

Bhutan Malaria Control Programme Review: A Report

23–30 March 2010



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Executive summary

The review of the malaria control programme was carried out by a team consisting of local and external reviewers during 23-30 March 2010. The general objective of the review was to assess the current policies, strategies, guidance, structures and performance in delivery of malaria control services in order to move the national programme from control to pre-elimination.

Overall, the Vector-borne Disease Control Programme (VDCP) made good progress in implementing recommendations made by the programme review in 2007. There have been several key achievements supported by GFATM. There has been significant improvement in national capacity in monitoring and evaluation, research capacity and cross-border collaboration as well as an increase in well trained staff.

However, some technical and operational gaps were identified by the review team in 2010. These include inadequacy in national staff and knowledge gaps in entomology and indoor residual spraying (IRS) policy and insecticide issues, lack of a functional quality control system of rapid diagnostic test (RDT) and information, education and communication (IEC) tools.

The review team fully supported moving the malaria control programme towards malaria elimination and strongly recommended intensification of surveillance to achieve the goal. The team also suggested stonger focus on malaria across the international border and for mobilization of external support (e.g. GFATM) to strengthen programme performance.

The review team also observed the progress made in establishing a Centre for Tropical and Zoonotic Diseases and some practical recommendations were made on staffing, programme direction and collaborative activities.

1. Country background and rationale

1.1 Location and extent

Bhutan is among Asia's smallest nations, landlocked between the extensive borders of the two great populous nations of China and India. It has an area of 38 394 sq km. The kingdom's longest east-west dimension stretches around 300 km and measures 170 km at its maximum north-south dimension. It is located in the Eastern Himalayas and is mostly mountainous and heavily forested. In the northern part it has a 470 km border with China's Xizang Autonomous Region and a 605 km border with the Indian state of Sikkim to the west, West Bengal to the southwest, Assam to the south and southeast, and Arunachal Pradesh to the east.

Nearly 72.5% of the country is covered with forests; 10 % with year-round snow and glaciers; nearly 8% is permanently cultivated or used for human habitation; another 2% is used for shifting cultivation, a practice banned by the government; and 3.9% as meadows and pastures, while the rest is either barren, rocky or scrubland.

1.2 Geographical features

Bhutan is one of the most rugged mountain terrains in the world; it has an elevation ranging from 160 metres to more than 7000 metres above sea level. The highest peak is about 7314 metres above sea level.

In the north, the snowcapped Great Himalayan Range reaches heights of over 7500 metres above sea level and extends along the Bhutan-China border. The northern region is sparsely populated.

The inner Himalayas are southward spurs of the Great Himalayan range. Peaks in this part range between 1500 metres and 2700 metres above sea level. The woodlands of the central region provide most of Bhutan's valuable forest products.

In the south, the Southern Hills, the foothills of the Himalayas, are covered with dense deciduous forest, alluvial lowland river valleys, and mountains that are nearly 1500 metres above sea level. The foothills descend into the subtropical plains.

1.3 Climate and vegetation

The country can be divided into three distinct climatic zones corresponding to the three main geographical divisions. Bhutan's climate is as varied as its altitudes and, like most of Asia, it is affected by the monsoons. Western Bhutan is particularly affected by monsoons that bring between 60%-90% of the area's rainfall. The climate is humid and subtropical in the southern plains and foothills, temperate in the inner Himalayan valleys of the southern and central regions, and cold in the north, with year-round snow on the main Himalayan summits.

Temperatures vary according to elevation. Temperatures in Thimphu, located at 2320 meters above sea level in west-central Bhutan, range from approximately 14^o C to 25^o C during the monsoon season of June through September but drop to between about -3^o C and 14^o C in January. Most of the central portion of the country experiences a cool, temperate climate year round. In the south, a hot, humid climate helps maintain a fairly even temperature range of between 15^o C to 30^o C year round, although temperatures sometimes cross 35^o C in the valleys during the summer.

Annual precipitation ranges widely in various parts of the country. In the severe climate of the north, there is only about 40 millimetres of annual precipitation primarily snow. In the temperate central regions, a yearly average of around 1000 millimetres is more common, and 7800 millimetres per year has been registered at some locations in the humid, subtropical regions in the south. The summer monsoon lasts from late June through late September with heavy rains from the south-west. The monsoon weather, blocked from its northward progress by the Himalayas, brings heavy rains, high humidity, flash floods and landslides, and numerous misty, overcast days.

The vegetation cover in the three different zones of the country varies drastically due to the varied climatic conditions across the kingdom. The

southern foothills are mostly covered by dense and thick deciduous trees while the inner regions are dotted by an infinite variety of plants, flowers and trees. The northern part has rich coniferous trees and other alpine growth like magnolia, rhododendrons, birch, fir, spruce etc. The vegetation is the overall expression of various ecological factors, and it is one of the basic analytical tools for developing and understanding the mountain environment.

1.4 Population

The estimated population of Bhutan in 2009 was 683 407 (male 52% and female 48%). While 11% of the population is under 5 years, 20% is in the age group 5-14, 55% is in the age group of 15-49 and 14% is above 50 years; 79% of the people practice subsistence farming on just 8% of the total land. Even though the density of population across the country is low (16 persons per square kilometre) almost all arable land is under cultivation, so the density of population per area of arable land is one of the highest in the world at 520 per sq. km.

Seventy-two per cent of the country's population reside in the malaria-risk areas. Of these, 57% reside in seven perennial transmission districts, namely Sarpang, Samdrup Jongkhar, Samtse, Chukha, Zhemgang, Dagana and Pemagatshel, and 43% reside in malaria-receptive districts (Tsirang, Wangdiphodrang, Punakha, Trongsa, Tashigang, Mongar, Tashiyangtse and Lhuntse).

1.5 Transportation

Road transport is the principal mode of transport in Bhutan. Air transport is limited to some neighbouring countries serving a small section of the country's population, and rail transport is non-existent. Bhutan's road network is narrow and winding owing to the rugged terrain. Good progress has been made in the transportation sector easing the life of the rural as well as urban population. With about 4900 km of roads, the road density is about 7 km for every 1000 inhabitants. As a result, almost one-third of the country's rural population has no access to roads and has to walk for almost two-three days to reach the nearest road-head. The road network is

inadequate with about 58% of the households living within one hour walking distance from the nearest motorable road and 20.9% of the households living at more than four hours walking distance from the nearest motorable road. Due to the lack of motorable roads, often travel from one place to another in southern Bhutan is through roads in India.

In the four decades since the establishment of the first hospital with only one doctor in the country, health-care provision has progressed significantly. Health care is delivered through a totally integrated three-tiered system, namely the primary, secondary and tertiary levels. The primary level constitutes the outreach clinics and the basic health units. The outreach clinics provide preventive and therapeutic care for minor ailments to communities at regular intervals. There are 518 outreach clinics, 181 basic health units (BHU), 27 district and subdistrict hospitals and three referral hospitals (AHB 2010). The BHU is the primary level health care facility and is manned by three health workers. Secondary-level health care services are delivered through district hospitals, subdistrict hospitals and grade I basic health units. These facilities have medical doctors with basic diagnostic facilities (laboratory and radiology) and inpatient and out-patient services. The regional referral hospitals and national referral hospital provide tertiary health care services.

1.6 Previous malaria survey

The first malaria survey was carried out by a team from the National Malaria Eradication Programme (NMEP) of India in 1962 in Samchi district. The survey revealed child spleen rates ranging from 0.36% to 93.3%, child parasite rates varying from 10.78% to 55.5%, and infant parasite rates between 3.9% to 33.3%. Two malaria parasite species, namely *P. vivax* and *P. falciparum*, were reported. *An. minimus* was the predominant anopheline species recorded and one specimen was found to be sporozoite-positive. The other species recorded as suspected vectors were *An. maculatus*, *An. fluviatilis* and *An. dirus*. *An. maculatus* has been found to be the predominant species during all surveys, and its role as a vector is considered to be very probable because of its numerical preponderance but no sporozoites have been detected so far (Akiyama: Mosquito Survey Report; unpublished, 2003). The role of the prevalent species, i.e., *An. culicifacies*, *An. willmori* and *An. pseudowillmori* remains to be established.

The transmission season in Bhutan according to the temperature suitable for sporogony and propagation of vector mosquitoes is between mid-March and November while the overall peak months have been noted to be April-May and July-August, although it may differ from district to district.

1.7 Malaria eradication programme

In 1964, the Malaria Eradication Programme was launched using the following strategies:

- Three rounds of DDT spraying in a year at a dosage of 1 gm per sq metre.
- Presumptive treatment of fever cases with chloroquine and radical treatment of malaria cases.
- Active case finding was taken up during 1969.

However, in line with the global strategies, the programme shifted from eradication to control to address the malaria epidemiological dynamics.

1.8 Malaria control programme

The malaria control programme started in Bhutan in 1965. Since then, the programme has functioned systematically to help reduce the malaria burden in the country. The steady decrease in malaria morbidity and mortality over the past 10 years is shown in Table 1.

Table 1: Malaria incidence in Bhutan from 2000 to 2009

Year	BSC	Total positive	P.f cases	P.f %	ABER	API	SPR	No. of deaths	CFR (%)	SFR (%)
2000	76 445	5935	2507	46	22	14	8	15	0.5	4
2001	56 974	5982	3177	53	18	14	9	14	0.4	5
2002	74 696	6511	3496	54	20	15	9	11	0.3	5
2003	61246	3806	1680	44	14	8	6	15	0.9	3
2004	54892	2670	1090	41	12	6	5	5	0.5	2
2005	60152	1825	954	52	13	4	3	5	0.5	2
2006	66079	1868	905	48	14	4	3	6	0.7	1
2007	51446	793	379	48	11	2	1.5	2	0.5	0.7
2008	47268	329	180	55	10	0.7	0.7	2	1.1	0.4
2009	62328	972	559	58	12	2	2	4	0.8	0.9

BSC= Blood slide collection

ABER= Annual blood examination rate

API =Annual parasite incidence (per 1000)

SPR: Slide positivity rate

P.f = *P. falciparum*

CFR = Case fatality rate

SFR= Slide falciparum rate

Bhutan is divided into 20 administrative districts according to their geographical location. In 2009, 509 406 people living in 15 districts were at risk of malaria. These 15 districts are stratified as follows:

- (1) Seven perennial transmission districts (endemic areas where malaria transmission occurs throughout the year); and
- (2) Eight periodic transmission districts (where transmission occurs seasonally) with a population of 220 251.

Figure 1: Location of seven perennial transmission border districts and eight seasonal malaria transmission districts

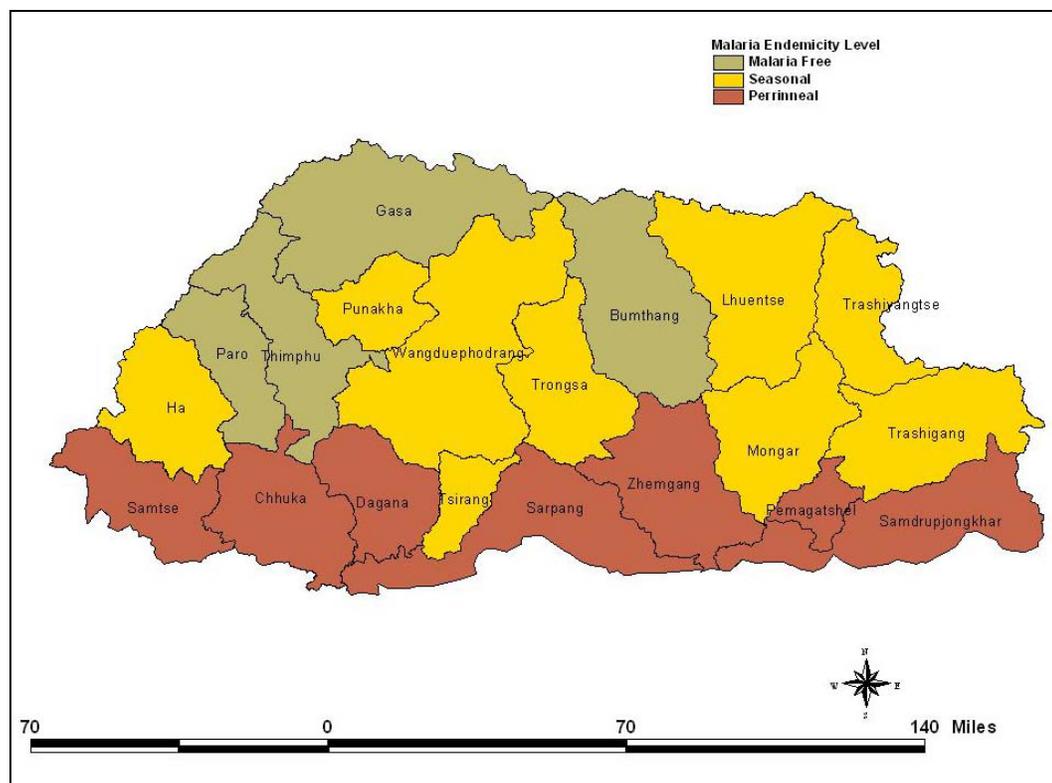


Table 2: Population of districts with perennial malaria transmission in Bhutan in 2009

	Male	Female	Total
Chukha	45 415	34 528	79 943
Dagana	12 408	12 171	24 579
Pemagatshel	11 647	11 831	23 478
Sjongkhar	18 782	17 826	36 608
Samtse	33 283	31 030	64 313
Sarpang	20 974	19 462	40 436
Zhemgang	10 012	9 786	19 798
			289 155

Table 3: Population of districts with seasonal transmission of malaria in Bhutan in 2009

	Male	Female	Total
Lhuntse	8 156	8 145	16 301
Mongar	19 996	19 926	39 922
Punakha	12 793	12 411	25 204
Wangdi	17 295	16 373	33 668
Tashigang	26 243	25 538	51 781
Tashiyangtse	9 431	9 564	18 995
Tongsa	7 360	7 088	14 448
Tsirang	10 107	9 825	19 932
			220 251

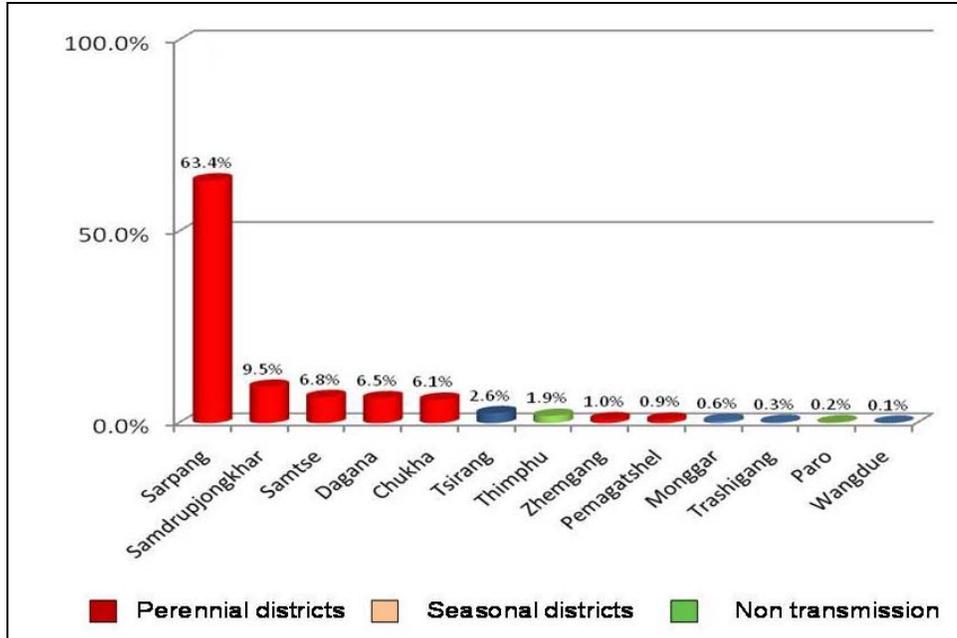
Table 4: Population of districts in non-transmission areas in Bhutan in 2009

	Male	Female	Total
Bumthang	9 315	7 942	17 257
Gasa	1 750	1 596	3 346
Haa	6 673	5 724	12 397
Paro	20 613	18 505	39 118
Thimphu	55 058	46 825	101 883
			174 001

Table 5: Population at risk of malaria in perennial transmission districts and geogs (cluster of villages) in 2009.

District	Total geogs & towns	Geogs at risk	% of population at risk
Sarpang	12	10	85
Samtse	15	13	88
Samdrup Jongkhar	10	8	85
Pemagatshel	16	10	90
Dagana	16	15	94
Chukha	15	4	57
Zhemgang	10	7	54

Figure 2: **Proportion of malaria cases reported from 13 leading districts in Bhutan, 2009**



1.9 Malaria outbreaks

Malaria outbreaks are frequently reported in the country in endemic areas (Table 5). The outbreaks are mostly confined to the border districts where transmission is perennial. In 2009 there was an increase in malaria cases in all the health centres in Sarpang district. However, an outbreak was also reported in a periodic transmission area in Tsirang district.

Table 6: Malaria outbreaks reported and investigated in Bhutan in 2009

Place of outbreak (year)	Number of house holds affected	Population affected	Number of cases	Date of outbreak	Time of outbreak investigation	Outbreak investigators	Remarks
Patalay (2009)	97	699	5 cases	18 -22 April 2009	24 April 2009	District & VDCP	This outbreak occurred as the focal IRS was delayed in the stratified area.
Doban (2009)	362	1875	6 cases		July 2009	District & VDCP	6 cases had been reported from Jan to July so an investigation was done in the non-transmission villages in Sarpang
Chepchepi (2009)	6	25	9 cases	second week of May 2009	Done on 20 May	District & VDCP	This area had been the point of transmission to Doban in 2009
Gelephu Fishery Project (2009)	10	30	5 cases	First week of August 2009	Done on 7 August 2009	VDCP	Indigenous transmission within the fishery project area.

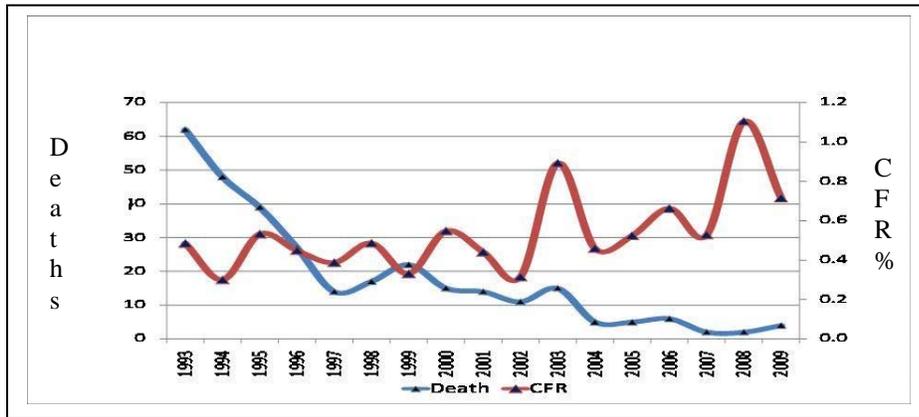
1.10 Malaria deaths

Although there has been a significant reduction in the malaria deaths from 63 in 1993 to 4 in 2009, the case fatality rate has remained steadily over 0.5%. In 2009, of the four deaths reported, three were from health centres in Samdrup Jongkhar District. The fourth case that died in Phuntsholing hospital under Chukha District was, however, a person that had traveled to Phuntsholing from Samdrup Jongkhar, which was a known endemic area.

All four deaths were of females and occurred in the first three months of 2009 (three in January and one in March). The ages of the patients were 4, 5, 35 and 66 years. All had been living in Samdrup Jongkhar District. The

66-year-old patient had lived in a border area in India for the last month before she returned to her village in Bhutan just before her death. All four deaths involved late health-seeking behaviour, as a result of which they presented to the health centre with signs and symptoms of severe and complicated malaria.

Figure 3: Number of reported malaria deaths and case fatality rates in Bhutan during 1993–2009



1.11 District-wise malaria caseload 2000-2009

The following table shows distribution of malaria cases in five endemic districts, with the Sarpang and Samdrup Jongkhar Districts contributing the highest number of cases.

Table 7: Proportion of malaria cases reported in the perennial transmission districts and other districts during 2000 to 2009

District	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Sarpang	43	51	49	36	34	36	30	32	41	63
S/Jongkhar	34	26	23	18	14	28	33	35	26	10
Samtse	8	14	17	28	38	19	13	7	8	7
Chukha	4	3	5	12	7	6	11	7	8	6
Zhemgang	5	2	1	1	1	2	2	0.4	1	1
Pemagatshel									4	1
Dagana									3	6
Other districts	6	4	5	5	6	9	11	18	9	6
Total	100	100	100	100	100	100	100	100	100	100

1.12 Border malaria situation

About 10%–20% of the patients treated in the health centres near the Indian border are those residing in the border areas in India. In 1994 when Bhutan experienced malaria outbreaks in many parts of the country, about 18% of the cases were imported cases that contracted the disease from India. In 2006 the percentage of cases from across the border again increased to about 20% of the total cases. In 2009, 126 foreign nationals were treated in Bhutan. Of these, 95% of cases (120) were reported in Sarpang District. Only 5% of the total cases were reported from the other border districts.

Among the malaria-endemic districts, Sarpang treats the maximum number of non-Bhutanese cases.

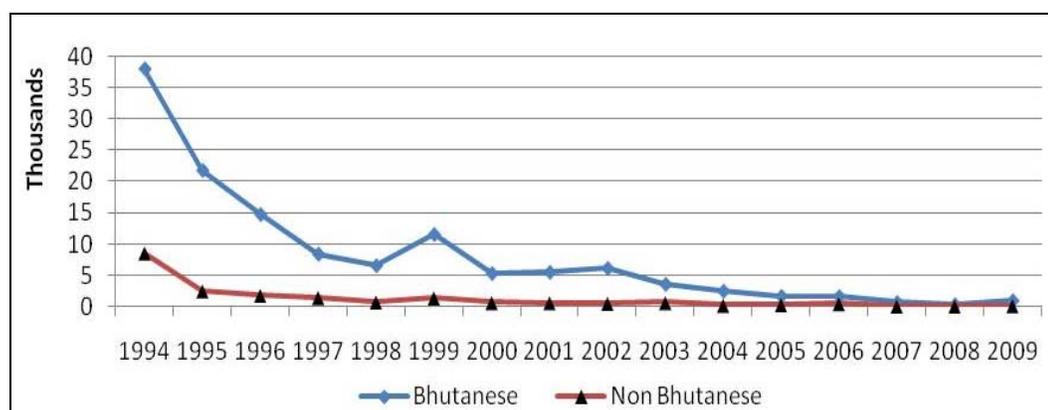
Table 8: Proportion of non-Bhutanese malaria cases reported in the Sarpang District and other districts during 2004 and 2009

No. of cases (%)	2004	2005	2006	2007	2008	2009
Bhutan	177	257	408	60	32	126
Sarpang District	155 (88%)	231 (90%)	359 (88%)	34 (57%)	20 (63%)	120 (95%)
Other districts	22 (12%)	26 (10%)	49 (12%)	26 (43%)	12 (27%)	6 (05%)

Table 9: Proportion of non-Bhutanese patients treated in each district during 1994–2008

District	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Sarpang	17	10	10	19	11	15	13	12	12	27	15	26	39	12	13
Samdrup Jongkhar	23	12	12	11	9	7	9	8	1	1	0.6	2	6	7	9
Samtse	8	4	3	6	6	4	3	2	2	2	0.9	2	2	3	6
Chukha	27	17	16	12	7	6	3	5	6	13	6	5	3	2	4
Pemagatshel															8
Dagana														3	8

Figure 4: Trend of malaria cases in Bhutanese and non-Bhutanese during 1994–2009



2. National malaria control strategy 2008-2013

The national tenth five-year plan (2008 to 2013) focuses on further improving the health status of the people. It mainly focuses on strengthening universal access to basic health care and reducing child and maternal mortality towards achieving MDGs. The malaria control programme, through universal coverage of the population at risk with available prevention and control methods, can significantly contribute to the overall poverty reduction leading to a decrease in the mortality and morbidity rates due to malaria.

2.1 Prevention, early detection and containment of epidemics

The malaria control programme has a weekly fever and malaria reporting system in place for epidemic detection. The malaria control programme intends to initiate an epidemiological surveillance system for epidemic prediction on the basis of meteorological variables, morbidity and mortality, and entomological and socioeconomic variables. Epidemic response includes: provision of adequate relief to the affected population, containment of transmission, prevention of further spread and emergency preparedness.

2.2 Malaria prevention through vector control

Vector control strategy

From 2003 onwards, a comprehensive vector control (CVC) programme under the managerial structure of the Vector-Borne Disease Control Programme has been instituted and implemented. Under the CVC, insecticide-treated nets (ITN), indoor residual spraying (IRS), larviciding and environmental management are being implemented according to certain criteria as mentioned later in the report. In 2006, long-lasting insecticidal nets (LLINs) were introduced in place of re-treatable mosquito nets. But re-treatment of nets other than LLIN is also being done to sustain and achieve coverage of 90% households in malaria-endemic areas.

Insecticide-treated nets (ITNs)

The use of insecticide-treated nets is being promoted strongly as an acceptable and sustainable strategy for future. The strategy consists of treatment of community-owned plain nets, and distribution of LLINs. Deltamethrin 2.5% flow (SC) was used for net treatment at the dosage of 1 ml/sq metre from 1997 until 2001. But deltamethrin has been replaced by cyfluthrin 50% EW (emulsion-based oil in water) due to complaints of skin irritation by some users. Two rounds of insecticide treatment are carried out annually in perennial transmission areas and once a year in seasonal transmission areas. The first round of net impregnation runs from 15 March to the end of the month, to cover six months of the high-transmission season, and the second round is from 15 September to the end of the month to cover the period of low transmission in winter. Prior to net treatment, communities are advised to wash their nets and repair them if torn. The treatment is carried out at selected health centres.

Efforts are made to ensure the success of net treatment programmes by (a) community mobilization on scheduled dates of impregnation by the health centres through village heads; (b) awareness campaigns on the advantages of persistent and proper use of insecticide-treated nets throughout the year in malaria-endemic areas through the mass media; and (c) persuading hotel owners to provide insecticide-treated nets in every room. LLINs were introduced in Bhutan in 2006. The insecticide used is deltamethrin, 55 mg active ingredient /sq m and the net can last 3 - 4 years if cared for properly.

Indoor residual spraying (IRS)

Indoor residual spraying with deltamethrin has been the mainstay of malaria control since 1995. Spectacular reduction in malariometric indices have been achieved.

The programme finally decided to carry out micro-stratification at village level in all districts with set criteria. The main objectives were to identify villages that need focused attention and have integrated prevention and control activities in order to reduce malaria transmission.

For micro-stratification, three years (2006, 2007 and 2008) were considered for the following criteria.

- (1) Consistent malaria cases for the past three years (2006-2008).
- (2) API above 5 per 1000 population for the past three years (2006-2008)
- (3) SPR above 3 % for the past three years (2006-2008).
- (4) *P. falciparum* rate above 50 % for the past three years (2006-2008)
- (5) Death due to malaria occurred in that village within the past three years.
- (6) Vector prevalence.

IRS is carried out annually in selected areas before the onset of the high transmission season (July to September). Deltamethrin 2.5% wettable powder was used at a dosage of 25 mg/sq.m. Following a spurt in API and SPR in 1995, the vector control strategy was changed and two rounds of IRS with deltamethrin at six-month intervals were introduced to cover all the endemic districts. This was continued for another three years, as a result of which the API showed a marked improvement between 1995 and 1998, declining from 111.1/1000 in 1994 to 20/1000 in 1998 and SPR from 40% in 1994 to 12% in 1998.

From 1998 onwards IRS was phased out and replaced by the ITN programme, but in 1999 again the situation deteriorated. API and SPR increased and the proportion of *P. falciparum* reached 51%, indicating that the vector control strategy was not adequate to cover the populations at risk.

From 1999 onwards there has been a steady increase in the populations under ITN, as a result of which API and SPR decreased by 50% in 2002 as compared to 1999. Despite all the efforts, the proportion of *P. falciparum* remained static at 50% in 2002. Therefore, in 2003 focal IRS was conducted in high *P. falciparum* areas in the endemic areas which led to a further decline in API and SPR while the Annual Blood Examination Rate was adequate. The blood slide collection in the health centres also showed declining trends, indicating a reduction in transmission through the effective

and integrated use of IRS, scaled-up ITN and other methods such as weekly larviciding and environmental management methods. Other vector control methods include larviciding with temephos 50% EC and environmental modification.

2.3 Diagnosis and treatment

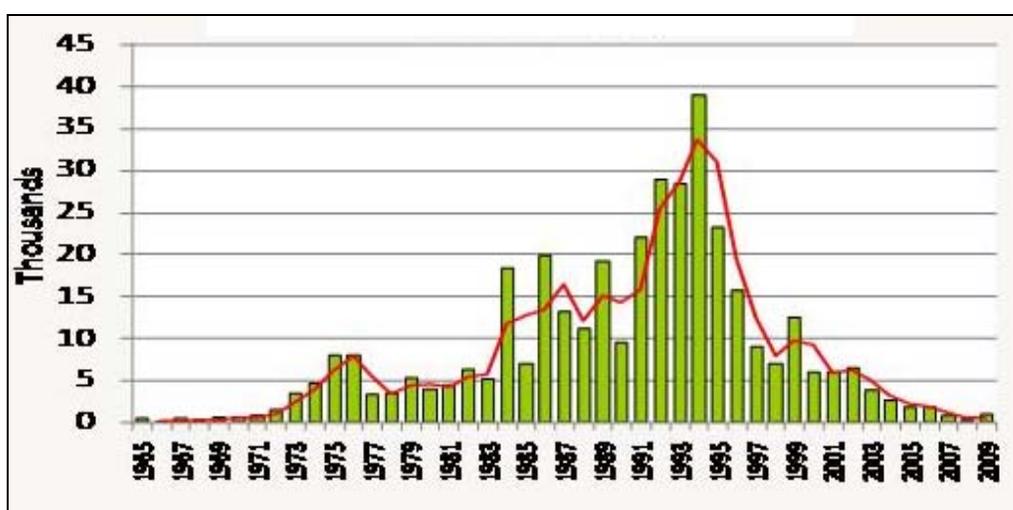
Microscopy is the main diagnostic method used in the country to diagnose malaria. This is complemented by rapid diagnostic tests (RDT) in special situations like emergencies, outbreaks, places where there are no facilities for microscopy, and in some outreach clinics. The village health workers and the communities play an active role in motivating the public to go to the health centre for testing in case of fever and to avail of early treatment. The quality of microscopy is assured through regular cross-checking of the slides and through regular training and refresher training for all health staff.

All health centres in the country follow the treatment guidelines. The current treatment protocol followed is artemisinin-based combination therapy (ACT) for uncomplicated *P. falciparum*, injectable quinine or injectable artesunate for severe malaria, and chloroquine and primaquine for all *P. vivax* cases. To prevent resistance to ACT, it is mandatory for all *P. falciparum* cases to be admitted for three days so as to ensure compliance. Furthermore, all *P. falciparum* cases are followed up after their discharge to check on the status of the patient and also to carry out other preventive methods.

3. Current malaria situation

The malaria trend is declining as compared to 1994, the year of the biggest epidemic of malaria in Bhutan. In the last five years the malaria situation has improved and the lowest number of cases was reported in 2008. However, in 2009 the cases have increased to 972, and small focal outbreaks have been reported in Sarpang District.

Figure 5: *Bhutan malaria trend, 1965-2009**



* The bar chart is the number of cases in thousands and the line shows the trend over the years. 1994 is an epidemic year.

In 2009, the epidemiological profile was based on the reports received from 195 reporting centres (hospitals, BHUs and outreach clinics). It represents about 92% of the health centres in the country. A total of 61 720 blood slides were screened for malaria parasites and 972 malaria cases were diagnosed, so the slide positivity rate (SPR) was 2%. Of these, 58% were *Plasmodium falciparum* cases. In 2009, Sarpang district alone reported 63% of the country's malaria cases, followed by Samdrup Jongkhar with 10% of the cases. The main occupation of the malaria cases is farming; farmers constitute 38% of cases, followed by students (26%). While 68% of the cases are above 15 years old, the rest are under 15.

Table 9: Malaria parameters in Bhutan in the last five years

Year	BSE	Positive	ABER (%)	API per 1000	SPR (%)	No. of Death	SFR (%)	Mortality rate per 100 000
2005	60 152	1825	13	4	3	5	2	1.1
2006	66 079	1868	14	4	3	6	1	1.3
2007	51 446	793	11	2	2	2	1	0.4
2008	47 268	329	10	1	1	2	0	0.4
2009	61 720	972	12	2	2	4	1	0.8

BSE=Blood slide examined; ABER= Annual Blood Examination Rate; API = Annual Parasite Incidence; SPR=Slide Positivity Rate; SFR=Slide Falciparum Rate.

Figure 6: Percentage of reported malaria cases by district (2009)

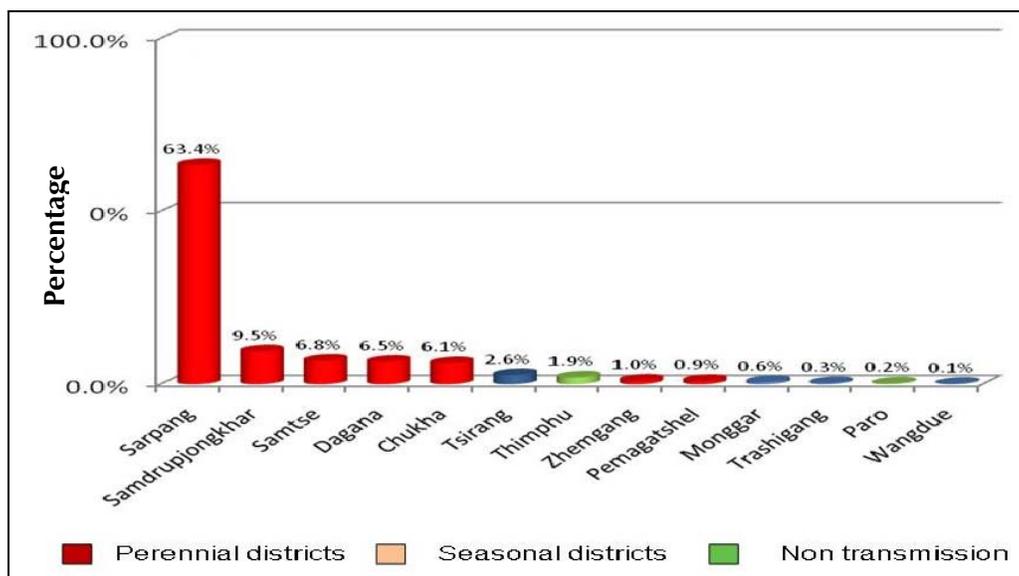
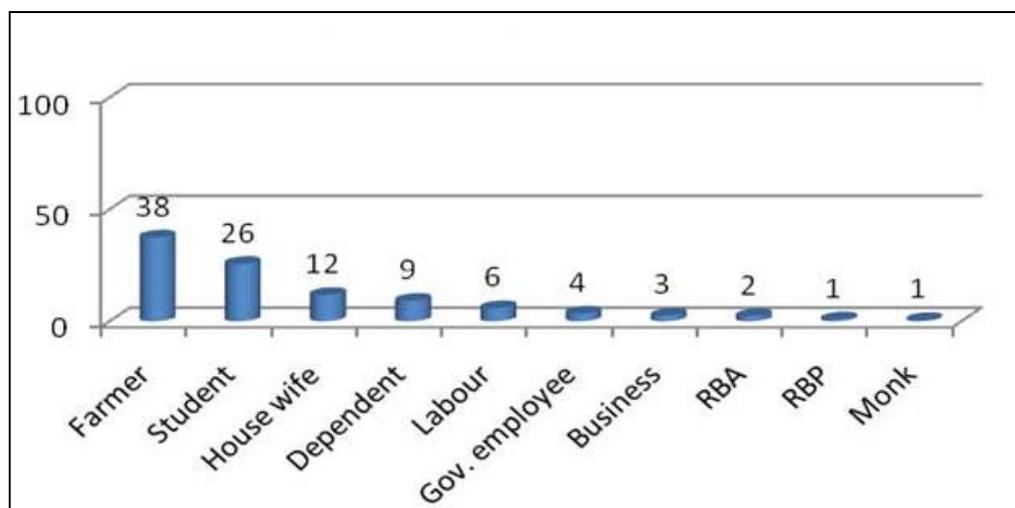


Figure 7: **Occupations of malaria cases (2009)**



Remarks: RBA = Royal Bhutanese Army
RBP = Royal Bhutanese Police

4. Challenges

4.1 Environmental changes

With a fragile mountain ecosystem and being a least developed country, Bhutan is most vulnerable to the impacts of climate change. Largely pristine watersheds, heavy monsoon rains and steep gradients mean that the potential for hydropower generation is tremendous. At present only about 1.5% of this hydroelectric potential has been tapped through run-of-the-river schemes, and contributes about 45% of the government's revenue earnings. In the next few years there are several hydropower projects planned in Bhutan, mainly in the seasonal transmission districts, which will mean an influx of a huge number of migrant workers from the neighbouring states of India. The phase 1 Punatshangchu hydropower project has already started in Wangdiphodrang, one of the seasonal districts, with phase 2 scheduled to start soon. Next in the pipeline is the construction of another six hydropower projects in seasonal districts to develop a total capacity of 10 000 megawatts by 2020 in the three main river basins of the country.

Although the malaria control programme has progressed in terms of reduction of malaria morbidity and mortality, it faces a big challenge with regard to increasing large hydropower projects, increasing number of fishery ponds and irrigation canals, and population movement from highlands to lowlands.

Climate change is an emerging challenge which needs to be addressed for intensifying the malaria control activities.

4.2 Border trade and border crossing

The open border with India in the south, and greater trade and population movement with the constant influx of “carrier” population demands harmonization with cross-border issues and strengthening of control strategies. Clear policy and legislative guidelines on the use of chemicals, environmental management, vector management and other issues are lacking. Community participation and intersectoral collaboration need to be further strengthened. Development activities conducted by other sectors/ ministries like agriculture (fishery, irrigation), hydroelectric power, trade and industry, works and housing are creating an environment conducive to the proliferation of disease vectors. A vector control strategy for man-made breeding places needs to be developed.

5. Major funding agencies for malaria control

The programme is supported financially by four major agencies: the Royal Government of Bhutan, the Government of India, the Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM) and WHO.

Bhutan received US\$ 1.74 million extending over five years from GFATM in the fourth round. The GFATM project implementation started in April 2005 and provided an opportunity to enhance programme activities; improve access to early diagnosis and prompt treatment; reduce transmission through supply of LLINs and IRS; and improve human resource capacity. The fourth round grant was consolidated with the seventh Round in 2008. Further support of about US\$ 2.05 million for Phase 1 of the

seventh round GFATM grant was approved for July 2008 to June 2010. Phase 2 of the seventh round grant starting from July 2010 was in process of approval at the time of this review. Bhutan is also planning to apply for a malaria grant in the tenth round of the Global Fund.

6. Malaria programme review

Rationale: As mentioned above, the country has made some progress but there are several areas that need improvement. At present, the main tool for monitoring and evaluation is the regular case report in terms of morbidity and mortality. In addition, the programme also gathers other information such as LLIN distribution, blood slide examination and vector surveys, which are used for programme monitoring and to develop strategies. In order to review overall programme performance and achievements towards the set targets of the national strategies, it is proposed to conduct an external, independent programme review in collaboration with WHO by involving experts of various disciplines related to malaria control.

Objectives of the malaria control programme review

An external review was organized during 22-29 March 2010 with the following objectives.

6.1 General objective

To assess the current policies, strategies, guidance, structures and performance in delivery of malaria control services with a view of moving the national programme from control to pre-elimination.

6.2 Specific objectives

- To review the epidemiology of malaria, including the trend in the last 10 years.

- To review the key achievements in malaria control and elimination.
- To review the national malaria control programme structure, policies and strategies, political support and resources.
- To review progress made in recommendations made by the Programme Review in February 2007.
- To review the contribution of WHO's collaborative programme and GFATM projects over the past 10 years.
- To review progress in the establishment of the Centre for Tropical and Zoonotic Disease with special focus on malaria.
- To prepare specific recommendations for improving the malaria control programme including key policies and strategies, and estimate the resources needed for scaling up the programme in the next five years.

6.3 Review team

The review team members comprised both external and national experts with expertise related to different areas such as programme management, epidemiology, malariology, parasitology, entomology and vector control, policy, strategic planning, financial and human resource development, advocacy, communications and social mobilization, procurement and supply management, quality control and laboratory, and training and research.

The list of team members is given in Annex 1.

6.4 Methodology

The review began with an initial briefing and consultation with senior health policy-makers in the MoH regarding their expectations from the review. There was a request for the review to be objective but critical and constructive. This was followed by a desk review of documents both published and unpublished, and consultations with the VDCP programme and key MoH departments. Field work was conducted to review delivery of

malaria control services through Basic Health Units (BHU, BHU1), district and regional hospitals.

Groups were formed and each group was assigned a mandate as shown in Annex 2. Information was collected through individual consultations with national staff and field visits to districts; regional hospitals, district hospitals, BHUs, and mosquito breeding sites. Interviews and observations with health-care providers, stakeholders from areas visited and persons met are shown in Annexes 3-4. The programme of briefing and field visits is shown in Annexes 5. A desk review on the reference list (Annex 7) was conducted.

Observations made during the field visits were shared among the team members and presentations were made, followed by discussions at the community level. Comments, draft findings and recommendations were synthesized and presented to the VDCP. Based on the comments and discussions, a final draft was developed and presented to the MoH. Comments and additional inputs were made by senior officials, and the draft report of the external programme review was prepared and developed.

7. Key findings and recommendations

The review team concluded that the malaria control programme had best practices on weekly surveillance and case follow-up of falciparum cases to ensure radical cure and prevention of deaths and supported by strong political commitment and dedicated health-care providers as well as active involvement of communities. The health system at all levels is well coordinated and the service delivery outputs are visible in terms of LLIN coverage, gender equity, free-of-charge services and protection of the vulnerable population, including those in hard-to-reach areas.

However, in order to sustain the achievements made and to move further to reach an elimination target, the review team provided feasible recommendations based on the findings in strategic areas to facilitate the operationalization of effective interventions.

7.1 Epidemiology of malaria including the trend in the last 10 years

Findings

- (1) The document review showed significant reduction of malaria cases from 2001 to 2008. However, in 2008 there was a significant increase of falciparum cases compared with 2007 (from 48% to 55% of the total case load).
- (2) The decreasing trend of malaria cases could not be sustained in 2009, with 972 positive cases and with an increase of API from 0.7 (2008) to 2 per 1000 risk population. While approximately 94% of the cases were from seven perennial transmission districts, only 6% were from other districts.
- (3) Approximately 68% of cases were reported from Sarpang district in 2009 (609 positive cases), with the API of more than 10, while other districts contributed 6% -7% each. The cases were scattered all over the Sarpang district with a few outbreaks. Gelephu Referral hospital recorded a majority of malaria cases in 2009.
- (4) The incidence of falciparum cases was significantly high in 2009 compared with 2008 figures (559 cases and 181 cases, respectively).
- (5) Farmers and students made up 38% and 26%, respectively, of the national figure in 2009.
- (6) The incidence of malaria was high among the age group 15–49 years, among males and among farmers. This can be expected as males are in the more economically productive age group and vulnerable to acquire malaria as they engage in paddy and maize cultivation and stay outdoors.
- (7) When calculating national figures only national cases were taken into account, and non-national cases were recorded separately. However, when analysing the figures, it was revealed that SPR and proportion of falciparum cases are very high among non-national cases.
- (8) Other than the number, no other information was collected on non-national malaria cases.
- (9) When reviewing past records and during discussions with malaria staff it was revealed that an abnormal rain pattern prevailed in 2009 and

fishery ponds may have contributed to an increase in the case load in that year. In the same period, there was an increase in the malaria case load in border areas of Assam state; this may also have contributed to an increase in malaria cases in border districts of Bhutan.

- (10) Although the national programme reported an increase in malaria cases in 2009, a thorough investigation of cases epidemiologically and entomologically was not done.
- (11) Although case fatality has generally increased during the last three years, in 2009 it decreased to 0.7%. This may reflect improved case management of severe and complicated falciparum malaria cases in health facilities, mandatory admission of all falciparum cases to health facilities, administration of directly observed treatment (DOT) and improvements of follow up of all falciparum patients to ensure completion of doses and early detection of clinical treatment failures.

Recommendations

- (1) It is important to sustain the government's commitment and the high commitment of field staff to sustain the achievements in the control programme and to further reduce the disease burden.
- (2) Data should be reported not only health centre-wise, but also according to the place where transmission occurred. Therefore, the existing map of classification of malaria risk by districts may not be accurate. It is advised that the map be revised after collecting the above mentioned data and classifying risk areas as no risk, susceptible areas, and high-risk areas.
- (3) It is crucial to investigate all positive cases irrespective of the species at the health facility level and at field level. The investigation should include parasitological and entomological parameters. It is advised that the existing investigation forms be revised to cater to all these parameters and to include all above-mentioned parameters in the guidelines. There should be case-based investigation.
- (4) When a positive case is found it is important to screen all persons within 1 km radius from the patient's residence irrespective of the fever status (this will help to detect asymptomatic patients' and to clear the parasite reservoir from the community) and conduct vector surveillance and repeated IRS and larval source control measures.

- (5) After thorough case investigation, control actions should be taken within two weeks to curtail further transmission of the disease. Area-specific and case-specific control measures should be advocated.
- (6) Non-national cases should be investigated thoroughly, taking into account the travel history, working site, duration of stay, number of fever cases, history of malaria, drugs taken etc.
- (7) All deaths should be investigated and reviewed to identify possible solutions and improve case management.
- (8) It is advised that data be collected on meteorology parameters (rainfall) and correlated with the number of malaria cases reported. This will help to predict outbreaks of malaria in the country.
- (9) Spot mapping of all positive cases along the border in 2008 and 2009 should be conducted. Following detection of indigenous cases, spraying should be conducted in all households within 1 km radius from the location of indigenous cases as barrier spraying.
- (10) The national programme should include active case detection in the strategic plan to further reduce disease burden.
- (11) Research projects on parasite strain, vector strain, human host and environmental factors and their interaction should be undertaken in collaboration with a regional reference laboratory and research institutes.
- (12) Studies should be conducted on the use of repellents by farmers and students for prevention of malaria due to outdoor exposure.

7.2 The key achievement in malaria control and elimination

Findings

A significant increase in technical and administrative staff was observed (one programme officer, one data manager in addition to existing M&E officer, and one laboratory technician were appointed in addition to the existing senior laboratory technician).

In 2008 a border meeting was organized between the Department of Public Health of Bhutan and state malaria officers from Assam and West

Bengal, India in Phuentsholing using GFATM support. The WHO Representative to Bhutan also participated in this meeting. The second meeting was planned for 2010.

A death review meeting was conducted to review four deaths in 2009. This review has been institutionalized by the concerned hospital and DMOs.

During the IVM training for malaria technicians in April 2009, data analysis was added. A total of 28 staff received training.

Malaria reporting has been incorporated into the integrated disease surveillance.

M&E has been gradually strengthened. A monitoring and evaluation framework and report forms have been developed in 2009.

An external programme review, which is a part of M&E, has been done intermittently (February 2007 and March 2010).

A malaria indicator survey and a KAP survey on bednets were conducted in 2009.

Apparently, more technical staff have been assigned to work in VDCP. Three more technical staff and M&E staff were appointed in 2009.

Efforts have been made in communicating with the contractors of developmental projects pertaining to malaria prevention.

A cross-checking system of blood slides has been in place to assure quality of microscopic diagnosis.

Field supervision of RDT storage has been done irregularly due to insufficient supplies of RDT, but it has been regular since 2009 when VDCP received regular supplies of RDT.

Monitoring of therapeutic efficacy has been conducted continuously by VDCP since the introduction of artemether-lumefantrine in 2006.

Border collaboration with two states of India has been initiated, especially for information sharing.

A social scientist is being trained in Australia using GFATM support. Upon completion of the study she will be assigned to work in Thimphu on IEC activities for malaria control.

A short-term consultant on IEC was recruited using GFATM budget. As a result, a draft BCC strategy has been developed.

The first batch of malaria technicians were trained in entomological survey in 2009 and the second batch is being trained at Chiangmai University, Thailand using GFATM budget. A number of malaria vector surveys have been carried out.

A need assessment was conducted during the district household survey in 2009 for the first time. An HMIS survey was also conducted. These surveys provided information on LLIN coverage/utilization.

The seventh Round GFATM proposal was granted and a policy of LLIN distribution was included in the proposal. However, this policy covers only Bhutanese nationals but not private sector/contractors for bednet coverage.

A group of staff were trained on IVM. Community leaders are fully involved in IVM activities initiated in 2009.

Recommendations

The achievements need to be sustained and more resources need to be invested at programme and community levels. The country should move towards malaria elimination. However, as several major threats (cross-border malaria, environmental changes, epidemic-prone status, etc) to the programme remain, it is advised to carefully monitor and minimize their impact.

7.3 The national malaria control programme structure, policies and strategies, political support and resources

Findings

- (1) **Policies and strategies** - Malaria control is the oldest and still the priority vector-borne disease control programme in Bhutan. The Royal Government of Bhutan through the Ministry of Health has developed policies, strategies, plans and guidelines as part of the national health system in an effort to control malaria. The malaria control programme has developed a five-year strategic plan (2008 to 2013). Overall, the policies and strategies are in line with regional and international standards, but the strategic plan has not been costed and published.
- (2) **Guidelines** - The 2006 malaria control guidelines on case management and vector control provide standard guidance to all health workers.
- (3) **Integrated health system** - Implementation of the malaria control services is decentralized at the district level to the local administration and is integrated with delivery of health services through the BHUs and the district and regional hospitals, under the oversight of the district health officer and supported by the district medical officer.
- (4) **Vector-borne disease control programme** - This malaria control programme is coordinated at all levels by a well-structured and organized Vector-borne Disease Control Programme (VDCP) based in Gelephu in the high malaria risk southern region. The VDCP has built its core service delivery structure based on deployment of malaria technicians to BHUs and hospitals.
- (5) **Health workers** - Multipurpose health workers are providing microscopy, rapid diagnostic tests (RDT), recording and reporting, IEC materials, case follow-up, supporting LLIN and IRS delivery and entomological surveillance and supporting delivery of LLIN, IRS and larval source control. This work is supported by health assistants, nurses and doctors and supplemented through IEC and community mobilization by village health workers, and in IRS by spray operators.
- (6) **Reporting** - The VDCP prepares weekly outbreak reports, quarterly feedback to BHU and annual malaria reports. Malaria data from health

facilities are reported to the districts which, in turn, report to VDCP. VDCP reports quarterly to the Bhutan Health Management and Information System (BHMIS) in the Ministry of Health. However, the BHMIS is still in the development process and lacks capacity. Vertical reporting to the programme will continue till the BHMIS is fully functional.

- (7) **Technical Advisory Committee (TAC)** - The VDCP has no standing technical advisory committees on malaria control but organizes *ad-hoc* annual malaria control review meetings and task-driven consultations as per need. An independent external review is now being conducted biennially.
- (8) **Partnership** - There is a well-established partnership since 1964 with sustained investment by MoH, WHO and the Government of India (GOI), and since 2006 with the Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM). There are gaps in financing to support more intensification, capacity and infrastructure building, cross-border control and health system strengthening. Public-private partnership with regard to malaria control is a new concept in Bhutan (as there are very few private health-care providers) and thus it is yet to be developed.
- (9) **Vision for future** - The MoH and the programme is considering moving towards pre-elimination by 2015 and is applying for the tenth round GFATM in July 2010 to sustain current levels of national control supplemented with cross-border control to accelerate and intensify activities towards malaria pre-elimination.
- (10) **Procurement and supply management system** - There is an effective national procurement and supply system (Drugs, Vaccines and Equipment Division (DVED)) that procures for the health ministry, including most malaria commodities. All products are procured based mostly on WHO specifications and recommendations. The area of product specifications and quantification of needs could be strengthened. There is a problem of lack of ACT paediatric doses; adult blister packs are broken for use.

Recommendations

It was recommended that the programme:

- Prepare a malaria policy document to support pre-elimination towards a malaria-free Bhutan.
- Prepare a costed malaria strategic plan 2010-2015.
- Set up a task team to prepare the malaria proposal for submission in the tenth round GFATM.
- Train a new batch of malaria technicians to sustain control and move to malaria pre-elimination.
- Reorientation of training needs to be considered to be in line with changing strategic directions.
- Restructure and reassign existing staff in VDCP to expand the data management unit to become an epidemiology, monitoring and evaluation unit. Expand drug efficacy testing to become a parasitology unit and establish a unit on health promotion.
- Update the 2006 guidelines to include strategies to move from control to pre-elimination.
- Develop a joint Bhutan–India cross-border implementation strategic plan and proposal, with follow-up of joint service delivery in target border districts.

7.4 Surveillance, monitoring and evaluation

Findings

- All the components of the surveillance system are in place.
- All the surveillance forms and formats are well maintained and regularly checked for accuracy of data. A quarterly feedback mechanism is well established.
- A weekly alert system for epidemics, a comprehensive malaria reporting system by different variables and supervision visits and data quality checks are in place.
- A thorough case investigation is not in place and only falciparum patients were followed up for treatment compliance.

- There is no mechanism to notify malaria patients from one BHU to another BHU and from one district to another district.

Recommendations

- Spot mapping of all malaria cases to identify malaria outbreaks and hotspots to target interventions for maximum impact.
- In addition to weekly and monthly line reporting, case-based reporting and investigation of all malaria confirmed positive cases, both falciparum and vivax cases should be instituted.
- Malaria cases should be analysed by place of infection and not place of detection, and notification should occur between BHUs and through districts to allow for proper investigation of causes and prevention of onward transmission.
- Short formal training should be conducted for data management staff in data management and epidemiology and statistics.
- Computer capacity should be updated with GIS software in district health offices and fax machines supplied to BHUs to strengthen capacity for timely reporting. Supply of cell phones to BHUs to support timely weekly reporting of fever cases and malaria cases should be considered.

7.5 Epidemic and outbreak preparedness

Findings

- A weekly alert system with outbreak alert thresholds and national outbreak systems and response in collaboration with the Public Health Laboratory (PHL) are in place.
- There is high sensitivity to malaria outbreaks and rapid response by VDCP and MoH.
- Malaria is not a national notifiable disease.
- Lack of strong parasitological investigation and screening response to outbreaks.
- Inadequate number of malaria technicians to conduct parasitological, entomological and control work.

- There is no malaria outbreak standby emergency stock of commodities.

Recommendations

- Continue reporting of all malaria cases within 24 hours to DHO and VBDP.
- Outbreak response should include parasitological screening of the whole village and suspected areas, with treatment and follow-up of positive cases.
- VDCP should strengthen collaboration with meteorological services to forecast outbreaks.
- Outbreak response should include repeated focal IRS, fogging and larval source control for 1km radius.
- One programme officer should be assigned in VDCP and within the districts to take responsibility to coordinate malaria outbreak preparedness and rapid response.

7.6 Entomology and vector control

Findings

- The main vector control interventions (IRS, LLIN) were found optimal and praiseworthy.
- Vector susceptibility to insecticides on LLIN and test kits was almost 100%.
- IRS and LLIN coverage was >90%.
- LLIN utilization exceeded 80% and meets WHO/GF recommendations.
- Vector biology and ecology of adult mosquitoes and larvae remains poorly understood and requires strengthening.

Recommendations

- Replace all three-year-old LLINs and ITNs with new LLINs.
- Establish a system for collection and safe disposal of used ITNs and LLINs.
- IRS insecticide should be ordered in insecticide sachets for correct dosage and safe use.
- Replace IRS hand compression pumps and establish a central workshop for maintenance.
- Review the insecticide policy and update the vector control guidelines to include strategy for integrated pest and vector management (IPVM).
- Conduct research on transmission-related vector biology and the role of insect growth regulators and larvivorous fish.
- Municipal and building byelaws and laws for malaria prevention in development projects and new settlements be drafted and adopted.

7.7 Advocacy, communication and social mobilization

Findings

- Health workers give malaria personal talks to patients and group talks to school assembly and school club days at social gatherings.
- Village health workers are used to mobilize fever cases.
- Malaria consultative meetings take place with communities, and malaria awareness and cleaning campaigns as follow-up to falciparum cases.
- Draft malaria BCC strategic approach developed in 2009.
- KABP studies were done in 2002, 2006, 2009.
- Key malaria messages need to be updated.
- There is no IEC focal person in VCDP.
- IEC materials are old and inadequate and need more visuals.

- No job aids checklist exists for improving quality of malaria talks.
- There is a need for communication skills among health workers.
- Inadequate use by malaria programme of school health programme.
- No audio-visual equipment.

Recommendations

- Reassign a focal point for IEC within VDCP.
- Develop, publish and disseminate the IEC strategy.
- Update key malaria messages.
- Develop and distribute job aids for health workers to increase the effectiveness of their malaria talks.
- Increase production and dissemination of malaria IEC materials.

7.8 Health systems and programme management

Findings

- (1) Apparently, more technical staff have been assigned to work in VDCP. Three more technical staff and M&E staff were appointed.
- (2) Capacity and quality of interventions at programme level and community level are relatively weak.
- (3) There has not been much progress as role of the private sector is limited.
- (4) Efforts have been made in communicating with the contractors pertaining to malaria prevention.
- (5) There is no complete system for epidemic preparedness. What is available is the early warning system and rapid response team for DHO, DMO and VDCP.
- (6) There is no emergency stockpiling of drugs and RDT. There is no outbreak plan and the preparedness plan is not yet implemented.
- (7) Though several new technical staff have been assigned to VDCP there is still no epidemiologist.

Recommendations

- (1) In order to effectively support malaria control activities and quality intervention at BHUs, the capacity of the district malaria officer and the technical skills of the core group at the national centre (VDCP in Gelephu) should be strengthened.
- (2) Although the private sector has a limited role in malaria control, it is worth exploring the possibility of involving private as well as other non-health sectors and the community for supporting and sustaining activities.
- (3) As the country is in an epidemic-prone situation, focal epidemics are common and may lead to a huge outbreak without proper preparedness. Therefore, capacity should be built up at the district level for local response to malaria outbreaks.
- (4) Strengthening the epidemiological capacity of the national VDCP is strongly suggested. Staff requirements for upgrading of VDCP to include at least one epidemiologist should be carefully considered.

7.9 Diagnosis and case management

Findings:

- Rational drug policy is available and is being implemented.
- Evidence of good access to definitive diagnosis and treatment in spite of difficult terrain.
- High attention/good strategy on prevention of malaria deaths.
- ACT (artemether-lumefantrine) adult doses are available but paediatric doses have not been procured due to the requirement of only a small number of doses, which makes procurement of small volume of drugs difficult.
- Pre-referral treatment practices and a referral system are in place for severe malaria cases.

Recommendations

- RDT should be the primary malaria diagnostic tool in non-transmission and low transmission areas with no malaria technicians.
- RDT should be the primary tool for screening and active case detection.
- ACT and RDT quality control should be established.
- Monitoring ACT should be continued and intensified.
- Ensure radical cure of PF cases by adding start dose of primaquine.
- Conduct follow-up of vivax cases as well as falciparum cases to investigate the cause of infections as well as to ensure compliance to completion of treatment.
- Secure a supply of paediatric dose of ACT.

7.10 Progress in recommendations made by programme review in February 2007

Findings

Overall, the VDCP made good progress in implementing the recommendations made by the programme review in 2007. There were several key achievements supported by GFATM as mentioned below. At the same time, some recommendations were not implemented and would be considered by the external review mission in 2010.

Actions taken

- (1) A need assessment was conducted during the district household survey in 2009 for the first time. An HMIS survey was also conducted. These surveys provided information on LLIN coverage/utilization.
- (2) The seventh round GFATM proposal which was accepted included the policy for LLIN distribution. However, the policy covers only Bhutanese nationals, not private sector/contractors for foreign laborers. There is as yet no policy on safe disposal of LLINs.

- (3) With the enhanced distribution of LLINs and treatment and re-treatment of community-owned bednets, community leaders can contribute to the success of this activity at geog level. They need to be equipped with appropriate IEC tools and perhaps some incentives. The community can also be involved in environment management, using bioenvironmental measures such as larvivorous fish, provided that they receive proper training and guidance.
- (4) A group of staff were trained on IVM. Community leaders are fully involved in IVM activities, which were initiated in 2009. Implementation, however, is yet to be assessed.

No IEC tool has been developed for community leaders. The main communications are verbal communication and demonstrations.

Key achievements:

- National capacity strengthened (more technical staff were assigned, some are being trained).
- Improved M&E (framework, forms, surveys, programme review – contribution from the fourth and seventh rounds of GFATM).
- IEC/BCC strategy drafted and staff trained.
- Cross-border collaboration initiated.
- Progress on research capacity.
- High political commitment sustained.

What has not been done?

- RDT quality control system.
- Proficiency test of laboratory technicians.
- Entomology – knowledge gap in vector biology remains.
- Larviciding and environmental control – need to know what the targeted vectors are.
- IRS policy – insecticide issues.
- LLIN distribution among non-nationals to be considered.

7.11 Capacity in conducting research

The VDCP should seek technical support from WHO, TDR or the Government of India in conducting operational research and training of staff on research methodology. The following are some suggested research topics:

- Malaria treatment-seeking behaviour of non-national patients.
- Patients' compliance with treatment of *P. vivax*.
- Choice of drugs for chemoprophylaxis for special groups (e.g. tourists).
- In future, other ACT may also be tested (there has been a report of artemether-lumefantrine resistance in Cambodia and mefloquine + artesunate resistance in Thailand).
- Investigation of high malaria mortality in low malarious areas.
- Specific strategy in low malarious areas.
- Role of various vectors in malaria transmission.
- Environmental measures to control primary vectors.

The VDCP received technical support from WHO and the TDR small grant scheme to conduct a research project (out of eight suggested research topics).

7.12 Contribution of partners' and donors' support during 2005-2009

Findings

The Royal Government of Bhutan allocated some US\$ 0.3 million annually (2%-3% of the health budget) to the VDCP. In addition to the national support, there are three main partners /donors supporting the programme:

Government of India: India provides Rs 8 million (equivalent to US\$ 0.2 million) annually. This amount is used mainly for procurement of insecticides.

WHO - Technical support provided by WHO is summarized below:

- Developing policy and strategy for malaria control.
- Development of GFATM proposals in 2004 and 2007.
- Development of M&E framework.
- Preparing and conducting malaria programme review in 2007 and 2010.
- Technical and financial support for one operational research project (TDR small grant).

GFATM

VDCP received the fourth round GFATM grant amounting to US\$ 1.73 million for five years. The project started in April 2005 and will be concluded in March 2010.

VDCP received the 7th round GFATM grant amounting to US\$ 3.05 million for five years. Phase I of the project is about to be completed and Phase II is due to commence in July 2010.

GF grants contributed enormously in the following areas:

- (a) Improving access to early diagnosis and prompt effective treatment (RDT & ACT).
- (b) Reduction of morbidity through distribution of LLIN (commenced in 2006).
- (c) Capacity building:
 - Training of entomological team (in Chiangmai University) in 2009 and 2010 (using the seventh round grant).
 - Training workshops for malaria technicians.
 - Training of data managers.
- (d) Improving surveillance and M&E:
 - Revision/introduction of new report forms.
 - MIS and bednet KAP survey conducted in 2009.
 - Programme review in 2007 and 2010 (co-funding).

The fourth round GF project will be completed in March 2010.

Analysis - The overall internal and external financial support is adequate in maintaining quality services. However, there are some gaps in technical areas as mentioned in other sections of this report.

Recommendations

In view of the MoH's decision to apply for the tenth Round GFATM grants as a continuation of the fourth round, the review team fully agrees that it is timely to apply for the tenth Round.

The following are the key recommendations:

- (1) The National Strategy for Malaria Control 2008-2013 should be finalized, taking into account the recommendations made by the review team. The tenth round proposal should be based on the national strategy.
- (2) The concept paper for the tenth round proposal should be developed in consultation with WHO. Malaria elimination may be considered for the tenth round; however, the VDCP needs to fill the gap or intensify surveillance towards malaria elimination, as recommended in other sections of this report.
- (3) VDCP may seek technical assistance for development of the tenth round proposal from WHO and others partners.

7.13 Progress in the establishment of the Centre for Tropical and Zoonotic Diseases with special focus on malaria

Follow-up actions on the establishment of the Centre of Tropical and Zoonotic Diseases (CTZD)

Actions undertaken

- Concept paper was developed in 2009 by Dr S K Sharma.
- A task force and a small group has been formed to work on the establishment of CTZD.

- MoH has included a budget of Rs 22 million for recurrent cost of infrastructure in the 2010 annual plan.
- A human resource plan has been developed. Some professional staff are being trained abroad.

Recommendations

- An expert in the field of vector-borne diseases should be assigned to help the CTZD so that the initial plan of research and training is in line with the objectives and the national commitment.
- Develop a plan for proposed CTZD.
- Involve and mobilize support from neighbouring countries and through SAARC for development of the research institute.

8. Recommendations for improving programme performance including key policies and strategies

8.1 Key policies and strategies

- Prepare a malaria policy document to support pre-elimination towards a malaria-free Bhutan.
- Prepare a costed malaria strategic plan 2010-2015 aimed at a long-term vision for a malaria-free Bhutan.
- Set up a national malaria task force to prepare the GFATM round 10 malaria proposal with technical assistance from WHO.
- Sustain the trained and experienced staff and pool of available resources and maximize use of their experience and expertise in planning, implementation, training and research activities.
- Reorientation training needs to be in line with changing strategic directions.

8.2 Programme management structure

- Restructure and reassign existing staff in VDCP to expand the data management unit into an **Epidemiology, Monitoring and Evaluation Unit**.
- Expand the drug research unit into a **Parasitology Unit** and establish a **Unit on Health Promotion**.

8.3 Strategy development

- Update the 2006 guidelines to include strategies to move from control to pre-elimination.

8.4 Cross-border strategic plan

- Develop a joint Bhutan-India malaria cross-border implementation strategic plan and proposal with follow-up joint service delivery in target border districts.

9. Conclusion

The review team observed a significant reduction in malaria cases from 2001 to 2008. However, in 2008 there was a significant increase of falciparum cases compared with 2007. The incidence of falciparum cases was significantly high in 2009 when compared with the 2008 figures. The problem of falciparum cases is very marked among non-national cases.

Based on the downward trend in malaria the programme is moving towards malaria elimination, but major threats include malaria among non-nationals, especially in the border districts. Overall, the Vector-borne Disease Control Programme (VDCP) made good progress in implementing recommendations made by the programme review in 2007. Several key achievements were observed. There have been significant achievements in national capacity in monitoring and evaluation, research and cross-border collaboration as well as increase in well-trained staff.

However, some technical and operational gaps were identified by the review team in 2010. These include inadequacy in national staff and knowledge gaps in entomology and IRS policy and insecticide issues, and a lack of functional quality control system with regard to RDT and IEC tools.

The review team fully supported the malaria control programme moving towards elimination and strongly recommended intensification of surveillance towards malaria elimination. The focus should be on malaria control across the international border. External support (e.g. GFATM) should be mobilized to strengthen programme performance. The review team encouraged VDCP to submit a proposal to the GFATM for the tenth round and seek technical support from WHO.

The review team also observed progress made in the establishment of the Centre for Tropical and Zoonotic Diseases and some practical recommendations were made on staffing, programme direction and collaborative activities.

10. Acknowledgement

The external reviewers thank the staff at VDCP, in particular Dr Karma Lhazeen, Chief Programme Officers, for their excellent preparation and the hospitality during the field visits. The team is also grateful to H.E Lyonpo Zangley Dukpa, Minister of Health, Dasho (Dr) Gado Tshering, Secretary of Health, and Dr Dorji Wangchuk, Director-General of Health for their strong support to the programme review. Thanks also to Dr Ugyen Dophu, Director, Public Health and the Officiating Director, Mr Nado Dukpa, who was the team leader of the national officers for actively participating in the review. Special thanks to Dr H.S.B. Tennakoon, WHO Representative to Bhutan and his staff for the technical and logistics support provided. Thanks to the GFATM for the financial and logistic support during the review. The team would also like to thank all the national officers at the Kamichu BHU, Gelephu Hospital, Umling BHU, Tsirang Hospital and Sarpang Hospital for their co-operation and hospitality.

Lastly, appreciation is expressed for the commitment and dedication of all the health volunteers and the communities visited by the team.

Annex 1

List of review team, key informants and secretariat

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Expertise: primary health care

Mr Sangay Chedup
District Malaria Supervisor
Sarpang Hospital
Expertise: medical technology

Annex 2

Formation of groups and mandates

International	National	Mandates	Places visited
Dr Gawrie N.L Galappaththy	Mr Sonam Wangchuk, Ms Dechen Pemo Mr Sonam Gyeltshen, Mr Choki Gyeltshen, Mr Sangay Chedup, Mr Gyeltshen	epidemiology/ surveillance/ monitoring evaluation and epidemic preparedness	regional hospital district hospitals VDCP BHUs
Dr V.P. Sharma	Dr Karma Lhazeen Mr Rinzin Namgay Mr Tshewang Norbu Dr Thinley Yangzom Mr Sonam Wangchuk	vector/operational research	fish ponds BHUs Entomology Unit
Dr Jeeraphat Sirichaisinthop	Dr Karma Lhazeen Dr Lobzang Mr Sonam Dorji Dr Thinley Yangzom Mr Singay Dukpa	diagnosis/treatment and quality assurance	hospitals laboratories medical stores medical wards
Dr Soe AUNG Dr Wilson Lo Dr Krongthong Thimasarn	Dr Karma Lhazeen Mr Tobgay Mr Pema Samdrup Dr Thinley Yangzom Ms Dechen Pemo Mr Kinley Dorji Mr Kaka & Mr.Tsheltrim	programme management (GFATM/WHO/GOI/ policy and strategy)	DMO office DHO office MOH BHUs Village Leaders VDCP
Dr Shiva Kumaran Murugasampillay	Dr Ripa, Mr Tobgay Mr Tshering Gyeltshen	health promotion	All health facilities VDCP BHUs

Annex 3

List of officials met by the Malaria External Review Team

Date	Office / Health Center visited	Officials met
22/3/2010	WHO Bhutan	WHO Representative
	Ministry of Health	Mr. Nado Dukpa, CPO, NCD/ Officiating Director, DoPH
		Dr Dorji Wangchuk, Director General, DMS/ Officiating secretary, MoH
23/3/2010	Kamichu BHU	Mr Kalu Dukpa, DHO, Wangdue
		Mr Norbu, HA, Kamichu BHU
	Meet with entomology field staff from VDCP	Mr Pem Tshering, Malaria Technician
		Mr Sonam Wangchuk, Insect collector
		Mr Pema Tshewang, Insect collector
During Lunch Break	Tsirang District	Dasho Pemba Wangchuk, Dzongdag, Tsirang Dzongkhag
		Dr Penden Wangchuk, CMO, Damphu Hospital
		Mr Pema Dorji, DHO, Tsirang
24/3/2010	Gelephu, Regional Referral Hospital	Dr Nado Zangpo, Medical Superintendent
		Dr T. B. Rana, Sr. Community Medicine Specialist
		Mr Karma Yeshey, Administrative Officer
		Mr Sonam Tashi, Malaria Technician
		Tshering Dorji, Malaria Technician
		Pharmacy Technician
		Sangay Wangchuk, Clinical Laboratory Technician

Date	Office / Health Center visited	Officials met
		Mr Ambar Gurung, Nursing Superintendent
25/3/2010	Umling BHU	Ms Chimme Dema, HA
		Mr Sonam Tashi, Sr. BHW
		Mr Jangchuk, Malaria Technician
		Ms Lakey Dema, VHW
		Mr Rinchen, VHW
		Mr Sangay Sangpa, VHW
		Mr Leki Drugay, VHW
	Umling Block Office	Mr Tashi Dorji, Tshokpa
		Mr Tshering, Mangmi
26/3/2010	Sarpang Hospital	Dr Lobzang Norbu, CMO
		Mr Choki Gyeltshen, DHO
		Mr Sangay Cheydrup, DMS
		Mr Dawa Tshering, Malaria Technician

Annex 4

List of national key informants for the Malaria External Review (23rd – 30th March 2010)

S.No	Name	Designation	Organization	Place
1	Mr Sonam Dorji	Drug Controller	Drug Regulatory Authority	Thimphu
2	Mr Sonam wangchuk	Head	Public Health Laboratory	Thimphu
3	Mr Nado Dukpa	Chief Programme Officer	NCD, DoPH	Thimphu
4	Mr Kado Zangpo	Chief Planning Officer	MoH	Thimphu
5	Mr Kaka Tshring	Procurement Officer	DVED, DMS	Thimphu
6	Mr Tshetrim Zangpo	HR Officer	MoH	Thimphu
7	Dr Ripa Chakma	Lecturer	RIHS	Thimphu
8	Dr lobzang Norbu	CMO	Sarpang hospital	Sarpang
9	Mr Choki Gyeltshen	DHO	Sarpang Dzongkhag	Sarpang
10	Mr Sangay Chedrup	DMS	Sarpang Hospital	Sarpang
11	Mr Tshering Gyeltshen	Communication Officer	ICB, DoPH	Thimphu
National Malaria Programme Officials				
12	Dr Karma Lhazeen	Chief Programme Officer	VDCP	Gelephu
13	Dr Thinley Yangzom	Offtg. Chief Program Officer	VDCP	Gelephu
14	Mr Sonam Gyeltshen	Research Assistant	VDCP	Gelephu
15	Ms Dechen Pemo	Asst. Programme Officer	VDCP	Gelephu
16	Mr Rinzin Namgay	Sr. Entomologist	VDCP	Gelephu
17	Mr Pema Samdrup	Asst. Programme Officer	VDCP	Gelephu
18	Mr Singay Dukpa	Sr. Lab. Technician	VDCP	Gelephu
19	Mr. Tshewang Norbu	Research Assistant	VDCP	Gelephu
20	Mr Gyeltshen	Asst. Data Manager	VDCP	Gelephu
21	Mr Kuenzang	Research Assistant	VDCP	Gelephu

Annex 5

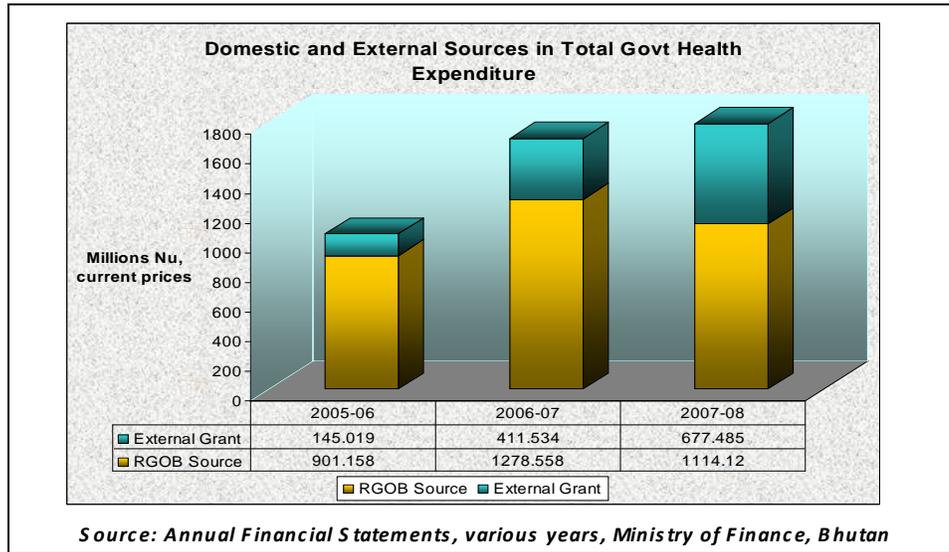
Time-table of the programme review

22 March 2010	Arrival of the review team at Paro International Airport	Received by CPO & Programme Officer, VDCP
Afternoon		
3.00 p.m.	Courtesy call with WR, WHO Office, Thimphu	
3.45 p.m.	Meeting with Director, DoPH, MoH, Thimphu	
4.30 p.m.	Courtesy call by Hon'ble Secretary, MoH	
23rd March 2010		
	Travel to Gelephu, on the way visit Kamichu BHU	Meet with Kamichu BHU Staff
	Lunch at Tsirang (arranged by DHO)	Halt at Gelephu
24th March 2010		
9.00 a.m. – 10.00 a.m.	Presentation on overview of the malaria programme	Chief Programme Officer, VDCP
11.00 a.m. – 1.00 p.m.	Visit VDCP Office and meet the staff	
2.00 p.m. – 3.00 p.m.	Visit Gelephu Regional Referral Hospital (laboratory, pharmacy store, etc)	
3.30 p.m.– 5.00 p.m.	Discussion	
25th March 2010		
(9.00 a.m.)	Field visit to observe malaria control activities (Umling BHU)	Meeting with field staff (packed lunch at Umling BHU)
3.00 p.m.	Meet with community leaders (Gup/Tshokpa, VWH etc)	
4.00 p.m.	Back to Gelephu	
26th March 2010		
8.30 a.m.	Travel to Sarpang Hospital	

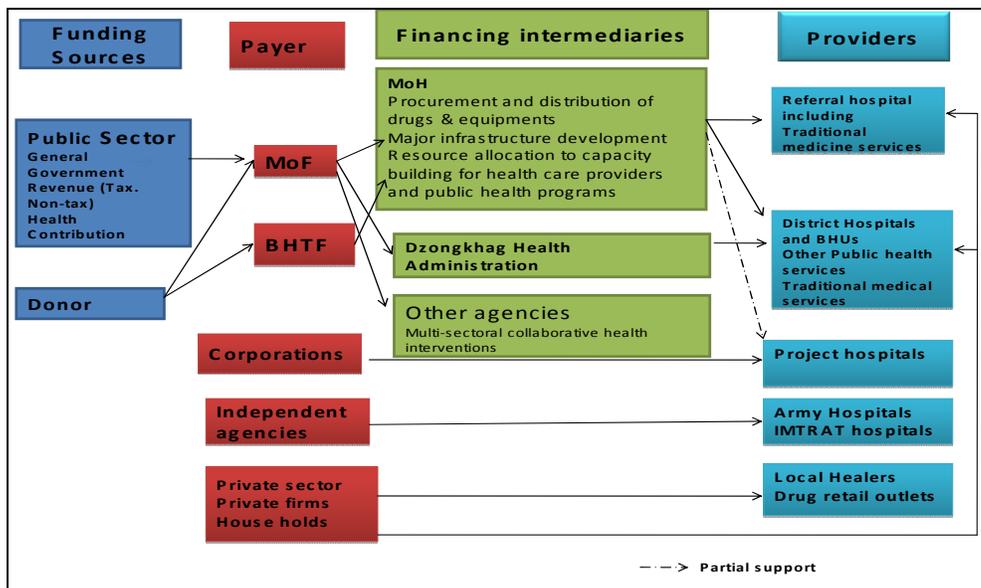
9.00 a.m. – 10.00 a.m.	Presentation on district health management and meet with DMO/DHO/DMS and hospital staff	DMO, Sarpang Hospital
10.00 a.m. -11.00 a.m.	Visit Sarpang Hospital Units	
27th March 2010	Discussion, recommendation and drafting of relevant report	Group work
	Official dinner hosted by Director, DoPH/CPO, VDCP	
28th March 2010 (7.00 a.m.)	Travel to Thimphu, on the way visit Bajo BHU Grade I	
	Lunch at Hotel Dargon Nest, Wangdue	
	Official dinner hosted by Hon'ble Secretary, MoH	
29th March 2010		
9.00 a.m. – 1.00 p.m.	Report writing	
3.00 p.m. – 5 p.m.	De-briefing on findings, chaired by Hon'ble Secretary, MoH	

Annex 6

Health budget, fund flow and malaria fund



Fund flow to Ministry of Health



Programme-wise expenditure

	Current	Capital	Share in	Share in	Share in
			revenue exp	capital exp	total exp
SECTT	56,175,896	99,299,468	7.5%	16.8%	11.6%
Public Health	73,694,317	113,290,334	9.8%	19.2%	13.9%
MEDICAL SERVICES	621,592,377	378,924,268	82.7%	64.1%	74.5%
GRAND TOTAL (MOH)	751,462,590	591,514,070	100.0%	100.0%	100.0%

source: Data provided by DPA and MOH, RGOB, Dec 2009

Budget for VDCP for the past 7 fiscal years (USD in millions)

Financial Year	RGOB	WHO	GOI	GFATM	Total Budget
2009-2010	0.237	0.052	0.200	1.200	1.689
2008-2009	0.199	0.054	0.200	1.353	1.805
2007-2008	0.188	0.022	0.091	0.572	0.872
2006-2007	0.180	0.042	0.215	0.689	1.126
2005-2006	0.177	0.012	0.200	0.578	0.967
2004-2005	0.296	0.032	0.100	0.139	0.567
2003-2004	0.154	-	0.100	-	0.254

Annex 7

List of references

Policy-related documents

- (1) Ninth Plan Sector Document (2002-2007)
- (2) Tenth Five Year Plan (2008-2013)
- (3) Report on joint Study tour by MoH and MoA to IPVM pilot project areas in Sri Lanka (22-24 October, 2009)

Strategy-related documents

- (1) Standard Manual on laboratory diagnosis of malaria 2009.
- (2) Guideline on management of malaria and vector borne diseases in Bhutan
- (3) The Strategic Approach to Behaviour Change Communications 2009-2013
- (4) Compliance with 14-day course of primaquine in *Plasmodium vivax* malaria
- (5) Global Fund 4th round proposal for malaria
- (6) Global Fund 4th round proposal for malaria
- (7) Malaria Control Strategy (2008-2013)

M&E related documents

- (1) Population & Housing Census of Bhutan 2005
- (2) Annual Malaria Report 2007
- (3) Annual Malaria report 2008 VDCP internal report of 2009
- (4) Annual Health bulletin 2007
- (5) Annual Health bulletin 2008
- (6) Annual Health bulletin 2009

- (7) KAP survey report on malaria awareness and bed net use 2002
- (8) Malaria Indicator survey 2006
- (9) Malaria Indicator Survey & Bed net KAP survey, 2009
- (10) Consultancy Report of Dr Beena Varghese on Sustainability of LLINs in Bhutan for malaria prevention May 7-11, 2009
- (11) Report on Bio-assay tests on LLINs in 2009
- (12) National Malaria Indicator framework (2008-2013)
- (13) Report of the Bhutan Malaria Control Programme Review of 2007
- (14) Report of Dr Jun Akiyama 2006
- (15) Report of Dr Somboon Pradya 2007
- (16) Summary activity report of Dr SK Sharma during his visit to Bhutan (22-12-2007 to 3.1.2008)
- (17) Health Financing and Expenditure Review. Bhutan, October 2009

Annex 8

List of abbreviations

ABER	annual blood examination rate
ACT	artemisinin-based combination therapy
API	annual parasite incidence
BCC	behavioral change communication
BHU	basic health unit
BSC	blood slide collection
CFR	case fatality rate
CTZD	Centre for Tropical and Zoonotic Disease
CVC	comprehensive vector control
DHO	district health office
DMO	district medical officer
DOT	directly observed treatment
GFATM	The Global Fund to Fight AIDS, Tuberculosis and Malaria
GIS	geographic information system
HMIS	health management information system
IEC	information, education and communication
IPVM	integrated pest vector management
IRS	indoor residual spraying
ITN	Insecticide-treated net
IVM	integrated vector management
LLIN	long-lasting insecticidal net
MDG	Millennium Development Goals

M&E	monitoring and evaluation
NMEP	national malaria eradication programme
RDT	rapid diagnostic test
SAARC	South-Asia Association Regional Cooperation
SFR	slide falciparum rate
SPR	slide positivity rate
VDCP	vector-borne disease control programme (VDCP)
WHO	World Health Organization

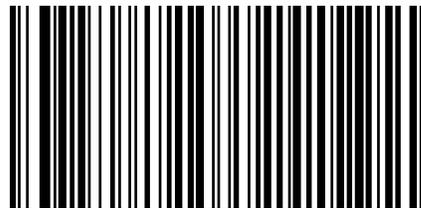
The programme review is a mechanism to assess overall programme achievements and performance, as well as to identify gaps. It provides an opportunity to propose strategic directions in order to improve the programme performance. The Ministry of Public Health of Bhutan, in collaboration with WHO, conducted the external evaluation of the malaria control programme during 23-30 March 2010. The review team observed significant improvement in national capacity and proposed several strategic directions in order to move towards malaria elimination. This report elaborates the rationale of programme review, process and results of the review.



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