Malaria Situation in Myanmar

1. Populations at risk

The humanitarian dimension of malaria in Myanmar is enormous as a large proportion of the population is affected. The disease is endemic in 284 out of 324 townships, mainly in rural areas and in some pen-urban places. Out of estimated total population of 54.28 million (2004), 38.54 million (71%) live in malaria risk areas (29% or 15.74 million in high-risk areas, 24% or 13.03 million in moderate risk areas, and 18% or 9.77 million in low risk areas). Aside from those who reside in high risk areas, the high risk groups are the internal migrants (laborers in development projects such as dams, irrigations, road, mining, logging, rubber plantation, etc), people who resettled in endemic areas, subsistence farmers in the forest and forest fringes, wood and bamboo cutters and other forest related workers. Although these groups are well known, they are very difficult to quantify due to their high mobility, seasonality of their work, lack of organization and coordination among themselves and inadequate coordination between the health sector and the agencies responsible for development projects. Pregnant women and children under 5 who comprise 3% and 12% of the total population are also high risk groups due to their biological vulnerability. Ethnic minority groups are also identified as malaria risk group. There are some specific risk groups for some areas (e.g., crude oil digging in Sagaing Division).

2. Risk Areas

Almost all parts of the country have malaria transmission except in most of the urban areas and central plain areas and high altitude where the main vectors cannot survive. The risk areas are categorized as high, moderate, low and no risk areas as per brief description below.

2.1 High risk areas

These areas are usually hyperendemic or holoendemic and mostly related with hilly forested environments where the main vectors are *An. dirus* and *An.minimus,* and range in distribution from Kachin State through Mandalay Division to Mon State and Tanintharyi Division in south.

2.2 Moderate risk areas

These areas are usually mesoendemic either in coastal or plain areas extend from Sittwe in rakhine state to Dawe in Tanintharyi Division through Ayeyarwaddy and Mon State and under the influence of *An.sundaicus* and *lorAn. annularis.*

2.3 Low risk areas

These areas are usually hypoendemic plain areas. Central-dry-zone belt of Mandalay, Sagaing, Bago and Yangon Divisions, which are under the influence of *An. culicifacies, An.hyracanus s.I.* and *An.aconitus.* They are prevalent with possibility of epidemics. However, malaria is generally sporadic in most towns of these areas.

2.4 Noriskareas

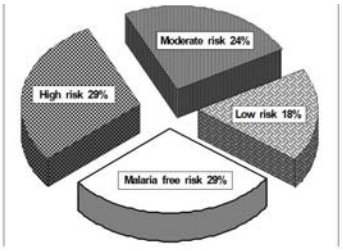
It is non-endemic and cases reported in these areas are imported from endemic areas. The area is not receptive but vulnerable.

Changing proportion of population in various phases of the programme can be seen in the following table. (Table A.)

Table A: Proportion of population living under various risk areas

Population living under imilaijous and Malaria free areasMyammr,2OO4

Year	**1988**	***1994***	2004
High risk area	38.9%	38.24%	29.14%
Moderate risk area	41.7%	28.59%	23.75%
Low risk area	13.8%	21.85%	18.17%
No risk area	8.6%	11.32%	28.94%



Malaria Risk Areas

Malaria area according to ecology

Malaria in forest fringe foot hifi area

3. Trend analysis of malaria problems *(1976* -2004)

3.1. Malaria morbidity and mortality trend (1976- 2004)

Malaria is one of the major public health problems in Myanmar. In 1976, total clinically suspected malaria cases from out patient department were 515 thousands; cases from inpatient department were 420 thousand and recorded malaria deaths were 707. The highest numbers of clinically suspected malaria cases from out patient department were 930 thousand in 1983; cases from in patient department were 154 thousand in 1990 and malaria deaths were 5231 in 1991. But in 2004, total clinically suspected malaria cases from out patient department were 544 thousands; cases from inpatient department were 59 thousand and recorded malaria deaths were 1982. It is now start to roll back its original level. We need to sustain the achievements which are already gained.

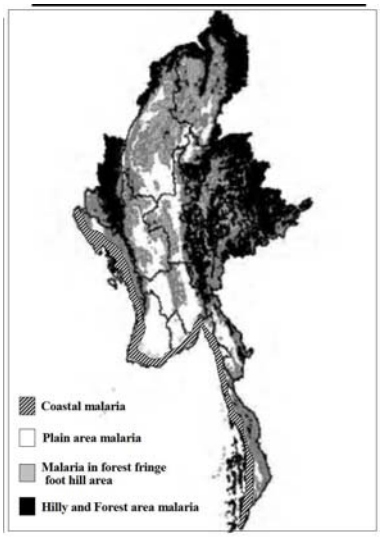
Year 2004 is the lowest recorded number of malaria cases in out patient and inpatient department, malaria deaths as well as malaria morbidity rate and mortality rate in Myanmar during the last two and half decades period. Case fatality rate was still high (>3%) for nearly two decades. It was because of admitted malaria cases and malaria deaths were reduced in more or less same proportion. Proportion of malaria deaths in hospitals also declined from > 20% to 15%. ***(Annex 1.— Table)***

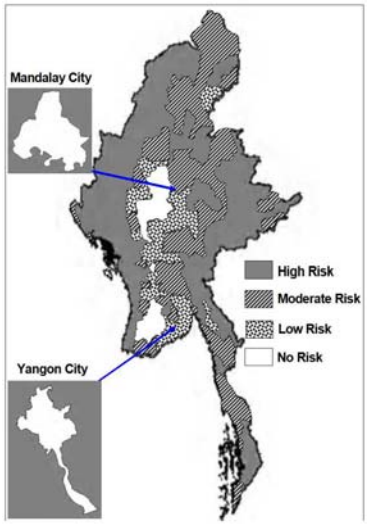
Mandalay City

Coastal malaria
Plain area malaria

Hilly **and Forest area** malaria

Malaria morbidity & Mortality Rate in Myanmar.1976-2004 1O:
Mortality 1,00.000 **Population**
0





Malaria Morbidity Rate!1000 in Myammar

In year 1978, Peoples Health Plan was initiated and malaria control programme was integrated with Basic Health Services. Because of transitional period, reporting cases may be declined in that year. After that cases and deaths became increase in number. This may be due to improving reporting system, increasing coverage of reporting units, appearance of drug resistant P. falciparum malaria. Round about in year 1988-1991, recorded malaria morbidity and mortality were highest due to instability of population, epidemics associated with uncontrolled population migration. After that gradual declination in malaria inpatients and malaria deaths were seen because of improved coverage of health services (more hospitals, Rural Health Centers, Sub-rural health centers) and getting early treatment as compared to that of previous years, utilization of potent antimalaria drugs (like Artemisinin compound, mefloquine, quinine), improved capacity building.

The average number of clinical cases and deaths in the past 10 years was 632,497 and 2,959, respectively (Table B). Compared to 2002 data, cases and deaths were lower in 2003 and 2004. These could be due to widespread use of artemisinin derivatives in the private sector, implementation of artemisinin-based combination treatment against *P. falciparum* since the fourth quarter of 2002, increasing coverage of ITNs and improving access and quality of diagnosis.

Table B. Reported malaria clinical cases and deaths in Myanmar

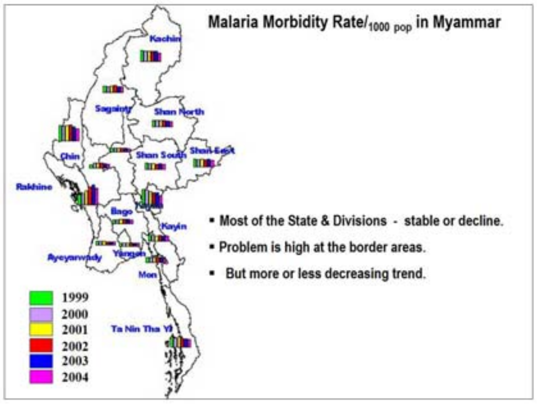
On average, malaria comprised 15% of inpatients and 10% of outpatients. Integrated disease surveillance in sentinel hospitals showed that malaria is one of the top three leading causes of morbidity among children below 10.

3.2. Annual Blood Examination Rate and Slide Positivity Rate Trend (1976-2004)

Slide positivity rate depend on many factors including selection policy for blood smear examination. In late 1970s & 1980s, the policy was "Fever may be malaria, take blood smear. At that time, annual blood examination rate (ABER) was high, but slide positivity rate (SPR) was low. The program was still practicing eradication concept and infection oriented. There were many back log slides and the results were mainly used for epidemiological purpose rather than for treatment of patients. Round about in 1987, policy was changed to take the blood smears from clinically suspected malaria

- Most of the State & Divisions - stable or decline.
- Problem is high at the border areas.
- But more or less decreasing trend.

Year	Clinical Cases	Deaths
1995	656,547	3,744
1996	664,417	3,424
1997	568,262	2,943
1998	548,066	3,182
1999	592,431	3,648
2000	592,354	2,746
2001	661,463	2,814
2002	721,739	2,634
2003	716,806	2,476
2004	602,883	1,982
Average	**632,497**	**2,959**



Malaria Control Program started to change the disease oriented program. Because of that, ABER declined and SPR increased. In 1993, blood smears were taken only from clinically suspected malaria cases and the results should be used for the benefit of the patients treatment. There was further declined in ABER but SPR became high because of improved clinical diagnosis accuracy, appearance and spread of multi drug resistant P.falciparum and non immune migrant workers in development projects, new-settlements in highly endemic areas. Now slide positivity rate is not used as epidemiological parameter. It is now about 35% to 40 % at the national level. ***(Annex 2. Table)***

Malaria (Annual Blood Smear Examined Rate & Slide Posith e Rate)
in 11vanmar (1976-2004)

50

20
10

SPR

* —e—A:ER
— Cl Cl Cl Cl Cl

3.3. P.falciparum (including mixed infection) and P.vivax ratio, Slide falciparum rate and Slide vivax rate. (1976-2004)

P.falciparum and P.vivax ratio was not much changed through out the period. P.falciparum and P.vivax contributed about 80% and 20% respectively. P.falciparum is more than 80% for two decades period. Now it declined slightly. Slide falciparum and Slide vivax rates were not much changed during last 4 years. High proportion of P.falciparum was due to the nature of the slides collection. Most of the slides were collected from hospital admitted malaria patients and because of nature of severity of disease; most of the cases were caused by P.falciparum. But in some parts of the country, although P.falciparum is predominant, P.vivax proportion is higher than national level. (Pf- Pv ratio – 60%: 40%). It is found in Mon State, Kayin State and Tanintharyi Division especially at the community level (RHC, Sub- RHC or village level). Similar finding was seen by other partners. In 2004, MSF (France), working in Mon and Kayin State, examined 20,858 slides. Out of 7964 positives (SPR 38.2%), Pf or mixed and Pv or Pm constituted 4641 cases and 3323 cases respectively. ***(Annex 2 Table)***

***P.falciparum* & *P.vivax* ratio in Myanmar (1976-2004)**
C) C) C) C) C) 00 C) C) C) C) C) C) C) C) C) C) C) C) C) C) C) C) C) C) C C C C C
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3.4. Age group wise malaria positive trend (1984, 1988,1998, 2003,2004)

0

100%

80%

60%

40%

20%

0%

-- *P.v*

4

Table C.

Yearly age group wise malaria positive trend & slide positivity rate

50
45
40

35
30
25
20
15
5
0

0-1 yr 1-9yr 10-14 yr 15+ yr

Slide positivity rate among different age groups were not much different in each year. Depending on smear collection policy, range of SPR was too much different.
Majority of the positive cases were found in socio-economically active 15 years and above age group.
In 1984, infant parasite rate (6.21%) was higher than slide positivity rate of all age groups (5.32%). But in 1988, 1998, 2003, 2004, infant parasite rate was lower than slide positivity rate of all age group of corresponding years. But in children population (1-14 year age groups), slide positivity rate became higher than slide positivity rate of all age group.
Proportion of malaria cases among 1-14 year age group was increasing in nature. In year 1984, 1988, 1998, 2003, 2004, proportion of malaria cases in that particular age group was
5

80
70
60
60
40
30
20
10
0

0-lyr 1-9yr 1O-l4yr 15+yr

1984 1988 1998

2003

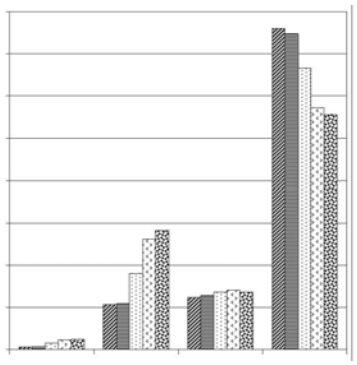
2004

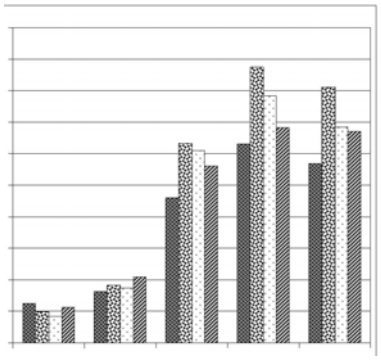
1984 1988 1998 2003 2004

Yr.		0-1 yr	**1-2 yr**	**2-9 yr**	10-14 yr	15+ yr	Total

	Examined	6758	16106	114650	179731	819379	1136624
positive	420	879	5640	7543	46006	60488	
SPR	6.21	5.46	4.92	4.20	5.61	5.32	
Proportion%	0.69	1.45	**9.32**	12.47	76.06	100.0	
2	Examined	8665	18714	101290	139599	679967	948235
positive	706	1527	9464	12157	70882	94736	
SPR	8.15	8.16	9.34	8.71	10.42	9.99	
Proportion%	0.75	***1.61***	**9.34**	12.83	74.82	100.0	

Yr.		0-1 yr	1-4 **yr**	**5-9** yr	10-14 yr	15+ yr	Total
	Examined	7022	22179	37733	46972	249088	362994
positive	1615	7363	11584	14325	69866	104753	
SPR	23.00	33.20	30.70	30.50	28.05	28.80	
Proportion %	1.54	7.03	11.06	13.68	66.70	100.0	
	Examined	13276	47611	59161	63490	297663	481201
positive	4187	21896	24826	24972	101749	177530	
SPR	31.54	45.99	41.96	39.17	34.18	36.89	
Proportion %	2.36	12.33	13.98	14.07	57.31	100.0	
	Examined	13113	48877	56583	60395	251060	430028
positive	3735	20517	22273	20686	84249	151460	
SPR	28.48	41.98	39.36	34.25	33.56	35.22	
Proportion%	2.47	13.55	14.71	13.65	55.62	100.0	





23.24%, 23.78%, 31 .77%, 40.38% and 41 .91% respectively. It seems that children became affected more and more and situation becomes worse. Actually it is not due to deterioration of country wise malaria situation. National figure is distorted by Rakhine State and can see in the following table C.

TableD. ***Slide positive rate & distribution of confirmed malaria among different age-groups, Myanmar Vs Rakhine State, 2004***

According to analysis on existing information, special survey on situation analysis including verification of the data/information is needed urgently in Rakhine State.

4. Malaria Situation in Year 2004.

4.1. Malaria morbidity and Mortality (2004)

According to year 2004 statistics, high malaria morbidity rate (per 1000 population) Rakhine State (62.43), Chin State (46.41), Kayah State (28.92), Kachin State (24.34) and Tanintharyi Division (21.46). High malaria mortality rate (per 100,000 population) were seen in Kayah State (14.00), Kachin State (8.80), Chin State (8.58), Shan State (7.55) and Tanintharyi Division (7.44). All above high malaria morbidity and mortality states/division were situated along the border areas. In these areas the following factors are influencing high malaria problem: topography and climatic conditions are favorable for malaria transmission; national races with low literacy rate are residing in those areas; difficult access to health services; uncontrolled population migration; prevalence of multi- drug resistant *P.falciparum.*

In all states and divisions, except in Rakhine state, malaria morbidity and mortality rates were more or less stable or declined in nature. Although national epidemiological indicators on malaria morbidity and mortality may indicate a declining trend, in Rakhine state, the situation is serious and requires special attention on situation analysis for introduction of effective prevention and control measures. Some contributing factors for high malaria morbidity and mortality in Rakhine State can identify at the macro level which are as follow.

(1) Different vectors are prevalent in different ecology. *An. minimus, An. dirus, An. annularis* and *An. sundaicus* are prevalent.

(2) Natural prawn breeding places where *An. sundaicus* breeds and responsible for some epidemics.

(3) Establishment of new settlement in malaria endemic areas where *An. minimus* is prevalent.

(4) Local vector, *An. annularis* is highly resistant to DDT in that area.

(5) Improve case finding activities by MSF (Holland) in most of the townships.

Changes of Malaria morbidity rate and mortality rate in Myanmar, StatelDivision wise.
(1988, 1998, 2003, 2004)
6

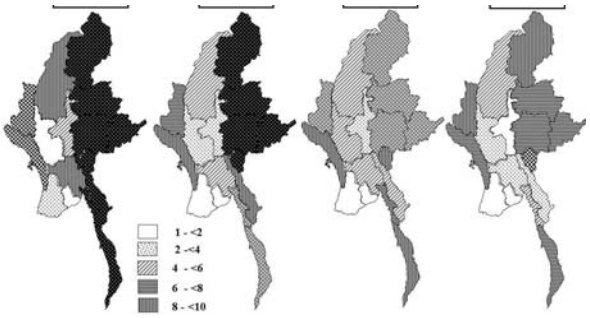
Age-group	All states and divisions			Not including Rakhine			Rakhine State only		
Positive Cases	SPR **(%)**	Propor-tion	Positive Cases	SPR **(%)**	Propor-tion	Positive Cases	SPR **(%)**	Proportion	
Infants	3735	28.48	2.47	1745	22.94	2.27	1990	36.14	2.67
1 -4	20517	41.98	13.55	5573	31.28	7.24	14944	48.11	20.07
5—9	22273	39.36	14.71	7602	28.42	9.87	14671	49.17	19.71
10—14	20686	34.25	13.65	9144	25.17	11.87	11542	47.95	15.50
15 & +	84249	33.56	55.62	52943	28.76	68.75	31306	46.75	42.05
Overall	151460	35.22	100	77007	28.25	100	74453	47.29	100

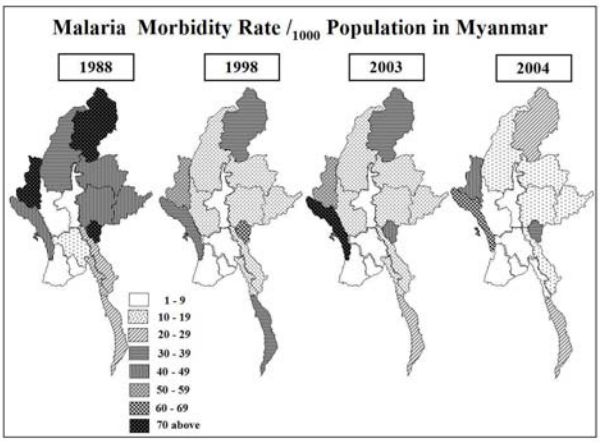
Generally, malaria morbidity and mortality were more intense at the eastern parts of the country. But magnitude of the problems became reduced gradually as seen in the map.
Annually over 400,000 smears were examined in last 4 years with overall slide positive rate of around 35%, mainly (75%) *P.falciparum.* Data in 2004 (Table D) showed that the slide positive rates ranged from 28.48% (in infants) to 41.98% (children 1 -4 years old). Although children under 5 comprised 12% of the total population, they contributed 16% of total confirmed cases.
The reported cases and deaths are just the tip of the iceberg considering that only 25% – 40% of fever cases utilize the public health facilities. Those who availed of services from the private sector (formal and informal) as well as those who self-medicated, and deaths that occurred outside of the health facilities, were not reported. Most deaths occurred among those who seek care only on the fourth day and beyond after the onset of symptoms. Due to poor reporting system in remote areas, a problem that is not unique to Myanmar but common to most malaria endemic countries, the number of malaria deaths is expected to be much higher than what is recorded.
On the other hand, most of the cases were diagnosed clinically and one small scale study showed that very high sensitivity (97%) and very low specificity (21%) of clinical diagnosis done by different categories of health staff. Positive predictive value was less than 50% in this study.

Malaria Mortality Rate 100000/Population in Myanmar

1988 1998 L J

3 1O-<12 12-<14
14abov





4.2. Malaria situation in States Vs Divisions (2004) Table E.

In Myanmar, the area is divided into 7 states and 7 divisions. All states are situated along the border areas. Tanintharyi Division is also situated at the Thailand border area. Although majority of the population are residing at the divisions (nearly 40 million), magnitude of the problems

are high at the states i.e., at the border areas. Malaria cases, proportion of malaria cases, number of severe malaria cases, malaria deaths, morbidity rate and mortality rates were high at the state as compared to that of division values.

In Myanmar, border areas have unique features like national races with low literacy rate, difficult communication because of topography, poor accessibility to health services, marked population migration, prevalence of multi drug resistant P.falciparum, that influence the malaria problems along the border areas.

4.3. *Malaria problem in children*

In Myanmar, Infant mortality rate was 63 in rural areas and 55 in urban areas where as under five mortality rates was 85 in rural and 65 in urban areas. (source- HIM 2002). According to data from the Health Management Information system (HMIS), Department of Health Planning, children under five years of age most commonly die from acute respiratory infections (ARI/Pneumonia), malaria and diarrhea. The prevalence of the cause of mortality differs depending on the region, with having malaria as the leading cause of death.

The U5MR Survey in 1995 (U5MR 1995) found six leading causes of under five conditions (15.1% of which pre-maturity *ISGAI* birth injury! asphyxia 11.2%, neonatal tetanus 2.8%, congenital anomaly 1.1%), cerebral malaria (12.0%), brain infections (10.6% -non-specific and TB) and malnutrition (7.5%).

The same causes were found among infant mortality in 521 children, however with a different distribution: ARI (35.9%), neonatal conditions (24.9%), brain infections (10.4%), diarrhea (10.2%), cerebral malaria (6.7%) and malnutrition (5.2%).

According to VBDC reports, malaria morbidity rate and mortality rate in under 5 year children were 10.7! 1000 under 5 population and 4.3 /1 00,000 under 5 population respectively in year 2004.

Available data on child morbidity are derived from the Central Epidemiological Unit in the Department of Public Health, based on weekly reporting from sentinel sites. Accordingly the morbidity data solely reflects diseases detected in the Public sector.

Table *F: Diseases Under National Surveillance, 1999*

8

	Division	**State**
Total population in million	39.35	14.95
Malaria cases at out-patient department	209,799	334,443
% of malaria cases to total out patients	6.19 %	18.52%
Malaria cases at in-patient department	30673	27968
% of malaria cases to total admission	8.19 %	12.34 %
Severe malaria cases	4154	6569
Malaria deaths	973	1009
Malaria morbidity rate per 1000 population	6.11	24.25
Malaria mortality rate per 100,000 population	2.47	6.75

Age group <1 1-4 59		
31318	63196	26637
3071	10979	12278
48539	74544	31734
13960	**48245**	**59196**
49	361	296
33	167	392
39	183	246
47	48	22
0	0	8

34	54	46
49	0	0
24	52	35
136	166	117
161	454	639
0	6	5
(poisonous) 53	187	280
132	490	706
positive) 32	100	124

According to Diseases under National Surveillance (DUNS) report, ARI/pneumonia and diarrhea cases were higher than the malaria burden. But in 5-9 years age group, malaria cases

were higher number than ARI/pneumonia and diarrhea.

5. Malaria vectors

Of the 37 *Anopheline* species recorded in Myanmar, ten have been incriminated as vectors. The main vectors in order of importance in the country are:
Anopheles minimus, An. dirus, in localized situations *An.annularis, An. sundaicus An.culicifacies* and *An. aconitus.* Studies and experience on indoor residual spraying (IRS) and the use of insecticide- treated mosquito nets indicated that these vectors are amenable to these interventions. *An. annularis* is local vector in Rakhine State and is highly resistant to DDT. Transmission is perennial with peak during the period from June to September in most places. Main vectors can be seen in the following

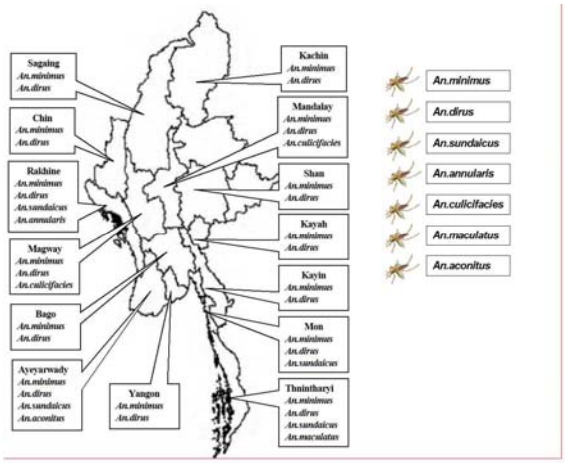
map.

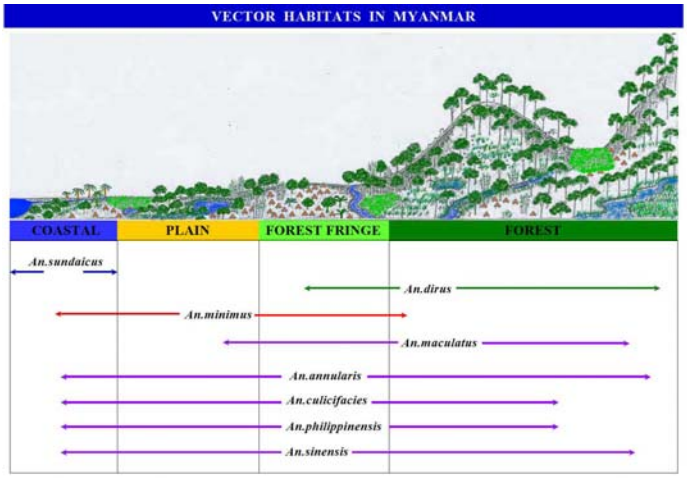
Distribution of Malaria Vectors in Myanmar

Detail entomological situation can be seen in Entomology report.

An.min!mus
An.dfrus
An.sundaicus
An.annularis
An.cu!!cifacies
An.macuiafus
An.acon!tus

I VECTOR HABITATS IN MYANMAR





Vector Species and Suspected Vectors of Secondary Importance and

A.philippinensis
A.maculatus

Foothill areas of all States *I* Divisions
Forested and foothill areas of all States *I* Divisions
It has been recorded almost everywhere in the country.
Coastal areas of Rakhine State, Ayeyarwaddy Div: Mon State and Tanintharyi Div:.
Distributed in Mandalay, Sagaing, Magway, Bago and Yangon Divisions.
Rakhine State.
It has been recorded almost everywhere in the country.
Distributed all over the country.
Similar distribution as *A.minimus.* Especially in Tanintheryi Division.

Important vector involving a human population of 8.0 million.
Most important and notorious vector involving a human population of about 6.0 million.
Vector of local importance. Probably one million people live in the areas of influence. So far this species was considered to be the main vector in Rakhine State only.
Important vector involving a human population of roughly 2 million.

Secondary vector of local importance.
Vector of local importance.
This was suspected as a vector when an outbreak of malaria occurred in rice growing areas. Approximately 0.5 million people living within the area of its influence.
Natural infection had been reported in Myan mar but it is not considered and important carrier.
This could be a vector of local importance in Tanintharyi Div:
approximately 1 million.

Susceptibility status of Anopheline species to different insecticide in Myanmar.

S = Susceptible
T = Tolerant
R = Resistance

their areas of Influence, Myanmar

A.minimus
A. dirus
A. annularis
A.sundaicus
A. culicifacies
A.jeyporiensis A. aconitus
A.hyrcanus

10

Species	**Insecticide**		
Organophosphorous	**Organochiorine**	**Pyrethroid**	
A.minimus	**S**	**S**	**S**
A.dirus	**S**	**T**	**S**
A.culicifacies	**S**	**R**	**S**
A.aconitus	**S**	**R**	**S**
A.sundaicus	**S**	**S**	**S**
A.annularia	**S**	**R**	**S**
A.hyrcanus	**S**	**R**	**S**

Species	**Areas of Influence**	**Population involving**

6. Drug Resistant situation

Drug resistance (Chioroquine) in Myanmar has been first noticed since 1989 in Zaungtu area of Bago

Township. Drug resistance studies of various antimalarial drugs including recent combination therapy were conducted in almost all States and Divisions. Sensitivity level of drugs varied from one place to another and one drug to another. It was obvious that sensitivity levels of chloroquine, SP and mefloquine declined gradually, notably in Myanmar-Thailand border areas, Myanmar-Bangladesh border areas and gem mining areas. Recent test results from sentinel sites indicated treatment failure rates for chloroquine, SP and mefloquine as ranges between (23 –37.5%), (14 -33%) and (6-20%) respectively. All most all the tests were done for 14 days duration.

Therapeutic efficacy tests were also conducted in certain parts of the country.

Artesunate-Mefloquine combination failure rate was 4% to 6.2% in these studies. In MyanmarThailand border (Tachileik), adequate clinical and parasitological responses for ArtesunateMefloquine, Artesunate-amodiaquine, Artemether-lumefantrine combinations were 100% in 2004.

Chloroquine resistance in Pv has been documented in Myanmar in some studies but is not a threatening problem as yet.

In vitro test results of sensitivity levels of quinine indicated a reducing trend from 100% during 1989-90 to 70-75% during 1999-2000.

Table Drug Resistant Test Results

7. Epidemic situation

Although it seems to have certain extent of immunity in most of the populations, epidemics always threaten the lives of the affected population. Malaria epidemics were encountered more frequently during 1991-2000. The reasons for which are different in different situations. Some of the augmenting factors are:

(a) Population migration to or from malaria risk areas

(b) Establishment of new settlements and development projects in malarious area

(c) Unusual rain fall and meteorological changes producing increased breeding sources

(d) Ecological changes due to man-made circumstances

(e) Possibility of introduction of new strains of parasites from one place to another along with population migrations

Occurrence of Epidemics in Myanmar during (1 991-2004) in different states and divisions are shown in the following table.

Table *G: showing* State & *Division-wise Malaria Epidemics in Myanmar (1991-2004)*

Year	Area	Drug used	No. tested	ACR	TF (Early/Late)
2002	Myeik	**Chioroquine**	72	45 *(62.5%)*	27 *(37.5%)*
2002	Myitkyinar	**Chioroquine**	70	*53* (76%)	17 (24%)
2002	Kalay	**Chioroquine**	78	60 (77%)	18 (23%)
2002	Myeik	s-P	70	49 (70%)	21(30%)
2002	Myitkyinar	S-P	71	48 (67%)	23 (33%)
2002	Kalay	S-P	71	61(85.9%)	10 (14.1%)
2002	Myeik	***Mefloquine***	71	**66** (94%)	5 (6°/o)
2002	Myitkyinar	***Mefloquine***	70	56 (80%)	14 (20%)
2002	Kalay	***Mefloquine***	70	64 (91.4%)	6 (8.6%)
2002	Kalay	AS + **Mef**	50	48 (96%)	2 (4%)

2002	Thabeikkyin	AS + **Mef**	**60**	57 (93.8%)	3 (6.2%)
2003	Kawthaung	AS + **Mef**	32	32 (100%)	
		AS+SP	18	18(100%)	
2003	Tamu	AS + **Mef**	25	25 (100%)	
		AS+SP	18	18(100%)	

Regarding State/Division-wise analysis, Shan state, Rakhine state, Magway Divison, Mandalay Division and Tanintharyi Division had been experienced epidemics in most of the years. Generally, malaria epidemics occurred in Shan State (Eastern Shan State, Northern Shan State and Southern Shan State) and Rakhine Statae in almost every year during this 14 years period. However, malaria epidemics were reported in more frequently Mandalay Division and Tanintharyi Division during last 5 years. Ayeyarwaddy Division, Chin State, Kachin State, Kayin State and Yangon Division have once or twice of epidemics during these (14) years. During this period, no malaria epidemic was reported in Mon State, Kayah State and Sagaing Division.

Most frequent out breaks were recorded in year 1998 and 1999. During 1991-2004,

highest frequencies of malaria epidemics occurred in Shan States mainly due to new settlement (Wa region), changing agricultural practices (Kokant area), epidemic prone villages (Southern Shan State) and some development projects constructed at endemic areas. Most of the epidemics in Rakhine

State were due to new resettlements, construction of prawn breeding ponds mainly.

Some divisions/states which did not report epidemics need to do surveillance properly. There may be under reporting of epidemics in these States/Divisions.

State/Division wise frequencies of occurrence of epidemics during 199 1-2004 were seen in the following graph.

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Number of townships, villages, population and malaria deaths affected by malaria epidemics were shown in the following table.

12

State! r iIVISIOfl	0) 0) .	CV 0) 0) .	C) 0) 0) .	0) 0) .	4) 0) 0) .	CD 0) 0) .	1%. 0) 0) .	0) 0) .	0) 0) 0) .			C4 I	() I	
Shan														
Rakh me														
Chin														
Kachin														
Mon														
Kayin														
Kayah														

Bago														
Magway														
Mandalay														
Ayeyawaddy														
Sagaing														
Taninthayi														
Yangon														

Malaria epidemics occurred more frequently during the period from 1994 to 2000 and the frequency of malaria epidemic declined after 2000. Extensive outbreak occurred in "Wa special region of Eastern Shan State where population of (22955) were affected and (1017) lives were claimed. In year 2003, epidemic occurred at Kokant area of Myanmar-China border. The dominant parasite species in all these outbreaks was *P. falciparum* accounting 80%- 90%.

Various factors can be identified as the causes of epidemics. Some epidemic may have multi-factorial causes. The main causes of epidemics are shown in the following tables.

Table I: Causes of Malaria Epidemics (199 1-2004)

According to the above table, the most frequent cause of epidemic was due to population migration to and from malaria high risk areas for various reasons especially for economic purpose. Natural cause like meteorological change (unusual rain) stood second in line. Although these causes are described separately, some of which are inter-related to each other (e.g.; Unusual rain vs. Increased breeding source). Apart from above causes inadequate surveillance and control measures, inadequate knowledge of the changing pattern of local malaria transmission also contribute causes of epidemics from programme aspect.

8. Insec ticide Treated Mosquito Net Program

In Myanmar, about 28.7 million populations are residing in high and moderate risk areas comprising about 5.7 million house holds. Approximately 50% of households already own mosquito nets, and on average each household owns 2 mosquito nets. Based on those findings, estimated numbers of existing mosquito nets in these areas are about 6 million. Mass treatment of nets at least once a year, 1 – 2 months before the expected peak of transmission, can be done by thousands of trained volunteers, local NGO members, VBDC staff and basic health staff. Those who have no mosquito nets will be encouraged to secure it. Targeted distribution of long lasting insecticidal nets (LLIN5) will be planned. Target groups include marginalized communities in very remote areas where re-treating mosquito nets are difficult and pregnant women in moderate and high risk areas.

Table H: Number of townships, villages and population affected by epidemics in Myanmar, (1991-2004)

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Year	No: of Townships affected	No. of Villages	Population affected	No. of Malaria Deaths

1991	1	16	8578	23
1992	1	4	7000	35
1993	2	30	22425	42
1994	8	23	13100	69
1995	10	105	64500	37
1996	6	44	12356	56
1997	12	27	12460	71
1998	9	35	30945	60
1999	12	31	37359	96
2000	4	29	22955	1017
2001	4	20	11626	2
2002	3	16	12582	-
2003	6	58	31118	171
2004	1	1	4245	-

SIN	**Causes of Epidemics**	**Total No. of Epidemics**	**Proportion of Contribution**
1	Population Migration	23	33.3%
2	Unusual rainfall, climatic conditions	14	21.7%
3	New Settlement	9	13.0%
4	Increased breeding sources	9	13.0%
5	Imported malaria cases	6	8.7%
6	Changes in Agricultural Practices	3	4.3%
7	Floods	2	3.0%
8	Prawn breeding	2	3.0%
	Total	69	100.0%

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Above table clearly indicated that local fish ***Ophicephalus*** was found to be effective against anopheline larvae. Wells with debris had high density of larvae as compared to that of wells with out debris.

Estimated number of existing mosquito nets,
Number to be treated per year and the gaps(in millions),Myanmar
7
6
0
.0
E
Existing Nets Available jfflTargets for net tx, R3 Gaps in tx of existing Nets
The graph above shows the millions of nets available in moderate and high risk areas, and the numbers what we have targeted for treatment from year 1(2005) to 5 (2009) in Round 3 GFATM grant. It can not be achieved because of termination of global fund. The gaps in treatment of existing nets need to be addressed in order to massively and rapidly increase ITN coverage and bring down quickly the malaria burden as illustrated in the figure below.
Malaria Programme Scale-up Coverage and Burden Reduction

Yr-I Yr-2 Yr-3 Yr-4 Yr-5 Yr-6

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Source – Dr. Mark Young, UNICEF

9. Use of larvivorous fish

In Mon, Kayin and Tanintharyi states/division, An.dirus breeds in the wells During 1983 (August & September), one survey showed that 69 out of the 113 wells surveyed (61%) were found positive for larvae. Approximately 10% of the wells contained naturally occurring fish (Genus Ophicephalus sp.)
Anopheline larval collection in 1983

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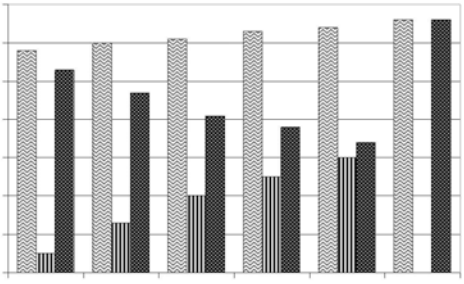
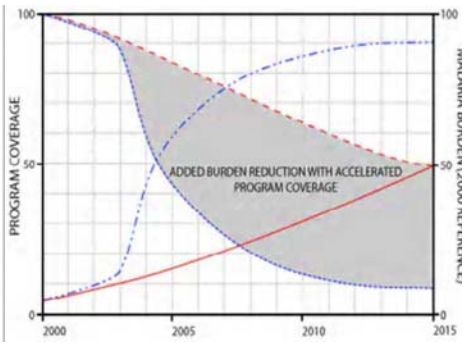
	Month	No. of wells examined	Total larvae & pupae	Average larvae & pupae perwell
Wells with local fish	August September October November	12 12 11 15	40 26 15 10	3.0 2.1 1.3 0.7
Wells with out local fish	August September October	103 101 17	1453 854 75	14.1 8.4 4.4

	November	17	259	15.2





Releasing of fishes in the wells was done in Mon State during that period. It needs yearly replenishment of fishes especially after heavy rain. On the long term community participation was weak and cannot sustain the achievements. Now it is used as control measures individually rather than mass prevention.

10. Behaviour studies of malaria patients

Treatment seeking behavior of malaria patients in Namkham, Northern Shan State study (done by Dr. Khin Maung Wynn, State Health Director, Kayah; previous malariologist) pointed out that self-treatment (39.3%) is common (154 patients out of 392). Treatment results by self- medication were 227% of cases cured and 37.7%of cases became worse. Nearly the same result is seen in treatment given by drug sellers! quacks . It is necessary to educate the community regarding the danger of self treatment and treatment given by non-health personnel It also needs to educate important of early diagnosis and appropriate treatment according to laboratory results for adherence of new antimalarial treatment policy.

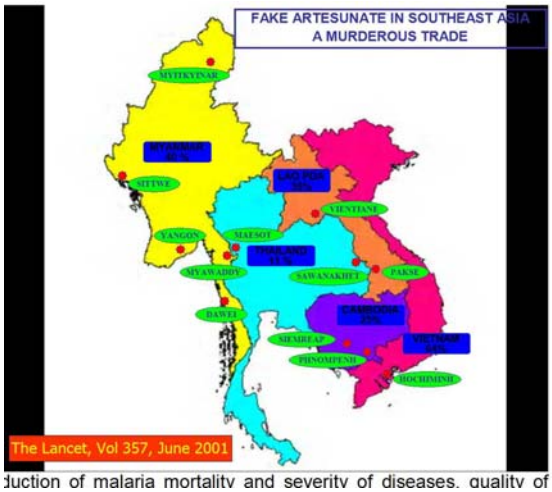
Behaviour diagnostic study and participatory action plan research done in Chaung Oo, Laputta and Ywangan representing dry zone, delta region and hilly region respectively. (Dr. Khin Maung Lwin, Deputy Director, HEB, 1994). From the results of that study, it can be found out the factors influencing the belief were resources of knowledge on malaria are poor; BHS plays major role in treatment of malaria; print media and mass media have negligible impact on malaria education;less community action for health in concern with malaria; socioeconomic factors and environmental factors pushing the people towards taking risk factors. It was recommended to do community based education especially interpersonal education.

One exploratory study showed that, 90.4% of sample population gave history of travel to the forest (1994, Nyaunglaybin Township, Bago Division, 30 clusters sampling method, sample size 4792)

11 Availability **of Fake Antimalarial Drugs**

For reduction of malaria mortality and severity of diseases, r, j ol anti-malarial drugs used for treatment of malaria cases is very important. Fake or sub-standard anti-malarial drugs are available in the market. But magnitude of problem is not known. Fake artesunate tablet is commonly seen in the market especially Guilin Pharmaceutical Co.Ltd brand. Other fake or substandard anti-malarial drugs may be available especially Quinine, Mefloquine, Chloroquine etc. In "The Lancet" volume 357,June, 2001 ; it was mentioned that fake artesunate in Southeast Asia as a murderous trade. In that article, fake artesunate were available in all countries of Greater Mekong Sub-region. Recent report from welcome Trust also pointed out that fake artesunate (1 0/48-21%) and mefloquine (3/30 – 10%) were detected in Myanmar.

‘5



duction of malaria mortality and severity of diseases, quality of

Annex(*1)* Table; Malaria Morbidity and Mortality in Myanmar (1976-2004)

16

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Sr	Years	Population	Out- Patients Department			In-Patients__Department									Morbidity Rate	Mortality Rate
TPA	CSM	%	T PA	C S M	%	cm !scm	T. Dths	M. Dths	C F R	CFR among SCM	MD. Prop					
1	1976	29810601	5659340	515000	9.10	338709	42000	12.40	Data	NA	707	1.68		0.00	18.68	2.37
2	1977	30578447	6317393	562248	8.90	390941	46913	12.00	not	NA	936	2.00		0.00	19.92	3.06
3	1978	31346292	4566487	356186	7.80	283500	39690	14.00	available	NA	917	2.31		0.00	12.63	2.93

4	1979	32114138	6681177	414233	6.20	340256	55802	16.40	-	NA	1282	2.30		0.00	14.64	3.99
5	1980	32881983	11404234	729871	6.40	607084	100776	16.60	-	NA	2120	2.10		0.00	25.26	6.45
6	1981	33649829	10,402,559	641,279	6.16	538,022	77,011	14.31	Data	NA	1,718	2.23		0.00	21.35	5.11
7	1982	34320735	19,528,878	773,690	3.96	669,598	104,951	15.67	not	10,255	1,980	1.89		19.31	25.60	5.77
8	1983	35374453	15,002,454	930,013	6.20	707,900	102,130	14.43	available	11,782	2,217	2.17		18.82	29.18	6.27
9	1984	35845787	12,371,823	566,669	4.58	675,932	109,330	16.17	-	12,723	3,097	2.83		24.34	18.86	8.64
10	1985	36746965	14,527,682	761,627	5.24	755,191	111,227	14.73	-	17,940	2,856	2.57		15.92	23.75	7.77
11	1986	37489253	14,458,543	764,325	5.29	719,028	114,163	15.88	-	16,644	3,102	2.72		18.64	23.43	8.27
12	1987	38246538	14,437,195	764,022	5.29	750,380	127,260	16.96	-	19,971	3,578	2.81		17.92	23.30	9.36
13	1988	39019117	13,206,017	822,614	6.23	680,921	134,517	19.76	Data	21,483	4,072	3.03		18.95	24.53	10.44
14	1989	39807303	11,918,146	870,428	7.30	709,874	146,152	20.59	not	21,869	4,885	3.34		22.34	25.54	12.27
15	1990	40611411	10,753,199	834,556	7.76	761,218	154,486	20.29	available	24,095	5,127	3.32		21.28	24.35	12.62
16	1991	41431761	9,877,096	787,326	7.97	736,399	151,931	20.63	-	24,733	5,231	3.44		21.15	22.67	12.63
1	19	4226	8,681	657,41	7.	690,64	132,25	19.1	5,09	20,69	4,73	3.5	93.1	22.9	18.6	11.2

7	92	8682	,959	7	57	5	5	5	0	3	9	8	0	0	8	1
18	1993	43122509	8,126,485	573,490	7.06	690,035	128,749	18.66	5,388	19,999	4,219	3.28	78.30	21.10	16.28	9.78
19	1994	43993583	7,342,797	569,425	7.75	692,124	131,618	19.02	8,168	21,360	4,380	3.33	53.62	20.51	15.94	9.96
20	1995	44816263	6,208,921	550,917	8.87	614,581	105,630	17.19	8,838	18,493	3,744	3.54	42.36	20.25	14.65	8.35
21	1996	45654327	5,616,521	561,196	9.99	603,314	103,311	17.12	7,980	17,458	3,424	3.31	42.91	19.61	14.56	7.50
22	1997	46494366	5,069,195	480,461	9.48	581,710	87,801	15.09	8,172	17,217	2,943	3.35	36.01	17.09	12.22	6.33
23	1998	47349862	4,816,083	453,501	9.42	584,487	94,565	16.18	8,480	16,436	3,182	3.36	37.52	19.36	11.57	6.72
24	1999	48216365	4,825,657	489,375	10.14	574,128	103,056	17.95	11,948	17,053	3,648	3.54	30.53	21.39	12.29	7.57
25	2000	50125000	4,828,170	506,945	10.50	529,464	85,409	16.13	9,470	14,212	2,756	3.23	29.10	19.39	11.82	5.50
26	2001	51127530	5,182,738	574,352	11.08	591,546	87,111	14.73	12,046	15,382	2,814	3.23	23.36	18.29	12.94	5.50
27	2002	52170511	5,243,515	639,546	12.20	612,823	82,193	13.41	12,748	14,583	2,634	3.20	20.66	18.06	13.83	5.05
28	2003	53224361	5,250,160	643,982	12.27	602,178	72,824	12.09	11,986	14,269	2,476	3.40	20.66	17.35	13.47	4.65
29	2004	54299498	5,195,966	544,242	10.47	600,939	58,641	9.76	10,725	13,183	1,982	3.38	18.48	15.03	11.10	3.65

Annex(2)

Table Blood Smear Examination and Results in Myanmar (1976-2004)

18

Sr Years Population	Exam	Positive	Pf	Pv	Pm	Po	Mix	Other	SPR	ABER	API	Pf% including	Pv%	Slide Pf rate	Slide Pv rate
1 1976 29810 601	**345554**	**11174**	**7507**	**3627**	**0**	**0**	**0**	**40**	**3.23**	**1.16**	**0.37**	**67.2**	**32.5**	**2.17**	**1.05**
2 1977 30578 447	313868	14760	10111	4589	0	0	0	60	4.70	1.03	0.48	68.5	31.1	3.22	1.46
3 1978 31346 292	285232	15889	11897	3950	0	0	0	42	5.57	0.91	0.51	74.9	24.9	4.17	1.38
4 1979 32114 138	400316	14953	12312	2545	0	0	0	96	3.74	1.25	0.47	82.3	17.0	3.08	0.64
5 1980 32881 983	367545 598979	30870	25275	5412	0	0	0	183	8.40	1.12	0.94	81.9	17.5	6.88	1.47
6 1981 33649829		42019	34840	6731	0	0	0	448	7.02	1.78	1.25	82.9	16.0	5.82	1.12
7 1982 34320 735	768763	42021	34768	7110	8	0	135	-	5.47	2.24	1.22	83.1	16.9	4.54	0.92
8 1983 35374 453	1111582	47700	40928	6628	6	0	138	-	4.29	3.14	1.35	86.1	13.9	3.69	0.60
9 1984 35845 787	1136624	60488	52235	8113	32	0	108	-	5.32	3.17	1.69	86.5	13.4	4.61	0.71
10 1985	1305	652	558	92	3	0	16	-	5.0	3.55	1.	85.8	14	4.2	0.

36746965	807	79	49	32	7		1		0		78		.1	9	71
11 198637489253	1160354	62917	54068	8531	15	0	303	-	5.42	3.10	1.68	86.4	13.6	4.69	0.74
12 198738246538	917241	66643	58746	7749	1	0	147	-	7.27	2.40	174	88.4	11.6	6.42	0.84
13 198839019117	948235	94736	84032	10373	0	0	331	-	9.99	2.43	2.43	89.1	10.9	8.90	1.09
14 198939807303	1242271	135194	115887	18850	0	0	457	-	10.88	3.12	3.40	86.1	13.9	9.37	1.52
15 199040611411	1147570	133049	112570	20112	0	0	367	-	11.59	2.83	3.28	84.9	15.1	9.84	1.751.91
16 199141431761	1038248	126967	106365	19877	0	0	725	-	12.23	2.51	3.06	84.3	15.7	10.31	
17 199242268682	878237	125710	106030	19006	0	0	674	-	14.31	2.08	2.97	84.9	15.1	12.15	2.16
18 199343122509	746166	116724	99684	16154	0	0	886	-	15.64	1.73	2.71	86.2	13.8	13.48	2.16
19 199443993583	600252	111672	94670	15832	0	0	1170	-	18.60	1.36	2.54	85.8	14.2	15.97	2.64
20 199544816	486616	100448	82520	1705	0	0	877	-	20.64	1J9	2.24	83.0	17.0	17.14	3.50

263				1											
21 19964565432 7	427288	96203	77858	17293	0	0	1052	-	22.51	0.94	2.11	82.0	18.0	18.47	4.05
22 19974649436 6	367866	88662	71547	15853	56	0	1206	-	24.10	0.79	1.91	82.1	17.9	19.78	4.31
23 19984734986 2	362994	104753	83501	19052	43	0	2157	-	28.86	0.77	2.21	81.8	18.2	23.60	5.25
24 19994821636 5	379785	121376	98261	20421	124	0	2570	-	31.96	0.79	2.52	83.1	16.8	26.55	5.38
25 20005012500 0	381619	120029	95489	21749	250	2	2539	-	31.45	0.76	2.39	81.7	18.1	25.69	5.70
26 20015112753 0	463194	170502	130029	35783	933	8	3749	-	36.81	0.91	3.33	78.5	21.0	28.88	7.73
27 20025217051 1	467871	173096	133187	35030	859	5	4015	-	37.00	0.90	3.32	79.3	20.2	29.32	7.49
28 20035322436 1	481201	177546	138187	35151	799	68	3341	-	36.90	0.90	3.34	79.7	19.8	29.41	7.30
29 20045429949 8	432581	152070	114523	34045	475	26	3001	-	35.15	0.80	2.80	77.3	22.4	27.17	7.87

MALARIA SITUATION IN MYANMAR (1976-2004)

Vector Borne Disease Control Programme

December. 2005

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