MALARIA

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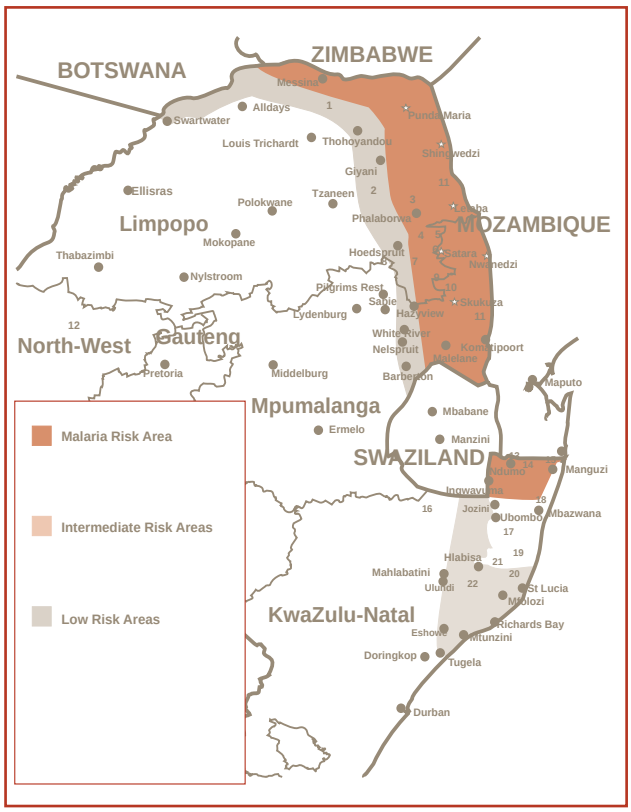
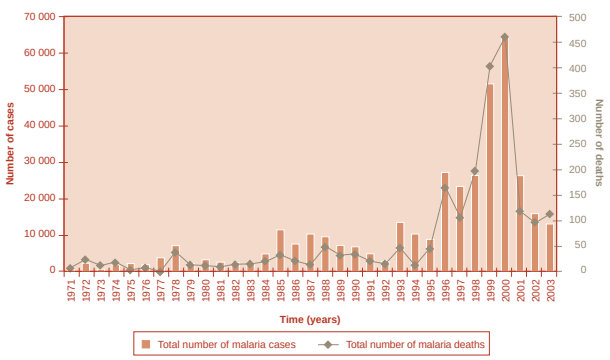
Malaria risk in South Africa



Annual notified malaria cases and deaths 1971 - 2003



Key Messages

- Malaria morbidity and mortality in many areas have decreased, largely as a result of more effective vector control and the use of new treatment options.
- Although controversial, limited use of DDT has been effective.
- Greater use of artemisinin-combination therapy will be necessary as resistance to older agents develops.
- Effective control in all districts remains a challenge.
- In future, health sub-districts should be used as the basis for routine monitoring and interventions.

Framework for Monitoring and Evaluation

Global:

- WHO Global Malaria Control Strategy
- Roll Back Malaria Initiative and Abuja Declaration

South Africa:

- National Malaria Control Policy
- Health Goals, Objectives and Indicators 2001-2005

Key Indicators

Case fatality rate

Reported cases of malaria

Key References and Data Sources

DoH Disease notification system

Roll Back Malaria initiative

Introduction

Malaria continues to be a major impediment to health in Africa south of the Sahara, where it frequently takes its greatest toll on very young children and pregnant women. New analyses confirm that malaria is the principal cause of at least one-fifth of all young child deaths in Africa.[1]

In South Africa (SA) approximately 95% of the malaria infections are due to the parasite *Plasmodium falciparum*.[2]

Malaria transmission in South Africa is seasonal; malaria cases start to rise in October, peaking in January to February and waning thereafter. The malarious regions in the country are the eastern parts of Limpopo and Mpumalanga provinces and the north eastern parts of KwaZulu-Natal (Map 1). Occasionally small malaria outbreaks develop in the Northern Cape and North West provinces. Malarious areas only occur below ±1 000m above sea level. Malaria, being a life threatening disease and epidemic in nature, has been a notifiable disease in South Africa since 1958. A vigilant malaria surveillance programme exists in malaria affected areas. However, in the private sector and the non malarious areas malaria notification is not optimal.

This chapter will cover the South African national malaria control policy, goals and strategies. It focuses on malaria control within the context of South Africa, highlighting specifically the current situation, progress and the challenges that affect malaria control implementation within the malaria affected provinces in South Africa.

Framework for Monitoring and Evaluation

Box 1: WHO core list of indicators for monitoring malaria[5]

Main indicators (markers)	Comments
1. Malaria death rate among target groups	1,2. Probable and confirmed deaths and cases, in under 5 years old and other target groups
2. Number of cases of malaria cases, severe and uncomplicated, among target groups	
3. % of households having at least one treated bed net	3. Though periodic surveys
4. % patients with uncomplicated malaria getting correct treatment within 24 hours of onset of symptoms	4. Quality: indicates recognition of symptoms and access to care
Output indicators	
1. % pregnant women who have taken chemoprophylaxis or preventive intermittent antimalarial treatment	1. Through community surveys. 1-3 indicate quality: recognition of symptoms and access to care
2. % patients with uncomplicated malaria getting correct treatment at community level within 24 hours of symptoms	2,3,4. Through community surveys
3. % mothers/caretakers able to recognise signs and symptoms of a febrile disease in children under 5 years old	
4. % of households having at least one treated bed net	
Epidemiological indicators	
1. Trend in malaria deaths	1. Requires data from death registration
2. Reported incidence of uncomplicated malaria (clinical or confirmed) per 1000 population	2. Source: health facility data. Useful also for estimating drug requirements
3. Reported incidence of cases with parasitaemia (Annual Parasite Incidence, API) for low-transmission areas, by age, sex and parasite species, per 1000 population	3. Practical only when laboratory or testing facilities are available

The National Policy Goals and strategies for malaria as outlined below are in keeping with the World Health Organization's Global Malaria Control Strategy[3] as well as the 2001-2005 Health Goals, Objectives and Indicators.[4]

WHO has suggested a core list of indicators appropriate for managing district level activities (Box 1).[5] Most of these indicators are available for South Africa, either from data collected for national malaria control or for monitoring progress in terms of the Abuja Declaration.

National Malaria Policy

The national malaria control policy for South Africa has been formulated in close consultation with the national and provincial departments of health and malaria experts.[6]

Goals

The goals of the malaria control programme are:

1. To prevent mortality and reduce morbidity due to malaria, and thus maintain and improve the social and economic upliftment achieved during the past five decades.
2. To progressively improve and strengthen District, Provincial, National and Southern African capabilities for malaria control.[6]

Objectives

The objectives of the programme are:

1. To maintain a malaria case fatality rate below 0.5%.
2. To reduce and keep the incidence of indigenous malaria at the lowest practical level. An incidence rate, as judged by annual malaria notifications, of less than 100 new local cases per 100 000 people per year (i.e. 4000 cases per 4 million population at risk per year - people living within the malaria affected areas [see Map1]) should be attained in all districts by the year 2005.

Strategies

The basic technical elements of the strategy are:

1. To provide early diagnosis and prompt treatment.
2. To plan and implement selective and sustainable preventive measures, including vector control, on the basis of the malaria surveillance information.
3. To predict and detect epidemics early and prevent or contain them.
4. To strengthen capacity in evaluation, basic and applied research in order to:
   a. promote the regular assessment of the malaria situation, in particular the ecological, social and economic determinants of the disease, and
   b. develop human resource capacity at all levels in the malaria control programme by appropriate training and motivation.[6]

Malaria indicators

At the national level the key indicators for monitoring malaria control in include, malaria cases, malaria deaths and malaria case fatality rate. Data is collected at the health care facility level, sent to the district level, then to the provincial level and finally to the national level. Monthly data is collected at the national level, whilst the provinces and the districts collect weekly and daily malaria data respectively. Key data collected at the provincial level include: patient name, age, sex, blood smear date, method of detection, notification area and parasite species.

Indicator Definitions

Case fatality rate: Malaria

Number of deaths divided by number of cases, expressed as a percentage.

Reported cases (and deaths) of malaria

The number of cases (and deaths) of malaria reported to the Department of Health. Note: Since malaria transmission in South Africa is seasonal, occurring primarily between October to May, data may be reported by season rather than by calendar year. In this case data labelled '2001/02 season' would be data for July 2001 to June 2002.

Policy formulation and Implementation

A committee called the Malaria Advisory Group (MAG), consisting of national and provincial malaria officers, parastatal officers and malaria experts from the public and private sector, was appointed in 1994. MAG is instrumental in the formation of the malaria policy and has continued to review the control programme giving particular attention to challenges within the malaria control programme with recommendations for appropriate changes in policy. The latter have included changes of insecticides and drugs in response to the appearance of resistance.

The implementation of the malaria policy is undertaken by the provincial Departments of Health and coordinated by the national Department of Health.

Roll Back Malaria

South Africa is a signatory to the Abuja Declaration, committing itself to the Roll Back Malaria (RBM) Initiative.[7, 8] The goals and the strategy of the RBM initiative[8] have been formulated in close consultation with core technical teams from African countries

under the guidance of World Health Organization (WHO). The goal of Roll Back Malaria is to halve the burden of malaria by 2010.

The following targets for specific intervention strategies were established at the Abuja Malaria Summit, April 2000 (Box 2).

Box 2: RBM strategies and targets

RBM strategy	Abuja target (by 2005)
Prompt access to effective treatment	60% of those suffering with malaria should have access to and be able to use correct, affordable, and appropriate treatment within 24 hours of the onset of symptoms
Insecticide-treated nets (ITNs)	60% of those at risk for malaria, particularly children under 5 years of age and pregnant women, will benefit from a suitable combination of personal and community protective measures, such as ITNs
Prevention and control of malaria in pregnant women	60% of pregnant women at risk of malaria will be covered with suitable combinations of personal and community protective measures, such as ITNs
	60% of pregnant women at risk of malaria will have access to Intermittent Preventive Treatment
Malaria epidemic and emergency response	60% of epidemics are detected within 2 weeks of onset 60% of epidemics are responded to within 2 weeks of detection

Source: Roll Back Malaria[7]

Data and Analysis

The malaria transmission map is an official map that is produced by the Medical Research Council after consultation with the National Malaria Advisory group. The low; intermediate and high risk zones are determined using malaria notification data. This transmission map is updated every two years.

National Malaria Situation

Annual malaria cases and deaths

From 1996 the number of infections reported annually increased dramatically in the KwaZulu-Natal, Mpumalanga and Limpopo Provinces. During the years 1976 to 1995 annual malaria cases ranged from 2000 to 13 000. In 1996, 27 035 infections were reported and during 2000 this figure reached 61 934 infections with 423 deaths. These dramatic increases have been attributed to climatic conditions, parasite drug resistance and vector insecticide resistance. Subsequent to robust malaria interventions and mobilisation of additional resources, malaria cases and deaths have declined over the past 2 years. The malaria cases in 2002 deceased by 41% when compared to the 2001 figures (Figure 1). The key interventions influencing this decrease include: change in Drug Policy; change in Insecticide Policy and inter-country collaboration on malaria control. The background to these key interventions is described below.

Drug treatment interventions

The choice of first-line antimalarial drug has become controversial, with some advocating early changes to the drug selections (largely to artemisinin-combination therapies), while others have suggested adding such products to drugs that retain some activity against the parasite. In early 2004 this became a global issue, with the WHO and Global Fund being accused of supporting (and funding) irrational drug choices for economic reasons.[9] The choices that face malaria programmes are clearly illustrated by the different options exercised by the different provinces over the past few years.

In KwaZulu-Natal, during 2001, Sulphadoxine Pyrimethamine (SP)

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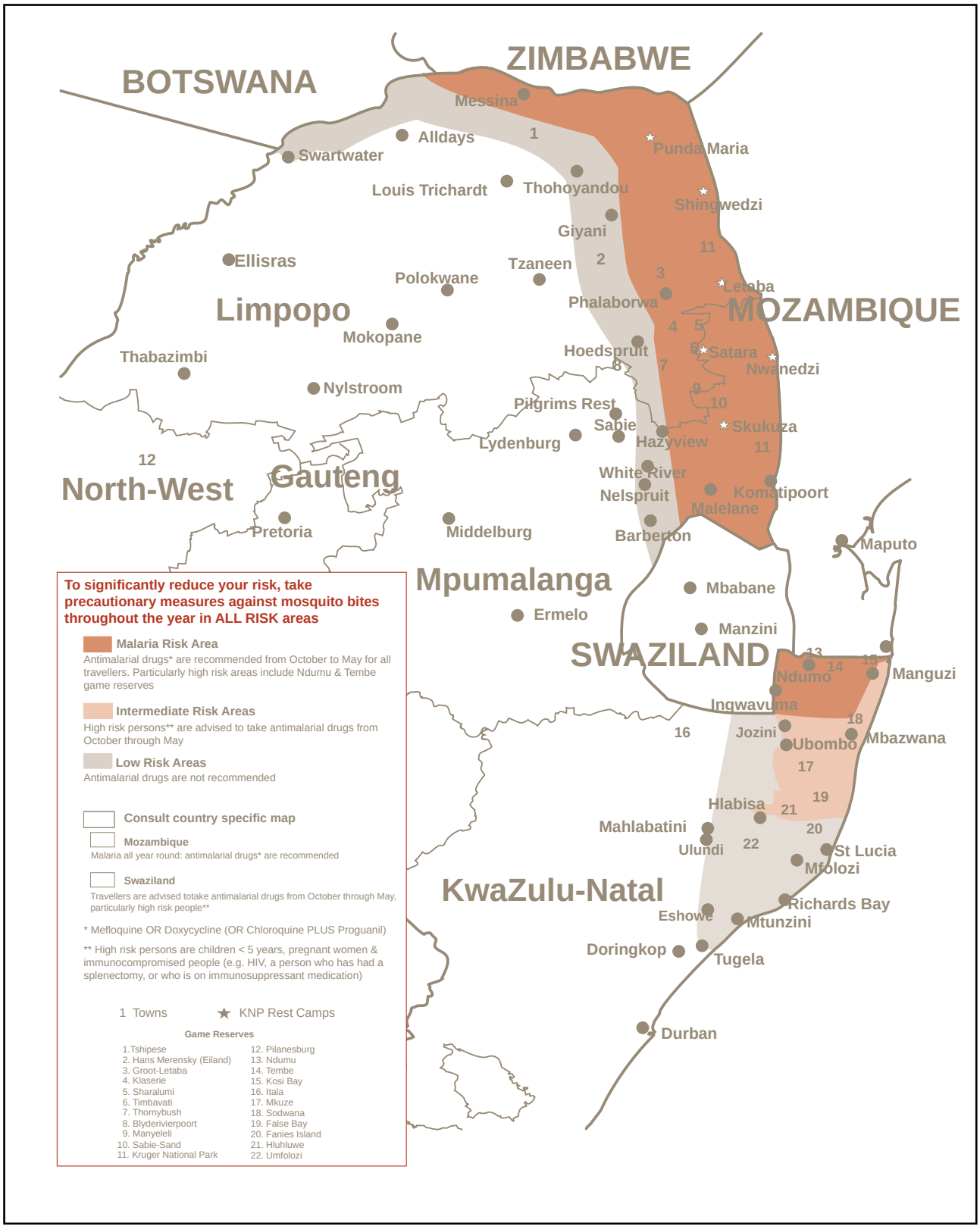
Map 1: Malaria Risk Areas in South Africa[16]



resistance levels reached 62% requiring a drug policy change to a fixed dose drug combination treatment[10] (Co-artem,® artemether plus lumefantrine). In 2002, in-vivo drug tests in Mpumalanga[11] revealed a 14% resistance to SP, necessitating the addition of a combination based (artesunate) therapy to protect SP from further increases in resistance.[12] In 2001, the in-vivo drug trials in the Limpopo province revealed a 5% resistance to SP, obviating the need for an immediate drug policy change. The change in malaria drug policy has contributed significantly to the decrease in malaria morbidity, mortality and transmission,

primarily because of the efficacy of the drug combination against the asexual stages of *Plasmodium falciparum* and a further effect by the artemisinin component which blocks the transmission stage (gametocyte) of the parasite.[13] The way forward for treating malaria in SA is through the use of combination based therapy (using the artemisinin based derivatives) which conforms with WHO drug policy.[12]

Spraying with effective insecticides

Malaria vector resistance to existing insecticides (*An. funestus* to pyrethroids), discovered in KwaZulu-Natal in 1999,[14] necessitated the change to an effective insecticide (DDT).

SA, together with 5 other African countries, was given permission from the United Nations Environmental Programme (UNEP) to use DDT only for public health use. This was after SA signed the Stockholm convention on persistent organic pollutants (pops) in 2000. DDT is currently the insecticide of choice due to its cost-efficacy and residual life. Research institutes are in the process of conducting research with the aim of looking for alternatives.

This change in insecticide has contributed significantly to the decrease in malaria morbidity and mortality in South Africa. DDT has resulted in the eradication of *An. funestus* (a potent transmitter of malaria).

Collaboration with neighbouring countries e.g. Lubombo Spatial Development Initiative (LSDI)

SA is collaborating on malaria control with neighbouring countries, Swaziland and Mozambique, within the framework of the LSDI.[15] Significant reduction in malaria cases and deaths in KwaZulu-Natal (Figure 4) have occurred since the implementation of the LSDI malaria programme in 2000.

Figure 1: Annual notified malaria cases and deaths, South Africa, 1971 - June 2003

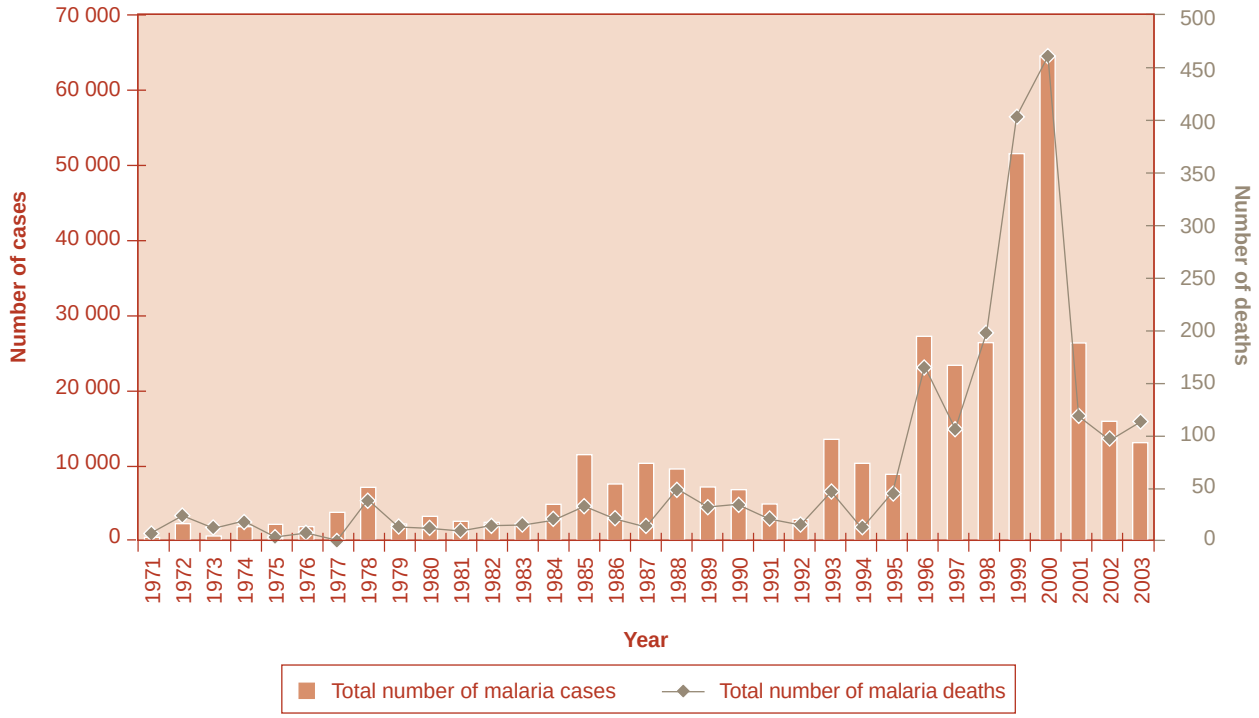


Figure 2: Malaria case fatality rate (%), South Africa, 1999-2002

Malaria case fatality rate

The national target for malaria case fatality rate in SA is 0.5%. The annual malaria case fatality rate reported during 1999, 2000 and 2002 was above this target. In 2000, due to cyclone Eline and subsequent flooding, drug and insecticide resistance, SA experienced a malaria epidemic.

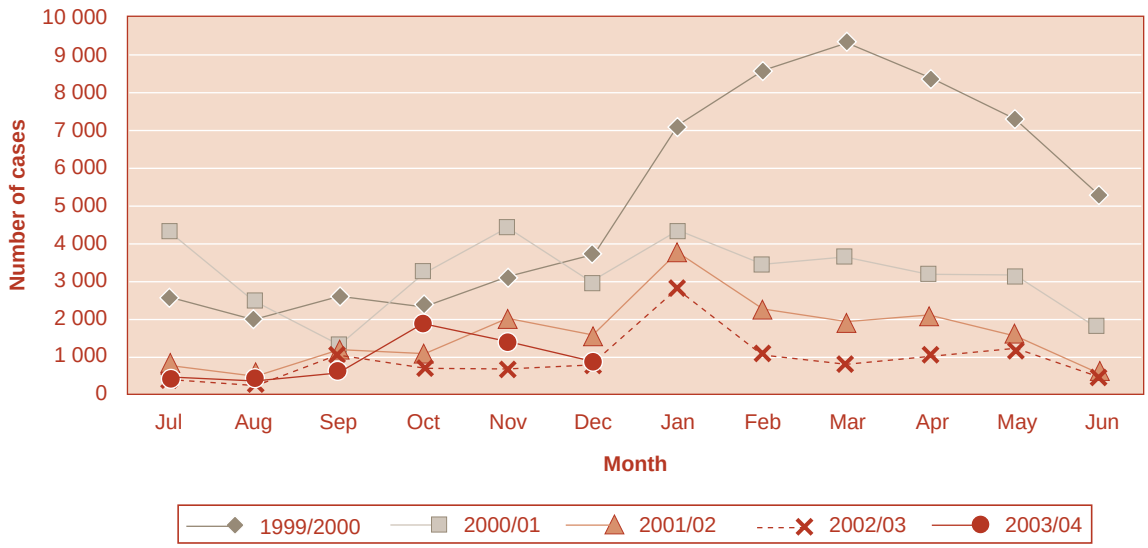
In 2002 the case fatality rate increased to above 1% in Limpopo. Investigations on the increases in malaria cases, revealed a high level of delay in treatment seeking by the malaria-affected communities.

17

Seasonal National Malaria cases for South Africa

Malaria transmission in SA is seasonal and is therefore best described using seasonal data, as presented below. Malaria cases start to increase in October, peaking in January-February, and decreases towards May. Malaria case peaks correlate with the rainy summer season resulting in a distinct pattern of transmission. The 2002/03 transmission pattern closely follows that of the two previous seasons. For the past three seasons, a decrease in the number of nationally reported cases has occurred. For the 2002/03 season, 10 989 malaria cases were reported. This represents a 42% decrease in comparison to the 2001/02 season. Decreases in the number of provincially reported malaria cases have occurred during the past two malaria seasons (Table 4).

Figure 3: Reported malaria cases by season, South Africa, 1999-2004



Provincial Malaria Situation

Table 1: Annual reported cases of malaria by province, 1999-2003 (calendar years)

	KZN	LP	MP	Rest of provinces	SA
1999	27 238	11 228	11 741	1 237	51 444
2000	41 786	9 487	12 390	959	64 622
2001	9 473	7 197	9 061	775	26 506
2002	2 345	4 836	7 965	495	15 614
2003	2 042	6 779	4 201	35	13 057

Table 2: Seasonal reported cases of malaria by province, 1998/99-2002/03

	KZN	LP	MP	Rest of provinces	SA
1998/99 season	22 278	8 952	9 941		42 425
1999/2000 season	40 784	8 589	12 348		62 220
2000/01 season	17 494	9 747	9 747		38 665
2001/02 season	3 493	6 068	8 819	574	18 954
2002/03 season	1 709	5 135	4 098	47	10 989

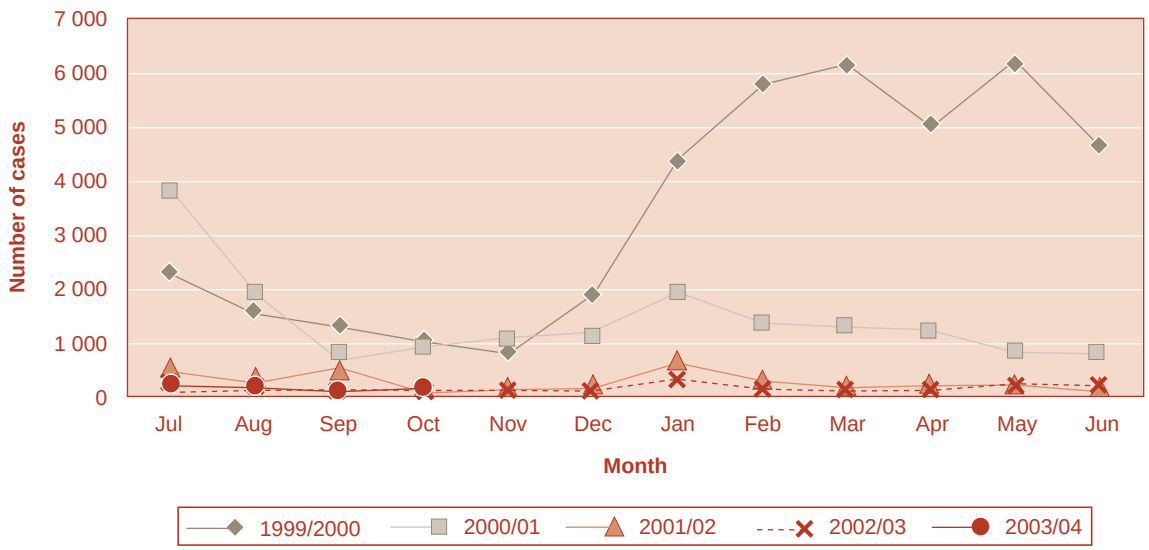
Table 3: Annual Case Fatality Rate for Malaria by province, 1999-2002

	KZN	LP	MP	SA
1999	0.8	1.1	0.6	0.8
2000	0.8	0.7	0.4	0.7
2001	0.5	0.8	0.1	0.4
2002	0.7	0.9	0.4	0.6

KwaZulu-Natal

Malaria cases have been steadily decreasing in KwaZulu-Natal, over the past seasons. This is due to the cross border malaria collaboration with Swaziland and Mozambique, and the use of ACT and DDT.

Figure 4: Reported malaria cases by season, KwaZulu-Natal, 1999-2004



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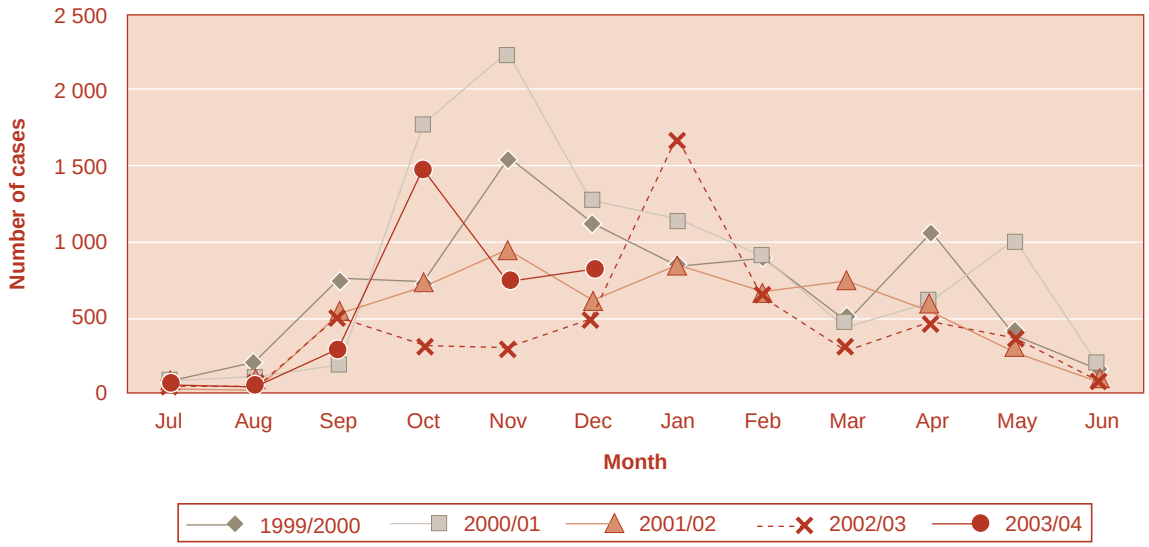
Limpopo

The seasonal malaria transmission trend for Limpopo resembles the national trend. However, monthly variations resulting from localised outbreaks can be seen. A 15% decrease in the number of reported malaria cases was recorded in the Limpopo Province for the 2002/2003 season when compared to the 2001/2002 malaria season. In January 2003, an outbreak of malaria occurred in the northeastern part of the province and affected districts included: Vhembe, Malamulele, Mutale and Thohoyandou. For this period (Jan 2003), a total of 1685 malaria cases and 23 malaria deaths were notified. This represents a 49% increase in the number of malaria cases in comparison to same period in 2002. Following the 2000/2001 epidemic season, reported malaria cases in successive seasons have decreased.

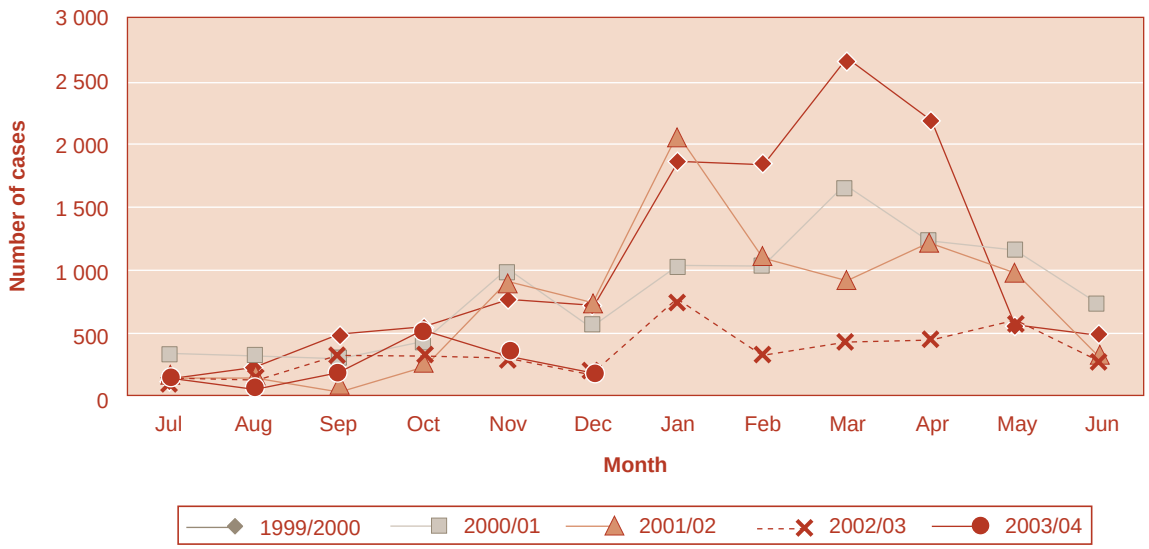
Figure 5: Reported malaria cases by season, Limpopo, 1999-2004



Mpumalanga

Following the 2000/2001 malaria epidemic season, reported malaria cases in successive seasons have decreased. A 53% decrease in the number of reported malaria cases was recorded in the Mpumalanga Province for the 2002/2003 season when compared to the 2001/2002 malaria season. These decreases in malaria cases can be attributed to re-introduction of DDT and the drought conditions currently prevailing in the Mpumalanga Province.

Figure 6: Reported malaria cases by season, Mpumalanga, 1999-2004



Malaria seasonal comparison

When data from the 2001/2002 and 2002/2003 malaria seasons are compared, the burden of South African malaria cases appears to have shifted slightly from Mpumalanga Province to Limpopo Province. In 2001/2002 Limpopo Province accounted for 32% of the total South African malaria cases, while in 2002/2003, this increased to 47% (an increase of 15%). However, as the total number of South African malaria cases decreased in 2002/2003 when compared to 2001/2002, the actual number of malaria cases in Limpopo Province also decreased from 6068 in 2001/2002 to 5135 in 2002/2003.

Figure 7: Proportion of malaria cases by province, South Africa, 2001/2002 season (n=18 954)

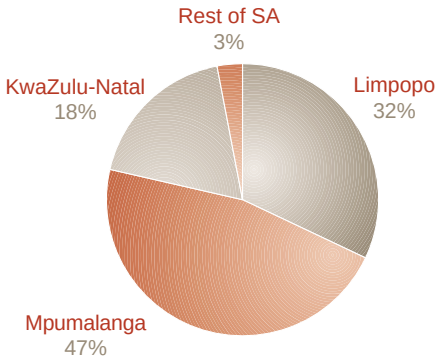
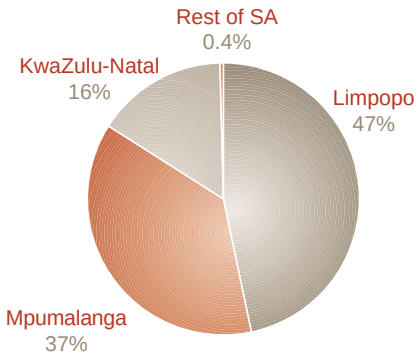


Figure 8: Proportion of malaria cases by province, South Africa, 2002/2003 season (n=10 989)



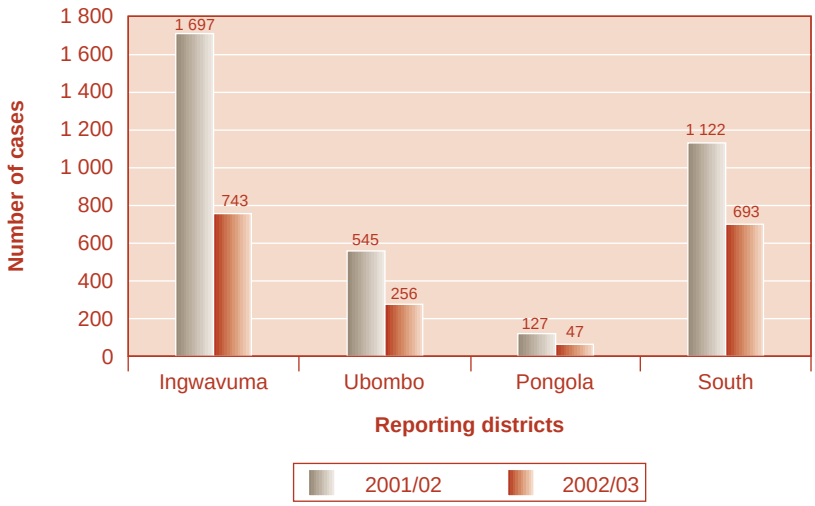
Malaria cases by districts[a]

The malaria cases in most of the districts in KwaZulu-Natal, barring Ubombo, have been decreasing in the 2002-2003 season compared to the 2001-2002 season (Figure 9). The reasons for this are due to the cross border malaria collaboration with Swaziland and Mozambique, the use of DDT and the use of Co-artem®.

In the Limpopo provinces malaria cases in all malaria districts barring Giyane district have decreased in the 2002-2003 season compared to the 2001-2002 season (Figure 10). Malaria interventions need to be scaled up in the Malamulele, Namakgale, Vuwani and Giyane districts, as these districts still record relatively high malaria cases.

The number of malaria cases in all the malarious districts of the Mpumalanga province (Figure 11) decreased in the 2002-2003 season compared to the 2001-2002 season. Tonga however remains the highest malaria affected district.

Figure 9: Reported malaria cases by district, KwaZulu-Natal, 2001/02 and 2002/03 seasons



a The malaria surveillance system is still using the old magisterial districts and has not implemented the newly demarcated districts.

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Figure 10: Reported malaria cases by district, Limpopo, 2001/02 and 2002/03 seasons

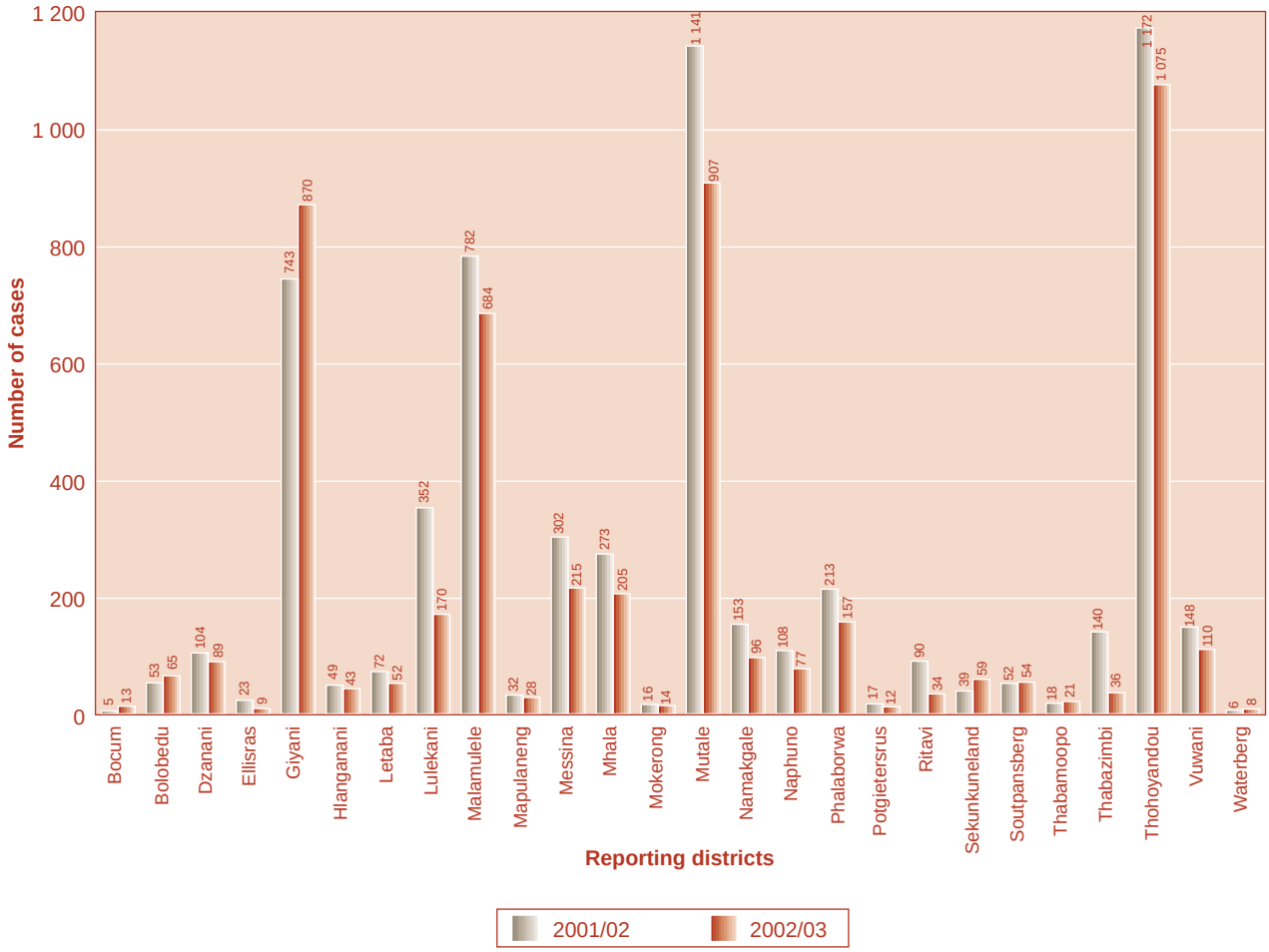
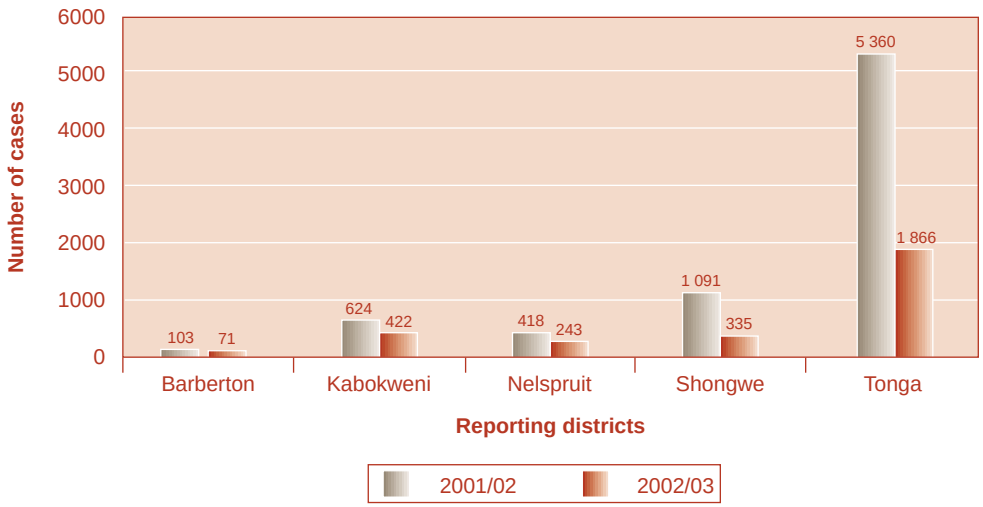


Figure 11: Reported malaria cases by district, Mpumalanga, 2001/02 and 2002/03 seasons



Abuja and National Targets

South Africa has surpassed the Abuja targets for several indicators, including access to treatment. The RBM baseline survey is yet to be conducted in SA, hence the data quoted here are from the desk review based on the provincial figures.

Access to treatment within 24hrs

Health care facilities within the malarious areas are well stocked (in the region of 95-100%) with antimalarial drugs, hence access to treatment, subsequent to diagnosis, is not a concern.

Use of appropriate treatment within 24hrs

Provincial Malaria programmes ensure that training and drug supplies are in keeping with the National Malaria Treatment Policy,[16] hence appropriate drugs are stocked at the health care facilities within the malaria affected provinces.

Epidemics detected within 2 weeks and appropriately responded to within 2 weeks

Malaria surveillance systems in the malaria affected provinces are sensitive, and able to detect malaria epidemics within 2 weeks. However malaria surveillance at the district level requires strengthening.

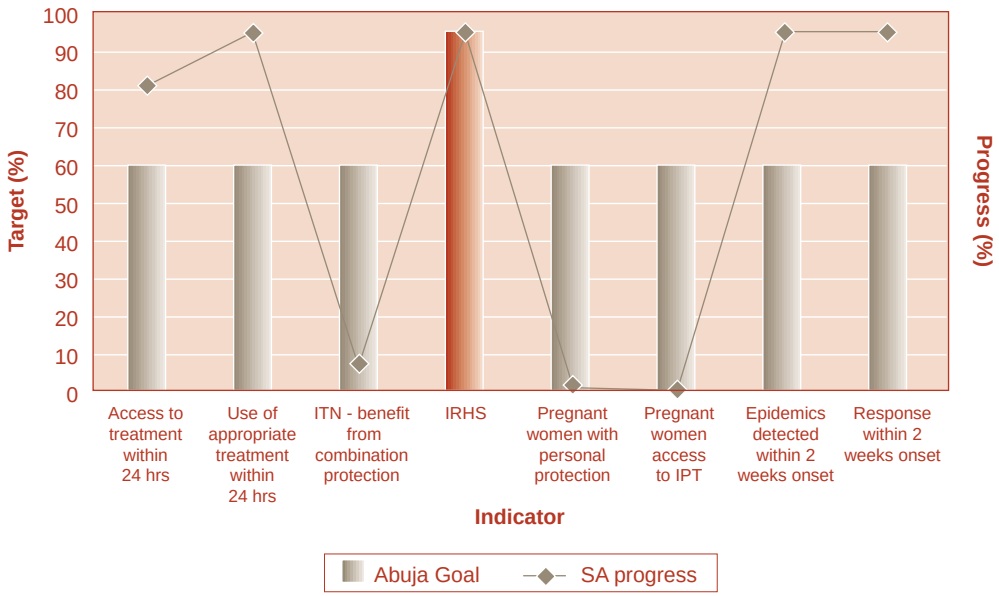
Insecticide Treated Nets (ITN)

The use of ITNs is a strategy that is not being used widely in SA. Thus the coverage of ITNs is low, ranging from 3-5%. Indoor residual house spraying (IRHS) remains the major vector control thrust of the malaria control programme. Studies in SA, showing that ITN interventions have a positive impact on malaria case reductions, are limited.[17] Thus policy makers are wary of adopting ITN as a main strategy for controlling malaria. Nevertheless, ITN policy is being developed, but the debate continues for the implementation of ITNs as a complementary or routine strategy, or in epidemic situations.

Intermittent Presumptive Therapy (IPT) use for pregnant women

IPT for pregnant women is not a priority for SA, as people living in malaria areas are rarely asymptomatic parasite carriers. In South Africa's context this intervention may promote drug resistance and will not be cost-effective.

Figure 12: South Africa's progress towards Abuja and National Goals, 2003



Note: Indoor residual house spraying (IRHS) is not an Abuja Target, but data have been included to show population protected.

17

Recommendations

From the late 1940s, the malaria risk area in SA was at least five times greater than it is today. The success of the malaria control programme in SA is largely due to vector control methods such as indoor residual house spraying (IRHS). The distribution of malaria in SA has decreased dramatically since the 1940's, when vector control was implemented on a large scale. Both larval and adult mosquito control, the latter by spraying houses with residual insecticides, have been practised. The resultant control has been followed by significant economic development, by opening previously uninhabitable areas for agriculture, mining and industry.

Over the past few years, the South African Malaria Control Programme has managed, through its various interventions and collaborative work, to decrease the incidence of malaria, annually. However, the overall challenge is to maintain the current trends. Factors influencing malaria transmission include: social change, climate variation, migration, cross-country collaboration and other factors e.g. drug and insecticide resistance. These factors need to be monitored via routine programme activities or operational research.

The South African Malaria Control Programme is fortunate to have a strong support base in the National Malaria Advisory Group. It is recommended that advisory groups such as this continue to support the programme. Malaria has been rolled back to the areas bordering neighbouring countries. In order to reduce the transmission area further, good collaboration between neighbouring countries is crucial.

Malaria transmission in Limpopo is largely limited to the border areas with Mozambique and Zimbabwe. Strategies to address cross border malaria control with Limpopo and Mozambique will have a significant positive impact on malaria reduction in South Africa, similar to the achievements made with the LSDI malaria initiative. The Department of Health (National and Limpopo Province) is currently in the initial stages of setting up a cross border malaria initiative with Zimbabwe; this initiative should be encouraged and supported by partners and stakeholders.

Some of the challenges facing the malaria programmes and requiring solutions are outlined below:

- As South Africa's economy grows, population movement from neighbouring malarious countries is inevitable. Parasite and vector transmission is highly likely to occur during population movement. Control programmes need to ensure that, with increased movement of people, malaria transmission is minimised.
- The shift from rural mud structure to western style housing coupled with insecticide resistance means that alternative insecticides and / or alternative vector interventions will need to be sought.
- Skills in case management, vector control and programme management capacity needs strengthening at the district levels.
- Community awareness needs to be increased especially in districts of Limpopo. Malaria awareness raising campaigns needs to be ongoing before and during the malaria transmission period. There is a tendency for communities to be lax and therefore delay seeking treatment when malaria incidence decreases.
- Vector resistance to insecticides needs to be regularly monitored as undetected resistance could result in epidemics due to vector numbers increasing.
- Drug resistance monitoring needs to be ongoing, in view of the rapid development of parasite drug resistance in recent years in SA.
- Data need to be collected and analysed according to new district demarcations. This will enable better planning at the district level.

Conclusions

The South African Malaria Control Programme has made significant strides in controlling malaria in South Africa, amidst a changing environment. The malaria morbidity and mortality figures are testimony to this. With new challenges: cross border movement of people, parasite drug resistance and insecticide resistance the malaria programmes will need to strengthen its arsenal of interventions especially at the district levels. With the change in housing structures and the added problem of insecticide resistance among rural communities within the malarious areas, alternative vector control strategies may be needed. New strategies such as Integrated vector management (insecticide repellents, Insecticide Treated Nets and Larviciding) should be considered. Interventions that are adopted should be based on sound, scientific evidence.

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