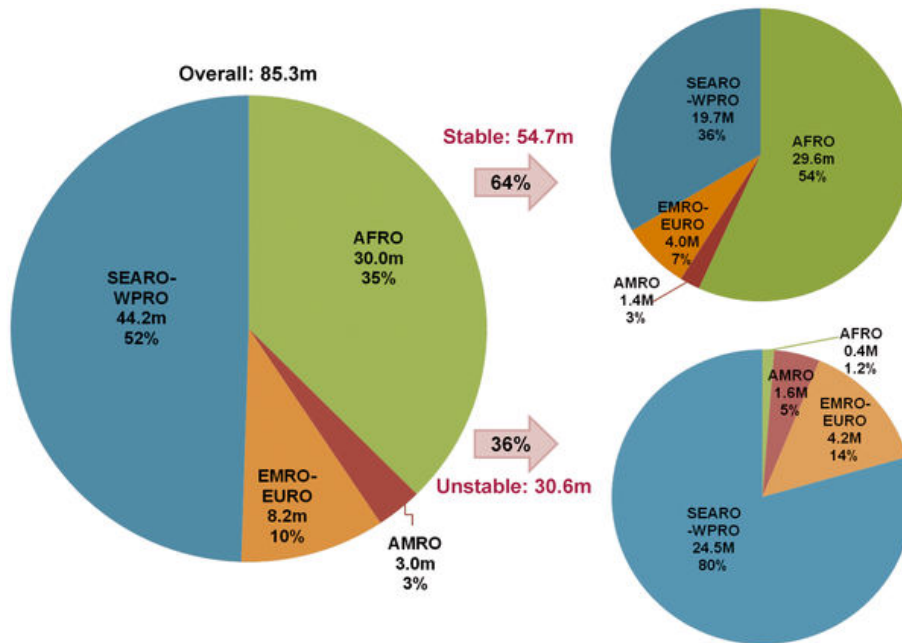
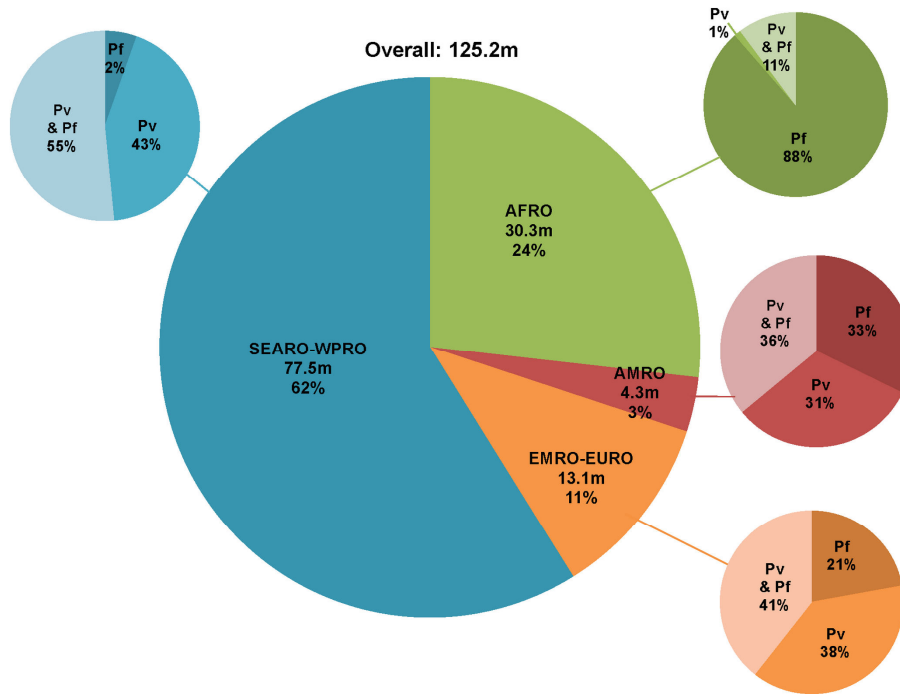


Figure 2: Distribution of the number of pregnancies in malaria endemic areas in 2007 by WHO regions and by species (*P. vivax* transmission only, *Pf* transmission only or transmission of both species)



Stratification of malaria transmission is being pursued by many of the countries of the region. Many areas have managed to reduce malaria transmission to zero due to changes in forest cover and vigorous implementation of malaria prevention using ITNs/long lasting insecticidal nets (LLINs) and early diagnosis and treatment with rapidly fully effective antimalarials. Malaria transmission, however, continues unabated and at a higher more stable rate in the more inaccessible, mountainous, forested border areas mainly inhabited by the very poor and ethnic minority groups whose access to care is limited by poverty, and lack of infrastructure, as well as cultural and linguistic barriers. These areas are also often characterised by high levels of migration and are sometimes affected by conflict and discrimination. The efforts of the various NMCPs, implementing partners and donors to reduce and finally eliminate malaria could easily be reversed with the appearance of widespread insecticide or drug resistance, especially in view of the large reforestation projects in countries like Myanmar and the growth of rubber and fruit tree plantations all over the region where effective vectors such as *Anopheles (An.) dirus* and *An. minimus* could possibly thrive again. The increase of migrant labour, both male and increasingly, female, within countries and across borders also poses a risk to malaria control activities. Military personal working in these areas also includes females both as soldiers and among accompanying families.

Annex 2: Characteristics of local vectors

- *An.dirus*: is typically associated with forested mountains and foothills, cultivated forests, plantations (e.g. rubber) and forest fringes. The larvae inhabit small, shallow, often temporary, mostly shaded bodies of fresh, stagnant (or very slowly flowing) water, such as pools, puddles, small pits (e.g. gem pits), animal footprints, wheel ruts, hollow logs, streams and even wells located in primary, secondary evergreen or deciduous forests, bamboo forests and fruit or rubber plantations. Water can be clear or turbid, and habitats with nitrogenous wastes, due to animal excreta or rotten leaves, appear more productive. It primarily bites outside, early in the evening before people are under nets. It is a particularly efficient biter meaning that low numbers are sufficient to maintain high levels of transmission.
- *An. minimus*: breeds in a variety of habitats but is found in highest numbers outside of the forest or in areas where the forest has been cut. Larvae are generally found in small to moderate-sized streams or canals. They bite between 20:00 h and 03:00 h depending on locality. Females prefer to lay their eggs in slow running, clear and cool water, partially shaded and with grassy margins. They mainly bite humans but the degree of anthropophily/zoophily depends on the availability of alternative hosts (e.g. cattle). This species is mainly endophagic in India, Thailand and central Vietnam, and more exophagic in Cambodia and northern Vietnam.
- *An. epiroticus* and *sundacus* breed in saline water so they are predominately a coastal vector. The immature stages develop primarily in habitats containing levels of salinity ranging from low, brackish to sea water concentrations. Females are mainly anthropophilic and exhibit both endophagic and exophagic feeding habits and approximately 35% bite outdoors

Annex 3: Field visits

Cambodia

Phnom Penh

At central level, malaria in pregnancy is not perceived to be an important problem by the CNM, but when the Director of the Maternal and Child Health Programme, Dr Rathavy, was interviewed, she expressed concern that this aspect of the care of pregnant women was underestimated. On the other hand, the NMCP's newly revised National Treatment Guidelines do advise the routine screening for malaria of all pregnant women. Coordination with the MCH department is extremely limited and therefore the new treatment guidelines have not been incorporated into the training and guidelines provided by the MCH department for nurses and ANC staff. There is little money to devote to the development of specific health education materials and data, apart from VMWs, is not routinely collected. In all areas visited by the assessment team, women and health staff had an excellent knowledge of the signs and symptoms of malaria, its mode of transmission and how it could be prevented. This was true at all levels of the community from hospitals to remote villages, and usage of mosquito nets was also high. The CNM is to be commended on this high level of knowledge. The effects of malaria in pregnancy, however, were less well known and many women denied having experienced malaria.

Ratanakiri

Ratanakiri is a sparsely populated province in the North East of Cambodia; its population of 150,000 makes up just over 1% of the country's total population. Residents generally live in villages of 20 to 60 families and engage in subsistence slash and burn agriculture. Ratanakiri is among the least developed provinces of Cambodia. Its infrastructure is poor, and the local government is weak. Health indicators in Ratanakiri are extremely poor, and almost two in four children die before reaching the age of five. Education levels are also low; three quarters of the population is illiterate.

While in Ratanakiri, the assessment team visited the PHD and Ratanakiri Referral Hospital in the provincial capital, Ban Lung, as well as Andong Meas Health Centre, Nhang Health Post and seven rural villages.

Various highland groups' "ethnic minorities", collectively called Khmer Loeu, make up just more than half of Ratanakiri's population. These groups included the Tampuan (24.3%), Jarai (17.1%), Kreung (16.3%), Brou (7.0%), Kachok (2.7%), Kavet (1.9%), Kuy (0.5%), and Lun (0.1%). Ethnic Khmers make up 19.1% of the population, and ethnic Lao 9.6%. The remainder consisted of Vietnamese (0.7%), Cham (0.6%), and Chinese (0.3%). Since the 1998 census, migration to Ratanakiri from elsewhere in Cambodia has accelerated, including an increase in the proportion of Khmer people living in the province. These people may come from non-malarious areas, increasing the risk of serious outbreaks. Though the official language of Ratanakiri (like all of Cambodia) is Khmer, each indigenous group speaks its own language. Less than 10% of

Ratanakiri's indigenous population can speak Khmer fluently. Although large areas of forest have been cleared - often illegally - exposing the minority population to loss of traditional livelihood, sale of land has, at least temporarily, increased access to money. The land is now being reforested with large plantations of rubber and fruit trees, and attracting a good deal of mobile labour including families living in new villages, or temporary, and often unsatisfactory, accommodation.

Malaria has a high incidence in Ratanakiri, where the remoteness, poverty, cultural beliefs, diverse languages barriers and high levels of illiteracy make health service delivery challenging.

Ban Lung, Ratanakiri

In Ban Lung, the provincial capital of Ratanakiri, the assessment team visited the PHD and then met the Director, the Head of the MCH programme and the Malaria Responsible. There was little coordination between the MCH department and the malaria department, neither of which had copies of the new NMCP malaria treatment guidelines. However, the MCH department did have the Safe Motherhood Clinical Management Protocols for health centres that is used to train midwives in ANC, safe delivery and Post Natal Care. This document includes the effects and management of malaria in pregnancy. However it does not include the new policy of screening and treating pregnant women during ANC. Training for midwives occurs regularly every three months and the closest training facility for midwives is in Kampong Speu.

We visited the provincial hospital Obstetrics (OB) and gynaecology department and spoke to the hospital director (who is also the surgeon responsible for caesarean sections). On the OB ward, the team met the head obstetrician and nine midwives.



Staff at Ratanakiri Referral Hospital OB Ward

ANC does not occur in the hospital, which deals mainly with severe cases requiring operative care and normal deliveries choosing to deliver in the hospital. These cases were mainly from the area of Ban Lung itself. The hospital has a maternity waiting centre, but it is not well utilised. During the assessment visit only one patient was staying there, but she was a member of staff who lived in a remote area and intended to deliver in the hospital.

Andong Meas Health Centre

There are five 'midwives' assigned to Andong Meas Health Centre, three of which were on duty during the assessment visit. One was a TBA, one a secondary midwife with six months training, and one a primary midwife with three years formal training. The clinic included a small lab, but no technician was available to speak with us on the day, and the last logged in last lab test was from five days earlier. Although it is the policy of the Cambodian government to provide microscopy at health centre level, the equipment looked largely unused. RDTs were usually available but there had been a stockout for one month and the midwives spoken with had not received any training on how to carry out an RDT. The health centre is open daily from eight o'clock until five, with a night shift schedule. So theoretically, a midwife is always available for deliveries. There were no health education materials related to the prevention or management of malaria in pregnancy and the midwives did not have a copy of the new NMCP treatment and prevention guidelines for pregnant women. Regular testing for anaemia is not possible except on clinical grounds. Women suspected of severe anaemia are referred to hospitals. The only routine tests available for pregnant women were for TB and malaria.



Andong Meas Health Centre, Ratanakiri Province, Cambodia

The health centre had a maternity waiting home, with 16 beds, however in the last four months only two women had stayed there, despite the midwives saying they attended between 18-20 deliveries a month.

Nhang Health Post

The health post was manned by a health assistant with eight months initial training and some refresher training form time to time. The initial training included some general information on malaria, but nothing specific for malaria during pregnancy. He is able to carry out RDTs for pregnant women, but not able to treat them. Therefore if a pregnant woman tests positive, she is referred to the nearest health centre for treatment. He had a register, RDTs and ACTs available, but he did not record whether a patient was pregnant or not.



Health Assistant responsible for Nhang Health Post

Focus Group Discussions in Ratanakiri

The assessment team visited a total of seven villages in Ratanakiri and spoke with 35 pregnant women, 15 TBAs and two VMWs. Most of the pregnant women spoken to wanted to deliver in a health centre and to attend ANC on a regular basis. This was especially true for the younger and more educated women with better access to care. Ethnic minority women felt that attendance might be constrained by lack of transport, money and permission from husbands. Most women would like to have two to three children except among the ethnic minorities where child mortality is high and the desire for large families still exists. The availability and awareness of birth-spacing technologies in this group was low. Early marriage and constant childbearing were characteristics of this group. The majority of babies continue to be delivered at home by TBAs.

TBAs, therefore, still have an important role in the communities. The majority of TBAs interviewed had not had any formal training on MIP and had little support from the formal health sector, however they are advised to encourage women to attend the health facility for delivery.

VMWs interviewed during the assessment reported a recent rapid decline in cases, following increased cover of LLINs and expansion of the VMW programmes, as well as the improvement of the supply of drugs and diagnostics at health centres and hospitals. One VMW we spoke with said that he had previously seen up to 30 positive cases per month and now only sees two or three. However, due to recent problems with GFATM disbursements VMWs have not been routinely receiving their monthly transport allowance of 60,000 Riels and this has led to problems with attending the monthly health centre meetings and reporting of data.

Ratanakiri has a pregnancy rate of 4.1% (higher than Cambodia as a whole) and knowledge of birth-spacing was low among the women interviewed. A very high number of pregnancies took place before the age of 30 years and up to nine pregnancies per woman was common. However, the rate of (spontaneous) abortion was also high, as well as infant and child mortality. Among the women interviewed, it was gathered that approximately 40% of children died before the age of five. Although the cause of death was unknown, many mothers reported that their children suffered from fever, convulsions and difficulties breathing.



Focus Group Discussion with pregnant women and TBAs in Chay Toch village, Ratanakiri, Cambodia

With a pregnancy rate of 4.1%, this would mean 6,151 pregnant women per year, and with 29 reported cases of malaria in pregnancy, an incidence of 0.5%. In 2011-2012, with USAID support, WHO supported the Ratanakiri Provincial Health Department to implement a malaria screening pilot strategy for pregnant women using RDTs (and treatment, if the RDT was positive) as part of antenatal care in three selected health centres. Results indicate a malaria prevalence

of 5% (64/1,277) at health centres and 6% (20/316) in villages (tested by VMWs). This corresponds to the prevalence found in some areas of high burden countries, such as Nigeria, where recent research into the efficacy of IPTp with SP found a prevalence of 6% in Ibadan (even though a prevalence of 25% was expected). This gives some indication of the difference between the reported data and the true burden of malaria in pregnant women in Cambodia. A study done in 2011 by Dr Abdur Rashid, of WHO, and his team described the acceptability of doing rapid tests in non-febrile pregnant women in the province.

Pailin

Pailin has seen a dramatic decline in malaria prevalence and now has a very low burden, however it is part of the ACT resistance containment zone and therefore of particular interest. In Pailin, the team visited the PHD and referral hospital (both the outpatient department [OPD] and inpatient department [IPD]), as well as three health centres (Suon Koma, Kracham and Ta Sanh), where the team carried out focus group discussions (FGDs) with pregnant women and TBAs.

Focus Group Discussions

The role of TBAs was to encourage pregnant women to attend HCs for ANC and delivery and assist in other health interventions at the community level, such as immunisation and bed net distribution. Few young women are entering the profession and so the skills are dying out.



Focus group discussion with TBAs at Krachab Health Centre, Pailin, Cambodia

Field visits in Thailand

Tak Province

While in Tak the assessment team visited the Mao Tao clinic in Mae Sot, a local Karen community living in an unofficial settlement just outside of Mae Sot, Naugn Bwar village (where the team visited a health promotion hospital - the equivalent of a sub-district clinic - as well as some households), close to the border and the Thasongyang District Hospital.

Mae Tao Clinic serves a mainly Karen refugee/migrant population from Myanmar. The majority of staff at the clinic are from Myanmar themselves and have not received formal training through the Thai or Myanmar health system, but were trained through the Mae Tao clinic. Complicated pregnancies and deliveries are referred to the Mae Sot Hospital. Some of the pregnant women interviewed at the clinic had crossed the border specifically in order to access ANC services and deliver in the clinic. Malaria infections, particularly of *Pf*, have seen a decline over the last few years by about 70%. However, the true prevalence is unknown as pregnant women are not routinely screened for malaria but are tested when they are present with a fever. The health assistant interviewed in the RH outpatient department had not received any training on MIP and was not aware of the additional risks caused by malaria to pregnant women, but did know that the treatment regime was different in the first trimester. All positive cases of MIP are referred to the RH in-patient department (IPD), regardless of the severity.

All MIP cases are admitted to the IPD for three days, where they are provided with chloroquine under Directly Observed Therapy (DOT) for *Pv*. For *Pf*, women in the first trimester are given quinine and clindamycin, and those in the second and third trimester receive artesunate and clindamycin (this is based on the guidelines developed by SMRU for the border clinics, and does not follow Thailand's NMCP protocol). If a pregnant woman is malaria positive then the baby is checked for malaria at day three after delivery. The doctor interviewed (a trainee from the UK doing an three month internship at Mae Tao) had seen three cases of MIP in the two months that she had been there (September and October). Patients with severe malaria are admitted for minimum of seven days and are tested for malaria every day. After being discharged, they are asked to come back one week after delivery for a checkup. Mae Tao Clinic is unable to do G6DP testing, but it is available at Mae Sot Hospital. LLINs are given to all pregnant women who test positive for malaria, but are not routinely given out during ANC for prevention of malaria.

Many of the residents in the Karen settlement, just outside of Mae Sot town were born in Thailand, but are not able to access Thai health facilities for free. This unofficial settlement was considerably less developed than the rest of Mae Sot and most of the children were born at home with the support of the local TBA. The main source of care was from traditional healers. Children did not attend school. Knowledge of malaria was less than in the local Thai population although (conventional) bed net use was still common. Data from these communities is not included in Thai national data, despite the fact that exposure to malaria is likely to be considerably higher.



Unofficial Karen village on the edge of Mae Sot

Naung Bwar health promotion hospital (sub-district clinic level) provides ANC services for pregnant women, as well as post-natal, EPI and health promotion activities. This facility does not have any clinical staff (doctors or midwives), but rather university-level trained public health staff. Some staff are able to speak the local ethnic minority languages (most notably Karen). There are no facilities for testing for malaria, HIV or anaemia, and patients suspected of these problems are referred to the district hospital or, in the case of malaria, to the nearest malaria clinic. Diagnosis can take place at the malaria clinic, but if positive, malaria clinic personnel are supposed to refer the patient to the district hospital. As the pregnant women seen in these sites are often from the ethnic minority population from across the border in Myanmar, they have few resources to be able to get from one facility to another. The majority of women in this area continue to deliver at home with the assistance of a TBA. The TBAs that the team interviewed had a limited knowledge of malaria, but they were aware that pregnant women are more at risk. They said they were occasionally provided with clean delivery kits from the health promotion hospital, but often had stockouts. Staff from the district hospital and the health promotion hospital did refresher training with the TBAs once a year and malaria was included as part of this training.



Karen ethnicity TBAs in Naung Bwar, on the Thai-Myanmar border

Thasongyang District Hospital provides a full range of services including diagnosis and ANC and delivery, including Emergency Obstetric Care. However pregnant women are not routinely screened for malaria unless they present with a fever. The hospital has translators available for ethnic minority patients. Services are available free to Thai and M1s (registered migrants in the country for more than six months) but M2s (unregistered, new or illegal migrants) are charged for services. There is an informal exemption scheme for the very poor that depends on the discretion of the doctor in charge. The doctor in charge of the OB ward said that since the majority of patients seen are from ethnic minority groups, most are unable to pay and are exempt. However, lack of official free services does affect access. Cases of MIP are very low, with just four cases seen at the hospital over the last three years. *Pf* cases are treated with IV artesunate in the first trimester and artesunate with mefloquine during the second and third trimesters. *Pv* is treated with chloroquine only, at all stages of the pregnancy. Babies delivered to women with malaria are tested three days post-delivery.

Chantaburi Province

In Chantaburi the assessment team visited an urban malaria clinic and the district hospital, as well as the Provincial NMCP officer, but was unable to carry out any FGDs with pregnant women or TBAs. Again, no records were available about malaria in pregnancy.

The malaria clinic only sees approximately seven people a day, with just two positive cases seen the whole month of October. From January to September 2012, they saw only 51 positive cases, 50 of which were *Pv*. The majority of people coming to the clinic are men, a mix of migrants from Cambodia and the local Thai population. As with all malaria clinics and posts in the country, they were unable to treat pregnant women who tested positive for malaria, and referred them to the district hospital nearby.

Pan Nan Rom District Hospital carries out a range of services, including ANC and is able to test for and treat malaria. In 2011 there were a total of 132 cases of malaria seen at the hospital, 88% of which were *Pv*. One of these was a pregnant woman (also *Pv*) who was treated with chloroquine. If a pregnant woman tests positive for *Pf* she cannot be treated at the district hospital, but is referred to the provincial hospital (approximately 42km away). Thai nationals and M1s are exempt from payment, but M2s and unregistered migrants have to pay between THB 600-800 per day for treatment, as well as THB 500 for the ambulance, if needed. None of the public health officers and nurses that were interviewed by the team had received any specific training on MIP. The local malaria clinic is responsible for collecting the malaria data from the hospital and sharing it with the national programme through the malaria online system.

Field visits to Myanmar

Nay Pyi Taw and Yangon

The assessment team visited the NMCP and MCH departments of the MoH in the official capital, Nay Pyi Taw, as well as numerous malaria implementing partners in Yangon. MSF-Holland is working in Rakhine State and screens all pregnant women for malaria and has found a 2% point positivity rate in its clinics there. GHAP, which works among the ethnic minorities in Karen State in a recent survey, found a positivity rate of 11.8% among pregnant women. GHAP's partner organisation based in Myanmar, Friends for Health (FFH), carries out MCH and malaria activities in Kachin State and reported that, out of 45 women tested in the State in 2012, 34 were positive (29% *Pv* and 71% *Pf*)⁵. The head of MCH informed the assessment team that in 2012 out of eight maternal deaths in Ayawaddy Division, the delta region, three were due to severe malaria⁶.

⁵ Personal communication from FFH malaria and MCH team in Yangon

⁶ Personal communication from Dr Theingi Myint, Director of MCH Department, Myanmar

Bago Division, Shan State, and Sagaing Division

Unfortunately, due to limited time and access issues, the team was unable to visit any rural villages, but FGDs were carried out with pregnant women at the health facilities and the midwives who travel to remote communities to serve the population while visiting the health facilities. Pregnant women, even from monitories, were well versed in the causes and means of prevention of malaria. All had nets and slept under them. Midwives conduct outreach visits to the village where they record pregnancies, conduct ANC, deliver babies and educate the population. They are also equipped with RDTs and malaria treatment. They are able to administer injectable drugs for pre-referral treatment of severe diseases, however, routine screening of pregnant women for malaria is not standard practice and is not included in any of the guidelines. The majority of women interviewed in the assessment had delivered at home with the assistance of a midwife. A few women in Bago intended to deliver at the Township Hospital in Bago Town; this was mainly because they did not want to have any more children and wanted to have permanent sterilisation after they delivered.



Focus group discussion with pregnant women in a sub-health centre in Bago, Myanmar

Data collected in Bago by the Japanese International Cooperation Agency (JICA) for the years 2009-2012 appears to show a decline in malaria in children under five from 0.98% prevalence in 2009 to 0.53% in 2012 and declines in severe malaria from 1.86 of admissions to hospital to 0.69%. However malaria in pregnancy does not appear to have followed this trend with 0.01% prevalence in pregnant women in 2009 to 0.05% in 2012. Severe malaria in pregnant women has followed this trend with 0.15 of pregnant women infected in 2009 compared with 0.17 in 2012.

Annex 4: Interview guide

Central /District/ Provincial Level

- Malaria strategic plans (Cambodia, Thailand, Myanmar) - Are there any strategies specifically for tackling MIP: nets, prophylaxis, screening (all or symptomatic women only), BCC strategies to increase ANC attendance, increase awareness of malaria symptoms and anaemia (prevention and treatment)?
- Reproductive health strategic plan – Are there any specific strategies for tackling MIP, increasing attendance at ANC, any alignment with WHO's FANC policies with a focus on disease detection and treatment?
- Are there policies or guidelines either from RH programmes/departments or NMCPs on the prevention and treatment of malaria in pregnancy, anaemia, severe malaria in pregnant women?
- Data collection - How is data collected in relation to MIP incidence e.g. simple and severe outcomes related to maternal and foetal/infant mortality, low birth weight, net coverage, mild/severe anaemia? Who reports RH or malaria data? How is that data reported and acted on?

Hospital/Health Centre Level

Doctor and midwives

- Knowledge of the consequences of MIP
- Prevention of MIP
- Detection of MIP (screening or symptomatic)
- Management of severe malaria/anaemia in pregnancy
- Emergency management/referral, use of rectal artesunate, etc
- Detection of symptoms and management of congenital malaria and low birth weight/premature infants

Pregnant Women Attending ANC/Clinic

- Is this their first pregnancy
- How many have other children and how many
- Are all those children living
- If not, what was the cause of death
- Why they attend ANC
- How often do they attend ANC
- How do they think they should attend ANC
- What things make it difficult to attend ANC
- Do health staff treat them well when they come to ANC
- Where do they plan to deliver their child
- Why they chose that place to deliver
- Who do they trust to give them advice about pregnancy and delivery
- How does one catch malaria

- Have they had malaria
- Have they had malaria while pregnant
- Why are pregnant women especially at risk
- What are the risks for the baby
- What are the symptoms of malaria and why is it dangerous for pregnant women
- What should they do to prevent malaria in pregnancy
- If they feel sick what do they do
- Where do they go when they think they have malaria
- If they are seriously ill what happens
- Have they ever had a finger prick test to test for malaria
- What are the symptoms of anaemia and what should they do to prevent it

Pregnant Women Not At ANC

- For how many is this the first pregnancy
- How many have other children and how many
- Are all those children living
- If not, what was the cause of death
- Have they had malaria
- Have they had malaria while pregnant
- What are the symptoms of malaria and the dangers of MIP
- How does one catch malaria
- What are the risks for the baby
- Why are pregnant women especially at risk
- Why don't /can't they attend ANC
- Why should they attend ANC
- What should they do to prevent malaria in pregnancy
- What are the symptoms of anaemia and what should they do to prevent it
- How many times should they come to ANC
- If they feel sick what do they do
- If they are seriously ill what happens

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Annex 7: Tools available in the area to control malaria in SE Asia

Prevention methodologies

WHO advises prevention of malaria in pregnancy through the following.

- **Sleeping under an ITN (preferably a LLIN) every night.** Net use in the GMS is already very high, even in remote areas, being almost 100% among the people interviewed. Cambodia has made a great effort to distribute LLINs to the population over the last few years. The communities do, however, prefer their own large family sized conventional nets which are softer and longer than LLINs. In view of the different biting and resting habits of the vectors in the region, and therefore possible only partial efficacy of ITNs, as well as the difficulties and costs of maintaining high coverage with LLINs, reliance on nets as a preventive measure may be limited.
- **IPTp 2-3 doses in the second and third trimesters of pregnancy.** Due to the high prevalence of drug resistance to the drugs commonly used for IPTp and prophylaxis, SP and Chloroquine, regimes containing these drugs are ineffective and not accepted in the GMS. The safety and effectiveness in pregnancy of alternative regimes is not fully known. The cost and cost effectiveness of such interventions and the ethics of treating a large number of non-infected patients with potentially dangerous drugs has deterred NMCPs from consideration of IPTp. A review of the safety of drugs³⁶ has been published IPTp may only be suitable in limited areas, where transmission remains high and where the risk of malaria outweighs the risk of taking drugs in pregnancy. However, the main population group at risk has the least access to ANC and is likely to be the most strongly against taking preventive drugs in pregnancy as many ethnic minority and remote populations are reluctant to take any medications during pregnancy Even in Africa, IPTp with two does is seen to be less effective than IPTp with 3 doses.
- **ISTp: (Intermittent Screening and Treating)** much research is proceeding on ISTp even in countries where IPTp remains the current policy. Studies to compare the efficacy of ISTp are taking place in India and Ghana. MSF and SMRU have been using this technique for some time in low transmission areas such as India, Myanmar and Burundi

Diagnosis and treatment

In general, in the countries visited, diagnosis is only carried out when pregnant women present with fever or have a history of fever. Even in malaria endemic areas, it was found that not all fevers are suspected to be malaria related and availability of testing material such as efficient microscopy or suitable RDTs is not guaranteed. Although the effectiveness of RDTs (HRP2 based tests for *P. falciparum*) has been tested extensively in Africa among pregnant women⁴¹, no efficacy studies have been done in pregnant women in Asia, using either microscopy or the combo RDT. It is well known that detection of malaria in pregnancy poses challenges. Parasites may be sequestered in the placenta and therefore not seen in the peripheral blood. The use of both RDTs and microscopy has been recommended by African research and unpublished research by MSF in India. The detection and significance of very low parasitaemias has not been defined. A rapid, robust, point of care PCR

test is urgently needed for detection of malaria in pregnancy as early as possible in the course of the infection. Infection in the first trimester may affect the development of the placenta and subsequently the optimum growth of the foetus.

Recommended treatment for malaria among pregnant women was the same in all the countries visited:

Pf and mixed infections:

- First trimester: quinine for seven days (in Myanmar clindamycin is recommended as well but not always available when ACTs can be given) quinine infusion is also recommended for severe malaria
- Second and third trimester: ACTs (DHA/piperaquine, Coartem or AS+MQ.)

Annex 8: List of interviewees, places and organisations visited

Thailand

- Total FGD Participants: 14 pregnant women, 5 postnatal women and 2 TBAs

Interviewees

- Dr Wichai Satimai, Director NMCP
- K. Piyaporn Wangroongsarb, NMCP
- Michael O'Dwyer, Health Sector Specialist, AUSAID
- Dr Charles Delacollette, Mekong Malaria Programme, WHO
- Eh Thwa Training Manager, Mae Tao Clinic
- Dr Rose McGready, SMRU

Places and organisations visited

- **Bangkok**
 - BVBD (NMCP), WHO, AusAID
- **Tak**
 - Mae Tao Clinic, Mae Sot (7 pregnant women)
 - Karen community, Mae Sot (5 PN, 1 pregnant woman)
 - Naung Bwar Health Promotion Hospital (6 pregnant women)
 - Naung Bwar village (2 TBAs)
 - Thasongyang District Hospital
- **Chiang Mai**
 - Dr Rose McGready, SMRU
- **Chanthaburi**
 - Pan Nan Ron Malaria Clinic
 - Pan Nan Ron District Hospital
 - Chanthaburi Provincial NMCP office

Cambodia

- Total FGD Participants: 83 pregnant women , 24 TBAs and 3 VMWs

Interviewees

- Dr Char Meng Chuor, Director, NMCP
- Dr Chea Nguon, Vice Director, NMCP
- Dr Kheng Sim, Vice Director, NMCP
- Dr Po Ly, NMCP
- Dr Meas Thea, Vice Director, NMCP
- Dr Thung Rathavy, Director MCH
- Dr Abdur Rashid, Medical Officer, WHO

- Dr Cheang Kanmitha, Making Pregnancy Safer Programme National Professional Officer, WHO
- Dr Samphor Narann, WHO
- Abigail Beeson, MCH Programme Manager, CARE Cambodia
- Sokomar Nguon, Country Programme Director, CAP Malaria Project /URC
- Mauricio Vazquez, Asia Regional Programme Manager, Health Poverty Action
- Ellen Jones, Country Director, Health Poverty Action
- Global Fund Project Team Leader, Health Poverty Action
- Dr Chea Meng Tieng, Community Health Specialist, Reproductive Health Association of Cambodia (RHAC)
- Ms Kagnabelle Thou, FHI 360
- Lim Kinseng, SBC Officer, Malaria Programme, FHI 360
- Dr SimS orn Lai, Director, Ratanakiri PHD
- Dr Hoy Vannarra, Malaria Programme Manager, Ratanakiri PHD
- MCH Programme Manager, Ratanakiri PHD
- Mr Mean Vanna, Malaria Department, Ratanakiri PHD
- Dr Hing Pan Sokunthea, Director, Ratanakiri Referral Hospital, Ban Lung
- Head of OB Ward, Ratanakiri Referral Hospital, Ban Lung
- Dr Luy Sopheap, Deputy Director, Pailin PHD
- Dr Prak Sokhon, MCH Manager, Pailin PHD
- DrPhabSouvichet, RH Director, Pailin PHD
- Mr Soum Chen, NMCP Representative, Pailin PHD
- Khem Monykosal, Deputy Director, Pailin Referral Hospital

Places and organisations visited

- **Phnom Penh**
 - CNM (NMCP)
 - Care
 - Health Poverty Action
 - RHAC
 - WHO
 - URC
 - FHI 360
- **Ratanakiri**
 - PHD office in Ban Lung
 - Ratanakiri Referral Hospital
 - Andong Meas Health Centre
 - Nhang Health Post
 - 7 villages (we were also meant to visit Taing Mlu village but the road was too bad so we turned back):
 1. Malik
 2. ChayToch
 3. Thom
 4. Keth Thom

5. Nay
 6. Kachut Phnom:
 7. Unnamed, new annex village, not yet registered (included women from Dr Marc Cooseman`s insect repellent study)
- **Pailin**
 - PHD office in Pailin
 - Pailin Referral Hospital
 - Suon Koma Health Centre
 - Krachab Health Centre
 - Ta Sanh Health Centre
 - Thai-Cambodia border crossing Malaria Post

Myanmar

- Total FGD Participants: 48 pregnant women and 1 auxiliary midwife

Interviewees

- Dr Krongthong Thimasarn, Malaria Medical Officer, SEARO WHO
- Dr Gawrie Nirdoshi, SEARO WHO
- Dr Myat Phone Kyaw, Director (Research), Department of Medical Research (Lower Myanmar)
- Dr Thar Tun Kyaw, Director NMCP, MoH
- Dr Khin Nyein Chan, Medical Coordinator, MSF Holland
- Dr Myo Set Aung Medical Coordinator, MSF Swiss
- Dr Soe Aung, Program Management Department, Myanmar Medical Association
- Dr Myo Min, Project Manager, Myanmar Medical Association
- Dr Theingi Myint, Director Maternal and Child Health, MoH
- Dr May Aung Lin, Country Programme Director, CAP Malaria/URC
- Louise Mellor, Health Advisor, DFID
- Dr Kyi Thai, Program Consultant, Community Partners International
- Dr Phyto Maung Maung, Programme Coordinator, Friends for Health
- Daw Myint Su, Executive Director, Community Partners International
- Billy Pick, Technical Advisor, USAID
- Dr Mya Sapal Ngon , Health Programme Manager, USAID
- Dr Kyaw Nyunt Sein, Fund Manager, Joint Initiative of MNCH Fund, UNOPS
- Dr Pietro Di Mattei, 3MDF Head of Programme Unit, UNOPS
- Dr Adelaida DeGregorio, Country Programme Manager CAP-Malaria, Save the Children
- Dr Phone, Deputy Programme Manager CAP-Malaria, Save the Children
- Dr Han Lin Zaw, Health Programme Advisor, Save the Children
- Professor Mya Thida, University of Medicine (II)
- Dr Frank Smithus , MAM (by phone)
- Dr Masatoshi Nakamura, JICA
- Daw Mar Mar win, Senior Entomologist, NMCP
- Dr Nay Yi Yi Linn, Assistant Director, NMCP
- Dr Khin Than Win, WHO Training Coordinator for GFATM

- Dr Sai Naw Ngin, WHO National Coordinator for GFATM
- Dr Nay Myo Ohm, Division Health Director, Bago
- Dr Ni Ni Aye, Acting Township Medical Officer, Bago
- Dr Tun Min, Regional Officer, VBDC Bago
- Dr Aung Ko Ko, WHO MARC Field Project Coordinator, Bago
- Si Thu Myint Thein Health Assistant Rural Health Centre S. Shan State
- Dr Myo Nyunt Oo Township Medical Officer S. Shan State
- May Min Theint maternal and child health officer Tanuggi S. Shan State
- Dr Cayhi Chaing, Director of Station Hospital Ywarthitgi
- Dr Thet Aung, Deputy medical superintendant of Saigaing health division
- DrT het Oo Wai, Township health officer, Saigaing
- Dr May Thu Khin, Head of Reproductive Health and School Health, Saigaing

Places and organisations visited

- **Yangon**
 - WHO
 - MMA
 - FHI
 - MSF – Holland
 - MSF – Swiss
 - Department of Medical Research (Lower Myanmar)
 - 3MDG UNOPS
 - Joint Initiative of MNCH UNOPS
 - Save the Children
 - MAM (by phone)
 - USAID
 - DFID
 - JICA
 - URC
- **Bago**
 - Bago Division Health Office
 - Bago Township Primary Health Care Centre
 - Nyaung Inn Sub Health Centre
 - Inn Ta Kaw Rural Health Centre
- **Shan**
 - South Shan health office
 - Specialist Hospital
 - Malaria Clinic
 - Urban health centre
 - Rural health centre
 - Sub centre
- **Sagaing**
 - Saigaing Division health office Shwe Bo endemic area

- Township hospital
- Rural health centre
- Ywarthitgyi Station Hospital