PROGRESS OF PARTIAL INTEGRATION OF MALARIA CONTROL WITH OTHER VECTOR BORNE DISEASES CONTROL IN NORTHERN THAILAND

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Abstract. Thailand partially integrated the malaria program into the provincial and local Public Health system starting in 2003 by adding it to the control of other vector borne diseases and by transferring some activities to the Public Health Department. This study evaluates the results of this transfer on 8 high malaria incidence districts of Mae Hong Son and Chiang Mai Provinces. Indicators were measured for all community hospitals, Vector Borne Disease Control Units, (VBDU), health centers (HC), malaria clinics, and malaria posts in 2003 and 2004 during the first two years of partial integration. The number of Vector Borne Disease Control staff decreased 1.8 - 3%, and their operational budgets decreased 25%. The VBDU staff did all the indoor residual spraying (IRS), insecticide treated net (ITN) work and entomology surveys, they took 80.6% of the blood films, and treated 72% of the patients, while Public Health system did the remainder. The Annual Parasite Incidence (API) (1 - 10/1,000) and IRS coverage (88 - 100%) remained adequate in most areas during the first years after partial integration, but the API increased (to 31.6 - 57.6/1,000) in some populations. The percentage of insecticide treated bed net coverage was adequate in Mae Hong Son (95.4%), but inadequate in Chiang Mai (52.2%). Early diagnosis and prompt treatment (4 - 23 days), hospitals reporting disruption of anti-malarial drugs (3 of 7), and health centers having all needed equipment, training, and drugs for malaria diagnosis (9%) remain inadequate. If the program is allowed to diminish, malaria could spread again among the population. Integration of antimalarial activities into the general Public Health system has only been partially successful. We recommend the integration process and results should be monitored and evaluated to find and mitigate problems as they occur, and modify the integration process if needed.

Key words: malaria, vector borne disease, control program, partial integration

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INTRODUCTION

The 1978 International Conference on Primary Health Care (Trigg and Kondrachine, 1998) recommended integration of malaria control into primary health care systems (PHC). The 1986 WHO Expert Committee on Malaria, 18th

Report also recommended vertical malaria control be transferred to PHC, with training and supervision by malariologists (WHO Export Committee on Malaria, 1986). The 1992 WHO Global Ministerial Conference on Malaria in Amsterdam, issued the World Declaration on the Control of Malaria, that adopted control as the main strategy for malaria, with integration into PHC (Kidson, 1992; Trigg and Kondrachine, 1998; WHO Export Committee on Malaria, 2000).

The control strategies obtained good results in parts of several endemic countries, (Mabaso *et al*, 2004; Sharp *et al*, 2007; WHO, 2008). Control programs were plagued with the same operational problems as eradication programs (Sharma VP, 1996; WHO, 2008). Cost-saving in many control programs resulted in decreased indoor residual spraying (IRS), leading to increased malaria in the 1990s (Roberts *et al*, 1997).

When the PHC integration policy was proposed, some doubted the feasibility of transferring malaria control activities to general PHC, because in many countries PHC was not yet strong enough to handle malaria control (Bruce-Chwatt, 1983). Countries with effective PHC had a decrease in malaria when malaria control was integrated with PHC, such as in China (Tang *et al*, 1991; Luo *et al*, 1996). Several Southeast Asian countries have integrated malaria vertical programs into PHC, with treatment transferred to PHC, but malaria vector control teams continued their work and combined it with other insect-borne disease vector control, such as dengue (Rashid *et al*, 1987).

As predicted, some PHC systems could not handle the malaria control in addition to the other diseases they were already having difficulties controlling. Despite successes in most malarious areas of China, PHC systems were insufficient to control malaria well in some areas (Li *et al*, 1995). In some countries, high malaria transmission occurred when using the control strategy, allowing a resurgence of malaria, such as in India. Some experts recommended continuing to have a core of specialized malaria staff, especially for vector control (Rashid, 1987; Dhingra *et al*, 1997; Sharma, 1999; Kroeger *et al*, 2002). Even in countries experiencing sufficient malaria control progress to potentially eliminate indigenous transmission in some areas, the WHO recommended a core group of malaria experts organize the vertical program to eliminate malaria (WHO, 2007).

In this international context of similar problems occurring in several countries, this study examines the progress toward transferring malaria activities into the PHC system in areas of northern Thailand. Malaria control in Thailand commenced in 1950s with impressive reductions in morbidity and mortality. Transmission, however, is still ongoing, particularly along international borders and in the forest and forest fringe where the local vectors are present. Only slow progress in malaria control has been achieved in these core areas, in spite of continuous case and vector management implemented for decades. The ecology of the vectors, difficult travel, language and ethnic diversity, and genetic polymorphism of the people compound these problems (Malikul, 1988; Charoenviriyaphap, 2000).

Over its history, Thailand's malaria program policies have been altered several times to fit changes in the malaria situation affecting control and reporting activities. These paralleled international policy changes described above, since Thailand

participates in international malaria information exchange, and made the strategy changes simultaneously with other countries.

Thirty to fifty years ago the Malaria Division provided almost all the malaria services in outlying rural areas. These included active case detection by malaria workers going to houses, passive case detection by Malaria Clinics and trained volunteers, and vector control by malaria workers doing IRS and helping people distribute insecticide treated mosquito nets (ITN). Later, the general Public Health system gradually expanded its operations into these areas, mainly by establishing hundreds of Health Centers offering preventive and therapeutic services for a wide range of diseases. The Malaria Division, Ministry of Public Health (MOPH), started doing work to prevent dengue and filariasis, and changed its name to the Bureau of Vector Borne Diseases (BVBD). In recent years, hospital and health center staff, vector borne disease control staff and volunteers, have obtained blood films from patients suspected of having malaria. One of the main activities of Vector Borne Disease Control Unit (VBDU) staff is IRS and ITN work with villagers and Public Health staff. The MOPH is gradually phasing out the VBDU staff, letting them retire one by one, and not hiring replacements. According to plan, general Public Health system staff will eventually take responsibility for IRS and ITN, but thus far, they have relied on VBDU staff to do this.

Since this integration process is partially completed, its progress must be evaluated. Therefore, the objectives of this study were to determine how partial integration is positively or negatively affecting malaria control processes and outcomes and to identify activities or areas which ought to be modified. In order to do this, we assessed malaria control program indicators of processes for a) vector control and prevention and b) malaria passive case detection activities, impacts, malaria prevention, disease management, and health sector development.

MATERIALS AND METHODS

Chiang Mai and Mae Hong Son provinces were selected because they have the highest reported malaria cases in northern Thailand. Two of Mae Hong Son's 7 districts (Mae Sariang and Sop Moei), and 6 of Chiang Mai's 24 districts (Chiang Dao, Fang, Wiang Haeng, Mae Ai, Omkoi and Chai Prakan) were selected because they had the highest malaria incidence of all the districts in the 2 provinces (Fig 1). All the community hospitals and VBDU were selected at the district level and all the health centers (HC), malaria clinics and malaria posts were included at the community level.

Several indicators were studied retrospectively or cross-sectionally at the community, district and provincial levels. During the integration process of transferring work from the VBDU staff to the Public Health staff, both sets of agencies continued to record and report all activities, so these indicators provided reliable data.

1) Work transfer indicators measured the activities conducted by the VBDU staff, and the Public Health staff, including blood films taken from suspected cases, blood films microscopically examined, patients treated, entomology surveys done, houses and farm huts sprayed and bed nets treated. This also included the number of VBDU personnel in the study areas, and the budgets of those offices.

2) Process indicators were vector control and prevention activities. We evalu-

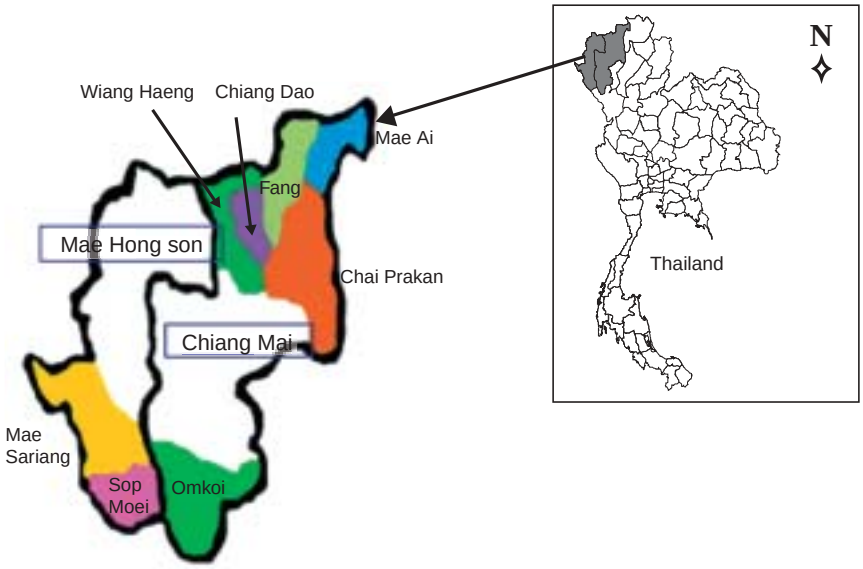

Fig 1–Locations of the study sites, Sop Moei and Mae Sariang in Mae Hong Son; Omkoi, Wiang Haeng, Chiang Dao, Fang, Mae Ai and Chai Prakan Districts in Chiang Mai Province. The white colored areas were not included in this study.

ated vector control and prevention activities carried out compared to those planned. These included households and farm huts protected by IRS, and distribution of ITN. Data regarding malaria control activities were obtained from VBDU for 2003 and 2004 in order to determine the percentages of activities carried out versus those planned, divided by the households, farm huts, and populations protected.

3) Impact indicators measured the impact on malaria, calculated by the Annual Parasite Incidence rate (API per 1,000 population), obtained from the routine activity reports of the VBDU, and annually summarized as morbidity rates by districts and provinces.

4) Malaria prevention indicators evaluated households having at least one ITN, and average number of persons per net. Data were collected using a Malaria Households questionnaire survey (MHS) of informant knowledge, attitudes and behaviors toward malaria disease, mosquito net ownership and use and their informed consent.

5) Disease management indicators were: a) early diagnosis and prompt treatment (EDPT), the mean period from symptom onset to treatment, collected from the district VBDU routine activities; and b) percentages of health facilities having malaria diagnostic equipment and capabilities to do malaria microscopy diagnosis and provide treatment correctly according to national policies. Data were collected using a structured health facility questionnaire.

6) Health sector development indicators evaluated percentages of health facilities reporting no disruption of stock of antimalarial drugs for more than one week during the previous three months, col-

lected in the same structured health facility questionnaire and interview.

RESULTS

The work transfer indicators

The work transfer indicators showed the VBDU staff did all the IRS and ITN work. They slowed and then stopped doing adult mosquito surveys, but continued doing larvae surveys in 90 - 100% of target villages, but the Public Health staff did not do this. Among the blood films taken and microscopically examined, 80.6% were done by VBDU staff and volunteers, and 19.4% by Public Health staff. Seventy-two percent of the patients were treated by VBDU staff, and 28.0% by Public Health staff. The number of VBDU personnel in the study areas decreased by 1.8-3% during the study. The operational budget of the VBDU decreased by >25% so the remaining personnel were able to do less field work. They were changing their roles from implementing full disease control operations to technical support and coaching of Public Health personnel.

Process indicators

The IRS and ITN activities planned and finished on time in the first two years of partial integration, 2003 and 2004, increased in some areas, and changed little in some areas. The percentages of planned households protected by IRS increased significantly in Mae Hong Son (77.98% to 88.01%) ($p < 0.001$), while there was little change among Mae Hong Son farm huts (100.0% to 101%), Chiang Mai households (95.9% to 94.3%), and Chiang Mai farm huts (100% to 99.9%). However, number of ITN distributed increased significantly from 91.3% to 96.8% in Mae Hong Son ($p < 0.001$), and 89.3% to 98.4% in Chiang Mai ($p < 0.001$), comparing 2003 and 2004, respectively.

The impact indicator

The Annual Parasite Incidence (API per 1,000) in our routine epidemiological data has been systematically reported separately for Thai citizens and non-permanent foreign patients. This is used to identify foci and communities needing additional investigation, vector control, and case detection and treatment. In Mae Hong Son Province the API decreased in Thai residents from 14.2 to 10.0 from 2003 to 2004. In Mae Sariang the API decreased from 9.04 to 6.6 from 2003 to 2004. In Chiang Mai Province, the API decreased from 1.11 to 1.08 from 2003 to 2004 among Thai residents. However, among Thai residents this indicator increased from 2003 to 2004 in Wiang Haeng (24.21 to 31.63), and deceased slightly in Chiang Dao (18.76 to 15.68) districts (Table 1). In contrast, many non-permanent foreign residents had high, increasing APIs, rising from 47.17 to 50.68 in Sop Moei, and 28.10 to 57.46 in Mae Sariang Districts of Mae Hong Son, from 2003 to 2004. Over a longer period from 1999 to 2004, the API among Thai residents decreased in Mae Hong Son Province from 25 to 10, and in Chiang Mai Province from 2.38 to 1.08.

The malaria prevention indicator

The proportion of households having ITN, was 95.3% in Mae Hong Son, and 52.2% in Chiang Mai. The average number of persons per net was 2.05 in Mae Hong Son, and 2.52 in Chiang Mai. Two areas of Chiang Mai Province had especially low percentages of households with nets: 25% in Ban Pa Kha (Fang District), and 29% in Ban Huoy Poo Luong (Omkoi District).

The disease management indicators

Early diagnosis and prompt treatment (EDPT), the mean period from symptoms

Table 1
Annual Parasite Incidence (API per 1,000) collected from the routine epidemiology reporting system, Vector Borne Disease Control Center (former, Malaria Center).

Province	District	Annual Parasite Incidence/1,000 population[a]	
		2003[b]	2004[c]
Chiang Mai (whole province)		1.11	1.08
	Chiang Dao	18.76	15.68
	Omkoi	6.34	3.67
	Wiang Haeng	24.21	31.63
	Fang	2.83	2.87
	Mae Ai	2.81	3.44
	Chai Prakan	1.35	2.11
Mae Hong Son (whole province)		14.20	10.04
	Sop Moei	9.61	9.38
	Mae Sariang	9.04	6.6

[a]Thai-permanent resident: Thai citizens
[b]2003, October 2002 to September 2003
[c]2004, October 2003 to September 2004

Table 2
Availability of malaria diagnostic and treatment supplies and facilities obtained by questionnaire and interviews, from 73 health sectors in study sites in Mae Hong Son and Chiang Mai Provinces.

Resources	General district hospital (7)		Health center (66)		Malaria clinic (16)	
	CM (5)	MHS (2)	CM (49)	MHS (17)	CM (12)	MHS (4)
Human resources						
Microscopist (available)	5	2	4	4	12	4
Equipment						
Microscope	5	2	31	9	12	4
Glass slide	5	2	30	9	12	4
Malaria staining reagent	5	2	2	4	12	4
Malaria treatment guidelines	5	2	7	6	12	4
Thermometer	5	2	31	9	10	2
Malaria rapid diagnostic kit	0	0	0	0	0	1
Anti-malaria drugs (disruption more than one week)						
Chloroquine tablets	0	0	38	9	1	0
Mefloquine tablets	2	1	15	11	1	0
Quinine tablets	0	0	14	13	4	3
Quinine injection	0	0	15	17	None	None
Artemisinin derivative tablets	2	1	14	12	5	1

MHS, Mae Hong Son Province; CM, Chiang Mai Province; None, Not available because the malaria clinic was not allowed to provide injections to patients following National Malaria Control Program policies.

until treatment, ranged from 4 to 23 days. In Mae Sariang District, Mae Hong Son Province, this decreased: 4.26, 3.58 and 1.88 days in 2002, 2003 and 2004. In Chiang Mai Province there was little change. The length of time even increased in some districts, such as Fang District (11.67 to 14.14), and Omkoi District (7.51 to 11.11).

The percentages of health facilities able to do malaria diagnosis varied. Among the 7 general district community hospitals located in the study area (2 in Mae Hong Son and 5 in Chiang Mai), all had malaria diagnostic equipment (light microscope, glass slides, staining facilities, etc), and personnel capable of making a correct diagnosis and treatment. None had rapid malaria diagnosis test kits. However, only 40 of 66 (60.6%) HC had microscopes and only 8 had both microscopes and skills (12.1%). Only 13 (19.6%) HC had national malaria drug treatment guidelines. No HC had rapid malaria diagnosis tests (Table 2).

The health sector development indicator

Among the district hospitals, 3 out of 7 reported disruption of mefloquine and artemisinin derivative tablets (42.8%). However, among the 66 HCs, 47 (71.2%) lacked chloroquine, 27 (40.9%) lacked quinine, and 26 (39.4%) lacked mefloquine and artimisinin (Table 2).

Only 6 (9.0%) of the 66 HCs had the ability to diagnose and treat malaria: a microscope, equipment, a skilled microscopist, treatment guidelines and no disruption of medicines.

DISCUSSION

Work transfer indicators show VBDU personnel carried out reduced entomology activities, and almost all the IRS and ITN work, and Public Health personnel carried out only some testing and treatment of malaria patients, along with a large volume of work for many other diseases. After the dwindling number of VBDU staff stop doing entomology, IRS, and ITN work in the future, will public health staff carry out these duties as planned or not ? Carrying out these duties inadequately could result in an increase in malaria cases as has happened in other countries.

Process indicators show the VBDU had high coverage of IRS and ITN. The staff's diligence was shown in their attaining higher coverage in farm huts than in households, since more transmission occurs in huts, but they require arduous walking to reach. The numbers of ITN used increased in 2004 in both Chiang Mai and Mae Hong Son. High IRS and ITN coverage also reflects the public's willingness to cooperate with the malaria program.

Evaluation of malaria incidence from 1977- 2002 indicates a steady reduction in malaria incidence in northern Thailand, with an average decline of 6.4% per year (Childs *et al*, 2006). Our data shows the impact indicator, disease burden, is decreasing among Thai residents. But it is increasing among non-permanent foreigners in some areas, most of whom are ethnic groups from Myanmar, or from Lao PDR or China. Infection rates are higher along the Thailand-Myanmar border, including Chiang Mai and Mae Hong Son Provinces.The migration of infected individuals over international borders is considered a significant source of malaria transmission in Thailand (Somboon *et al*, 1998; Charoenviriyaphap, 2000). This reveals the currently decreasing case numbers could increase if malaria is allowed to spread among immigrants and across borders.

Several indicators revealed inadequate protection. The malaria prevention indicator, households and people with bed

nets, was adequate in Mae Hong Son, but not in Chiang Mai. Disease management indicators (early diagnosis and prompt treatment, and the ability of the health facility to diagnose malaria) were inadequate in many facilities, and urgently need improvement. Health sector development and anti-malaria drug disruption had logistical problems which could have been caused by budget constraints or their remote location.

Currently, malaria is under control, with morbidity and mortality at fractions of their levels decades ago. But several weaknesses in the health system, the incomplete transfer of work to Public Health agencies, and vulnerabilities in the social and ecological system, could result in a "rebound epidemic" of malaria (WHO, 2008). Malaria transmission is out of control in most of eastern Myanmar. People are carrying drug-resistant malaria across the border daily, and Thailand's hills and forests are optimum habitats for two efficient vectors, *An. dirus* s.l. and *An. minimus s.l.* (Suwonkerd *et al*, 2002, 2004; Overgaard *et al*, 2003). When malaria enters Thailand's rural communities, the Public Health system may not be able to find and stop it, because many Health Centers cannot diagnose and treat malaria. A positive step was made after this study was carried out, by creating a system of Malaria Posts, with villagers supplied and trained to perform malaria rapid tests and treatment.

This study shows the transfer of malaria prevention and treatment from the VBDU to the Public Health system has only been partially successful. In order to compare outcomes and epidemiology over periods with naturally fluctuating transmission, to find or predict problems, and to suggest mitigation methods, we will continue to monitor and evaluate these indicators. We recommend health administrators move cautiously toward the new strategy of integration into the public health services, and be prepared to change directions or stop if the integration process encounters more problems.

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